# Masterplan Report
# Eurobodalla Health Service - Capital Consultants

April 2021
For: NSW Health Infrastructure

NSW GOVERNMENT Health Southern NSW Local Health District

NSW GOVERNMENT Health Infrastructure

ROOT PARTNERSHIPS Advisory+ Project Management

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# Documentation Control

| Version | Date | Issued To | Status | Prepared by | Reviewed by |
|---|---|---|---|---|---|
| A | 23-03-2021 | Root Partnership | DRAFT | [redacted] | [redacted] |
| B | 29-03-2021 | Root Partnership & Health Infrastructure | DRAFT | [redacted] | [redacted] |
| C | 27-04-2021 | Root Partnership | FINAL | [redacted] | [redacted] |
| D | 05-05-2021 | Root Partnership | FINAL | [redacted] | [redacted] |

*We acknowledge the Walbunga people of the Yuin Nation, Traditional Custodians of the land on which the Eurobodalla Health Service will be sited, and pay respects to their Elders past and present.*

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# Abbreviations/Acronyms

| Term | Description |
|---|---|
| BAL | Bushfire Attack Level |
| CSP | Clinical Services Plan |
| ED | Emergency Department |
| EHS | Eurobodalla Health Service |
| FDB | Functional Design Brief |
| FFDI | Forest Fire Danger Index |
| HINSW | Health Infrastructure New South Wales |
| HLS | Helicopter Landing Site |
| HS | Hospital Service |
| NSW | New South Wales |
| NZE | Net Zero Emissions |
| PAS | Project Advisory Service |
| PMF | Probable Maximum Flood |
| PPT | Project Planning Team |
| PV | Photovoltaic |
| SNSWLHD | Southern New South Wales Local Health District |
| SOA | Schedule of Accommodation |
| WSUD | Water Sensitive Urban Design |
| ZMP | Zonal Masterplan |

# 1.0 Executive Summary

## 1.1 Executive Summary

Southern NSW Local Health District (SNSWLHD) currently provides health services across three campuses within the Eurobodalla Shire, including hospitals at Batemans Bay and Moruya. The Eurobodalla Health Service Clinical Services Plan (CSP), endorsed in March 2020, identified a need to consolidate existing services, reduce duplication and increase the provision of care to meet the needs of the Eurobodalla population.

The Eurobodalla Health Service project aims to create a sustainable, patient and community focused service which is digitally enabled. Planning has maintained a focus on sustainability; both environmentally and operationally, as well as community focused. This is evident in the use of the preferred site at Moruya in providing natural light and views for a majority of the facility, considering the topography to allow the indigenous community to maintain a connection with Country through significant life events as well as meeting clinical needs through access, co-location and key adjacencies.

As a pilot project for the NSW Government Architect's "Connecting with Country" framework, consultation has been undertaken with members of the Indigenous community both as part of identification of a preferred site as well as development of the Master Plan. This consultation is planned to continue through the life of the project to ensure the facility, its staff and visitors connect with, and respond to, Country.

Early planning identified a preferred Eurobodalla Health Service site, adjacent to the Princes Highway in Moruya, which can accommodate the health service along with appropriate future proofing, providing immediate access from the highway as well as alternate vehicular access from the north if needed. Initial planning responds to the natural topography, supporting northern orientation, as well as providing outlook to vegetation and distant views.

The development of this Master Plan has included consultation with a range of stakeholders within SNSWLHD, Community members and the Health Infrastructure Delivery team, Project Advisory Services and Expert Review Group.

Four workshops were held with the Project Planning Team (PPT) to review the opportunities and constraints of the preferred site as well as undertake evaluation of the four Master Plan options. Two options were identified as preferred as they were considered to best respond to the Clinical Services Plan as well as zonal requirements such as provision for future education, accommodation and other health providers.

The Master Plan considers the need and provides flexibility for the Eurobodalla Health Service campus, through provision of a "Day One/Go Live" service as well as opportunities for expansion to the full Clinical Services Plan date of 2031. It is envisioned the facility will support the required change from operating two aged hospitals to one health service providing efficient and appropriate care to the community whilst responding to technology advances and emerging clinical requirements in a post-pandemic world. Furthermore, the preferred site provides opportunities for connection to Moruya Township considering various modes of travel as well as a connection to Country for all staff and visitors.

## 1.2 Purpose of the Masterplan

The delivery of this Masterplan is included within the scope of the Eurobodalla Health Service Project.

The project scope has been identified in Section 3 of the Capital and Service Consultants: Principal and Project Specific Requirements by Health Infrastructure. This document notes that this Masterplanning report is Part 1 of Phase 1 Planning.

This Masterplan report stands separately to the project. It provides an opportunity for the design team and staff to review the campus, service and facilities prior to delving into the project itself. It is intended that the Masterplan provides a framework to inform the project (and others that may follow) to ensure decisions regarding facility locations, service diversions and future expansions etc. are not ad hoc and therefore, have a detrimental impact on future staging.

It is intended for this document to be adopted by SNSWLHD over the coming years.

## 1.3 Key Masterplan Objectives

A Masterplan strategy and structure has been developed to strengthen and assist with future capital works planning.

The Masterplan is underpinned by the following objectives:

1 Identify zones for various hospital uses
2 Identify expansion space
3 Address connectivity issues between the upper and lower levels
4 Address landscaped open space for staff and visitors
5 Address entrance and wayfinding
6 Relate the arrival experience, internal journeys and outlook to the natural environment wherever possible
7 Provide an appropriate sense of place for Aboriginal staff, public and clients; and
8 Utilise the hill dividing the site as natural planning zones.

# 2.0 Terms of Reference

## 2.1 Project Team

Table 1: Project Team

| Organisation | Project Team Member | Contact Name |
|---|---|---|
| Conrad Gargett | Executive Lead | [redacted] |
| Conrad Gargett | Project Lead | |
| Conrad Gargett | Project Lead Support (Master planning) | |
| Conrad Gargett | Project Architect | |
| Conrad Gargett | Director Design Strategy | |
| Conrad Gargett | Project Support | |
| Conrad Gargett | Project Support | |
| Conrad Gargett | Landscape Architect | |
| Conrad Gargett (WSP) | Associate – Sustainability | |
| Root Partnerships | Project Lead | |
| Root Partnerships | Project Director | |
| Root Partnerships | Senior Project Manager | |
| Root Partnerships | Project Manager | |
| Root Partnerships | Facility Planner | |
| Root Partnerships | Facility Planner | |
| HI NSW | Project Director | |
| HI NSW | Executive Director | |
| HI NSW | Project Director | |
| HI NSW | Executive Director | |
| HI NSW | Associate Project Director | |
| HI NSW | Senior Procurement Advisor | |
| SNSW Local Health District | A/General Manager, Eurobodalla | |
| SNSW Local Health District | Manager, Finance and Business | |
| SNSW Local Health District | District Director Finance & Performance | |
| SNSW Local Health District | Chief Executive | |
| SNSW Local Health District | Acting Director, Information & Infrastructure | |
| SNSW Local Health District | Director, Mental Health | |
| SNSW Local Health District | Director, Nursing & Midwifery | |
| SNSW Local Health District | Director, Medical Services | |
| Eurobodalla Council | Director, Infrastructure Services | |
| Eurobodalla Council | Planning and Sustainability Services | |
| Eurobodalla Council | General Manager | |
| Eurobodalla Council | Community, Arts and Recreation | |
| Ministry of Health | A/Executive Director Strategic Reform | |
| Ministry of Health | Principal Planning and Policy Officer | |
| TfNSW | Program Director, Princes Hwy Upgrade | |
| TfNSW | Project Manager, Moruya Bypass | |
| Community Consultative | Community Representative | |
| Community Consultative | Visiting Medical Officer | |
| Consultant Anthropologist | Anthropologist | |
| Genus Advisory – Cost Manager | Director | |
| Genus Advisory – Cost Manager | Associate | |
| Genus Advisory – Cost Manager | Associate Director | |
| Bonacci – Structural/Civil | Structural Lead | |
| Bonacci – Structural/Civil | Civil Lead | |
| Bonacci – Structural/Civil | Civil Designer | |
| Bonacci – Structural/Civil | Director | |
| Steensen Varming – Electrical and Communications | Electrical and Communications Lead | |
| Steensen Varming – Electrical and Communications | Electrical Engineer and Document Control | |
| Steensen Varming – Electrical and Communications | Project Director | |
| Steensen Varming – Electrical and Communications | Electrical Engineer | |
| Steensen Varming – Electrical and Communications | Electrical/BIM Engineer | |
| Stantec – Mechanical and Med Gases | Mechanical and Med Gases Lead eugen | |
| Arup – Hydraulic and Fire Systems | Hydraulic and Fire Systems Lead | |
| Specialist Health Advisory Service – TSA | Health Planning Lead | |
| Specialist Health Advisory Service – TSA | Project Manager | |
| Bitzios Consulting | Manager (Major Projects) | |
| Bitzios Consulting | Senior Traffic Engineer | |

## 2.2 Methodology

The master planning process develops a framework to establish the appropriate use of land and accommodation in terms of functional suitability and ability to support the delivery of services. This ensures that future infrastructure projects are able to reference proposed functional capacities and clinical adjacencies as well as identifying underlying constraints and site-specific issues.

It is important that the opportunities of the site are realised while satisfying SNSWLHD requirements in the short, medium and long term. The recommendation of a preferred solution provides a strategic direction for the future of the Campus.

The project team have undertaken the below activities during the Masterplan phase:

— Inspection and review of onsite and offsite facilities in Batemans Bay, Moruya and Narooma
— Review of the Eurobodalla Health Clinical Service Plan and Asset Strategic Plan
— Consultation with identified staff
— Site investigations and Site Analysis
— Departmental relationship benchmarking to similar projects
— Site investigations for services and topography
— Masterplan response and conclusion
— Masterplan response to the latest area schedule; and
— Precedent study to similar projects

This Masterplan will however focus on the Eurobodalla Site only.

## 2.3 Documentation Review

**Clinical Services Plan**

The Clinical Services Plan was developed by Southern NSW Local Health District (SNSWLHD) over many years, with endorsement from the Ministry of Health in May 2020. The Clinical Service Plan provides a comprehensive overview of current and future health service delivery across all care settings, and make recommendation for capital works enhancements and clinical services delivery.

**Planning and Prioritisation Report**

During Part 0 “Project Initiation”, a process of initial scope optimisation was undertaken to ensure a sustainable and appropriately sized service could be provided within the allocated budget. As a result, a Planning and Prioritisation Report was developed.

This report summarises the clinical service prioritisation process undertaken with Eurobodalla Health Service to date. The Planning and Prioritisation report seeks to provide an accurate record of the approach to reach the preferred service configuration at day 0 of the new Eurobodalla Health Service, through “transform and optimise” initiatives and a service prioritisation process for the Eurobodalla Health Service (EHS) Redevelopment.

**Reports:**

- Eurobodalla Health Service Clinical Service Plan, March 2020
- Australasian Health Facilities Guidelines, February 2021
- Eurobodalla Health Service Site Selection Report
- Eurobodalla HS Site Selection Flood Assessment Report Rev 0
- Moruya (Eurobodalla) Hospital HLS Aviation Feasibility Assessment AviPro V1.1 Final
- Preliminary Town Planning Assessment 30062020 – Site Selection
- Building Code of Australia (BCA)
- Eurobodalla Health Service Redevelopment -Value Management Study
- Site Selection Working Group Brief Final
- EHS Redevelopment - Recommendation Report V1.2
- Review of South East Regional Hospital & Site Visit
- POE Report Operating Theatres and IIOR 2017; and
- 190312 POE IPU Major Findings and Recommendations Presentation.

The below consultants’ reports have informed this Masterplan report:

— Electrical Engineers Report
— Engineers inspection reports (structural & civil)
— Geotechnical Report
— Mechanical Engineers Report; and
— Surveyor plans.

## 2.4 User Engagement

Master Plan studies and options for future expansion have been presented to a representative group of the SNSWLHD at several Master Planning Workshops. A review by the Expert Review Group and Project Advisory Strategy (PAS) at Health Infrastructure was also carried out concurrently and relevant feedback incorporated into the options. An evaluation of the options was carried out in the final workshop. The preferred option was issued to the primary stakeholders for final review and approval.

**Workshop Dates and Attendees**

| | |
|---|---|
| Eurobodalla Masterplan Review | 19th January 2021 |
| EHS Masterplan Workshop 1 | 2nd February 2021 |
| EHS Masterplan Workshop 2 | 17th February 2021 |
| HI Project Advisory Strategy (PAS) | 22nd February 2021 |
| EHS Masterplan Workshop 3 | 3rd March 2021 |
| Start Up Indigenous Consultation | 5th March 2021 |
| HI Expert Review Group | 24th March 2021 |
| Indigenous Consultation | 25th March 2021 |
| EHS Masterplan Workshop 4 | 25th March 2021 |

# 3.0 The Site

## 3.1 Location

The proposed health service campus is approximately 2km South East of the Moruya town centre (refer Figure 2), predominantly on a clear sloping site which forms a parkland setting. Links into the town centre rely mainly on motorised road transport but the local authority does encourage bicycle routes and public transport currently service the neighbouring TAFE campus and residential neighbourhood.

## 3.2 Indigenous People and Eurobodalla

### 3.2.1 First Nations Diversity

Eurobodalla Shire recognises Aboriginal people as the original inhabitants and custodians of all land and water in Eurobodalla and respects their enduring cultural and spiritual connections. Eurobodalla Shire acknowledges the Traditional Owners of the land in which we live.

The people of the Yuin Nation are the traditional custodians of the land we now know as Eurobodalla Shire. Yuin people have lived in the area for thousands of years and have an enduring custodianship and connection over the land and waterways of Eurobodalla.

The dispossession of Aboriginal people from their lands across Narooma, Batemans Bay and in other towns on the far south coast began in the nineteenth century. The combination of introduced diseases, violence and forced removals significantly affected the Aboriginal population across the wider region.

Today, the Indigenous population generally is disadvantaged across a range of measures including health, education and income. The Eurobodalla Shire has the largest Aboriginal population in SNSWLHD, with an estimated 6.8% of the Shire's population identifying as Aboriginal or Torres Strait Islanders, double the state average of 3.4%. This population is young, with 46% aged 0-19 years. Cultural recognition and identity are important to the health and wellbeing of the growing number of Indigenous people who use or work in health services. This information has been extracted from the Clinical Services Plan (CSP).

## 3.3 Site Plan

The site is mostly safe from the town's known flood area, with the western portion of the site within the flood plan (refer flooding Eurobodalla HS Site Selection Flood Assessment Report Rev0); the town itself sits alongside the river. The river and the Princes Highway should be considered in access planning and stocking, during disasters.

The site is outside a fire hazard zoning and currently is listed as posing no undue risk for spread of fire (refer Eurobodalla HS Site Selection Report).

The site has a large expansion area but is limited by the topography. Any form of developmentwill need to be closely positioned to the existing plateau in order to prevent extensive elevation above the hillside

## 3.4 Helipad

Moruya Hospital currently has a Helipad Landing Site. The new Eurobodalla Health Service may also have a helipad located on the site, although the number of retrievals is expected to decrease in response to a higher Role Delineation Level. An Aviation Consultant has advised the flight path on approach to the hospital is best from a North-East or South-West direction. The departure flight path is the same, departing from North-East or South-West direction.

The master plan will consider the location of the Helicopter Landing Site and the helicopter services flight path (refer Moruya (Eurobodalla) Hospital HLS Aviation Feasibility Assessment - AviPro V1.1 Final), along with potential obstacles, preferred clinical adjacencies and amenity to maximise patient privacy.

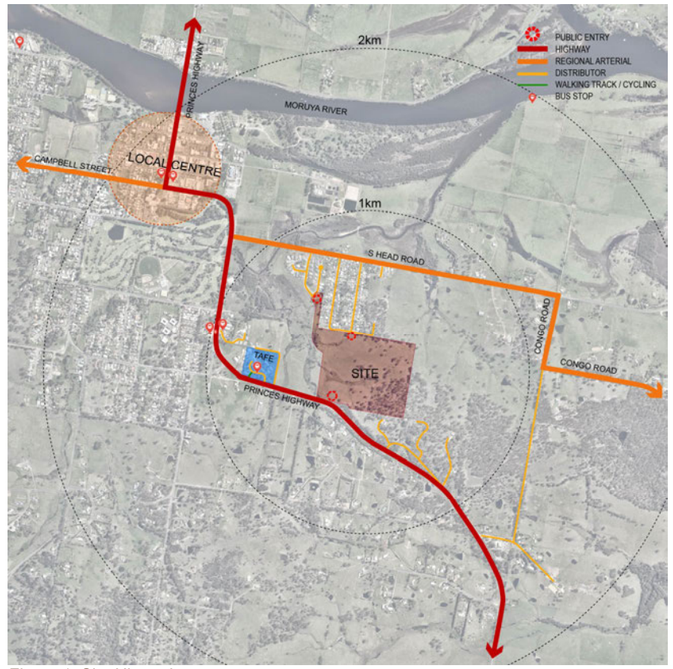



Figure 1: Site Hierarchy

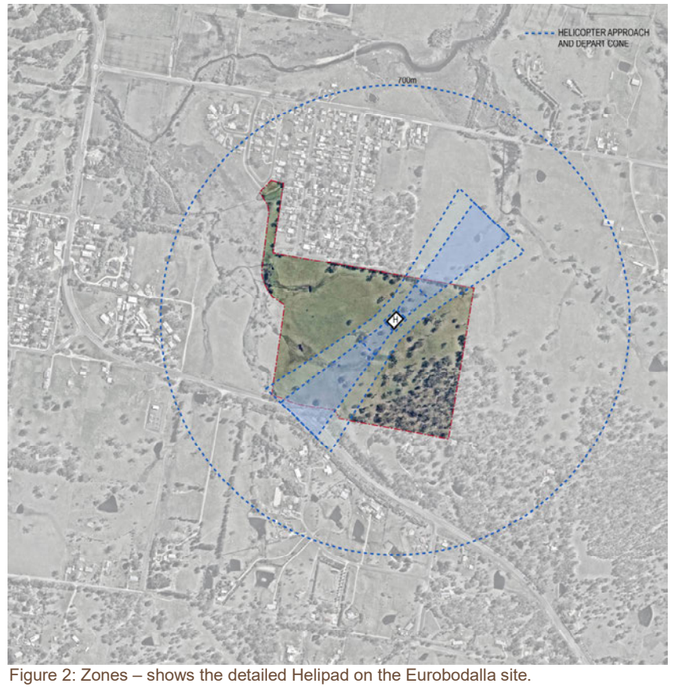



Figure 2: Zones – shows the detailed Helipad on the Eurobodalla site.

## 3.5 Solar Analysis

The sun path diagram confirms optimised orientation of proposed buildings should be sited with long axis orientated East-West.

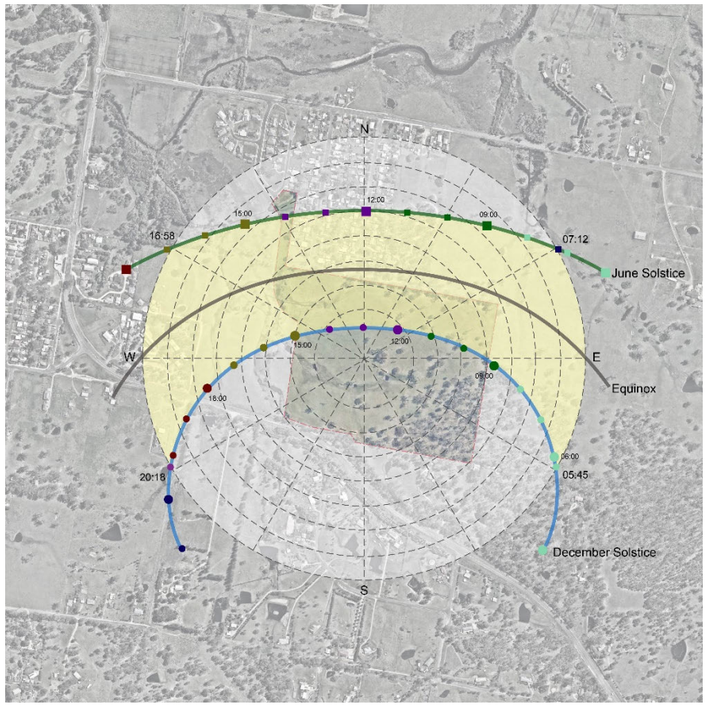



Figure 3: Sun Path Diagram

## 3.6 Wind Analysis

Figure 4: Wind Analysis – Wind Impact on site, demonstrates how the prevailing winds impact on the Eurobodalla site.

The raised topography to the North-East & South-East will assist in buffering the wind for the central zone of the site. As the Southerly winds are less desirable, the preferred zone for the hospital is positioned to the North of the large sloping hill to the South East.

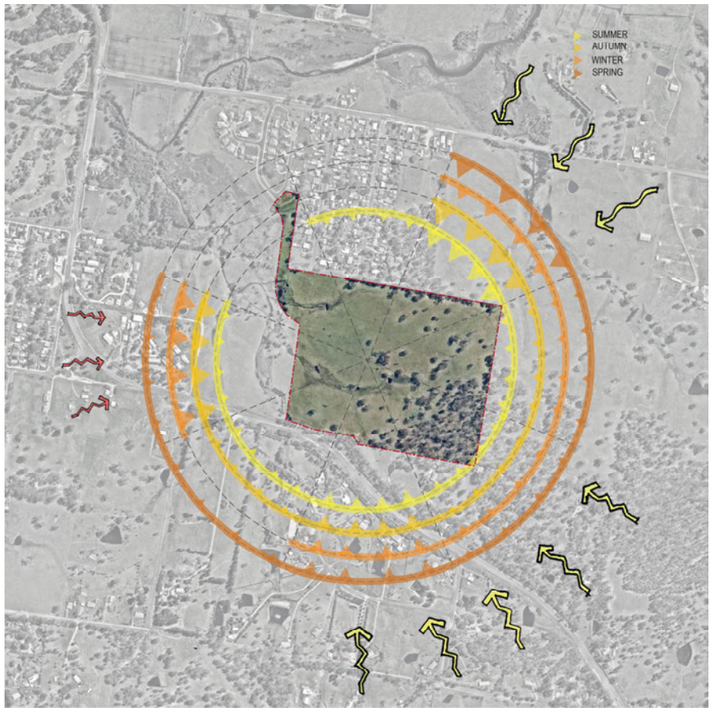



Figure 4: Wind Analysis – Wind Impact on site

## 3.7 Wind Rose

The wind rose provides a basis for designing for comfort conditions.  It also informs consideration for the location of a helipad, determining the most likely approach and departure flightpaths.

Data for the four seasons of the year indicates that:

— Summer breezes are primarily from North East
— Winter winds are from West, South East and East.

Therefore, it is recommended that:

— Sheltering from West and South East is required
— Flexible sheltering from West and South East side is required to protect from winter winds but allow for summer breezes.

## 3.8 Flooding

The site is mostly safe from the town's known flood area, with the western edge of the site within Probably Maximum flood plan (refer flooding Eurobodalla HS Site Selection Flood Assessment Report Rev0). Considerations have been made when looking at preferable zones for the building to be well above the Probable Maximum Flood (PMF) line, and for the main access road to also be well above the PMF.

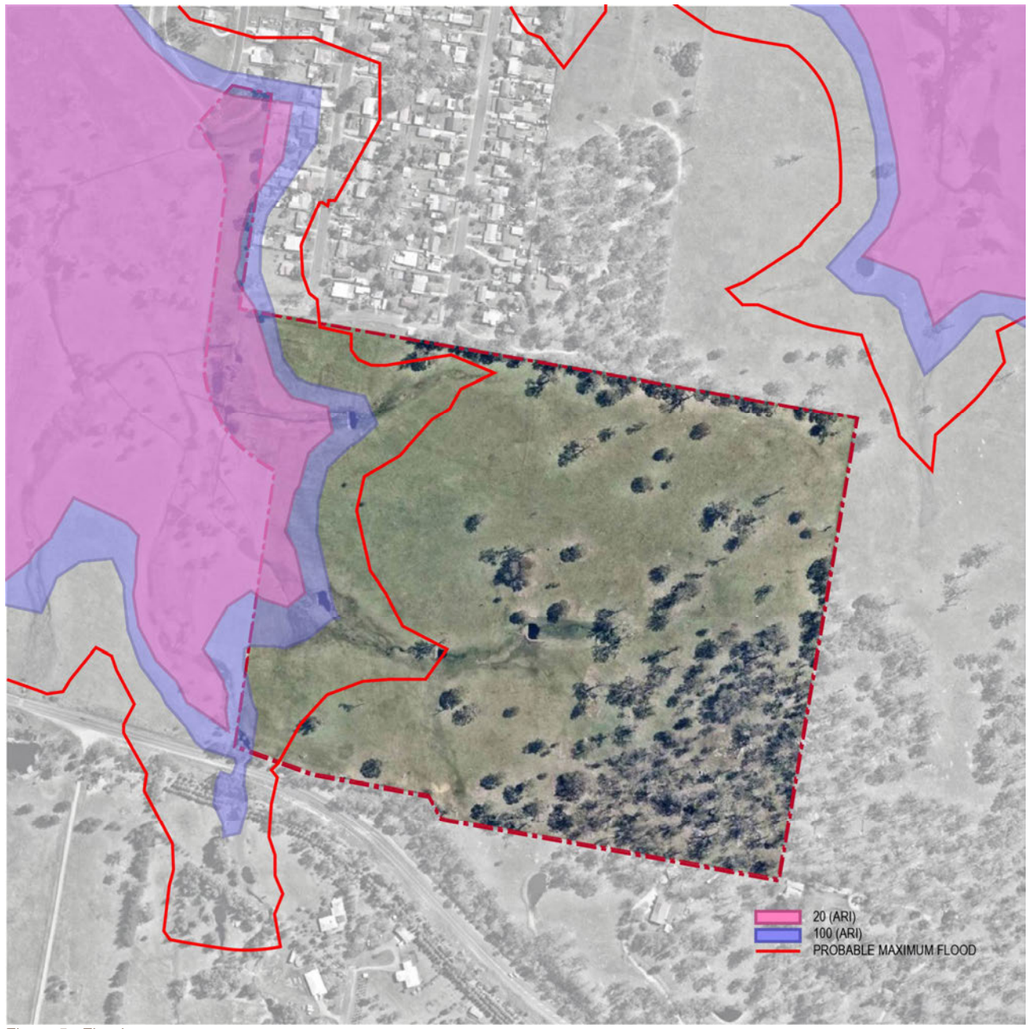



Figure 5: Flood

## 3.9 Topography/ Vegetation

The proposed Eurobodalla site is a large allotment comprising of primarily flat vacant land. A large portion of the site is cleared with some existing natural vegetation on the sloping portion to the south east of the site. The site is located circa 2.2km south of Moruya town centre.

Figure 6 shows the topography of the Eurobodalla site.

The topography of the site extends from a lowest point of approximately RL-1.5 at the north-west up to approximately RL-55 at the south-east ridge. This constitutes a total change in level of more than 50m. The area identified as usable and appropriate for development is to the north-east corner of the site. This zone contains a ridge point at around RL 22 which is intended to be used as a prominent green space and entry zone for the hospital building. The building is to be located to the west of this ridge over a zone which falls at a gradient of 3-5% towards to west.

A significant gully feature extends from east to west on the site and acts as a natural watercourse through the site. The high point is at the base of the south-east ridge at RL 19 and the gully extends to west into the flood zone. The low point of the gully on the western boundary is approximately RL 2.0.


Figure 6: Topography / Vegetation

## 3.10 Roads, Access and Parking

The following figure demonstrates the existing roadways and access routes to the Eurobodalla site.

### 3.10.1 Primary Vehicular Circulation and External Entries

Opportunities to establish multiple entries into the Eurobodalla precinct has been examined to ensure that the precinct does not operate as an island, with one northern entry and one southern entry. This is to ensure future provision for relieving emergency and/or peak conditions by more than two primary sources if preferred.

The future Princes Highway bypass for Moruya is mooted to occur in the near future. Any potential effects on existing surrounding site services infrastructure are noted within the consultants reports and will be further developed in the next stages of the project. The project is being designed based on current known information only.

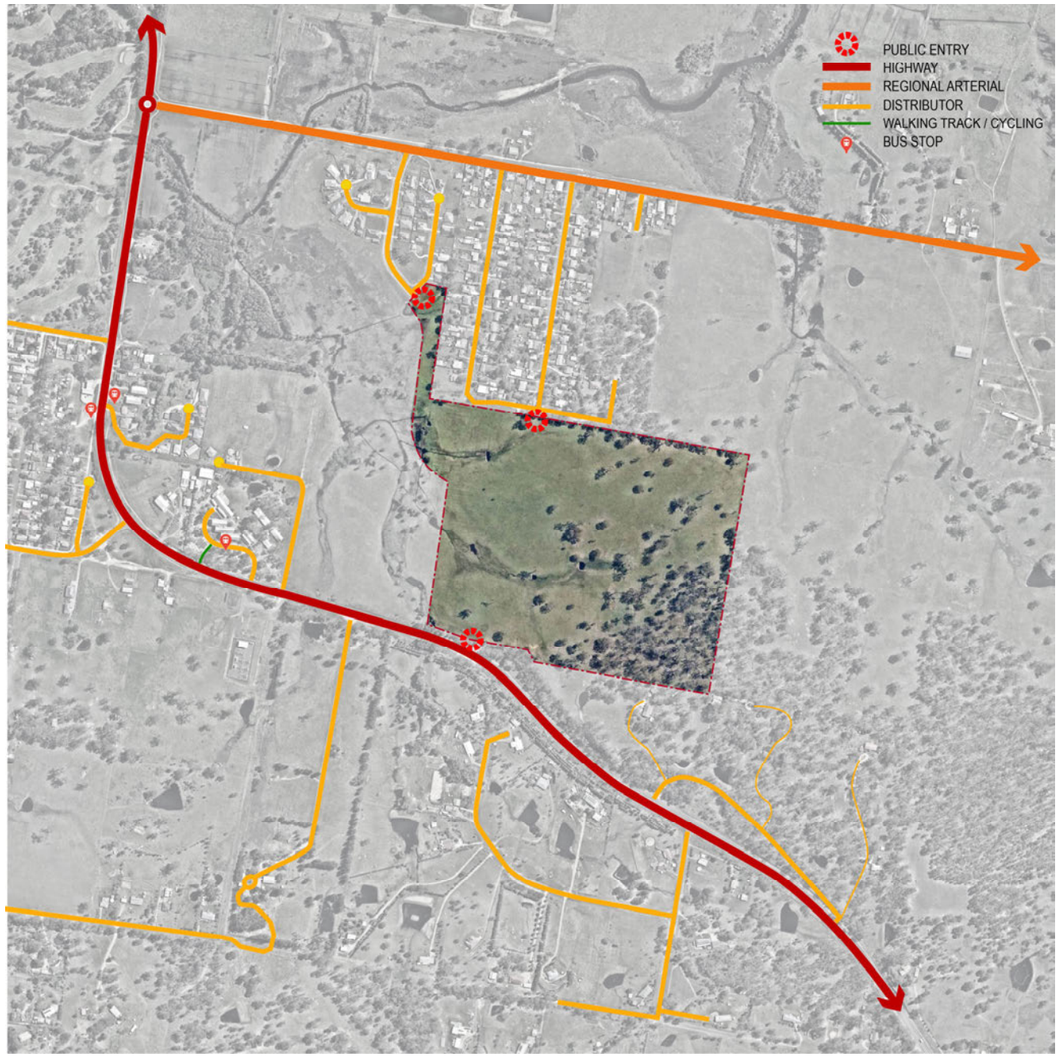



Figure 7: Site Road Hierarchy

## 3.11 Bushfire

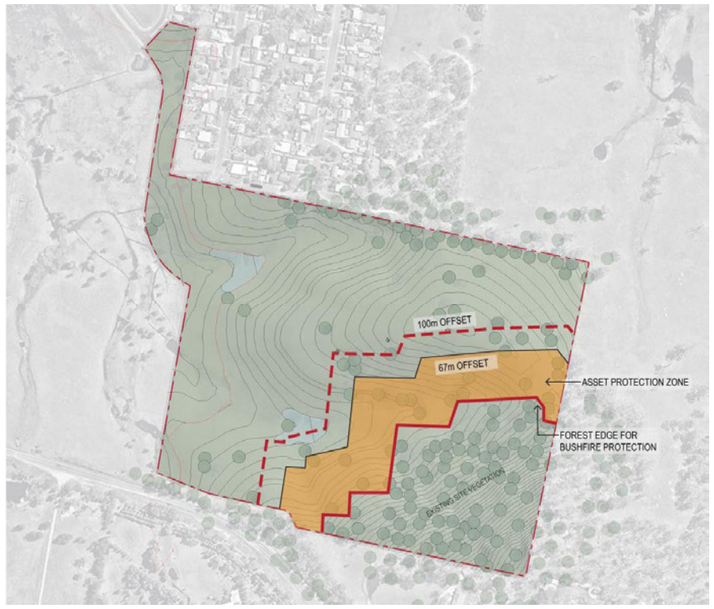



Figure 8: Asset Protection Zone and Offsets

The site is not mapped as bushfire prone land; however, there is evidence of a past bushfire having occurred on the site. With the publication of the Planning for Bushfire Protection 2019 document, the existing bushfire prone land map will be updated. This map is expected to show the land as being bushfire prone. The areas likely to be a bushfire hazard are the stand of trees to the east part of the site and open grassland. Open grassland that is unmanaged, and unmown, also poses a wildfire hazard.

Initial assessment of the site was conducted using survey methods in accordance with assessment methodology set in Appendix 2/1 of Planning for Bushfire Protection 2019, for Special Fire Protection Purpose, being a hospital development. A specific asset protection zone of 67 metres is required for the eastern intact forest. Bushfire Attack Level (BAL) 12.5 construction measures are required for bushfire protection for buildings within 100 metres of the forest or unmanaged grassland.

A formal bushfire assessment is to be prepared to guide both architectural design and emergency vehicle access within the site. For Bushfire Assessment purposes the Eurobodalla Shire is in the Far South Coast Region with a Forest Fire Danger index (FFDI) = 100. The requirement for this assessment will likely be triggered under the Environmental Planning and Assessment Act 1979.

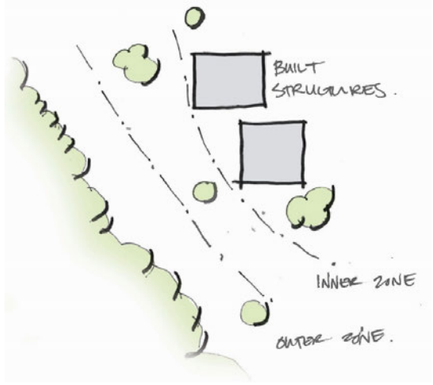



Figure 9: Setbacks and landscape buffers for bushfire planning.

## 3.12 Town Planning Parameters

### 3.12.1 Zoning

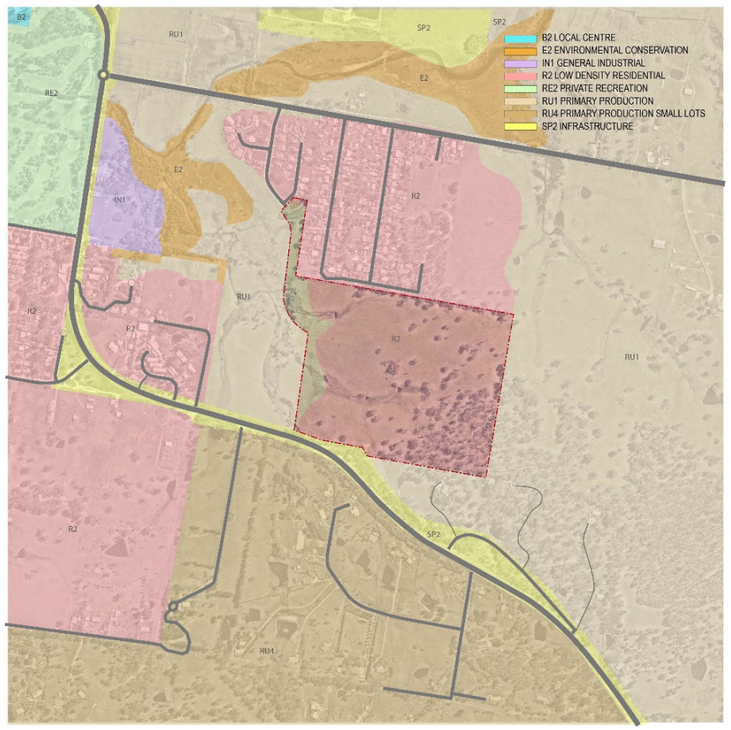



Figure 10: Zones – shows the detailed zoning on the Eurobodalla site.

Zoning categories include:

- Local Centre
- Environmental Conservation
- General Industrial
- Low density residential
- Private recreation
- Primary Production
- Primary Production Small Lots; and
- Infrastructure.

### 3.12.2 Title / Ownership / Site lots

The site is located 2 kilometres to the south east of Moruya town centre on the Princes Highway in the Eurobodalla Local Government Area. The property is approximately 40 hectares in area and is zoned variously R2 Low Density Residential (90%), and RU1 Primary Production (10%). The northern half of the site is also within the Coastal Zone as determined by State Environmental Planning Policy No 71 Coastal Protection.

Lot 6/DP1212271, Princes Highway, Moruya (Southeast of the township).

### 3.12.3 Neighbouring Service Providers on the Site

- Essential Energy have no assets affected on the Site
- Optus does not have any fibre optic cables on the Site, although a major fibre optic cable is present along the Princes Highway, in proximity to the Sites south west border
- A trench containing in-service/constructed NBN (Copper/ RF/Fibre) cables runs by the Princes Highway
- Telstra has not provided information on its asset

## 3.13 Environment

While the hospital is located near generous areas of green-space and planting along the Princes Highway, most landscape within the hospital site itself function as buffers and promote health and well-being.

The proposed community park is a large open space with stands of mature trees at the southern and northern edges. The landscaping is generally degraded with little maintenance being undertaken.

## 3.14 Adjoining Properties

Surrounding development includes a residential subdivision immediately adjacent to the north (known as Mynora) and a TAFE college immediately adjacent to the south west. The Princes Highway arcs around to the west and south of the site and South Head Road runs along some of its northern boundary. Other than the adjacent residential land at Mynora and the TAFE College, the surrounding lands are rural, principally used for grazing

## 3.15 Moruya

The Town of Moruya has rich connections to landscape and the surrounding context of the town. The natural rock that Is situated within the site provides connection to the history of granite mining in the town and is best known for the Buttresses on the Sydney Harbour Bridge.

All research regarding Historical context has been collected from the following resource;

Location of the Moruya granite quarries and some associated features (Moruya and District Historical Society)

### 3.15.1 Historic Moruya Granite

There were four Granite Quarries in Moruya – Louttits, Government, Zieglers and McCredies Quarries. One of the early projects for Moruya Granite was to construct training walls to ensure a navigable channel at the mouth of the Moruya River. When the training walls were under construction, the local Pilot Station Controller, Captain Ross, noticed that the granite was similar in quality to granite in Aberdeen, Scotland. He sent samples to the Colonial Architect in Sydney, Mr James Barnet, on the schooner “Woodpecker”. Soon after, Moruya granite became well known for its quality and colour and, as a result, was selected for the Sydney Harbour Bridge.

Figure 11: Location of the Moruya Granite Quarries
(Resource: Location of the Moruya granite quarries and some associated features (Moruya and District Historical Society)

Figure 12: Moruya Granite Quarry - 1864
(Resource: Moruya Granite Quarry - 1864- | www.engineersaustralia.org.au)

### 3.15.2 Uses

Granite is the hardest building stone, and due to its hardness, resistance to weathering, capability to take mirror polish, and fascinating colors and textural patterns, granite slabs and granite tiles are extremely popular. The principal characteristics of granite also include high load bearing capacity, crushing strength, abrasive strength, amenability to cutting and shaping without secondary flaws, ability to yield thin and large slabs and, above all, durability. Due to its highly dense grain, it is impervious to stain. Polished granite slabs and granite tiles have achieved a special status as building stones globally.

Moruya is known for its granite stone which was used to build Sydney’s heritage structures and landmarks such as the pylons for the Sydney Harbour Bridge, the colonnade columns of the General Post Office, columns for the Chief Secretaries and Burns Philp buildings, the Martin Place Cenotaph and the pedestals for monuments to Captain Cook and Queen Victoria.

From 1925 to 1932, Moruya Granite Quarries provided 18,000 cubic metres of dimension stone, 173,000 blocks and 200,000 yards of crushed stone that was used as aggregate for concrete on the Sydney Harbour Bridge.

Figure 13: Sydney Harbour Bridge Pylon Lookout
Resource: Sydney Harbour Bridge Pylon Loockout | izi.TRAVEL

Figure 14: Beashel Quarries Granite
(Resource: BEASHEL QUARRIES Granite)

## 3.16 Moruya Quarry

Between 1924 and 1932, 40,000 granite blocks were hewn at Moruya and individually shaped to a tolerance of 4mm. After being “dressed”, they were individually numbered before being shipped to Sydney from the quarry wharf.

Figure 15: Panoramic View of the Moruya Granite Quarry
Resource: Panoramic View of the Moruya Granite Quarry (Wikimedia commons)

The park is located on the northern bank of the Moruya River, approximately 5km from Moruya. The quarry is an important part of Moruya's history, dating back to the early years of settlement. The community approached Council to upgrade the park to improve the experience for people who use it for fishing and recreation, and to preserve its significant heritage value. The upgrade to the Moruya Quarry Park landscape was undertaken by the Eurobodalla Shire Council. At the opening, the Council unveiled an interpretive panel and heritage plaque to recognise the significant importance of the granite quarrying history of this site.


Figure 16: Location Map

## 3.17 Eurobodalla Significant Sites

### 3.17.1 Yuin People

The Yuin people are the traditional owners of the Eurobodalla region. This Country spans between Ulladulla to Eden north-south, and from the coast to Cooma in the west. The Yuin traditional territory is larger than that of Eurobodalla, covering parts of neighbouring shires. The Yuin hold a strong connection to the land, as well as to the coastline and ocean that borders their country, which holds their significant sites both through Dreaming stories and important sacred sites.

The Yuin lived in balance with their environment, treating the land with respect and helping to cultivate and maintain their abundance of natural resources and food. The social structure of the Yuin people embraced prescribed rules of behaviours to help maintain social order. These rules were told and passed down through stories and Dreamings. The original Dreaming story depicts Daramulun and his mother Ngalalbal living on earth;

*"Originally the earth was bare and like the sky, as hard as stone, and the land extended far out where the sea is now. There were no men or women, but only animals, birds, and reptiles. He placed trees on the earth. After Koboka, the thrush, had caused a great flood on the earth, which covered all the coast country, there were no people left, excepting some who crawled out of the water on to Mount Dromedary (Gulaga).*

*'Then Daramulun went up to the sky, where he lives and watches the actions of men… He told the Yuin what to do, and he gave them the laws which the old people have handed down from father to son to this time. When a man dies and his Tulugal (spirit) goes away it is Daramulun who meets it and takes care of it.'*

- Recounted by A W Howitt, 1904

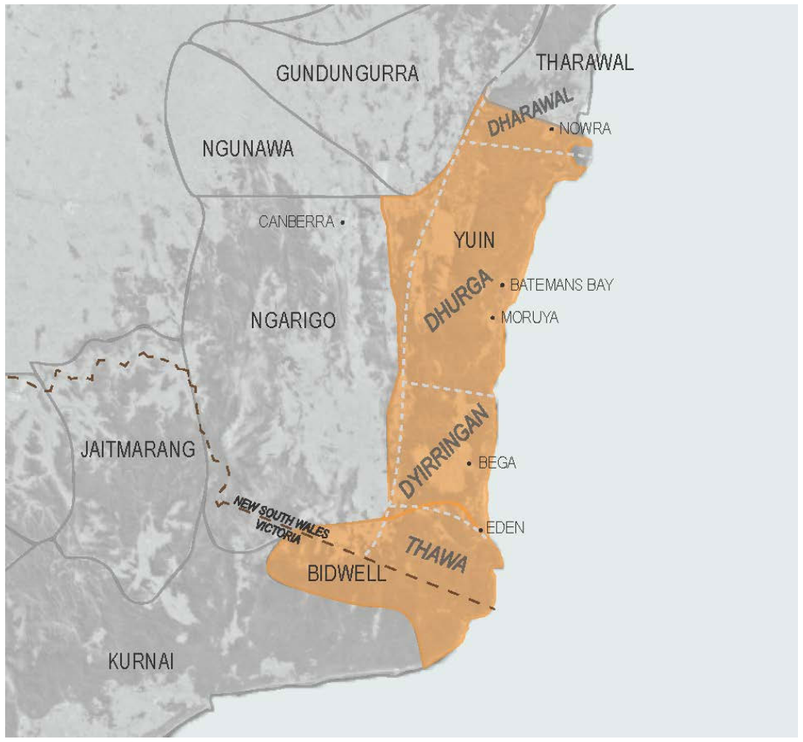



Figure 17: Yuin Country
(Resource: Adapted from '*Illawarra and South Coast language boundaries (Map: Brenda Thornley, based on Eades, 1976)')*

The Yuin people incapsulates many smaller groups within the region, including the Wandiwandian, Dhurga, Bidewal, Walbanja and the Djiringanj. All these groups are connected through the Dreaming of Gulaga, the mother mountain.

### 3.17.2 Gulaga (Mt Dromedary)

Gulaga is considered the place of ancestral origin for all Yuin people. The mountain is also retold as the Mother Mountain during the Dreaming, who had two sons and seven daughters. Gulaga represents the lesson of "always doing as you are told". This story depicts Gulaga's two sons, Najanuka and Baranguba, who live with their mother. Baranguba decided to move away from his mother and live alone, but not after long, he was separated from his mother by water and could not return home. Baranguba remains separated from Gulaga, and is what is now known as Montague Island. After Baranguba was unable to return home, Gulaga kept her second son, Najanuka, close, embodied by Little Dromedary.

Aside from the spiritual significance of Gulaga, the mountain is part of numerous songlines and significant sites for the local Yuin people. The mountain hosts both women's and men's places, characterised by the form of the mountain. The mountain also historically provided the main route for the Ngarigo people to the west (Cooma) to travel towards the coast for the winter, in order to avoid the colder inland temperatures. The local people also used Gulaga as a 'weather clock', able to determine changes in the weather and seasonal patterns through the fauna and flora of the mountain. Resources for making tools and weapons were also harvested from the mountain, including "Garrara" tree stems and "Mingo" grass (Kangaroo Grass) for use in fashioning spears.


Figure 18: Eurobodalla Region
(Resource: Eurobodolla Region, https://google.com/maps/place/Eurobodalla)

### 3.17.3 Moruya and Deua River

Alongside Gulaga's two sons, the Mother Mountain also had seven daughters. Before Baranguba left his mother, the sisters headed north together, towards what is now known as Batemans Bay. As they travelled north they looked back to see their mother and brothers, and continued to travel onwards. At one point (near Hanging Mountain) when they turned back, they could no longer see their mother. They continued to the north, crying as they walked, creating the seven rock pools along the Deua River. These rock pools are considered highly significant places, and are believed to host both healing and fertility powers.

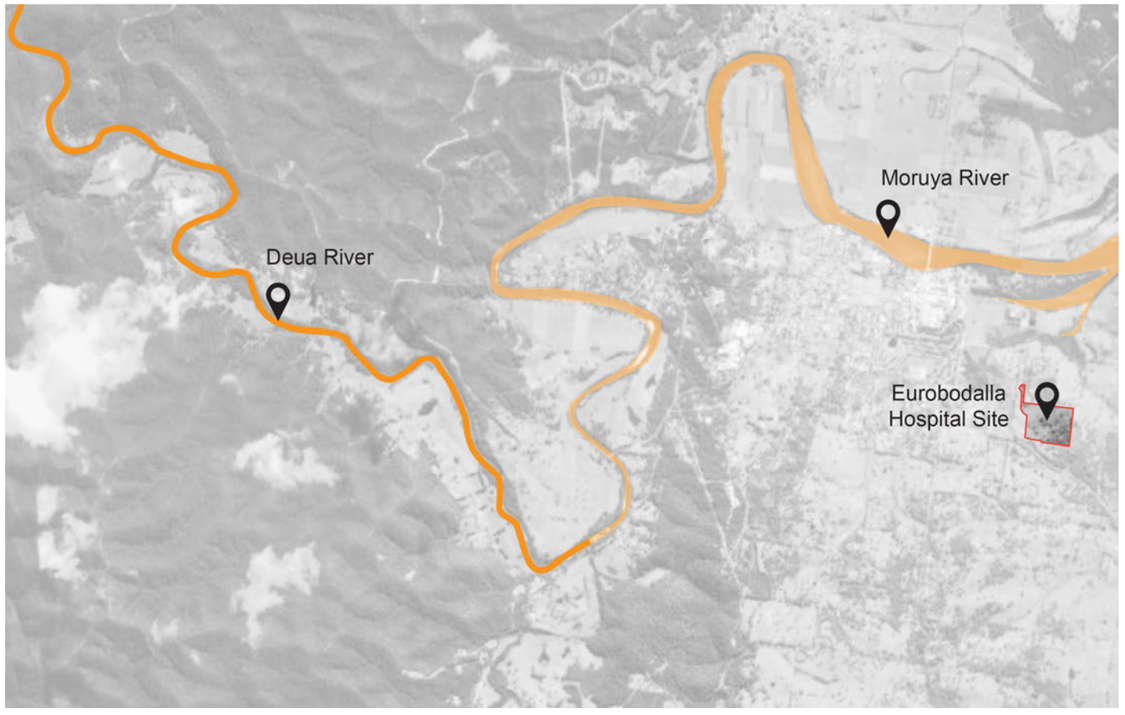



Figure 19: Moruya & Deua River
(Resource: Moruya & Deua River, https://www.google.com/maps/place/Deua+River)

The physical history of both the Deua and Moruya Rivers show these locations as educational landscapes; places to pass down knowledge through generations. There are numerous oral recollections within the local community of these rivers being utilised as training grounds for gathering and hunting, as well as reading and protecting the land. The Moruya River also holds significance as a black swan gathering ground. Black swans are generally regarded as the totem animal of the Yuin people (separate from the individual totems given to each person), and as such holds importance as an area to be protected. Part of the Indigenous connection to land is protection and conservation, both to the fauna and flora. With totemic animals, each community or group would be responsible for protecting both their totem and its habitat.

### 3.17.4 Catalina (Hanging Rock Creek)

Located within the Batemans Bay area, Hanging Rock Creek, specifically the site of the original ironstone pillar, was a significant meeting place for local groups and travellers. There was a rich social life surrounding this site, and fishing and fresh water were abundant. In 1997-98, the local council removed the rock due to seeing the monolith as dangerous due to its proximity to the road. The removal had a lasting impact on the local Indigenous community, having destroyed the physical marker of a significant place within their social history.


Figure 20: Hanging Rock Creek
(Resource: Hanging Rock Creek, https://www.google.com/maps/place/Hanging+Rock+Creek)

### 3.17.5 Songlines and connections

Many of the significant places within the Eurobodalla region are connected by pathways or 'songlines'. Songlines have proved difficult to interpret from an outside perspective, but are described as the way in which the landscape of the country was formed. Songlines describe the movements of the creator gods as they made their way through the country, and have strong ties to Dreaming stories and sacred sites. These passages are present both physically, as well as metaphysically, meaning they are unable to be physically seen, but are equally important to landscape and Indigenous Culture.

Within the Eurobodalla region there are songlines present surrounding Gulaga and her children, but the more identifiable connections through the land have been worn by historic movement between sacred sites, ceremonial grounds, and seasonal movement. Links described, to a surface level to preserve significant sites and pathways for the local community, by local Yuin people include travelling from Wallaga Lake to Ulladulla, Wallaga Lake to Pebbly Beach, and Potato Point to Brou Lake. These connections were frequently travelled, and followed the landscape to provide abundant food, water, and shelter during travel,

Another link is the Corn Trail; the shortest route down Clyde Mountain. This route followed traditional walkways used for generations, as well as Dreaming paths and natural resources, allowing the landscape to guide and provide. This track also provided a social link between the coastal groups and the inland groups within Yuin country, providing an important social link.

# 4.0 Service Planning Summary

## 4.1 Health Services

Southern NSW Local Health District (SNSWLHD) mission states ‘all people across our diverse communities are able to have timely access to the right health care in the right setting to maximise their health, wellbeing and independence’.

## 4.2 Schedule of Accommodation (SoA)

| Eurobodalla Health Service | |
|---|---|
| SOA based on CSP V3.0 | V2.7 Preferred Option |
| **Service / Unit** | |
| Main Entry / Café | 296 |
| Emergency Dept | 835 |
| Intensive Care | 646 |
| Operating Theatres | 1169 |
| Sterilising Unit | |
| IPU 1 - Medical | 1118 |
| IPU 2 - Medical/Surgical | 1044 |
| Women's & Paediatric Unit | 542 |
| IPU 3 - Rehabilitation IPU | |
| IPU 3 - Rehabilitation / GEM | 1155 |
| Medical Imaging | 523 |
| Pathology | 399 |
| Pharmacy | 221 |
| Ambulatory Care / Chemo / Renal / Oral Health / Allied Health/Virtual Care | 2164 |
| Executive/ Administration / Education | 393 |
| Mortuary | 100 |
| Health Information Unit | 140 |
| Back of House (inc. Kitchen/Engineering/Linen/Environmental/Dock) | 775 |
| Staff Accommodation | |
| **SOA SUB TOTAL** | **11520** |
| T&E (23%) | |
| T&E (28%) | 3259 |
| Planning Contingency 5% | 576 |
| **TOTAL SQM WITH T&E** | **15356** |

Figure 21: EHS SoA V3 Option 2.7

## 4.3 Clinical Services Plan

The CSP is dated March 2020. Within the CSP, the challenges facing the Eurobodalla Health Service are identified as:

- Fragmented services that result in the duplication of some clinical and non-clinical support services and negatively impact on the effective utilisation of resources including staff and infrastructure
- Providing a safe environment for staff and community in the current infrastructure
- Ageing population placing extra demand on health services
- The impact on the emergency department from the large tourism population
- Providing the right services for the complex health needs of the Aboriginal population
- Having no tertiary hospital within the SNSWLHD boundaries and the reliance on the ACT
- Adapting to and incorporating ever increasing advances in technology
- Realisation of District-wide ICT strategies to inform future opportunities to support more services remotely based on workforce constraints and a lack of critical mass for some specific services
- Attracting and retaining a skilled clinical workforce
- Establishing relationships and networks with education providers
- The geography of Eurobodalla places it up to three hours from the nearest major centre and major hospital capable of providing definitive critical care; and
- Operating services from infrastructure that are not fit for purpose, are non-compliant with building standards and which have dysfunctional and poorly connected spaces.

