5.0 Environmental Assessment

5.1 Introduction

The development proposals contained within this Project Application are generally in accordance with the approved Concept Plan for the redevelopment of Liverpool Hospital. The detailed studies prepared as part of the Project Plan Application assessed the potential impacts of the components and found that the impacts were limited. These findings were consistent with the Concept Plan assessments.

This section of the Project Application together with the appendices provides additional information and addresses the key assessment requirements identified by the Director General including:

- Relevant EPIs and Guidelines.
- Key Issues
  - Transport, Traffic and Access
  - Urban form and Design
  - Multi-Storey carpark
  - Child Care Centre
  - Amenity Impacts on neighbouring properties
  - Construction and operational impacts.
  - Stormwater, drainage and flooding
  - Services.

The Draft Statement of Commitments is setout in Section 6 of this report.

5.2 Relevant Environmental Planning Instruments and Guidelines

Director General's Requirements are

- *Provide an assessment against the Concept Plan and justification for any departures or non-compliances;*
- *DCP 30 – Liverpool City Centre urban design guidelines.*

Assessment against the Concept Plan

As noted in Section 3 the Concept Plan has been closely followed in the design development phase that led to this Project Application.

In the Clinical Services Building Project Application lodged with the Department of Planning in July 2008 it was noted that the proposed expansion of the Central Energy Plant on the East Campus had been deflected to within the new Clinical Services complex. As a consequence the redundant site immediately west of the rail corridor and adjacent to the proposed vehicular bridge ramp access has been selected for the Engineering Services Building.

The relocation of the Engineering Services Building (which forms part of this Project Application) to East Campus provided an opportunity to retain a significant part of the existing Ron Dunbier building and the retention of on site accommodation for Hospital staff.

The Concept Plan provided for the construction of an additional road lane along the northern boundary of the West Campus which involved acquiring lands occupied by the Liverpool Girls' High School. The detailed design phase identified a number of difficulties associated with this option and it was concluded that the additional lane, which was for private hospital purposes only, was not required and that a number of the functions could be met by alternative means. Accordingly it is no longer proposed to construct the additional lane on land within the Liverpool Girls' High School.

The Concept Plan also indicated that a potential review of the existing Remembrance Avenue intersection with the Hume Highway would be undertaken given the extension of Hart Street and the construction of a new intersection with the Hume Highway.

The traffic studies indicated that removing the existing Remembrance Avenue intersection could place unnecessary traffic movements on the Hart Street intersection and on the road leg between the Hume Highway and the first roundabout at Remembrance Drive. Accordingly it was resolved that the Hume Highway new intersection and Hart Street traffic would be monitored together with the pattern of traffic movement on the existing Remembrance Drive/Hume Highway intersection for the first three years following the completion of the new intersection. The resultant data base would then allow an informed decision to be made on the Remembrance Drive/ Hume Highway intersection.

Apart from the above variations this Project Application reflects the principles and specific intent of the approved Concept Plan.

State Environmental Planning Policies

State Environmental Planning Policy (Major Projects) 2005

In April 2006 the Minister for Planning formed the opinion that Liverpool Hospital Redevelopment was a Major Project under the terms of the State Environmental Planning Policy – Major Projects.

In September 2006 the Minister declared the proposal to be a Critical Infrastructure Project.

In February 2007 the Concept Plan Application was approved by the Minister.

The Minister's declaration that the proposal was a Critical Infrastructure Project, under Section 75R of the Act, effectively meant that Environmental Planning Instruments other than any specific State Environmental Planning Policies do not apply. In the Director General's Environmental Assessment Report it was noted that there were no specific SEPPs that applied.

However given the Director General's reference to DCP 30 the following sections of this report address the relevant LEP and DCP instruments that would otherwise apply to the project.

Liverpool Local Environmental Plan 2008

The Concept Plan Application referred to the Liverpool Local Environmental Plan 1997. The current and relevant LEP is the Liverpool LEP (2008) which was gazetted on 29 August 2008.

The lands to which this Project Application relates include the following land use zones:

- SP2: Infrastructure (Health Services Facility and Educational Establishment)
- SP2: Infrastructure (Railway)
- SP2: Infrastructure (Classified Road)
- IN1: General Industrial
- RE1: Public Recreation
- R3: Medium Density Residential

Refer Table 2.01 - Landownership and Figs. 2.03 and 2.04

The objectives of the principle SP2: Infrastructure component include:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.
- To reserve land for the provision of infrastructure.

The proposed Stage 2 Infrastructure and Ancillary Works are consistent with the objectives of the Liverpool Local Environmental Plan 2008 and will provide for enhanced medical and ancillary facilities within the Hospital campus.

Liverpool DCP 2008

The DCP 30 – Liverpool City Centre Urban Design Guidelines referred to in the Director General's Requirements was replaced by the Liverpool City Centre DCP 2007 which in turn has been replaced by DCP 2008 (adopted by Council 28 July 2008 and came into effect on 29 August 2008). This DCP supplements the provisions of the Liverpool Local Environmental Plan 2008 by providing detailed guidance for the development and redevelopment of land within the Liverpool City Centre and environs.

The proposed Stage 2 Infrastructure and Ancillary Works are consistent with the objectives of the current 2008 DCP.

Compliance with DCP 30

As previously indicated above DCP 30 Liverpool City Centre Urban Design was the applicable DCP during the preparation of the approved Concept Plan. DCP 30 was replaced by the Liverpool City Centre DCP 2007 which was adopted by Council in June 2007 and came into effect in December 2007. The DCP was prepared by the Cities Taskforce and is focused primarily on the commercial, retail and residential areas associated with the City Centre.

The Liverpool City Centre DCP 2007 was subsequently integrated into the Liverpool DCP 2008 which came into effect on 29 August 2008.

A careful assessment of the various diagrams, controls and objectives within the relevant DCP indicates that there is little specific direction for the Hospital campus. The DCP identifies the education and medical precinct located at the eastern edge of the City Centre. The precinct includes the SSWAHS (Liverpool Hospital) and attendant medical centres and clinics, the Liverpool Private Hospital, public and private schools and Liverpool TAFE buildings. It is noted that the education and health uses intersect with the railway and transport interchange.

The DCP notes that apart from the recently completed TAFE building on Bigge Street, which reinforces an urban dialogue between historical buildings and the Liverpool Railway Station, the precinct character is fragmented elsewhere. The DCP comments on the Hospital as follows:

> '*... Expansion of the Hospital has occurred in a piecemeal fashion and without consideration for the development of a masterplan for the precinct. The Hospital lands extend to the east of the railway line and abut the Georges River. This places constraints on transport access, communication, land use and public access to the foreshore.*'

The approved Concept Plan for the Hospital addressed the need for a clear masterplan. The construction of the new Clinical Services Building and refurbished Clinical Services Building will mark the first stage of the hospital redevelopment. The Stage 2 Infrastructure and Ancillary Works will provide for necessary support services and infrastructure which will enable the new Main Hospital works to function efficiently. The Stage 2 Infrastructure and Ancillary Works will address a range of issues identified in the analytical processes that led to the Concept Plan and the constraints identified in the DCP.

The relevant sections of the DCP include:

- Building Form.
- Pedestrian Amenity.
- Environmental Management.

The key headings identified in the DCP under Building Form include:

- Building to street alignment and street setbacks.
- Street frontage heights.
- Building depth and bulk.
- Boundary setbacks and building separation.
- Mixed use buildings.
- Site cover and deep soil zones.
- Landscape design.
- Planting on structures.
- Solar Access.

A critical assessment of the relevant figures, objectives and controls under each of the above headings demonstrates that for the most part they have limited relevance for the works proposed as part of this Project Application. For example none of the proposed buildings will have frontage to a public road. However, principles of good urban design as described in the DCP such as maximising pedestrian connections between land uses, articulation of building facades and minimisation of overshadowing have been incorporated into campus planning as well as design development of individual buildings.

Building depth and bulk issues as well as boundary setbacks and building separation cannot readily be applied to the Hospital complex. The approved model for the hospital redevelopment under the Concept Plan is that of a campus rather than a mixed use urban precinct. The reference to mixed use buildings does not readily apply to the Hospital development in general and to this Project Application in particular. The single use buildings and structures such as the multi-storey carpark, child care centre, engineering services building and bridges over the rail corridor form part of the approved Concept Plan.

Site cover and deep soil zones were addressed as part of the studies leading to the approved Concept Plan. The proposed landscape works address a number of the objectives identified in the DCP. Soft landscape works are proposed adjacent to the multi-storey car park, the ambulatory entry sequence to the new Clinical Services Building, the northern link road between the northern boundary of the Hospital and Lachlan Street as well as the introduction of landscape into the modified Hart Street and the extension through to the Hume Highway. Existing, mature trees located on the hospital campus will be retained wherever possible. The child care centre will be provided with the appropriate areas for indoor and outdoor play and recreation in accordance with the relevant Australian Standards.

The Stage 2 Infrastructure and Ancillary Hospital Works will have no impact or effect on solar access to public open spaces including Bigge Park.

The key headings under Pedestrian Amenity include

- Permeability.
- Active street frontages and addresses.
- Front fences.
- Safety and security.
- Awnings.
- Vehicular/footpath crossings.
- Pedestrian over and under passes.
- Building exteriors.
- Corner treatments.
- Public artworks.
- Advertising and Signage.

As with Building Form the specific diagrams relating to pedestrian amenity do not provide specific direction for the Hospital complex and a number of the issues are of questionable relevance. However, the approved Concept Plan placed a high level of importance on improving the pedestrian permeability of the hospital campus. The Infrastructure and Ancillary Hospital Works support the improved pedestrian permeability of the campus in the following ways:

- The pedestrian bridge will provide a 24 hour, covered, security monitored link across the rail corridor between the East and West campuses.
- The pedestrian bridge will provide for direct access between the multi storey car park and the new Clinical Services Building. It will also enable staff located in the East Campus to gain access to West Campus facilities
- Rationalisation and upgrading of internal roads on the East and West Campuses will facilitate improved pedestrian connections to at grade car parking areas.

Issues such as active street frontages, front fences, awnings and the associated objectives have little direct bearing on the proposed buildings. Under public artworks all major developments in the Liverpool City Centre over 5,000m^2 are required to prepare a public art plan as part of their development proposal. A public art plan has not been prepared for this Project Application.

The DCP contains objectives and controls on pedestrian access, vehicular access, on-site parking and site facilities including refuse collection and removal. The provision and allocation of car parking on the hospital campus is discussed in Section 4.3 and Section 5.3 of the Project Application.

Provision has been made for the increased parking demands identified in the approved Concept Plan. Elements include a new multi storey car park (800 spaces) on the East Campus, extension of existing surface parking areas on the West Campus together with new short term parking areas adjacent to the Clinical Services Building ambulatory entry approach as well as the 150 basement car parking provided within the new Clinical Services Building. Provision has also been made for the upgrading the surface areas and formal marking of informal car parking areas currently utilised within East Campus.

Section 5 of the DCP deals with environmental management and addresses the following issues

Energy efficiency and conservation.
- Water conservation.
- Reflectivity.
- Wind mitigation.
- Noise.
- Waste and recycling.
- Flood plain and water cycle management.

This Project Application addresses energy efficiency as well as water conservation as part of a range of ESD measures.

In terms of flood plain and water cycle management assessments have been carried out into the 1:100 flood event as well as a Probable Maximum Flood event (PMF). Negotiations between the Hospital and Council have acknowledged that neither the Child Care Centre or the Engineering Services Building are critical functional elements of the Hospital in a PMF event. Accordingly it has been acknowledged that the Child Care Centre can be expanded at its current floor level which is set above the 1:100 flood event. The Engineering Services Building floor level matches the existing Central Energy Building floor level and is set above the 1:100 flood event but below the PMF event.

