

NEPEAN HOSPITAL, STAGE 2

ELECTRICAL SERVICES SSDA SEARS REPORT



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1 EXECUTIVE SUMMARY

Health Infrastructure NSW (HI) is the applicant for the proposed Stage 2 Redevelopment of Nepean Hospital in Penrith Local Government Area (LGA).

The proposal is State Significant Development (SSD) for the purposes of the Environmental Planning and Assessment Act 1979 (EP&A Act) and clause 14(a) of Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD) as it involves development for the purposes of a hospital with a capital investment value in excess of \$30 million.

The Stage 2 Redevelopment seeks to deliver significantly enhanced acute services, as well as a new campus main entry and drop-off area. It complements the recent Stage 1 Redevelopment (SSD 8766) approved in February 2019 and due for completion by early 2022.

The proposed Stage 2 Tower will be located west of, and connected to, the Stage 1 Tower. Portions of the North Block (north section) will be demolished with the remaining sections of the North Block (to the south of the Stage 2 Tower) to remain operational.

Departments to be provided in the Stage 2 Tower include:

- Front of House, including retail;
- Education and Training Centre;
- Transit Lounge;
- Medical Imaging;
- Interventional Radiology;
- Intensive Care Unit and Close Observation Unit;
- In-Centre Dialysis and Renal Inpatient Unit;
- Paediatric In-patient Unit;
- Plant areas;
- Clinical Support areas; and
- Kitchen.

The Stage 2 Redevelopment project scope includes:

- The Stage 2 Tower, being predominantly a 7-storey building, with roof plant;
- Demolition of parts of the existing North Block and other satellite buildings directly within the Stage 2 Tower footprint (excluding other buildings already approved under the Stage 1 SSD consent);
- Demolition of the Total Asset Management (TAM) facility;
- Reconfiguration of the loading dock area and back of house functions;
- Landscaping and other associated at-grade works within the Stage 2 Tower's immediate vicinity; and
- Barber Avenue upgrade and access road to the Stage 2 Tower's forecourt, port cochere, and front of house area.

The Stage 2 Redevelopment's SEARs was issued by the Department of Planning, Industry and Environment on 22 April 2021.



In preparing this report, the following SEARs General Requirements, Key Issues, and Agency's Advice letters have been addressed. The table below sets out the reference or location of these matters within this report.

General Requirement or Key Issue or Agency Advice	Reference / Location within this report		
 Environmental Amenity Assess amenity impacts on the surrounding locality, including solar access, visual privacy, visual amenity, overshadowing, wind impacts and acoustic impacts. A high level of environmental amenity for any surrounding residential land uses must be demonstrated. Provide: An analysis of proposed lighting that identifies lighting on-site that will impact surrounding sensitive receivers and includes mitigation management measures to manage any impacts. 	Section 4 External Lighting		
 Utilities In consultation with relevant service providers: Assess the impacts of the development on existing utility infrastructure and service provider assets surrounding the site. Identify any infrastructure upgrades required off-site to facilitate the development and any arrangements to ensure that the upgrades will be implemented on time and be maintained. Provide an infrastructure delivery and staging plan, including a description of how infrastructure requirements would be coordinated, funded and delivered to facilitate the development. 	Section 3 Primary Stage 2 Utility Infrastructure Works Appendix A Site Services Plan For SSDA / SEARs Submission		



2 INTRODUCTION

2.1 PURPOSE

JHA have been engaged by Health Infrastructure to provide schematic design for the Electrical and ICT related services for the new Stage 2 Development.

The purpose of this report is to respond to relevant criteria identified in the main Stage 2 Development State Significant Development Application (SSDA) / Secretary's Environmental Assessment Requirements (SEARs) submission.

2.2 **PROJECT DESCRIPTION**

The proposed Nepean Hospital Redevelopment – Stage 2 (NH2) is located at Derby Street, Kingswood, NSW and forms part of the Blue Mountains Local Health District (BMLHD). The Stage 2 works consist of a mix of demolition, new build, services diversions (some of which are occurring under a separate scope to the main works), refurbishments and integration with Stage 1, which will be delivered in a staged manner.

The staging of the works is a vital element for the successful delivery of the project. Equally the timing of these elements / staging will also have a significant impact on the services planning and consequently, costings.