The overarching principles of the new service will ensure that it:

- Is culturally appropriate and inclusive
- Is integrated across all disciplines
- Includes a range of emergency, inpatient and ambulatory models
- Reduces duplication; and
- Is underpinned by the unique population needs of the Eurobodalla.

The key priorities identified within the CSP, are outlined below.

**As close to home as possible**

- Improving access to health services as close to home as possible and enable the provision of high-quality care in local rural health services
- Attracting, developing and retaining a skilled workforce
- District Demand Management Strategy ‘is to ensure that residents of SNSWLHD receive secondary level care as close to home as possible, while retaining appropriate access to the ACT for tertiary level care
- Enhancing collaborative partnerships with the education and university sectors and other health providers; and
- Maintaining and strengthening the use of telehealth.

**Promotion of wellness and quality of life**

- Enhancing public and community health initiatives to improve health education and early identification of health issues
- Improving coordination of care between the care providers
- Developing services to build community capacity and promote self-management of care
- Enhancing services focussed on screening, intervention and healthy development
- Implementing integrated models of care to reduce hospitalisations; and
- Engaging with service providers and other groups in the community.

**Meeting the needs of the community and consumers**

- Improving continuity of care between departments and across health service providers
- Providing coordinated support for people with chronic disease; and
- Enhancing services for the Aboriginal population.

## 4.4 Future Role Delineation (Importance Level)

The Southern NSW Local Health District (SNSWLHD) has identified Eurobodalla Health Service to become an Importance Level 4 development. Clause A3 of the Building Code defines the significance of a building by its importance level (IL), which is related to the consequences of failure. There are five levels of importance, considered by the importance of the building to society.

The definition of Importance Level 4 is detailed below:

- Level 4: Buildings that must be operational immediately after an earthquake or other disastrous event, such as emergency shelters and hospital operating theatres, triage centres and other critical post-disaster infrastructure.

# 5.0 Functional Relationships and Assessment

## 5.1 Functional Relationships (Clinical, Clinical Support, Non-clinical Support)

All clinical services at the Eurobodalla Health Service will be located on the new site, with the Emergency entry connecting off the same entry road as the main entry. Key conceptual adjacencies include Operating Theatres and Women's and Paediatric being in close proximity on the same level, with a direct connection to external space. Medical acute impatient units are also to be vertically connected with Operating Theatres and, as a result, all acute clinical services are collocated with good connections. Rehabilitation sub-acute beds and some ambulatory services are located together within Ambulatory on ground floor with external public access, although the remainder of ambulatory services are dispersed over ground floor and level 1.

Clinical support is located in several locations. Administration and meeting rooms can be found within the executive zone on level 1. Pharmacy and Pathology are located together on Ground floor and Mortuary is located on lower ground, co-located with back of house. The Executive Suite is located on level 1 with oversight of the main entry and the ambulatory waiting area. Medical Imaging is well placed adjacent to Emergency, centrally located to acute services and easily accessed from the public main entry.

Non-clinical support is centred on the back of house areas at lower ground below the Emergency Department.

Staff and public generally share corridors between departments and there are numerous public access points into the clinical areas from the main entry.

## 5.2 Functional Suitability

The new Eurobodalla Health Service will work to deliver the needs of the region, reacting to the rapidly increasing population and growth in tourism numbers. Good co-locations and short travel distances between main entry, emergency, theatres and acute inpatient units create an efficient layout, and define a 'hub' for of the hospital.

The main entry and Emergency Department (ED) Entry at Ground Level have been adopted as a separate outpatient, sub-acute and emergency entry point. This is located in the centre of the site, convenient for patient drop-offs, with the approach somewhat shared with back of house traffic to the loading dock.

The proposed retail space is accessible from the main circulation route, and provides access to the external courtyards. Despite their non-central location, Mortuary, Health Information Unit work well at on the lower ground floor of the building as they all have their own access independent to the main hospital. Internal access to mortuary is not ideal as bodies need to be transported in shared public corridors; this will be further reviewed in the further design stages of the project, along with consideration for Indigenous rituals for recently deceased.

Figure 22: Arrival Sequence Diagram

## 5.3 Operational Efficiency and Clinical Compliance

All acute services are located in the new build. The proportion of single beds on the inpatient units is expected to be 40-50%. The outpatient services for Paediatrics and Maternity will be located within the ambulatory area, and the Paediatric Assessment unit will operate from within the Paediatric Department.

Offices in the new build will provide opportunity for an open plan areal, as well as collaboration spaces. This will also provide future soft expansion space for clinical areas. Non-acute and support services have been located to allow for expansion space throughout the building, noting that this will impact on non-clinical space when delivered.

The site affords a number of opportunities to improve on baseline compliance and exceed minimum requirements for accessibility. The introduction of an onsite public transport hub centrally located and directly connected to the hospital building, for example, may reduce the need for pedestrian access from the allotment boundaries. However, this approach is subject to the final boundary configuration, nearby property use, and public transportation principles.

## 5.4 Expansion Strategy

The options presented in master planning have been designed for two strategies; Day one masterplan, which is based upon an SOA derived from the Planning and Prioritisation Report, as well as the Final CSP Masterplan which needs to take into consideration expansion to reach the full SOA derived from the CSP v3.0.

The options were designed to create unused space from day one within the lower ground footprint of the building. The lower ground level provides the opportunity for expansion strategies of departments and for future clinical uses, whilst there has also been additional external expansion identified within a new wing of the hospital for larger clinical department growth.

The options take into consideration opportunities for both site expansion including Accommodation, Private Provider, Education, NSW Ambulance, and also for clinical expansion within the hospital. The diagrams below (refer Figure 23) identify the clinical expansion strategy for soft expansion spaces, within the clinical buildings.

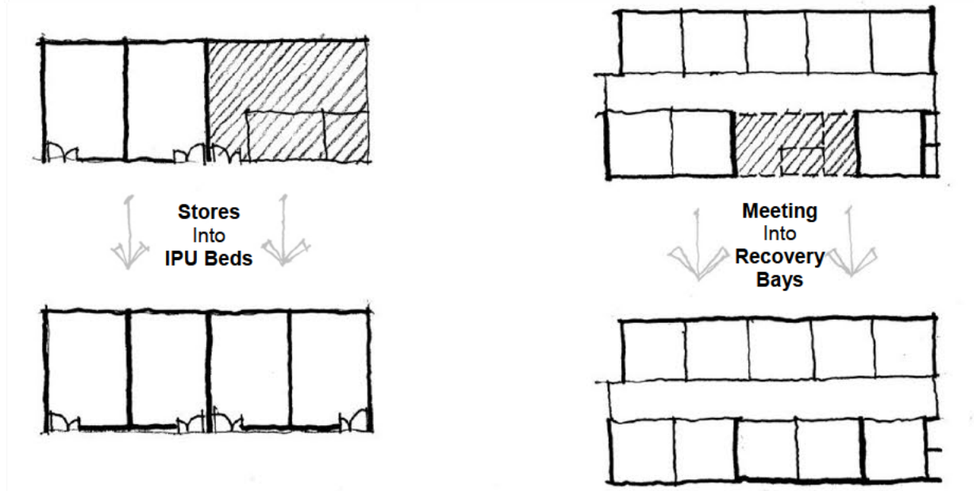



Figure 23: Example Soft Expansion Strategies

# 6.0 Masterplanning Design Principles

## 6.1 Architectural

To optimise outcomes, stakeholder engagement and an open design process is utilised. A broad range of stakeholders make creative contributions and help to deliver significant benefits including: generating better ideas with a high degree of user value, improved knowledge of the LHD's needs, rapid validation of ideas or concepts, and more efficient decision making. Giving stakeholders design options is critical in robust analysis, achieving the best design outcome, and ensuring stakeholder support.

Site information to understand the existing campus; analysis of existing information.

The site analysis captures: topography, existing buildings, environmental issues, potential contamination, infrastructure services, flooding and overland flow, heritage (indigenous and non-indigenous), and acoustic considerations. This also includes feedback from stakeholders to capture; pedestrian networks, traffic, and logistics networks.

The functional design brief enables the establishment of a footprint which is representative of the project requirements. This includes an indicative building envelope and access requirements.

The outcome of the Master Plan workshop consultations resulted in the identification of a clearly defined zonal masterplan, with further design work to finalise the 'Hospital Street' or 'Town Square' options. The comments received from the workshop were addressed and a final recommended zonal masterplan was established.

- Developing a design approach that leverages urban design, architecture, and interior design to transform the hospital into a significant community asset that expresses wellness.
- Using the NSW Health Facility Planning Process Guideline, prioritising intuitive way finding with reference points to circulation such as views, colours, materials and functional elements; and
- Benchmarking travel and engineering ratios to ensure design proposals have inbuilt optimisation prior to being costed by the project cost planner.

Hospital and health projects, as part of public service delivery, have the opportunity to look beyond organisational boundaries with renewed aspiration and intent. This transformative ambition can build upon people and places and underpin visions in a radical and innovative way, to add value to projects on a macro and micro scale. Place-based transformation can deliver for communities at a grass roots level and must be underpinned by key architectural principles and activities in the master planning process.

The following principles and activities have been undertaken to assist HINSW, SNSWLHD, and the wider design and project teams, in supporting a collaborative master planning process:

- Making strategic choices based on fundamental characteristics underpinning places, people, and communities so that the outcome is rooted in a deep understanding of the core values of the place
- Clearly identifying the issues and opportunities that matter to local people, including local indigenous communities, and the interdependencies between them, keeping these aspects at the forefront of thinking
- Understanding the needs of the community, including First Nations people, and facility now and looking into the future as far as practicable
- Developing a set of shared objectives and project vision which define the project intent
- Addressing the commercial potential of publicly held assets to deliver investment offset where appropriate
- Common estate strategies
- Exploring opportunities to standardise and simplify common administrative processes, reducing duplication and fragmentation; and
- Being socially responsible and future-thinking.

**Planning Principles**

***Respect for:***

- The history of the site by telling the story of the place
- The indigenous stories of the site and wider region
- The dignified and safe workplace
- The global markets, Eurobodalla, and neighbouring community
- The desires of the occupants within the precincts; and
- The human as the centre of the hospital.

***Respond to:***

- The natural context
- The challenges and opportunities of the site topography
- Opportunity of views and aspects
- The wider region developments of infrastructure and urban planning
- The functional and operational requirements
- Current and future demands to avoid duplicity
- 'Connected Care' model – ambulatory models and 'hospital avoidance' strategies
- Flexible community needs, industry and education drivers; and
- Cultural protocols and customs
- Child-friendly, ageing-friendly, disability-friendly.

***Rejuvenate the:***

- Healing environment by quality design and integration of landscape elements
- Quality of life for consumers, staff, students, and general public by evidenced-based, innovative and integrated model of care
- People's health and wellness through people-centred design and wellness-focused environment
- Physical environment through passive design strategies and indoor/outdoor spaces
- Health services by embracing digital opportunities
- Public spaces with art and community activities
- Precinct as a conduit or a destination with coherent planning; and
- Collaborative environment with activated edges as part of the local community;

### 6.1.1 Context informing the Architectural Design

Key learnings from the context have informed the decision-making process of the architectural design for the site master plan.

The following list summaries the mapping aspects considered in the feasibility to optimise the Eurobodalla site:

- Public Transportation
- Education – TAFE & Tertiary Education
- Future residential developments to the north of our site
- Emergency Response locations – Ambulance
- Retail
- Community and Cultural
- Medical Services, including Private Hospitals; and
- Parks and Parkland

This has culminated into the following opportunities for use:

- Transport hub
- Emergency Response Centre (Ambulance) - proximity to emergency department, helipad response and access to Princes Highway.
- Private Provider
- Accommodation

## 6.2 Connecting with Country

Connecting with Country is an initiative by the NSW Government's Architect Office, and is a draft framework intended to help form, design, and deliver government infrastructure that will undergo 12 months of testing and piloting alongside Aboriginal Communities to find the best method for implementing a finalised framework, looking at all projects state-wide.

The framework is to be utilised by community, local government, government agencies, industry, and developers. The intention is to have all groups involved in delivering government projects adopt the following long term commitment:

*Through our projects, we commit to helping support the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people, who know that if we care for Country – it will care for us.*

This commitment expects the attempts to realise 3 strategic goals:

- Reduce the impacts of natural events such as fire, drought, and flooding through sustainable land and water use practices
- Value and respect Aboriginal cultural knowledge with Aboriginal people co-leading design and development of all NSW infrastructure projects; and
- Ensure Country is cared for appropriately and sensitive sites are protected by Aboriginal people having access to their homelands to continue their cultural practices.

Connecting with Country will support the design and planning industry in engagement with Aboriginal culture and heritage to help produce projects that:

- Protect the health and wellbeing of Country and therefore of Aboriginal communities, and by extension all communities; and
- Embed Aboriginal knowledge into the design and planning of our built environment to make NSW a better place for all its citizens.

The people's connection to Country has produced a large database of Aboriginal wisdom and knowledge that future projects are looking to embrace and embed within planning and design. A project is enhanced by incorporating this knowledge, not only benefitting the community, as well as Country, but, in addition, these cultural lessons are preserved in a tactile and immediate form.

The human centred design method has limitations and if people are the first priority then the land and nature become secondary. When this happens, people are affected negatively as they are immediately influenced by nature. Taking a traditional Aboriginal world view, designing with nature at the centre and considering people as a part of nature, we can create a more holistic and sustainable future.

**Our Approach**

- Identifying the Aboriginal knowledge holders and Contributors early in the project to have a comprehensive Aboriginal influence throughout the project
- Drawing upon available research to gain understanding of local history and culture, which reveals traditional ways of recording knowledge and builds relationships within the Aboriginal community
- Including appropriate space or facilities for cultural proceedings that the community requires. Projects may require the inclusion of culturally specific facilities, or the project site may have significant cultural history that requires an appropriate design alteration.
- Creating an opportunity for outside interaction. Many people (Indigenous and non-Indigenous) do not have access to the world of Aboriginal culture and knowledge, and often have a thirst for learning more about the First Peoples
- Building a database to identify people in the project that influence and guide the project and determine who benefits from the project success and how
- Creating an ongoing line of communication for the project user group and design consultants to provide feedback on successful practice that can be carried into future projects
- Incorporating traditional local land and water management techniques into design – ESD
- Considering the original use of the site and community needs, the project will dedicate space for traditional Custodians to continue their cultural practice on Country
- Including cultural practices in the process of a project and including all participants to connect the people of the Country's past with the people in control of its future use; and
- Seeking local Aboriginal-owned businesses to partner with throughout the project and after. Design Consultancy, Construction, Material Provision, and Tenancy are possibilities – Wayfinding, Placemaking and Graphic Design.

Figure 24: Country Centred Design

## 6.3 Arts Strategy

As part of the Arts Strategy the project team is committed to providing a campus that will facilitate and optimise health and research practices of the highest standard.

A HI Arts in Health strategy will be developed in coordination with the hospital design and construction, to acknowledge the major contribution the arts make to well-being, health, effective health care provision and positive health care environments.

### 6.3.1 Benefits of arts-in-health

An ever-growing and global body of research demonstrates the personal and social benefits derived from the arts when effectively integrated into health care and hospital practices and settings. These benefits extend across the health care network, enhancing the experiences of patients, carers, visitors, staff, and the wider community.

Medical and health care practitioners acknowledge the benefits of art, design, and new technologies in health care, particularly for stress reduction, distraction during painful or uncomfortable procedures, various therapeutic activities, acceptance, and ongoing healing and catharsis.

A variety of art forms may be used to deliver the program; visual arts (painting, drawing, sculpture, photography, film, mixed media), performing arts (music, theatre, dance, circus), and new technologies (digital media, projections, social networking, virtual worlds and gaming).

Over the last three decades, dedicated arts-in-health practices have developed in Australia and around the world. Research now demonstrates the following benefits can be derived from well-integrated arts practice and products in health care settings:

- Contributing to a positive and welcoming atmosphere for the arrival of patients and their families
- Generating different expectations for the general public about a hospital as a public institution
- Providing multiple varied ways to integrate the voices of patients and families into hospital operations
- Building effective patient-nurse communication
- Improving patient morale
- Improving staff morale, job satisfaction and assist in recruitment and retention of staff
- Promoting good health habits
- Raising awareness of public health issues
- Supporting and enhance the process of healing (reduced anxiety and depression, lowering of blood pressure, reduced use of anaesthesia and analgesia)
- Reducing the duration of hospital stays and need for medication
- Delivering therapeutic benefits and improved clinical outcomes
- Promoting holistic treatment
- Helping in recovery after trauma
- Enhancing medical education
- Providing a real perception of pain relief through entertainment, positive distraction, and comfort
- Fostering positive working conditions and open new lines of workplace communication through artistic outlets for healthcare professionals; and
- Enhancing the quality of service by creating arts-in-health culture.

Figure 25: Mothers, Families and Children; artwork by Alison Simpson

## 6.4 Retail Strategy

Retail outlets are currently concentrated in Moruya Town Centre, in various small to medium scale stores. On the Eurobodalla Health Service site, space has been allocated that can be used for amenity retail (cafes, groceries, etc). This will be reviewed and confirmed during the next stages of the project. The below is an example of how this strategy can be achieved in both the street & town square options.

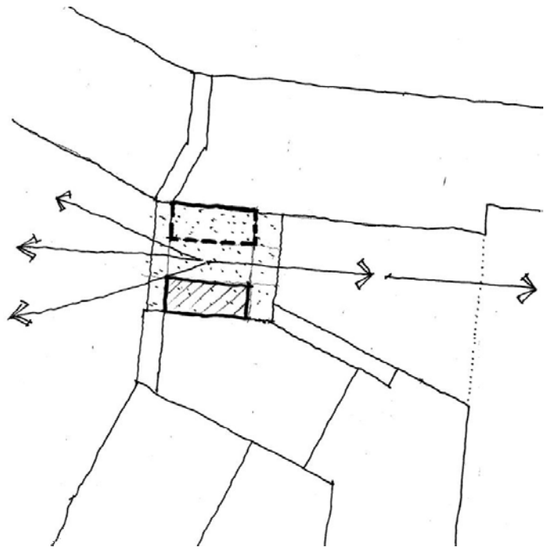


Figure 26: Retail Strategy Example

## 6.5 Landscaping

Landscape spaces provide a strong sense of connection to the outdoors and provide a pivotal role in the project and its connection with country. Significant international attention is now focused on the role of nature in promoting healing, with growing interest specifically in therapeutic landscapes. Therapeutic landscapes are primary elements in the design of hospital projects, particularly in urban contexts. Therapeutic landscapes are green spaces designed to promote wellbeing, emotional, and cognitive restoration to patients, their families, and staff. Research in various theoretical fields demonstrates that human beings are physically, neurologically, and emotionally responsive to cues in their surrounding environments.

Using salutogenic (design for wellbeing) design, therapeutic landscapes and gardens feel comfortable and conducive to healing for the user. These spaces are designed to promote stress reduction through creating an environment that resonates with people's innate preference for nature, certain environmental conditions, and settings. Therapeutic landscapes influence the parasympathetic nervous system and allow for contemplation, relaxation and a sense of being grounded and safe.

Therapeutic landscapes connect with people's individual experiences and feel 'familiar' through the use of plants and natural materials from the region. They provide an immersive experience that visually, acoustically, and mentally takes people away from the often highly emotional, disorientating, and unfamiliar experience of being a patient or family member in a hospital, to an environment that feels familiar and normal.


A considered landscape approach can:

- Create a therapeutic relationship with local nature and natural features for the benefits of patients, their families, and staff for rehabilitation, enjoyment and comfort
- Design for health and wellbeing using nature and nature-based environments; the significant role nature plays in promoting healing is well documented in the extant literature
- Use biophilic (nature loving) design to connect people with the natural environment, utilising our innate emotional connection with nature to promote health, wellbeing, and healing
- Use salutogenic design (designing for wellness) by considering the precursors and causes of good health, and how to create, enhance and improve mental, physical, and social wellbeing.
- Design outdoor space to appeal to all our senses to maximize healing benefits and enjoyment by visitors;
- Co-locate internal and external hospital functions to and allow the visitor to immerse themselves in nature during therapy, rehabilitation and relaxation;
- Provide a variety of therapeutic landscape spaces for different uses (active, passive, organized, reflective) and users (indigenous and other ethnic communities; people of all ages and abilities);
- Allocate adequate green spaces with careful considerations of preferred orientation and aspect;
- Consider operational, functional and aesthetic values to maximize visitor experience and provide value for money;
- Offer greens spaces in easy reach which distract from the hospital environment;
- Deliver easy access to sunshine, fresh air and view of the sky;
- Provide different outdoor typologies (open, enclosed, roof terrace and garden) and scale of outdoor spaces - secret gardens, view orientated gardens, historically inspired gardens, secure gardens, sensory gardens, social meeting place gardens, adventure and play gardens, rehabilitation focus gardens;
- Maximise opportunities for therapeutic design by using nature in many ways. Use the landscape design lens to guide design thinking.
- Focus design drivers on therapeutic landscapes (healing gardens) for the benefits of people and the natural environment. The Conrad Gargett landscape design lens () illustrates the consideration of context and character, flexibility and change, inclusiveness and the natural environment. Each one of these design drivers encapsulates a myriad of further considerations to enable a holistic design outcome.

- Visual outlook from hospital
  - Retain existing trees
  - Maximise view and sight lines
  - Buffer and screening planting
  - Borrowed landscapes
- Room for physical activity
  - Walking tracks
  - Stairs and ramps for physiotherapy
- Create spaces of various sizes for different uses
  - Intimate spaces for quiet contemplation
  - Small family groups
  - Grief and counselling
  - Meetings
  - Staff lunches
  - Bigger fundraising events
- Stimulate the senses
  - Provide seasonal interest
  - Bush Tucker plants
  - Plants with texture
  - Scented flowers and bark
  - Soothing sound of running water and wildlife
- Design for comfort outdoors
  - Microclimates
  - Shade and wind protection
  - Prospect and refuge
  - Comfortable seating
  - Wayfinding and easy navigation
  - CPTED
- Design for the local environment
  - Native and endemic plants
  - Biodiversity corridors
  - Riparian and water catchment
  - Rehabilitation strategies
  - Green infrastructure initiatives WSUD
  - Natural and locally sourced materials
  - Permeable surfaces
- Walking and cycling connections
  - Accessible for all
  - Destinations and wayfinding
  - Wider pathway connections

- Function spaces
    - Inclusive and accessible
    - Multiple of uses and sizes
    - Seasonal and annual events
- Destination and recreational uses
    - Hospital and Community uses

### 6.5.1 Biodiversity

The site is surrounded by rural and residential land uses. It is currently a grazing property that consists of mostly cleared grasslands. The main vegetation is present in the community grassy woodlands in the elevated areas, some coastal Saltmarsh and the Swamp Oak Floodplain Forest in the lower neighbouring properties (https://geo.seed.nsw.gov.au/). The Swamp Oak Floodplain is listed as a recognised endangered ecological community in the South East Corner of NSW. The Keystone ecological Flora and Fauna report (Ref: ESC 06-054C, OCT 2007) has identified the following flora and fauna exists on the site:

**Endangered ecological communities:**

— Coastal Saltmarsh
— Swamp Oak Floodplain Forest
— Lowland Grassy Woodland

**Threatened Fauna:**

— Mormopterus norfolkensis Eastern Freetail-bat
— Miniopterus schreibersil oceanensis Eastern Bentwing-bat

The site is also potential habitat for the following significant species

**Threatened Flora**

— Wilsonia rotundifolia
— Persicaria elatior
— Thesium austral

**Threatened Fauna**

— Ninox strenua Powerful Owl
— Tyto novaehollandiae Masked Owl
— Phascolarctos cinerus Koala
— Pteropus poliocephalus Grey-Headed Flying Fox

Many of the ecological communities that occur in the area have been cleared for development or modified by farming actives and, as such, they are considered poorly represented in conservation reserves; there remains few or no unmodified examples to show what they might have been like prior to European settlement.

Figure 27: Images: (Left to right): Koala, Grey headed flying-fox and Eastern Freetail Bat

The Eurobodalla Local Environmental Plan 2012 has highlighted areas of endangered ecological considerations and significant bio-corridor connections within the site, as seen in Figure 28.

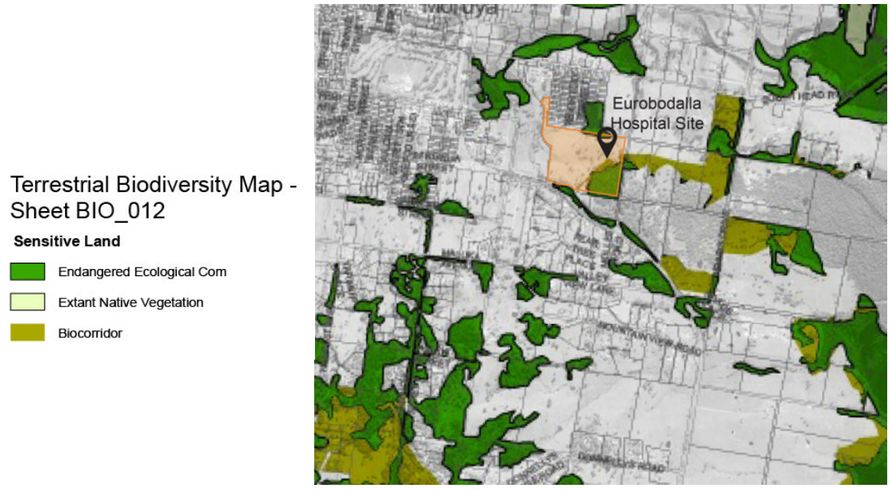



Figure 28: Biodiversity Map (Source: (Eurobodalla Local Environmental Plan, 2012)

### 6.5.2 Biodiversity Strategy

Landscape vegetation buffers and stormwater control and run off from development works will need to be mitigated to protect what remains of the endangered communities – particularly the coastal saltmarsh and lowland grassy woodland area, which are down slope from the proposed development. The site has the potential to provide new connections and strengthen existing bio-corridors as seen below in Figure 29.

Figure 29: Potential bio corridor connections through and around the site

Existing trees, including dead trees and hollows, are to be retained where possible to provide habitat for native fauna. Significant trees that are felled are to be repurposed as habitat logs and positioned in an appropriate landscape revegetation area. Nesting box strategies and monitoring programs should be implemented.

**Plant Species (not limited to)**

**Trees & Palms:**

Acacia longifolia ssp longifolia

Allocasuarina littoralis **(1)**

Angophora floribunda

Acmena smithii

Backhousia myrtifolia **(2)** *Bush Tucker

Banksia integrifolia **(3)**

Brachychiton poulneus

Casuarina glauca

Eucalpyptus elata

Eucalyptus globoidea

Eucalyptus melliodora **(4)**

Eucalyptus pauciflora

Eucalyptus tereticornis *Koala habitat tree

Eupomatia laurina *Bush Tucker

Livistona australis **(5)**

Pittosporum undulatum

**Shrubs:**

Bursaria spinose **(6)**

Cassinia longifolia

Hovea heterophyll

Hymenanthera dentate

Melaleuca ericifolia **(7)**

Ozothamnus diosmifolius **(9)**

Acacia floribunda **(11)**

Banksia spinulosa

Callistemon citrinus **(8)**

Hibbertia aspera

Leptospermum polygalifolium

Macrozamia communis **(10)**

Pittosporum revolutum **(12)** *Bush Tucker

Doodia aspera

Rubus rosifolius *Bush Tucker

**Vines:**

Cissus Antarctica

Hardenbergia violacea

Kennedia rubicunda

Pandorea pandorana **(13)**

**Groundcovers and Grasses:**

Viola hederacea

Themeda australis

Baumea juncea

Carex appressa **(14)**

Gahnia aspera

Ficinia nodosa

Tetragonia tetragonioides *Bush Tucker

Ajuga australis

Arthopodium milleflorum *Bush Tucker

Bulbine glauca

Chrysocephalum apiculatum

Dianella caerulea

Dianella longifolia

Dianella revoluta **(15)** *Bush Tucker

Dichondra repens

Geranium solanderi

Hypericum gramineum

Poa labillardieri **(16)**

Themeda triandra

Gahnia aspera

Lomandra longifolia

Lomandra multiflora

Mentha satureoides *Bush Tucker

Plectranthus graveolens *Bush Tucker

### 6.5.3 Flood & Water Management

The western edge of the site falls within the probable maximum floodplain from rises within the neighbouring Racecourse Creek, a tributary of Moruya River (refer flooding Eurobodalla HS Site Section Flood Assessment Report Rev 0). Introducing large areas of hardstand, through parking requirements and the building footprint of the hospital itself, will have a significant impact on the current water catchment of the area. Water conservation, wastewater minimisation and stormwater management will need to be considered in the design phase of the project. Successful integration of well-planned Water Sensitive Urban Design (WSUD) can have a positive impact on the surrounding environment, whilst also creating a green and inviting landscape for the community, hospital visitors, and patients.

The natural undulating topography and the large size of the site will support a network of WSUD opportunities. Dedicating areas within the proposed open space to filtration, water harvesting, and catchment will not only contribute to the overall aesthetics and natural character of the landscape, but also reduce the downstream flooding. There are many environmental benefits to incorporating WSUD, from providing additional habitat spaces, reducing irrigation needs, re-supplying the local water table, and cooling the surrounding microclimates.

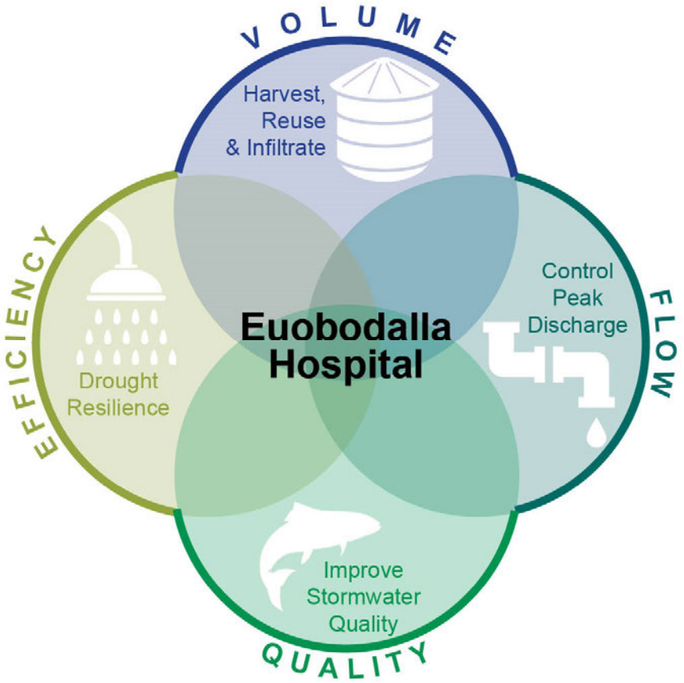



Figure 30: Adapted from Australian Rainfall and Runoff Guide – ARR 2016, Engineers Australia Chapter 9 (Urban Drainage)

Figure 31: Attractive road and pedestrian corridors with integrated WSUD catchments
(Source: https://www.water.wa.gov.au/urban-water/urban-development/urban-water-design)

Figure 32: Integrating WSUD into the public domain
(Source: https://watersensitivecities.org.au/content/evolving-concept-wsud-statutory-land-planning/)

Figure 33: Rain water harvesting integrated within car parking
[Source: https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/centre-for-urban-design/water-sensitive-urban-design-guideline.pdf]

Figure 34: Open space with constructed wetland
[Source: https://www.blacktown.nsw.gov.au/Plan-build/Stage-2-plans-and-guidelines/]

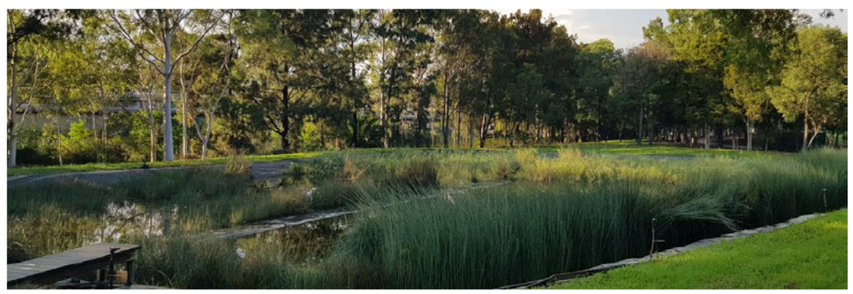


Figure 35: Man made wetlands to filter storm water runoff
[Source: https://www.sydneyolympicpark.com.au/Environment/Innovative-Landfill-Waste-Water-Treatment]

### 6.5.4 Acid Sulphate Soils

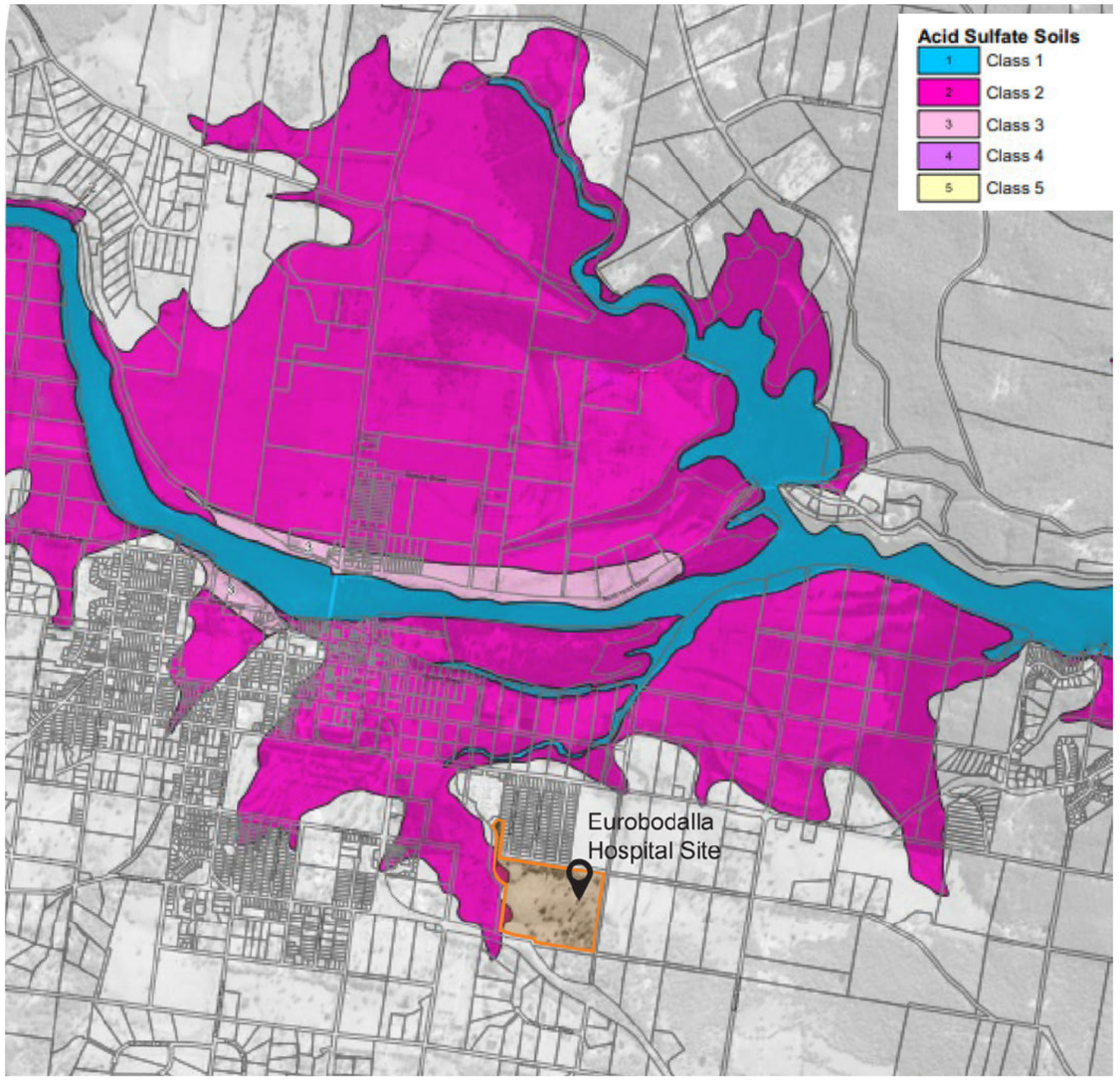



Figure 36: Acid Sulphate Soils

## 6.6 Wayfinding

Wayfinding and experience design will be considered throughout the evolution of the Eurobodalla Health Service.

Cues from the built environment are a fundamental aspect of intuitive wayfinding and navigation. Our ability to read the architecture, structures and landscape is a key factor in being able to understand the site. How legible a site or building is to the visitor is critical to establishing an effective wayfinding system.

Wayfinding is a complex task that involves many steps.

### 6.6.1 Campus Wayfinding

Wayfinding is a collaborative and people-centred process that effects the overall experience of a place. A campus wide wayfinding strategy considers the end to end journey to, from, and on the campus of the master plan. It includes;

- Pre-visit information (finding out how to get to your desired destination)
- The journey there (following a consistent set of directions)
- The experience of the place (making you aware of what's available and where); and
- The journey back (finding your way out).

In addition, wayfinding considers how the provision of basic needs and services, such as clean toilets, Wi-Fi, and seating, may influence a user's behaviour and overall experience. The act of self-orientation is complex and a person's state of mind can make simple tasks very difficult in stressed circumstances.

Hospitals and hospital campuses are considered high stress environments. The less directional information a patient or a visitor has to retain, the higher the likelihood there is to decrease cognitive overload; the more information, the more processes the brain has to perform. Intuitive wayfinding will improve a consumer's experience of a place and an organisation. It shows them where they are, where they're going, and lets them know when they've arrived; it reduces stress.

Poor wayfinding can lead to late appointments, missed connections, and a frustrating and stressful customer experience.

Wayfinding's ultimate role is to connect all the elements of the built environment and guide experience so all users can easily navigate the space with equity. When brought in at the beginning of a project it can identify user needs and gaps and help shape an environment to maximise intuitive navigation and minimise the use of signs.

### 6.6.2 Passive Wayfinding

The architecture and built environment can assist wayfinding by providing cues that define pathways, arrival points, and gathering spaces. The appearance of entries and all arrival points should be inviting. The location of entries and receptions should be intuitive and naturally follow the pedestrian flow.

Sites and buildings that provide intuitive wayfinding purely by the design of the spaces requires fewer signs. If a building fails to express to the user how the spaces work and how they connect with each other, then a higher level of signage is required to assist and direct these users.

Successful wayfinding involves many underlying elements and factors which users consider while making decisions at a conscious and subconscious level. These include;

- The surrounding environment and how easy it is to read and evaluate. While navigating unfamiliar environments, one of the most effective strategies that people use subconsciously is forming a mental map of the space they are confronted with
- Successful communication at each level, includes information provided on the website, letter sent out, conversation over the phones, text messages, and digital tools as well as verbal and written instructions provided on site; and
- Understanding of the facility processes that are user-focused, but also align with the hospital's operational needs.

### 6.6.3 Wayfinding Consideration in Master Plan

The following are key principles that have been considered in the development of the masterplan options:

- Pedestrian circulation
- Vehicular navigations
- Public transport integration
- Key entry points
- Key focal points
- Access to retail
- Legibility and visibility of messages and information
- Equity / Accessible health care

Designing the wayfinding system for Eurobodalla Health Service will require a legible environment and a spatial organisation that will have an essential role to play during navigation.

### 6.6.4 Navigational aids

Good wayfinding is natural and instinctive. It is knowing where you are, knowing where you are going, and comprehending how to get there easily. As a preference wayfinding should occur without using signage.

Navigational aids may include:

- Placement of built form, structures, buildings, and landmarks
- Landscape placement, both hard and soft
- Urban form and topography
- Visual Signage
- Braille and tactile signage
- Pathways, walkways, and roof cover
- Look and Feel Aspects: Materials, Finishes, Colour, Texture
- Identity: theme, branding, visual character
- Vistas, view creation, and sightlines
- Access to technology to assist in wayfinding
- Audible cues
- Communication and marketing
- Artwork placement; and
- Lighting placements and directional lighting.

### 6.6.5 Equitable and accessible wayfinding

Wayfinding must be accessible and equitable, considering a variety of ability, including physical and psychological factors.

### 6.6.6 Experience Design in Placemaking

The following are key principles that have been considered in the development of the masterplan options:

- Memory association of the place
- Interpreting community through public art and urban design
- Integration of campus planning with First Nations diversity and non-English speaking people; and
- Existing and significant green infrastructure on the site in mature trees and waterway.

## 6.8 Sustainability

### 6.8.1 Approach

Throughout the masterplanning phase, during option development and review, sustainability has been at the core of the design methodology. The imperative for embedded sustainability performance is strong. At a time when global greenhouse gas emissions continue to rise, and the effects of climate change are already being felt, it is critical that state sponsored infrastructure responds to the challenge in a cohesive way, and sets an example that demonstrates our collective resolve to rise to the task, and provide inspiration for others to do the same. The approach has a keen emphasis on climate change mitigation, seeking to reduce greenhouse gas emissions throughout the design life of the project. Further, with the effects of climate change already emerging, the importance of managing climate risk and prioritising resilience to external shocks and stresses is already apparent. Indeed, this has been recognised through the allocation of additional funding to this project to support a resilient public asset, providing foundational support to the community, and an opportunity to provide a climate adapted asset.

Beyond climate change mitigation, adaptation, and resilience, the sustainability approach highlights patient centric design, prioritising health and wellness as a key factor in developing solutions with long term value. This is not only demonstrated through operational cost savings, but also results in reduced hospitals stays, increased rates of patient recovery, and greater staff satisfaction. By prioritising performance metrics of daylight availability, visual comfort, district views, thermal comfort, occupant interface/control, and access to green spaces, we are developing a hospital that provides improved outcomes and quality of life. Closely coupled with this is a focus on indigenous design principles. Understanding the local demographic, it is critically important to the success of the hospital that a familiar and welcoming building can support better Indigenous health outcomes. Engagement with local indigenous leaders will enable the hospital to being value on many different fronts; socially, culturally and environmentally, contributing to the community and society in a variety of ways.

The approach extends to a responsible approach to water; seeking to integrate water recycling opportunities to minimise the quantity of potable water used in the development. Similarly, our role as custodians of the environment drives us to integrate opportunities to reduce waste and seek out potential for using waste products as inputs to other processes onsite. This philosophy leads us to consider opportunities to recycle waste water to offset potable water, and also opportunities to use waste as energy, or inputs to other processes on site.

### 6.8.2 Policy Context

There is significant policy context supporting the elevation of sustainable design principles and the development of environmentally conscious and resilient buildings and infrastructure. These policies, strategies, and guidance documents exist at the global, national, and particularly state level and intend to inform direction and action at a project level. Our team has taken note and guidance from these documents in considering the sustainability response of the project and its master plan to date:

— United Nations Sustainable Development Goals
— National Climate Resilience and Adaptation Strategy
— NSW Net Zero Stage 1: 2020-2030 Plan
— NSW Climate Change Policy Framework
— NSW Circular Economy Policy Statement; and
— NSW Government Resource Efficiency Policy (GREP).


Figure 37: United Nations Sustainable Development Goals


Figure 38: NSW State policy is targeting net zero emissions, climate change and circular economy

### 6.8.3 Emerging Trends

In preparing the new Eurobodalla Health Service for a long life of service to the local community, the master plan considers how the hospital might engage with future challenges, changing climate, changing demographics, and emerging technologies.

— **Net Zero Emissions** – Globally and locally there is an increased focus on net zero emissions performance. How can we provide the development and progress we need, without exacerbating the climate change issue? Increasingly, sustainability policies and certification schemes are focusing on developments that can achieve net zero emissions (NZE). NZE buildings are characterised by efficient architecture and engineering, onsite renewable energy and storage, green power purchasing, and carbon offsets for scope 1 and scope 3 emissions. Coupled with this ambition is a trend toward all electric buildings; removing all fossil fuel combustion (e.g. gas consumption) from the building
— **Embodied Emissions** – Coupled with ongoing emissions from building operations, acknowledgement of the impact of embodied emissions on a development's environmental impact is becoming prevalent, alongside initiatives and approaches to minimise those impacts. These emissions occur now and can be directly controlled by project team decision making.

— **Climate Change Risk** – Greater acknowledgement of the changing climate and the risks that we are already seeing such as hotter temperatures, lower rainfall, flash flooding, increased wind and increased bushfire risk is critical. Integrating design and operational responses that provide greater climate adaptation is now considered fundamental to new buildings and will be a critical consideration to ensure the hospital is accessible and functional during climate related events within the community.

— **Resilience** – In addition to climate change risk, the consideration of additional external risks in the development of design, construction and operation of the building is also more prevalent. Consideration of how an asset such as this can respond in various emergencies as a community asset is important. These might include low likelihood but high impact events such as health pandemics, infrastructure failure, terrorism, and humanitarian crises.

— **Technology and the Internet of Things** – Technology is changing rapidly and how buildings utilise technology, data and interface with communities offers opportunity to provide better and more efficient service.

— **Electric Vehicles** – Electric vehicles are on the horizon, soon offering the potential interaction between buildings and vehicles as storage and power management systems to improve outcomes for both.

— **Indigenous Reconciliation** – Australia is continuing its journey toward reconciliation and embracing a long history that can provide a brighter future for indigenous populations. Deep, authentic engagement in signature projects is recognised as a critical piece of an improved shared future and will be a key factor in this projects core purpose – delivering better health outcomes for the community.

Figure 39: Connectivity will unlock the internet of things


Figure 40: Electric vehicles are forecast to become the primary private transportation method

#### 6.8.4 Health Infrastructure Sustainability Framework and Roadmap

Health Infrastructure NSW are in the process of developing a Sustainability Framework and Roadmap that intends to elevate and progress sustainability within projects. While the details are still undergoing development, Health Infrastructure have identified 6 key focus areas to form the basis of the roadmap and signify priorities and aspirations. These key focus areas are as follows:

— Greenhouse Gas Emissions

— Sustainable Water

— Climate Resilience

— Local Focus

— Transport; and

— Circular Economy.

#### 6.8.5 Sustainability Plan

The sustainability plan for the Eurobodalla Health Service takes on the key focus areas nominated by Health Infrastructures Sustainability Framework and Roadmap. The sustainability plan at this stage builds upon these key focus areas by adding key components or elements that will help drive the project toward sustainable outcomes that meet the intent of those areas. These components include:

— Focus Area and Intent

— Performance Targets and Outcomes; and

— Potential Initiatives and Required Studies.

These are developed as below:

**Focus Area and Intent:**

Greenhouse Gas Emissions – intending to minimise the project's lifetime greenhouse gas emissions, considering the embodied emissions of materials, emissions associated with construction and building operational emissions.

**Performance Targets and Outcomes:**

— Embodied Emissions reduction of 20%

— Construction Emissions reduction of 20%

— Operational Emissions reduction of 30%

— Annual onsite renewable energy of 10%

— 100% electric building

— 100% powered by renewable electricity

— Net Zero Emissions in Construction and Operation; and

— 5 Star NABERS for public hospitals rating.

**Potential Initiatives and Required Studies:**

— Life Cycle Analysis of major building components early in design process, evaluating the potential for:

  - Use of structural mass timber
  - Optimized structural design alternative for LCA impact of material savings; and
  - Alternative products including green concrete variants, geopolymer concrete, glass-fibre reinforced concrete, recycled steel, timber, etc.

— Operational energy/emissions analysis, evaluating the potential for:

  - Passive and façade design optimization
  - Natural ventilation and natural lighting optimization
  - HVAC and lighting optimization

- Ground source heat exchange; and.
- Renewable energy and storage optimization
    - All electric building analysis

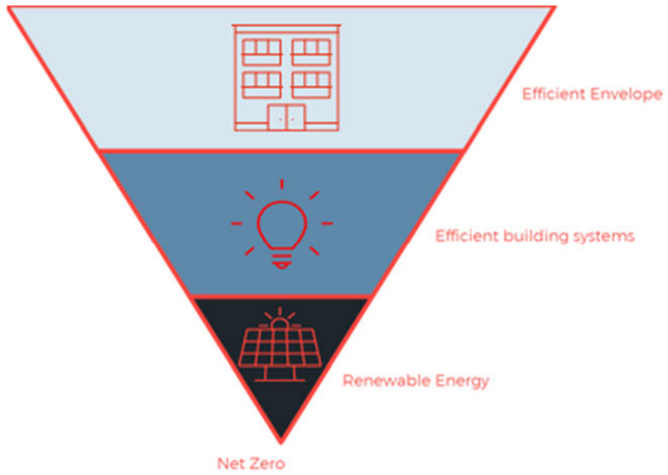



Figure 41: Basic Net Zero Emissions Concept Hierarchy

**Focus Area and Intent:**

Sustainable Water – intending to minimise the project's lifetime potable water consumption and impact on surrounding water management infrastructure.

**Performance Targets and Outcomes:**

— Potable water use reduction of 30%; and

— No Potable water used for non-potable needs.

**Potential Initiatives and Required Studies:**

— Feasibility Studies for:

- Rainwater collection, treatment and reuse
- Stormwater collection, treatment and reuse; and
- Wastewater collection, treatment and reuse.

— Design Studies for site green infrastructure – water sensitive urban design maximization including bioswales, raingardens, green roofs to manage runoff quantities and pollution.

Figure 42: Bioswales can passively manage onsite stormwater in a natural and aesthetically pleasing way

Figure 43: Green roofs can reduce peak runoff flows and treat pollution

**Focus Area and Intent:**

Climate Resilience – intending to improve the building's risk profile toward future climate change trends.

**Performance Targets and Outcomes:**

— Climate change risk and adaptation plan; and

— Address all Extreme and High Risks identified.

**Potential Initiatives and Required Studies:**

— Collaborative multi-disciplinary climate change risk workshop.

**Focus Area and Intent:**

Local Focus – intending to improve the building's ability to address local issues including Indigenous engagement, Indigenous health outcomes, patient centric design, and urban heat island.

**Performance Targets and Outcomes:**

- 100% native local indigenous species in landscaping
- 100% in-patient rooms have access to natural ventilation
- 100% patients have accessible access to landscape gardens for social and individual respite
- 100% in-patient rooms meet daylight, views, visual and thermal comfort benchmarks from WELL or Green Star; and
- 100% shaded hard surfaces between hours of 9am and 3pm.

**Potential Initiatives and Required Studies:**

- Design process engagement with local Aboriginal community leaders
- Solar Photovoltaics (PV) to shade car park areas
- Urban tree canopies for external shade
- Operable windows to in-patient rooms to facilitate natural ventilation
- Biophilic design features (exposed mass timber, natural materials/textures/colours); and
- Accessible landscaped areas.

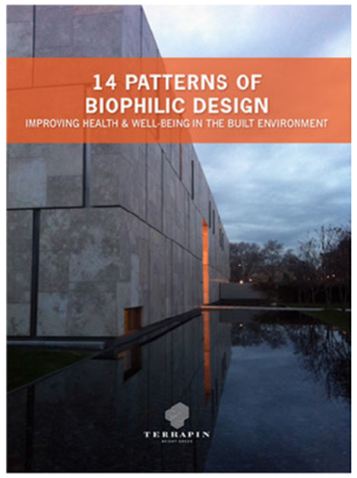



Figure 44: Biophilic Design book by Terrapin Bright Green

Figure 45: GluLam columns, Surrey Hospital, as an example of biophilic design

Figure 46: Indigenous Design at 900 Ann St (including yarning circle and indigenous artwork)


Figure 47: Elements of health focused patient centric design

**Focus Area and Intent:**

Transport – intending to improve the building's accessibility through alternative transportation modes and reducing environmental impact through emissions, noise and air pollution.

**Performance Targets and Outcomes:**

- End of trip facilities for active transport mode users (cyclists, pedestrians, e-modes)
- EV charging stations for cars and e-modes

— Public transport routes with comfortable, shaded, accessible shelters and access; and

— Solar PV to shade car park areas.

**Potential Initiatives and Required Studies:**

— Transport Plan identifying likely quantities of mode share for scenarios, now and at least two timeframes into the future.

Figure 48: PV canopies shade car parks and provide renewable energy

**Focus Area and Intent:**

Circular Economy – intending to improve the building's throughput of operational materials by closing the loop on use.

**Performance Targets and Outcomes:**

— 100% onsite organic waste management; and

— Zero single use plastic on site (e.g. café, public areas).

**Potential Initiatives and Required Studies:**

— Holistic Waste Management Strategy to:

- Review current site waste operations, operational procedures and policy
- Reduce consumption to reduce cost and spatial requirements for waste
- Promote stream separation for increased diversion from landfill; and
- Implement efficient waste equipment and loading arrangements to improve efficiency, reduce cost, and increase safety.

— Waste management plan for operation

— Waste management plan for construction; and

— Waste to energy plant feasibility.

### 6.8.6 Master Plan Sustainability Features

Critical to the project's sustainability performance is the consideration of sustainability issues from the very beginning of the design process. This includes masterplanning, where many decisions are made that have long term implications, be they positive or negative, on the ultimate environmental impact of the project and its ability to serve the long-term sustainability objectives of the community and stakeholders.

The general orientation and massing of a masterplan's built form will have a large impact on the success of the building's sustainability. The final master plan options and the preferred master plan have all considered the following site characteristics in the context of the project's sustainability aspirations:

— **Solar Gain**: From a summer time cooling perspective solar gain can be problematic, adding additional heat load to the space that must be removed using energy and requiring larger HVAC equipment sizes. It is most difficult to protect from low angle sun, which occurs in from the east and west directions, and so the master plan seeks to provide less east and west frontage, favouring north and south oriented facades, particularly where glazing proportions are higher. These same characteristics also impact a façade's opportunity to protect from visual discomfort and thermal discomfort.

— **Wind Exposure**: Exposure to wind pressures can be desirable during the summer time, when breezes are available to enhance availability and performance of natural ventilation. During the winter, cold breezes can be undesirable, creating wind chill for pedestrians and discouraging window opening. The Eurobodalla area receives summer time breezes from the south, often in the afternoon, as a useful cooling mechanism and winter breezes from the west. Again, the masterplan options favour southern and northern exposures, creating useful pressure differentials for natural ventilation in summer, while minimizing west exposure where protection from winter winds is needed.

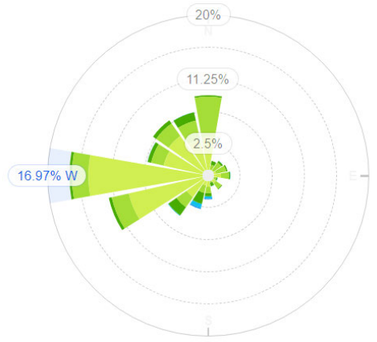



Figure 49: July Wind Rose (2016-2020)

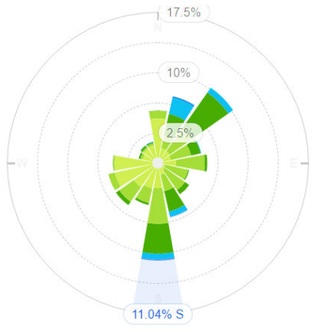



Figure 50: January Wind Rose (2017-2021)

— **Views**: The most favourable district views available at the site are to the west, however, providing exposure to the west is in conflict with the solar gain and wind exposure items noted above. It is therefore important to make sure that in seeking views to the west, we do not abandon those important principles. The preferred master plan option provides predominantly north and south orientations, but the massing includes diverging wings, allowing the opportunity for views to be leveraged while maintaining north and south aspects.