5.3 Key Issues

Introduction

The following section focuses on the issues set out in the Director General's Requirements. The key headings addressed in this document are as follows;

- Transport, Traffic and Access
- Urban form and Design
- Multi-Storey carpark
- Child Care Centre
- Amenity Impacts on neighbouring properties
- Construction and operational impacts.
- Stormwater, drainage and flooding
- Services

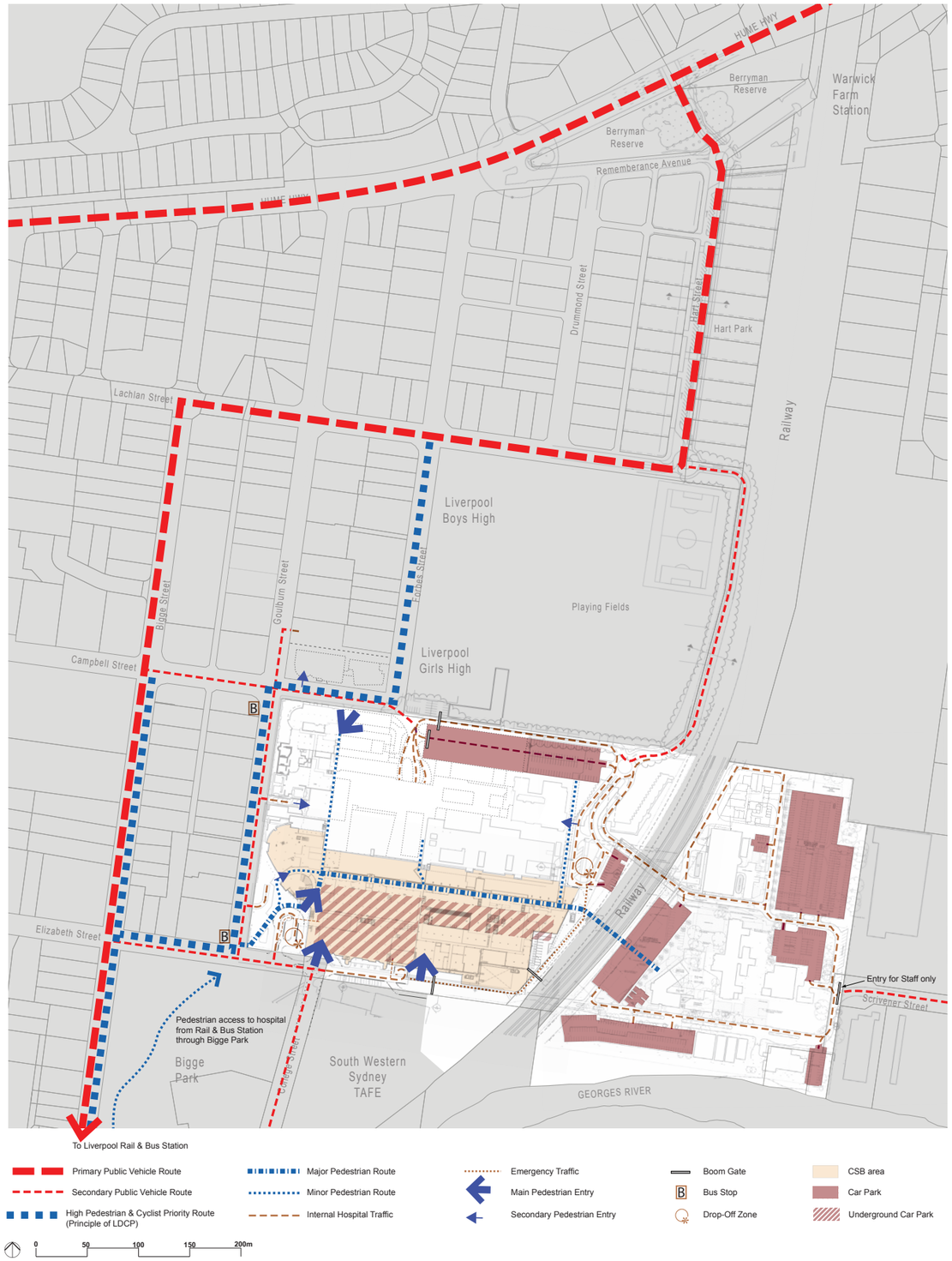


Fig 5.01 - Proposed Movement System

Transport Traffic and Access

The Director General's Requirements are:

- *Land acquisition arrangements and design details for roads and bridges*
- *Internal road design, access points, traffic management and hierarchy;*
- *Car parking management across the site;*
- *Pedestrian and bicycle paths and linkages;*
- *Compliance with council standards for external roads*

Land acquisition arrangements

To secure the external road pattern identified in the approved Concept Plan negotiations have been conducted with RailCorp and with the Department of Education (Liverpool Girls' High School), Liverpool City Council, Department of Planning and RTA. The objective has been to identify land required to construct the northern link road from the northern boundary of the West Campus of Liverpool Hospital through to Lachlan Street as well as the modification and extension of Hart Street to the Hume Highway.

During the design development phase it was resolved that the proposed additional road lane in the approved Concept Plan, located immediately north of the northern boundary of the Hospital and extending from the railway corridor through to Campbell Street, would not proceed. In part this decision reflected complexities and difficulties associated with securing the land for the additional lane and the impacts that it would have had on a number of school facilities and functions.

With the Hart Street extension through Berryman Reserve the land is effectively in public ownership (Department of Planning) and under the effective care, control and management of Liverpool City Council as is Hart Street.

The Department of Planning indicated support for the Hart Street extension through the Berryman Reserve to secure the new intersection with the Hume Highway.

The modifications to Hart Street include the introduction of a landscaped median and will result in a marginal increase in the width of the Hart Street easement. The increase in easement will be taken up by minor modifications to the eastern boundary of Hart Park in accordance with the approved Concept Plan. Liverpool City Council officers have been consulted on the detailed design of Hart Street modifications and have attended meetings with the RTA.

Design details external roads

Design details for the Northern Link Road provide for a 7.5m wide pavement set within a 11m wide easement. Provision has been made for landscaping and 1.2m pedestrian pathway which will link Lachlan Street to the northern boundary of the Hospital. The Northern Link Road will be fenced on both sides to secure the playing fields associated with Liverpool Boys' and Girl's High Schools and to maintain the integrity of the rail corridor.

The Hart Street modifications provide for the introduction of a landscaped median which will facilitate traffic flows and access to the Hospital from the Hume Highway. The intersections with Lachlan Street and Remembrance Avenue are defined by roundabouts which will facilitate traffic turning movements particularly given the level of long term car parking associated with Warwick Farm Station and the Hospital.

The design of Hart Street between Lachlan Street and Remembrance Avenue will retain the existing forms of access to the residential apartment buildings which face Hart Street and provision has been made for angled parking along the eastern boundary of Hart Street. Negotiations with Council have indicated a clear preference to maintain the existing level of car parking as far as possible. It is noted that there has been recent activity and development within Hart Park. To the south, a circular garden has been established which has been implemented by Aboriginal participation and Council has prepared proposals for upgrading the northern sector of Hart Park. The proposed parking arrangements reflect and respect the committed works within Hart Park.

Negotiations have been conducted with the RTA and detailed design work has been prepared for the Hart Street and Hume Highway intersection. The detailed drawings that have been prepared for the Hart Street component are contained in Appendix C.

In summary the proposed external road works include:

- New northern link road and the associated new north eastern entry to the hospital campus. The road will be private.
- Modifications to Hart Street including landscaped median, angled commuter parking and a new intersection with the Hume Highway.

Design details bridges

- Vehicular Bridge
  The new vehicular bridge will provide direct vehicular access between the East and West Campuses of the Hospital across the rail corridor. Fig 5.02 illustrates the bridge and approach ramps on either side of the vehicular bridge and the bridge component .

The main span of the bridge will consist of 5x1,800mm deep Super-T girders with a clear span of approximately 39m across the rail corridor. Concrete parapets with steel railings will be incorporated on either side of the road carriageway and anti-throw screens will be attached to the main span over the railway corridor.

The horizontal and vertical alignment of the approach ramps and the superstructure of the bridge have been influenced by the need to provide ready access to Level 6 (RL 17.8m) of the proposed multi storey car park.

The design of the bridge enables foundations, piers and other bridge elements to be constructed outside the rail corridor with minimal impact on train movements. The bridge deck will have a clear width between traffic barriers of 7.6m with two 3.5m wide traffic lanes and 300mm shoulders. The bridge approaches will be constructed with reinforced soil ramps faced with vertical walls of concrete block Standard concrete traffic parapets will be located on either side of the ramp carriageways and the road surface of compacted road sub base overlaid by asphalt.

The bridge and associated ramps will be private roads. The ramp lengths and alignments have been developed to suit the road geometry and will meet the relevant Australian Standards.

The existing 33kV line is located in the western sector of the rail corridor and is 18m above ground level. It is anticipated that the 33kV line will be relocated underground in the vicinity of the bridge.

The vertical clearance above track level for the vehicular bridge is in accordance with the minimum vertical clearance requirements of RailCorp Standard ESC 215 Transit Space – October 2006. Refer to Appendix H for detailed drawings of the vehicular bridge and design report.

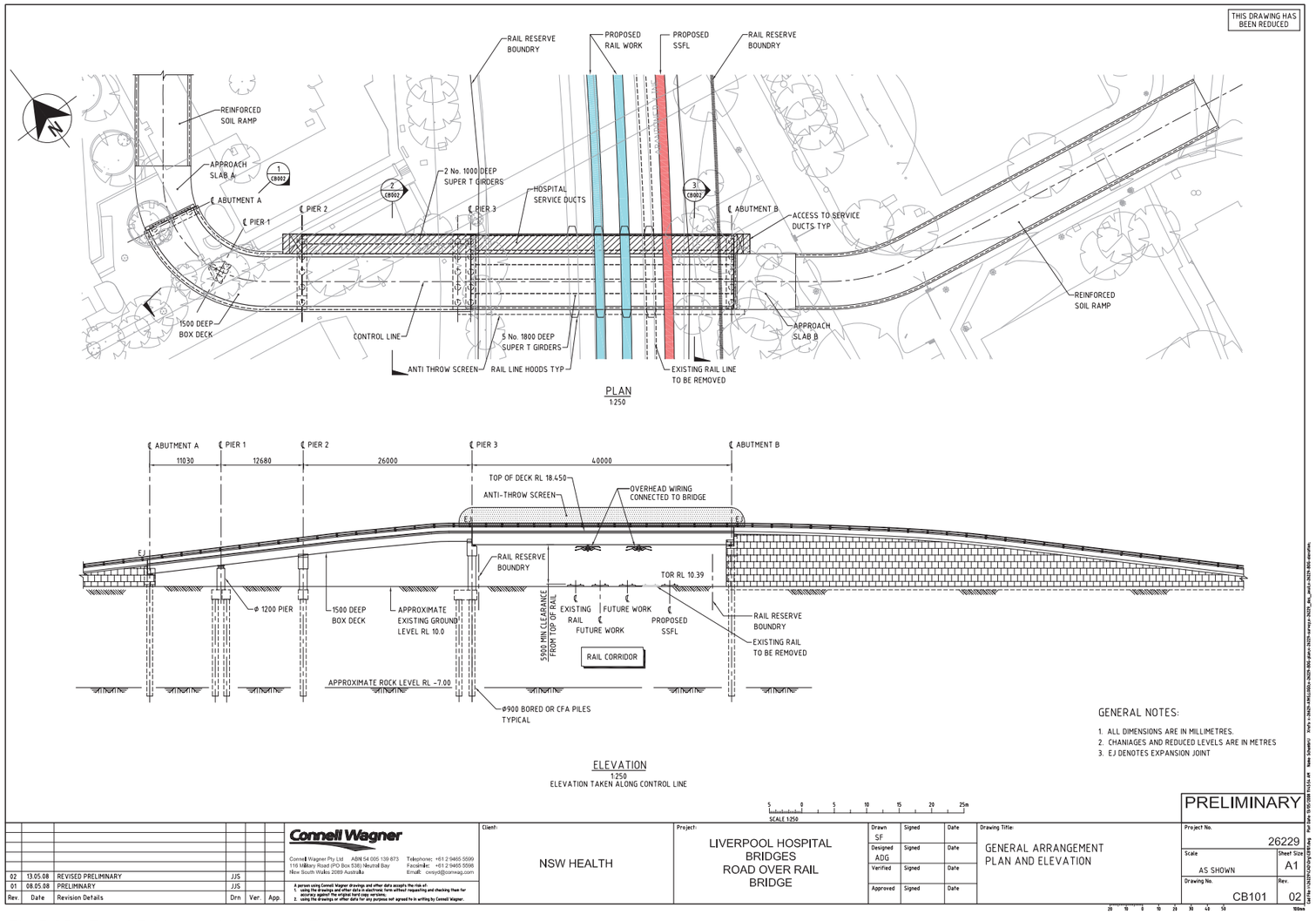


Fig 5.02 - Road Bridge and Approach Ramps

- Pedestrian bridge

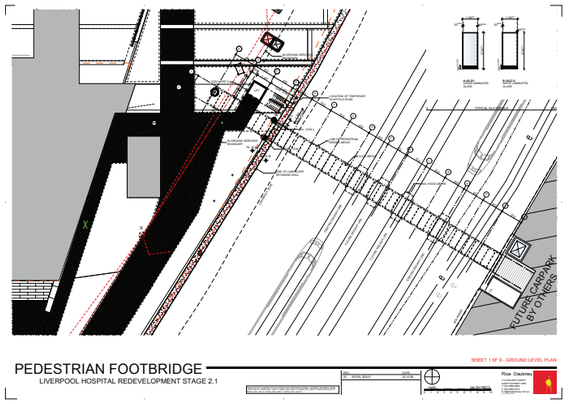
  The pedestrian bridge will provide direct covered access across the rail corridor and directly link the multi storey car park and the new Clinical Services Building. Access links will also be provided so that staff located within the East Campus can readily gain access to facilities and resources in the West Campus. Lift and stair access will be provided at each end of the pedestrian bridge to enhance pedestrian access between the East and West Campuses. Figs. 5.03 and 5.04 illustrate the way in which the pedestrian bridge will be linked with the new Clinical Services Building and the multi storey car park.