The existing hospital needs to maintain functionality throughout the duration of the Stage 2 works.

2.3 NEW BUILD

The proposed scope for Stage 2 is to construct an 8 storey building (Level 7 cold shell) with an approximate gross floor area of 30,300m². The building predominantly consists of FOH, Medical Imaging, Interventional Radiology, Clinical Support, Education, ICU and IPUs.

Under this new build, electrical infrastructure will be sized to accommodate the needs of Stage 2. There will also be an element of spare capacity which could potentially support future stages.



Figure 1 Stage 2 Tower



2.4 STAGE 1 INTEGRATION

A key objective of the Stage 2 works is to leverage off infrastructure that has been installed within Stage 1. Key site wide infrastructure will be installed within Stage 1 (i.e. Campus Distributor, nurse call, security etc) which, due to its modular and IP nature, readily allows for its expansion and integration into Stage 2.

The Stage 1 design has included for a new Combined Campus Distributor (CD)/ Building Distributor (BD-1) on Level 01 and a second Building Distributor (BD-2) on Level 4. Stage 2 also is proposed to include a Combined CD / BD-1 on Level 0 and a BD-2 on Level 4. Both of these Stage 2 ICT rooms will interface with Stage 1 via multiple fibre and copper backbone cables via diverse paths.

The Stage 1 tower will include a Distributed Antenna System (DAS) room on Level 01. It is anticipated that the Stage 1 DAS system can be extended into the Stage 2 tower. It is considered that the Stage 1 Primary Carrier Room is adequately sized to service the needs of Stage 2 via interfacing with a series of subordinate carrier equipment within the Stage 2 tower. The Stage 2 DAS will be design in accordance with the forthcoming 2021 Design Standard for DAS.



3 PRIMARY STAGE 2 UTILITY INFRASTRUCTURE WORKS

3.1 OVERVIEW

The following key infrastructure works will be associated with the new Stage 2 Tower Development:

- New incoming HV infrastructure Endeavour Energy high voltage feeder to supply the site
- New internal HV infrastructure High voltage private chamber substation and associated HV cabling
- New telecommunications lead-in pit and conduit network to facilitate a second telco lead-in service to the new Stage 2 lead-in room
- Distributed Antenna System (DAS) coverage throughout the Stage 2 Building for mobile phase / device coverage
- Diversion and/or decommissioning of existing in ground services infrastructure including electrical and telecommunications cabling to facilitate demolition works associated with the introduction of the new Stage 2 Tower.
- External lighting, inclusive of internal roadways, pathways, pedestrian areas and the like. These works are to form a seamless solution with those implemented under the Stage 1 program, requiring the use of similar fittings and fixtures,
- All works are to be carefully staged so that operations on campus within other active buildings can be maintained with limited disruption.

3.2 HIGH VOLTAGE SERVICES

On the basis of existing and planned high voltage works on campus, there is insufficient capacity to accommodate the needs of Stage 2 and subsequent stages. The following high voltage works are proposed under the Stage 2 project:

- Introduction of a new and additional dedicated primary high voltage feeder, with new back-up feeder, from a local zone substation (6MVA) to supplement that currently being planned for under Stage 1 and existing to the legacy campus. The high voltage feeder is proposed to be sourced from the Kingswood zone substation.
- A new Endeavour Energy switching station is proposed to be installed at the boundary of the site, delineating between Endeavour Energy's network and the hospital's private HV network.
- There is also a planned interface between the Stage 1 and Stage 2 HV switchboards for additional diversity / supply integrity.
- A new chamber substation will be introduced into the new Stage 2 building. The chamber will be sized to accommodate the high voltage switchboard for the Stage 2 feeder, HV Authority metering, 3-off 1500KVA dry type transformers and be capable of delivering 4.5MVA to Stages 2, with spare capacity.
- HV Bus-tie arrangement will be provided in the event that one transformer fails
- The proposed location of the Stage 2 chamber substation (and other associated major electrical infrastructure) on Level 04 of the new tower. This represents the most economical location from a reticulation point of view.
- Note, as identified earlier within this report, the Stage 2 new high voltage feeder will initially service the needs of Stages 2 (i.e. 3.2MVA) which will leave approximately 2.8MVA of spare capacity for future stages. Early planning indicates that an acute services building is proposed immediately adjacent to the Stage 2 building. The intent would be that this future development (identified as approx. 19,000m²) could be adequately accommodated onto the Stage 2 feeder.