— **Photo Voltaic Renewable Energy**: Roof top PV arrays can be most efficiently arranged where minimal overshadowing occurs between rows of panels. Again, this consideration favours massing that is long in the east/west direction with predominantly north facing aspects. This characteristic has been adopted by the preferred master plan option and will enable a greater deployment of renewable energy, reducing overall carbon emissions, operational costs, and improving asset resiliency.

— **Façade Length**: In addition to orientation, it is important to consider the amount of internal floor area that might have access to daylight, views and natural ventilation. Shapes with a higher aspect ratio will have shallow floor plate depths and greater access to daylight, views, and natural ventilation. The preferred master plan option includes shapes with high aspects ratios. Of course, a higher proportion of internal floor area closer to the perimeter, also makes the building more susceptible to heat gain and heat loss. Façade design and performance is a priority focus for the development of these massing ideas to ensure opportunity is maximized for good sustainability outcomes.

# 7.0 Masterplan

## 7.1 Site Useability

The proposed site is a green field site, free of any existing developments. The site analysis conducted has identified key attributes that help determine the preferred areas of the site for development and future uses.

There is a large portion of mature vegetation which creates a buffer between the Princes Highway and the site. This vegetation is primarily to the southeast corner of the site on a sloping hill that has exposed granite rocks and natural environments for natives' flora and fauna. A buffer of trees borders most frontages of the site and provides a barrier to neighbouring properties.

Another key attribute has been identification of flood levels that may impact on the proposed development. The site falls from East to West with two gentle valleys splitting the site into thirds. These valleys provide natural overland flow from the east down to the lower western boundary of the site which meets a low-lying flood plain. The probable maximum flood line has been identified and takes up a portion of the western zone of the site. This helps identify appropriate planning site access and also proposed development sites.

Multiple siting options for the project have been considered in detail which culminated in the preferred site area, indicated within Figure 51. The highest point of preferred site area is in the North East quadrant and sits 22m above sea level. A proposed preferred site area was determined in relation to this level when considering this highest level of the site, and subsequent building levels for entering the building. This site also considered lower levels that could take advantage of the slope of the land to reduce excessive costs in earth works. The remaining area of site appears to have opportunity for future development and sites have been identified within the masterplan options.

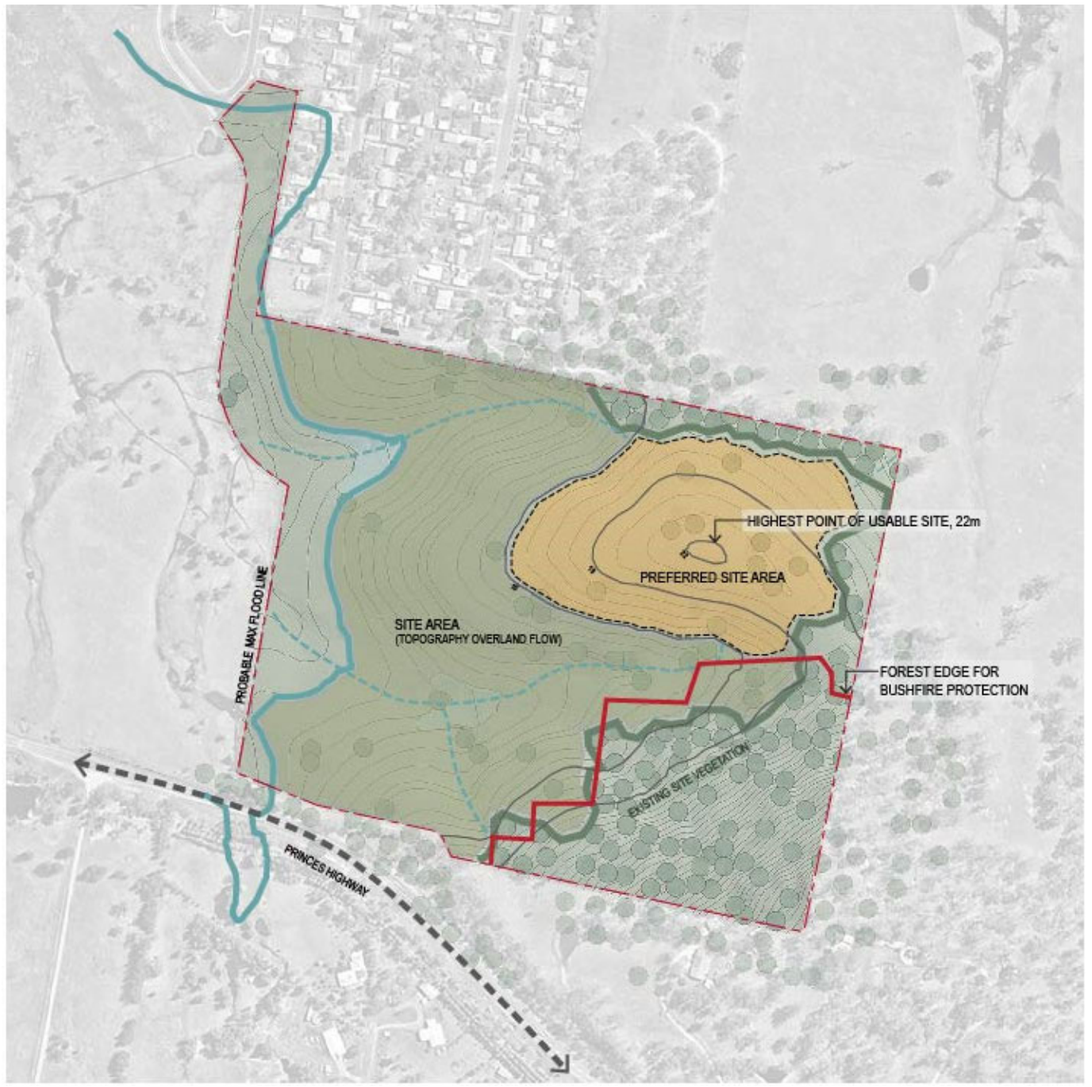



Figure 51: Useable Site Diagram

**Masterplan siting options considered**

To determine the preferred building location multiple siting options have been reviewed and investigated. In early stages a majority of the options explored siting the building close to the Princes Highway. This allowed close proximity to the Princes Highway, however; potential flood ingress, overland flow, and topography limitations are restrictive for this location. Access to the north of the site would also be limited.

A key driver in defining the preferred site area was the ability to have a primary access from the highway and also a secondary access from the North West. It is anticipated that this secondary access would require some measures to prevent being cut off in the event of a flooding event. An alternate secondary access point, identified on all options, is used to create a connection from the Eastern side of the residential development, which is above the PMF line.

The site proper has a large area, however; the landforms, topography, and gradients in many locations are quite limiting. The preferred site area is at a crest in the north east corner and covers a zone of relatively even gradients and consistent topographical features. It is also out of the flood zone and, being at a high point of the site, facilitates good overland flow strategies. Any form of development will need is to be closely positioned to the existing plateau in order to prevent extensive elevation above the hillside.

In all options the loading and service area of the hospital takes advantage of site contours by allowing a service road to break away from the main access route and drop down to the 4-6m level, where the loading could be located out of sight underneath the hospital.

The Helicopter Landing Site (HLS) location in all options is on grade, and on the ideal flight path between the hospital and the existing residential development. It is separated from the main building and would have the ability to be a graded zone with clear surrounds.

Refer Masterplanning Options Considered:

## 7.2 Topography Explorations

**Exploration 01**

This exploration establishes a flat building pad to the useable zone at approximately RL 20. This would negate the need to provide any cut into the existing ground. At the same time this would create an exorbitant amount of fill (up to 10metres of retaining) required to be brought to the site. This would be challenging technically and likely would be prohibitively expensive. Road gradients up to this level would also be inappropriately steep.

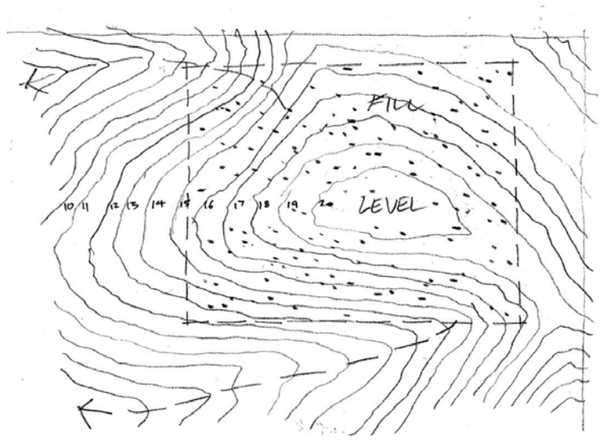



Figure 52: Topography Exploration 01

**Exploration 02**

This exploration looks at putting the building pad at a lower level i.e. RL 18.0. This would reduce required fill however would also create the need for a large amount of cut. Although this provides more balance of cut and fill, there is still significant fill and the addition of a large amount of cut would also be challenging technically and high in cost.

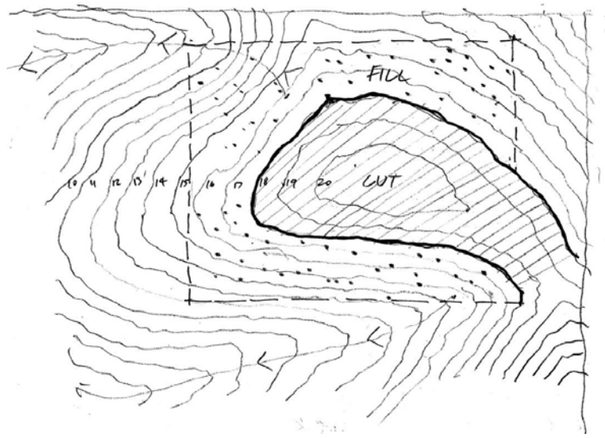



Figure 53: Topography Exploration 02

**Exploration 03**

This exploration explores balancing cut and fill by utilising the natural contours of the site as much as possible. The crest of the hill would be cut by a minimal amount. The buildings and structures would be sited into the edges of the hill. This minimises the amounts of cut and fill and embeds the buildings into the topography. This strategy works with the natural levels of the site and also allows under-croft spaces to be utilised beneath the buildings. This option is a balanced, holistic approach using cut, fill, and building siting to maximise the opportunities of the site.

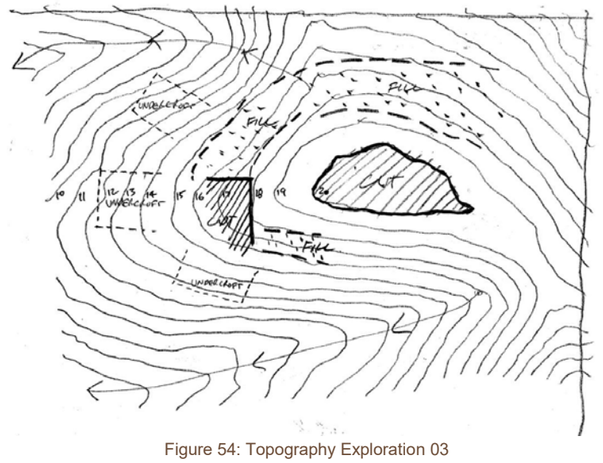



Figure 54: Topography Exploration 03

## 7.3 Opportunities and Constraints

Opportunities:

- Addressing the topography of the site relating to surround road and streets (accessibility and equity)
- The presentation of the hospital on the hilltop as a navigation point from the city centre and new surrounds
- The opportunity from the hilltop to embrace views and breezes
- The relationship of the front entrance and the choices of pathways to various destinations within the hospital
- Identification of zones for various hospital uses
- Identification of future expansion space
- Addressing entrances and wayfinding
- Relating the arrival experience, internal journeys and outlook to the natural environment wherever possible
- Providing an appropriate sense of place for staff, the public and clients
- Utilising the hill dividing the site as natural planning zones
- Working with the challenges and opportunities of the site topography
- Creating healing environments through quality built-environment and integration of landscape elements
- Enabling future-proofing opportunities within the site; and
- The opportunity to use Princes Highway as a primary access point and the residential area as secondary access point.

Constraints:

- Helipad – on grade HLS will create some limitations
- Bush Fire Hazard – site is likely to require a setback from the heavily wooded area
- Existing topography; and
- Flooding – The opportunity is to site the building on a higher portion of the site.

## 7.4 Arrival Sequence and Building Entry

The entry to the site and the journey to the building is via a road which hugs the topography of the existing ridge to the south. The entry foyer for the hospital has a direct visual connection with the green common entry space to the east and then visually through to distant views to the west.
At the entry there is a significant green space, “the green common”, oriented east / west, sitting at crest of the preferred useable site.
The entry sequence is designed to orient people as they enter the hospital; a journey via green space that provides opportunity to de stress and reduce anxiety before entering the building.

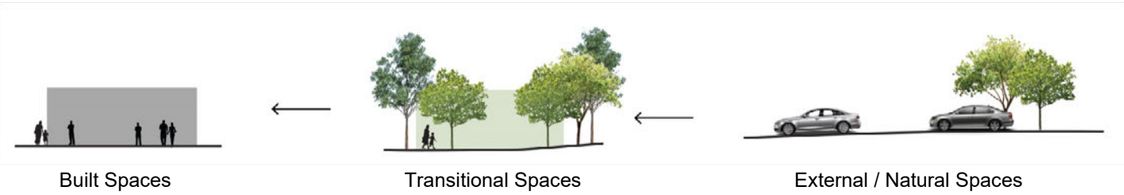



Figure 55: Arrival Sequence Diagram

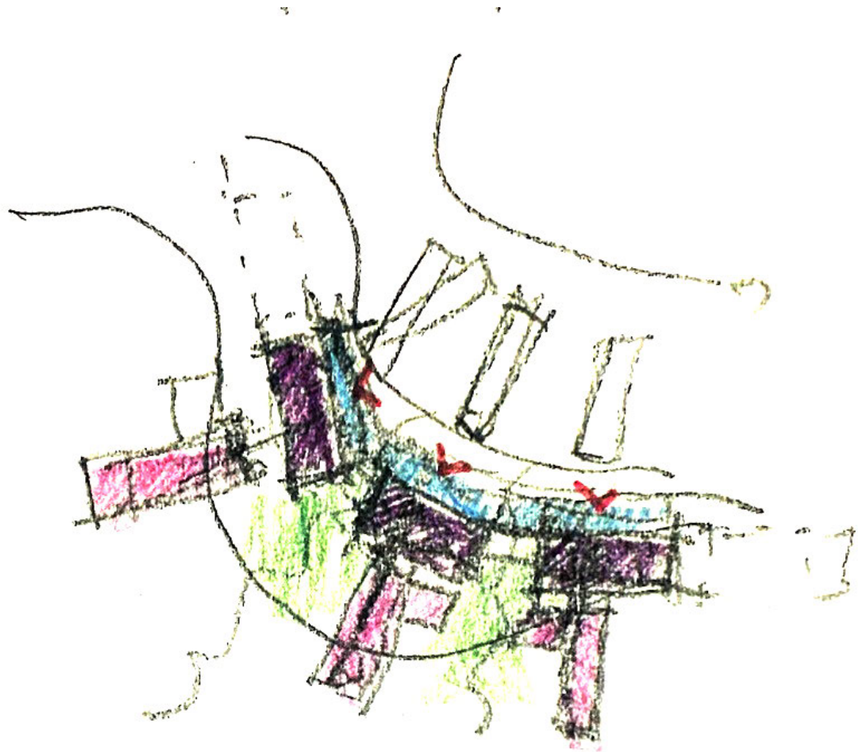


Figure 56: Siting Sketch

## 7.5 Masterplanning Options Considered

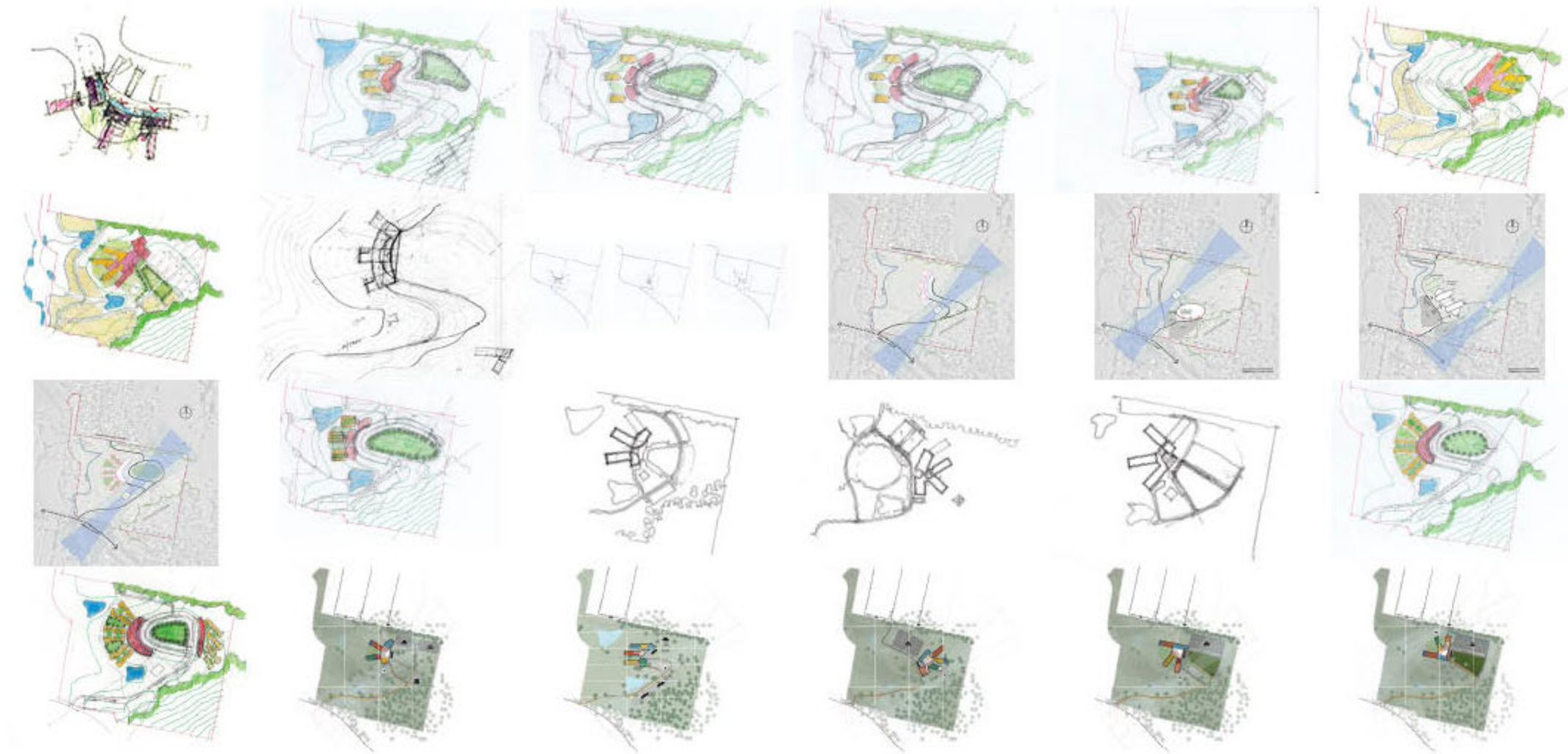


Figure 57: Masterplanning options

## 7.6 Summary of Masterplan Options

### 7.6.1 Option 1 Hospital Street Summary

The Option 1 masterplan is designed around the narrative of a Hospital Street; a linear space that provides clear delineation and wayfinding to different departments. The Hospital Street provides a clear identification spine for wayfinding and also a communal area for people to gather. The street has connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 58: Option 1 Zonal Masterplan

### 7.6.2 Option 2 Hospital Street (Linkways) Summary

The Option 2 masterplan is designed around the narrative of a Hospital Street; a linear space that provides clear delineation and wayfinding to different departments through a series of link ways. The Hospital Street provides a clear identification spine for wayfinding and also a communal area for people to gather. The linkways that connect the 3 different zones of the buildings provide connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 59: Option 2 Zonal Masterplan

### 7.6.3 Option 3 Town Square (West) Summary

The Option 3 masterplan is designed around the narrative of a Town Square; a central communal space that provides clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit on the highest point of the site. The siting of this options provides challenges with arrival sequences and the levels of the site. Opportunities for under croft spaces and connections to the land from lower levels are limited and do not create as good of a connection as other options.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 60: Option 3 Zonal Masterplan

### 7.6.4 Option 4 Town Square (East) Summary

The Option 4 masterplan is designed around the narrative of a Town Square; a central communal space that provides clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed Hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

Figure 61: Option 4 Zonal Masterplan

### 7.6.5 Option 4b Town Square (East Flipped) Summary

The Option 4b masterplan is designed as an alternative option of 4 Town Square. A flipped format that provides a central communal space with clear delineation and wayfinding for an arrival sequence. The Town Square helps provide a sense of community for the users and is designed to create connections from the proposed Hospital to the land, sky, and water. This provides a key relationship between the users and people visiting the facility, as well as Connecting with Country. The blocking of the masterplan option embraces a pinwheel approach where different clinical departments radiate off the central Town Square. The clinical zone is positioned to sit off the western side of the highest point of the site. This is to provide opportunity for under croft and lower levels that connect to the land. The arrival sequence to emergency appears to be secondary and may pose challenges.

The zonal masterplan has been designed to include Clinical Zones, Future Accommodation, Future Education, Community Park, and Future Private Providers, which creates a precinct plan with key relationships between buildings and landscape / external spaces.

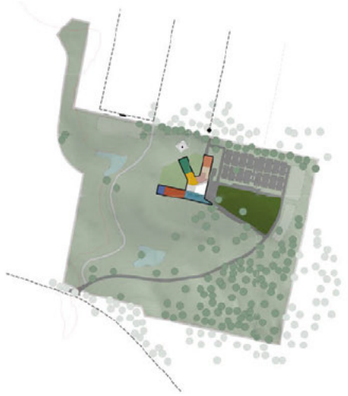


Figure 62: Option 4b Zonal Masterplan

## 7.7 Masterplan Options

### Option 1 – Hospital Street

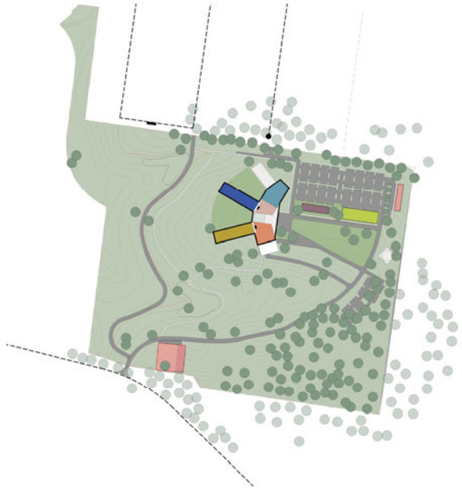


Figure 63: Masterplan Option 1 – Hospital Street

**Advantages**
- Views to local range from Entry & Rooms
- East / West orientation
- Sensitive to topography
- Hospital street connection
- Potential future expansion zones
- Car park access is direct
- Building Designed with direct connection to external green space

**Constraints**
- Site topography will need to be manipulated
- Helipad approach to be negotiated
- Car park is large & could act as a ‘Heat Island’ if not treated correctly

### Option 2 – Hospital Street

Figure 64: Masterplan Option 2 – Hospital Street

**Advantages**
- Views to local range from Entry & Rooms
- Break in main circulation route provides view opportunities
- Car parking not visually intrusive
- East / West orientation
- Building layout is sensitive to site topography
- Helipad close to Emergency Department
- Hospital street connection

**Constraints**
- Potential future expansion zones
- Distance to car park is undesirable
- Helipad approach to be negotiated

### Option 3 – Town Square (West)

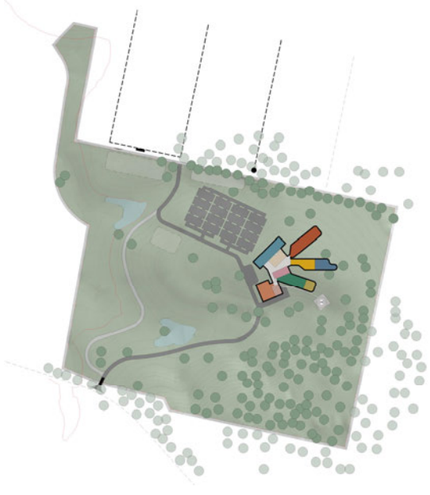


Figure 65: Masterplan Option 3 – Town Square (West)

**Advantages**
- Connectivity to existing streets is good
- Car park access is direct
- East / West orientation
- Potential future expansion zones
- Helipad close to Emergency Department
- Building designed around ‘Town Square’ with direction connection to external green space

**Constraints**
- Site topography will need to be manipulated
- Helipad approach to be negotiated
- Car park is large & could act as a ‘Heat Island’ if not treated correctly

### Option 4 – Town Square (East)

Figure 66: Masterplan Option 4 – Town Square (East)

**Advantages**
- Connectivity to existing streets is good
- Ability to provide future sites for other facilities
- Building layout sensitive to site topography
- Building designed around ‘Town Square’ with direction connection to external green space
- East / West orientation
- Car park access is direct
- Views to local range from Entry

**Constraints**
- Car park is large & could act as a ‘Heat Island’ if not treated correctly
- Helipad approach to be negotiated
- Site topography will need to be manipulated

Conrad Gargett

## Option 1 – Hospital Street – Zonal Masterplan


Figure 67: Option 1 – Hospital Street - Zonal Masterplan

### Clinical Services
- Located with good access to services to suit future expansion
- Future expansion zones identified

### Ambulatory Services
- Located with main entry arrival
- Good street access
- Future expansion zones identified

### Future Expansion
- Consolidates Clinical zone
- Provides expansion for Acute and Ambulatory services
- Provides expansion opportunities for Private Providers and accommodation services
- Provides Future Potential Ambulance Zone

### Community Park
- Opportunity to activate the site and address the town

### Future Private Provider
- Adjacent to Ambulatory Services and carpark
- Dedicated access from main arrival road

### Education & Research
- Good access to all clinical services
- Dedicated access from main arrival road

## Option 1 – Hospital Street


Figure 68: Option 1 – Hospital Street - Flows

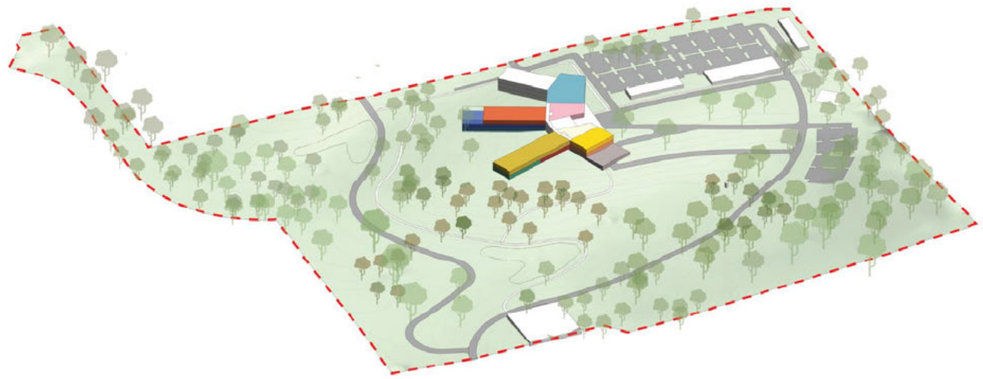


Figure 69: Option 1 – Hospital Street – 3D View

### Advantages

- Views to local range from Entry & Rooms
- Break in main circulation route provides view opportunities
- Car parking not visually intrusive
- East / West orientation
- Building layout sensitive to site topography
- Hospital street connection

### Constraints

- Potential future expansion zones
- Helipad approach to be negotiated

Option 1 – Hospital Street – Key Adjacencies

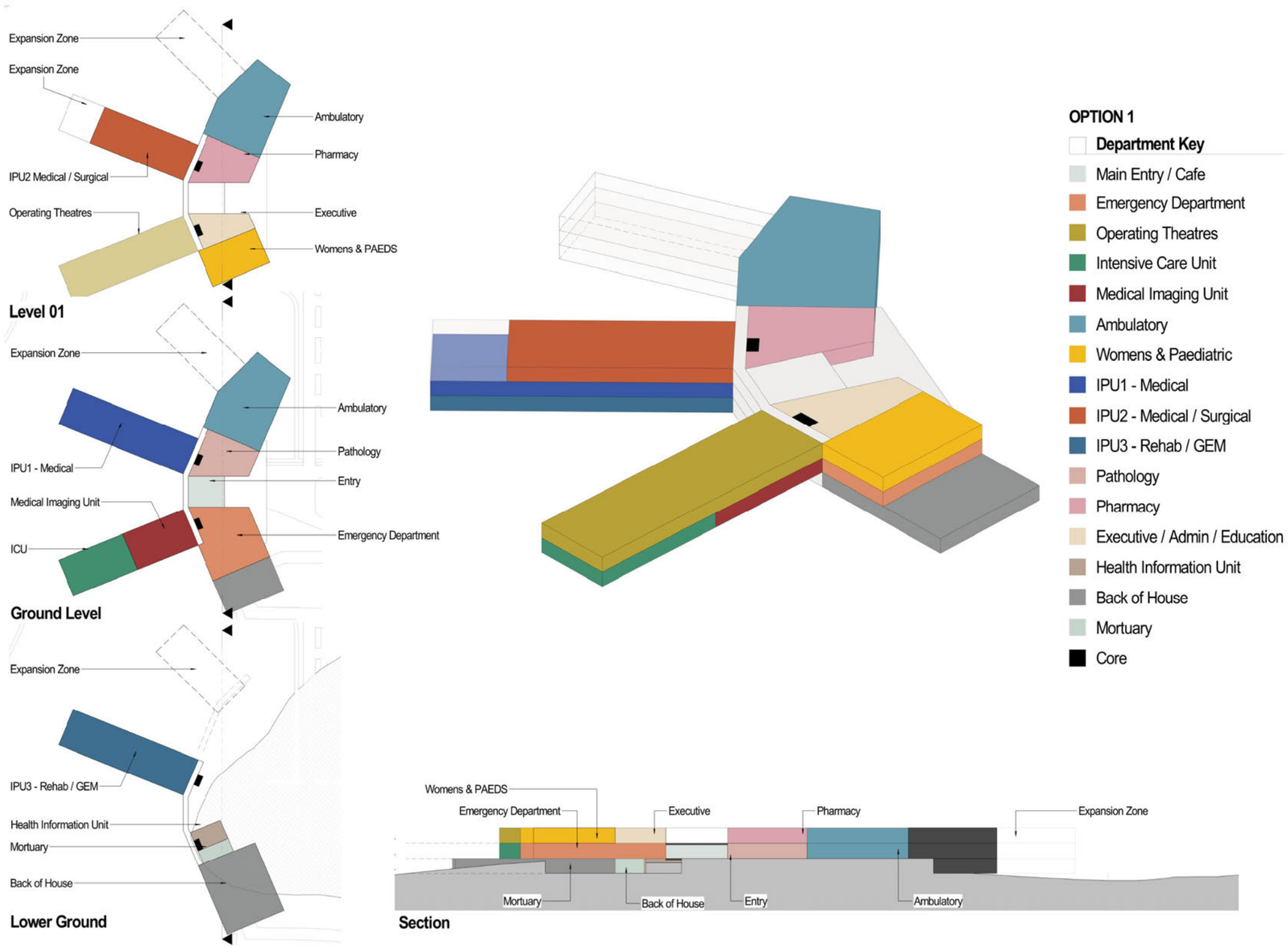



Figure 70: Option 1 – Hospital Street – Department Adjacencies - Plans

Option 1 – Hospital Street – Key Adjacencies

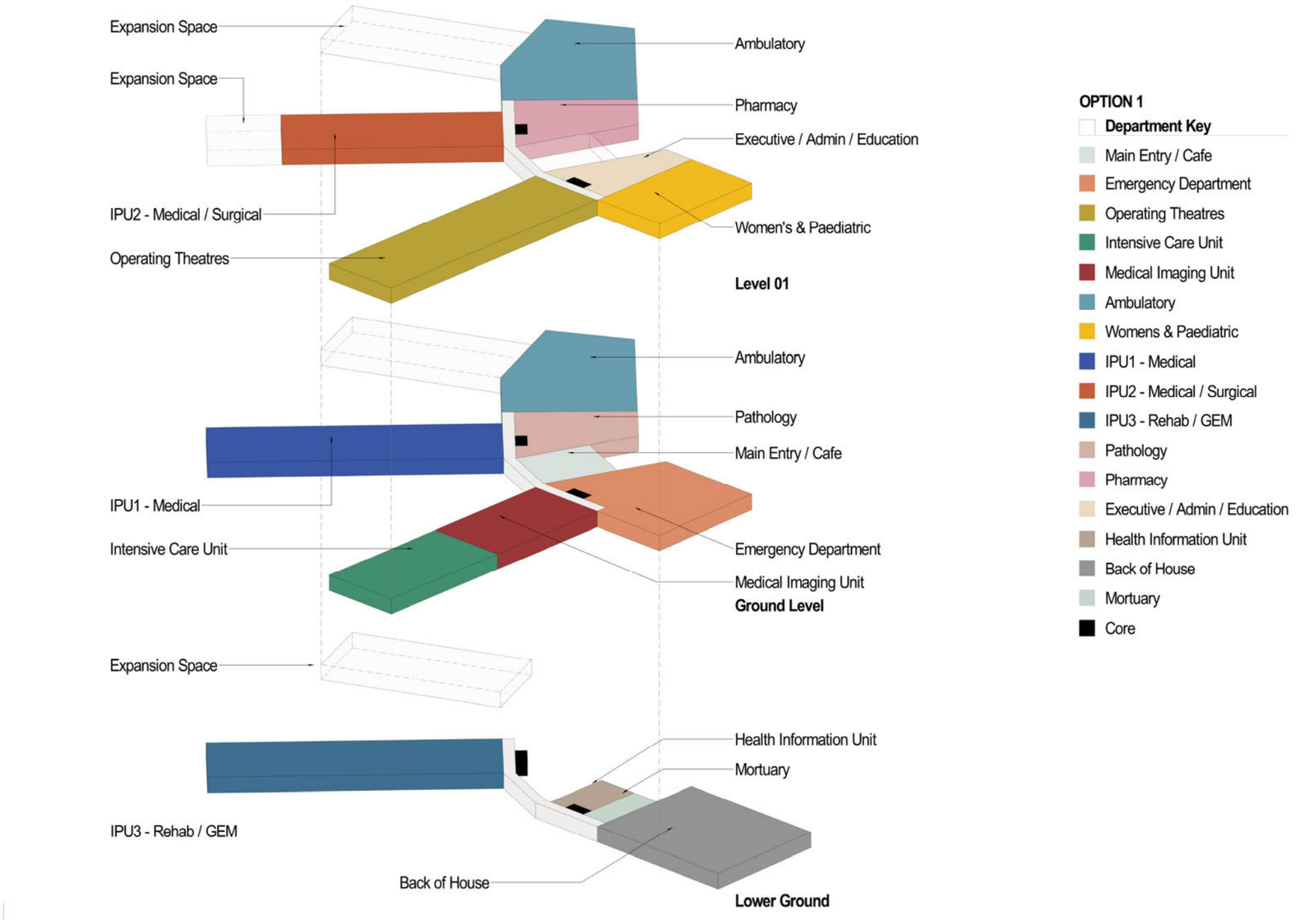



Figure 71: Option 1 – Hospital Street – Department Adjacencies – Exploded Axonometric

## Option 2 – Hospital Street – Zonal Masterplan

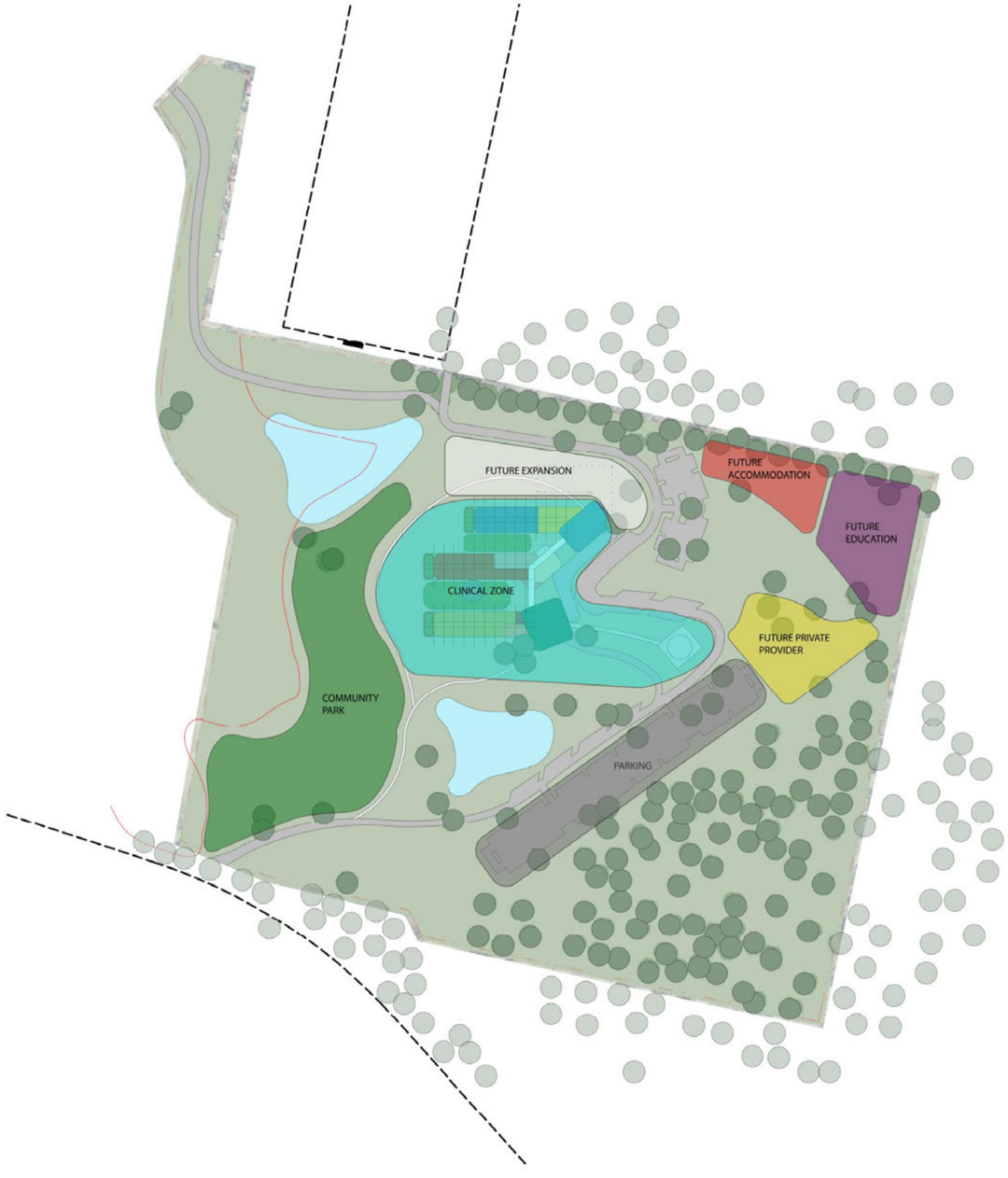



Figure 72: Option 2 – Hospital Street – Zonal Masterplan

### Clinical Services
- Located with good access to services to suit future expansion
- Future expansion zones identified

### Ambulatory Services
- Located with main entry arrival
- Good street access
- Future expansion zones identified

### Future Expansion
- Consolidates Clinical zone
- Provides expansion for Acute and Ambulatory services
- Provides expansion opportunities for Private Providers and accommodation services

### Community Park
- Opportunity to active the site and address the town

### Future Private Provider
- Adjacent to Ambulatory Services and carpark
- Dedicated access from main arrival road

### Education & Research
- Good access to all clinical services
- Dedicated access from main arrival road

## Option 2 – Hospital Street

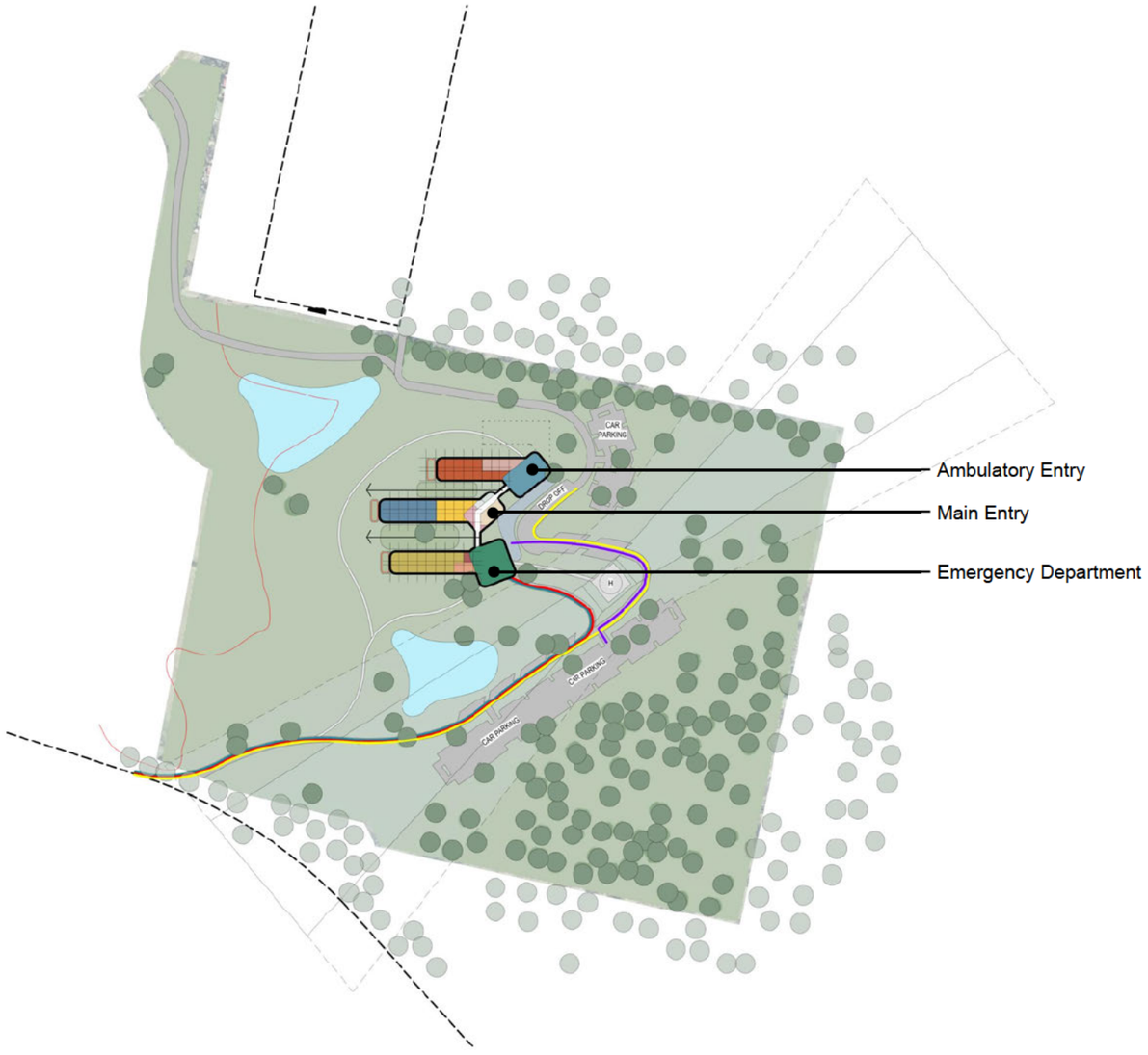



Figure 73: Option 2 – Hospital Street - Flows

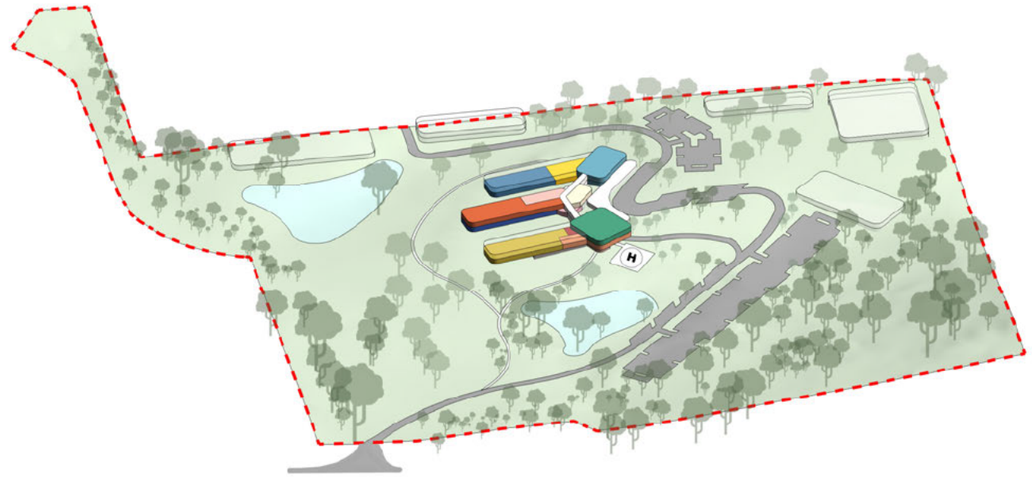



Figure 74: Option 2 – Hospital Street – 3D View

### Advantages

- Views to local range from Entry & Rooms
- Break in main circulation route provides view opportunities
- Car parking not visually intrusive
- East / West orientation
- Building layout sensitive to site topography
- Helipad close to Emergency Department
- Hospital street connection

### Constraints

- Potential future expansion zones
- Distance to car park is undesirable
- Helipad approach to be negotiated

Option 2 – Hospital Street – Key Adjacencies

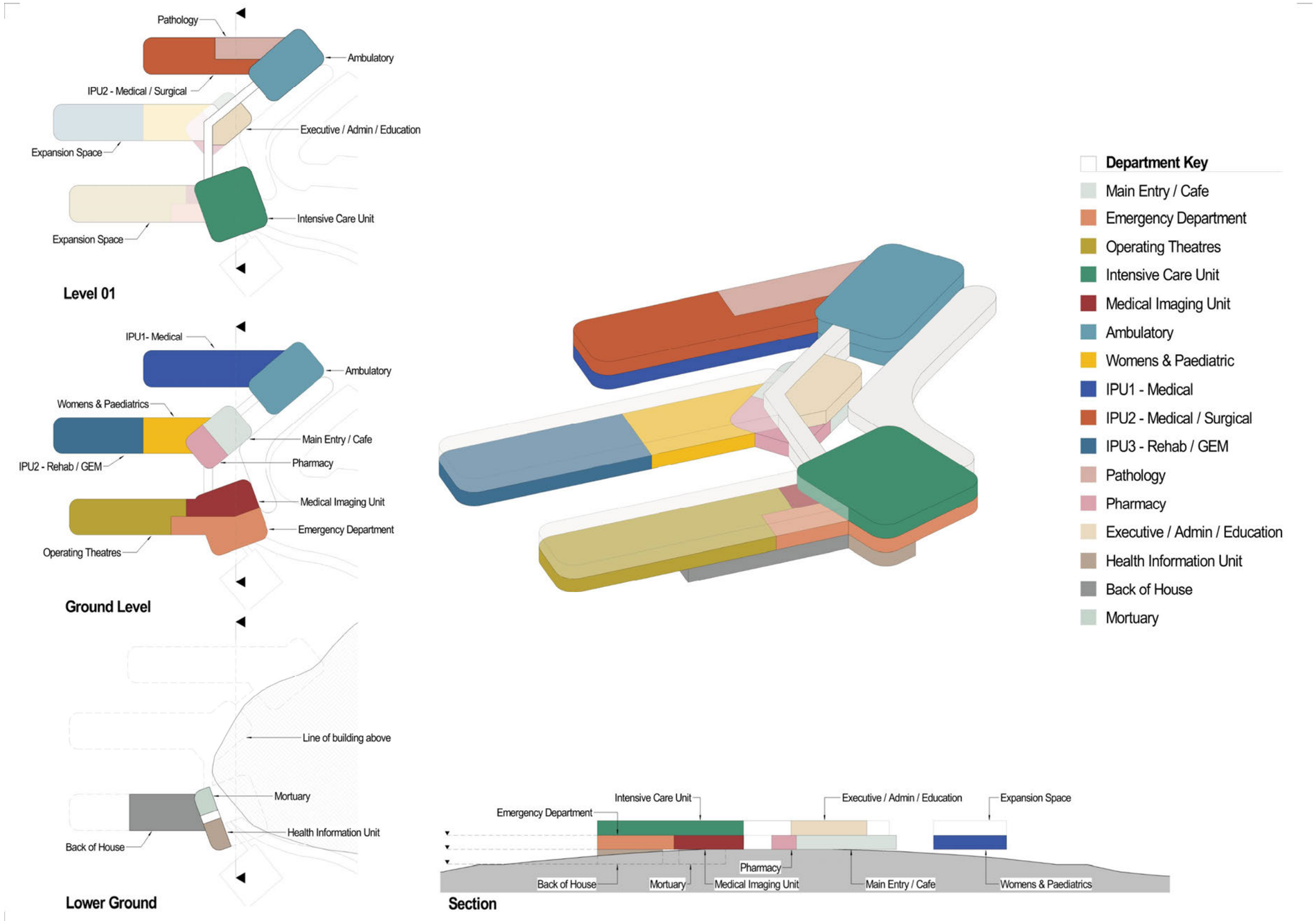



Figure 75: Option 2 – Hospital Street: Department Adjacencies - Plans

Option 2 – Hospital Street – Key Adjacencies

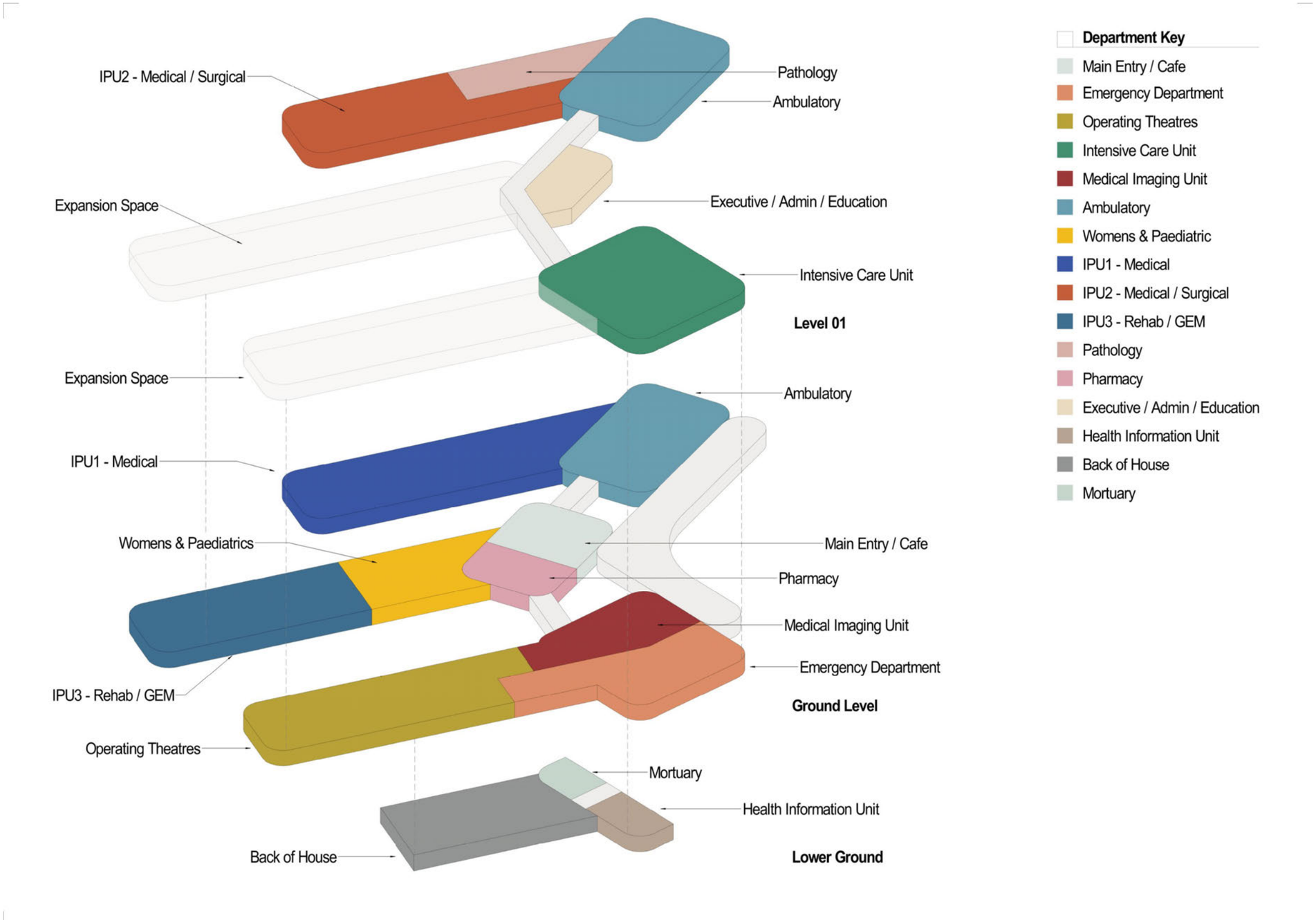



Figure 76: Option 2 – Hospital Street – Department Adjacencies – Exploded Axonometric