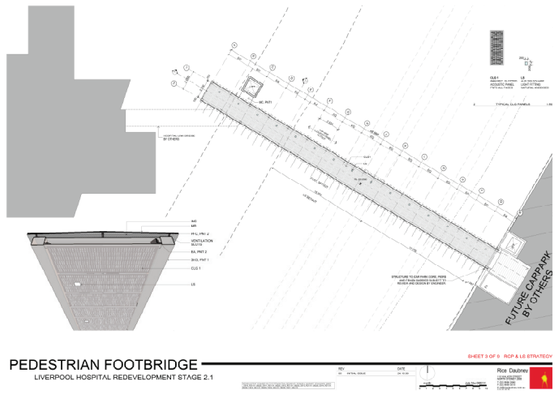
  In part the pedestrian bridge reflects the substantial additional staff parking provided in East Campus. As a consequence there will be increased levels of staff pedestrian movements between the East and the West Campuses.

  The bridge will clear span the rail corridor (approximately 40m). The bridge structure consists of vertical steel trusses with an in situ concrete bridge deck. The trusses will be clad in glass with a metal roof.

  The western end of the bridge is supported by a concrete column located outside the 20m train impact zone. The residual short span is cantilevered and connects with the lift structure adjacent to the new Clinical Services Building. To the east the pedestrian bridge is supported by a lift shaft and stairs which form an integral part of the multi storey car park.

  The design of the pedestrian bridge allows for all supporting elements to be constructed outside the rail corridor and hence minimal impact on railway operations within the rail corridor.





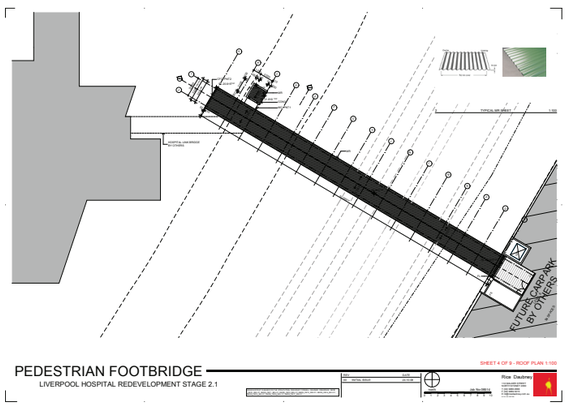


Fig 5.03 - Pedestrian Bridge

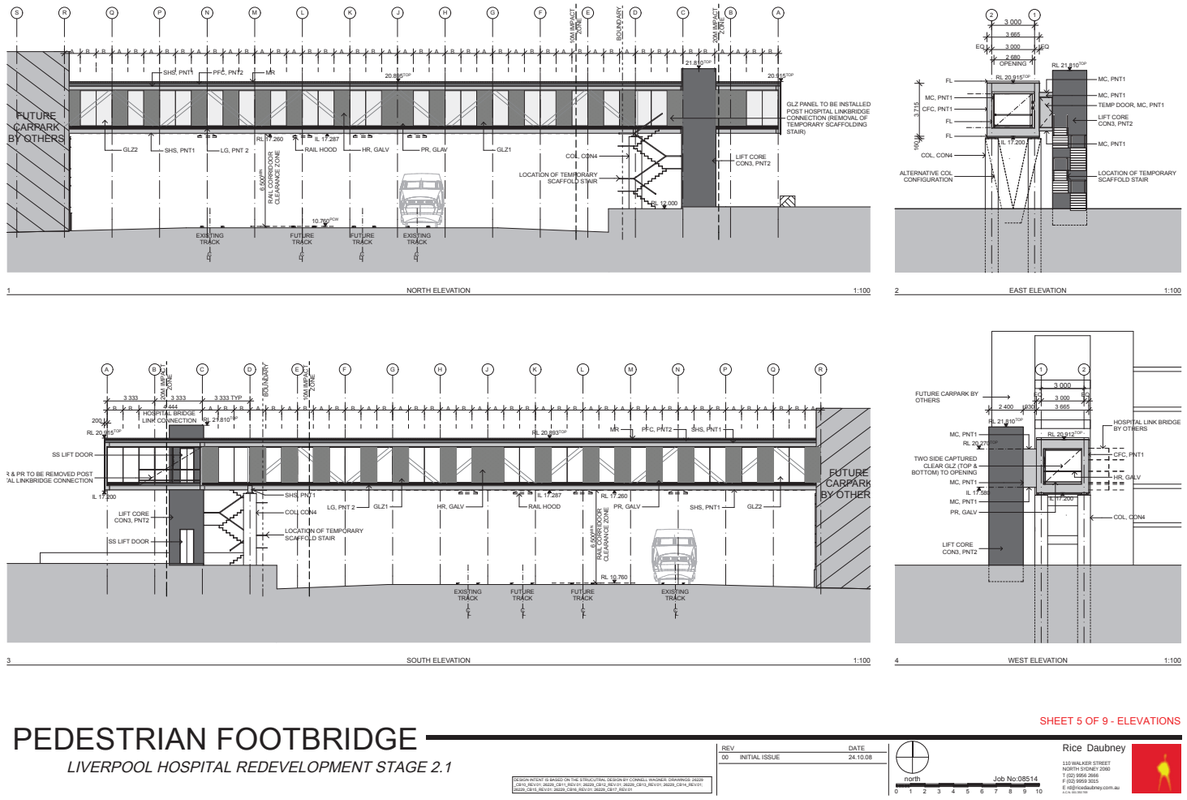


Fig 5.04 - Pedestrian Bridge Elevations

Internal road design, access points, traffic management and hierarchy

All internal Hospital campus roads will be private. Fig. 5.01 illustrates the layout of the internal roads on the East and West Campuses and identifies the new ambulatory entrance to the Clinical Services complex. The pattern of roads is consistent with the approved Concept Plan.

In summary the proposed works provide:

- Provision of direct access to the new ambulatory entry located on the eastern edge of the Clinical Services Building
- Access to the 150 basement car park located in the new Clinical Services Building.
- Access to the multi storey car park located in the East Campus.
- Enhanced road provision servicing the new Engineering Services Building.
- Access to the vehicular bridge, East and West Campuses and from the new northern entry
- Enhanced access to surface car park areas located in both the East and West Campuses.

The Scrivener Street entry will not be available to the general public and it will be controlled, as at present, by a secure boom gate with intercom and remote control monitoring.

As noted in the Clinical Services Building Project Application the emergency access will be retained with the main hospital entry accessed from Elizabeth Street and secondary entries from Campbell Street.

The basement of the new Clinical Services Building will also provide access to the emergency department for any emergency vehicles accessing the Hospital site from the north.

Car Parking Management across the site

The pattern of car parking provision across the site is consistent with the approach outlined in the approved Concept Plan.

The Concept Plan noted that the existing on site car parking facilities will be substantially augmented to redress an existing shortfall as well as provide for the future increased demands of staff, patients and visitors associated with the redevelopment and expansion of Liverpool Hospital. It was noted that some 890 additional car parking spaces will be created leading to a total parking capacity of 2,400 spaces.

The approved Concept Plan foreshadowed the development of two major new parking structures, one located within the basement of the new Clinical Services Building and the other associated with the multi storey car park located on the East Campus.

This Project Application addresses the construction of the multi storey car park on East Campus, notes that the Project Application submitted to the Department of Planning (July 2008) included a 150 basement car park and acknowledges that the third phase of redevelopment of Liverpool Hospital, which is yet to be committed, will involve the construction of a future basement car park as part of the redevelopment of the Cancer Services Building. The latter works will provide a net gain of a further 58 car park spaces on completion.

This Project Application will result in a total provision of 2,363 car park spaces distributed between the East and West Campuses (refer to Table 4.01 and Fig. 4.03). As part of the process of development a number of existing at grade car parking spaces will be lost. Such areas include the site of the Engineering Services Building.

- Distribution of car parking
  The pattern of car parking includes the retention of existing structured and surface car parking as well as the introduction of new structured parking and formalised at grade parking distributed between the East and West Campuses of the Hospital. The detailed consultation that led to the revised pattern of parking in the approved Concept Plan was primarily based on providing increased public parking for visitors within the West Campus and substantially increased parking for staff in the East Campus.

  The works addressed by this Project Application include the construction of car parking facilities in both the West and East Campuses. They include:

  West Campus
  - Extension of the existing at grade car parking area associated with the existing Campbell Street multi storey car park.
  - At grade car parking spaces associated with the new northern entry and ambulatory entry to the new Clinical Services Building.
  - Access ramps to the basement car park within the new Clinical Services Building.

  East Campus
  - A 800 multi storey car park associated with staff car parking immediately east of the railway corridor.
  - At grade car parking associated with the Engineering Services Building
  - Surface upgrading and line marking of at grade car parking areas located against the eastern boundary of the East Campus.

The Project Application includes 17 short stay car parking spaces associated with the new Clinical Services Building and 10 short stay car parking spaces associated with the Child Care Centre to facilitate the drop off/pick up of children by staff.

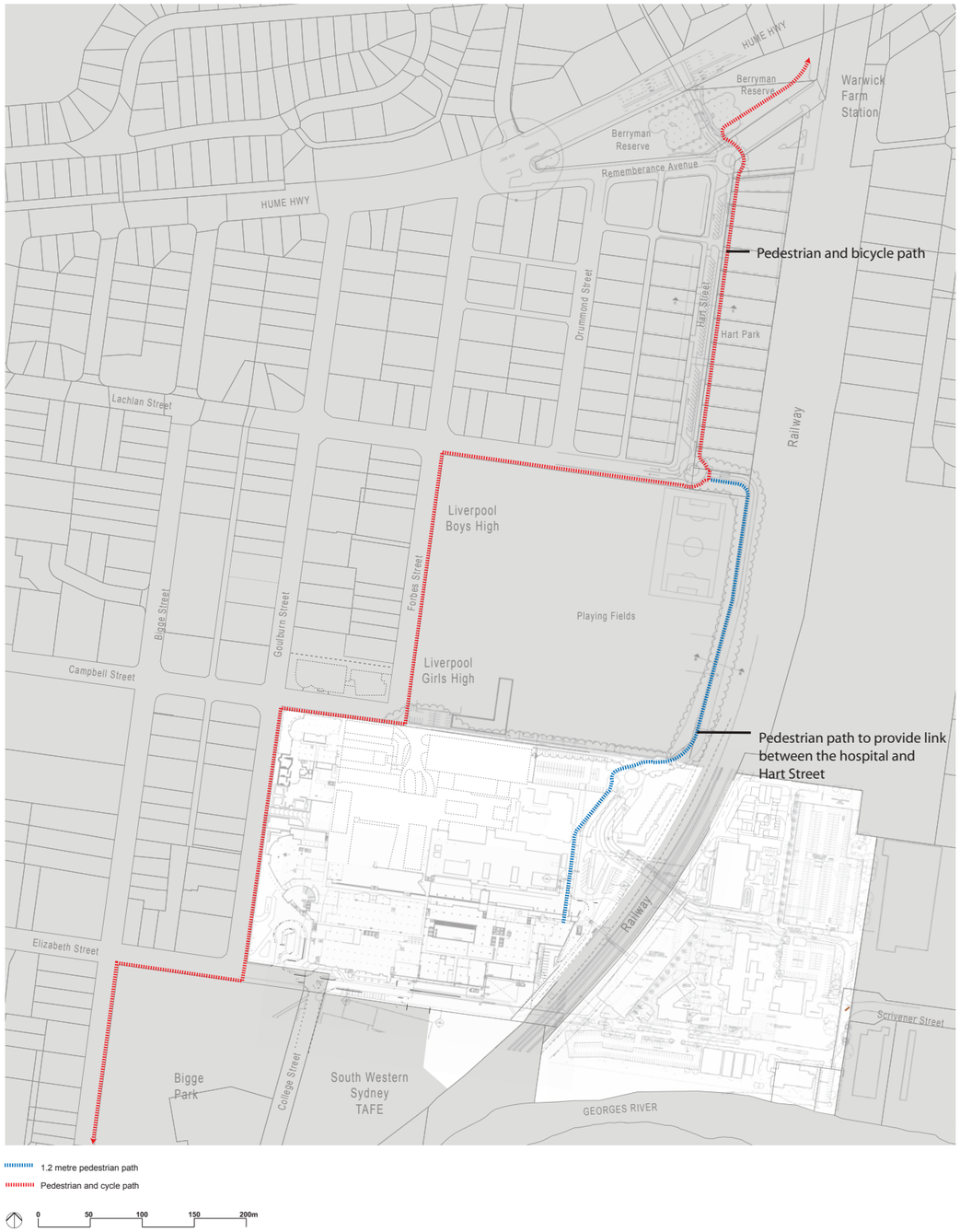


Fig 5.05 - Pedestrian and Bicycle Paths and Linkages

Pedestrian and bicycle paths and linkages

Pedestrian links between the Warwick Farm Station and the Hospital are provided within Hart Park and via the landscaped footpath in the new northern road link.