Figure 2 Proposed Stage 2 HV Services

3.2.1 NEW HV INFRASTRUCTURE PLANNING AND IMPLEMENTATION

Early coordination of the design associated with the proposed new high voltage feeder from the local zone substation is a critical item of the proposed Stage 2 Development. A new feeder is a complex item of infrastructure that needs extensive coordination with other in-ground services in its path to the remote zone substation. Consequently, the design process can take in excess of 6 months.

The project team is cognizant of the fact that early action is required to ensure that a Level 3 ASP design is fully certified by the Authority in a timely manner for pricing and engagement of the nominated contractor.

JHA has been formally engaged to undertake the Level 3 ASP design for the proposed new HV Feeder to the site.

The intention is to progress with the Level 3 ASP design for the proposed new HV feeder immediately and in parallel to the main project contract. To this effect, JHA is working closely with HI, CBRE and Delta Elcom (engaged as a facilitator for the HV works) to ensure the design is completed in a timely manner. This will ensure that all infrastructure is in place and fully commissioned prior to the planned energisation date for the new Stage 2 Tower.

All required HV upgrade works are to be funded by the Stage 2 Development Program.



3.3 NEW STAGE 2 TELCO SERVICES

3.3.1 GENERAL

The proposed solution is for Stage 2 to become a critical hub for the overall site's telecommunications needs (mirroring the role that the Stage 1 project is to occupy).

The proposed Stage 2 works will see a new Campus Distributor introduced to the new building to supplement the Campus Distributor being introduced under Stage 1. The Stage 2 Campus Distributor will be interfaced (via diverse redundant fibre links) to the Campus Distributor in Stage 1 and former Campus Distributors in South Block (ICT Room 04) and North Block (ICT Room 00) respectively, so as to establish a seamless and robust network (multiple levels of redundancy).

A comprehensive network of spare conduits and pits will be provided as part of Stage 2 to facilitate interconnection with future stages.

The proposed solution is for Stage 2 to become a critical hub for the overall site's telecommunications needs (mirroring the role that the Stage 1 project is to occupy).

3.3.2 PROPOSED COMMUNICATIONS NETWORK

It is proposed that Stage 2 ICT infrastructure will consist of the following elements:

- 1. A new combined Campus Distributor (CD) / Building Distributor (BD) / Floor Distributor (FD) to be established on Level 0 within the Stage 2 tower. This CD along with that established in Stage 1 will replace the existing antiquated Campus Distributors in South Block (ICT Room 04) and North Block (ICT Room 00) respectively, which will be downgraded to major ICT distribution nodes to support connectivity to legacy areas on campus
- 2. A new lead-in Telco service will be introduced for the new Stage 2 Campus Distributor. This will serve as a diverse lead-in with respect to that established under the Stage 1 development.
- 3. A network of interconnecting fibre / copper backbone cabling will be implemented
- 4. Redundant backbone interfaces between Stage 1 and Stage 2 primary ICT rooms will be established via diverse redundant paths
- 5. A new Building Distributor (BD) room is proposed on Level 4 within the Stage 2 tower. This BD will be linked to both the Stage 1 and Stage 2 CDs; likewise for the planned Stage 1 tower BD on Level 4
- 6. It is currently proposed that strategically positioned Floor Distributors (FDs) will be established on each floor within the Stage 2 tower. 2-off Floor Distributors (FDs) per floor on Levels 1 -3; potentially 1-off centralized FD on Levels 4 7. Note that the CD and Level 4 BD will also serve as FDs for the local floor space
- 7. All planning will strictly comply with the Nepean Hospital "Stage 2 –ICT Strategy", the Nepean Stage 1 "ICT Blueprint" and the NSW Health ICT Cabling Specification, V3.

3.3.3 NEW TELCO LEAD-IN PLANNING AND IMPLEMENTATION

The proposed telco lead-in service to the Stage 2 Tower will augment the primary lead-in service established under the Stage 1 Program.