## Option 3 – Town Square West – Zonal Masterplan

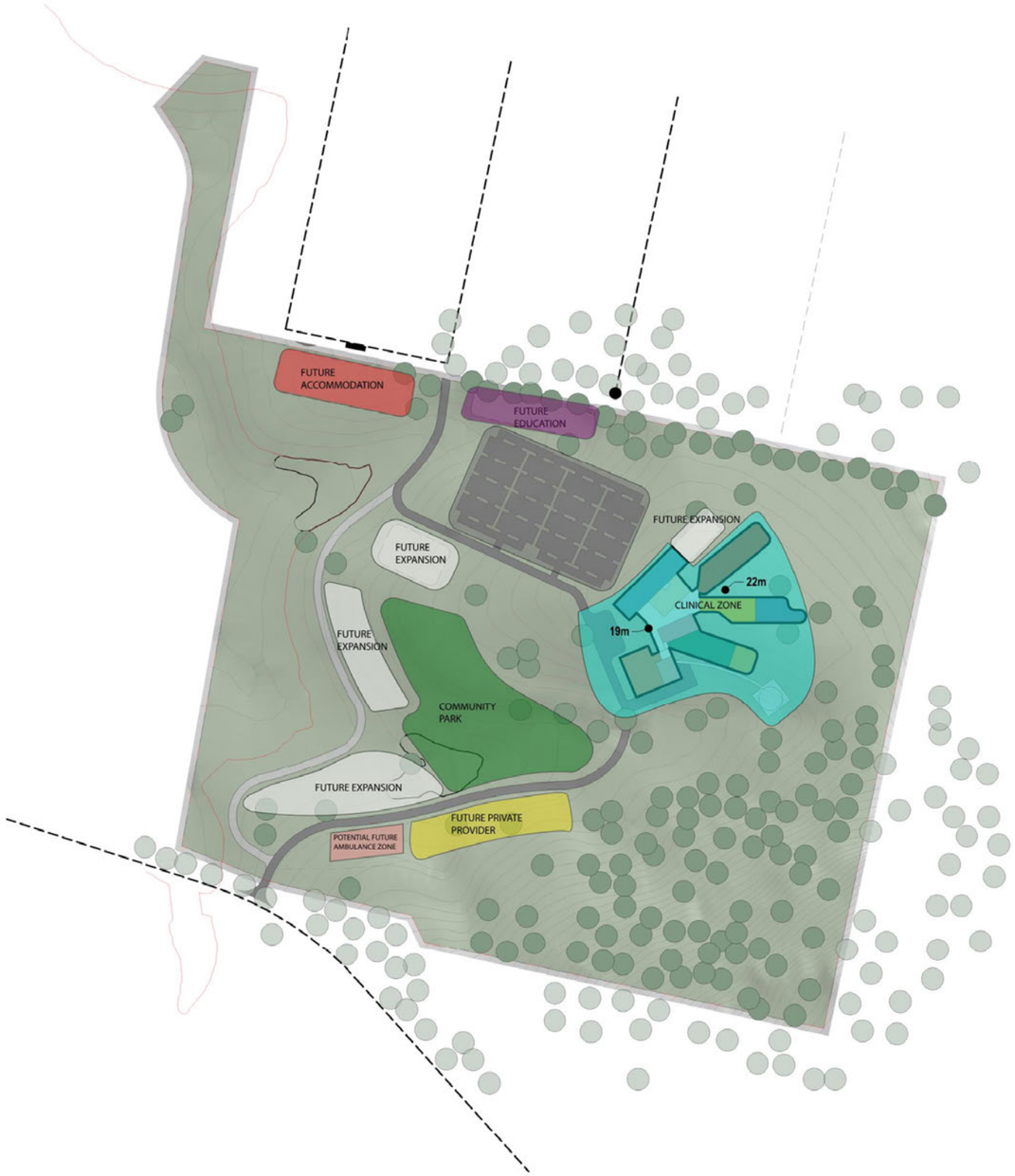



Figure 77: Option 3 – Town Square West - Zonal Masterplan

### Clinical Services
- Located with good access to services to suit future expansion
- Future expansion zones identified

### Ambulatory Services
- Located with main entry
- Good street access
- Future expansion zones identified

### Future Expansion
- Consolidates Clinical zone
- Provides expansion for Acute and Ambulatory services
- Provides expansion opportunities for Private Providers and accommodation services
- Provides Future Potential Ambulance Zone

### Community Park
- Opportunity to activate the site and address the town

### Future Private Provider
- Adjacent to Ambulatory Services and carpark
- Dedicated access from main arrival road

### Education & Research
- Good access to all clinical services
- Dedicated access from main arrival road

## Option 3 - Town Square West


Figure 78: Option 3 – Town Square West – Flows

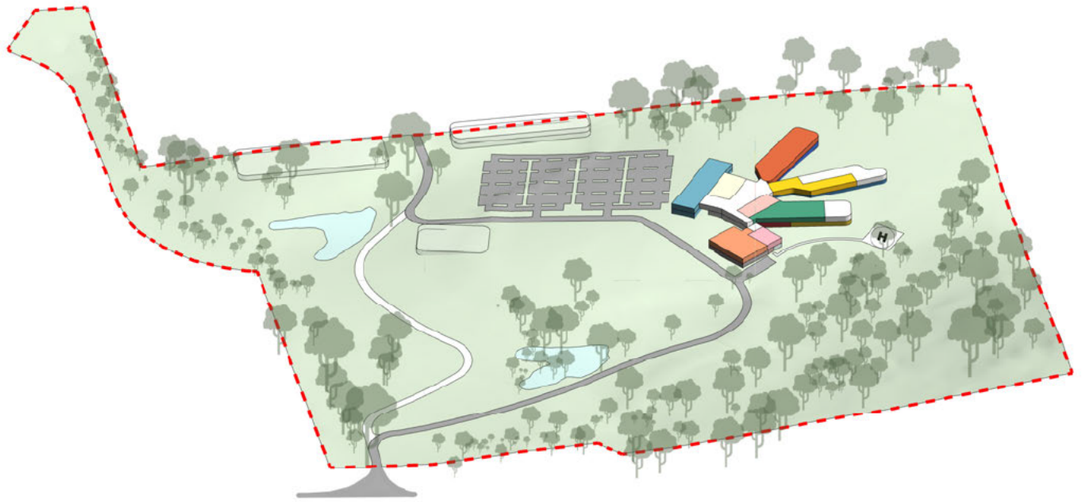



Figure 79: Option 3 – Town Square West – 3D View

### Advantages

- Connectivity to existing streets is good
- Car park access is direct
- East / West orientation
- Potential views to the East
- Potential future expansion zones
- Helipad close to Emergency Department

### Constraints

- Site topography will need to be manipulated
- Helipad approach to be negotiated

## Option 3 – Town Square West – Key Adjacencies

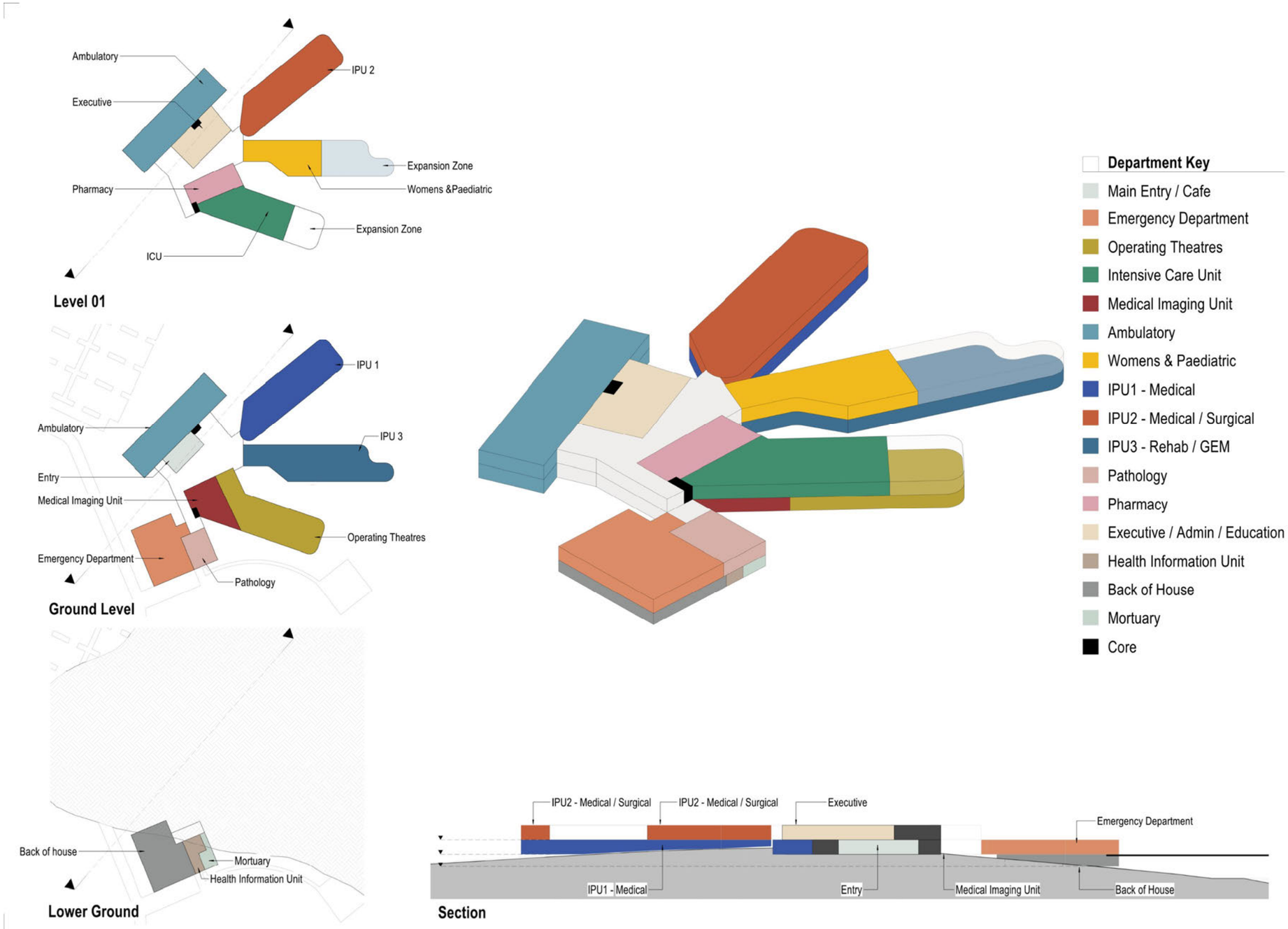



Figure 80: Option 3 – Town Square West – Department Adjacencies - Plans

## Option 3 – Town Square West – Key Adjacencies

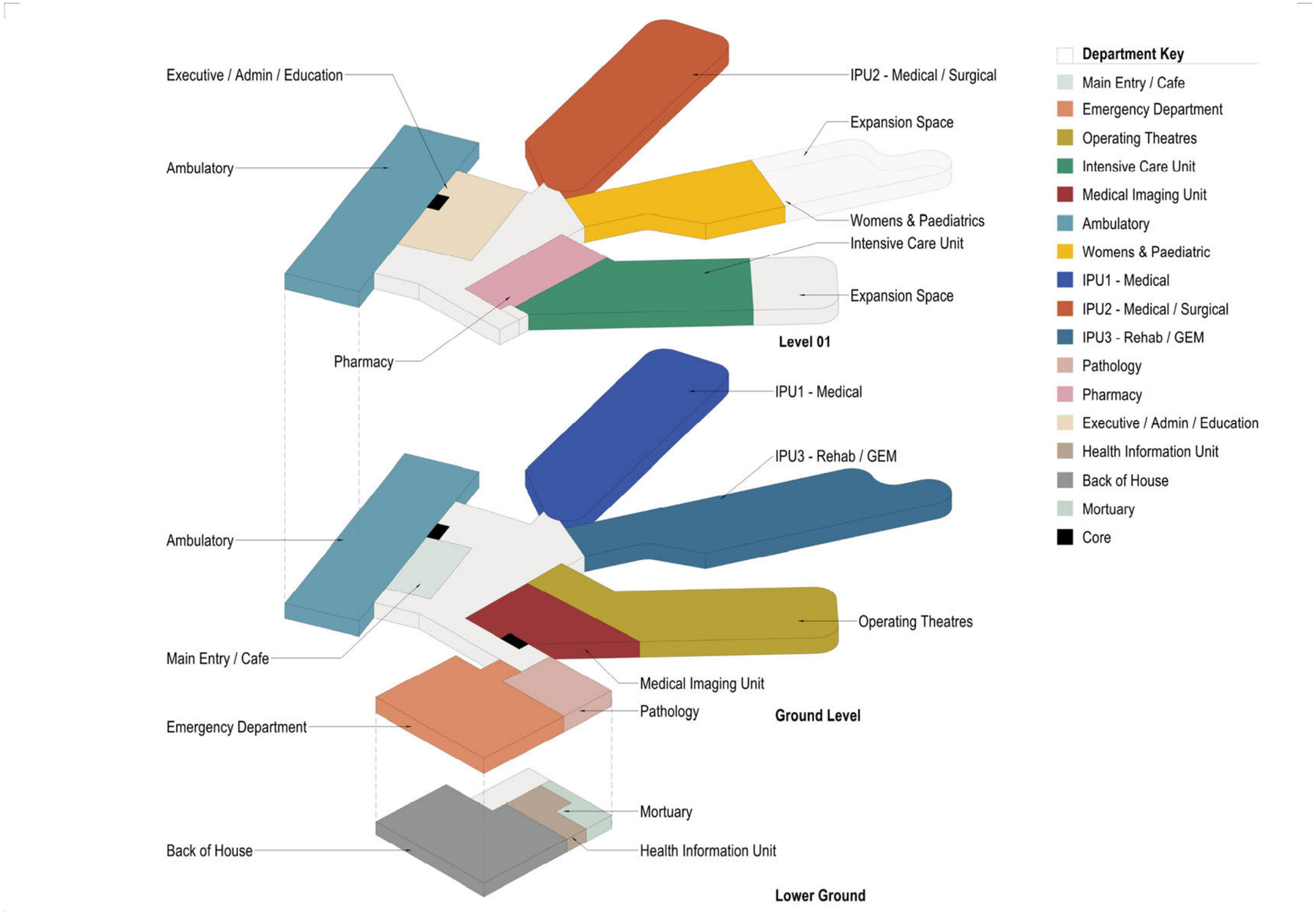



Figure 81: Option 3 – Town Square West – Department Adjacencies – Exploded Axonometric

## Option 4 – Town Square East – Zonal Masterplan

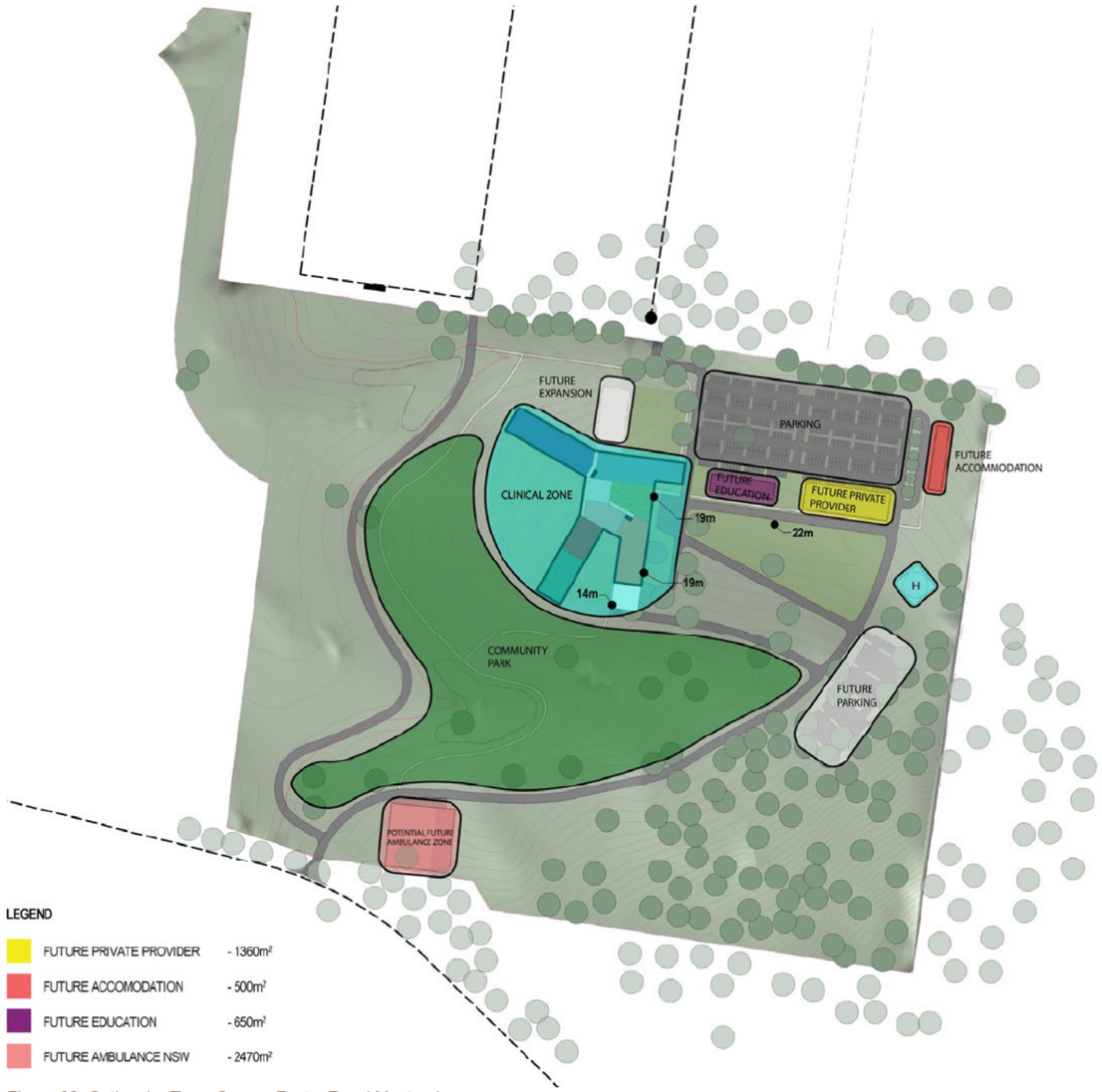



Figure 82: Option 4 – Town Square East – Zonal Masterplan

### Clinical Services
- Located with good access to services to suit future expansion
- Future expansion zones identified

### Ambulatory Services
- Located with main entry arrival
- Good street access
- Future expansion zones identified

### Future Expansion
- Consolidates Clinical zone
- Provides expansion for Acute and Ambulatory services
- Provides expansion opportunities for Private Providers and accommodation services
- Provides Future Potential Ambulance Zone

### Community Park
- Opportunity to activate the site and address the town

### Future Private Provider
- Adjacent to Ambulatory Services and carpark
- Dedicated access from main arrival road

### Education & Research
- Good access to all clinical services
- Dedicated access from main arrival road

## Option 4 – Town Square East


Figure 83: Option 4 – Towns Square East - Flows

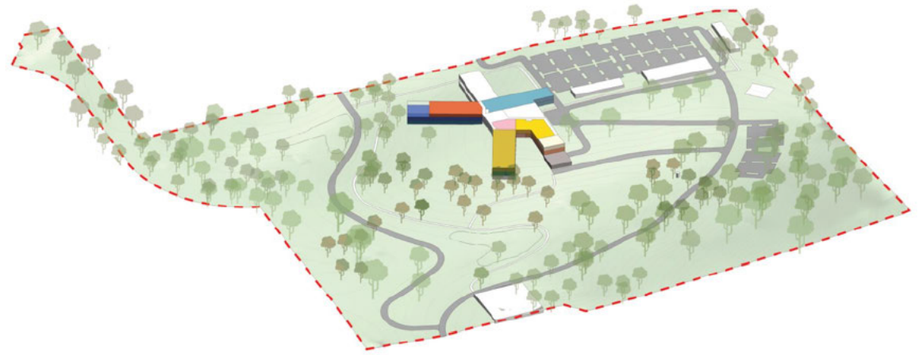


Figure 84: Option 4 – Town Square East – 3D View

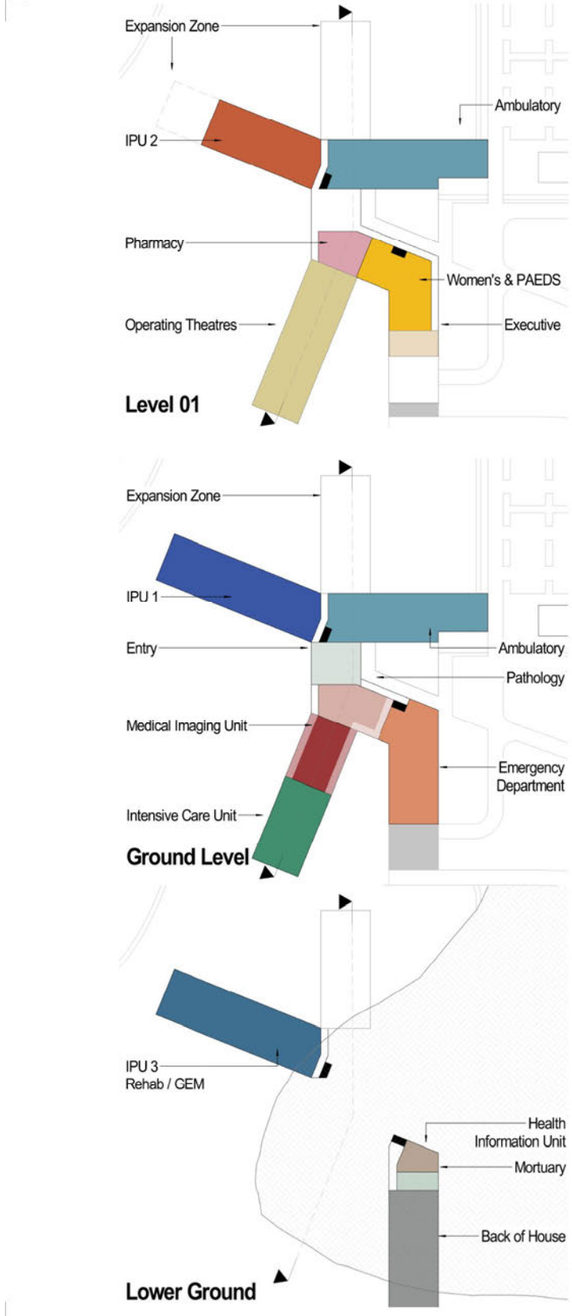
**Advantages**

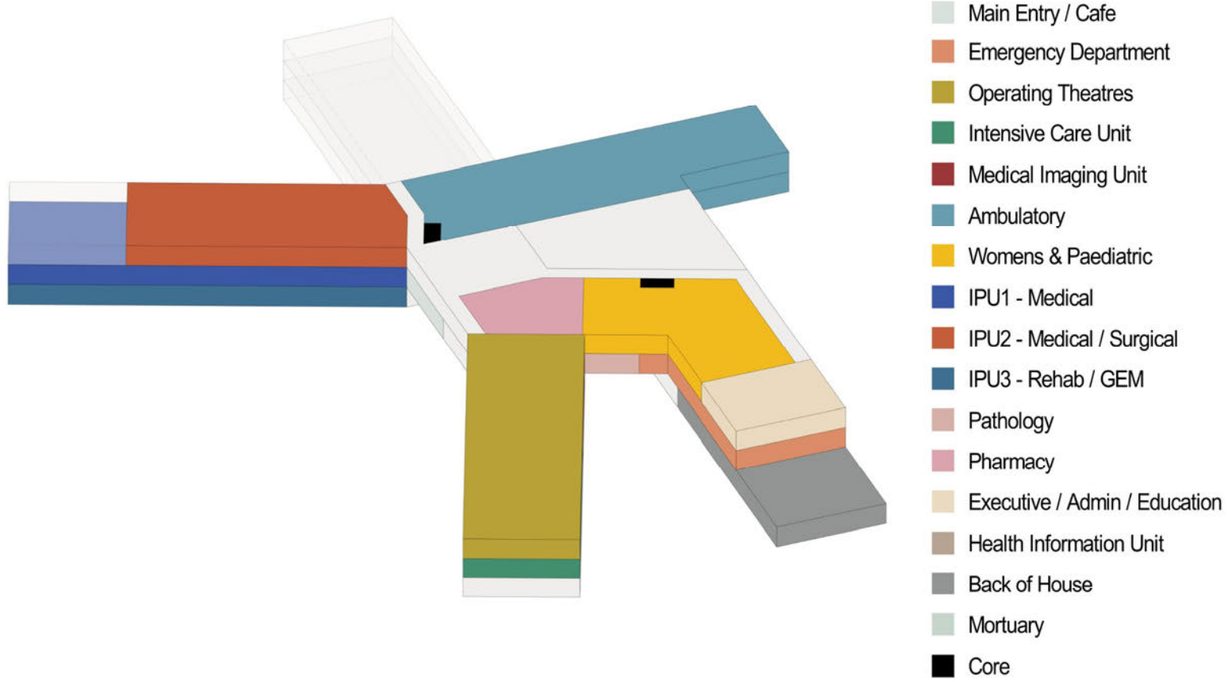
- Connectivity to existing streets is good
- Ability to provided future sites for other facilities
- Building Layout sensitive to site topography
- Building designed around 'Town Square' with direct connection to external green space
- East / West orientation
- Car park access is direct
- Views to local range from Entry & Rooms

**Constraints**

- Car park is large & could act as a 'Heat Island' if not treated correctly
- Helipad approach to be negotiated

## Option 4 – Town Square East – Key Adjacencies





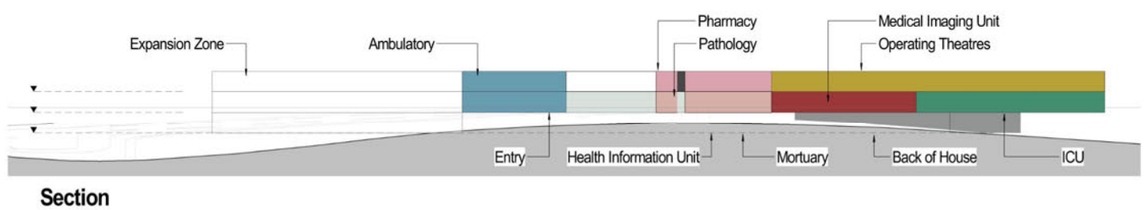




Figure 85: Option 4 – Town Square East – Department Adjacencies - Plans

## Option 4 – Town Square East – Key Adjacencies

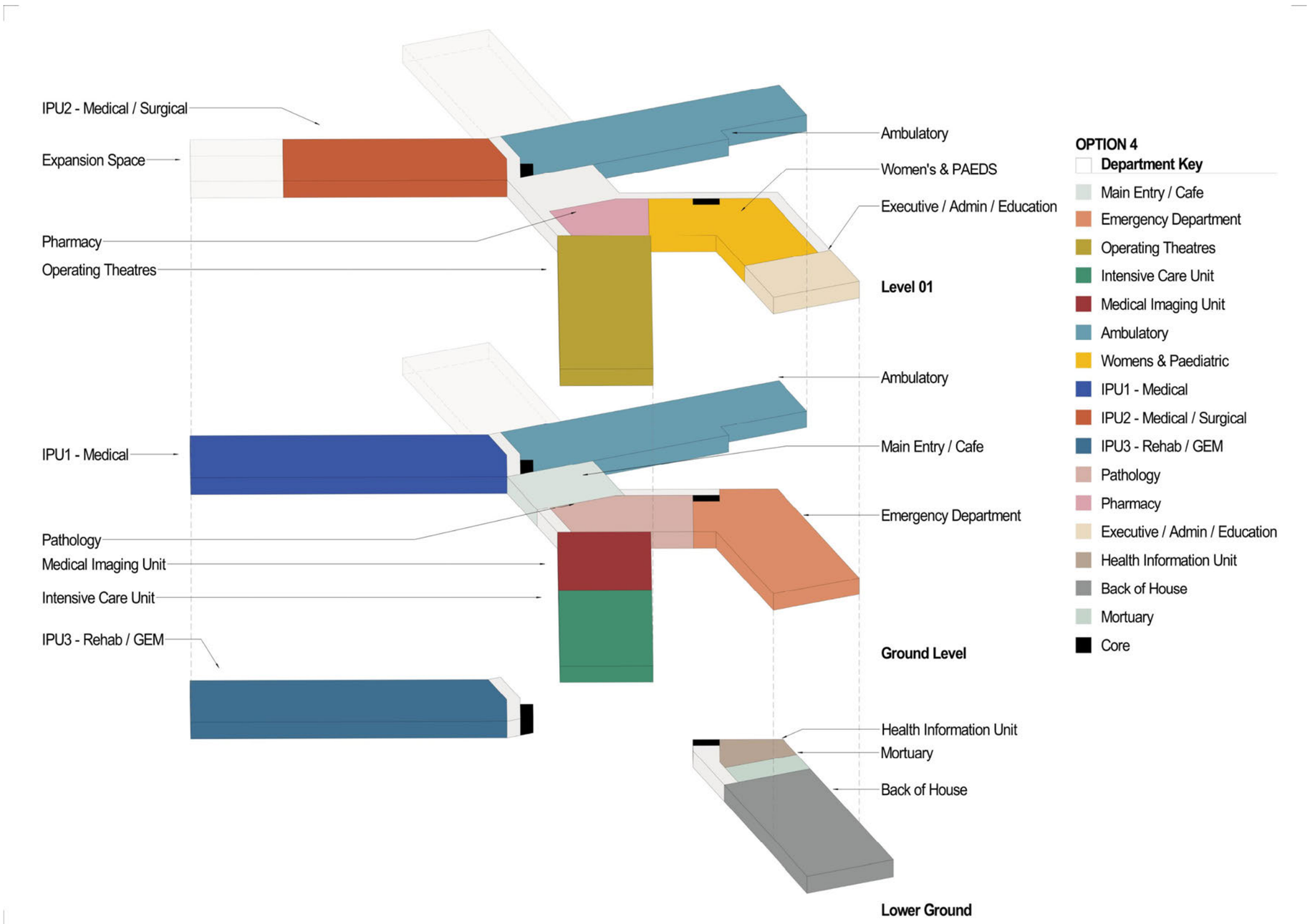



Figure 86: Option 4 – Town Square East – Department Adjacencies – Exploded Axonometric

# Option 4b – Town Square

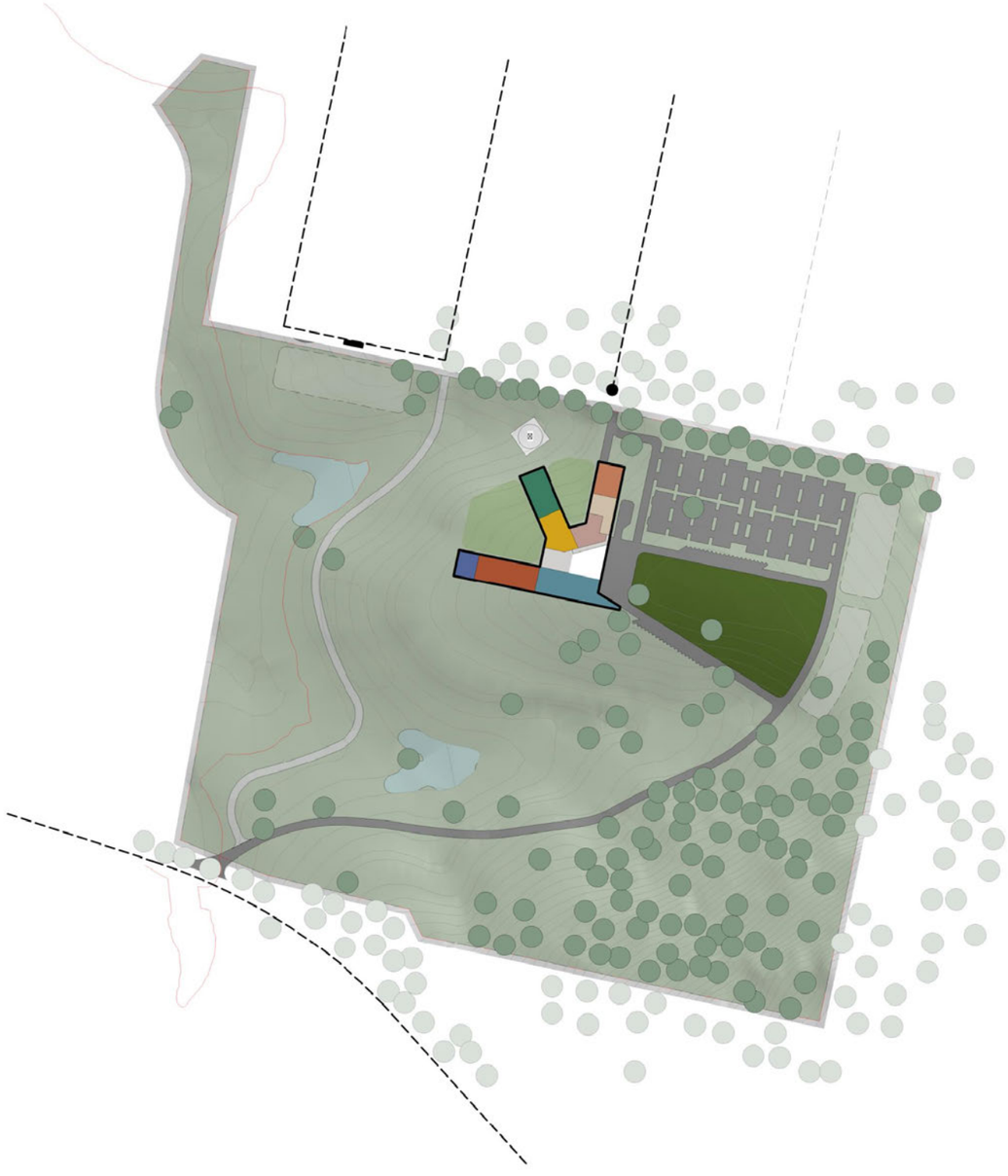


Figure 87: Option 4b – Town Square Flipped – Masterplan

**Clinical Services**
- Located with good access to services to suit future expansion
- Future expansion zones identified

**Ambulatory Services**
- Located with main entry arrival
- Good street access
- Future expansion zones identified

**Future Expansion**
- Consolidates Clinical zone
- Provides expansion for Acute and Ambulatory services
- Provides expansion opportunities for Private Providers and accommodation services

**Community Park**
- Opportunity to activate the site and address the town

**Future Private Provider**
- Adjacent to Ambulatory Services and carpark
- Dedicated access from main arrival road

**Education & Research**
- Good access to all clinical services
- Dedicated access from main arrival road

## 7.8 Endorsed Zonal Masterplan

Through 4 rounds of user group meetings with key stakeholders, an endorsed zonal masterplan was nominated. The endorsed zonal masterplan. Both options 1 and 4, outlined in previous sections of this report, whilst they champion different planning strategies, their zonal planning strategies follow the same methodologies. The planning of the building itself is to be progressed and testing in the next phases of the project.

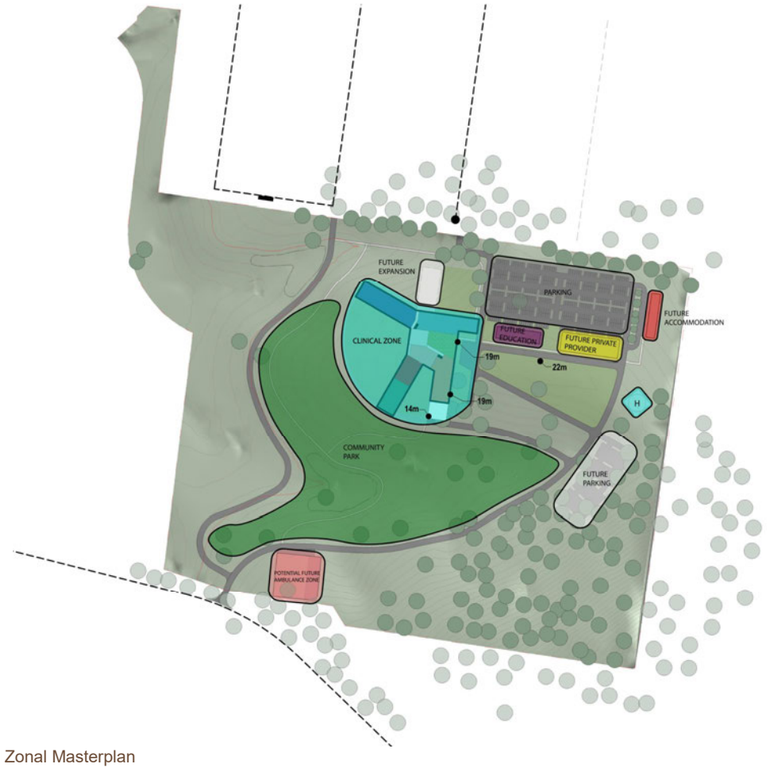



Figure 88: Endorsed Zonal Masterplan

The endorsed plan champions the hospital building in a key location along the highest point of the site, stretching out towards the lower areas and back towards the town. The areas closer to the PMF line have been prioritised as community parklands. The proximity of the future NSW Ambulance site to the Princes Highway allows for both efficient access to the hospital, as well as quick exit from the site. The other future expansion areas, being education, private provider, and accommodation, also maintain key connections to the central green, as well as appropriate proximity to the hospital building.

The education building, which is likely to be utilised more frequently by hospital staff, is located closest to the main hospital, adjacent to the central green. Providing a greater sense of personal identity, the future private provider has been nominated on the far side of the future education building. This location allows the future provider a more personalised identity, whilst still retaining its location within the main ‘hub’ zone of the site. The future accommodation building has been located in the north-east corner, providing privacy and a sense of disconnect from the clinical setting of the hospital. The view out to the east of the site also provides a unique outlook for the accommodation building, further differentiating it from the main hospital. This building also sits in close proximity to the residential area to tPhe north of the site, emphasising the domestic nature of this future building.

## 7.9 Design Sketchbook

The design Sketchbook is an integral part of our process as architects, it demonstrates the working and testing's of different options and ideas as the design and masterplan evolves. The sketchbook began with an initial design idea at project initiation. A question we asked ourselves was 'How would this building sit on the site and what may the key attributes of the building be'. The sketch was based on the idea of a building that was of its place and connected to the contours of the site and also a building that would connect to the existing landscape and nature. This creates some key principles when developing the masterplan options. A number of different options were tested based on key design principles relating to climatic response and also master planning. Two key ideas that were essential to these options was the design idea of a 'Hospital Street' or the 'Town Square'. The evolution of four (4) main options were further investigated through a series of workshops with all stakeholders. The sketchbook is a continuous part of our design process and helps with the evolution of the design and problem solving.

# 8.0 Engineering Input

## 8.1 Civil and Structural

### 8.1.1 Overview

On 7th December 2020, NSW Health announced that a rural block east of Moruya TAFE, between Albert Street and the Princes Highway would be the site for the new Eurobodalla Regional Hospital. The NSW government has committed $200 million to the development which will combine Eurobodalla's two hospitals, Moruya District Hospital and Batemans Bay Hospital. The Project is legally described as Lot 6, DP 1212271 located in Moruya NSW 2537. (Project Site).

This Masterplan Report has been prepared to describe the project in relation to civil and structural disciplines. This project consists of:

Delivery of a new major referral hospital to provide the health services required to meet the needs of the growing population of Eurobodalla, in conjunction with the other hospitals and community health centres across the region;

Delivery of the supporting infrastructure required for the new major referral hospital, including green space and other amenities, campus roads and car parking, external road upgrades and connections, utilities connections, and other supporting infrastructure.

The new hospital will include the following:

— A main entry and cafe area
— Ambulatory Services
— Executive/ Admin/ Education
— Women's & Paediatrics
— Intensive Care Unit
— Health Information Unit
— Pathology
— Pharmacy
— Emergency Department
— Integrated Practice Units
— Medical Imaging
— Mortuary
— Back of house Services
— Car parking
— Future expansion area
— Operating Theatres

### 8.1.2 Existing Documentation

The following relevant existing documentation has been referenced for the proposed design:

— Masterplan Options by Conrad Gargett Architects, dated 16st March 2021,
— Level and Detail Survey by LTS dated 23rd February 2021,
— Site Selection Flood Assessment, NSW Health Infrastructure by Arup, dated November 2020
— Eurobodalla Council Flood Study, provided 24th February 2021,
— Ecology & Bushfire Due Diligence Report AE21-2248-DDREP-ISS-1, by Adel Ecology, dated 3rd March 2021,

Historical Existing Site information for surrounding area;

— Guiding Ecological Principles by Keystone Ecological, dated October 2007
— Flora and Fauna Impact Assessment by Keystone Ecological, dated October 2007
— Archaeological Subsurface test report by Julie Dibden, dated September 2005
— Heritage Assessment by City Plan Heritage, dated November 2005
— Bushfire Protection Assessment by Aust Bushfire Protection Planners, dated June 2006
— Flood Evacuation by Evans and Peck, dated October 2007
— Water and Flood Clarification by Evans and Peck, dated April 2008
— Hydrology Climate Change Response by Evans and Peck, dated September 2008.
— Stormwater Management Comment by Keystone Ecological, dated April 2008
— Groundwater Response by Evans and Peck, dated December 2008
— Soil Survey and Acid Sulphate Soil Invest by Sydney Environmental and Soil Lab, dated September 2006
— Riparian Corridors and contours by EDAW AECOM, dated June 2007

### 8.1.3 Site Description

**Location**

The proposed development is within the parcel of land identified as Lot 6, DP 1212271 located in Moruya NSW 2537. The site is bordered by Princes Highway to the south. The proposed site is located within Eurobodalla Shire Council Local Government Area (LGA). The locality map of the site is shown in Figure below:


Figure 2-1: Site Locality Map (Conrad Gargett)

### Topography

The site is located on a localised crest. The proposed location of the earthworks and associated infrastructure sit on a local crest and generally fall to the west and south-west. Several Riparian zones run through the site and there are a number of existing on-site dams. There is a residential development to the north of the site.

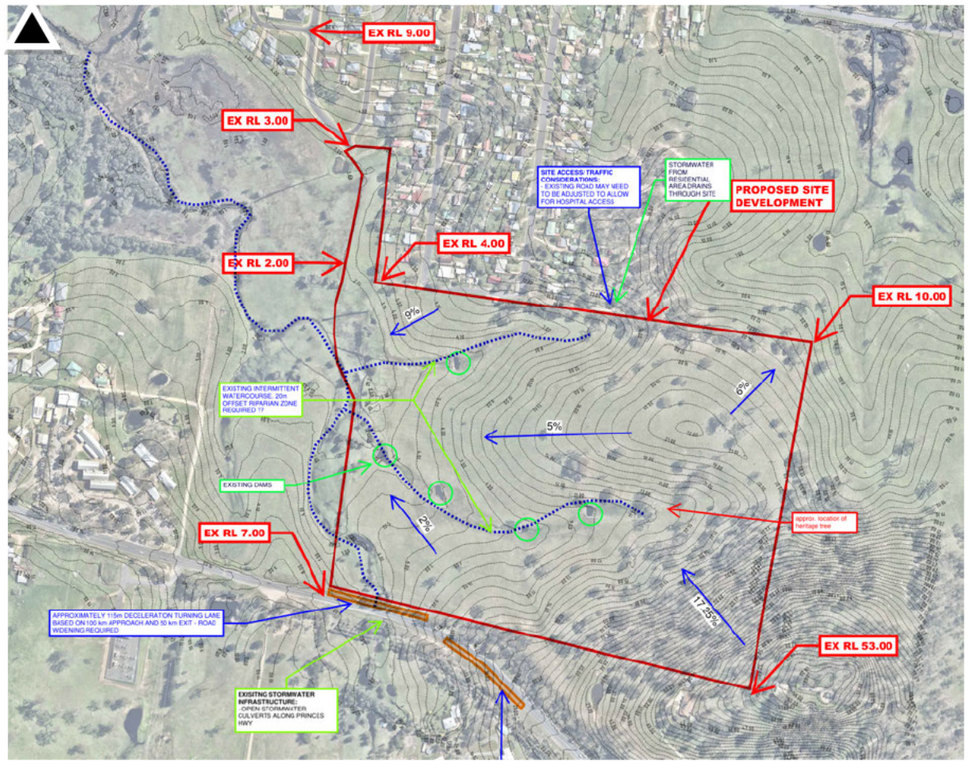



Figure 2-2: Site Topography (LIDAR SURVEY)

### Preliminary Geotechnical Information

Geotechnical investigations are yet to be carried out. The below figure indicates the proposed borehole locations. Once the geotechnical report has been completed the soil profile for the site will be better understood and this will help drive the foundation design and the bulk earthworks design.

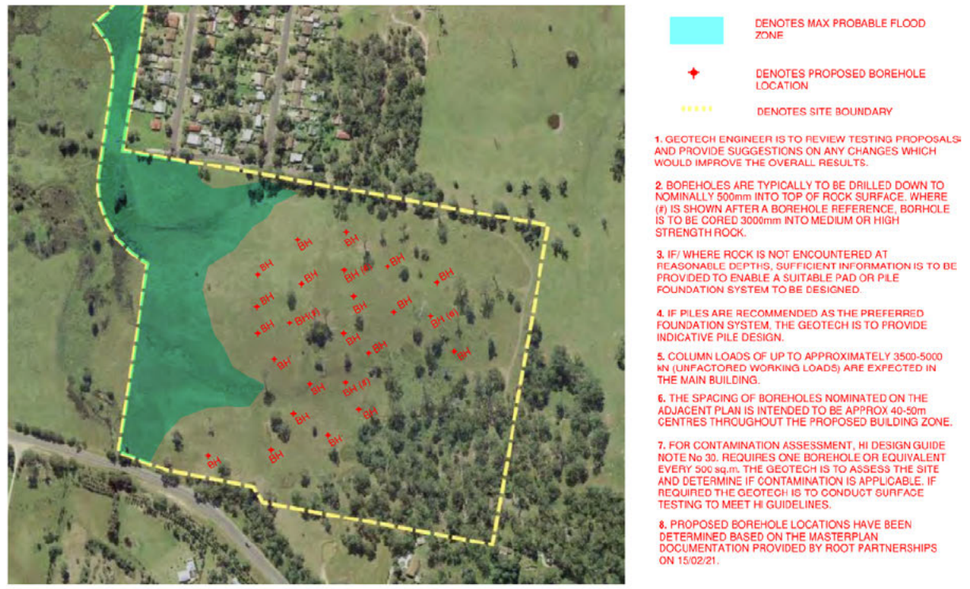



Figure 2-3: Proposed Borehole Location

### Flooding

Eurobodalla Council flood studies have found that the western portion of the site is flood affected for 1% AEP and PMF events. See figure below.

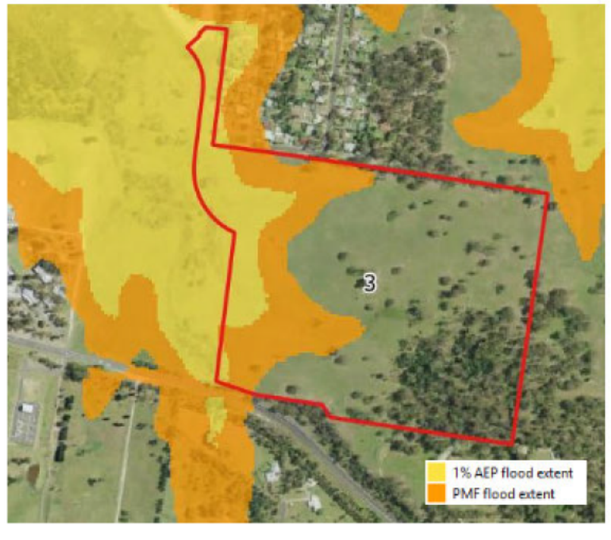



Figure 2-4: 1% AEP Flood Extent & PMF Level (by Arup)

The areas which are flood affected are located within the existing environmental area along the western boundary of the site.

The flood levels at the key location of the site are:

- 1% AEP 5.01m AHD
- PMF 8.97m AHD

**Stormwater**

The site does not currently have any formal stormwater system. A series of sub catchments drain to small dams and ponds. There is an upstream catchment which discharges via a headwall at the northern boundary of the site.

### 8.1.4 Future Development

The site is intended to support the development of a new three level hospital building and surrounding carparks. Provision for future expansion is also required. Proposed roads and civil infrastructure include provision for; ambulance access, loading dock access, carpark access, helipad connection as well as main hospital entry. The main site access will be from Princes Hwy in the South West corner of the site. Alternative access is also proposed on the North boundary. This is likely to require road upgrades, further input from the traffic consultant will be required. Consideration also needs to be given to the future Moruya By-pass.

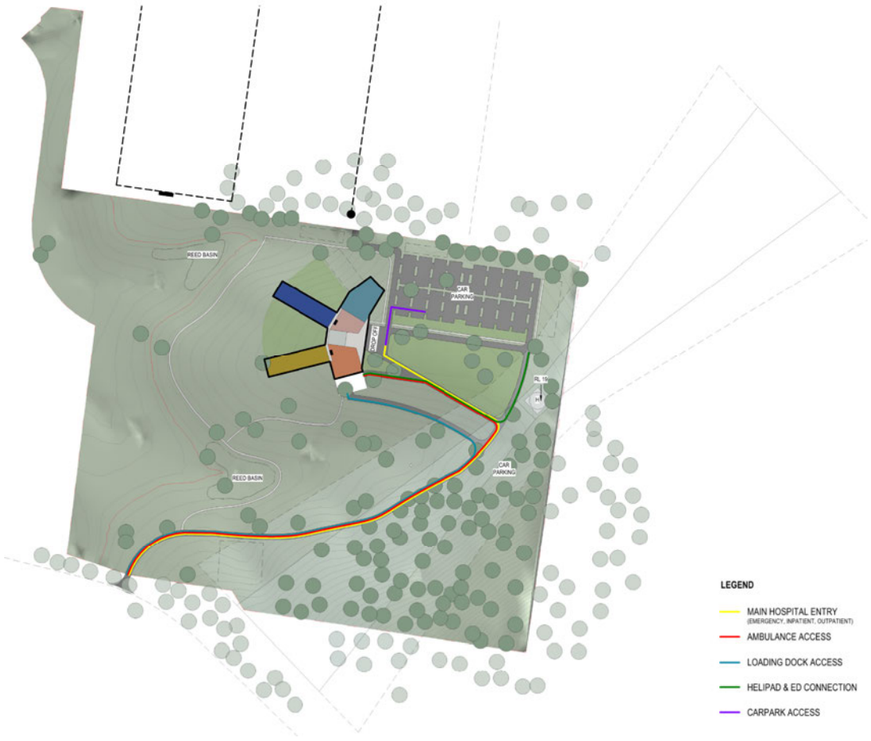



Figure 3-1: Architectural Masterplan - Option 1 (by Conrad Gargett)


Figure 3-2: Architectural Masterplan - Option 4 (by Conrad Gargett)

**Substructure**

Retention systems

It is expected that soil will not be self-supporting therefore either retaining walls or permanent batters are to be utilised. To avoid the potential issues with long term performance of waterproofing systems, batters within subfloor spaces may be preferable where possible if adjacent to any clinical areas in preference to retaining walls.

Foundations

It is proposed to found the main building structure on consistent material comprising of high strength rock. At the time of writing, Geotech investigations had not yet been completed. Should high strength rock be encountered at shallow depths, pad footings could be utilised. If suitable rock is found more than 1m below bulk excavation level, bored piers may be the preferred option.

### 8.1.5 Super Structure

**Structural Grid**

The structural is generally to be to be based on a standard 8.4 x 8.4 grid in accordance with HI guide lines.

**Floor systems**

The floors are to be post tensioned concrete supported on reinforced concrete columns. Floors are to be designed to support the loads specified by AS1170.1. In addition, the floors are to be designed to limit accelerations due to vibration as specified by Health Infrastructure.

**Structure resisting lateral forces**

Seismic forces specified by AS1170.4 and wind forces specified by AS1170.2 are to be resisted by reinforced concrete shear walls. Generally, these are to be incorporated into lift shafts and stair cores.

### Importance Level

The building is to be considered as Importance Level 4 as defined by the NCC.

### Structural sizes for planning purposes

For the purpose of setting floor levels and allocating space for structure, the following structure is proposed:

| Item | Location | Size | Quantities | Notes |
|---|---|---|---|---|
| Columns | Generally on 8.4x8.4 grid | 500mm x500 mm supporting 3 levels | Concrete varies N65 to N40 | Avoid transfers unless they result in a cost saving. |
| Suspended floors | Clinical Areas, Theatres, Imaging | 260mm slabs 450mm x 2200mm band beams | Concrete - S40 Reinforcement - 45 kg/cum & PT - 24 kg/cum | Design for Response Rf =1 |
| Suspended floors | IPU's | 220mm slabs generally (260 end bays) 400mm x2200mm band beams | Concrete - S40 Reinforcement - 45 kg/cum & PT - 24 kg/cum | Design for Response Rf =2 |
| Stair shafts | Generally | 250mm tk. concrete walls | Reinforcement - 200 kg/m2 | |
| Lift shafts | Generally | 250mm tk. concrete walls | Reinforcement - 200 kg/m2 | |
| Shear walls | T.B.C - Allow for 8.4m long wall per 500 sqm on plan | 250mm tk. average | Reinforcement - 180 kg/m2 | |
| Roof | Over wards/ theatres/IP U's | Post tensioned concrete 220mm slabs generally (260mm end bays) 400mm x 2200mm band beams Provide metal deck roof over | Concrete - S40 Reinforcement - 45 kg/cum + SL82 mesh top throughout PT - 26 kg/cum | |
| Roof | Over plant | Structural steel Extend 400mm x400mm concrete columns to roof | Allow 28 kg/sqm of steel | |
| Stairs | Internal | Reinforced concrete Throat thickness – 250mm | Concrete S32 Reinforcement - 120 kg/m2 | |
| Stairs | External | Reinforced Concrete or structural steel depending on purpose | | Avoid stair pressurisation if possible by making stairs "external" |
| Substructure | | Bored Piers or Pad Footings | Concrete – N65 | TBC with geotech |
| Retaining walls | Building | 250 thick reinforced concrete indicative depending on wall height | Concrete – S32 reinforcement Re | Avoid retaining walls wh where possible |
| | Undercroft | | Reinforcement 150 kg/cum | Where possible |
| Retaining walls | External | < 2.4m - Blockwork 290mm tk. 2.4m – 4.0m - Reinforced concrete 350 tk. | | |

### Flooding

As the western portion of the site is flood affected for 1% AEP and PMF events, appropriate flood controls need to be applied for the development. Council's *Infrastructure Design Standard* requires a freeboard of 500mm for residential development and 300mm for commercial and industrial developments in 1% AEP flood event. However, *NSW Floodplain Development Manual* requires a freeboard of 500mm in PMF event for critical developments such as a hospital. As the development is classified as a critical structure, proposed floor levels need to be higher than 8.97mAHD (PMF) + 0.5m = 9.47.

Flood Evacuation Strategy will need to be developed. As the development floor is higher than PMF level, it is expected that evacuation from the hospital will not be required. However, access roads will need to be assessed to ensure continued access to and from the hospital is retained in the PMF event.

### Stormwater Management

As the development is located in a rural area and in close vicinity of natural waterways, stormwater within the site will need to be managed both in terms of quantity and quality to ensure there is as little disturbance as possible to the existing natural environment. This will include swales to convey stormwater instead of pit/ pipe network for the permeable areas and bio retention basins instead of detention tanks.

The upstream catchment which currently discharges via headwall at the northern boundary will need to be collected and conveyed by a swale and diverted away from the proposed development and bio retention basin before discharging via an energy dissipator to ensure scour protection. See figure below for the location of the existing headwall.