Pedestrian links from East Campus are provided to West Campus via the pedestrian bridge and Hospital concourse.

Bicycle links to the Hospital are via the existing road system and identified bike paths.

The existing pedestrian and cyclist paths in Hart Street will generally be retained on current alignments with a connection to the Hume Highway underpass to the north of Warwick Farm Station. Minor modifications to the alignment of the path in Hart Street will be made in the vicinity of the large stand of trees located in close proximity to the Lachlan Street/Hart Street intersection. The dual use path (pedestrian and cycle path) will be retained along the edge of Hart Park and will link up with the existing path system in Lachlan Street and Forbes Street.

A 1.2 metre pedestrian path will be located on the western side of the new north link road and will provide a direct pedestrian link between the hospital campus, Warwick Farm Station and public parking areas in Hart Street.

Pedestrian linkages to the south and to the Liverpool Rail Station and Bus Interchange will be via the existing off campus movement system along College Street and Bigge Street.

Compliance with Council standards for external roads

The relevant Infrastructure and Ancillary Hospital Works will be designed in accordance with the latest issue of all relevant design standards, codes and other statutory and authority requirements. As a minimum requirement, the design will be based on but not limited to:

- Liverpool City Council's Guidelines for Engineering Works for Subdivisions and Developments – Part 1 (Design).
- Liverpool City Council's Guidelines for Engineering Works for Subdivisions and Developments – Part 2 (Construction).
- Managing Urban Stormwater: Soils and Construction Manual.
- Australian Rainfall & Runoff.
- Australian Water Quality Runoff.
- AS 3500.3 Stormwater Drainage.
- AS 2890.1 Off Street Car Parking.
- AS 1428.1 Design for Access and Mobility.
- AS 2890.2 Commercial Parking Facilities.
- AS 1742 Manual of Uniform Traffic Control Devices.
- New South Wales Roads & Traffic Authority (RTA) – Road Design Guides.
- New South Wales Roads & Traffic Authority (RTA) Traffic Control at Worksites manual.
- AustRoads - Guide to Traffic Engineering Practice.
- AustRoads – Pavement Design, A Guide to the Structural Design of Road Pavements.
- AustRoads – Pavement Design for Light Traffic: Supplement to AustRoads Pavement Design Guide.

Urban Form and Design

The Director General's Requirements are:

- *Urban design, height, bulk and scale of all buildings*
- *At-grade car park design;*
- *Site analysis and architectural plans;*
- *External materials and finishes including a sample board;*
- *Photomontages and view analysis;*
- *Details of proposed landscaping*

Urban design, scale, height and bulk of all buildings
Site analysis and architectural plans
External materials and finishes including a sample board
Photomontages and view analysis

This Project Application is directly linked to three new buildings located on the East Campus including:

- Multi storey car park
- Engineering Services Building
- Child Care Centre

The design development of each of the three buildings is consistent with the approved Concept Plan and reflects the bulk, height and scale set out in that application.

- Multi storey car park
  The multi storey car park (refer Appendix G) is a linear building with a split floor pattern which allows for ready ramp access between levels. The car park structure occupies some 6 levels with a maximum height equivalent to an RL 27m. The building will effectively help shield a large part of the Eastern Campus from the noise levels associated with the anticipated increase in train movements and the introduction of an additional rail line.

  To minimise the visual impact of the building varying external treatments on the facades have been introduced. The external elevations include solid vertical panels as well as full height aluminimun screens. This approach effectively diminishes the perceived scale of the building and provides building modulation.

The design of the building provides for a number of vehicular and pedestrian connections at different levels. In terms of vehicular access provision has been made for direct access/egress at ground level from the existing road pattern (the privatised Elizabeth Street). Direct access/egress is also provided from the vehicular bridge link at level 6.

At the pedestrian level, lift and stair access are provided within the building including direct access to the pedestrian bridge which will be linked across the rail corridor to the new Clinical Services Building. The access link will primarily provide for staff access . The car park structure includes a metal deck roof.

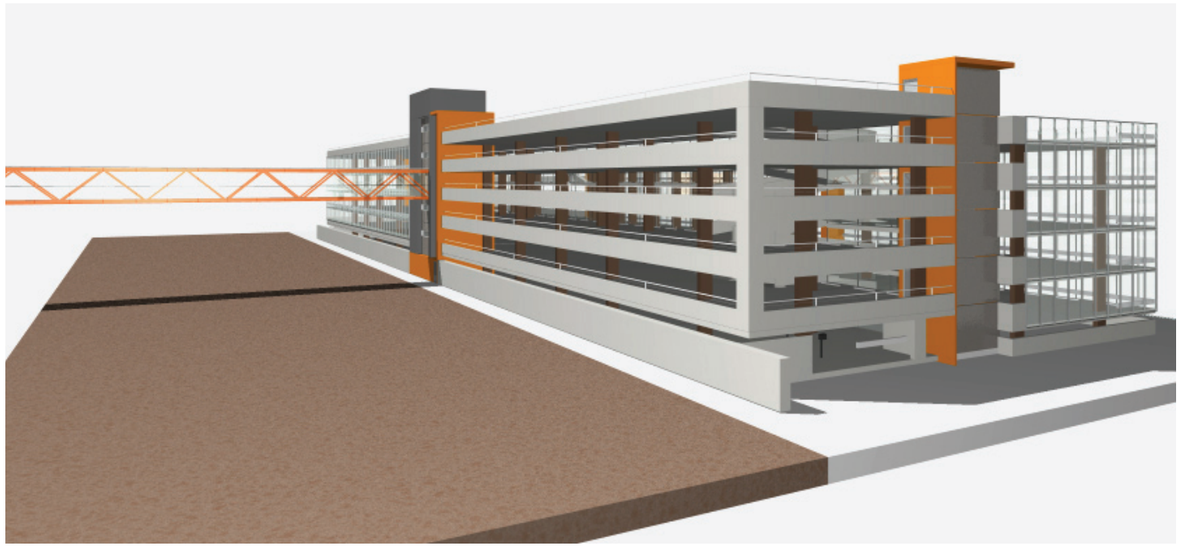


Fig 5.06 - Multi Storey Car Park South West Perspective

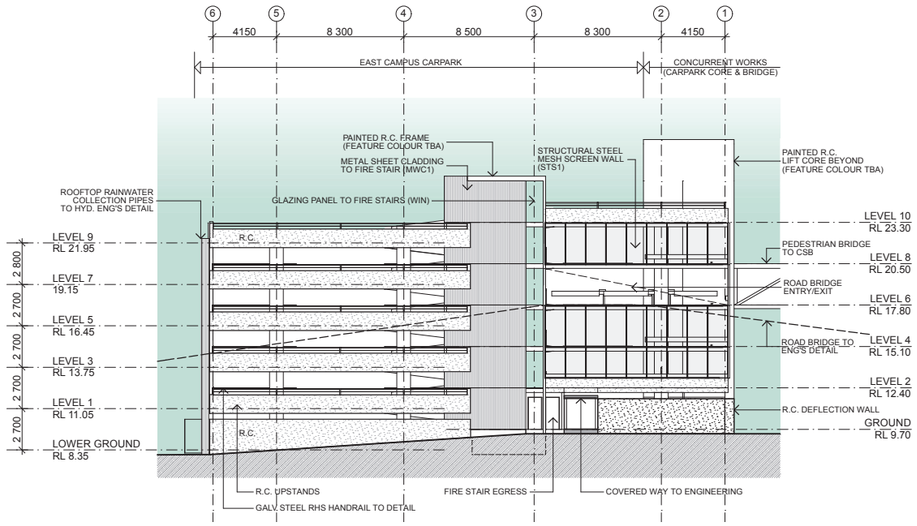


Fig 5.07 - Multi Storey Car Park North Elevation

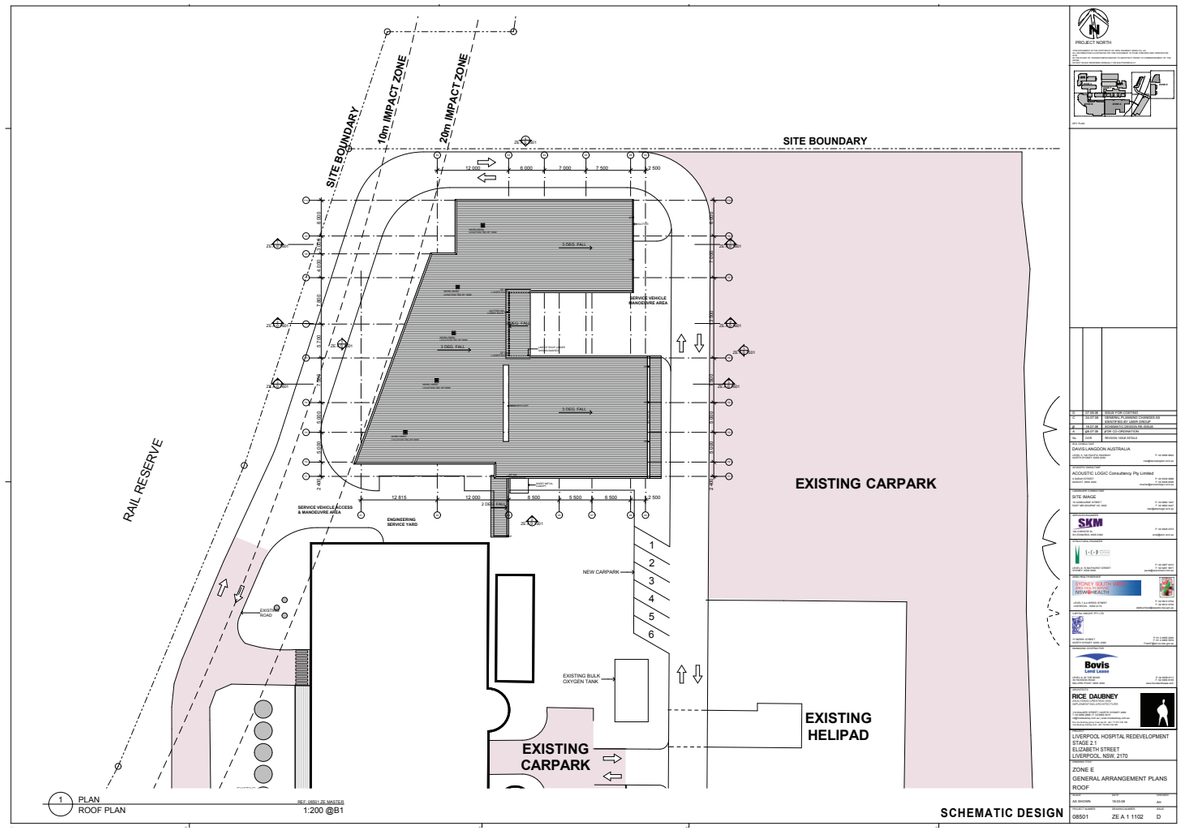


Fig 5.08 - Engineering Services Building Roof Plan

- Engineering Services Building
  The Engineering Services Building (refer Appendix K) occupies the area identified in the approved Concept Plan for the expansion of the Central Energy Building. As noted in the Project Application associated with the Clinical Services Building complex lodged with the Department of Planning (July 2008) the required additional energy facilities were incorporated into the detailed design of the Clinical Services Building. As a consequence the Engineering Services Building occupies the identified footprint in the approved Concept Plan.

  The Engineering Services Building provides for an array of facilities to service the expanded Hospital and includes workshops, storage areas and offices.

  The building has been designed as a low simple building clad in prefinished metal cladding with a skillion roof line rising to a maximum height of around RL 15.3m which is less than 6m above the existing ground levels.

- Child Care Centre
  The proposed Child Care Centre (refer Appendix J) expansion involves extending the single storey brick/ colourbond roof building with a pavilion to the east and a slight expansion of the existing building to the north.

Summary

The multi storey carpark, Child Care Centre and Engineering Services Building are designed in accordance with the principles identified in the approved Concept Plan. All buildings will readily meet the maximum permissible height limit of 35m identified in the Liverpool DCP 2008.

The external materials and finishes for each of the three buildings are set out in the relevant appendices.