In order to facilitated a higher degree of integrity, the Stage 2 Telco lead-in service will be established via an underground pit and conduit route which is fully independent to that established under Stage 1.

It is currently proposed that this service lead-in be established through entering via Parker Street and travelling parallel to Barker Avenue, before reticulating to the western side of the proposed Stage 2 Tower and through to the Carrier Room on Level 0.

Initial Application to NBN is to be made during the Design Development Phase, in order to fully establish the project's requirements with the provider.





Note, this provision is inclusive of provisioning NBN services within the building as a Group 1 item. The head contractor is to allow for an FTTP connection type and a minimum of 20 lock IDs.

All required telco lead-in works are to be funded by the Stage 2 Development Program.

Figure 3 Stage 2 CD /BD-1 / FD & Carrier Room Layout

3.3.4 DISTRIBUTED ANTENNA SYSTEM (DAS)

Distributed Antenna Systems (DAS) are implemented to facilitate enhanced mobile coverage throughout buildings which would otherwise be subject to impaired mobile carrier coverage due to physical building constraints.

The design of DAS systems must currently comply with the Mobile Carrier Forum's (MCF's) "Design Specification for Distributed Antenna Systems". The 2021 revision of this document is due to be formally issued, taking effect in January 2022. This updated version covers requirements for 5G coverage. The Stage 2 Tower DAS will be designed to this updated Standard.

3.3.5 STAGE 1 DAS

The Stage 1 building (by others) is being provided with a Distributed Antenna System (DAS), including a primary carrier room on Level 1, adjacent to the new Stage 1 Campus Distributor (CD) Room.

The Stage 1 building DAS is to extend the coverage of the three primary carrier networks (Telstra, Optus and Vodafone) throughout the Stage 1 tower only. The Stage 1 DAS is currently design to support up to 4G coverage.

The Stage 1 DAS is a hybrid system, consisting of a combination of active head-end equipment and passive antennas for cross-facility distribution and integration.

Based on preliminary coordination with Health Infrastructure, Telstra representatives, Stage 1 and Stage 2 project stakeholders, it is planned for the Stage 1 DAS system to be extended into the Stage 2 tower.

3.3.6 STAGE 2 DAS INTEGRATION

Extension of the DAS into Stage 2 will negate the need for a second dedicated primary carrier room in the Stage 2 tower footprint. The primary benefits of this approach are summarised as follows:

- 1. Reduced spatial requirements for DAS infrastructure within the Stage 2 tower footprint
- 2. Reduced CAPEX associated with additional carrier DAS lead-in services and associated infrastructure
- 3. Reduced CAPEX associated with the activation of a second set (3-off) of carrier services
- 4. Reduced ongoing subscription and maintenance fees associated with carrier services and infrastructure.



Furthermore, representatives from Telstra have so far been receptive to the use of Stage 1 incoming carrier infrastructure to support the Stage 2 DAS coverage. It is anticipated that the incoming lead-in fibre infrastructure will be sufficient to support this solution.

It is anticipated that Stage 2 can be interfaced with the Stage 1 DAS head-end via dedicated single mode fibre optic backbone cables reticulated from the Stage 1 Base Transceiver Station in the primary carrier room to Remote Repeater Units (RRU) or similar technology within the Stage 2 tower to facilitate coverage throughout).

It is proposed that a primary DAS Remote Repeater Unit (RRU) room be established on Level 0 respectively of the Stage 2 tower.

Spatial allocation within this room will facilitate each carrier's installation of active repeater equipment to extend the Stage 1 system into Stage 2.

Commscope ERA or approved equal repeater unit outputs will then be combined onto a shared passive antenna system reticulated throughout the Stage 2 tower. It is anticipated that splitters and other passive system components could be installed within nominated ICT Floor Distributor (FD) rooms and otherwise as necessary throughout the Stage 2 tower to support DAS distribution.

All DAS designed and implemented after January 2022 must be designed in accordance with MCF21, and designed with a MIMO architecture as a baseline. DAS after this time must be 5G capable; however, feedback from Telstra representatives is that DAS need NOT be initially 5G activated.