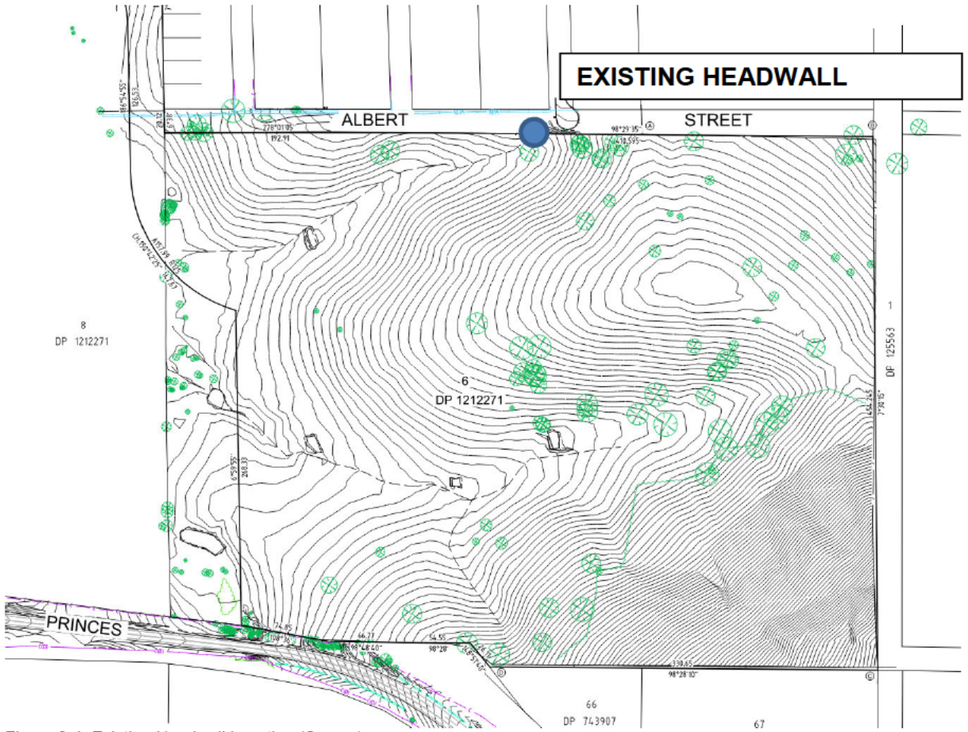



Figure 3-4: Existing Headwall Location (Survey)

A minor/ major system will be adopted where a pit/ pipe network will be sized for 5% AEP minor storm event and overland flow path such as footpath, swale and access road will be sized to convey 1% AEP major storm event.

Pit/ pipe network will be required for the roof and hardstand areas such as the car park and the access road.

The stormwater conveyed by pit/pipe network will discharge to wide swales as early as possible to limit the pipe run and emulate the natural flow as much as possible rather than a concentrated flow. The swale will then convey the stormwater to bio retention basins for water quality and quantity management. Bio retention basins will then discharge via headwalls and energy dissipators for low flow and via weirs for high flow.

**Stormwater Management - Quantity**

On-Site Detention system will be required to limit post-development flow to pre-development flow for all storm events up to and including 1% AEP. For the reason already stated in section 3.4 of this report, bio retention basins are proposed instead of detention tanks.

Two bio retention basins are proposed as the site has two major sub catchments. Any sub catchment that does not drain to the bio basin needs to be treated as a bypass catchment and compensated by increasing the basin size and limiting the flow from the basin.

A total bio retention footprint of 8000 m² with a ponding depth of 0.7m is expected subject to detailed DRAINS analysis. The basin may be required to be fenced off for public safety subject to Council review.

A smaller bio retention basin footprint may be possible with strategic location of the bio retention basin subject to further coordination and DRAINS analysis.

**Stormwater Management - Quality**

The Eurobodalla Shire Council Infrastructure Design Standard set targets for the reductions of water borne pollution being conveyed from the site through the stormwater drainage system and ultimately public waterways.

Stormwater quality requirements specified by Eurobodalla Shire Council are pollution load reductions:

- 80% retention of the typical urban annual load for Total Suspended Solids (TSS)
- 45% retention of the typical urban annual load for Total Phosphorus (TP)
- 45% retention of the typical urban annual load for Total Nitrogen (TN)
- 70% retention of the typical urban annual load for gross pollutants (litter)

Modelling for the determination of the mean annual loads of land uses will need to be undertaken in MUSIC and in accordance with the associated WSUD Technical Guidelines. More stringent stormwater quality targets may be required as the site is close to natural waterways.

Further consultation with Council is required to discuss the extent of area the water quality targets apply to. As the majority of the site is untouched and retains the existing natural environment, there is a case for the water quality targets to apply to the developed area only.

A series of treatment train including Bio retention basins, OceanGuard, rainwater tank and swales will be utilised to meet water quality requirements. Additional proprietary devices such as filter cartridges may be required if the proposed treatment train is not adequate to achieve water quality targets.

Wetlands are one of the treatment train options in lieu of the bio retention basin as these closely resemble the surrounding natural environment. However, it is much more complex and often more expensive than the bio retention basin. This requires further ecological analysis of the site and permanent ponding.

Further information on each element of the proposed treatment devices is provided below:

<u>OceanGuard</u>

OceanGuards (or other similar approved equivalents) provide effective removal of TSS and gross pollutants. OceanGuards are a filter cage system which are inserted into roadway gully pits to filter and remove pollutants before the water enters the piped drainage system.

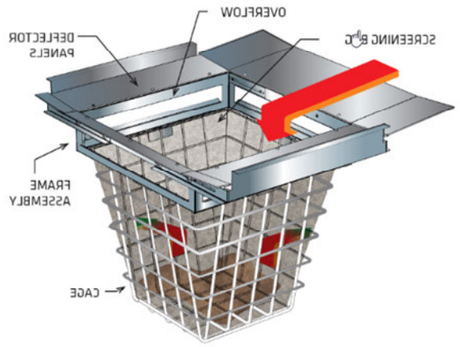



Figure 3-4.2.1: OceanGuard

Bio-Retention Basin

Bio-retention systems are vegetated areas where stormwater is passed through densely planted filter media (loamy sand) allowing the plants to absorb the collected and stored nutrients. Bio-retention basins utilise temporary ponding above the vegetated surface to increase the volume of stored water for treatment. Bio-retention systems can take a number of forms but all have common features including the extended detention depth above the media surface, the filter media and a low level drainage media and subsoil system. These are shown in the figure below. The bio-retention basins will also be used to detain water for stormwater quantity purposes as discussed in section 3.4.1.

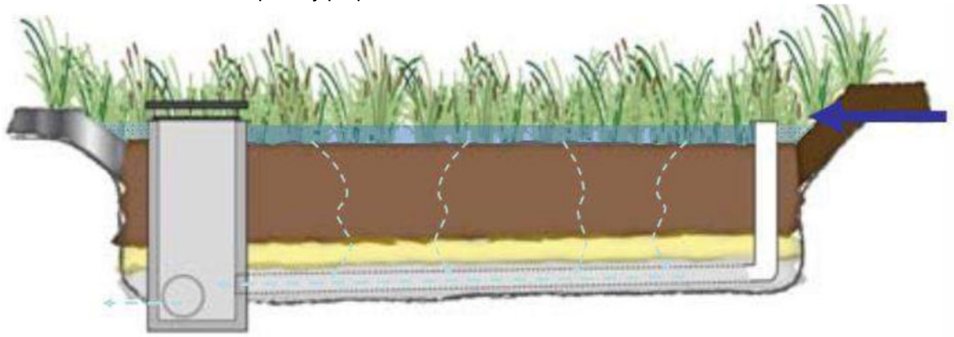


Figure 3-4.2.2: Bio Basin

Swale

Swales systems are vegetated channels where stormwater is conveyed from one location to another. Swales also provide water quality improvements by capturing total suspended soils and gross pollutants.

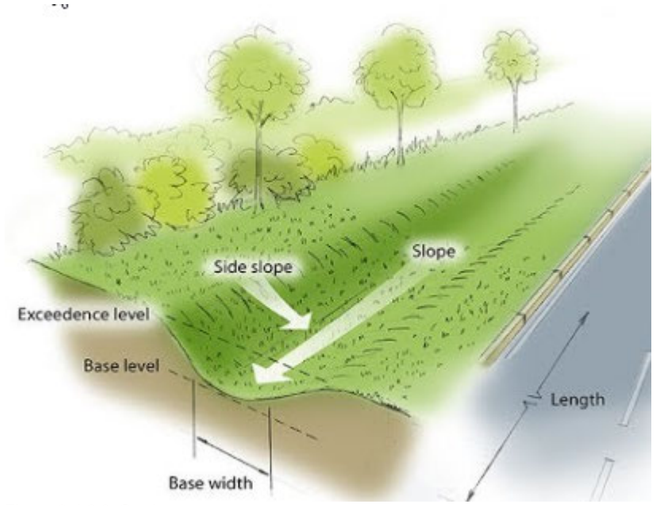



Figure 3-4.2.3: Swale

Rainwater Tank

Rainwater can be collected via a rainwater tank and be used for irrigation of landscape area and/or flushing of toilets.

### 8.1.6 Bulk Earthworks / Soil & Water Management

Bulk earthworks for the proposed hospital development and associated infrastructure will be required. Preliminary earthworks models have been prepared for options 1 and 4, these drawings can be seen in Appendix A. The proposed ground floor finished floor levels for the main building are RL20.0m and RL19.0m AHD for options 1 and 4 respectively.

Approximate volumes of cut and fill, based on a indicative bulk excavation of 300mm below finished floor level, are as follows;

Option 1: Cut 10,660m$^3$, Fill 10,210m$^3$

Option 4: Cut 13,890m$^3$, Fill 11,980m$^3$

Also assumed is a 150mm surface stripping (21,200m$^3$). This material can either be distributed to landscaped areas or removed from site as a last resort. Excavated rock is to be crushed to appropriate grade and reused on site as road base where suitable and general fill where appropriate.

The aim is to balance cut/ fill requirements where possible to avoid the cost of removing soil from site. It is proposed to use the excess fill below ground floor to act as formwork to support the suspended ground floor slab where appropriate.

Soil and water management of the proposed development will be implemented during construction. The design of these measures will be in accordance with the Landcom “Blue Book”.

For soil and water management of the site, the following measures will need to be provided to minimise the risk of sediment being washed into neighbouring properties, receiving environmental areas and erosion of the site.

*A sediment fence/catch drain (or diversion bund) around the site*

*Temporary access to site with shaker pad*

*Indicative stockpile areas with sediment fence around it during construction. The stockpile must be located out of water flow paths (and be protected by earth banks/drains as required).*

A sediment basin is to be provided to capture runoff from the disturbed site. Upstream and undisturbed catchments should be excluded by providing diversion stormwater drainage lines (which bypasses the proposed site or sediment basin during the construction stage) to control stormwater quality in accordance with Soil and Construction Volume 1, March 2004 by Landcom.

## 8.2 Electrical, ICT, Security, and Lighting

### 8.2.1 Executive Summary

Steensen Varming have been engaged by Health Infrastructure to undertake the design and documentation of Electrical, ICT, Security and Lighting services of the new Eurobodalla Health Precinct. This Master Plan Report has been developed to review the various engineering arrangements associated, with electrical, communications and security services and how these systems would best suit the functional clinical requirements and the buildings that accommodate them.

Existing & Proposed Site Infrastructure, Proposed Services Summary and Project Risks are summarised below:

#### 8.2.1.1 Existing Site Infrastructure

| Systems / Utility Providers | Description |
|---|---|
| Essential Energy | There is an existing Zone Substation and associated High Voltage cabling near the proposed site supporting the district including the TAFE facility to the west.<br>No diversions are believed to be affected by the new health facility; however, this is pending detail design of the road works. |
| National Broadband Network (NBN) | No existing National Broadband Network (NBN) assets are near or on the site. The NBN have confirmed that the site address is outside new development scope. As such NBN are not the Provider of Responsibility in the area (IPOLR – Infrastructure Provider of Last Resort) as the premises are located outside the fixed line footprint.<br>No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works.<br>Future highway works may or may not involve some separate NBN work, but this is yet to be verified. |
| Telstra | DBYD and site investigation confirms that there are existing Telstra network cables on Princess Highway and in the north servicing residential properties.<br>No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works. |
| Optus | Based on DBYD, it is noted that Optus Fibre Optic Telecommunications cables exist in the vicinity of the site.<br>No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works. |

#### 8.2.1.2 Proposed Site Infrastructure

| Systems / Utility Providers | Description |
|---|---|
| Essential Energy | The existing assets will be used and/or modified to support the new facility's electrical power requirements. |
| National Broadband Network (NBN) | The site is not in a fixed wire area but is within wireless area, with capacity built into the tower system to allow for new connections to be added for internet services. No fixed wired links are proposed at this stage. The speed and performance of the wireless network is pending further investigation and negotiation. |
| Telstra | Telstra is the IPOLR of phone services for new the facility.<br>It is anticipated that the adjacent underground network will be used to support the new facility. |

#### 8.2.1.3 Electrical Services Summary

| Systems | Description |
|---|---|
| Substations | It is proposed that pad mount substation shall be provided based on preliminary maximum demand calculations |
| Switchboards | It is proposed that two Main switchboards shall be provided in the Main Switchroom located close to the pad mount substation. New custom-built main switchboards be provided to a minimum of Form 4, complete with insulated busbars to supply the electrical requirements of the building. The switchboard will incorporate non-essential section and a life safety section / business critical section that will be supported by a standby alternative power source, as well as facility for connection of a mobile generator. |
| Generators | It is proposed that one standby diesel generators sized approx. 1,000kVA shall be required to accommodate the diversified standby power load of the new development, located with 24/7 access for maintenance and refuelling. It is proposed that the generators be supported by the provision of a 24-hour bulk storage fuel tank. The testing facility for the generators is to be determined (either synchronised with grid or load bank). |
| UPS | It is proposed a centralised UPS system with N + 1 configuration shall be provided to support critical items of equipment as identified within the Engineering Services Guidelines and the approved Room Data Sheets (Australian Health Facility Guidelines) to maintain power supply to critical items of equipment. |
| Communications | It is proposed that 2 off combined campus &building distributors and Floor Distributors shall be provided as per relevant NSW Health ICT Standards.<br>It is proposed that voice and data services be provided as per relevant standards. |
| Distributed Antenna System (DAS)/Mobile Phone Coverage | It is proposed that the new facility shall incorporate an active Distributed Antenna System. |
| Wireless Systems | To be provided as per NSW Health Wi-Fi Standard |
| Security | It is proposed that the new development be provided with an IP security system comprising access control, intruder alarms, duress alarms, CCTV system, PA systems, paging systems, hearing augmentation and intercom systems. |
| Nurse Call | A new IP based nurse call system is proposed for the facility. The nurse call system shall be capable to be expanded to accommodate future Stages of developments. The nurse call system shall incorporate all outlets, indicator lights, cabling, terminations, control units, power supplies and system interfaces to complete the installation |

### 8.2.2 Project Risks

With a rare green field opportunity, the risks presented for the Eurobodalla Redevelopment are not like those of other hospitals, which typically relate to existing site conditions, and interface with engineering systems. Our risks relate more to process, procurement, information flow and communication; these risks though different, still need to be carefully managed to ensure our great opportunity is leveraged to the best of the team's ability.

The following key project risks have been identified together with our proposed methodology to manage these risks.

- **Obstructive Light** – Specialist Lighting Design to ensure all external lighting complies with relevant standards and avoid environmental and community concerns.
- **Covid-19** – The design to be in accordance with guidelines.
- **Road Works** – Ideally lock in highway road works with TfNSW early.

— **Procurement** – Ensure that the commercial aspects of the contract consider the technical and quality requirements agreed to date, not prevent complete rework to minimum standard.

— **Master planning Flexibility** – The design at this stage must allow for flexibility in clinical care, and engineered solutions. For example, the extent of the facility health care accommodation and the types of energy used for heating and hot water. Manage the solution to enable scalability.

| Risk ID | Risk Name | ID'd by | Status | Project specific | Risk Owner (SM) | Cause(s) | Effect / Consequence | Existing Controls | C | L | Risk Rating | List further Tasks required to Reduce Risk to HI acceptance criteria | Task Owner | Task Due Date | C | L | Risk Rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 050 | Obstructive Light | Elect. Eng./MH | Open Risk | Technical Risks | HI/PM | the local of the new hospital will be seen from many angles and locations | Spill light, both direct and indirect will impact on the surrounding environment. This may need to be addressed in the PEP. Either way ITA or that some community feedback will complain. | Standard approach on lighting design. | S3 | L1 | J | Engage a specialist lighting firm to complete a review and provide solutions to mitigate risks. | Project Team/Design Consultants | | S4 | L3 | R |
| 051 | Covid Design risk | Elect. Eng./MH | Open Risk | Technical Risks | Project Team/Design Consultants | not catering for enhanced COVID measures to be introduced. | COVID Breakout in hospital | Provide building services as per standard ESG and DGN. | S2 | L2 | E | Provide solutions that enable enhanced ICT provisions to cater for high demand remote eHealth. Allow space and provisions to enable other COVID management building services to be implemented. Eg UVC. / Outside air volumes... | Project Team/Design Consultants | | S3 | L3 | M |
| 052 | Road Works | Elect. Eng./MH | Open Risk | Program | Project Team/Design Consultants | uncertainty in the final road designs | rework and delays in procedurement of hospital services augmentation | access roads, slip roads and the like from major highways needs to be carefully considered and coordinated with major electrical services including street lighting. | S3 | L2 | K | Look in road works early that are coordinated with the hospital and site needs | Project Team/Design Consultants | | S4 | L4 | U |
| 053 | D&C contractors present cost savers and solutions that do not present best quality. | Elect. Eng./MH | Open Risk | Technical Risks | Project Team/Design Consultants | Performance criteria not well defined for tender | Recurrent costs are higher and the building services reliability is less | critical that the deliverables are tailored to set a solid baseline against which future change can be measured, and that key performance aspects are well defined at an early stage for the contractor. | S3 | L3 | M | ensure commerical aspects of the tender address technical aspects and requirements | Project Team/Design Consultants | | S4 | L4 | U |
| 054 | Master planning implementation. | Elect. Eng./MH | Open Risk | Financial | Project Team/Design Consultants | uncertainty in the final masterplan whilst ensuring flexibility for the future / required provisions may not match the funding envelope. | Changes in occupancy and use of the wider site may impact on the building services solutions. | Services designs to accommodate the project staging and be flexible over time. Implement plant and energy strategies for building services that encompass modular/scalable approaches to central engineering systems. This will enable a long-term view to be taken of the site to ensure that it can adapt and change in the years to come, as populations grow and other entities arrive. | S2 | L3 | H | manage the budget restraints so that they do not limit scalability in the future | Project Team/Design Consultants | | S3 | L4 | N |

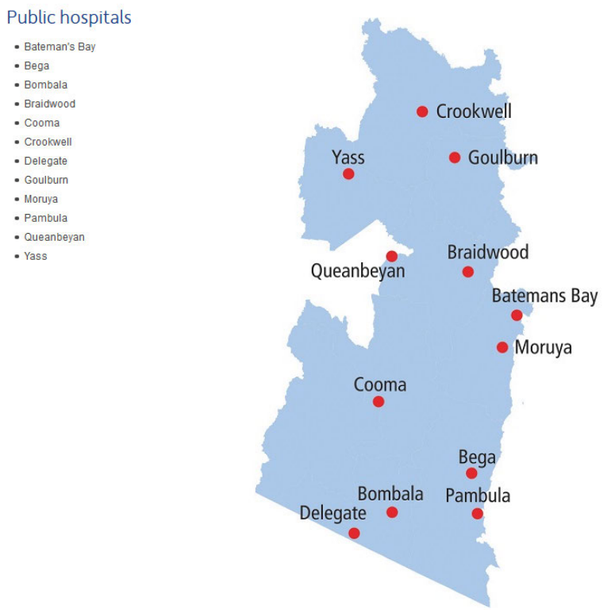


### 8.2.3 Local Health District Overview

Southern NSW Local Health District (SNSWLHD) provides health services for about 200,000 residents and additional visitors in the South East of NSW. SNSWLHD has a population of approximately 200,000, as of June 2016. This is expected to grow to around 245,000 by 2026. Projections to 2026 indicate the fastest growing age groups will be those 65 years and over. In the 2011 about 3.5% of residents identified as Aboriginal and/or Torres Strait Islander.

The District is continuing to improve the quality and access to health services, including continued development of capital upgrades, extension of population health activities and community engagement.

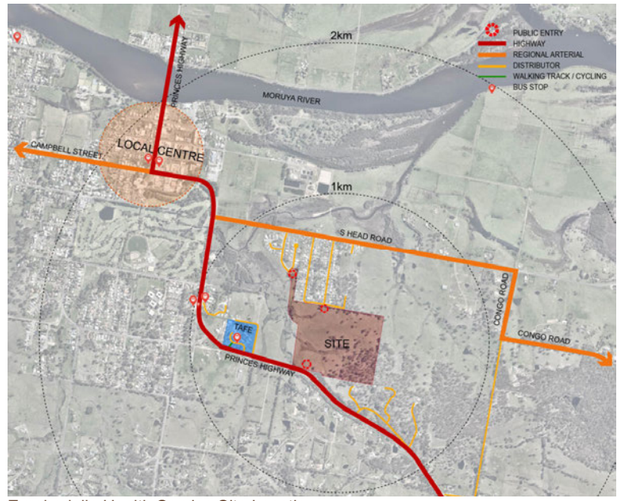
Below map shows the location of public hospitals only.




### 8.2.4 New Eurobodalla Health Service

The Eurobodalla Health Service will provide a new facility that services Moruya, Batemans Bay and surrounding towns.

Several sites were considered for the new green field facility, with an area just outside of the Moruya adjacent to the TAFE being selected.




Eurobodalla Health Service Site Location

The project will deliver new contemporary medical, surgical, allied health and mental health infrastructure along with the required support services for the local and surrounding communities including the Bugelli-Manji and Yuin first nation people.

The Eurobodalla Health Service is a rare opportunity to provide a state-of-the-art hospital on a greenfield site. Key to the success of the project is providing a scheme that can adapt over time, meeting the needs of the Clinical Services Plan long into the future. It is also important to provide flexible building services that can deliver against environmental targets, meeting the LHD's sustainability ambitions, and the decarbonisation of the health estate. Noting the regional setting, delivering a reliable and maintainable system with local skills in mind will be key.

For the new development, there are key considerations related to block and stack selection, massing, land use distribution and design that can support the wider sustainability strategy for the site now and to the future.

There is a separate package of state government road work planned, being the Moruya Bypass Project, which may present traffic management and coordination challenges which must be dealt with early in the project to ensure the best outcome is achieved.

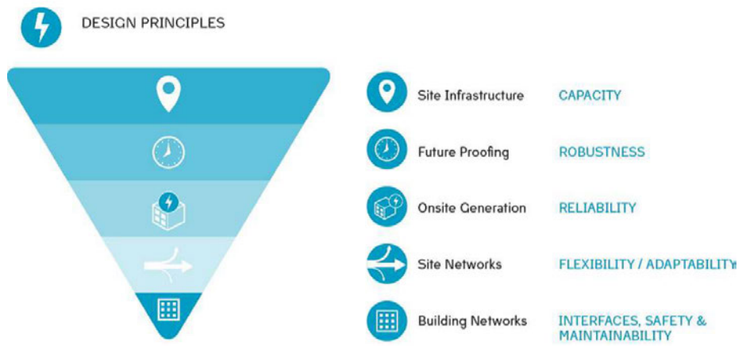
The options presented in master planning have been designed for two strategies; Day one masterplan, which is based upon an SOA derived from the Planning and Prioritisation Report, as well as the Final CSP Masterplan which needs to take into consideration expansion to reach the full SOA derived from the CSP v3.0.

### 8.2.5 Key Engineering Design Principles

#### 8.2.5.1 Overview

It is important that the building services form an integral part of the overall new hospital building concept at an early stage in the design process. If services are not considered until a later stage, problems which could have been overcome by simple measures may require a more complex solution.

Our approach to electrical, security and ICT design follows a 'top down' design principles approach. The 'top down' design principles firstly take a holistic view of the project site infrastructure, future expansion, on-site generation, site networks and building networks and assesses these design inputs against the design principles of capacity, robustness, reliability, adaptability and maintainability. Once the above design principles are considered for each electrical, security and communications system, then the design can progress in an informed manner.




The following design principles will form the basis of determining the optimal electrical services design to support the Refurbishment.

**8.2.5.2** Resilience / Redundancy

The engineering services must be designed and installed to provide systems that satisfy the design requirements and meet the need of the building users with the highest attention to staff and patient welfare and system reliability possible.

Providing key equipment with backup capacity allows for unexpected extended maintenance on the equipment or replacement of major components during peak loads without impacting patient care and facility operation.

**8.2.5.3** Service and Maintenance

The engineering services must be designed and installed to provide adequate and appropriate space and access, to all systems, that permits repair or replacement of equipment. The more limited the access space, the less likely it is that equipment will be properly maintained and therefore proper space planning is an important element of the early design process. In addition to this the choice of equipment must be made with reliability and minimal maintenance as key considerations.

**8.2.5.4** Standardisation

The engineering services system components and methods of installation will be documented as being the same wherever practicable.

**8.2.5.5** Flexibility / Expandability

Departmental functional areas will be provided with separate services, where reasonably possible, so that isolation for repair or failure of the services in one area won't affect other areas.

The engineering services must be designed with an understanding of the expected growth plans for the facility so that adequate future capacity can be integrated into the design, if required.

**8.2.5.6** Comfort

Beyond the reliability and safety of the hospital occupants, the next priority of the engineering services will be to provide systems that meet or exceed all the requirements of the staff and patients in terms of comfort.

**8.2.5.7** Energy

The extent to which cost / energy is used for the intended purpose. There are also several other general principles that will come into play as future discussions occur with other disciplines. Principles such as capital cost investment, relevant costs, facilitation of early enabling works and aligning with the masterplan vision will be central to future discussions to assist in developing the optimal solution for the Refurbishment works.

**8.2.5.8** Design Criteria

The Electrical, ICT and Security services Concept Design has been prepared in accordance with Australian and AS/NZ Standards referenced in the National Construction Code of Australia or with other approved standards where the Australian Standards are not applicable.

ll works shall be in accordance with this specification and the current Australian Standards and standards detailed within.

Except where the specification required a higher standard, the work is to be carried out in strict conformity with the provisions of all relevant Authorities and Councils such as:

— The local Council, Eurobodalla Shire Council;
— Essential Energy;
— NSW Fire and Rescue;
— NSW Rural Fire Service;
— NSW Environment Protection Authority (EPA);
— Safe Work NSW;
— Any other Authority having jurisdiction over the installation to ensure that the machinery and installation will comply with the Rules and Regulations.

Guidelines and Standards not limited to the following:

**Health**

— NSW Health Infrastructure Engineering Services Guidelines
— NSW Health Southern NSW LHD Guidelines
— NSW Health Infrastructure Design Guidance Notes
— Australian Health Facilities Guidelines
— Green Guide for Healthcare
— NSW Government Facilities Energy Efficiency Guide
— NSW Health Design Guidance Notes

**Electrical**

— NSW Service and Installation Rules
— AS/NZS 3000 SAA Wiring Rules
— AS/NZS 3003 Electrical installations – Patient Areas
— AS/NZS 3009 Electric installations – Emergency power supplies in hospitals
— AS/NZS 3010 Electrical installations – Generating sets
— AS/NZS 3008 Selection of Cables
— AS/NZS 61439 Switch and Switchboard Construction
— AS/NZS 1768 Lightning Protection Systems
— AS1428 Design for Access and Mobility
— AS/NZS 3013 Electrical Installation - Classification of the fire and mechanical performance of wiring system elements.
— BSRIA Power Quality Guide – Application Guide AS 2/2000
— ENA Guidance on Electrical Installation Practices to Reduce EMF from Low Voltage Wiring
— Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).
— CIBSE Guide K Electricity in Buildings

**Lighting**

- AS4282 Control of Obtrusive Effects of Outdoor Lighting
- AS/NZS 6A0598.1 Luminaires, general requirements, and Tests.
- AS/NZS 2293 Emergency and Exit Lighting
- AS/NZS 1680.2.1 Interior and Workplace Lighting
- AS/NZS 1680.2.2 Interior and Workplace Lighting
- AS/NZS 1680.2.5 Hospital and Medical Tasks
- AS/NZS 1158 External Lighting – Roads and Public Spaces
- AS/NZS 4485 Security for Health Care Facilities
- The National Construction Code - Section J6 for energy efficiency

**Communications**

- AS/NZS 1367 Multiple Outlet Distribution Systems – Sound and Vision
- AS/NZS 3080 Information technology – Generic cabling for customer premises,
- AS/CA S009 Installation requirements for customer cabling (Wiring Rules)
- NSW Health ICT Cabling Standard (current version)
- AS/CA S008 Requirements for customer cabling products
- NSW Health Wi-Fi Blueprint Standard
- NSW Health Wireless LAN Infrastructure Design Guide
- NSW Health Communications Room User Acceptance Testing
- NSW Health Policy Directive Electronic Information Security Policy PD2013_033
- ISO 11064 1 - 7: Ergonomic design of control centres

**Uninterruptable Power Supply**

- AS 6A2040.1.1 Uninterruptible Power Systems (UPS) - - General and safety requirements for UPS used in operator access areas.
- AS 6A2040.1.2 Uninterruptible power systems (UPS) - - General and safety requirements for UPS used in restricted access locations.
- AS 6A2040.2 Uninterruptible power systems (UPS) - Electromagnetic compatibility (EMC) requirements.

**Security**

- AS 2201 Intruder Alarm systems
- AS1428 Design for Access and Mobility
- AS/NZS 4485.2 Security for Health care facilities
- AS 4806 Closed circuit television (CCTV)
- NSW Health Policy and Standards for Security Risk Management in NSW Health Agencies - Protecting Property and People

### 8.2.6 Electrical Services

#### 8.2.6.1 Site Infrastructure

The detail presented on the existing site infrastructure is based on Dial Before You Dig (DBYD), Utility information and on-site investigations.

Existing assets will be used and/or modified to suit the planned new works. The exact size and configuration of the site services is pending further input on loads and final health care requirements.

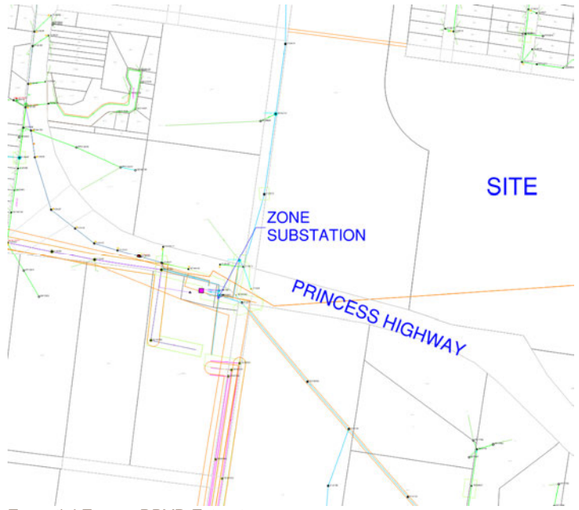
The engineered solutions within the following sections of the report address the wider site master plan which considers not only the Hospital requirements but possible future developments, by providing solutions that enable scalability and flexibility with clear lines of delineation and scope.

#### 8.2.6.1.1 Essential Energy

It is noted that there is an existing Zone Substation near the proposed site.

No diversions are believed to be affected by the new health facility however this is pending detail design of the road works.

The existing assets will be used and/or modified to support the new facility's electrical power requirements.




Essential Energy DBYD Extract

#### 8.2.6.1.2 NBN

NBN has confirmed that the site address is outside new development scope as NBN are not the Provider of Responsibility in the area (IPOLR) as the premises are located outside the fixed line footprint.
No existing National Broadband Network (NBN) assets are near or on the site. The NBN have confirmed that the site address is outside new development scope. As such NBN are not the Provider of Responsibility in the area (IPOLR) as the premises are located outside the fixed line footprint.
No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works.

Future highway works may or may not involve some separate NBN work, but this is yet to be verified.

The site is not in a fixed wire area but is within wireless area, with capacity built into the tower system to allow for new connections to be added for internet services. No fixed wired links are proposed at this stage. The speed and performance of the wireless network is pending further investigation and negotiation.

#### 8.2.6.1.3 Telstra

DBYD and site investigation confirms that there are existing Telstra network cables on Princess Highway and in the north servicing residential properties.

No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the roadway works.

Telstra is the IPOLR of phone services for new the facility. It is anticipated that the adjacent underground network will be used to support the new facility.


Telstra DBYD Extract

**8.2.6.1.4** Optus

Based on DBYD, it is noted that Optus Fibre Optic Telecommunications cables exist in the vicinity of the site. No diversions are anticipated, nor existing services affected by the new health facility, however this is pending detail design of the road works.

**8.2.6.2** Power Supply Maximum Demand

**General**

The Maximum Demand is the largest electrical current that will exist in the electrical infrastructure at any one time under expected operating conditions.

The maximum demand calculations reflect as close as reasonably possible the actual loads that would be realised plus realistic allowance for future expansion as required. Realistic diversity figures have been used when sizing, substations, switchboards, generators and the like.

The following have been considered:

— Gross area of the new buildings;

— Diversified VA/m² figures for appropriate areas ( eg figure of 100VA/m² for high demand areas, 85VA/m² for other areas and 50VA/m² for low demand areas);

— The type of HVAC solutions being applied;

— Special medical equipment;

— Number of lifts and their individual supply demand, and;

— Embedded renewable energy however these cannot officially be taken into account due to their possible load profiles.

Electrification of Hot Water Services

The mechanical and hydraulic engineers are looking at the option of degassing all or part of the hot water energy sources. Thus, this will present an increase in the connected electrical load. The actual additional ekW/sqm load for the alternative use of electricity for HVAC heating instead of gas and hotwater cannot be assessed at this stage of design as the mechanical and hydraulic engineers do not have sufficient information to provide an accurate figure. This will need to be assessed at later stages in the design. In the meantime, nominal Max Demand figures have been added below the line for this which is at this point tipping the load over 2MVA.

Spare Capacity

An appropriate allowance for the space / capacity for future expansion should be allowed for. Spare capacity should be balanced with the appropriate allocation of available budget and should be agreed to by the design team and Health Infrastructure on a project-by-project basis.

**Standards**

The calculations shall be completed in accordance with the following:

— AS/NZS 3000 Wiring Rules

— Health Infrastructure – Engineering Guidelines

— Steensen Varming Database

**Proposed**

Based on the information available the estimated maximum demand is as follows:

| Eurobodalla Health Service | | | |
|---|---|---|---|
| SOA based on CSP V3.0 | V2.7 Preferred Option | VA/ sqm | Total kVa |
| **Service / Unit** | | | |
| Main Entry / Café | 296 | 85 | 25 |
| Emergency Dept | 835 | 85 | 71 |
| Intensive Care | 646 | 85 | 55 |
| Operating Theatres | 1169 | 100 | 117 |
| Sterilising Unit - see below | 0 | 100 | 0 |
| IPU 1 - Medical | 1118 | 70 | 78 |
| IPU 2 - Medical/Surgical | 1044 | 70 | 73 |
| Women's & Paediatric Unit | 542 | 85 | 46 |
| IPU 3 - see below | 0 | 85 | 0 |
| IPU 4 - Rehabilitation / GEM | 1155 | 85 | 98 |
| Medical Imaging | 523 | 100 | 52 |
| Pathology | 399 | 85 | 34 |
| Pharmacy | 221 | 85 | 19 |
| Ambulatory Care / Chemo / Renal / Oral Health / Allied Health/Virtual Care | 2164 | 85 | 184 |
| Executive/ Administration / Education | 393 | 85 | 33 |
| Mortuary | 100 | 85 | 9 |
| Health Information Unit | 140 | 85 | 12 |
| Back of House (inc. Kitchen/Engineering/Linen/Environmental/Dock) | 775 | 85 | 66 |
| Staff Accommodation - see below | 0 | 85 | 0 |
| **OVERALL HOSPITAL** | **11520** | | **972** |
| T&E (28%) | 3226 | 50 | 161 |
| Planning Contingency 5% | 576 | 50 | 29 |
| | | | |
| **OVERALL HOSPITAL WITH T&E** | **15322** | | **1162** |
| | | | |
| Possible de-gasing / Electrification - Domestic Hot Water ** | 15322 | 15 | 230 |
| Possible de-gasing / Electrification - HVAC - Heating ** | 11520 | 15 | 173 |
| Possible de-gasing / Electrification - CSSD equipment ** | | | 150 |
| **Electrical Hot Water Option** | | | **553** |
| | | | |
| Future Hospital Expansion - Accommodation | 350 | 70 | 25 |
| Future Hospital Expansion - Education | 650 | 85 | 55 |
| Future Hospital Expansion - Sterilising Unit | 427 | 100 | 43 |
| Future Hospital Expansion - IPU 3 | 1085 | 70 | 76 |
| Future Hospital Expansion - Other - TBC | TBC | | |
| **OVERALL FUTURE EXPANSION** | **4806** | **85** | **409** |
| | | | |
| **OVERALL HOSPITAL WITH T&E + FUTURE EXPANSION** | **20128** | | **2123** |
| | | | |
| **Eurobodalla Health Service - Separate Entities** | | | |
| Future Ambulance Station | 2470 | 70 | 173 |
| Future Private Provider | 1360 | 85 | 116 |
| | | | |
| **OVERALL SITE ESTIMATE** | **23958** | | **2412** |

**COMMENTS**

* Blue - Expansion to be confirmed.
** Red - estimate only pending detailed infromation from mechanical / hydraulic engineers.
Please note the future expansion allowance for Accommodation and Education has been included as a 'FUTURE EXPANSION' provision. As the future allowance for Sterilising Unit and IPU 3 Rehabilitation IPU is not known, it has not been included in the calculations. Maximum Demand for Overall site has been estimated including the Future Ambulance Station and Private Provide along with 15% overall spare capacity.

Schedule of Area and Maximum Demand.

### 8.2.6.3 Substations and High Voltage Connection

**General**

Depending on the Supply Authority configuration of their equipment, the High Voltage Cabling and the substations offer a different range of features that help support reliability in different ways.

The intent is to provide an appropriate level of reliability to the site and to the substation configuration.

High Voltage Cabling

The reliability of supply to the site will be influenced by the means of supply either underground or overhead, and also with the topology of the High Voltage wiring.

The Supply Authority and Policy may govern the cables to be underground. This is more expensive but does avoid risks from bush fires, storms and vehicle accidents.

The topology of the cabling to site can also influence the level of reliability. Generally, the higher the reliability the higher the costs are. Options include:

| Level of Reliability | Options | Description and Comments |
|---|---|---|
| Very High | Dedicated Supplies from two different Zone Substations in diverse paths. | Direct connections from the Zone Substations are generally only viable for loads over 4-5MVA. |
| High | Loop In and Loop Out using diverse or separated paths with connecting ability to switch from one zone network to the other. | Generally, the normal configuration applied to Supply Authority for critical load connections. |
| Medium | Loop In and Loop Out | Generally, the normal configuration applied to Supply Authority standard noncritical load connections. |
| Low | Spur Connection | The lowest means of connection to the network. Usually applied to rural and remote locations. |

Where possible a high level of reliability would be provided for a hospital. The ability to achieve this within reasonable investment depends on the Supply Authority network in the area.

With the Zone Substation located close by it is understood that a high reliability connection can be achieved without extensive additional cost and appropriate use of a standard Ring Main Unit.

**Substations**

Substation / Transformer configurations range is size and type from Pole Mount, Padmount and Chamber Types. The proposed type will be governed by the local supply Authority. The final configuration depends on the type of customer. I.e, High Voltage or Low Voltage customer connection, the size of load and customer preferences.

Generally, for a hospital a decision is made on the type of substation, either Padmount or Chamber. Some notes of each type is below.

**Kiosks Pad Mount Type**

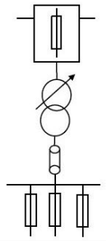
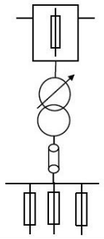
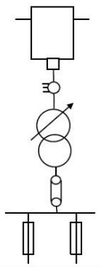
- Used general for small to medium loads
- Limited in capacity to 1500kVA
- Approx. Easement for each 4.2m x 7m 29.4sqm of space per TX
- Possible Limitations depening size in the low voltage and high voltage switching arrangements due to limited space.
- Can't be generally built over therefore limiting the full use of real-estate
- Cost less than chamber type substation
- 6m clearances from ventilation openings can be harder to achieve
- Aesthetically treatment generally warranted poor and more exposed to vandalism.

**Chamber Type**

- Used for medium to high demand loads
- 1000 and 1500kVA Txs
- Take up more space - 47.6sqm. each Tx
- Can be built over and thus ability to obtain better use of valuable land.
- More Secure and less prone to vandalism
- Easier to maintain especially in wet weather.
- In some case TXs can be Parralled i.e 2 TX can joined provide 2 supplies making it easier to manage and balance loads.

The following confirms the supply connection available for each transformer type.

The padmount and chamber configurations are shown below:

| Substation Type | Transformers kVA | Approximate Rating AMPS Per Phase | Application |
|---|---|---|---|
| 11kV Padmount / Chamber  | 1 x 315<br><br>Various LV Fuse Options Up to 1 x 400A | 400 | Underground 11kV Radial or Closed Network Feeders |
| 11kV Padmount / Chamber  | 1 x 315<br>1 x 500<br>1 x 750<br>1 x 1000<br><br>**Single/LV Circuit Customer**: LV Bushing, isolator and circuit breaker connected.<br>**Multiple/LV Circuits customer:** TX Isolator and various fuse/circuit breaker options, up to 1x1600A. | 400<br>660<br>1000<br>1400 | Underground 11kV Radial or Closed Network Feeders |
| 11kV Padmount / Chamber  | 1 x 1500<br><br>**Single/LV Circuit Customer:** LV Bushing, isolator and circuit breaker connected.<br><br>**Multiple/LV Circuits Customer:** Tx Isolator and various fuse/circuit breaker options, up to 1 x 1900A | 1900 | Underground HV Radial Feeders only |

**Proposed**

Based on the information available, pad mount substation(s) have been allowed for this stage with the exact size and number pending further detail design. At this stage, allow for 2 substation easement locations. This excludes the separate future Ambulance and Private Provider Buildings.

**8.2.6.4** Standby Generation

**General**

Standby generators provide a backup power supply to nominated loads when the mains power supply fails. The need for standby power can be either a statutory or business / clinical requirement.

Standby generators can be either diesel or gas type, the type to be selected depends on several criteria such as site infrastructure, type of loads to be supported and the allowable time to take load upon a mains failure.

With regards to the sections of the Engineering Services Guidelines (ESG) on the extent of standby power supply, the decision on what does and doesn't gets finally connected to standby power is determined by the clinical staff and the LHD in regard to the functional operations of the facility, taking into account the safety of staff and the wellbeing of patients and visitors.

**Standards**

Standby Generation Power where provide shall be in accordance with the following standards and guidelines:

AS/NZS 3009 Emergency power supplies in hospitals;

NSW Department of Health – Engineering Services Guidelines (2016);

AS/NZS 3000 Electrical Installation Wiring Rules;

AS/NZS 2293.1 Emergency Lighting and Exit signs for buildings.

Australian Health Facility Guidelines (AusHFG) Room Data Sheets & Guidelines.

**Proposed**

At this stage, it is proposed that on site external padmount 1000KVA generator will be provided (considering 70% loading factor) with the provision of a 24-hour bulk storage fuel tank. The testing facility for the generator system is to be determined (either synchronised with grid or load bank). It is also proposed that the main switchboards will be supported by an external temporary mobile generator connection facility.

**8.2.6.5** Un-interruptible Power Supplies

**General**

Uninterruptable power supplies are power sources that incorporate an internal battery, inverter/rectifier that maintain power supply to selected items of equipment in the event of a mains power failure.

The NSW Health Engineering Services Guidelines identifies the following design principles associated with the provision of uninterruptible power supplies.

UPS systems will be required for specific critical loads. This includes ICT equipment, theatre equipment as basic requirements. Consideration should be given, on a project by project basis, as to what loads require UPS support and whether local or centralised UPS's are best suited. As some equipment may be provided with inbuilt UPS; they should be accounted for in any design and capacity calculations.

Purpose and application of UPS

In selected areas, critical computer and communication systems and those systems supporting critical and major medical equipment will need to keep on operating without interruption in the event of a power outage. Some equipment and lighting

cannot tolerate the delay between the power outage and the stand-by generator coming online and so an uninterruptible power supply (UPS) may be used to provide power to lighting and selected equipment until the stand-by generator is online and powering the critical load.

The on-battery runtime of most uninterruptible power sources is relatively short (up to 15 minutes is usually adequate) but it is sufficient to power the load until the stand-by generator is online, or until the protected equipment can properly shut down. In most cases a UPS will not be specified to supply high power equipment (e.g. x-ray generators) during the period with no power, but rather will be specified to keep the computers and control circuitry for major medical equipment operating, until the stand-by generator power is available.

**Standards**

System will be provided in accordance with the following standards.

Health Infrastructure – Engineering Guidelines

AS 62040.1 Uninterruptible Power Supplies – General and Safety requirements.

AS 62040.3 Uninterruptible Power Supplies – Method of specifying the performance and test requirements.

AS/NZS 3003.

**Proposed**

It is proposed a centralised UPS system shall be provided to support critical items of equipment as identified within the Engineering Services Guidelines and the approved Room Data Sheets (Australian Health Facility Guidelines) to maintain power supply to critical items of equipment.

The UPS system is to be configured with an N+1 redundancy arrangement, complete with an external maintenance bypass to allow removal of the UPS (for maintenance if required) without compromising the integrity of the power supply to the UPS supported loads and a minimum of 15 minute autonomy at end of life.

For large medical imaging equipment it is envisaged that the backup power systems will be integral to the procurement of the medical equipment.

UPS outlets for patient care areas will be protected as defined in section 4.12.

Switchboards

**General**

Main switchboard will have a minimum form of separation of at least AS/NZS 61439 Form 4. Main switchboards at all new heath care facilities will as a minimum aim to be designed to the following design principles:

— The main switchboard will be housed in a separate, accessible room, suitably ventilated and not subject to flooding;

— Divide the busbar system into separate 'essential', 'fire safety' and 'non-essential' circuits, each segregated from the other by fixed and continuous barriers. Clearly label each segregated section of the busbar system;

— 25% spare capacity on all busbar sections, but no need to install spare breakers;

— Provide complete grading and discrimination of all switchgear throughout the installation with the utility and standby generation system and;

— Power factor correction equipment to be installed.

The main switch room requires two egress routes, one with large double door access for equipment. The room is required to be 120/120/120 fire rated and is preferred to be near the chamber substation room. Direct access from external to the hospital is required for authority and NSW Fire and Rescue access. Clearances to the equipment and room are required as per AS/NZS 3000:2018.

There is minimal to no requirement to treat the room for acoustics. Depending on spatial planning and the proximity of staff offices or sensitive equipment located near the main switch room, electromagnetic radiation affects and shielding of the room is to be considered. It is recommended to provide air conditioning to the main switch room as there is a possibility for the room to get quite hot which impacts lifespan and performance of equipment.

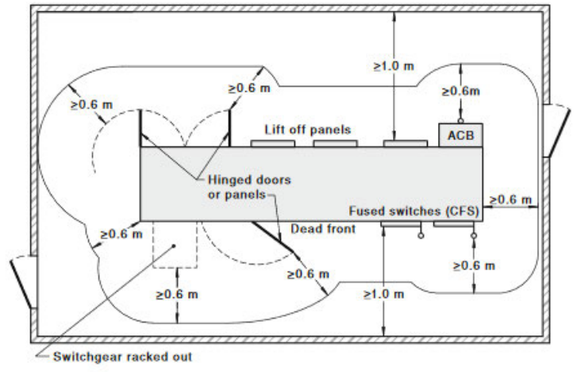



FIGURE 2.19 ACCESS TO SWITCHBOARDS—
FREESTANDING SWITCHBOARD WITH SWITCHGEAR RACKED OUT

**Proposed**

Main Switchboard

New custom-built main switchboards will be provided to a minimum of Form 4, complete with insulated busbars to supply the electrical requirements of the building. The switchboard will incorporate non-essential section and a life safety section / business critical section that will be supported by a standby alternative power source, as well as facility for connection of a mobile generator.

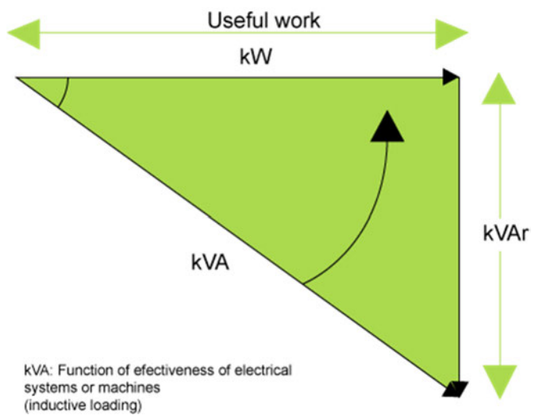
Distribution Boards

It is proposed that the new distribution boards that comply with current code requirements. Each new distribution boards will incorporate split chassis for power and lighting circuits, sub -metering, transient surge protection and RCD protected circuits where required. Each distribution board will be housed within dedicated electrical cupboards located directly off corridor spaces. The electrical cupboards will be sized to allow works on the switchboards without impeding pedestrian flow of the corridor. It is anticipated that each electrical cupboard will house a non-essential and essential distribution board in accordance with current Health Engineering Guidelines. Distribution boards will be Schneider Isobar / NHP Grizzbar or approved equal, to allow the option of working on life switchboards at this distribution level.

### 8.2.6.6 Power Factor Correction

**General**

Power factor correction is used within buildings to reduce the apparent power in kVA as seen by the supply authority metering, by installing capacitor banks to more closely align the apparent power kVA to the real power in kWatts.




Power Factor Graph

**Standards**

Power Factor Correction will be provided in accordance with the following standards.

NSW Service and Installation Rules

**Proposed**

It is proposed that new power factor correction shall be provided to the main switchboards in accordance with the NSW Service & Installation Rules.

The power factor correction system will be complete with all associated control equipment, current transformer, and power factor regulator, capacitor banks with multiple phases to accommodate the fluctuating building load, contactors, fuses and anti-harmonic reactors. The power factor correction system will be designed so that it is automatically disconnected form the electrical installation when the standby diesel generator is connected to the system.

### 8.2.6.7 Metering

**General**

Subsidiary electrical metering of various areas of the installation can assist in the auditing of energy use and in the troubleshooting for system abnormalities. Digital multi-function meters will be incorporated at various strategic locations of the electrical network. As a minimum, multi-function meters will be provided to monitor all sub-mains servicing distribution boards, mechanical services switchboards and all other major control cabinets.

**Standards**

Energy metering will be in accordance with the latest NCC requirements as a minimum. This is to be interfaced to the mechanical services building monitoring and system (BMS).

National Construction Code Requirements

Private sub-metering will be provided to each main switchboard main switch / circuit breaker and to each outgoing submain such as mechanical plant and lift services.

Switchboards will be provided with separate metering for lighting and power switchboards in accordance with NCC Section J requirements.

Private Meter Type

As a minimum requirement the meters will provide Voltage, Current, PF, kWh, kVA, THD and kVAr and provide for central connection / interfacing and monitoring via the software analysis and reporting system.

**Proposed**

Supply Authority metering will be provided in accordance with Essential Energy requirements to monitor the energy usage of the building.

The electrical system within the new development will incorporate private sub -metering to each distribution board power and lighting chassis as well as each large submain over 100A/ph. The private meters will be connected to the BMS or energy monitoring system to allow comparison against the newly implemented Energy Performance Contract.

### 8.2.6.8 Earthing

**General**

Main electrical supply points of the building are provided with a MEN earthing.

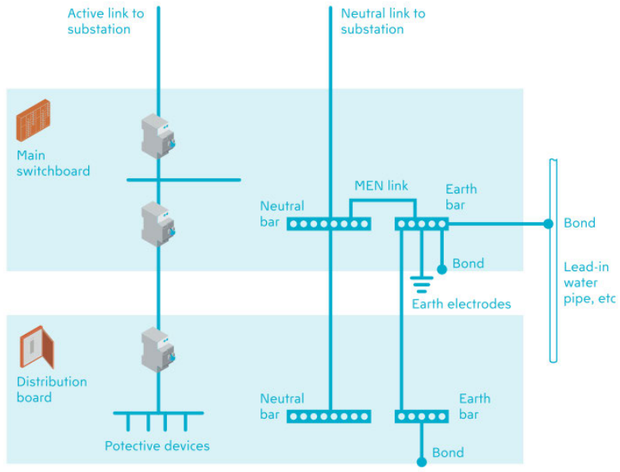
**Standards**

MEN earthing system shall be provided in accordance with AS/NZS 3000 and the local supply authority regulations. Throughout the building, the earthing system will be in accordance with AS/NZS 3000 and incorporate 30mA RCD circuit breakers to all lighting and general power socket outlets sub-circuits, unless areas are body / cardiac protected with 10mA RCD circuit breakers.

**Proposed**

A MEN will be provided. Throughout the building all power outlet sub-circuits and lighting sub-circuits will be provided with RCD protection generally located within the distribution boards and positioned locally in some clinical care spaces where required.

Within clinical areas, earthing will be provided to suit the requirements of Cardiac and Body protected spaces in accordance with AS/NZS 3003,




Typical MEN Earthing Arrangement

### 8.2.6.9 Submains and Services Reticulation

**General**

The types of submains for distribution of electricity supply from the main switchboard to light and power distribution boards and building services switchboards in various parts of a hospital building can broadly be categorised into the following groups:

Group A - Emergency Services (SAA defined)

Group B - Critical Care Services (Health Department defined)

Group C - General Services (Remainder)

**Group A Emergency / Safety Services**

The AS/NZS 3000 Electrical Installations define emergency services, some or all of which will be required in the hospital design. Submains for the emergency services require special provisions to ensure integrity of supply in fire and other building emergency situations.

Submains for the above SAA defined emergency equipment shall have fire and mechanical protection ratings as specified in the respective Australian Standard having jurisdiction over the system or installation.

**Group B Critical Care Services**

Standby lighting and power systems to AS/NZS 3009 shall be provided in critical care areas.

Submains for lighting and general purpose power outlets in critical care areas require special consideration to ensure continuous availability of power supply.

Light and general purpose power outlets in critical care areas shall have dedicated submains originating from the main switchboard, feeding dedicated distribution boards. The switchboard(s) and submains shall be configured to ensure continuous availability of electrical supply.

Two dedicated submains circuits shall be provided for each critical care area. At least one of the circuits shall be connected to the standby generator supply where installed. Via manual or automatic switching, it shall be possible to re-establish the supply to all distribution boards in particular areas if one submain supply fails. Critical care submains cables are not required to be fire rated. Protection against mechanical damage shall be provided.