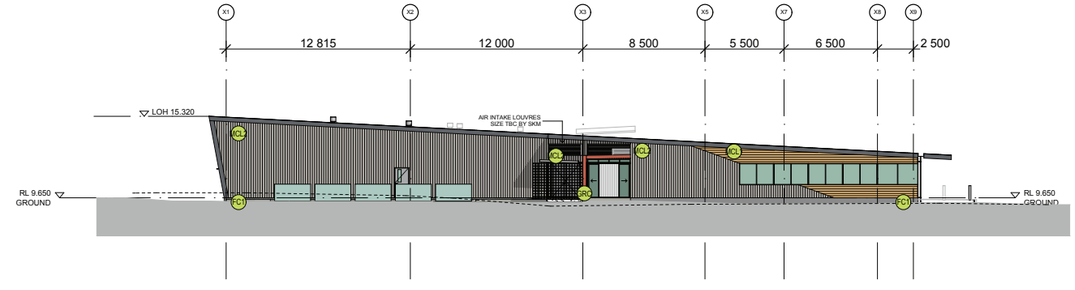


Fig 5.09 - Engineering Services Building South Elevation

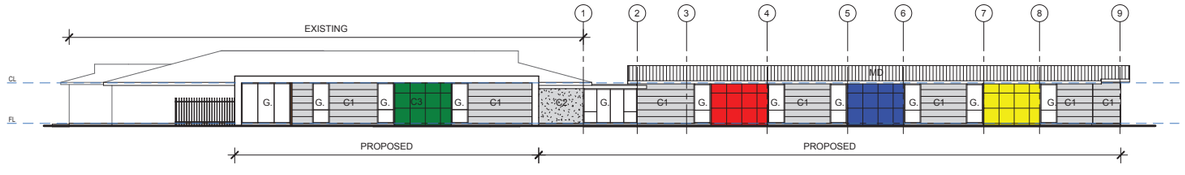


Fig 5.10 - Child Care Centre South Elevation

At-grade car park design

The at grade car parking provision to both the East and West Campuses will reflect the development of hospital facilities in accordance with the approved Concept Plan and identifies the proposed distribution of at grade car parking (refer Fig. 4.03). All at-grade car parking areas will be formalised with line marking, asphalted surfaces, lighting and fencing. Existing mature vegetation will be retained around the perimeter of car parks where possible. Entrance and exit arrangements from each carpark will be formalized to ensure safe access and egress to and from the internal road network. Appendices E and F include detailed layout drawings of the at-grade hospital car parks.

Details of proposed landscaping

- Hart Street
  The proposed landscape works in Hart Street will include the provision of native grasses and mulch within the Lachlan Street/Hart Street roundabout. Individual tree planing will be located in the Hart Street median at approximately 15m centres. On either side of Hart Street the landscape works will be restricted to the refurbishment of any modified lawn grass surfaces.

  The extension of Hart Street to the Hume Highway involves the removal of a small number of existing trees and making good the disturbance to dryland grass as necessitated by roadworks.

  The northern link to the hospital from Lachlan Street will require landscape treatment. The proposed street tree species will be *Eucalyptus sideroxylon* (pink flowering Ironbark) and grasses Poa Labillcarderi and *Thermeda australis 'mingo'*.

- West campus
  Proposed landscape works as part of this Project Application in relation to the West Campus include planting of established trees and shrubs and the installation of walls and lighting in the vicinity of the new Clinical Services Building (refer to Appendix E). Landscape works will also be completed immediately south of the new Clinical Services Building building and will include vehicular access to the short stay parking associated with the Dialysis Unit and the new ambulatory entrance. Low, mass planting will be implemented between the railway easement and the new Clinical Services Building and will complement the proposed at-grade access via new footpaths to the pedestrian bridge lift shaft.

- East campus
  The landscape works on the east campus of the hospital which form part of this Project Application include landscaping around the proposed Engineering Services Building and the Central Energy Building (refer to Appendix F). The landscape works include the establishment of footpaths around the facilities to ensure the appropriate segregation of pedestrian and vehicular movements. A number of existing trees have been retained adjacent to the rail corridor and those plantings will be supplemented by plantings of established trees, shrubs and ground cover to complement the architectural forms, texture and character of the proposed buildings.

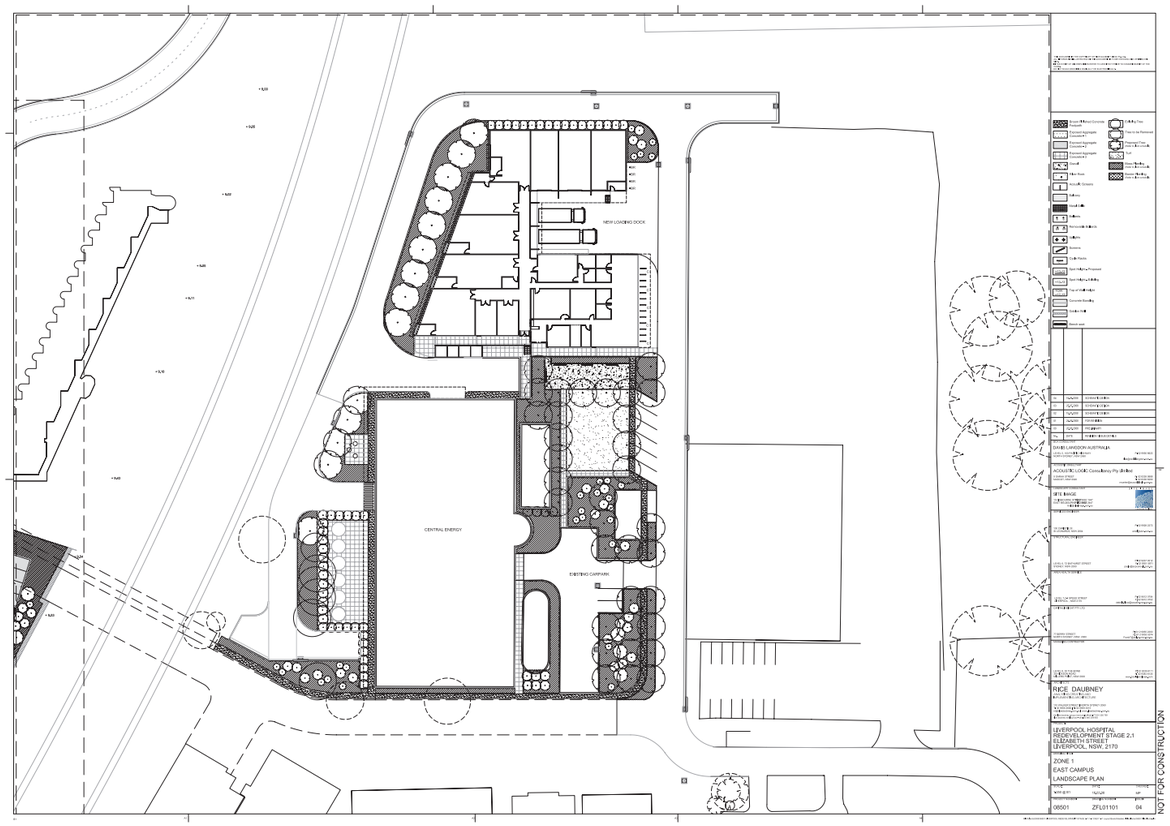
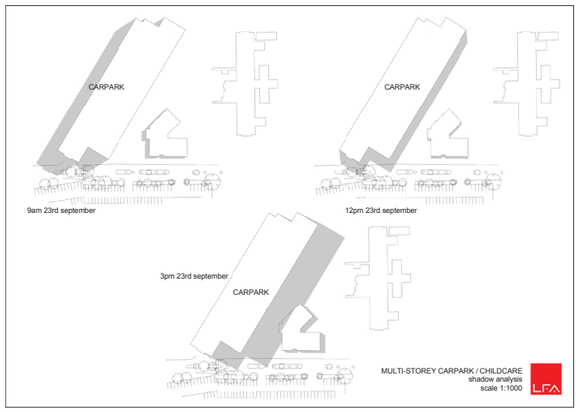


Fig 5.11 - East Campus Landscape



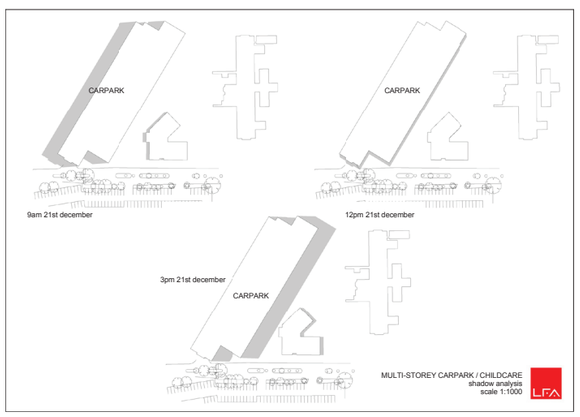


Fig 5.12 - Shadow Diagrams

Multi storey Car Park

The Director General's Requirements are:

- *Demonstrate the multi-storey carpark is of minimal visual impact, maintains amenity of adjoining uses, provides a safe and secure environment and considers the wider heritage impacts on the area.*

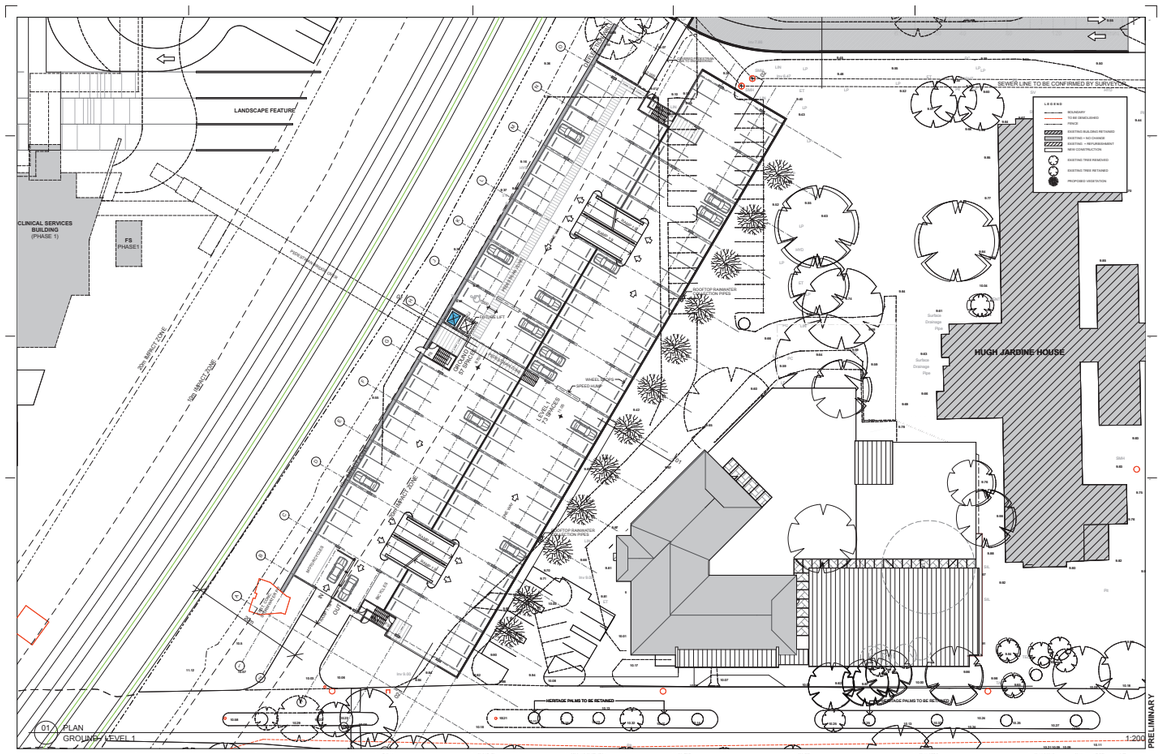


Fig 5.13 - Multi Storey Car Park (Ground Level)

Fig.5.13 illustrates the building footprint of the proposed carpark in relation to the rail corridor, Hugh Jardine House and the existing Child Care Centre. Appendix G incorporates the full set of architectural drawings including plans, sections and elevations. The drawings indicate the split level slab approach has been adopted in the design of the car park and the number of parking spaces to be provided (800).

In summary the car park is approximately 112m long, 34m wide and 15m high. It will be built to a maximum roof height in the order of RL 27m with a central lift core. The location reflects the new Clinical Services Building located immediately to the west. The scale of the building reflects but is significantly less than the new Clinical Services Building and provides for an appropriate transition between the Clinical Services Building complex and East Campus.

The location of the building immediately adjacent to the rail corridor is significant in that the building location provides direct elevated secure pedestrian access to the Clinical Services complex. The design and location of the building also enables direct vehicular access to be gained from the new bridge across the rail corridor given the significant impacts of increasing rail traffic at the existing at grade crossing associated with Elizabeth Street.

The visual impact of the multi storey car park as seen from the College and Elizabeth Street (ie the nearest public streets given that the car park is located over 250m from that point) is minimal. If existing and proposed landscape elements in the privatised Elizabeth Street were removed only a part of the southern most sector of the building would be visible (refer Fig. 5.14).

The other adjacent public place is Scrivener Street (to the east). Access involves travelling past a range of industrial buildings to the eastern boundary of East Campus. The car park is located approximately 200m from the Scrivener Street entry point and there are a number of buildings interposed between the car park and Scrivener Street including the Administration Building and Hugh Jardine House.

The most significant impact stemming from the proposed multi storey car park will be on the existing Child Care Centre. A series of studies have been initiated to identify the shadow impact in mid summer, equinox and mid winter (refer Fig. 5.12). The studies show that there will be little shadow impact on the Child Care Centre given that most of the active spaces within the centre are focused toward the north and to the east. Discussions with the Child Care operator also indicate that there are substantial shade cover requirements that must be provided within the outdoor play areas to minimise solar radiation on children. The shadow impacts from the multi storey car park will not result in negative outcomes for the Child Care Centre.