Noting the above, the following DAS solution is proposed:

- 1. The Stage 2 DAS can be designed and installed to MCF21; utilising 5G compatible architecture, including but not limited to Commscope ERA units.
- 2. The Stage 2 DAS can be initially 4G activated, leveraging off of the Stage 1 DAS head-end
- 3. The entire facility (Stage 1 and Stage 2) can be augmented (Stage 1) and 5G activated concurrently, at a later time.

All required works associated with DAS are to be funded by the Stage 2 Development Program.



Figure 4 Stage 2 DAS Backbone Schematic Diagram



4 EXTERNAL LIGHTING

The external lighting shall follow the below design requirements. External lighting schemes and layouts shall be determined in design development and detailed design.

- Lighting control systems shall be IP based and be able to readily interface with the site BMS for timing, switching, control and monitoring etc.
- The nature and positioning of the lighting shall also follow the lighting selected in the Stage 1 Development. However, should the lighting selection from the Stage 1 Development not conform to latest statutory requirements, the lighting strategy will be adjusted so that compliance is met.
- Automation and control of the lights across each area is important to ensure a seamless appearance. Lights are
 to be time switch controlled in combination with photoelectric cells. It is assumed a common time clock
 philosophy will be utilised across all campus buildings to ensure that lights are activated at the same time, with
 master control via the BMS. The use of separate photoelectric cells on each building may result in a staggered
 activation of lights; however, this can be mitigated utilising timeclock override where desired.
- Exterior lighting will be provided in accordance with NSW Health's policy manual, 'Protecting People and Property (noting that lighting will be connected to the generator supply and not the UPS), as well as compliance to AS 1158.3.1 and AS 4282. Lighting designs will achieve recommended light levels for safety and security, while allowing for full function of CCTV surveillance.
- All external lighting local to Stage 2 will be connected to the generator supply.

As noted above all external lighting associated with the Stage 2 Development will be designed in accordance with both AS/NZS 1158.3.1 Lighting for roads and public spaces series and AS 4282 Control of Obtrusive Lighting. Careful consideration will be given to not only neighbouring sites, but also existing buildings and infrastructure internal to the Campus, in order to establish an overall lighting design and aesthetic that minimises glare and undesirable illumination levels to surrounding sensitive receivers and where necessary, includes mitigation management measures.

5 SERVICES DIVERSIONS

An extensive amount of demolition works is proposed to enable the Stage 2 new build to be constructed.

The majority of the areas / buildings identified for demolition do not contain key services nodes and as such their demolition is relatively simple and will cause minimal disruption to operations in other retained buildings.

However, the existing buildings in the northern campus are to be retained and remain operational for the duration of Stage 2 construction works. In order to accommodate this requirement a series of cable diversions and infrastructure augmentations under a separate Site Wide Infrastructure Works Package.

The existing ICT Campus Distributors fall outside of any areas scheduled for either demolition or major refurbishment; however, ICT Room 02 on Level 1 in North Block resides directly adjacent to the planned demolition footprint. This room serves as a primary distributor to many of the Floors Distributors within North and West Block, while also serving as a Floor Distributor for the surrounding clinical areas. Current planning has been undertaken by the design team to retain ICT Room 02, while still accommodating the new Stage 2 tower.

Existing kiosk substation F (SUB-F) is in the demolition zone and adjacent to many of the buildings identified for demolition under Stage 2 Early Works. This substation predominately serves these local buildings and as such its demolition, subject to timing, will have limited impact. However, there are a number of existing buildings which will require resupply. A number of diversions are occurring under a separate Site Wide Infrastructure Works Package; will the remainder will occur under the Stage 2 Program.



6 PHOTO-VOLTAIC (PV) SYSTEM

It is proposed that anew PV system be installed on the new Stage 2 Tower roof. At this stage, the Stage 2 project team is designing and provisioning for installation of a system in the order of up to 125kW.

Final installation of the system will either be undertaken under the primary Stage 2 program, or otherwise installed post Stage 2 completion, utilising electrical, architectural and structural provisions implemented under the Stage 2 program.





APPENDIX A – STAGE 2 DEVELOPMENT SERVICES SITE PLANS FOR SSDA SUBMISSION



APPENDIX B – STAGE 2 HIGH VOLTAGE (HV) SINGLE LINE DIAGRAM



APPENDIX C – STAGE 2 ICT BACKBONE SCHEMATIC DIAGRAM