Standby power shall be connected to all critical patient equipment involved in invasive subcutaneous procedures. This will allow clinical personnel time to complete or finalise an invasive procedure without risk to the patient.

Standby power shall also be provided to all subsidiary mechanical, hydraulic and medical gas systems (which are dependent on an electrical power source to operate) and are essential in delivering the services to the Critical Care areas.

**Group C General Services**

The remaining sub-mains for non-critical services and equipment will be wired in accordance with AS3000 and will comprise the following:

— General light and power throughout the buildings;

— Mechanical services systems;

— Medical imaging system;

— Computer (IT servers) system; and,

— Hydraulic services system

**Standards**

Submains shall be in accordance with the following standards and guidelines:

AS/NZS 3009:1998 Emergency power supplies in hospitals;

NSW Department of Health – Engineering Services Guidelines (2016);

**Proposed**

It is proposed that Submains will be provided in accordance with the NSW Health Engineering Guidelines. All new power cabling be sized to accommodate the load and incorporate spare capacity for future expansion in accordance with the Engineering Services Guidelines, AS/NZS3000 and AS/NZS3008. Submain cabling will be fire rated where it serves life safety equipment.

Cabling will be reticulated throughout the building on dedicated cable trays with IL4 seismic fixings (separate for power and communications services) sized to accommodate the required cabling and have 30% spare capacity for future cable installation. It is proposed that fire rated cable tray be provided with IL4 seismic fixings to support all submains, including ‘life safety’ fire rated submains, in accordance with AS/NZS 3013:2005 fire test requires that all the items that comprise a cabling system operating in the fire rated zone must be tested and pass as a system.

It is proposed that cable trays for power and communication services be separated either side of corridors, to assist in minimising the effects of EMI on the communication cabling.

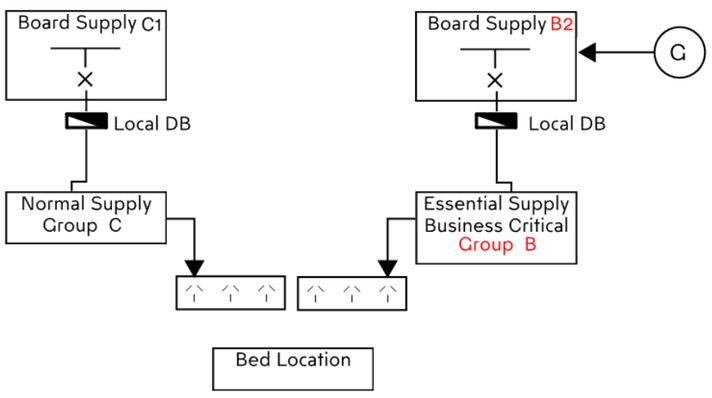
In review of a number projects, there has been various methods of achieving the requirement of providing two dedicated submains to critical care areas. In some cases, some solutions have provided the primary submains and the backup submains from the same section of the Main Switchboard. While this method meets the written requirements of the guidelines, it is our opinion that it does not meet the intent. Having both submains from the same section of the main switchboard presents an installation that has a single critical point of supply failure. Thus, if maintenance work or an outage occurred on that section of the main switchboard, all supply would be lost.

The various types of submains proposed are in accordance with the guidelines. Quantities shall be provided to accommodate the various loads required in satisfying the functional brief.

**Power Arrangement for Health Buildings**

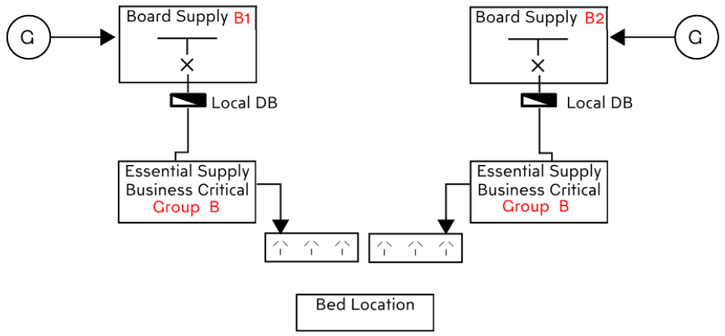
Typically, there are three (3) Types of supplying power to typical Patient Care Areas which the following high-level diagrams indicate. The load in the images indicate Bed Location the same logic will be applied to critical loads such as ICT Comms racks.

**Type 1 Main Power Supply Arrangement**



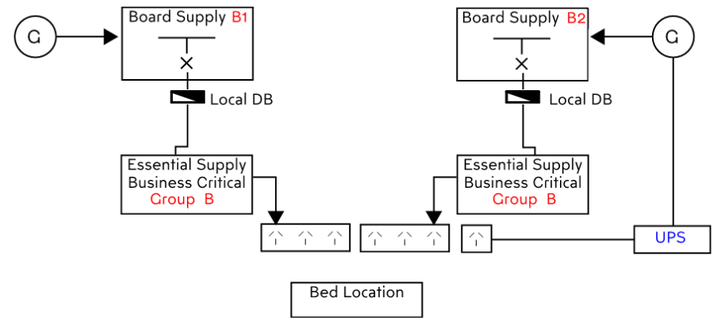

In **Type 1 arrangement** there is a mixture of power outlets from two different power supplies *Normal Supply Group C* & *Essential Business Critical Supply Group B*.
Each supply would originate at different Main Switchboards (MSB) where possible. One of the Sections, the Essential Section is Generator backed up.

**Type 2 Main Power Supply Arrangement**




In **Type 2 Arrangement** there is a mixture of power outlets from two different power supplies; both are *Essential Business Critical Group B*. Each supply would originate at different Main Switchboards (MSB) where possible. Both Sections are backed up by Standby Power Generator.

**Type 3 Main Power Supply Arrangement**




In **Type 3 Arrangement** there is a mixture of power outlets from two different power supplies; both are *Essential Business Critical Group B*. Each supply would originate at different Main Switchboards (MSB) where possible. Both Sections are backed up by Standby Power Generator.

In addition, there is Uninterruptible power systems (UPS) which supplies a limited number of power outlets.

These arrangements shall also be considered for services and functional areas that support patient care areas such as Nurse Call and staff stations. Thus, where field equipment is provided for a service the power supply to these items of kit should be arranged such at each alternate item is supplied from different power supply.

At this stage dual power supplies from separate supply sources will be provided to following.

Nurse Call Main Panels; this covered at ICT racks but also need to consider remote main gear in the field.

IT Cabinets and Racks; - this is covered in our standard rack layouts BMS main terminal & Data Gather Panels.

Dual Supply for journey boards.

**8.2.6.10** Servicing Strategy and Redundancy

Redundancy is a central strategic question to any business that relies on certain systems for its operation. In order to determine the required level of redundancy and reliability when planning a facility or extending an existing one it is of utmost importance to first analyse which services require which degree of availability.

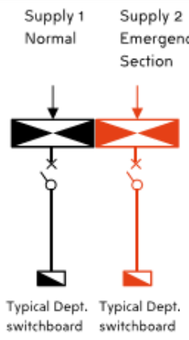
Although it may be desirable for reasons of operational ease to provide high availability to all services, the cost of this level of availability must be compared to the potential cost of failures of these services.

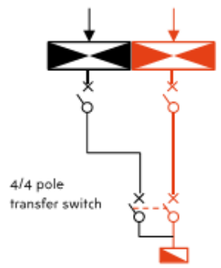
Providing a higher level of redundancy and reliability than a service requires may increase the inefficiency of the infrastructure and the operational recurrent costs would be higher.

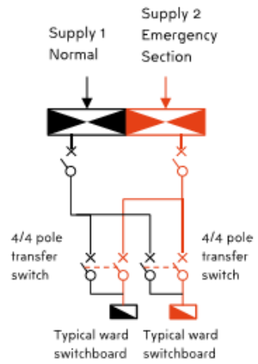
It is noted that the ability to service equipment and maintain operations is desirable. Thus, solutions that enable this including n+1 arrangements and alternative supply solutions must be provided. It is noted that the true understanding of the systems involved is necessary for example there is less benefit in providing redundancy by way of an alternative power supply to a chiller if the pumps are off another non -functional supply.

To provide resiliency, each level of power supply can have an alternative redundant back up supply with alternative servicing routes. This can be applied from power feeders, substations, generators, UPS, main switchboards, distribution boards and down to each outlet such that there is no single point failure in the system.

There are generally three options for supplying power to distribution boards. The third option provides the most redundancy but requires the most space and comes at a higher cost.

| Option 1<br>Separate Supplies & Switchboards<br>Each Dept. has two individual switchboards | Pros | Cons |
|---|---|---|
|  | - Each department has a mixture of normal and emergency power outlets and lighting.<br>- In Planned or Unplanned power outage at local switchboard the department can still function with limited power and lighting. | - More space and costs for extra switchboard and additional final sub-circuiting . |
| | - If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting. | |
| | - | - |

| Option 2<br>Single Board with Redundancy<br>Submain Supply Transfer Switch | Pros | Cons |
|---|---|---|
|  | - Less space and costs for extra switchboard and additional final sub-circuiting . | - All Lighting and power is on the one switchboard thus in Planned or Unplanned outage of local board department can not function. |
| | - If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting. | - All services in department are on same local Switchboard – single point critical |
| | | - |

| OPTION 3<br>Separate Supplies & Switchboards<br>Full Redundancy | Pros | Cons |
|---|---|---|
|  <br>**Note:** High Critical loads also have UPS units and server equipment have dual supplies inputs. | - Each department has a mixture of normal and emergency power outlets and lighting.<br>- In Planned or Unplanned power outage at local switchboard the department can still function with limited power and lighting. | - More space and costs for extra switchboard and additional final sub-circuiting . |
| | - If Planned or Unplanned outage at Main Board or Submain occurs other submain can provide power and lighting.<br>- | - Additional cost & space for transfer switches<br>- |
| | - | - |

**8.2.6.11** Wiring Systems for Patient Treatment

**General**

Cardiac Protected Areas and Body Protected Areas are defined as per AS/NZS 3003.

Body Protected Areas

All patient occupied areas are to be provided with a minimum body protected wiring system. Patient areas include areas where the patient may be located for treatment, diagnosis or accommodation, including wards, patient bathrooms and patient holding areas.

Cardiac Protected Areas

A patient is considered as undergoing a cardiac type procedure when an electrical conductor is placed within the heart or is likely to come into contact with the heart and such conductor is accessible outside the patient's body. In this context, an electrical conductor includes electrical wires such as cardiac pacing electrodes, intra-cardiac ECG electrodes, intra-cardiac catheters or insulated tubes filed with conducting fluids. Equipotential Junctions and Terminals will be provided in all Cardiac Protected Areas to comply with AS/NZS 3003.

Generally, RCD's shall be flush mounted on the Medical Service Panels (MSP's) and shall include 'power available' indicators and trip alarms. Where the RCD serves more than one room or is otherwise remotely mounted, additional indicators shall be provided in accordance with the standard.

RCD's shall be provided in accordance with AS/NZS 3003 and shall be Type 1, 10mA rated and be connected to no more than 12 General Purpose Outlets (GPO's).

Equipotential earth bonding shall be provided to AS/NZS 3003. Testing shall be to AS/NZS 3003 and carried out by a medical system commissioning specialist. The appropriate symbol / label to indicate 'Body Protected Area' or 'Cardiac Protected Area' shall be supplied and fitted in a prominent location in accordance with AS/NZS 3003.

Some patient care areas warrant UPS power outlets. Where UPS power is provided to patient care areas detailed assessment must be completed to ascertain the appropriate protection is provided with options ranging from RCDs with Alarms to Isolation Transformers with LIOMs.

**Standards**

AS/NZS 3003 Electrical installations – Patient Areas

**Proposed**

Within the nominated Body Protected and Cardiac Protected areas of the building, additional Residual Current Device (RCD) earthing requirements will be provided in accordance with AS/NZS 3003. It is proposed that line isolation transformers and associated monitors are provided for selected UPS outlets within the cardiac protected areas, such as Operating theatre medical service pendants. The final protection will be verified in the future stages of design.

**8.2.6.12** Lightning & Transient Protection

**General**

Lightning protection and transient protection are important systems incorporated within buildings to assist in minimising damage to the building structure and to the electrical / electronic systems within buildings.

**Standards**

A lightning protection system will be provided in accordance with the following standards.

Health Infrastructure – Engineering Guidelines

AS/NZS 1768 Lightning Protection for Buildings

**Proposed**

It is proposed that Lightning Protection system shall be provided in accordance with AS/NZS1768. Surge protection must be installed on the Mains Power Supply.

Exposed metal roof and roof mounted elements must be bonded to the new structural reinforcement or via individual down conductors then bonded to earth via test points. It is also proposed that Surge Protection on the Main Switchboards, distribution boards and communications services will be provided.

**8.2.6.13** Electromagnetic Interference

**General**

Electrical equipment and cables produce electromagnetic fields that could be, under certain circumstances, dangerous to health and may cause interference to other electronic equipment located close to such fields.

**Standards and references**

It is noted that there is no specific client requirement however, the electrical installation must be provided in accordance with the following:

Guidelines for the Management of 50Hz Magnetic Fields in Office Buildings Owned and Managed by the Queensland Department of Public Works Queensland Government, Department of Public Works - as there is currently no NSW Guide;

ENA Guidance on Electrical Installation Practices to Reduce EMF from Low Voltage Wiring;

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

AS/NZS 3003.

**Proposed**

To minimise the impact of electromagnetic interference (EMI) the main sources of interference such as substation, main switch boards and diesel generator and their cabling are to be located away from sensitive areas and communications equipment within the building.

Also, the reticulation of submain routes throughout the building must be through dedicated services risers and along corridors to avoid areas with sensitive equipment or where people may be present for long periods of time.

It is noted that this may not always be possible therefore mitigation of interference must be implemented.

To reduce the likelihood of stray fields from submain installations, cables must be laid in trefoil configuration or in quad configuration as follows.

8.2.7 Communications

**8.2.7.1** Lead In Service

Telstra is the IPOLR of phone services for new the facility. It is anticipated that the adjacent underground network will be used to support the new facility.

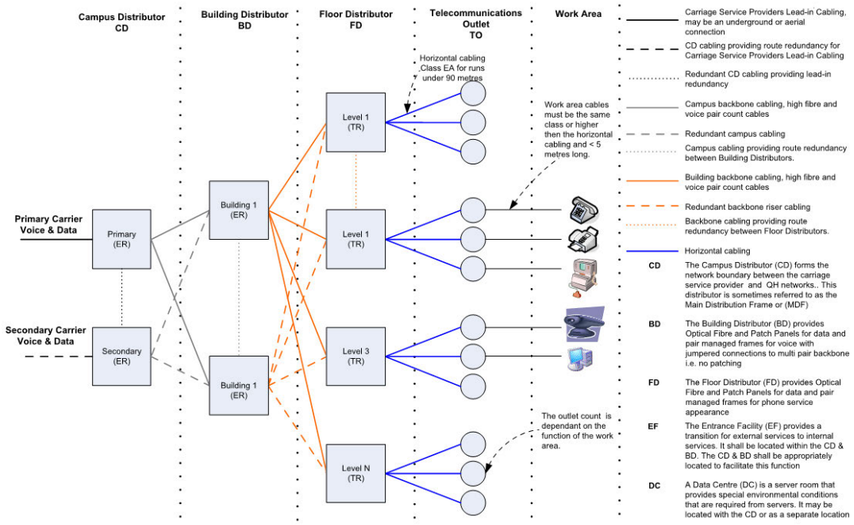
It is proposed that dual lead-in communications cables shall be provided to provide redundancy as required by NSW Health Standards.

**8.2.7.2** Structured Cabling System -Voice & Data

**General**

The NSW Health Engineering Guidelines identifies the following design principles associated with the provision of communications services.

All projects will consider the master-plan for the hospital campus. The site-wide infrastructure needs must be assessed and balanced with the needs of the project, including future land acquisition and divestment opportunities.




NSW Health ICT Cabling Standard – Cabling Architecture

Above Cabling architecture shows typical configuration of cabling between Campus Distributors, Building Distributors, Floor Distributors and outlets.

Key considerations include:

— Proposed cabling routes to connect new facilities;

— Site location in context to the major data centre(s);

— Site location in context to the legacy PABX Room and;

— Cost and service impacts.

Cabling routes should be chosen to minimise the need for future relocation. In-ground cabling infrastructure will be carefully planned to not reduce flexibility of the site.

Where the needs require a local data centre to be established, it will be viewed as a permanent fixture on campus and positioned in the best location for the overall future of the site. NSW Health, eHealth, Health Share, Local Health Districts and NSW Health Infrastructure all have standards that will influence the ICT related works for a health facility.

— There are other areas ICT will be influenced by the following criteria;

— Recommendations of Australian Standards;

— New technologies that offer significant benefits to a health facility;

— Specific Project Briefing process and;

— Best practice from similar projects.

**Proposed**

It is proposed that campus distributors, carrier room, building distributors and Floor Distributors be generally provided as per relevant NSW Health ICT Standards. Due to the size of the facility each Campus Distributor and Building Distributor shall be combined to room 1 and room 2, while still maintaining separation and redundancy.

It is proposed that voice and data services be provided as per relevant standards. It is proposed that Communications facility cabling will be Category 6A F/UTP in accordance with Health Communication Guidelines. Communication facility cabling will terminate at Cat. 6 A RJ45 shuttered outlets.

Communications cabling for other building services communications systems will be colour coded independently to each other and the LHD voice / data cabling.

**8.2.7.3** Wireless Communications

It is proposed the new facility be provided with wireless access points (WAPs) to allow ubiquitous coverage internally and coverage to nominated external locations.

The coverage provided to meet the performance criteria which enables high quality Voice over Wi-Fi and Real Time Location Services (RTLS). The access points will be provided in accordance with the NSW Health Wireless LAN Infrastructure Design Guide to achieve Clinical Grade coverage in accordance with NSW Health Wireless LAN Infrastructure Design Guidelines.

**8.2.7.4** Distributed Antenna System

General

Distributed Antenna Systems (DAS) transmits and receives or relays RF signals within buildings, structures, tunnels, or other areas where wireless services cannot be provided because of lack of signal penetration from outdoor networks or where no suitable outdoor network exists.

A DAS facilitates the In-Building Coverage (IBC) for mobile wireless devices where access to wireless communications is increasingly important in health facilities.

Mobile wireless devices in a health facility can include:

— Mobile and smart phones;

— Laptop computers and tablets;

— GRN devices;

— Health Interior Radio Paging Network;

— Any other devices using commercial carrier provided access, including security and biometric devices using Subscriber Identity Modules (SIM cards).

A dedicated In-Building Coverage system usually consists of:

— Mobile Telecommunications Operator base station equipment, often located in a facilities room, communications room or other service area;

— Cables which run from the base station through the building risers connecting the base station equipment to antennas;

— Small antennas located on ceilings or walls in strategic locations.

**Proposed**

It is proposed that the new facility incorporates an active Distributed Antenna System pending a detailed survey plus consideration future commercial and technology situations.

**8.2.7.5** Nurse Call

**General**

A new IP based nurse call system is proposed for the facility. The nurse call system shall be capable to be expanded to accommodate future Stages of developments. The nurse call system shall incorporate all outlets, indicator lights, cabling, terminations, control units, power supplies and system interfaces to complete the installation.

**Standards**

A new Nurse Call system will be provided in accordance with the following standards.

Health Infrastructure – Engineering Guidelines

AS/NZS 3811 Hard wired patient alarm systems for hospitals

NSW Health and LHD Guidelines.

**Proposed**

The nurse call system shall incorporate nurse calls with Emergency Calls, Staff Assist, and patient call points and emergency call. The system shall provide two-way speech facility which may be specified in certain areas as required.

The proposed nurse call system will incorporate LED monitor type annunciators to display all system alarms and information board functions.

**8.2.7.6** Electronic Security

**General**

Electronic security systems are an integral part of health services buildings as they assist in securing, monitoring and protecting building assets and staff during a security event. Systems include access control, intruder alarms, duress, both fixed and mobile and closed-circuit television systems.

**Standards**

Electronic Security will be provided in accordance with the following standards.

— Health Infrastructure – Engineering Guidelines

— Health Infrastructure Protecting People and Property

— AS 4485.2 Security for Health Care Facilities

— AusHFG room layouts

— NSW Health and LHD Guidelines.

**Proposed**

It is proposed that the new development be provided with an IP security system comprising access control, intruder alarms, duress alarms, CCTV system, PA systems, paging systems, hearing augmentation and intercom systems. The electronic security system will incorporate the following systems. All security systems will be supplied through the central UPS to ensure they remain powered during a power outage of the main electrical supply. Provision for external monitoring of the security system can be made in the system if required by the client.

<u>Access Control</u>

An IP access control system shall be provided throughout the building. Locations of access-controlled doors will be as per the AusHFG room layouts and discussions from meetings with the users and engineers.

Fail Safe electrical strikes / electromagnetic lock will be provided and interfaced with the fire services system to release in the event of a fire alarm. However, the exact details on this are pending further discussion to address the clinical security requirements and as such may warrant special approval by the BCA consultant and PCA to enable delayed controlled egress.

Fixed Duress

Fixed duress will be provided in accordance with the AusHFG room layout sheets and shall form part of the access control system. Fixed duress buttons will generally be located under desks in rooms where they are required. Where there is no desk, buttons shall be wall mounted directly adjacent to the person providing the treatment.

Mobile Duress

The mobile duress provision is expected to be facilitated via the Wi-Fi system.

Coverage is to be proposed to be provided throughout the building with the resolutions noted below:

— Carpark and other external areas directly outside the building – 10m
— All indoor spaces – 5m
— Special rooms (rooms to be advised) – 3m

CCTV

Final locations of CCTV cameras will be identified during the security user group process. A monitoring location has not been determined but it is typically located in the emergency department staff station. The areas to be covered by CCTV cameras are as follows:

— Main entrance into the building
— Waiting rooms
— Car park and loading dock
— Ambulance/drop off bay
— Department entry points
— Cash handling areas
— Gun safe locations
— External entry to the safe assessment room (if relevant)

The CCTV system shall be capable of:

— Storing video feeds from all CCTV cameras for a period up to 30 days, while recording for all cameras;
— Be capable of Remote off-site monitoring;
— Accommodating analytics software;
— Expansion of the system;
— Integration with other CCTV systems (IP and Analogue);
— Be open protocol and compatible with CCTV cameras and equipment of various manufactures;
— ONVIF compliant;
— Capable to send images to the Government Data Centre should the requirement for excess of 30 days recording be required;
— Being interfaced with Security Access Control system, Duress Alarm system and Intruder Detection system. This shall allow the CCTV system to cater for features like recording on motion detection and producing an alarm signal which shall initiate the intruder detection and/or access control systems. Contractor must ensure compatibility between the above-mentioned systems.

High level interface from the security system to the CCTV system matrix to provide:

— Alarm and event outputs and status signals from the Access Control Security System to the Surveillance CCTV System to initiate pre-programmed actions controlled by the CCTV System;
— On screen display of CCTV images associated with alarms at the Security System.

Intercoms

An IP audio and video intercom system shall be provided in locations as agreed during meetings with the user groups. All call stations shall be complete with video capabilities. Intercom headend equipment shall be in the various floor distributors. Video master stations shall be in the staff stations as required. Video call stations to be located at the agreed entrance locations with remote door release capability to be provided to selected locations.

Intruder Detection System

The requirement for an intruder detection system shall be discussed and agreed with the LHD at the security user group meetings.

PA Systems

Further discussion is required with the LHD to determine the need for a PA system.

Paging System

Further discussion is required with the LHD to determine the need for a paging system.

Hearing Augmentation

A hearing augmentation system will be provided to assist with amplified speech within rooms nominated by the BCA consultant. Further discussion is required with the LHD to determine the need for hearing augmentation.

### 8.2.7.7 MATV System

**General**

Master Antenna Television systems provide free to air TV and radio services to patient care areas and other nominated locations within the Unit. MATV systems can also provide distributed movie, educational services if required.

**Standards**

The MATV system will be provided in accordance with the following standards.

— AS 1367 Multiple outlet distribution systems – Sound and Vision
— Health Infrastructure – Engineering Guidelines

**Proposed**

It is proposed that a digital TV system be provided to suit the requirements of the proposed development. It is proposed to install a new digital MATV system to provide free to air TV and radio services to the TV outlets nominated in the room data sheets.

### 8.2.7.8 System Integration

It is proposed that the building engineering systems will be interconnected with each other to provide the required interfaces to enable the building to operate effectively and have the required building services information monitored / measured to assist in tuning the building to operate as efficiently and possible.

The various building services systems to be integrated will utilise the facilities communication structured cabling network to facilitate two-way communications with the hospital messaging platform.

This will allow the following, but not limited to, building services systems to be interfaced:

— Clinical systems alarms and monitoring;
— Fire System;
— Access Control System;
— CCTV System;
— Duress Alarm System, including Mobile Duress;

— WiFi Mobile Phone system;
— BMS, including building services systems monitoring;
— Electrical meters;
— Exit & Emergency Lighting System;
— Nurse Call system;
— MATV

As part of the project there is a requirement to set up and maintain messaging flows.

A new Message Integration Engine will be considered as part of the IT FFE budget.

### 8.2.8 Lighting

Light has a direct influence on the perception of the space and the visual performance and comfort of its users. Research has proven that lighting can have a significant impact on the visual comfort, health and productivity for people working within the built environment.

In Hospitals and health care facilities, complex and diverse task are continuously conducted. Optimizing natural daylight and electric lighting is necessary for both performance and comfort of the staff and patients. Lighting design within hospital buildings is especially important considering the higher illumination levels and complexity of the tasks being undertaken.

Lighting shall be designed to create a comfortable, varied and inviting atmosphere and support the design of the architecture. The lighting will be designed in accordance with AS/NZS 1680, the NSW Health Service Guidelines and the National Construction Code Part J6. Lighting controls for the JHHIP may incorporate BMS controls for major circulation corridors, localised switching and occupancy / daylight sensors to assist with achieving energy performance criteria.

#### **8.2.8.1** Daylight

The use of daylight will have a positive influence on staff and patients. Daylight entering a space provides a connection to the outside and is important for giving context in time and space. This perceptual contact and the dynamic properties of natural light are key factors of comfort in terms of physiology and psychology. Several studies have linked quicker patient recovery times when patients recover with daylight/view access.

On the other hand, if the sun penetrates the space it may cause disabling or discomfort glare. The amount of daylight, especially direct sunlight entering the building shall be controlled by employing appropriate mechanisms to avoid glare (external louvers, light shelves, blinds, etc.). The details and level of control (manual, automatic) may vary depending on the space and its use. Artificial lighting shall be used to balance and supplement daylight throughout the day, or during patient clinical evaluation.

#### **8.2.8.2** Cyanosis Lighting

For areas where cyanosis observation is required, as confirmed by the hospital, the light sources must meet the requirements of AS/NZS 1680.2.5:

— Correlated colour temperature (CCT) within CIE lamp colour appearance group 2, between 3300K and 5300K;
— Cyanoises Oberservation Index (COI) of not greater than 3.3, as determined in AS/NZS 1680.2.5.

Cyanosis compliant lighting is to be provided to patient transit areas and patient care areas and patient interaction areas including waiting areas, nurse stations, corridors, examination room, consultation rooms, operating theatres, wards.

The hospital should assemble a team of experienced staff members in different capacities (General Practitioner, Anaesthesiologist, Nurse, HI Representative, etc.) to assess and confirm the final spaces that will be designated for cyanosis observation and that require cyanosis compliant lighting.

#### **8.2.8.3** External Lighting Design

To create a comfortable night environment, the site lighting will be organized in a hierarchical way that draws public/patients to key entrances. The lighting will be a play an important role in signalling visitors to that entrance. The main entrance and car drop-off areas will have higher light levels for increased visibility. Pedestrian pathways will be uniformly lit, creating a safe night-time environment, while mindful of light-spill onto adjacent properties and dark sky considerations. All external lighting shall be controlled via PE Cell and timers and connected to the central lighting control system.

#### **8.2.8.4** Exit and Emergency Lighting

Emergency and Exit lighting will be provided throughout the building in accordance with the following guidelines and standards.

— Health Engineering Guidelines;
— AS/NZS 2293 Emergency escape lighting and exit signs for buildings;
— National Construction Code.

Emergency lighting and emergency exit lighting are an essential part of the building lighting. The system will consist of luminaries and exit signs that identify an escape route as per the NCC/ BCA consultant's advice and escape path.

The fittings require regularly scheduled maintenance testing in accordance with the requirements of AS/NZS 2293. The maintenance testing of the emergency lighting system shall have the capacity for automatic testing, generate test reports, colour graphic display and be capable of remote monitoring (testing, report generation).

A monitored emergency lighting system is proposed for the development. The style and type of emergency fittings will be selected to suit the area in which it is located and to match the hospital standards and preferences. Generally, the emergency lighting equipment will be an integral part of the design and mainly concealed or unobtrusive. In line with this principle, where possible, emergency lighting will be integrated within general luminaries where possible or provided through dedicated recessed LED emergency fittings complete with self-contained battery and charger. Exit signs are to be slimline LED versions.

**Standards**

— AS/NZS 1158 External Lighting – Roads and Public Spaces;
— AS/NZS 4282-1997 Control of Obtrusive Lighting Effects;
— AS/NZS 4485.1-1997 Security for Health Care Facilities.
— AS/NZS 2293 Emergency escape lighting and exit signs for buildings.

**Proposed**

The lighting is to be approached and designed in accordance with the following principles:

— An approach that supports the comfort and well-being of the patients;
— The lighting needs of the medical staff for examination, treatment and observation of patients;
— An approach that enhances and reinforces the Architect's vision and identity of the building, particularly to the lobby, and that is fully integrated into the architectural design;
— Designing lighting atmosphere (in terms of colour temperature, colour rendering properties, illumination intensity etc) to suit the context and use of different spaces;
— Provision of operational and functional lighting to the various spaces to fulfil visual task requirements without glare or discomfort;
— Lighting used to draw people to particular aeas of down certain routes (orientation and wayfinding);
— Minimisation of energy consumption and environmentally sustainable initiatives as part of the design;
— Use of LED light sources for energy efficiency and minimisation of maintenance due to extended lamp life in comparison to traditional light sources;
— All luminaires to consider efficacy, light output ratio and suitable light distribution;
— The provision of an intelligent lighting control system to key areas and consideration of the lighting control strategies to provide flexibility of operation and reduce energy consumption;
— Use of occupancy sensors and automated control to control lighting when appropriate;
— Maximise daylight access and views to the landscape, to maintain a connection to the outside/ day-night cycle for the patient;
— Designing night-time lighting so as to prevent light pollution or trespass onto adjacent properties.

## 8.3 Mechanical Services and Medical Gases

### 8.3.1 Executive Summary

This report aims to identify major project decisions that will affect the services budget and system design.

Mechanical and Medical Gas Services

The major risk items with respect to site infrastructure include:

- Medical gas and bulk oxygen supply to site.
- Location of the bulk oxygen store and medical gas store.
- Site climatic risks (flood, bushfire etc.)
- Future expansion provisions. Both soft expansion of clinical areas and Site expansion.

The major issues with respect to site wide infrastructure detailed in this report include:

— Medical gas early works and delivery requirements
— Access to site
— Staging of works
— Proposed Moruya Bypass works are not confirmed

The major considerations for future planning for mechanical, medical gases and vertical transportation services on the new build in respect to infrastructure are:

— Future building extension of proposed Medical Liquid Oxygen reticulation
— Future building extension of proposed Nitrous Oxide reticulation
— Future building extension of proposed Medical Dry Air reticulation
— Future building extension of proposed Scavenge/Suction reticulation (as required)
— Future building extension of proposed Pneumatic tube system
— Introduction of new lifts
— Proposed Moruya Bypass

The following systems are proposed for the HVAC systems:

— Water Cooled Chillers
— Cooling Towers
— Gas fired or electric Boilers for space heating
— Pumps for Heating Hot Water (HHW) and Chilled Water (CHW)
— Pumps for Condenser Water (CW)
— Air side Variable Volume (VAV) boxes
— Dedicated Multi-zone and Single zone Air Handling Units (AHU's)
— Dedicated Fan Coil Units (FCU's)
— Exhaust systems
— Zone Smoke Control Systems
— Stair Pressurisation Systems
— Suction Scavenge System
— Medical tool air system
— Pneumatic Tube system extension

Plant spaces will be nominated in SD in locations that allow independent access for maintenance staff to avoid interruption to the ongoing running of the hospital. Plant will be located on either the roof, basement or perimeter areas to allow for future removal/replacement.

Measures to reduce energy costs will include:

— Connection of new plant to BMCS which allows for close monitoring and control of all major pieces of plant
— Utilising a BMCS that is both open sourced and open protocol (Protocol meaning the computer language is universal & Source meaning any independent controls contractor can be used)
— VSD on all major motors and fans
— Selection of chillers with good part load operational efficiency
— Utilising passive design best practice in relation to glazing, facades and the location of plant and non-conditioned spaces
— Other ESD initiatives further developed in CD

### 8.3.2 Introduction

Stantec in conjunction with Root partnerships (RP) and Conrad Gargett Architecture (CGA), have been commissioned by Health Infrastructure (HI) to prepare a Master plan for the construction of a new health services campus at Eurobodalla to expand and consolidate the existing health services in the area. The new Health Services Campus is proposed to be built on a “green field” site located approximately 1.5 km from the local centre of Moruya and adjacent the existing NSW Tafe facility (shown below).

The site does not contain any covered roads, with potential public access locations proposed via the nearby Hwy., Albert Street and Braemar Drive. On grade parking is proposed across the site to facilitate both staff and visitors.


Figure 1: Eurobodalla Hospital proposed site location - Moruya

The site is intended to be developed to enable the construction of emergency services, counselling services, acute and sub-acute services, operating theatres, palliative care, CSSD, maternity/neonatal, community health and outpatient services, medical imaging services in order to provide improved health services to the Eurobodalla shire and its diverse community. The following list provides a high-level overview of the mechanical services requirements and scope for each department:

- Emergency Department, including Resus and Triage, is a critical area with a requirement for mechanical services capable of continuously functioning during power outages. This area is to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient and staff.
- Safe assessment rooms including forensic examination and crisis/emergency counselling will be conditioned to comfort levels with a requirement for priority mechanical services capable of functioning during site power outages. Anti-ligature fittings will be utilised to ensure the safety of patients.
- Acute medical wards including HDU/ICU are critical areas with a requirement for priority mechanical services capable of functioning during site power outages. Consideration of isolation rooms and their dedicated filtration and pressure requirements will be given at an early stage. Isolation rooms will be provided priority mechanical services capable of functioning during site power outages. Isolation room exhaust locations will be carefully considered and coordinated with potential helicopter flight path. Assessment of the ICU pandemic pod requirements as per HI design guidance will be conducted early in the design to ensure coordination of additional equipment and ductwork.
- Operating theatres to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient, staff and tools.
- Pre-admission and perioperative spaces are critical areas with a requirement for mechanical services capable of continuously functioning during power outages. These areas are to employ best practice HVAC design and achieve a high level of infection control. This will include the use of pressure regimes, clean to dirty air flow schemes and protection of patient and staff. Anaesthetic waste gas exhaust will be considered in Recovery Stage 1 to provide increased protection to staff.
- CSSD will require a clean steam system in compliance with AS 4187. Consideration of the compressed air requirements and protective pressure regimes between decontamination, clean and sterile areas will be required at an early stage.
- Maternity and neonatal services will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of critical conditioning and pressurisation requirements of birthing rooms and neonatal spaces will be given at an early stage.
- Palliative care unit is a critical area with a requirement for priority mechanical services capable of functioning during site power outages. High levels of comfort will be provided by increased temperature control within the space.
- Sub-acute services such as renal, rehabilitation and chemotherapy will be conditioned to comfort levels. Consideration of apheresis areas and their dedicated filtration, pressure and humidity requirements will be given at an early stage.
- Community and outpatient services will be conditioned to comfort levels and air balanced to ensure protection of staff and patients. Consideration of dental chair suction and medical gas requirements will be given at an early stage.
- Medical Imaging is a critical area with a requirement for mechanical services capable of continuously functioning during power outages. Dedicated chilled water systems would be investigated for the MRI and CT Scan room(s) cooling in line with HI guidelines and recent changes in imaging supplier requirements. Additional systems such as MRI quench pipes and emergency exhaust systems would also be required.
- Mortuary will be conditioned to comfort levels and air balanced to ensure protection of staff. Ventilation and temperature requirements will be considered at an early stage. Cool room condenser locations will require early coordination.
- Air conditioning and ventilation to back of house areas consumer amenities, administration and accommodation.

Additionally, non-medical department scope includes:

- Construction of new staff/public car park.
- Air conditioning and ventilation to back of house areas, parent facilities and consumer amenities.

### 8.3.3 General

The intent of this report is to cover the mechanical design options considered as part of the Master Plan. Stantec has been engaged by HI to prepare a Master Plan for the development of the "greenfield" Eurobodalla Campus, including investigation of the existing site constraints and to reporting on any latent conditions that may affect the cost of the proposed project. These Master Plan proposals have been developed in line with architectural and procedural developments and this report aims to identify key risks, positives and negatives for the proposed design so that buildability, cost, energy consumption and safety in regard to mechanical systems are not overlooked in the planning stage.

The report covers:

- HVAC systems
- Ventilation Systems
- Mechanical Switchboards and BMCS
- Medical Gases
- Suction/Scavenge
- Pneumatic Tube system

The following lists the impact to the proposed development of the master plan options on the site.

- Potential climatic risks including flood and bushfire zones
- Medical Gas and bulk oxygen delivery to site
- Location of VIE tank, this may require early works

It is envisaged that the new building will be classified as a Class 9a Building with a rise in stories of 2 with a sub level.

### 8.3.4 Masterplan options

There are four (4) master plan options put forward for the site as part of the clinical services plan (CSP). Two of these (options 1 and 4) have been nominated as preferred and are shown below in Figure 2 and 3. The mechanical services and medical gas services options outlined in this report have been formed based on the preferred options. Each masterplan option includes the future expansion provisions of health services; however, the following future expansion services are intended to be satellite sites and be separate works: This is to be further investigated in concept design.

- Future accommodation building
- Future Education building
- Future Private provider building
- Future Ambulance NSW building

The provision and sizing of central plant to serve these satellite sites will be reviewed in concept design.

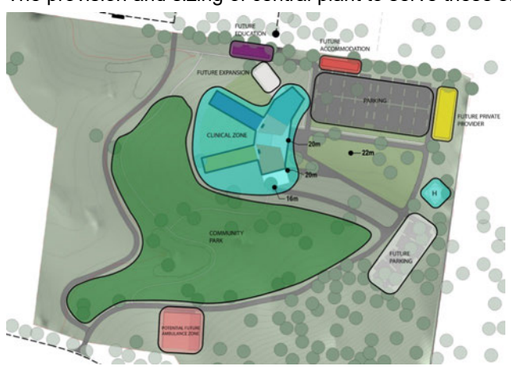



Figure 2: Masterplan Option 1

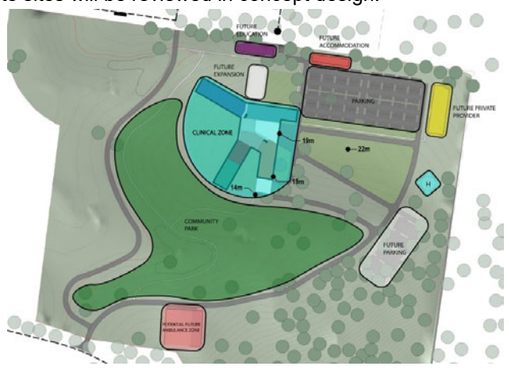



Figure 3: Masterplan Option 4

### 8.3.5 Report Basis

The Mechanical report has been based on the following:

- Design plans produced by Conrad Gargett Architects
- Master Plan Design documentation produced by Conrad Gargett Architects
- Site visits carried out by Stantec
- Meetings held to date
- Draft Bushfire and Ecology Due Diligence Report

### 8.3.6 ERG and Engineering Workshops

- 01.02.21 – EHS design team Workshop

### 8.3.7 Limitations of the Report

This report is based on site visits carried out by Stantec, contract documentation and information provided by Conrad Gargett architects. Stantec have based our report on the assumption that the information provided can be taken at face value and in general terms accurately reflect the installation on site.

Stantec's site visits involved walks around the site, and overall visual inspections. As such, this report should be read with the limitation of such site visits in mind. Only items visible were considered and any neighbouring boundaries assessed from visual inspection only.

Items Requiring Further consideration during Concept Design

The following items will require further consideration and design during Concept Design:

- Review of the external ambient temperatures recorded at Moruya is required. Recent year peaks have exceeded the AIRAH DA9 design temperatures significantly, raising concern over plant sizing being sufficient for future peak days. To be further investigated during Concept Design.
- Location and sizing of plant to suit future expansion areas. Stantec have proposed the option to have centralised plant serving the main hospital building. A detailed assessment of the future expansion areas will need to be undertaken to assess feasibility of serving these from the central plant or to provide local HVAC plant to future areas.

### 8.3.8 Existing Site Considerations

**Authority Infrastructure**

The site is serviced by potable water and power which will be utilised by the mechanical plant for the provision of HVAC services. The provision of gas to site is to be confirmed.

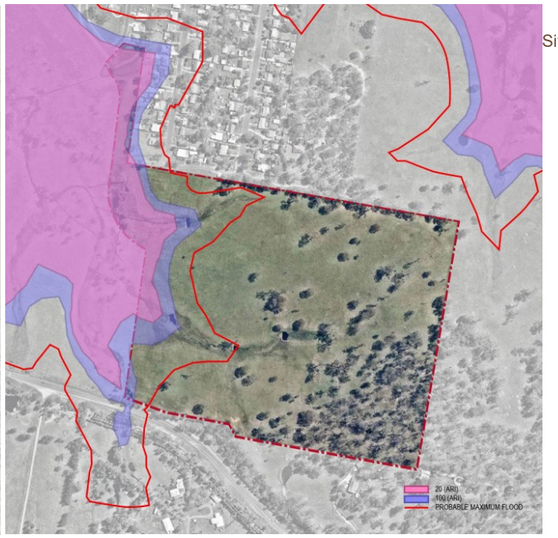
Climatic **Risks**

This section details the inherent climatic risks of the site that may impact mechanical systems in the development. The site is located within regional NSW adjacent the Moruya river and surrounded by varying levels of vegetation.

Flood **zones**

The site has a varying elevation of about +20m in the East to west direction and approx. +14m in the South to North direction, with the lowest point on site to be approximately 2m. The proposed options for the location of the new building and associated infrastructure are currently outside the determined 100-year Average Recurrence Interval (ARI) and the Maximum probable flood plain and therefore any on-site or internal mechanical/med gas services infrastructure will not be at considerable risk.

Topography




Site Flood plane

The Installation of external mechanical/med gas systems will require early review to ensure the locations are not affected by the flood plain. While it is not anticipated future works will involve the addition of services within the flood plain this will need to be considered.

**Bushfire Assessment**

The NSW rural fire service has identified the surrounding TAFE and residential areas as non-bush fire prone areas. Abel Ecology have undertaken a due diligence report to assess the threat of bushfires to the site. From the assessment it is expected that the site will be identified as a bushfire prone area as there is a reasonable amount of vegetation to the South East of the site which may justify a heightened risk of bushfire to the area. Figure 4 below outlines the extent of the bushfire asset protection zone as described in the due diligence report.

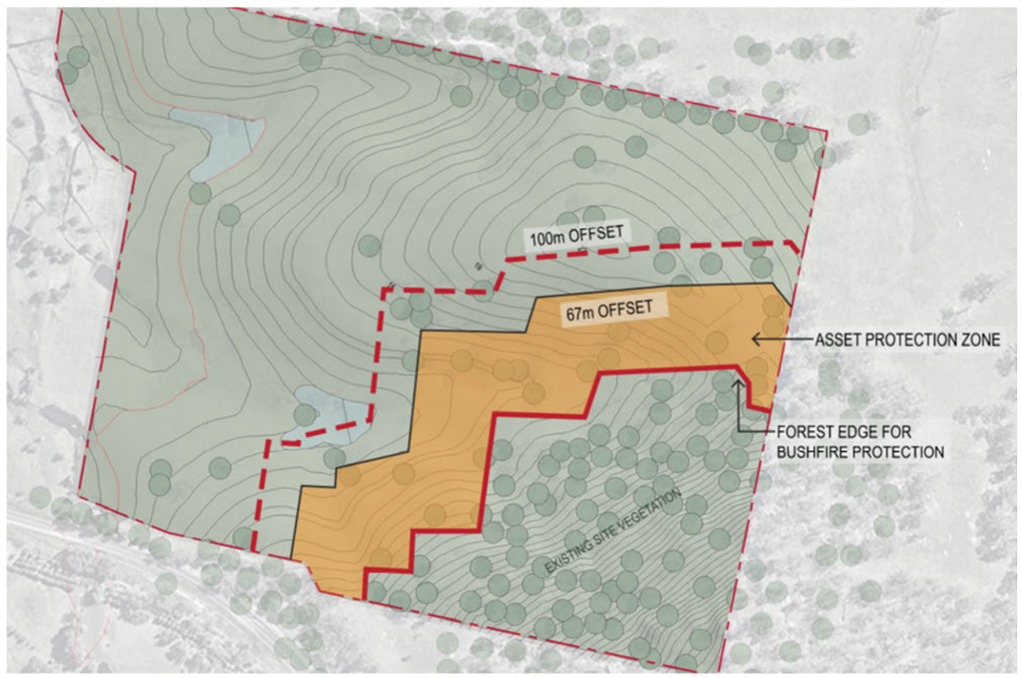



Figure 4: Bushfire Protection Zone

Stantec understand that any element constructed within the 100m offset from the forest edge shall be constructed as required for a Bushfire Attack Level (BAL) of 12.5. This classification is based on information from the NSW rural fire service and describes the level of bushfire risk as primarily from potential embers during a fire, as outlined below.

**Bush Fire Attack Level**

| BAL | Description of risk |
|---|---|
| BAL – LOW | Lowest risk from a potential fire. |
| BAL – 12.5 | Risk is primarily from potential embers during a fire. |
| BAL – 19 | Moderate risk, particularly from embers and burning debris. |
| BAL – 29 | High risk, particularly from embers, debris and heat. |
| BAL – 40 | Very high risk. Likely to be impacted by embers, debris, heat and potentially flames. |
| BAL – FZ | Extreme risk. Directly exposed to the flames of a potential fire front. |

NSW RFS Bushfire Attack Level Classification

Due to the increased risks of bushfire to the site, Stantec have outlined some bushfire smoke infiltration mitigation strategies, shown in ME-MEMO-001 for review and assessment. An in-depth bushfire assessment will be required at later stages to identify any potential risks associated to the mechanical systems.

### 8.3.9 Medical Gases Infrastructure

**Existing health services**

The current Eurobodalla Health Service is spread over three campuses, with one hospital located in Moruya (approx. 3km away from site), a hospital in Batemans Bay (approx. 25km away from site) and community health service located in Narooma (approx. 35km away from site).

Moruya hospital is currently operating as a 66-bed hospital offering emergency services, inpatient acute medical and general surgery, inpatient rehab and palliative care, maternity, home and renal care. Batemans Bay hospital is currently operating as a 37-bed hospital offering emergency services, inpatient acute medical, inpatient day only surgery, home, inpatient rehab and palliative care.

The hospitals are currently supplied by Coregas for the oxygen and medical gas services. Coregas delivery frequency to the area is 21-days or as needed.

**Oxygen Services**

Moruya - Main Plant

Moruya Hospital is currently served by one Primary VIE oxygen tank and back up bottles for redundancy. Oxygen is currently delivered on a 21-day frequency.


Batemans Bay – Main Plant

Batemans Bay Hospital is currently served by one Primary VIE oxygen tank and back up bottles for redundancy. Oxygen is currently delivered on a 21-day frequency.


### 8.3.10 Medical Gas Services

**Main Plant**

The existing health services in the Eurobodalla region offer the following services regionwide:

- Emergency services
- Inpatient acute medical
- General surgery
- Inpatient day only surgery
- Inpatient rehab
- Palliative care
- Maternity
- Home
- Renal care
- Community health

These are services are divided across all three campuses and in some cases duplicated. Based on the individual requirements of each service it is anticipated that the following gases are required to be supplied to site by Coregas:

- Tool air
- Nitrous Oxide
- Suction/Scavenge
- Medical Air
- $CO_2$

The list above is currently under review with Coregas. It is anticipated that the new development will require delivery of all or most of the medical gases listed above and stored on site. The required gas usage is under review and increased load to be confirmed with Coregas for delivery to site.

### 8.3.11 Impact of New Building on Existing Site

**Mechanical Services**

Stantec anticipate that the mechanical services infrastructure for the new building will affect the existing site and surrounding properties, however this is anticipated to be minor and not adversely impact the existing site. Any issues that are likely to arise from the installation of mechanical services can be mitigated by the inclusion of best practice design standards throughout the design (E.g. Acoustic attenuation and the like). To be further investigated in Feasibility.

**Exhaust discharge**

Various clinical areas proposed within the development require specific exhaust requirements as defined in the NSW HI guidelines. The discharge of these specialised areas may contain contaminants with the potential to have an adverse effect on human health. AS1668.2 details the recommended exhaust system requirements to safely discharge to the atmosphere. The potential to discharge these contaminants into the neighbouring properties is very low, however this will need to be considered in concept design and reviewed for future expansion areas.

### 8.3.12 Proposed Infrastructure

**Smoke Hazard Management**

While the rise in stories is anticipated to be 2, Stantec understand that the building may have a rise in storeys that is greater than 2 therefore requiring stair pressurisation to fire isolated stairwells. Fire stair arrangement needs to be determined early on to provide spatial allowance.

Relief air will be provided by way of dedicated relief air riser adjoining the fire stair.

Stantec understand that the building will have an effective height not more than 25m therefore requiring automatic zone pressurization where sprinkler systems are not located in patient care areas. AHUs and FCUs serving the fire affected compartment will shut down on fire trip with the exception of areas serving critical care areas which will run until such time as smoke is detected in the supply air ductwork.

**Building Management & Control System BMCS**

It is envisaged that the new development will incorporate DDC units using the BACNet protocol integrated onto a site-wide BMCS. The BMCS will provide facility management control and monitoring of all new major mechanical plant as well as lighting, and major hydraulics plant.

The BMCS will be implemented in such a way as to achieve:

— Integration with a future site wide system
— Optimisation of plant scheduling
— Electrical load shedding
— Data logging of plant run hours
— Data gathering to optimise the building energy performance and building tuning
— Prioritised fault alarms
— Lighting and movement detection
— Security

Studies have shown that building tuning is one of the most effective ways of reducing energy use. Hospitals are traditionally very high users of energy and a robust BMCS system that will allow ongoing building tuning is of paramount importance.

### 8.3.13 Medical Gases Scope

Medical gases will be provided in line with requirements of HI Engineering Guidelines and room data sheets.

It is anticipated that as part of concept design, and once final usage demands are calculated, the local connection points for the relevant gases can be incorporated into the design.

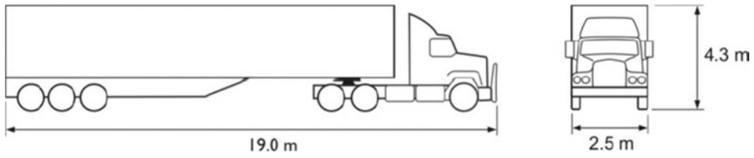
**Oxygen Services**

Main Plant

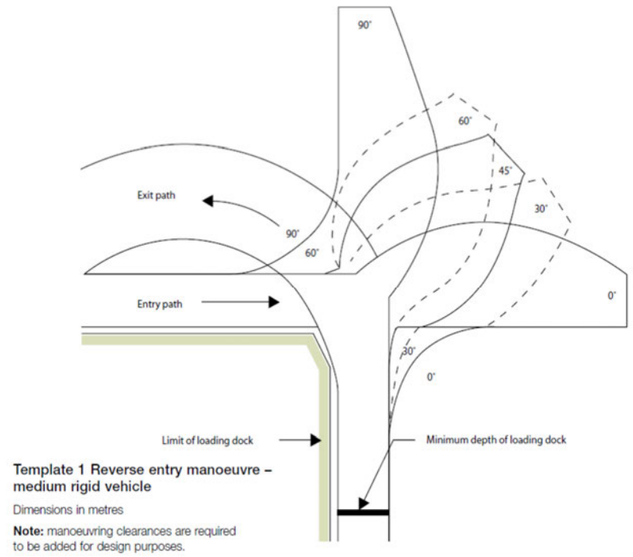
Following preliminary discussions with Coregas regarding present oxygen delivery rates to the existing hospital campuses and the proposed bedding plan, Stantec believe that a 10,000L VIE tank with 12 pack back-up bottles will be required. This assessment is subject to final hospital bed numbers and detailed review. Remote fill points are not recommended due to additional safety concerns. An emergency fill line, located within the depot, can also be utilised to maintain oxygen supply, where required.

The VIE tank and medical gas compound details will be required at an early stage of works to ensure adequate spatial allocation and structural design. ME_MEMO_002 outlines a proposed preliminary medical gas compound arrangement with indicative spatial allowances, based on advice obtained to the date of this document. Additionally, ME_MEMO_002 outlines the preferred truck access and locations of the compound on site, with regards to each of the preferred master plan options.

The new vessel will need to be installed in a location with appropriate access by the delivery truck to an appropriate fill point. The spatial requirements for the turning circle of the medical gas delivery truck (19m) are detailed below and in ME_MEMO_002 appendices. Note, heavy vehicle turning pathway does vary on the length of the trailer and the axle configuration, however, the general rule is for a full-length trailer is that the area required is 15 meters and for the smaller trailer around 9 meters.




The general rule is for Rigid trucks is that they are able to conduct a three-point turn to manoeuvre in tight places. A one-point turn takes 15 meters, a three-point turn can reduce the turning circle to within the length of the vehicle.




A solution to avoid delivery truck turning circles is for the oxygen delivery truck to pass through the compound when refilling the vessel and exit through the secondary access. Truck access will be reviewed at the feasibility stage.

Early discussion between Stantec and the traffic consultants has indicated that the preferred method of entry and exit onto site is via the highway only. This delivery method is outlined in options 2 and 3 of the two master plan options in ME_MEMO_002 and will require the use of a turning bay to manoeuvre the truck on site. A traffic study will be required to finalise the truck delivery requirements on site.

**Site Reticulation**

In order to serve the development, Stantec propose extending an oxygen ring main within the new building. The proximity of the oxygen store to the building will be investigated in terms of cost, future expansion and ease of maintenance. This solution allows for flexibility of future works, which can be conducted in segments by isolating parts of the ring main without losing oxygen supply to remainder of the building/s. Furthermore, the future extension of the ring main, if required, can be conducted with limited disruption to any existing site operation. Following final oxygen consumption estimation of the building, an assessment into future ring main pipe size capacity will be undertaken. We expect this assessment to occur at schematic design.