The development of a landscape zone between the multi storey car park and the Child Care Centre is an important screening device to ameliorate the scale and bulk of the car park. The proposed planting strip will provide visual screening to the full length of the eastern facade. The strategy will provide screening of the upper levels of the car park while also helping to break down the bulk of the car park at the ground level. The planting strategy will also allow for passive surveillance of this zone and pedestrian access into the car park.

The four rainwater collection tanks on the east façade will harvest roof water for landscape irrigation. All plant material proposed will be drought tolerant and not require a high level of maintenance.

The new multi-storey carpark will have disabled parking, access and egress in accordance with the appropriate Australian Standards and the BCA. Lift and stair access will be available to all levels. Vehicular access and egress will be available at ground level and also at level 6 via the road bridge. The car park will be lit with CCTV surveillance and duress alarms at all levels and be subject to regular security patrols.

The proposed external finishes and material are illustrated on the sample board (refer Appendix G). The carpark has been designed in the context of the new Clinical Services Building to ensure that the two structures are visually integrated.

The visual impact of the car park has been considered in design development. The structured façade of the car park has been designed to minimise the perception of bulk and scale, especially when viewed from the Child Care Centre.

Elevational treatment includes .5m high solid walls on the edges of slabs through to full height screening panels of aluminium mesh.

- Ventilation
  Ventilation of the multi-storey carpark has been the subject of detailed review by SKM (refer Appendix G). SKM recommended a natural ventilation approach for the total building other than the lower ground floor which is partially set below existing ground.

  SKM noted that the distance between the car park footprint and the existing Child Care Centre exceeds the standard required by some 50% and accordingly indicated that the proposed location of the car park with respect to ventilation requirements was fully compliant.

- Flood impacts
  Planning controls which apply to the hospital redevelopment in regard to flooding are identified in Section 4.3 Table 5 of the SKM Stormwater and Flooding Assessment Report (refer Appendix O). The new multi-deck carpark will have minimal impact on flood affectation.

Fig 5.14 - View into Hospital precinct from the intersection of Elizabeth and College Street

Child Care Centre

The Director General's Requirements are:

- *Child Care Centre design to meet relevant legislative requirements including the 'Children's Services Regulations 2004';.*

The existing Child Care Centre currently provides for 52 number of children. The pattern of distribution is as follows

• Birth to under 2 years	12
• 2 years to under 3 years	15
• 3 years to under 6 years	25
Total	**52**

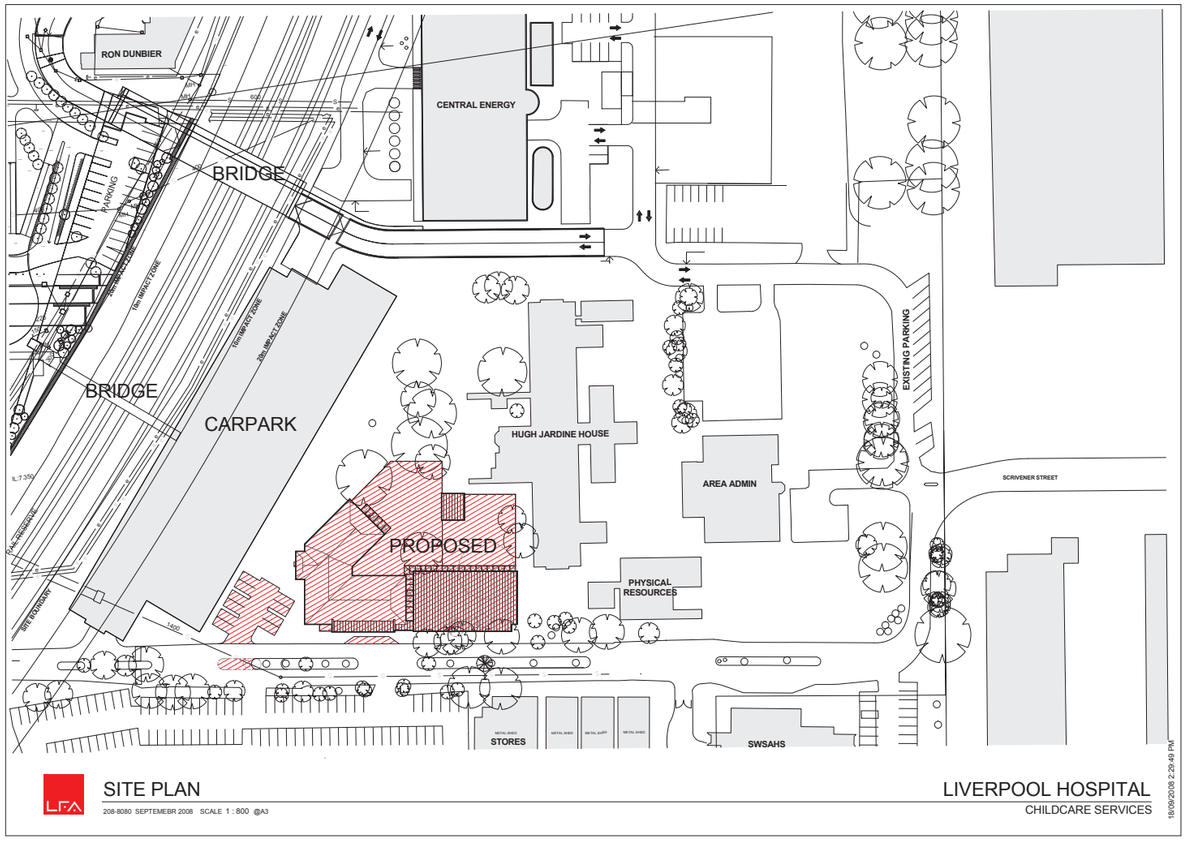


Fig 5.15 - Child Care Centre Site Plan

To meet the increased needs stemming from the substantial redevelopment of the Hospital and the subsequent increase in staff it is proposed that the Child Care Centre be expanded to cater for a total of 88 children. The pattern of anticipated care is as follows:

• Birth to under 2 years	30
• 2 years to under 3 years	32
• 3 years to under 6 years	26
Total	**88**

In addition evening care service will be provided for 10 children.

A detailed brief has been prepared (refer Appendix J) that identifies the functional and legislative requirements that need to be met as part of the part of the expanded scope and role of the Child Care Centre. Detailed consultation meeting sessions have been held with the Child Care User Group and the design approach was progressively resolved. Part of the design process also took into consideration the need for the existing centre to continue functioning during the construction phase.

Following a detailed assessment of options the preferred solution has been to develop a series of new facilities by extending eastward parallel to the privatised Elizabeth Street. As foreshadowed in the approved Concept Plan this has involved the demolition of an existing building used for training purposes. On completion of the new facilities it is intended that there will be a number of internal changes that will progressively take place within the existing building together with a minor expansion to the north to ensure that all spatial standards and functional requirements are met.

The existing playground area will be modified to reflect the division required between 0-2 and 3-5 play groups with the introduction of an internal fence. The extent of the existing play area is more than adequate although there will be a need to ensure that the requisite area of shadowing is provided to both play areas.

To facilitate parent's access to the Child Care Centre, 10 short stay car park spaces have been provided. All staff car parking will be provided within the staff car parking zones throughout the Hospital campuses.

Consideration has also been given to the servicing needs of the Child Care Centre and it is proposed that a lay-by be constructed parallel to the edge of the privatised Elizabeth Street so that food deliveries and waste collection can be readily met without impacting on the short stay parent parking zones.

The expansion of the centre provides for single storey extensions that are compatible in design and function with the existing single storey building. The objective has been to provide for clear lines of access lines within the Centre particularly given that part of the functional characteristics of the Centre involves parents accompanying children to the various play group locations.

The legislative requirements that have been taken into account in the preparation of the brief and in the design of expanded Child Care Centre include:

- New South Wales Consolidated Regulations, Centre Based and Mobile Child Care Services Regulation 2004.
- Occupational Health and Safety Act 2000.
- Occupational Health and Safety (First-aid) Regulation 1989.
- Australian and New Zealand Standards.
- Building Code of Australia.
- Department of Family and Community Services, Planning to Succeed in Child Care, November 2001.
- Food Act 1989 and the National Food Premises Code.
- Canterbury City Council, Development Control Plan (No. 25) – Child Care Centres Code, 27 March 1997.
- Central Sydney Area Health Service, Canterbury Hospital Redevelopment – Child Care Unit, Issue 1, 13 February 1996.

Amenity Impacts on Neighbouring Properties

The Director General's Requirements are:

- *Address the visual impact, privacy and overshadowing of the development on adjoining properties.*

Visual impact

The visual impact of the proposed infrastructure elements and buildings have been considered during the design development phase. The key project components with potential visual impact include the multi-storey carpark, vehicular and pedestrian bridges and the new Engineering Services Building.

The proposed road works include the Northern Link Road and the Hart Street modification and extension to provide a connection to the Hume Highway. The Northern Link Road involves the construction of a new road between Lachlan Street and the northern boundary of the Hospital. The road will be defined by the existing boundary fence defining the easterly extent of the playing fields associated with Liverpool Boys' and Girls' Schools. The corridor is relatively narrow (approximately 11m) and will be defined by a chain-mesh fence on the eastern edge which will mark the western extent of the rail corridor and a wrought iron fence on the boundary of the playing fields. The proposed roadworks will have little visual impact other than the landscape works which will be introduced as an integral part of the development.

At present the Hart Street easement is 20m wide with parallel parking on the western side and right angle parking adjacent to Hart Park on the eastern side. The introduction of a landscaped median will contribute to the visual amenity of the area. The works will also reinforce the landscape proposals currently under consideration by Council which involve the progressive upgrading of Hart Park over time.

The extension of Hart Street through the Berryman Reserve will involve the loss of a number of trees and landscape works will be undertaken to address that loss. The design parameters will need to ensure that visual access, safety issues and associated design criteria are fully met as part of the new intersection on the Hume Highway including the necessary turning lanes and slip lanes.The Hart Street works include the introduction of a roundabout at the junction of Hart Street and Remembrance Avenue as well as a roundabout at the intersection of Hart and Lachlan Streets.
In terms of the proposed bridge structures which are designed to inter-connect the East and West Campuses as well as the new buildings within the East Campus it is noted that there are no public spaces or public streets in the immediate vicinity of the proposed works.

The East Campus is defined to the south by the Georges River which is set within deeply incised banks. To the north an east the surrounding buildings that effectively define the East Campus are industrial in nature and large scale in built form.

Privacy

The proposed buildings and works will have limited impact on surrounding land uses. The Engineering Services Building is a low single storey building located adjacent to the northern boundary of the East Campus and to the rail corridor. The multi storey carpark is located immediately east of the rail corridor and represents a stepping down in the built form scale of the Clinical Services Building complex located on the West Campus.

Overshadowing

Neither the Engineering Services Building nor the Child Care Centre will have any overshadowing impacts within the East Campus or on adjacent properties.

The shadow studies carried out on the proposed multi storey car park clearly indicate that there are no shadowing impacts on adjacent properties external to the Hospital site.

In preparing the design of the Child Care Centre particular attention was paid to the impact that the proposed multi storey car park will have on the Child Care Centre both in terms of solar access to individual rooms and solar access to external play areas. The studies indicate that there will be a shadow impact at around 2.30pm in mid winter which will result in a shadow stretching from the car park building to a part of the external Child Care Centre play area and also impacting on solar access to a number of the activity rooms/facilities. The studies included assessments during mid summer and equinox periods which demonstrate that there is little impact other than late afternoon in mid winter. The issue has been taken into account in the design of the Child Care Centre and fully discussed as part of the user group meeting approach that has been adopted in the design of the expanded Child Care Centre.

Summary

The proposed new buildings will not impact visually nor impact in terms of privacy or overshadowing on neighbouring properties.

Construction and Operational Impacts

The Director General's Requirements are:

- *Any likely geotechnical impacts;*
- *Air pollution, soil and erosion and waste material; noise and vibration;*
- *Details of any cut and fill and whether any fill is proposed to be imported or exported to/from the site.*
- *Construction management plan addressing erosion and sediment control, site fencing, traffic management, car parking arrangements for construction workers.*

Geotechnical Impacts

A geotechnical assessment has been undertaken by Jeffery and Katauskas for the entire hospital campus. Additional investigations have been completed in relation to the proposed bridge and multi-storey carpark sites. The 1:100000 Series Geological Map of Penrith indicates that the site is underlain by Tertiary alluvium associated with the nearby Georges River. Generally the investigations indicated the presence of fill overlying variable and inter layered alluvial soils then shale bedrock. The implications of the geotechnical investigations have been incorporated into the structural design of the footings and structure of the multi storey carpark and other structures which are the subject of this Project Application (refer Appendix N)

Air pollution, soil and erosion and waste material; noise and vibration;

- Air pollution
  Major sources of air emissions from the proposed construction works at the site are anticipated to be associated with traffic movements (soil, dust and diesel emissions), excavation/stockpiling and handling of soils on site (soil dust). If contaminated soil or groundwater is encountered they may give rise to potential odour emissions as a result of excavation or soil disturbance.