**Nitrous Oxide Services**

Main Plant

The nitrous oxide supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at concept design.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

**Tool Air**

Main Plant

The tool air supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at concept design.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

**Medical Air**

Main Plant

Medical air compressor capacity and location will be reviewed in detail during schematic design. Investigation will include review of redundancy via manpacks.

Site Reticulation

In order to serve the development, Stantec propose extending a medical air ring main within the new building. This solution will offer the building with medical air supply into the building, consistent with the oxygen supply site arrangement. Works can be conducted in segments by isolating parts of the ring main without losing supply to remainder of buildings. Furthermore, the future extension of ring main, if required, can be conducted with limited disruption to any existing site operation. Following final consumption estimation of the building, an assessment into future ring main pipe size capacity will be undertaken. We expect this assessment to occur at schematic design.

**Carbon Dioxide**

Main Plant

The carbon dioxide supply and infrastructure should be adequate to serve the new development and any intended future works. Further assessment will be conducted at concept design.

Site Reticulation

During schematic design, a pipe size assessment will be undertaken to identify the required sizing and capacities.

**Suction Scavenge**

Main Plant

Stantec propose to utilise a vacuum pump system to serve the site. Medical air compressor capacity and location will be reviewed in detail during schematic design

Site Reticulation

Site reticulation shall be as per Medical Air supply.

## 8.4 HVAC Scope

### 8.4.1 Design Criteria

The design criteria for the Mechanical services are as outlined in Health Infrastructure Engineering Guidelines - August 2016 as follows:

**External Conditions (Comfort)**

Review of the external ambient temperatures recorded at Moruya (BCA climate zone 6) is required. Recent year peaks have exceeded the AIRAH DA9 design temperatures significantly, raising concern over plant sizing being sufficient for future peak days. To be further investigated during concept design.

| | |
|---|---|
| Summer | 26.7ºC Dry Bulb |
| | 22.5ºC Wet Bulb |
| Winter | 3.2ºC Dry Bulb |

**External Conditions (Critical)**

| | |
|---|---|
| Summer | 32.5ºC Dry Bulb |
| | 23.4ºC Wet Bulb |
| Winter | 3.2ºC Dry Bulb (Only comfort data available for heating) |

**Internal Conditions**

| SERVICES REQUIREMENTS FOR AREAS AFFECTING PATIENT CARE HOSPITALS ANDOUTPATIENT FACILITIES | | |
|---|---|---|
| **Area Designation** | **Relative Humidity (%)** | **Design Temp (Degrees C)** |
| **Surgery & Critical Care** | | |
| Operating Theatre | 35-60 | 16-27 |
| Birthing Room or Delivery Suite | 35-60 | 20-23 |
| Setup Room and Sterile Store | 35-60 | 20-23 |
| Recovery Room | 35-60 | 21 |
| Intensive Care | 35-60 | 21-24 |
| Neonatal Intensive Care | 35-60 | 22-26 |
| Burns | 35-95 | 21-32 |
| Treatment Room | | 24 |
| Resuscitation Room | 45-60 | 21-24 |
| Anaesthesia Gas Storage | | |
| Endoscopy Room | 35-60 | 20-23 |
| Bronchoscopy, Sputum Induction and & Pentamidine | 35-60 | 20-23 |
| Emergency Department and medical Imaging Waiting Room | 35-60 | 20-23 |
| Emergency unit Triage | 35-60 | 20-23 |
| **Nursing** | | |
| Patient Room | | 21-24 |
| Toilet Room / En-suite | | |
| Newborn Nursery Suite | | 24 |
| Protective Environment Room | | 24 |
| Class n Isolation Room | | 24 |
| Isolation Alcove or Anteroom | | |
| Patient Corridor | | |
| **Diagnostic and Treatment** | | |
| Consult Room | | 24 |
| Medication Room | | |
| Treatment Room | | 24 |
| Physiotherapy & Hydrotherapy | | 24 |
| Disposal Room | | |
| Clean Workroom or Clean Holding | | |
| Haemodialysis | | 20-25 |
| **Ancillary Radiology** | | |
| Radiology (Surgical / Critical Care & Catheterisation) | 30-60 | 21-27 |
| Radiology (Diagnostic & Treatment) | | 21-24 |
| Darkroom | | |
| **Laboratory** | | |
| General | | 24 |
| Biochemistry | | 24 |
| Cytology | | 24 |
| Glass washing | | |
| Histology | | 24 |
| Microbiology | | 24 |
| Nuclear medicine | | 24 |
| Pathology | | 24 |
| Serology | | 24 |
| Sterilising | | 24 |
| Autopsy room | | |
| Non refrigerated body holding room | | 21 |
| **Pharmacy** | | |
| Sterilising and Supply | | |
| Sterilising Room | | 24 |
| Sterilising Equipment Room | | |
| Central Medical & Surgical Supply | | |
| Disposal Room | | 20-23 |
| Clean Workroom | 30-60 | |
| Sterile Storage | Max 70 | |
| **Service** | | |
| Food Preparation | | |
| Dish/Pot Washing | | |
| Dietary Day Storage | | |
| Laundry General | | |
| Soiled Linen (Sorting & Storage) | | |
| Clean Linen Storage | | |

**Other Areas and areas not specifically referenced above:**

| | |
|---|---|
| Cooling | 23ºC Dry Bulb |
| Heating | 40 - 60% relative humidity anticipated by virtue of cooling coil performance |
| Control Tolerance | Plus or minus 1.0ºC at the point of control for heating and cooling. |

**Population**

| | |
|---|---|
| Generally | As per Room Data Sheets |
| Office Areas | One person per 10 m² |
| Lobby Areas | One person per 5 m² |

**Ventilation**

| SERVICES REQUIREMENTS FOR AREAS AFFECTING PATIENT CARE HOSPITALS AND OUTPATIENT FACILITIES | | | | | | |
|---|---|---|---|---|---|---|
| **Area designation** | **Air pressure relationship to adjacent area** | **Minimum air changes of outdoor per hour** | **Minimum total air changes/hour** | **All air exhausted directly to outdoors** | **Filtration efficiency** | **Re-circulated by means of room units** |
| **Surgery and Critical Care** | | | | | | |
| Operating Theatre | Positive | AS 1668.2 (3) | 20 | 50% | G4-F8 HEPA (1) | No |
| Birthing Room orDelivery Suite | Negative | 5 | 20 | | G4-F9 | No |
| Setup Room andSterile Store | Positive | AS 1668.2 (4) | 15 | | G4-F8 HEPA | No |
| Recovery Room | Positive | AS 1668.2 (5) | 10 | | G4-F8 | No |
| Intensive Care | Positive | 2 | 6 | | G4-F8 | No |
| Neonatal IntensiveCare | Positive | 2 | 6 | | G4-F8 | No |
| Burns | Positive | 3 | 10 | | G4-F8 | No |
| Treatment Room | Positive | 2 | 6 | | G4-F8 | |
| Resuscitation Room | Positive | 3 | 15 | | G4-F8 | No |
| Anaesthesia GasStorage | Negative | 2 | 8 | Yes | G4-F8 | No |
| Endoscopy Room | Negative | 2 | 6 | | G4-F8 | No |
| Bronchoscopy, Sputum Induction and & Pentamidine | Negative | 3 | 12 | Yes | G4-F8 | No |
| Emergency Departmentand Medical Imaging Waiting Room | Negative | 2 | 12 | Yes | G4-F8 | No |
| Emergency Unit Triage | Negative | 2 | 12 | Yes | G4-F8 | No |
| **Nursing** | | | | | | |
| Patient Room | Positive | 2 | 6 | | G4-F8 | |
| Toilet Room / En-Suite | Negative | 2 | 10 | | G4-F8 | |
| Newborn Nursery Suite | Positive | 2 | 6 | | G4-F8 | |
| Protective Environment Room | Positive | AS 1668.2 (4) | 12 | | G4-F8 HEPA | |
| Class N Isolation Room | Negative | AS 1668.2 (4) | 12 | Yes | G4-F8 | No |
| Isolation Alcove Or Anteroom | Neg or Pos | AS 1668.2 (4) | 12 | | G4-F8 | No |
| Patient Corridor | | 2 | 6 | | G4-F8 | |
| **Diagnostic and Treatment** | | | | | | |
| Consult Room | | 2 | 6 | | G4-F8 | |
| Medication Room | | 2 | 6 | | G4-F8 | |
| Treatment Room | | 2 | 6 | | G4-F8 | |
| Physiotherapy &Hydrotherapy | NEGATIVE | 2 | 6 | | G4-F8 | |
| Disposal Room | NEGATIVE | 2 | 10 | Yes | F4 | No |
| Clean Workroom Or Clean Holding | | 2 | 6 | | G4-F8 | |
| Haemodialysis | | 2 | 6 | | G4-F8 | No |
| **Ancillary Radiology** | | | | | | |
| Radiology (Surgical / Critical Care & Catheterisation) | POSITIVE | 3 | 15 | | G4-F9 | No |
| Radiology (Diagnostic & Treatment) | | 2 | 6 | | G4-F8 | |
| Darkroom | NEGATIVE | 3 | 10 | Yes | F7 | No |
| **Laboratory** | | | | | | |
| General | | 2 | 6 | | F7 | |
| Biochemistry | Positive | 2 | 6 | Yes | F7 | No |
| Cytology | Negative | 2 | 6 | Yes | F7 | No |
| Glass Washing | Negative | 2 | 10 | Yes | F7 | No |
| Histology | Negative | 22 | 6 | Yes | F7 | No |
| Microbiology | Negative | 2 | 6 | Yes | F7 | No |
| Nuclear Medicine | Negative | 2 | 66 | Yes | F7 | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pathology | Negative | 2 | 6 | Yes | F7 | No |
| Serology | | 2 | 6 | | F7 | No |
| Sterilising | Negative | 2 | 10 | Yes | F7 | No |
| Autopsy Room | Negative | AS 1668 | 12 | Yes | F7 | No |
| Non-Refrigerated Body Holding Room | Negative | 3 | 10 | Yes | F7 | No |
| Pharmacy | | 2 | 6 | | G4-F8 | |

**Note**: Where a positive or negative pressure is specified a minimum of 5 Pascals difference to the adjacent zones is required.

**Lighting & Equipment**

| **Heat Gain From Equipment** | | |
|---|---|---|
| **Department** | **Lighting W/m²** | **Power W/m²** |
| Medical Surgical Wards | 12 | 5 |
| Orthopaedic | 12 | 5 |
| Paediatric | 12 | 5 |
| | | |
| On-Call Accommodation | 12 | 5 |
| Rehabilitation | 12 | 5 |
| Allied Health | 12 | 5 |
| Psychiatric | 12 | 5 |
| Oncology | 12 | 5 |
| Bio-Medical Engineering | 12 | 10 |
| Medical Imaging – an assessment is also required of pointloads that may be generated by specialist medical imagingequipment. These loads can be high and need supplementary cooling. | 12 | 10 |
| Emergency | 15 | 10 |
| Medical Records | 12 | 5 |
| Pharmacy | 12 | 10 |
| Nuclear Medicine | 12 | 10 |
| Pathology | 15 | 10 |
| Blood Donor Unit | 12 | 5 |
| Medical Library | 12 | 5 |
| Day Procedures | 12 | 10 |
| Operating Suite | 35 | 40 |
| Intensive Care Unit | 15 | 10 |
| Coronary Care Unit | 15 | 10 |
| Mortuary | 10 | 5 |
| Linen Handling | 10 | 5 |
| Regional Store | 8 | 2 |
| Engineering & Maintenance | 8 | 5 |
| Kitchen | 10 | - |
| Staff Cafeteria | 12 | 10 |
| Education | 8 | 5 |
| Main Entrance & Foyer | 8 | 5 |
| Admission/Discharge | 12 | 15 |
| General Administration | 12 | 15 |
| Staff Amenities | 8 | - |

### 8.4.2 Exhaust Design

Exhaust systems that have similar effluents can be combined into a common system as and considered as a value engineering option. These system groupings are detailed below, all systems not listed are to be provided exhaust as per HI guidelines.

**Exhaust group 1:**
- Toilet exhaust
- Cleaners exhaust
- Dirty utility exhaust

**Exhaust group 2:**
- Storage exhaust
- Waiting room exhaust

**Exhaust group 3:**
- Disposal
- Garbage Rooms

**Exhaust group 4:**
- Recovery anaesthetic exhaust
- Anaesthetic induction room exhaust
- Anaesthetic store room exhaust

### 8.4.3 Chilled and Heating Water Plant

A selection of chilled and heating water plant has not been conducted at this stage. Provisionally, the intent is to serve the development with water cooled chillers complete with cooling towers. Condensing boilers will provide the heating hot water. The boilers will be gas-fired provided natural gas or LPG is available on site, otherwise electric type boilers may be considered as an alternative solution. Estimated sizing and system arrangement will be provided at concept design.

### 8.4.4 CSSD Steam Generation Plant

Steam boilers and a clean steam generator will likely be required to provide steam for the CSSD sterilisers. Investigation of mechanical provision of steam to hydraulics for heating of the high temperature hot water and pasteurisation of the RO system is to be conducted during concept Design.

### 8.4.5 List of areas to be served by HEPA filters

- CSSD Clean/Packaging room
- CSSD Sterile/Store room
- Sterile Stock Stores
- Operating Theatres
- Procedure rooms

### 8.4.6 Energy Saving Initiatives

The BCA requires that any air-conditioning system greater than 2000 l/s must have an outdoor air economy cycle. Stantec propose to also provide an outdoor air economy cycle to all air-handling units. This will allow for more economical energy use when outside air conditions are sufficiently cool, and hence reduce annual operating costs due to lower electrical energy consumption.

### 8.4.7 Proposed Generator Backup to Mechanical Systems

It is proposed that the several items of plant be powered from the generators in the event of power failure. This back up power is intended to not only serve life safety systems but also to power areas that always require air pressure regimes to be maintained. It is also intended to provide these important areas with air-conditioning at this stage. A summary of these areas is listed below:

- All Comms Rooms & UPS room
- Operating Theatres & Emergency Department
- Sterile Stock Stores
- CSSD
- Recovery, ICU and CCU wards
- Medical Imaging Department
- Isolation Rooms
- Fume Cupboards
- The items of plant that are required to condition these areas are generally as follows:
    - AHUs and return air fans serving the corresponding areas.
    - FCUs serving the respective areas
    - Exhaust and Outside air fans serving the respective areas
    - Chillers, Cooling Towers, Boilers, Pumps as required

### 8.4.8 Pandemic area considerations

At this stage it is suggested that the consideration of several items of plant be powered from the generators in the event of power failure to allow pandemic ward capabilities. This back up power is intended to not only serve life safety systems but also to power areas that always require air pressure regimes. To be further investigated in concept design.

### 8.4.9 Legislative design requirements

The building is designed to comply with the Building Code of Australia 2019, and all other relevant statutory requirements including Australian Standards:

AS 1228 (2006) Pressure Equipment Boilers

AS 1324.1 (2001)

AS1668.1 (2012), AS 1668.2 (2014), AS 1668.3 (2012) and AS 1668.4 (2012)

AS/NZS 1677 (2002)

AS 1940 (2006) The storage and handling of flammable and combustible liquids AS 2107 (2000)

AS 2243.3, AS 2243.6, AS 2243.8, AS 2243.9 Safety in Laboratories

AS 2252-5

AS 2896 (2021) Medical Gas Systems

AS 2982.1 (2010) Laboratory Design and construction AS/NZS 3000 (2009)

AS/NZS 3666 Part 1 (2011)

AS/NZS 3666 Part 2 (2011)

AS/NZS 3666 Part 3 (2011)

AS3892 (2001) Pressure Equipment installation AS 1940 (2006)

AS 4187 (2014)

AS 4254 (2002)

AS 4260 (1997) HEPA Filters- Classification, Construction and Performance AS 4273

AS 4332 (2005)

AS 4326 (2008)

AS 4426 (1997) Thermal insulation of Pipework, ductworks and equipment selection, installation and finish AS/NZS 5601 (2013)

ISO 14644

NSW HI Engineering Guidelines 2016

### 8.4.10 New Building Mechanical Scope

| HVAC Item | Description |
|---|---|
| Cooling Infrastructure | The Cooling Plant capacity and arrangement will be further developed during concept design. |
| Heating Hot water plant | The Heating Plant capacity and arrangement will be further developed during concept design. |
| CSSD Steam Generation plant | The Steam Generation plant capacity and arrangement will be further developed during concept design. |
| Air Handling | All areas will be supplied via multi zoned air handling units, complete with Variable Air Volume Boxes (VAVs) modulating the required supply air rate to respective rooms<br>Isolation rooms will have dedicated FCU's or dedicated AHU systems, pressurization and outdoor air as required by 1668.2 and NSW HI guidelines.<br>Operating theatres, and all areas that prohibit recirculation will have dedicated AHUs.<br>An outdoor air economy cycle will be provided to all AHUs in accordance with BCA requirements.<br>Ductwork traversing fire and smoke walls has been avoided to minimize capital costs of fire and smoke dampers and recurrent costs of maintenance inspections. |
| Ventilation | Exhaust Ventilation will be provided to:<br>Toilets, Disposal Rooms, Clean Utilities, Dirty Utilities, Isolation Rooms, Cleaners Store, Plant rooms, Photocopy rooms, Fire control rooms, Areas using aesthetic gas, Fume cupboards, CSSD, Clinical Engineering, Plaster rooms, Ancillary areas requiring exhaust<br>Ductwork traversing fire and smoke walls has been avoided to minimize capital costs of fire and smoke dampers and recurrent costs of maintenance inspections. |
| Smoke Management | In Fire mode all automatic Stair pressurization systems and their respective relief air systems will operate. Stair pressurization is provided by a dedicated fan per stair drawing air into a dedicated stair pressurization riser. The stair pressurization riser has openings into the stairwell on every second level to allow the pressurization of the stair. Relief of stair pressurization will be provided by dedicated relief air systems complete with fans mounted on the roof exhausting vertically, drawing air from the fire effected floor via a dedicated riser.<br>Mechanical ventilation and air-conditioning equipment serving areas with critical pressure regimes or critical cooling will continue to operate until smoke is sensed in the ductwork or in the room.<br>All other mechanical ventilation and air-conditioning equipment not required to operate in fire mode will shut down. |
| Building Management and Control System BMCS | Monitor and control all mechanical plant Time clock functions for lighting<br>On / Off Fault monitoring of hydraulic plant/ pumps etc. After hours A/C control<br>Low level interface with security and fire system. Data logging of plant run hours<br>Data gathering to optimise the building energy performance and building tuning<br>Refrigeration leak detection |
| Restricted Ceiling Voids | Risers, bulkheads will be confirmed following confirmation of final FFL's and plant space layout. |

### 8.4.11 Medical gasses scope

| Item | Description |
|---|---|
| Oxygen VIE | A new VIE tank and storage compound will be provided to serve the new site. Sizing will be further investigated as part of Concept Design.<br>Provide reticulation to new building/s and terminal points as required. |
| Medical Air | New dedicated medical air compressors will be provided to serve the new building and will be investigated as part of Concept Design. |
| Scavenge/Suction | Install dedicated suction pumps and reticulate as required |
| Nitrous | Nitrous manpacks will be provided within a centralised gas bottle storage compound to serve the new building. Sizing and consumption will be investigated as part of Concept Design.<br>Nitrous bottles will be stored in dedicated location and reticulated as required. |
| Medical gas pipework reticulation | Med gas pipework to be installed to reticulate gases from plant to new MSPs |

### 8.4.12 Pneumatic tube scope

| Item | Description |
|---|---|
| End Stations | Install new end stations to suit new building layout. |
| Pneumatic Tube | Install pneumatic tube between end stations and diverters, to reticulate back to the pneumatictube head end. |
| Diverters | Install diverters as required to connect multiple end stations back to the head end. |
| Turbine/head end | Install new head end as required to serve site. |

## 8.5 Bushfire and Ecology

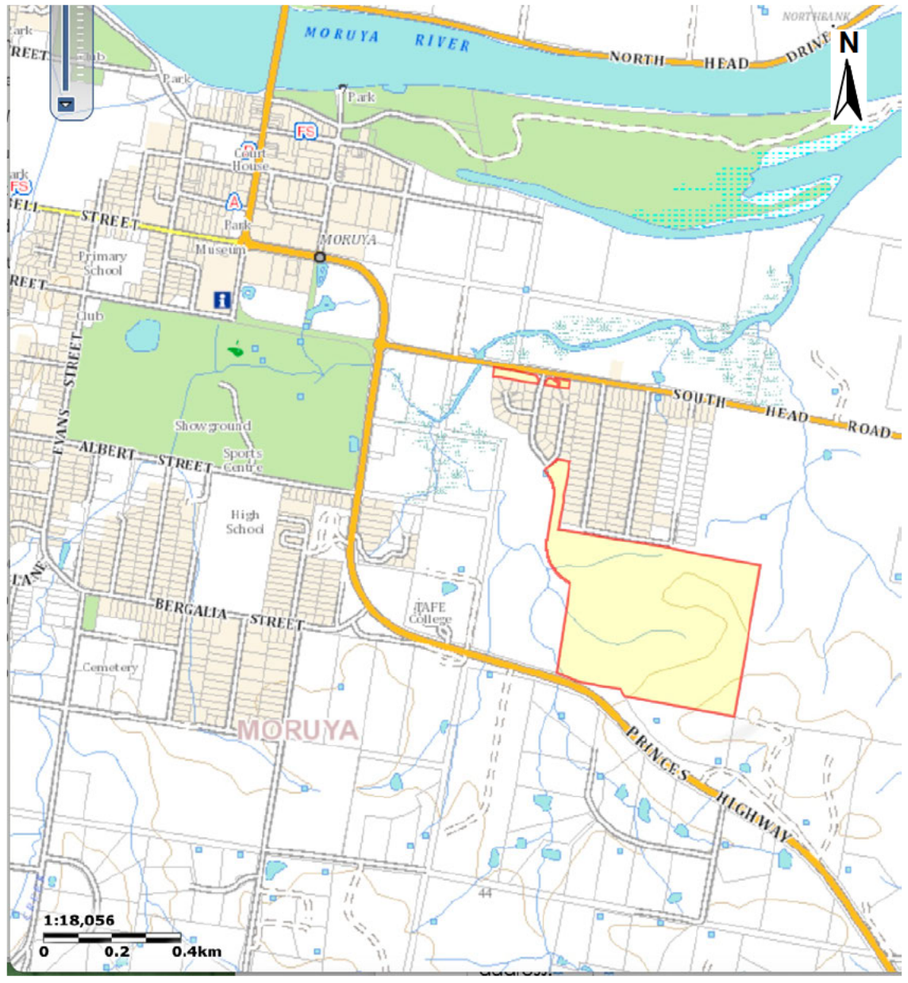



Figure 1: Locality map for new Moruya Hospital.

Site location

Land and property Information NSW. Spatial Information eXchange (SIX) website 2021.

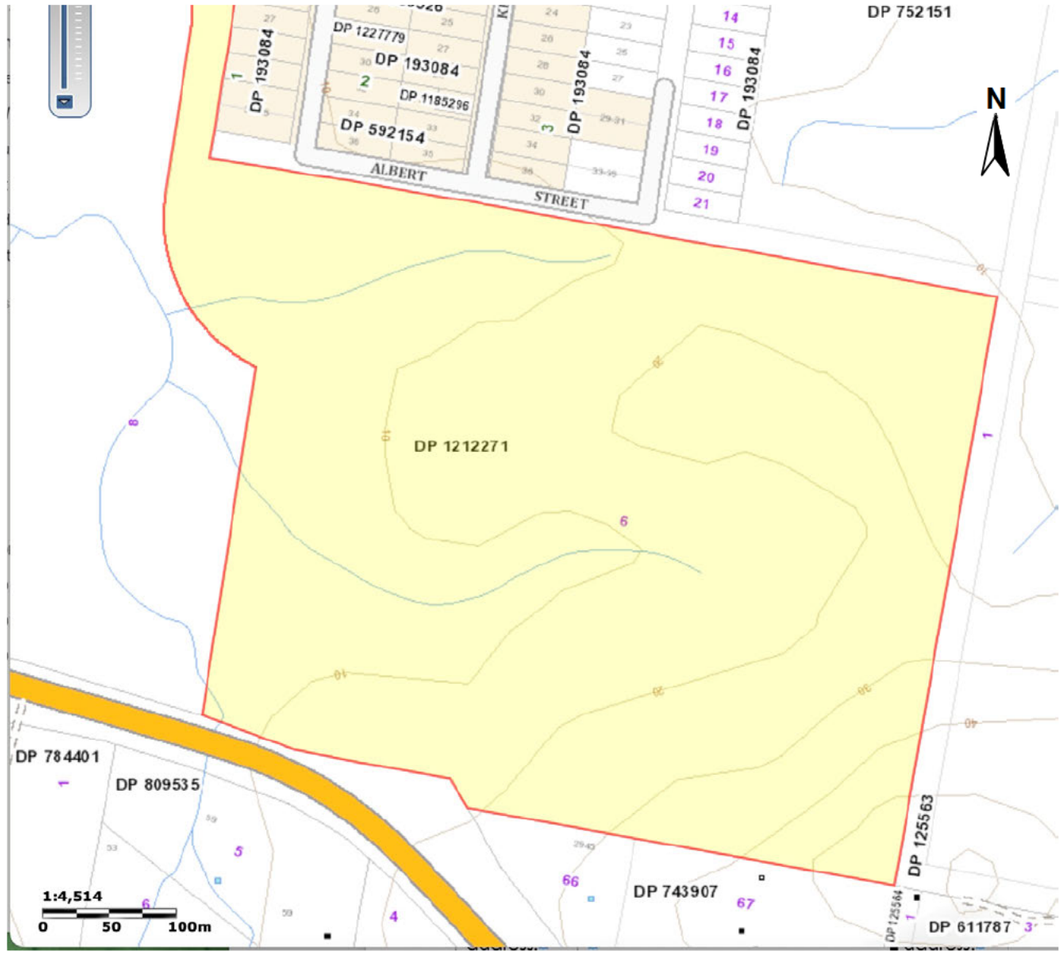



Figure 2: Proposal site map.


Figure 3: Site vegetation aerial photo.

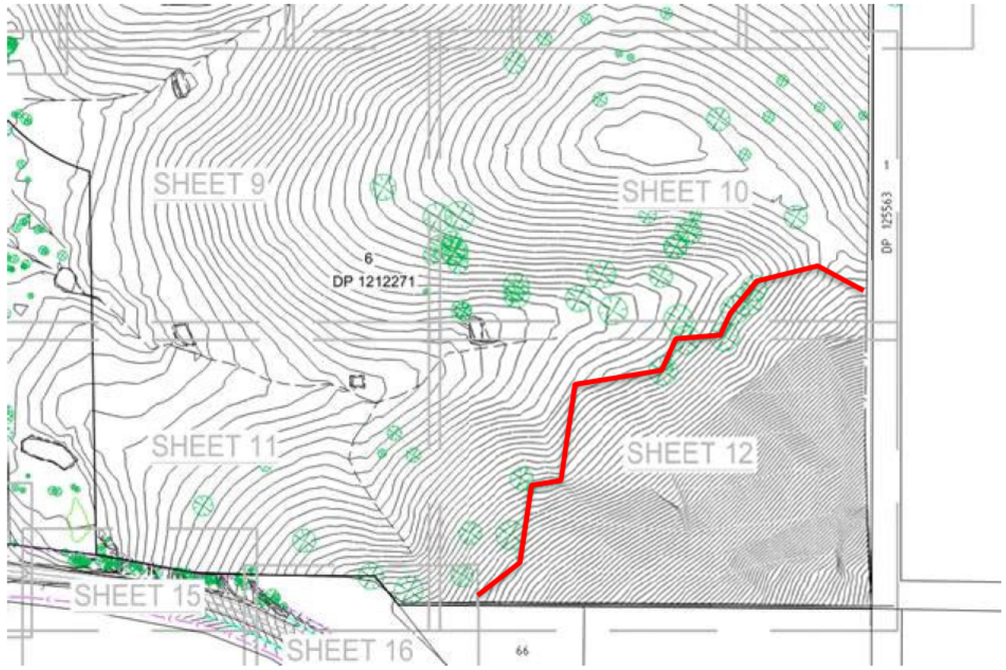



Figure 4: Tree survey forest line by surveyor.

Site location

Detail of forest edge for bushfire protection

Approximate forest line by surveyor

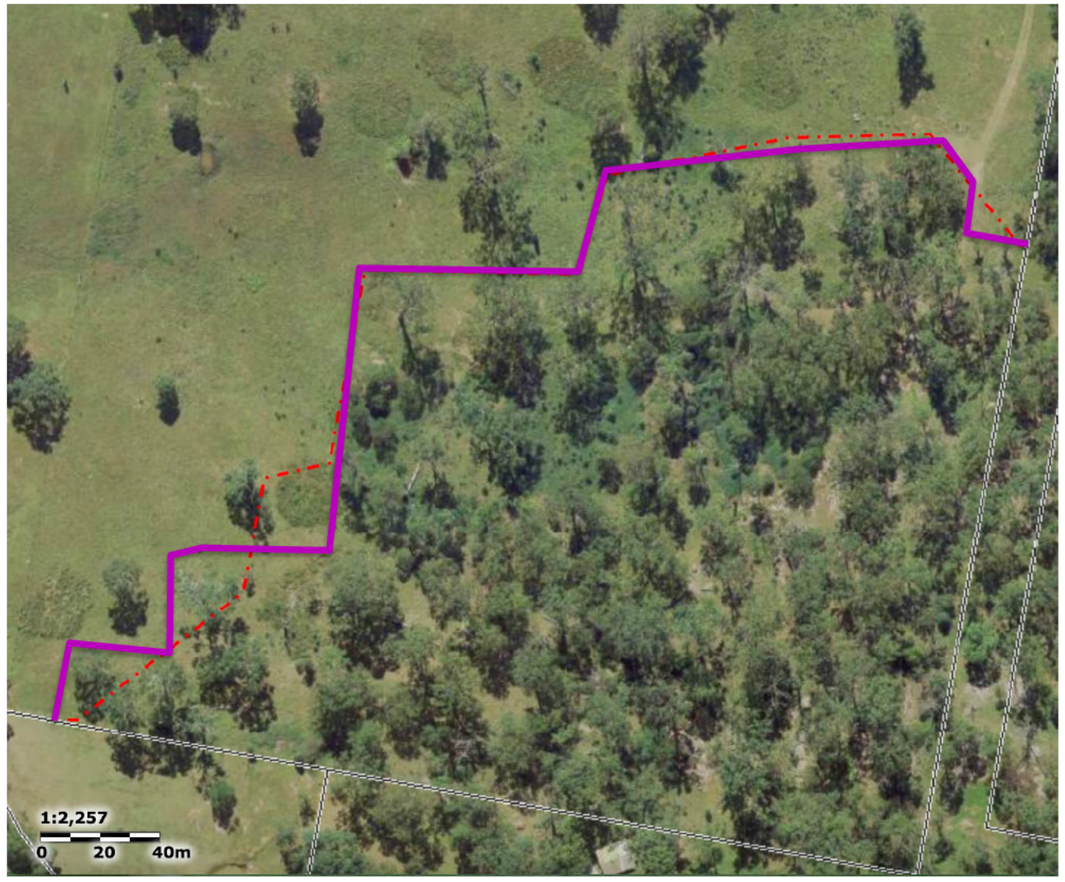



Figure 5: Forest line detail for bushfire APZ limit.

Detail of forest edge for bushfire protection asset protection zone

Approximate forest line by surveyor

Figure 6: Hollow tree and vegetation plot locations.

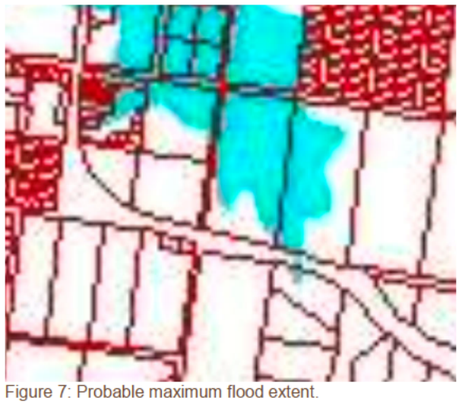


Figure 7: Probable maximum flood extent.

### 8.5.1 Executive Summary

A bushfire and flora and fauna assessment of the proposed new hospital at Moruya ('the site' – Figure 1) was undertaken on 22 February 2021.

The aim of the assessment is to ascertain the potential fire hazard and to survey the vegetation and fauna on site and determine whether it consists of remnant vegetation, or threatened, protected or endangered flora and fauna as prescribed by NSW legislation.

The current site and the adjoining properties are rural grazing with adjoining urban areas of residential dwellings. The vegetation consists of remnant forest of large Eucalypts, flood plain river flat of Casuarinas and upper slopes of grazed pasture with large paddock trees.

Probable maximum flood and Aboriginal cultural heritage also affect the site.

The following conclusions and recommendations apply:

- The site is not mapped as bush fire prone land. However, the vegetation on site is subject to bushfire. A specific asset protection zone of 67 metres is required for the eastern intact forest, and BAL 12.5 construction measures (Australian Standard AS3959) are required for bushfire protection for buildings within 100 metres of the forest or unmanaged grassland. A detailed bushfire assessment report is required to assess any specific proposal for submission in the development approval process.
- It is recommended that any development of the site give consideration to the place and ecological function of stormwater detention basins on the western boundary.
- For any future landscaping Abel Ecology recommends the inclusion of ecologically strategic locally indigenous tree species. Specific tree species may be used to provide foraging habitat for critically endangered migratory species such as Swift Parrot and Regent Honeyeater.
- Specific survey will be required to determine the species of fauna that are using the hollow trees as habitat. That survey will need to be done before the warm season finishes, preferably before May.
- Fauna habitat as tree hollows will need to be relocated or replaced by artificial hollows somewhere within the site.
- A formal bushfire assessment be prepared to guide both architectural design and emergency vehicle access into the hospital.
- There are Aboriginal records on or near the site so a Due Diligence for Aboriginal Cultural Heritage is recommended.
- An arborist assessment is a suitable means to determine use of trees within the development and appropriate tree protection measures.

### 8.5.2 Introduction

A preliminary fauna and flora survey of the proposed development site at Moruya ('the site' – Figure ) was undertaken on 22 February 2021.

The main aim of this survey was to provide preliminary data so that the biodiversity assessment requirements of the *Environmental Planning and Assessment Act 1979,* the *Biodiversity Conservation Act 2016* and the *Biodiversity Conservation Regulation 2017* can be considered.

Three "tests" are to be considered when determining whether a proposal will trigger the biodiversity offsets scheme and require a Biodiversity Development Assessment Report (BDAR) or a Biodiversity Certification Assessment Report (BCAR).

The three tests are;

- Will clearing of native vegetation be greater than the government threshold for the site (Biodiversity Conservation Regulation (cl 7.2(1))?
- Will any activities associated with the proposal take place on the Biodiversity Values Map (Biodiversity Conservation Regulation cl. 7.3))?
- Will the proposal trigger the "test of significance" – the five-part test (Biodiversity Conservation Act cl. 7.7(2))?

The "test is of significance" is used to determine whether the present proposal is likely to cause a significant effect on any endangered ecological community, endangered population, threatened species or their habitats. This assessment is based on the five factors listed under Section 7.3 of the Biodiversity Conservation Act. Where there is a likely significant effect the proposal is to be assessed under a Biodiversity Development Assessment Report (BDAR).

This assessment addresses both 'endangered' and 'vulnerable', as required by the *Biodiversity Conservation Act 2016* (BC Act 2016). Throughout this report 'threatened' refers to those species and communities listed as 'endangered' or 'vulnerable' in Schedules 1 & 2 of the BC Act 2016. 'Protected fauna' refers to any native bird, mammal (except the dingo), reptile or amphibian in NSW.

### 8.5.3 Planning Relationships

Legislation

Section 100B Rural Fires Act 1997,

Biodiversity Conservation Act 2016,

Biodiversity Conservation Regulation 2017,

Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth).

Planning Policies

- Planning for Bush Fire Protection 2019
- Standards Australia (2009) AS 3959, Construction of buildings in bushfire-prone areas
- Adjacent land is controlled by the Eurobodalla Bushfire Risk Management Plan 2019

**Literature Review**

Endangered ecological communities (EECs) of the Eurobodalla region

https://www.esc.nsw.gov.au/environment/native-and-threatened-species/endangered-ecological-communities

Vegetation community profiles:

*Lowland Grassy Woodland in the South East Corner Bioregion*

https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20070

*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*

https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10945

**Survey method**

A comprehensive flora survey was conducted to compile vegetation descriptions and species lists for the site. Three Quadrats of 20 m x 20 m were used as a basis for the vegetation assessment **Error! Reference source not found.**.

The methods of survey undertaken to detect the various faunal groups or their habitat were:

- Observation of scratches and feeding signs on trees; and
- Casual observation of fauna.

A random meander over most of the site was also made to record plant species.

### 8.5.4 The site and proposed development

**The** proposal

The proposal is to build a new hospital in existing exotic pasture grazing land.

Up to 46 hollow-bearing fauna habitat trees will be removed for the development.

A stormwater detention basin is likely to be required to intercept and treat runoff from the site before discharge into adjacent waterways.

**Site description**

For the purposes of this report, the site is defined by the Lot boundaries. It is 30 ha in size and the elevation is 10-40 m above sea level.

The site is sloped to the west.

There are two ephemeral drainage swales aligned east to west across the site, with farm dams installed.

The western boundary is a level flood plain with drainage from the south to the north (Figure).

The adjacent properties are rural and urban residential.

### 8.5.5 Vegetation and fauna habitat description

There are two vegetation communities on site, being forest and pasture. The site was substantially cleared of native vegetation and turned over to pasture which has been grazed for more than 100 years. Open grassy paddocks now occupy most of the site, with an area of mature canopy trees on the south-east quarter and very small groves of Swamp Oak on the western boundary.

Remaining native vegetation includes:

- Pasture - scattered native grasses and herbs as components of exotic-dominated grassy pastures, with large mature remnant trees of *Angophora* and *Eucalyptus*, many with large hollows across the site;
- Forest - a canopy of remnant trees of forest form on the higher rocky ground in the south east corner;
- River flat - very small groves of Swamp Oak *Casuarina glauca* on the western boundary with some disturbed semi-aquatic vegetation;
- Drainage lines - narrow bands of disturbed semi-aquatic vegetation along the drainage channels.

Pasture

The proportion of exotic species in the herb layer is consistently high across the site so there is no area that is regarded as a native community or derived grassland from a cleared forest area.

Native grasses and herbs occur through most of the extensive paddock areas, though they generally comprise a small part of the overall grassy biomass. Two plots in the upslope grasslands were surveyed to determine species composition and estimate relative species cover. Exotic grasses generally dominate throughout paddock areas and are estimated to comprise greater than 70% of the total cover. Particularly common pasture species include Paspalum *Paspalum dilatatum* and Carpet Grass *Axonopus fissifolius*.

Native species such as Redleg Grass *Bothriochloa macra*, Lovegrass *Eragrostis leptostachya*, Weeping Grass *Microlaena stipoides* and Rat-tail Grass *Sporobolus creber* are locally common through some areas, particularly on the upslope (eastern) side of the site although they comprise a smaller percentage of the biomass.

Herbs and forbs occur throughout the grassy paddocks and commonly include several weeds such as Flatweed *Hypochaeris radicata*, *Cyperus sesquiflorus* and *C.brevifolius*, and native species such as *Glycine* spp., Golden Weathergrass *Hypoxis hygrometrica* and Bluebells *Wahlenbergia gracilis*.

The mixed species composition and abundance of grazed areas (most of the site) is unlikely to qualify as a 'derived grassland', given the generally greater abundance of exotic grasses throughout. The threshold for a native community is 50% native cover, but on this site is <30%.

Scattered trees across the site are in varying condition including healthy, stressed, dying and dead. There is an unusually high proportion of the trees stressed and dying, possibly resulting from the drought up to January 2020, with the trees growing in shallow soils on granite bedrock. Several mature Forest Red Gum and Broad-leaved Apple have large hollows which have formed after large branches have fallen. More than 45 hollow-bearing habitat trees were identified on the site (Table).

Forest

Most of the original native vegetation on the site was possibly a form of, or allied to, the Endangered Ecological Community known as Lowland Grassy Woodland in the South East Corner Bioregion. From the Final Determination document for that community, listed tree species including Forest Red Gum Eucalyptus tereticornis, Rough-barked Apple Angophora floribunda and Hickory Acacia implexa occur on the site, while other species not listed include Broad-leaved Apple Angophora subvelutina and Thin-leaved Stringybark Eucalyptus eugenioides. Listed canopy species which appear to be absent from the site include Eucalyptus baueriana, Bosisto's Box E.bosistoana, Yellow Box E.melliodora and Ribbon Gum Eucalyptus viminalis.

Native understorey species are generally absent from the site though small saplings of *Acacia* spp. occur rarely as scattered plants beneath remnant forest canopy on the south-east. The forest has numerous fallen trees, logs and coarse woody debris. The herb layer is kept low by grazing but there are very few shrubs.

Dominant trees include Forest Red gum *Eucalyptus tereticornis*, Stringybark *Eucalyptus eugenioides* and Broad-leaved Apple *Angophora subvelutina* and Rough-barked Apple *Angophora floribunda*. Rare small trees include *Acacia implexa* and *Exocarpus cupressiformis.*

River flat

The western boundary is along a floodplain flat that has some She-oak trees *Casuarina glauca* with a pasture understorey of mostly exotic species. The small groves of mature Swamp Oak *Casuarina glauca* on the western boundary are probably part of original river flat forest. Common species of the lower swale sections and the wetland include *Carex* appressa, the Sedge *Cyperus sanguinolentus*, the Rush *Juncus gregiflorus*, the Spike-rush *Eleocharis dietrichiana*. The weed Umbrella Sedge *Cyperus eragrostis* also occurs in places and several small plants (30cm) of Sharp Rush *Juncus acutus*, a high-threat exotic species, occur by the fence line near the northern grove of Swamp Oak.

Drainage lines

Two drainage lines, which structurally form two broad swales, carry overland flow to the western boundary and feed a band of wetland vegetation connecting the swales. The native Water Couch *Paspalum distichum* is distributed as scattered patches in the small farm dams on drainage lines and in the lower wetland on the western boundary.

None of the site drainage lines have defined bed or banks and there is no aquatic vegetation in the drainage swales that is a defined riparian community. Pasture species of grasses, sedges and forbs extend through the drainage swales.

The pasture extends to the flood plain. It may have originally been *Swamp Oak Floodplain Forest* but has now only some small *Casuarina glauca* She-oaks present.

### 8.5.6 Significant environmental features

Exposed bedrock in the highest elevation along the eastern boundary has no crevices, caves or boulders that could be regarded as fauna habitat. The soil profile across the pasture areas of the site appears to be very shallow.

In the pasture area there are isolated trees, 46 of which are hollow to some extent, both live and dead, so provide habitat for a range of fauna.

Some trees have extensive scratches that indicate common brushtail possums sleep in the hollows. A falcon was active on the site during our survey, and appeared to centre on a particular hollow tree, possibly a nest site. Other fauna that use such hollows include threatened and common species of microbats, some reptiles such as goannas, various bird species and tree frogs.

Any large trees that are desirable to retain for aesthetic and amenity reasons within the landscape may be affected by earthworks, drainage and changes to soil hydrology. An arborist assessment is an appropriate means to determine tree root zones in order to decide whether to retain a tree and if so how it may best be protected during construction.

Table 2: Hollow bearing trees

| Tree number | Hollow bearing tree species | Comment |
|---|---|---|
| 1 | Angophora subvelutina | |
| 2 | Eucalyptus tereticornis | |
| 3 | Eucalyptus tereticornis | |
| 4 | Eucalyptus tereticornis | |
| 5 | Angophora subvelutina | |
| 6 | Angophora subvelutina | |
| 7 | Angophora subvelutina | |
| 8 | Eucalyptus tereticornis | |
| 9 | Eucalyptus sp. (dying) | Dying tree |
| 10 | Eucalyptus tereticornis | Beside fam dam |
| 11 | Eucalyptus tereticornis | |

| | | |
|---|---|---|
| 12 | Eucalyptus tereticornis | |
| 13 | Eucalyptus tereticornis | |
| 14 | Angophora subvelutina | |
| 15 | Angophora subvelutina | |
| 16 | Eucalyptus tereticornis | Top of ridge |
| 17 | Eucalyptus tereticornis | Very poor condition |
| 18 | Eucalyptus tereticornis | Very poor condition |
| 19 | Eucalyptus tereticornis | On fence line |
| 20 | Angophora subvelutina | Very large tree in the NW corner |
| 21 | Angophora subvelutina | Tree in NW corner |
| 22 | Angophora subvelutina | Tree in NW corner |
| 23 | Dead (stag) | Beside north boundary |
| 24 | Eucalyptus eugenioides | |
| 25 | Eucalyptus tereticornis | In drainage swale |
| 26 | Eucalyptus eugenioides | |
| 27 | Eucalyptus eugenioides | |
| 28 | Eucalyptus tereticornis | |
| 29 | Eucalyptus tereticornis | In drainage swale |
| 30 | Eucalyptus eugenioides | |
| 31 | Eucalyptus tereticornis | |
| 32 | Angophora subvelutina | |
| 33 | Eucalyptus tereticornis | |
| 34 | Eucalyptus tereticornis | |
| 35 | Angophora subvelutina | |
| 36 | Angophora subvelutina | |
| 37 | Eucalyptus eugenioides | |
| 38 | Eucalyptus eugenioides | |
| 39 | Eucalyptus eugenioides | |
| 40 | Eucalyptus tereticornis | |
| 41 | Eucalyptus tereticornis | |
| 42 | Eucalyptus tereticornis | Beside highway fence |
| 43 | Eucalyptus tereticornis | Beside highway fence |
| 44 | Dead (stag) | Beside highway fence |
| 45 | Dead (stag) | Beside highway fence |
| 46 | Angophora subvelutina | |

### 8.5.7 Threatened Flora and Fauna

A range of threatened species of flora and fauna occur in the area, some of which have potential habitat on the site (Tabl).

No part of the land has been identified as critical habitat.

Specific tree species in the area are used by fauna to provide foraging habitat, particularly for critically endangered migratory species such as Swift Parrot and Regent Honeyeater. Those trees are not present on site but include *Corymbia maculata* Spotted Gum and *Eucalyptus robusta* Swamp Mahogany.

Specific survey will be required to determine the species of fauna that are using the hollow trees as habitat. That survey will need to be done before the warm season finishes, preferably before May. The critical factor is average overnight minimum temperature, which affects nocturnal activity of microbats. There are four such species that are likely to use large hollow trees such as are present on site, for day roosts and breeding.

Table 3: Threatened fauna species that may occur on the site

| Scientific Name | Common Name | NSW status | Commonwealth status |
|---|---|---|---|
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | V | |
| *Lophoictinia isura* | Square-tailed Kite | V | |
| *Pandion cristatus* | Eastern Osprey | V | |
| *Calyptorhynchus lathami* | Glossy Black-Cockatoo | V,2 | |
| *Glossopsitta pusilla* | Little Lorikeet | V | |
| *Lathamus discolor* | Swift Parrot | E1 | CE |
| *Ninox strenua* | Powerful Owl | V | |
| *Tyto novaehollandiae* | Masked Owl | V | |
| *Anthochaera phrygia* | Regent Honeyeater | E4A | CE |
| *Stagonopleura guttata* | Diamond Firetail | V | |
| *Dasyurus maculatus* | Spotted-tailed Quoll | V | E |
| *Phascolarctos cinereus* | Koala | V | V |
| *Petaurus australis* | Yellow-bellied Glider | V | |
| *Petaurus norfolcensis* | Squirrel Glider | V | |
| *Petauroides volans* | Greater Glider population in the Eurobodalla local government area | E2 | V |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V |
| *Micronomus norfolkensis* | Eastern Coastal Free-tailed Bat | V | |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | V | |
| *Myotis macropus* | Southern Myotis | V | |
| *Miniopterus orianae oceanensis* | Large Bent-winged Bat | V | |

### 8.5.8 Threatened ecological communities

Two forest endangered ecological communities occur in the Eurobodalla area around Moruya and may have been on the site in the past.

Those are *Lowland Grassy Woodland in the South East Corner Bioregion* and *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*

The remnants of those communities are required to be addressed as such in any ecological impact assessment for a development, under the *Biodiversity Conservation Act 2016.*

The appropriate format is a Prescribed Ecological Actions Report (PEAR) under the Biodiversity Conservation Act 2016.

## 8.6 Bushfire

Survey methods were applied in accordance with assessment methodology set in Appendix 2/1 of *Planning for Bushfire Protection 2019*, for Special Fire Protection Purpose, being a hospital development. A need for assessment will likely be triggered under the *Environmental Planning and Assessment Act 1979.*

The relevant considerations are on page 89, **Table A1.12.1** Minimum distances for APZs – SFPP developments (<10kW/m2, 1200K).

Eurobodalla Shire is in the Far South Coast Region for bushfire assessment purposes, with a Fire danger index FFDI =100.

There is evidence of a past bushfire having occurred on the site. The site is not presently mapped as being bushfire prone but the existing bushfire prone land map will be updated now that the new *Planning for Bushfire Protection 2019* document has been published. The map is expected to show that land as being bushfire prone.

A surveyor has plotted both the forest area in the east of the site and individual paddock trees (Figure ). The area likely to be a bushfire hazard are the stand of trees to the east part of the site (Figure, Figure ) and open grassland. Open grassland that is unmanaged, that is unmown, also poses a wildfire hazard. Since the pasture is not a native vegetation community there is no impediment to management by mowing in order to eliminate grassland as a bushfire hazard.

The land under the forest is level from or upslope (slope 9˚) of any development area, requiring an asset protection zone clearance of 67 metres from forest the wall of any building used by staff or patients and 36-45 metres for unmanaged grassland.

A perimeter road and carparks or other structures not used by staff may be located within the bushfire asset protection zone. Any ambulance delivery bay is not to be within the APZ. A detailed bushfire assessment report is required to assess any specific proposal for submission in the development approval process.

## 8.7 Traffic and Carparking Master Planning Report

### 8.7.1 Traffic Summary

The subject site is located south-east of the Moruya local centre on the Princes Highway and has two proposed access locations, being a primary access on the Princes Highway and a secondary access on Albert Street. The Princes Highway is constrained by the existing road conditions, predominately the steep incline to the west of the site and restricted sight lines due to the curve/crest combination. TfNSW plans to construct a bypass of the Princes Highway for Moruya, however the planned alignment and timing of the construction has yet to be announced. Depending on the preferred alignment of the Moruya Bypass, this road upgrade has the potential to impact through traffic passing the site on Princes Highway as well as traffic distribution to and from the new Hospital.

An assessment of access options identified that a priority-controlled access intersection was not suitable for the primary access based on operations. Primary access is proposed via the Princes Highway and access will need to occur west of the culvert which is located under the Princes Highway and on the site frontage. The assessment determined that either a roundabout or signalised intersection would be suitable from a capacity perspective. A roundabout is the preferred access arrangement from an operational perspective. However, there are numerous design constraints on the subject site's Princes Highway frontage including a culvert, high speed road environment as well as horizontal and vertical curves. The access form and design will be subject further civil engineering investigations and consultation with TfNSW and Council.

A secondary access to the north is recommended for redundancy purposes, consistent with the proposal. This would be in the form of a driveway crossover and managed with boom gates to restrict access. Management of the northern access will be critical in restricting rat-running through the subject site.

### 8.7.2 Parking Summary

An assessment of parking demands was undertaken based on Council's minimum requirements, peak parking based on TfNSW rates and a comparison of parking provided for the recently approved regional greenfield hospitals identified the minimum parking provision required for the EHS as follows:

— A minimum of 425 car parking spaces is required for 137 bed proposal based on an equivalent parking rated adopted from the Tweed Valley Hospital

— A further 93 spaces will be required to cater for the CSP yield of 167 beds

— A further 42 spaces to accommodate ancillary supporting health service land uses.

### 8.7.3 Services Vehicles

It is understood that the largest vehicle required to be catered for will be that of a 19m articulated vehicle. Refuse collection will also occur on-site and will be expected to include various refuse collection types including but not limited to bulk bins, compactor systems and medical waste.

### 8.7.4 Active Transport

There is very little in terms of active and public transport surrounding the site. Footpaths stop at the adjacent TAFE campus located to the west of the site on Princes Highway and the nearest bus stop, also located on the TAFE campus, is serviced by a singular bus route. Both active and public transport provisions will be required as part of the development and integration with surrounding facilities. This will include provision of an on-site bus stop and provisions for a bus to turnaround on-site. An active transport connection will be required in the form of a shared path connection from the existing shared path fronting the TAFE the main entry of the hospital.

Further detailed investigations will be required as part of the ongoing EHS Master Plan works in which more targeted traffic and transport engineering assessments will be undertaken.

### 8.7.5 Masterplan Considerations

Four masterplan options were prepared by the design team and include different configurations with respect to traffic and transport components. Below outlines the key transport objectives and principles that were considered when assessing the masterplan options and for further ongoing masterplan development. Table 8.1 provides a summary review of each option.

— Traffic and Access

- Provide adequate vehicular access to the site via the Princes Highway to cater for forecast demand traffic volumes
- Manage impacts of potential through traffic to the site's road network, hospital operations and internal traffic flow
- Provide an internal road layout that separates the various vehicle types and travel modes
- Provide an internal road network and pick-up / drop-off areas to clearly separate the Emergency Department's from general Hospital entrance
- Provide an alternate vehicular access point in the event of an emergency when the primary access may be impacted (i.e. flooding, bushfire or traffic accident)
- Provide an internal road layout that caters for changes in traffic flow in the event of an emergency or closure of the Princes Highway access.

— Emergency Vehicles

- Provide an intersection form and internal road network than enables direct access for emergency vehicles to the emergency department and ambulance vehicle parking areas
- Provide an internal road network which avoids ambulance vehicles from passing through the general pick-up / drop-off area or high pedestrian activity areas around the Hospital
- Consider the need for separate secure "sallyport" parking area needs and locations for emergency vehicles including ambulance or police vehicles.

— Parking

- Provide car parking on site to meet the needs of the Hospital operations and allow for future expansion
- Position car parking on the site to minimise vehicle conflicts and queueing around the Hospital entry or Emergency Department
- Locate the designated staff parking to allow for safe and secure pedestrian movement for staff to and from the Hospital entrance at all times
- Position parking for persons with a disability (PWD) in close proximity to the Hospital entrance with appropriate pathway connections and crossing facilities.

— Walking and Cycling

- Provide an internal pedestrian pathway network and internal road layout which minimises the need for crossing internal roads and traversing areas of significant grades
- Provide pathways linking the car parking area to the Hospital building
- Provide end-of-journey cycle facilities for staff and visitors.

— Public and Community Transport

- Provide pick-up / drop-off areas to accommodate public bus and community transport vehicles
- Consider parking needs or overflow 'layover' areas for larger passenger or community transport vehicles.