  The key management issues and site controls during the planning, construction, training and monitoring phases are identified in Section 18.9 of the EHS Plan (Appendix Q).

- Soil and erosion
  Construction activity on the project site will involve excavation to facilitate the proposed development of infrastructure and ancillary works. The soils are noted to be of high erosion potential and the permeability of site soils and proximity to groundwater would suggest that dewatering of site excavations may be required.

  Measures to control soil erosion during construction will be in accordance with the Stormwater and Erosion Management Plan (Section 18.7 of the EHS Plan) and currently accepted principles, as described in Managing Urban Stormwater (EPA NSW) and Sediment Control (The Institute of Engineers Australia).

- Construction Waste management
  A Waste Management Plan (Construction) is included as Section 18.3 of the EHS Plan (refer to Appendix Q). The objectives of the Waste Management Plan (Construction) are based on the hierarchy of avoidance/reduce, re-use, recycle, treat and dispose as outlined in the National Waste Minimisation and Recycling Strategy.

  A waste management contractor will be involved in the early stage of the project to ensure effective planning for waste management. Major sub-contractors will be required to submit site waste minimisation details including practical measures to minimise waste entering the site, the potential for on-site recycling of waste materials and the use of alternative, recycled materials which meet all relevant standards and design specifications.

LIVERPOOL HOSPITAL
Established 1813

SYDNEY SOUTH WEST
AREA HEALTH SERVICE
NSW HEALTH

8 October 2008

Mr Gary Tower
Project Director Implementation
Liverpool Hospital Redevelopment
Capital Insight Pty Ltd
7 / 2-4 Speed St
Liverpool NSW 2170

Dear Mr Tower,

Prior to the opening of the new hospital facilities, existing operating policies, procedures and Operational Management Plan will be reviewed and updated as necessary for the impact of the new development prior to occupation of the new building and structures.

These include, but are not limited to:

- Protection of flora and fauna
- Visitor safety
- Site Security
- Traffic and pedestrian management
- Storage of materials
- Emergency and evacuation procedures
- Fire safety
- Waste management and ESD initiatives
- Signage
- Lighting

The review and update of the operating policies will be carried out with consideration to all relevant legislation and in consultation with relevant stakeholders.

Yours sincerely

Glenda Cleaver
General Manager

General Manager's Unit
Locked Mailbag 7103, Liverpool BC, NSW 1871 Telephone: 9828 6301

Fig 5.16 - NSW Health commitment to review operational policies and procedures

- Noise and vibration (Construction)
  A Noise and Vibration Management Plan (Construction) is included as Section 18.8 of the EHS Plan. The noise impacts of construction are predicted to be negligible as no driven piling is proposed.

  It is expected that noise generated during construction will be primarily associated with vehicle movements, generators, heavy machinery (eg excavators) and hand held machinery and tools. Some additional vehicle noise may be generated by the thoroughfare of vehicles using transport corridors to and from the site.

- Operational Waste Management
  NSW Health have provided an undertaking in relation to the preparation of an Operational Management Plan (refer to Fig. 5.16) The undertaking states:

  'Prior to the opening of the new hospital facilities, existing operating policies, procedures and Operational Management Plan will be reviewed and updated as necessary for the impact of the new development prior to occupation of the new building and structures.

  These include, but are not limited to:

  - *Protection of flora and fauna*
  - *Visitor safety*
  - *Site Security*
  - *Traffic and pedestrian management*
  - *Storage of materials*
  - *Emergency and evacuation pr,?cedures*
  - *Fire safety*
  - *Waste management and ESD initiatives*
  - *Signage*
  - *Lighting*

  The review and update of the operating policies will be carried out with consideration to all relevant legislation and in consultation with re levant stakeholders.'

Details of any cut and fill and whether any fill is proposed to be imported or exported to/from the site.

Any material cut from the site will be used for the parts of the project requiring fill. Filling works will be as per the Geotechnical Report requirements for importation and compaction. Any excess material will be moved off site. Based on the current scope of the overall project the expectation is that only limited amounts of material will be exported to a waste facility which is lawfully permitted to accept the material.

Construction Management Plan

A Construction Management Plan has been prepared by the managing contractor, Bovis Lend Lease. It provides detailed Management Plans for the array of issues which may arise during the construction period and is included as Appendix Q. In accordance with the Director General's Requirements and the Statement of Commitments the proponent has prepared a Construction Environmental Management Plan titled Environment Health and Safety Plan (EHS) (Appendix Q).

Bovis Lend Lease, in its role of Contractor for a number of the Infrastructure and Ancillary Hospital Works projects has developed a specific Project Management Plan integrating the Environment Health and Safety Plan with a series of additional plans including:

- Quality Management Plan.
- Stakeholder Consultation and Communications Plan.
- Archaeological and Heritage Management Plan.

The Environment Health and Safety Plan is a key component of the Bovis Lend Lease Project Management Plan. It has been developed to ensure that Environmental, Health and Safety aspects of the construction process are appropriately managed. The EHS Plan defines the relevant management and operational procedures for the following:

- Air quality/dust control (EHS Plan Section 18.9 Air Quality Management Plan).
- Noise and vibration management (EHS Plan Section 18.8 Noise & Vibration Management Plan).
- Waste management (EHS Plan Section 18.3 Waste Management Plan).
- Flora and fauna protection (EHS Plan Section 18.13 Conservation & Habitat Management Plan).
- Site specific soil erosion and sediment control (EHS Plan Section 18.7 Stormwater & Erosion Management Plan).
- Traffic and pedestrian management (EHS Plan Section 18.10 Traffic & Parking Management Plan).
- Storage and handling of materials (EHS Plan Section 18.1 Hazardous Substance/Dangerous Goods Management Plan and EHS Plan Section 18.2 Asbestos (& Hazardous Building Material) Management Plan).
- Environmental training and awareness (EHS Plan Section 10 Skilling and Training).
- Contact and complaints handling procedures (EHS Plan Section 16 Complaint Management).
- Emergency preparedness and response (EHS Plan Section 19 Incident and Emergency Procedures).
- Site induction, OHS&R management and training (EHS Plan Section 10 Skilling and Training).

Signage will be provided on the hoarding around the perimeter of the construction site and at all entry points to the site will contain contact details of the site manager.

Bovis Lend Lease has been contracted to construct the northern link road, the roadworks and landscaping associated with the new Clinical Services Building, the Engineering Services Building and defined roadworks within the East Campus. Contractors have yet to be appointed for the construction of vehicular and pedestrian bridges, the multi storey car park, the Child Care Centre expansion and Hart Street modifications.

Part of the contractual commitments that will be entered into by future contractors will involve the preparation of construction management plans which address the range of construction processes and management controls set out in the Bovis Lend Lease documents.

Stormwater, Drainage and Flooding

The Director General's Requirements are:

- *Key matters to be addressed include flooding, drainage and stormwater management issues including on-site detention of stormwater, Water Sensitive Urban Design and drainage infrastructure*

Flooding, drainage and stormwater management issues

- Existing conditions
  The Liverpool Hospital is located east of the Liverpool CBD. The upstream catchment originates in Terminus Street and generally falls towards the Hospital and flows towards the Georges River, a distance of some 1.5km. The Infrastructure and Ancillary Hospital Works sites are predominantly impervious surfaces consisting of buildings, roadways and other paved areas. There are substantial, existing stormwater drainage systems within the western and eastern campuses which are designed to collect the surface runoff from open space and roof surface runoff from the buildings.

  The existing internal site stormwater drainage system connects to the Campbell Street and Elizabeth Street stormwater drainage system which discharges to the Georges River via the outlet which is located south of the proposed multi deck car park at the southern end of the eastern campus.

  Significant existing drainage systems are located on site and the surrounding streets. Two Council stormwater drainage systems are located along the Hospital boundaries. An existing 1650 mm diameter drainage system originates in Terminus Street, continues through the CBD and then runs parallel to and underneath Elizabeth Street. The outlet of the drainage system is located adjacent to the rail reserve near the existing car park on the eastern campus and discharges runoff into the Georges River.

  A 900mm to 1,800mm diameter drainage system also runs parallel to and underneath Campbell Street and along the Hospital's boundary adjacent to the gas main reserve. The existing system then crosses the rail reserve and continues along the Hospital boundary until it reaches an outlet located near the open space of the car park located south east of the eastern campus.

- On-site detention requirements
  Liverpool City Council has confirmed that on-site detention (OSD) is not required as the site is within the floodplain and near the Georges River. [1]

- Stormwater Drainage Concept
  The proposed stormwater drainage concept is based on Liverpool City Council's Development Design Specification D5 entitled Stormwater Drainage Design. Where necessary the existing pits and pipes in the areas of redevelopment will be removed and replaced with a new stormwater drainage system to suit the development.

- Stormwater Harvesting
  Consideration will be given to rainwater tanks and rainwater use with new and refurbished buildings within Liverpool Hospital.

- Stormwater Quality Improvement Controls
  The main stormwater pollution sources identified on site are the car parks and roadways which contribute hydrocarbons and heavy metals as pollutants. The proposed concept for improving stormwater quality from the roadways and car parks involves grading the pavement so that runoff is able to drain to vegetated swales or biofiltration units on the periphery of the paved area. The proposed location of stormwater quality controls are subject to verification of the stormwater system invert levels as well as a more detailed assessment of pollutant and runoff loads.

- Vegetated swales
  Vegetated swales with side slopes of approximately 1:6 and a minimum longitudinal slope of approximately 1% are proposed to be implemented in locations where:
  - The contributing paved area is relatively small, such as roadways.
  - The available area is constrained.
  - The depth to pipe invert at the downstream stormwater pit is less than approximately 1m which limits the ability to utilise subsurface filtration and drainage to improve pollutant removal.

- Biofiltration units
  Biofiltration units are proposed in locations where downstream stormwater connections are sufficiently deep to allow connection with subsoil drainage pipes. The proposed units are to consist of a sand filter with the sand filter surface landscaped or turfed. Subsoil drainage pipes will be located within and at the base of the sand filter. Runoff from the adjacent paved areas will be directed into the biofiltration area and will percolate through the sand filter into the subsoil drainage pipes which will drain the treated runoff into the downstream stormwater system via a connection pit. Where practical biofiltration units will be fitted beneath vegetated swales to increase levels of pollutant removal.

[1] SKM (2007) pp.6

Flooding Assessment

- Existing Flood Conditions
  Liverpool City Council has advised the Proponent[2] that the flood level for the 100 year Average Recurrence Interval (ARI) event is 8.8m Australian Height Datum (AHD) and 10.9m AHD for the Probable Maximum Flood (PMF). Fig. 2.05 illustrates the extent of the 100 year ARI and the PMF flood event in relation to the hospital. The majority of the hospital site is above the 100 year ARI flood level except for a small portion in the north east of the western campus and the north of the eastern campus. Detailed ground survey information indicates that a large portion of the hospital and approximately 100m of Elizabeth Street is within the Low Flood Risk Precinct (ie between the 100 year ARI and PMF flood levels)

- Flood Risk Precinct Classification
  The area of the hospital which will be inundated by a 100 year ARI flood has been identified as a Medium Flood Risk Precinct. It will not be subject to a high hydraulic hazard and generally will have no significant evacuation difficulties.

  Most of the eastern campus and approximately 50% of the western campus have been classified as Low Flood Risk Precincts where the land is within the extent of the PMF. Fig 2.05 illustrates the Flood Risk Precinct classification in relation to the proposed Redevelopment Concept Masterplan. The following table identifies the relevant flood risk precinct for buildings which are the subject of this Project Application.

Flood Risk Precinct	Risk
Engineering Services Building	Medium
Multi storey car park	Low
Child Care Centre	Low

The NSW Floodplain Management Policy is to restrict the development of critical emergency response and recovery facilities such as hospitals on flood prone land and it is noted that the Draft Floodplain Risk Management Development Control Plan (DCP) No. 52 classifies Liverpool Hospital as Critical Uses and Facilities. However, in negotiation with Liverpool City Council it has been agreed that the proposed works constitute redevelopment of an existing hospital it will be considered to be Concessional Development.

In preparing the detailed design for both the Child Care Centre and Engineering Services Building due regard was given to the commitment associated with the approved Concept Plan that all habitable spaces will be set above the PMF (10.9 AHD).

The existing floor level of the Child Care Centre is set at RL 10.14m which is above the 1:100 year flood level but below the PMF. Detailed internal discussions as well as negotiations with Council were undertaken as part of the process. It was agreed that the Child Care Centre is not seen to be a critical facility in the event of a major event and hence the current level floor levels could be maintained as part of the Child Care Centre expansion.

A similar approach was followed with the Engineering Services Building. The building mainly contains workshop areas with limited ‘habitable’ space and was defined by the Hospital administration as a non-critical facility in a major event. Accordingly the floor level of the new facility has been set at 9.65m which is above the 1:100 flood event but below the PMF. The ground plane in the vicinity of the Engineering Services Building is in the order of RL 9.40m

The following development controls will be implemented in the redevelopment to satisfy Council requirements.

[2] Refer to SKM (2007) pp. 17

Planning consideration	Development Controls
Floor Level	Medium and low flood risk
	Flood levels to be no lower that the design floor level. Where this is not practical due to compatibility with the floor level of existing building, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances the floor level is to be as high as practical and when undertaking alterations or additions no lower than the existing floor level. A restriction is to be placed in the title of the land pursuant to s. 88B of the Conveyanacing Act where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the undercroft area is not to be enclosed
Building components	Medium and Low flood risk
	All structures are to be flood compatible building components below the 100 year flood level plus freeboards of 500mm
Structural soundness	Medium Flood Risk
	Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus freeboards of 500mm
	Low Flood Risk
	Applicant to demonstrate that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year flood plus freeboards of 500mm. An engineers report may be required

Planning consideration	Development Controls
Flood effects	Medium and low flood risk
	The flood impact of the development to be considered to ensure that the development will not increase flood effects elsewhere having regard to (i) loss of flood storage, (ii) changes to flood levels and velocities caused by alterations to the flood conveyance and (iii) the cumulative impact of multiple potential developments in the floodplain. An engineers report may be required.
Car parking and driveway access	Medium and low flood risk
	Enclosed car parking and car parking areas accommodating more than 3 vehicles (other than on Rural zoned land), with a floor level below the 20 year flood or more than 0.8m below the 100 year flood level, shall have adequate warning systems, signage and exits. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year flood. Driveway and parking space levels to be no lower than the design ground/floor levels. Where this is not practical a lower level may be considered. In these circumstances the level is to be as high as practical and when undertaking alterations or additions no lower than the existing level.

Planning consideration	Development Controls
Evacuation	Medium and low risk
	Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon the SES or other authorised emergency services personnel. The development is to be consistent with any relevant flood evacuation strategy, Flood Plan adopted by Council or similar plan.
Management and Design	Medium and low risk
	Site Emergency Response Flood Plan required where floor levels are below the design floor level (except for single dwelling houses). Applicant to demonstrate that areas are available to store goods above the 10 year flood level plus freeboards of 500mm. No storage of materials below the design floor level which may cause pollution or be potentially hazardous during any flood.

Certification of flood levels for the Hospital site has been obtained from Liverpool City Council for the 1:100 year average recurrence interval and Probable Maximum Flood (PMF) events. Based on this information, the following flood levels have been adopted for the project:

- Probable Maximum Flood (PMF) 10.9m (AHD)
- 1:100 year Average Recurrence Interval Flood 8.8m (AHD) (1%AEP Flood)

Services

The Director General's Requirements are:

- *Key matters to be addressed include the capacity of utilities including water, sewer, stormwater, gas, power and telecommunications infrastructure which will serve the project.*

The development of the three new buildings which are covered by this Project Application (multi storey car park, the extension to the Child Care Centre and Engineering Services Building) will be serviced by the existing and new plant facilities. Where relevant mechanical plant will be located in dedicated plant rooms.

The services to be provided for the above buildings include but are not limited to:

- Electrical Services;
- Communication Services;
- Building Control and Security Services;
- Fire alarm and warning systems;
- Mechanical Services;
- Hydraulic Services;
- Fire Protection Services;
- Automatic Fire Detection and Alarm Systems;

The buildings will be designed with reference to the following:

- The NSW Health Engineering Services Guidelines TS11 2005;
- Relevant Australian Standards;
- The Building Code of Australia;
- Government Department's Regulations.
- Authorities and Councils such as:
- The requirements of relevant Local Councils;
- Sydney Water Corporation;
- Integral Energy;
- NSW Fire brigades;
- Environmental Protection Authority.

Multi Storey Car Park

- Mechanical Services
  Provision has been made for the lower ground floor car park area to be mechanically exhausted through the roof of the multi storey car park.

- Hydraulic Services
  - Rainwater Harvesting
    Rainwater from new roof areas will be collected, filtered and used for the irrigation of landscape areas.

- Fire Services
  The multi storey car park has been designed to satisfy requirements of BCA2008. The Multi storey car park will have a Building Occupant Warning System to alert occupants in the entire building. Fire hydrants & fire hose reels have been provided to meet BCA & Australian Standards.

  A comprehensive set of fire safety management and evacuation plans will be developed which are consistent with all fire and life safety protection equipment to be installed and EPA regulations relating to OH&S and fire safety.

- Electrical
  The power supply to the multi storey car park will be derived from within the Hospital facility. The main switchboard and external lighting will be balanced as best as possible on each individual mains supply and distribution of boards. The sizing of sub-mains will be based on both maximum demand and voltage drop to comply with the requirements of the relevant standards.

  Lighting and power circuits within each area will be protected from the distribution boards. All distribution boards are fitted with the appropriate circuit breakers to control the circuits nominated, each chassis to have a minimum of 30% spare capacity.

  Distribution board for the external lighting will be heavy duty panelboard IP66 rated enclosed in 316 stainless steel cabinet. All external lighting control will be housed within an external distribution board cupboard.

  The external lighting will meet the requirements of the AS4485.1 and AS1158.3.1. An emergency and exit lighting system complying with AS2293 will be installed throughout multi storey car park. All emergency lights will be of the non maintained type and exit lights will be of the sustained type.

- Environmental Sustainable Design
  Energy efficiency is addressed by considering mechanical systems, controls and light fittings and lighting controls that meet the functional/ maintenance requirements while operating efficiently. Water conservation is addressed by use of rainwater for landscape irrigation purposes. Additionally, to minimise irrigation needs, it is recommended that where possible native plants are selected and a subsoil drip irrigation system with automatic timers installed.

- Communication Services
  All telecommunications services cabling infrastructure will be structured end-to-end and certified Category 6 cabling infrastructure installed by certified cabling contractors. The installed structured cabling system will be in accordance with relevant Specifications for Structured Cabling Systems and implemented in accordance with AS3080, AS3084 and 3085 recommendations.

Child Care Centre

- Mechanical Services
  The new building components of the Child Care Centre will be provided with an air cooled system. Outside air will be provided in accordance with accordance with AS1668.2-1991

- Hydraulic Services
  - Sewer
    The proposed sanitary drainage will discharge into the existing drainage pipe work.
  - Sanitary Plumbing
    The system will be installed in accordance with AS 3500.2 – 2003, and the NSW Code of Practice 2006. Materials will be Poly Ethylene and/or cast iron tube and fittings.
  - Potable Cold Water
    The proposed potable cold water will be connected to the existing site infrastructure of the Child Care Centre and reticulated to all fixtures and equipment that require cold water. The system will be installed in accordance with AS 3500.2 – 2003, and the NSW Code of Practice 2006. Materials for pipes up to 20mm will be cross linked polyethylene (Pe-X) and type 3 polypropylene (type 3 PP-R) tube and fittings for pipes 25mm and over.
  - Hot and Warm Water Systems
    The proposed potable hot water will be generated by means of boilers and heat exchangers and reticulated to all fixtures and equipment that requires hot water.

- Fire Services
  The Child Care Centre has been designed to satisfy requirements of BCA2008. The Child Care Centre will have a Building Occupant Warning System to alert occupants in the entire building. Fire hydrants & fire hose reels have been provided to meet BCA & Australian Standards.

  A comprehensive set of fire safety management and evacuation plans will be developed which are consistent with all fire and life safety protection equipment to be installed and EPA regulations relating to OH&S and fire safety.

- Electrical
  The power supply to the Child Care Centre will be derived from within the facility. The main switchboard for the Child Care Centre and external lighting will be balanced as best as possible on each individual mains supply and distribution of boards. The sizing of sub-mains will be based on both maximum demand and voltage drop to comply with the requirements of the relevant standards. Lighting and power circuits within each area will be protected from the distribution boards. All distribution boards are fitted with the appropriate circuit breakers to control the circuits nominated, each chassis to have a minimum of 30% spare capacity.

  Distribution board for the external lighting will be heavy duty panelboard IP66 rated enclosed in 16 stainless steel cabinet. All external lighting control will be housed within an external distribution board cupboard. External lighting will generally comprise long life metal halide HID lamps in vandal resistant luminaires. Low glare luminaires will be used to ensure that safety and amenity are maintained. The external lighting will meet the requirements of the AS4485.1 and AS1158.3.1. An emergency and exit lighting system complying with AS2293 will be installed throughout the Child Care Centre. All emergency lights will be of the non maintained type and exit lights will be of the sustained type.

- Environmental Sustainable Design
  Energy efficiency is addressed by considering mechanical systems, controls and light fittings and lighting controls that meet the functional/maintenance requirements while operating efficiently. Water conservation is addressed by reducing potable water consumption and use of rainwater. Additionally, to minimise irrigation needs, it is recommended that where possible native plants are selected and subsoil drip irrigation system with automatic timers are installed.

  It is recommended that the hospital implements a recycling and waste policy to comprehensively address all waste streams and all aspects of waste management ie recycling, safe handling and disposal and staff training.

- Communication Services
  All telecommunications services cabling infrastructure will be structured end-to-end and certified Category 6 cabling infrastructure installed by certified cabling contractors. The installed structured cabling system will be in accordance with relevant Specifications for Structured Cabling Systems and implemented in accordance with AS3080, AS3084 and 3085 recommendations.

Engineering Services Building

- Mechanical Services
  The office areas of the Engineering Services Building will be air conditioned by a VRV (Variable refrigerant volume) air cooled system with the condensing unit located on the north side of the building. Outside air will be provided in accordance with AS1668.2-1991. The workshop areas will be naturally ventilated and provided with heating in winter via wall radiators. The Engineering Services Building will be provided with toilet exhaust, welding bay exhaust and paint shop/sign writing room exhaust in accordance with AS1668.2-1991.

- Hydraulic Services
  - Sewer
    The proposed sanitary drainage will discharge into the existing drainage pipe work outside the existing Engineering Services Building, located on the south side of the development.
  - Sanitary Plumbing
    The system will be installed in accordance with AS 3500.2 – 2003, and the NSW Code of Practice 2006. Materials will be Poly Ethylene and/or cast iron tube and fittings.
  - Potable Cold Water
    The proposed potable cold water will be connected to the existing site infrastructure of the existing Engineering Services Building and reticulated to all fixtures and equipment that require cold water. The system will be installed in accordance with AS 3500.2 – 2003, and the NSW Code of Practice 2006. Materials for pipes up to 20mm will be cross linked polyethylene (Pe-X) and type 3 polypropylene (type 3 PP-R) tube and fittings for pipes 25mm and over.
  - Hot and Warm Water Systems
    The proposed potable hot water will be generated by means of boilers and heat exchangers and reticulated to all fixtures and equipment that requires hot water.

- Fire Services
  The New Engineering Services Building has been designed to satisfy requirements of BCA2008. The New Engineering Services Building will have a Building Occupant Warning System to alert occupants in the entire building. Fire hydrants & fire hose reels have been provided to meet BCA & Australian Standards.

  A comprehensive set of fire safety management and evacuation plans will be developed which are consistent with all fire and life safety protection equipment to be installed and EPA regulations relating to OH&S and fire safety.

- Electrical
  The power supply to the Engineering Services Building will be derived from within the facility and carpark. The main switchboard for the Engineering Services Building and external lighting will be balanced as best as possible on each individual mains supply and distribution of boards. The sizing of sub-mains will be based on both maximum demand and voltage drop to comply with the requirements of the relevant standards.

  Lighting and power circuits within each area will be protected from the distribution boards. All distribution boards are fitted with the appropriate circuit breakers to control the circuits nominated, each chassis to have a minimum of 30% spare capacity.

  Distribution board for the external lighting will be heavy duty panelboard IP66 rated enclosed in 316 stainless steel cabinet. All external lighting control will be housed within an external distribution board cupboard. External lighting will generally comprise long life metal halide HID lamps in vandal resistant luminaires. Low glare luminaires will be used to ensure that safety and amenity are maintained.

  The external lighting will meet the requirements of the AS4485.1 and AS1158.3.1. An emergency and exit lighting system complying with AS2293 will be installed throughout the Engineering Services Building. All emergency lights will be of the non maintained type and exit lights will be of the sustained type.

- Environmental Sustainable Design
  Energy efficiency is addressed by considering mechanical systems, controls and light fittings and lighting controls that meet the functional/ maintenance requirements while operating efficiently. Water conservation is addressed by reducing potable water consumption and use of rainwater. Additionally, to minimise irrigation needs, it is recommended that where possible native plants are selected and subsoil drip irrigation system with automatic timers are installed.

  It is recommended that the hospital implements a recycling and waste policy to comprehensively address all waste streams and all aspects of waste management ie recycling, safe handling and disposal and staff training.

- Communication Services
  All telecommunications services cabling infrastructure will be structured end-to-end and certified Category 6 cabling infrastructure installed by certified cabling contractors. The installed structured cabling system will be in accordance with relevant Specifications for Structured Cabling Systems and implemented in accordance with AS3080, AS3084 and 3085 recommendations.