— Services Vehicles

- Provide an internal road layout to accommodate the design service vehicle turn paths
- Separate back-of-house service vehicles areas and access from general traffic areas.

| Aspect | Option 1 | Option 3 | Option 4 | Option 4 (b) |
|---|---|---|---|---|
| Public Traffic accessibility and through traffic | Drop-off route located en route to car parking and as a left turn in<br>Pedestrian movements between car park and hospital miss the busiest section of the access road and away from ambulances<br>Drop-off allows passengers to get out on left hand side<br>Road allows circulation back to main entry<br>Route not attractive for use by residents to the north as a short cut<br>Rear access is to an unformed road<br>Distance between spine road and drop off area seems unnecessarily excessive<br>Angled parking conflicts with traffic flow to drop-off areas | Drop-off on opposite side of the road to building – no pedestrian protection? A drop-off 'loop' in front of building would resolve this<br>No separated drop-off area<br>No easy bus/taxi recirculation opportunity<br>Western route attractive for use by residents<br>Western route intersection has limited separation from main access<br>Main route not attractive for use by residents to the north as a short cut<br>Pedestrian movements between car park and hospital separated from traffic<br>Rear access is to a formed, wide road | Drop-off route located en route to car parking and as a left turn in<br>Pedestrian movements between car park and hospital miss the busiest section of the access road and away from ambulances<br>Road allows circulation back to main entry<br>Main route not attractive for use by residents to the north as a short cut<br>Western route attractive for use by residents to the north as a short cut<br>Rear access is to an unformed road<br>Western route intersection has limited separation from main access<br>Distance between spine road and drop off area seems unnecessarily excessive<br>Can green space and hospital pad be 'flipped' or split east and west of building<br>Angled parking conflicts with traffic flow to drop-off areas | Drop-off route located en route to car parking and as a left turn in<br>Pedestrian movements between car park and hospital miss the busiest section of the access road and away from ambulances<br>Road allows circulation back to main entry<br>Western route attractive for use by residents to the north as a short cut<br>Rear access is to an unformed road<br>Distance between spine road and drop off area seems unnecessarily excessive<br>Can green space and hospital pad be 'flipped' or split east and west of building<br>Angled parking conflicts with traffic flow to drop-off areas<br>No separation for service vehicles – service vehicles circulate through car park<br>No separation for ambulances |
| Parking locations | ½ of the parking located close to the building<br>½ of the parking a reasonable walking distance away<br>Future car parking a reasonable walking distance away<br>Split car parking, some excess circulation | Parking located close to the building<br>No future / overflow parking area | Parking located close to the building<br>Good staged parking development opportunities<br>Parking 'loads from the front' – no excess circulation | Parking located close to the building<br>Good staged parking development opportunities<br>Parking 'loads from the front' – no excess circulation |
| Emergency vehicles and services | ED entry aisle separated from general traffic<br>Long sections of shared spine route – may need wider road inbound with auxiliary lane<br>No separation between ED and servicing | ED entry aisle separated from general traffic<br>Long sections of shared spine route – may need wider road inbound with auxiliary lane<br>No separation between ED and servicing | ED entry aisle separated from general traffic<br>Long sections of shared spine route – may need wider road inbound with auxiliary lane<br>No separation between ED and servicing | Long sections of shared spine route – may need wider road inbound with auxiliary lane<br>ED entry aisle not separated from general traffic<br>ED entry not the first point of entry |

### 8.7.6 Next Steps

The Desktop Traffic Assessment has utilised available information to review the transport context and inform the masterplan development and options analysis phase. Further detailed traffic and transport assessments will be undertaken to refine the preferred masterplan and inform the traffic and transport components. These assessments will include:

- A survey of existing traffic and parking demands for existing hospitals within Eurobodalla Shire including at Batemans Bay and Moruya
- Detailed traffic and road geometry investigations surrounding the site including the proposed primary access location on the Princes Highway
- Consultation with TfNSW regarding the planned Moruya Bypass Project and its impacts on traffic and access arrangements for the site
- Network traffic analysis of the proposal to identify road network requirements and operational impacts
- A review of walk and cycle connectivity to the site from the surrounding area
- A review of public and community transport needs for the site
- More detailed internal transport and movement assessments to inform spatial requirements.

## 8.8 Hydraulic and Fire

### 8.8.1 Background

The Eurobodalla Health Service (EHS) is part of the “Eurobodalla Clinical Services Plan (CSP)” formed in 2020. Currently, the Eurobodalla Shire is supported by 3 different campuses located at Batemans Bay, Moruya, and Narooma. With a growing and aging population, the current arrangement of campuses will have proved to be inefficient in providing adequate care to its surrounding community, as it suffers from a duplication and separation of services.

In 2020, the NSW Government announced a total of $200 million towards the development of a sustainable, modern, and purpose-built facility to support the needs of the entire Eurobodalla Shire from Narooma to Batemans Bay.

The EHS development will deliver new contemporary Medical, Surgical, Allied Health and Mental Health infrastructure along with new clinical and non-clinical support services. The development will include the following Clinical Services Configuration:

— Intensive Care Services
— Renal Dialysis
— Ambulatory Services
— Paediatrics
— Maternity and Neonatal Services
— Sub-Acute Care (Rehabilitation / GEM and Palliative Care)
— Acute Inpatient – Medical and Surgical
— Perioperative – Surgical Care

The full schedule of the Clinical Service Configuration is listed in EHS Redevelopment Report V1.2 dated 8 February 2021.

### 8.8.2 Site location and adjacencies

The EHS site is located in South-East Moruya and is bounded by Albert Street to the north, Princes Highway to the south, TAFE to the west and Congo Road to the east. The final layout of the EHS’s facilities are yet to be decided as of the writing of this master plan, with one of two options (option 1 or 4) to be selected as the preferred arrangement for the development.

In the future, a level of integration is expected between the EHS development and the Moruya Bypass project, with consultation and coordination between TfNSW and HI continuing to occur throughout the development of both projects. The objective will be to provide opportunities for improved access for residents of the Batemans Bay and Narooma regions, to the TAFE, town, and new hospital. Interim and permanent options for patient access will be considered to accommodate for the later completion date of the Moruya Bypass.

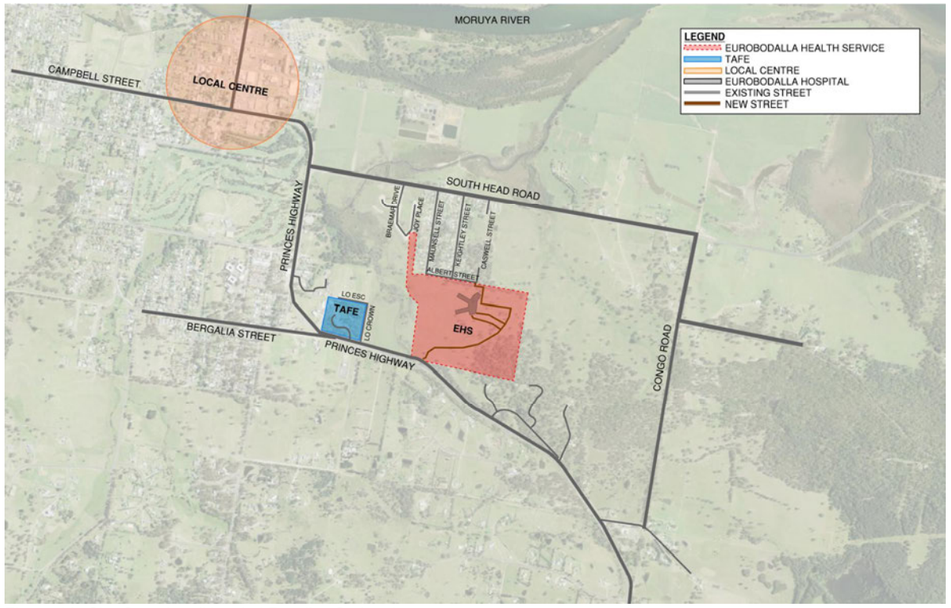



Figure 1A: Site Overview (Hospital Road) – Option 1

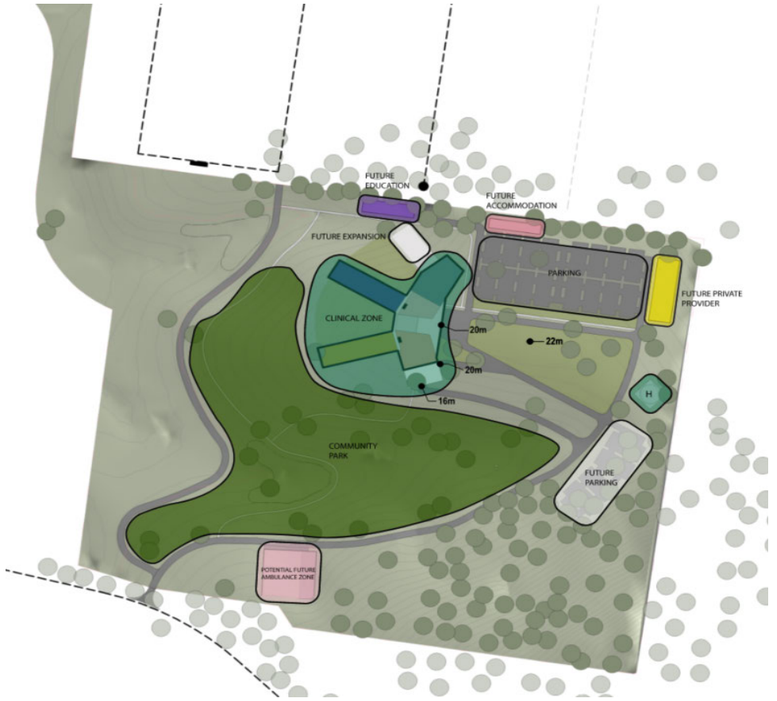



Figure 1B: Precinct Overview (Hospital Road) – Option 1

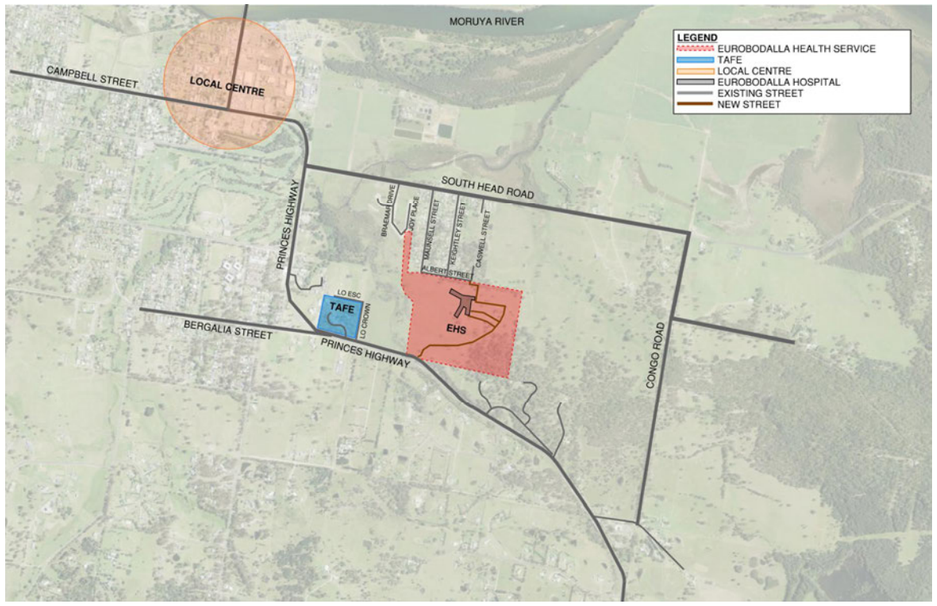



Figure 2A: Site Overview (Town Square) – Option 4

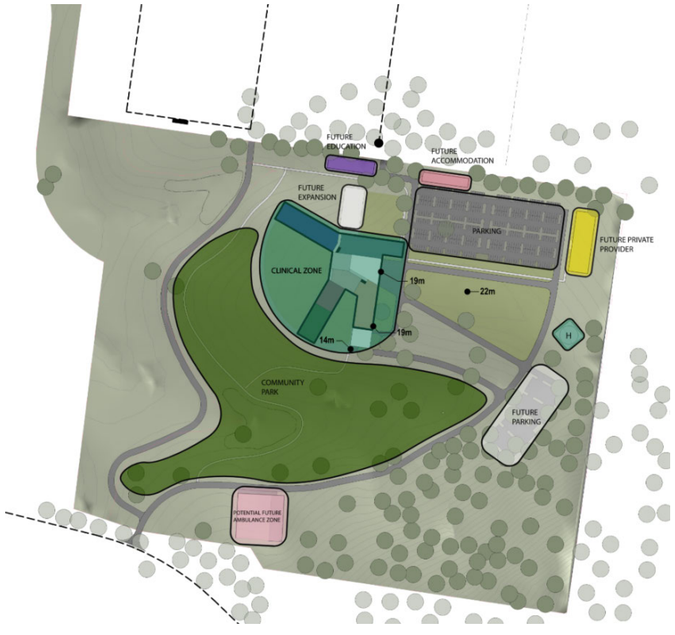



Figure 2B: Precinct Overview (Town Square) – Option 4

### 8.8.3 Zone Locations

Zone locations allows for the identification of industrial, residential, environmental, and commercial areas around the site. This information will be used for the planning of decisions and the managing of the way land is used within the local government area.

The following zones have been identified around the EHS area.

— B2 Local Centre
— E2 Environmental Conservation
— IN1 General Industrial
— R2 Low Density Residential
— RE2 Private Recreation
— RU1 Primary Production
— RU4 Primary Production Small Lots
— SP2 Infrastructure

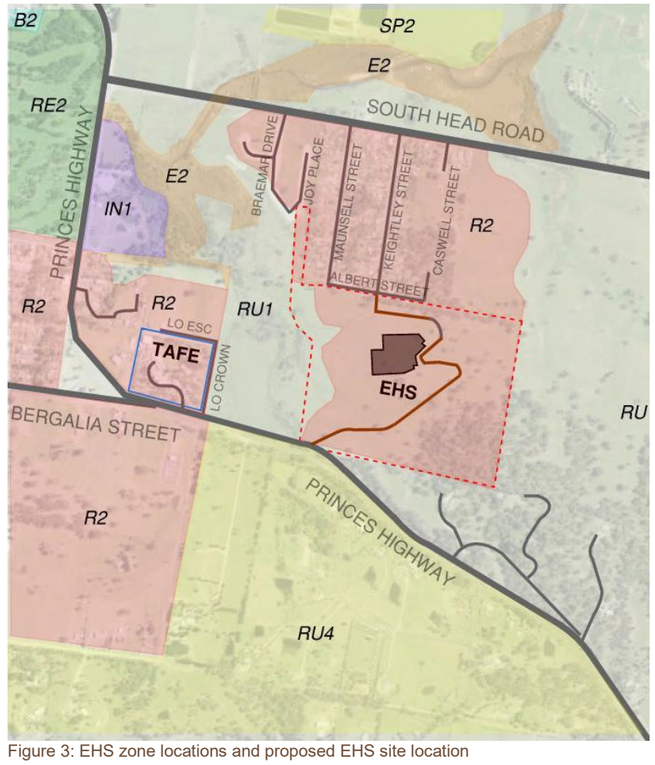



Figure 3: EHS zone locations and proposed EHS site location

### 8.8.4 Purpose of Masterplan

The focus of this hydraulic and fire services assessment has been to analyse the existing site and surrounding buildings, to understand the existing constraints and available utilities around the site to inform the proposed master planning and identify the risk and opportunities associated with the proposed development.

The content of this document should be read in conjunction with the documents produced by the Architect and other consultants for all other disciplines.

8.8.5 Sources of Information

The following sources of information have been used in preparation of this report

— Eurobodalla Health Service SoA based on CSPV3.0 dated 04/02/21.

— Architectural 'Eurobodalla Hospital Master - Plan Presentation' dated February 2021.

— Eurobodalla Shire Council water and sewerage drawings dated March 2021.

— Eurobodalla Health Service Master Plan Design Assumptions dated 11/03/21.

— Eurobodalla Health Services Redevelopment – Value Management Study – V1.1 dated February 2021.

— Level and Details Survey prepared by LTS dated 23/02/2021

It is noted the sources of information used in the preparation of this report do not provide a complete set of documentation. During the further stages of design, Arup will provide recommendations as to any further inspections and testing necessary.

8.8.6 Scope and Limitations

— This report is based on a desktop study. Additional surveys and investigations might be required if certain options are to be considered further.

— Any future fire engineering requirements that have not been considered during this phase should be considered once BCA Report/Statement is provided.

— No detailed calculations or quantitative assessments of the adequacy or compliance of the building to current design codes or the National Construction Code (NCC) were carried out as part of this report, nor was any physical materials testing carried out or enquiries made of statutory authorities in connection with the building.

8.8.7 General Assumptions

a) Importance Level 4

b) Bushfire Hazard Assessment (to be advised, if any)

c) National Construction Code 2019 (NCC)

d) Building classification – to be confirmed based on the BCA Report:

e) All applicable Australian Standards

8.8.8 Existing H&F Infrastructure

This section describes existing utility infrastructure located in proximity of the Eurobodalla Health Service area. The approximate location of utilities services has been determined based on data provided from the Eurobodalla Shire Council.

Cold Water for Domestic Cold Water and Fire Services

***Existing Authority Infrastructure***

Existing water mains are available running along roads adjacent to the site as follows:

— Eurobodalla Shire Council:

- Albert Street:
  200mm asbestos-cement (AC) main, TWL 119.9m.
  200mm polyvinyl chloride (PVC) main, TWL 60m.
- Lo Crown:
  200mm asbestos-cement (AC) main, TWL 119.9m.
  150mm polyvinyl chloride (PVC) main, TWL 60m.
- Princes Highway:
  450mm ductile iron cement mortar lined (DICL) main, TWL 119.9m.
  100mm polyvinyl chloride (PVC) main, TWL 60m.
- South Head Road:
  Pipework to be determined, TWL 77.5m.

The water mains around the site are supplied from three different pressure zones. Moruya Low Pressure Zone (TWL 60m) and Moruya Heads Pressure Zone (TWL 77.5m) are the low-pressure zones and Moruya High Pressure Zone (TWL 119.9m) is the high-pressure zone servicing the site. The pressure from the cold-water pipework will govern if the fire or cold water system for the EHS will require additional infrastructure requirements.

**See Appendix A** for Existing Pressure Zone Reticulation of Cold-Water Mains

**Existing Private Cold-Water Infrastructure**

Based on the discission with Council Engineering team and review existing infrastructure we understand the there is no private cold water or fire services infrastructure crossing or connected to the EHS site.

The next sections of the report provide preliminary assessment of the current infrastructure and proposed options for service connections.

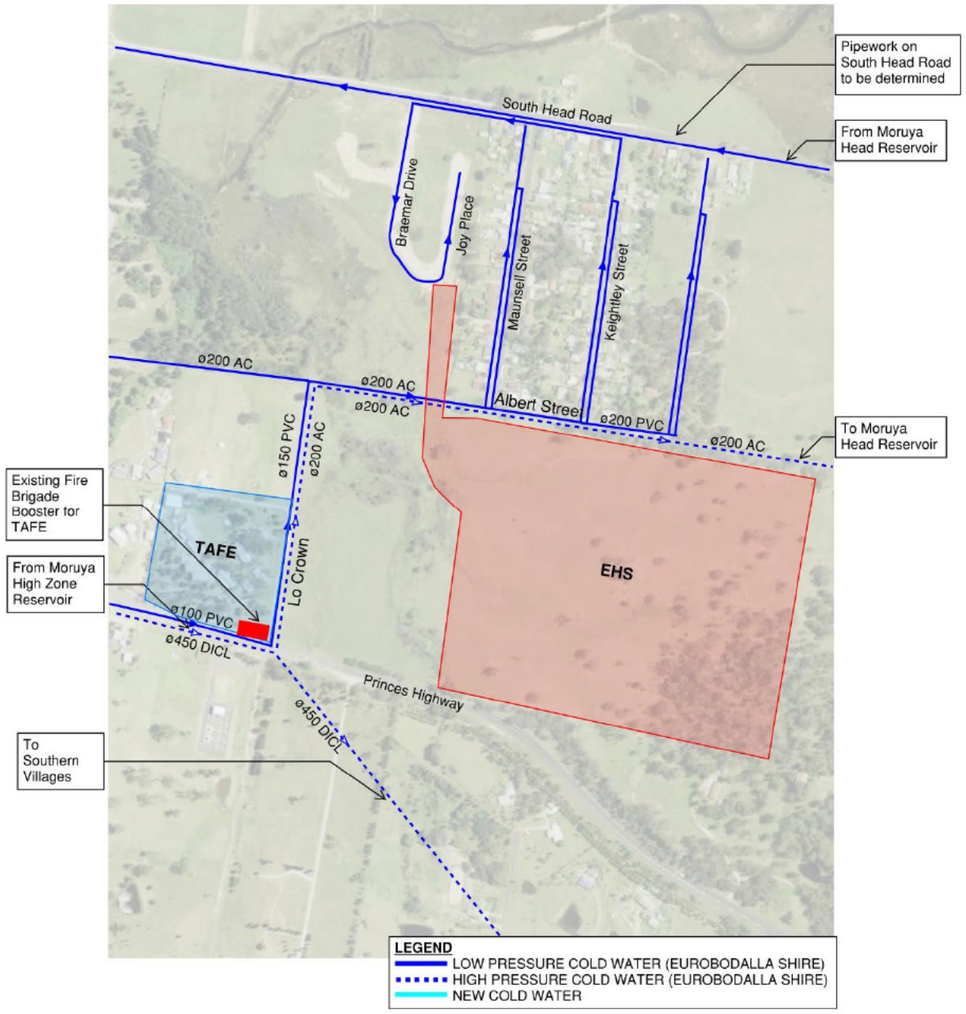



Figure 4: Cold water infrastructure around the hospital site indicating high and low pressure pipework

**Water Quality**

The Eurobodalla Shire Council regularly tests and monitors water quality to ensure community health and safety and the detailed information are listed on the Council website.

The drinking water supplied from Eurobodalla Council is safe and reliable, with drinking water being routinely tested throughout the water supply system. Analysis is undertaken at independent NATA certified laboratories, in accordance with the Australian Drinking Water Guidelines 2011 (ADWG).

**See Appendix B** for latest Drinking Water Quality Summary provided by Eurobodalla Shire Council

**Existing Cold Water Infrastructure Capacity**

In order to assess the capabilities of the surrounding hydraulic services infrastructure, Arup has undertaken a preliminary load take down assessment for the new proposed Eurobodalla hospital.

The following loads have been calculated based on the floor area and proposed Clinical Service Configuration. The loads are preliminary at this stage and will be refined with design development.

From the estimated peak water demand, the preliminary minimum pipe size requirements, and spare capacity within that pipe have been calculated as seen below. The mechanical loads have been estimated based on previous hospital projects.

| Building/Service | Peak Water Demand Flow (L/s) | Estimated Pipe Size (mm) |
|---|---|---|
| EHS | 5.73 | 80 |
| Mechanical Equipment | 3 | 65 |
| Total Water Requirement | 8.73 | 100 |
| Fire Hydrants | 20 | - |
| Fire Sprinklers | 14 | - |
| Drenchers | 6 | - |
| Total Fire Requirement | 34 | 150 |
| Note: Preliminary figures based on similar sized hospitals and standard size of fire compartments (compartments under 10,000m2) subject to further assessment and hydraulic calculations. | | |

The EHS building requires a 100mm water connection for domestic cold water and a 150mm water connection for fire services. These calculations are an estimate and will be developed further in the following stages. Further investigation will be undertaken in the feasibility stage to establish existing main capacity and discussion with Council is currently underway.

### 8.8.9 Sewer Drainage

**Existing Authority Sewer Infrastructure**

Existing sewer mains are available running along adjacent streets at the locations shown below:

Eurobodalla Shire Council:

— Bergalia Street, John Street and Princes Highway:
  - 150mm vitrified clay (RL-VC) main
— Keightley Street, Maunsell Street, Joy Place and Braemar Drive:
  - 150mm vitrified clay (RL-VC) main
— Lo Esc
  - Sewage pumping station SPSMO05

**Existing Private Sewer Infrastructure**

There is no existing private sewer infrastructure located on the proposed EHS site.

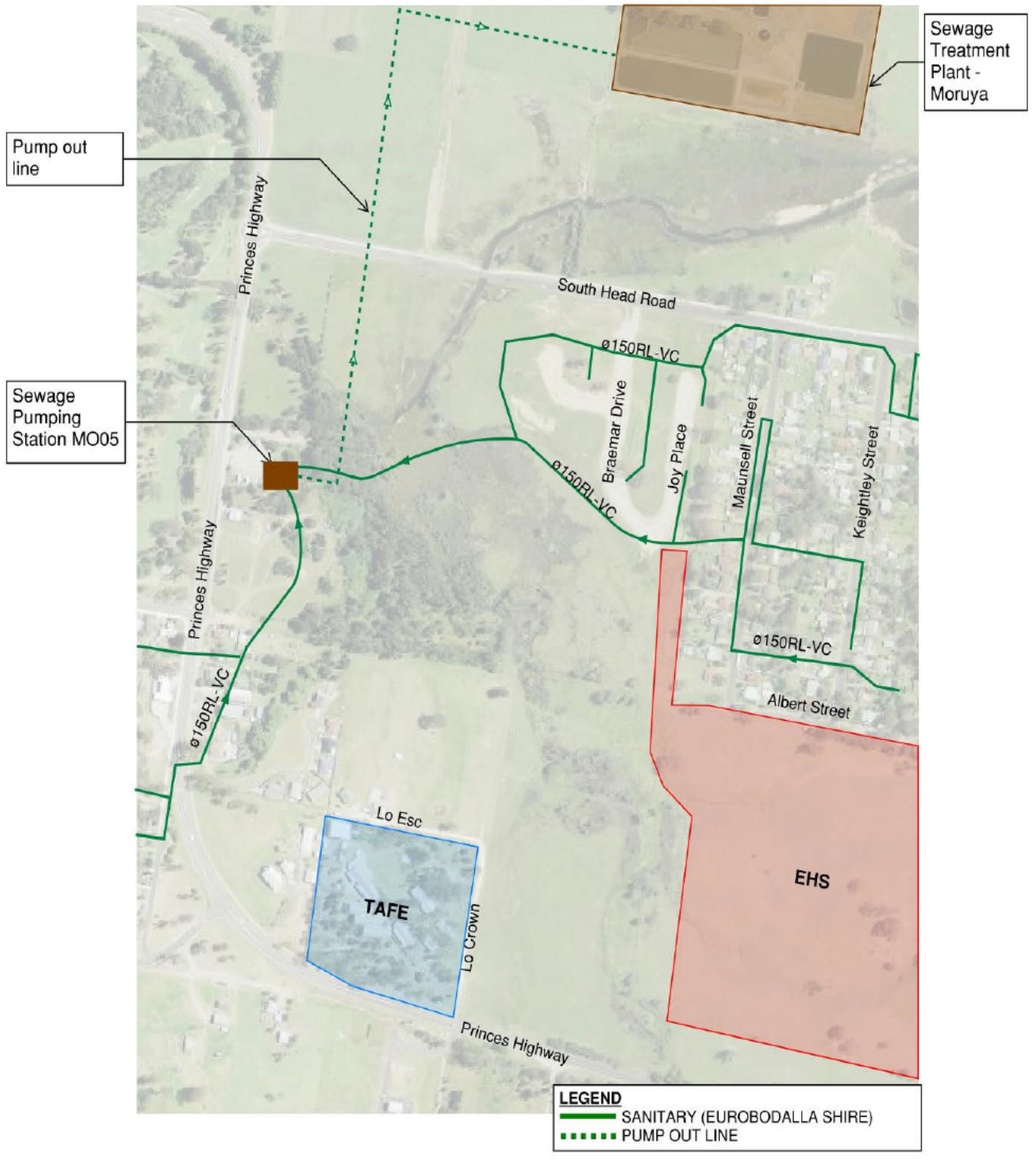



Figure 5: Council Sewer infrastructure around the hospital site

**Existing Sewer Infrastructure Capacity**

In order to assess the capabilities of the surrounding hydraulic services infrastructure, Arup has undertaken a preliminary load take down assessment for the new proposed Eurobodalla Hospital.

The following loads have been calculated based on the floor area and proposed departments. These loads are preliminary at this stage and will be refined with design development.

| Building | Estimated Peak Sewer Discharge (L/s) | Minimum Pipe Size (mm) @ 1% slope |
|---|---|---|
| EHS | 5.50 | - |
| Mechanical Equipment | 2.80 | - |
| Combined | 8.30 | 225 |
| Note: Pipework sized to be 50% full. | | |

The required pipe size for the EHS building is 225mm. These loads are estimates and will be further developed in the concept design stage.

Further investigation will be undertaken in the feasibility stage to establish existing main capacity and discussion with Council is currently underway. The proposed sewer connection options are described in the next sections of this report.

8.8.10 Natural Gas

**Existing Authority Infrastructure**

No existing reticulated gas supply is available in Moruya. The need for a gas supply will be dependent on the new development's requirements, ESD aspirations and services which require gas for heating systems. This could be needed (but not limited to) to mechanical heating boilers, domestic hot water plant or hot water for commercial kitchen.

## 8.9 New Eurobodalla Health Service

### 8.9.1 Hydraulic Services Strategy

The proposed building will generally be designed as a standalone building with services interconnections being connected into existing Authority infrastructure. The key strategies for the EHS redevelopment have been summarised in the following pages.

The following section provides a description of the design criteria, systems and concept design considerations for hydraulic services.

### 8.9.2 Environmental Expectations

This section provides a brief description of the environmental aspirations proposed for the hydraulic systems. They are subject to development of the overall ESD and sustainability strategy for the building.

The hydraulic systems design will embrace water conservation measures and take steps to use renewable energy which include:

— Reducing town main water supply by:
  - Reuse / recirculation of fire test drain water
  - Harvest and reuse building rainwater for irrigation and cooling tower supply
— Reducing water usage at fixtures and fittings where possible.
— Reducing water usage across the site by using:
  - Smart metering and monitoring of water use throughout the building
  - Pressure reducing devices on system reticulation
— Exploring heat rejection recovery from mechanical chillers to pre-heat domestic hot water.
— It should be noted that a transition plan away from the fossil fuels will be developed and agreed with HI for the project.

### 8.9.3 Description of Systems

The following list of systems is described in the subsequent sections:

a) Domestic cold water supply
b) Domestic hot water supply
c) Reverse Osmosis Water
d) Sanitary plumbing and drainage
e) Grease waste and trade waste drainage
f) Rainwater roof drainage and Recycled Non-Potable Water
g) Natural Gas supply
h) Fire hose reel system

### 8.9.4 Design Criteria

The following codes and standards will form the basis of the hydraulic services design:

a) Building Code of Australia (BCA) / National Construction Code (NCC) 2019
b) Plumbing Code of Australia 2019
c) AS 3500.1:2018 – Plumbing and drainage Part 1: Water Services
d) AS 3500.2:2018 – Plumbing and drainage Part 2: Sanitary plumbing and drainage
e) AS 3500.3:2018 – Plumbing and drainage Part 3: Stormwater drainage
f) AS 3500.4:2018 – Plumbing and drainage Part 4: Heated water services
g) AS 2441- 2005 Installation of Fire Hose Reels
h) AS 5601 – 2013 Gas Installations
i) Eurobodalla Council requirements
j) NSW Health Infrastructure: Standards, Policies, Procedures and Guidelines (SPPG)
k) NSW Health Infrastructure: Engineering Services Guidelines dated on 26 Aug 2016
l) NSW Health Infrastructure: Design Guidance Note 001 to 040 including No. 006 General Design Principles
m) Australian Health Facility Guidelines Part E: Building Services and Environmental Design 2016 (AusHFG)
n) International Health Facility Guidelines (iHFG)

A summary of the key design criteria is as follows:

| Item | Parameter |
|---|---|
| Rain Water drainage | Intensity: 5min 1:100-year event<br>CSIRO report, "Roof drainage" by K.G Martin.<br>Australian Rainfall and Runoff<br>AS3500.3-2015<br>Local Eurobodalla council requirements<br>(gutters to incorporate measures to prevent failure from leaves and silt with minimal maintenance. Details of the gutters and safety overflow will be shown on architectural plans and indicated on hydraulic plans) |
| Domestic Hot Water Delivery Temperature | Hot water distribution: 60ºC - 65ºC<br>*Patient use / access areas*<br>Personal hygiene and hand washing utensils, cups, etc.:<br>38 - 40.5 ºC with 43.5 ºC thermal shutoff for children,<br>40.5 - 45 ºC with 46 ºC thermal shutoff for adults.<br>Beverage preparation: boiling water 100 ºC<br><br>*Non-patient use (staff use only)*<br>Beverage preparation: boiling 100 ºC<br>Sinks for manual dishwashing: 77ºC min **<br>Cleaner's sink/laundry tub: 60ºC min<br>Automatic dishwasher: 60 - 70ºC at inlet<br>Automatic washer/disinfector: 60 ºC min at inlet<br>Automatic clothes washer: 70 - 85 ºC at inlet **<br>Personal hygiene: 50 ºC max<br>The above temperatures comply to Heath Infrastructure 'Water – Requirements for the Provision of Cold and Heated Water'.<br>**Requirement TBC with HI. It may require an additional localised hot water boost. |
| Working velocities in water services pipes | Max 1.5 m/s due to noise sensitivity for domestic cold water and 0.6 to 1.0 m/s for domestic hot water, based on HI Engineering Services Guidelines. |
| Maximum operational water pressure | 500kPa |
| Minimum operational water pressure | 300kPa |
| Cold water average supply temperature | 10ºC |

| | |
|---|---|
| Velocities within storm-water drainage | Self-cleansing velocities between 0.75m/s and 2m/s |
| Hot water plant | Storage vessels – heat loss is not to exceed values within Table A1 of AS4692.2. Primary pipe work between heat source and storage vessels is to have 25mm Rockwool insulation.<br>Heating plant minimum efficiency 80% |
| Fire Hose Reels | 0.33l/s @ 230kpa minimum, located throughout building to provide full coverage in compliance with AS 2441-2005 |

**Cold Water Storage Tank**

Storage tanks for cold water supply are usually provided to offer a buffer for peak demand in the system and redundancy in case of water shortage. The new tank requirements and size will have to be assessed based on considerations regarding various factors including reliability of water mains and the continuity for essential services/departments.

The NSW Health Infrastructure Engineering Services Guidelines (2016) specify 24 hour cold water storage needed for those building required to deliver service continuity in the event of civil emergencies only. We believe this requirement will not be required for EHS project however water storage requirement will need to be agreed and discussed with HI, Council and SNSWLHD.

**Domestics Cold-Water Supply**

Two options have been explored to provide water to the EHS and all their respective sanitary fixtures and equipment's. Three options with different pressure mains have been considered to determine new infrastructure required to supply appropriate cold water to the site. These options have been discussed with Council and further coordination will be required to establish the most suitable connection point taking into consideration domestic and fire services requirements.

**Option 1**: New connection into Eurobodalla Council main located on South Head Road with a cross connection to the 200mm AC main located on Albert Street.. This is connection to the low-pressure cold water main.

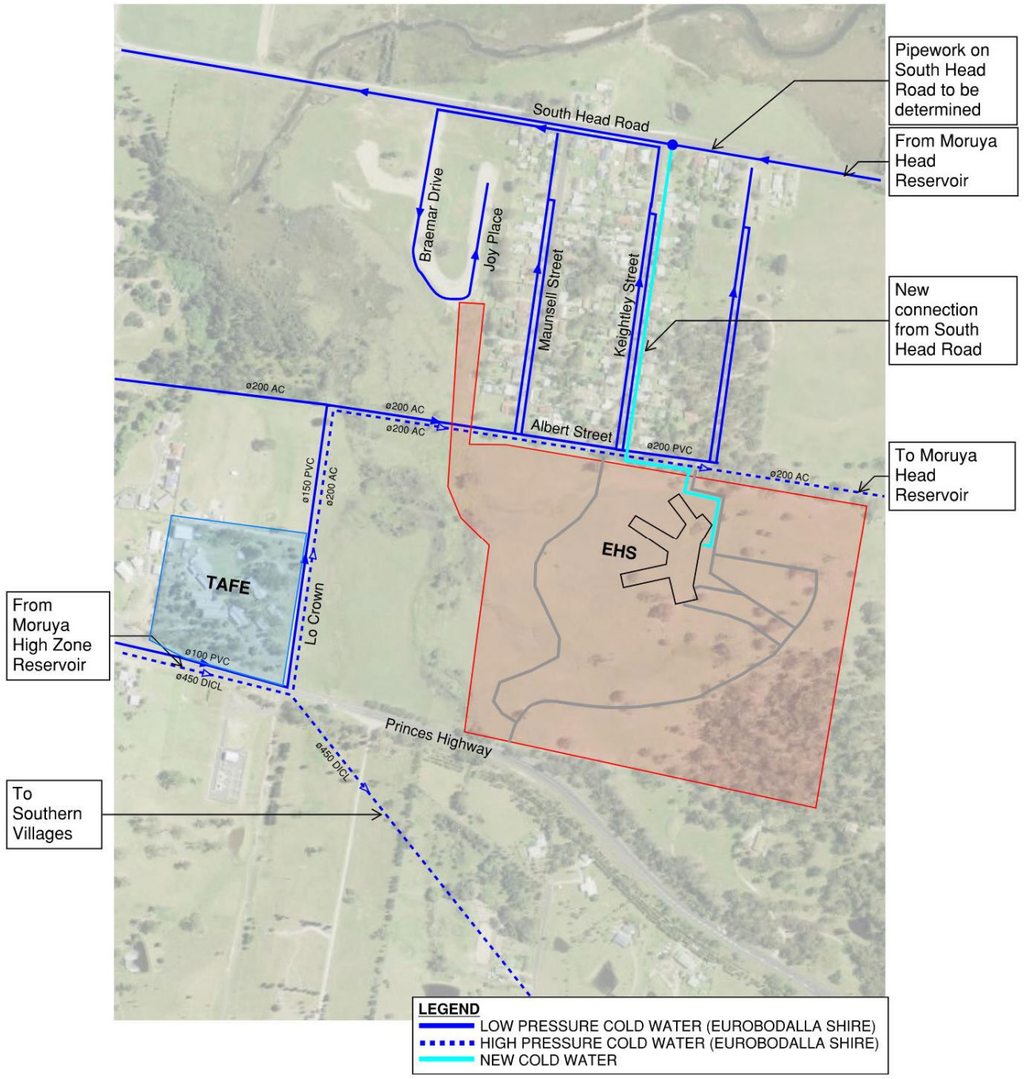



Figure 6: **Option 1** - New cold-water connection from South Head Road – low pressure green. New Connections shown in green.

**Option 2A**: New connection into Eurobodalla Council 200mm AC main located on Albert Street/Lo Crown. To be provided with a pressure reduction device near the new cold-water meter. Council approval will be required as this high-pressure main supply Moruya Head Reservoir.

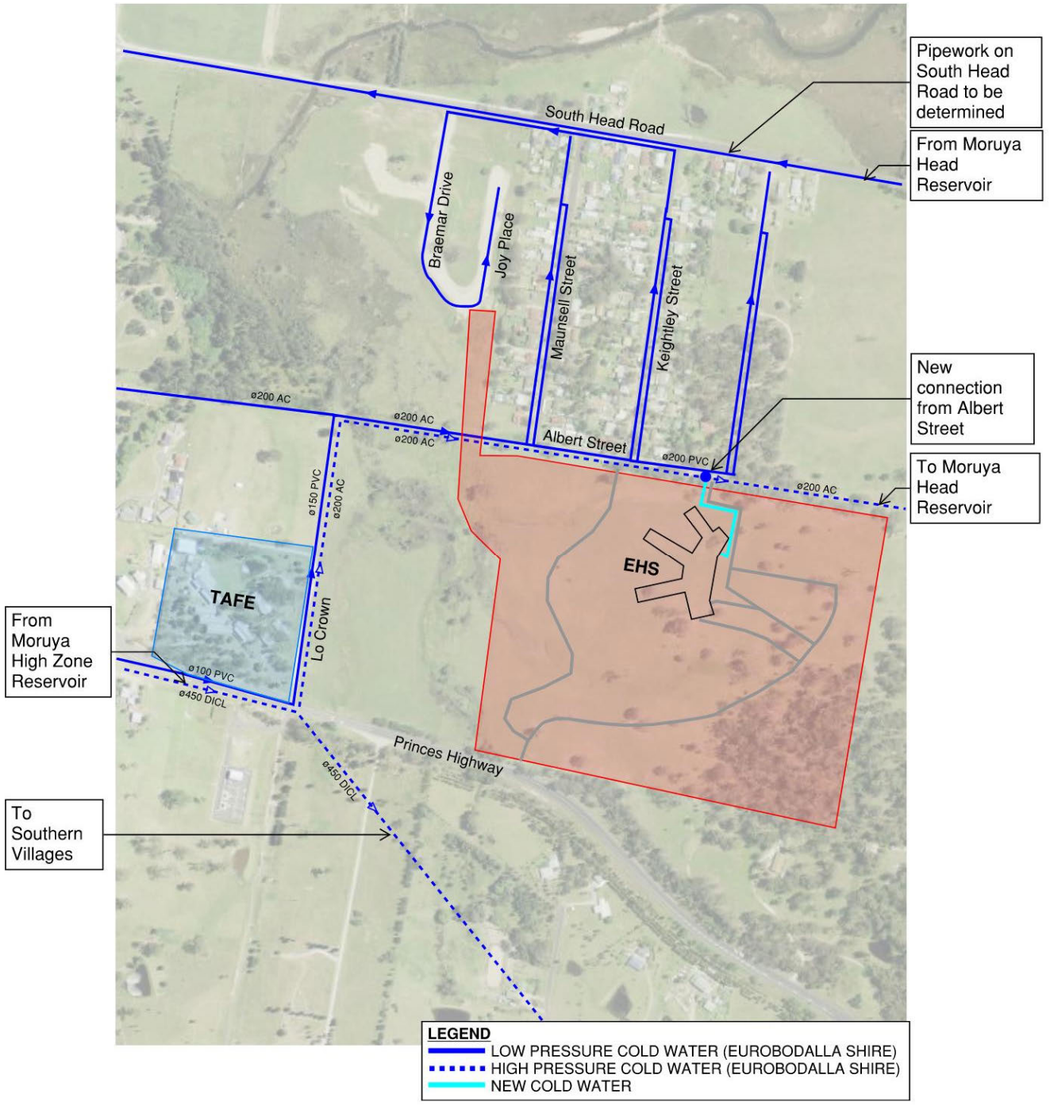



Figure 7: **Option 2A** - New cold-water connection from Albert Street – High Pressure Zone

**Option 2B**: New connection into 450mm DICL main located on the Princes Highway. To be provided with a pressure reduction device near the water meter. Council approval and detail assessment will be required as this high-pressure main supply Moruya Head Reservoir.

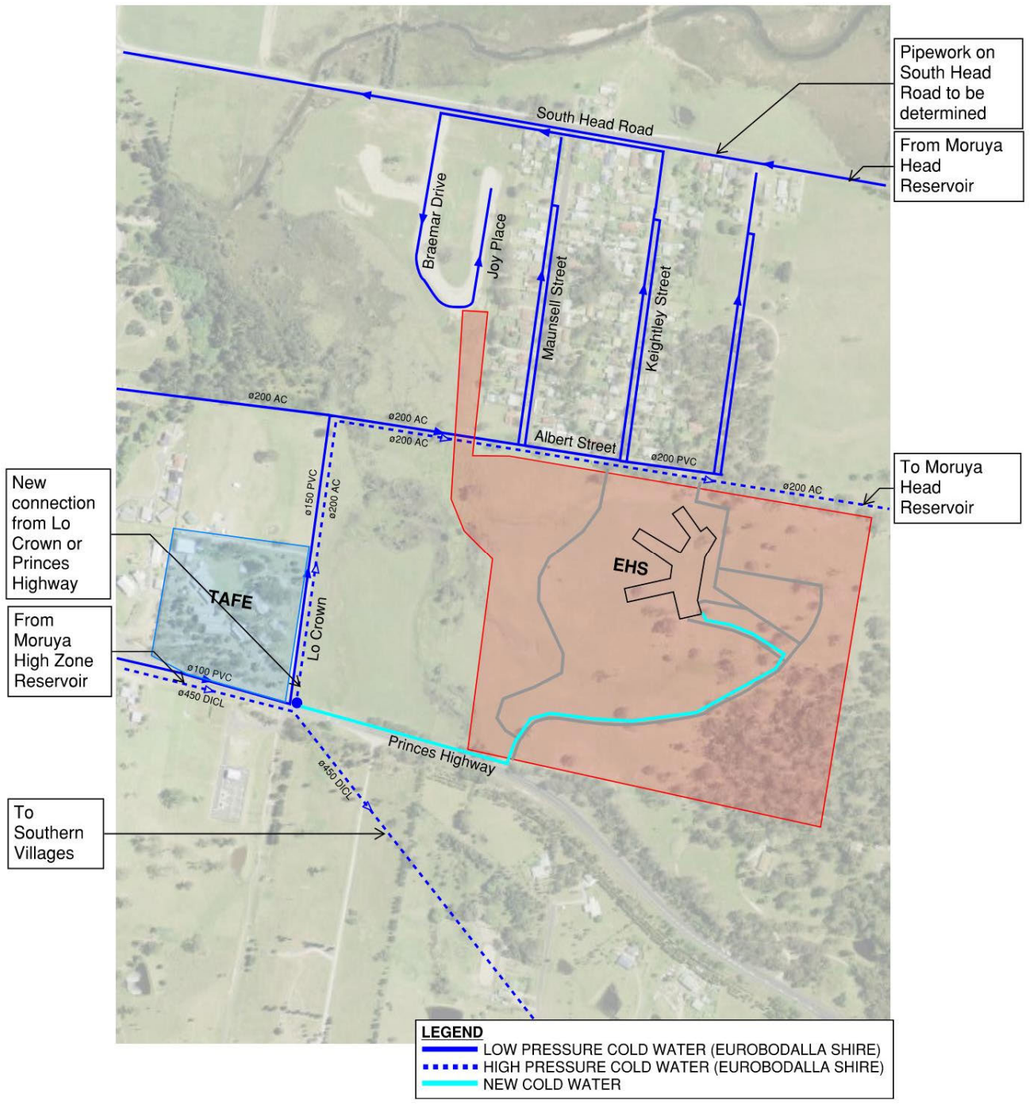



Figure 8: **Option 2B** - New cold-water connection from Princes Highway – High Pressure Zone

**Sanitary Drainage**

The EHS site is currently located approx. distance of 700-800m from the existing Moruya Sewerage Pumping Station MO05 which discharging via sewer rising main to Moruya Sewerage Treatment Plant.

The existing sewer line located north of Albert Street is not suitable for connection due to the limited capacity. Based on the discussion with Council and review existing sewer network there are no available existing gravity sewer main connection points located in close proximity to the Hospital Site.

For this reason, a new connection into the existing Sewage Pumping Station SPSMO05 has been proposed by Council Engineers which would require detailed coordination with Moruya Bypass Project. We have also explored option for connection to the existing Sewerage Pumping Station SPSMO08 located in Keightley Street however this has not been recommended on this stage due to the limited capacity of the unit.

The new connection to Council SPSMO05 could be either gravity or pumped from EHS site. Due to the existing invert levels and significant travel distance between the site and SPSMO05 we believe that gravity connection would be problematic to fully service the new EHS site and to allow for future expansions. This will be confirmed during concept design phase.

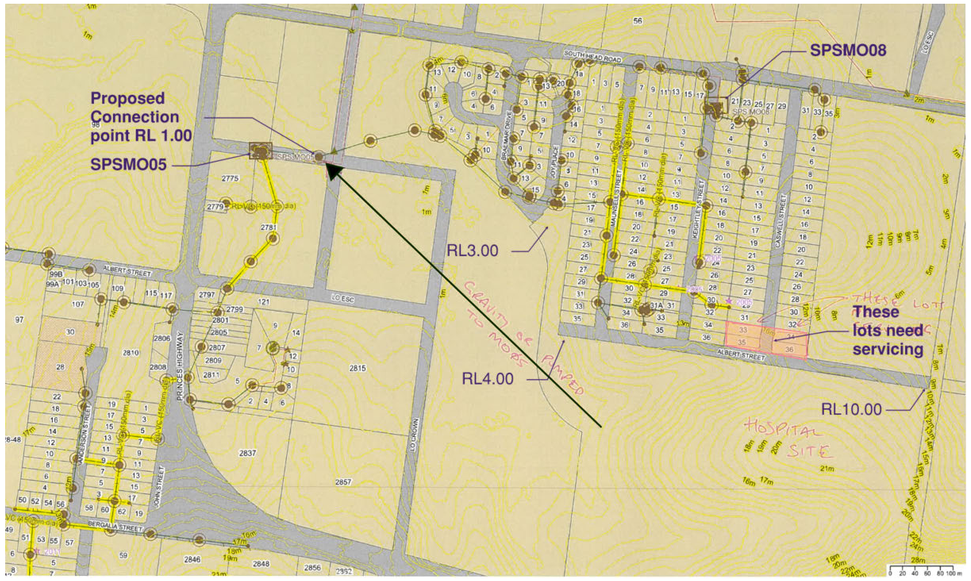



Figure 9: Sewer network around Eurobodalla Hospital Site

If gravity connection is not possible a new dedicated sewerage pumping station is to be installed on the proposed site in accordance to Eurobodalla Shire Council requirements. It should be also noted that the existing and future portion of the residential lots located at the end of Albert Street have similar issues to achieve gravity connection into the existing Council network.

Further to above the proposed sewer design for new Hospital should also consider provision points to enable future connections for the buildings identified as part of the Architectural Master Planning including future Accommodation, Ambulance NSW, Education facilities and Private providers.

During discussion with Council these and the future lots could be also connected the new sewerage pumping station and the final arrangement would need to be discussed with Council Engineers. Council would own and operate the pumping station if the sewerage pumping station is built to Council's standards and requirements.

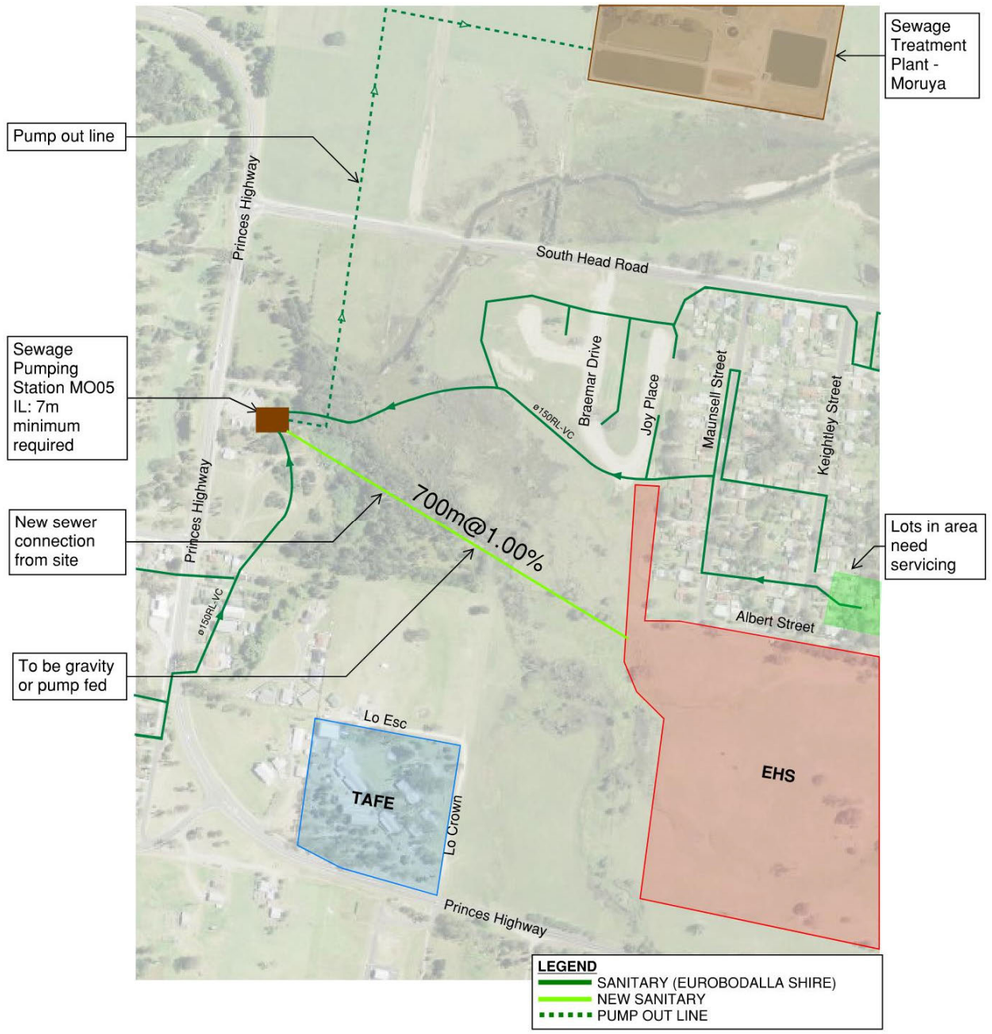



Figure 10: New sewer connection to existing sewer pumping station MO05

**See Appendix C** for Eurobodalla Shire Council Pump Station Sizing and Requirements.

**Domestic Hot-Water Supply**

The Domestic Hot Water (DHW) system will be installed in accordance with Health NSW requirements for the provisions of cold and hot water. The DHW system is to be a flow and return system, with pipework reticulating to all nominated fixtures and fittings.

The system will be supplied by either a large LPG vessels or by an electric heating system. Below are some indicative high level options that would need to be further discussed during concept development:

| Items | Instantaneous heaters + storage tank supply from LPG | Heat pumps with electric boost | Electric storage tanks |
|---|---|---|---|
| Energy Source | Gas | Electric | Electric |
| Heat Transfer | LPG gas to heat water | Electrically generated refrigerant cycle transfers heat absorbed through the air to heat the water | Electric heating element |
| Spatial Requirement (m) | ✓✓<br>Continuous flow water heaters<br>+<br>Storage Cylinders<br>40 sqm | ✓✓✓<br>Heat pumps +<br>Storage Units<br>100 sqm | ✓✓<br>Storage Units<br>only<br>45 sqm |
| Electrical Requirement (kW) | ✓<br>Supply 240V – 22Amps | ✓✓<br>HP 4 x 11kW, 3 Ph, 415V<br>HE 5 x 30kW 3 Ph, 415V | ✓✓✓<br>HE 5 x 60kW power input, 415V, 3 Phase, 80Amps/phase |
| Gas Requirement (MJ/hr) | ✓✓✓<br>3.5 GJ/hr | N/A | N/A |
| Capital Cost ($) | ✓✓ | ✓✓✓ | ✓✓ |
| Notes | Additional cost for LPG vessels will be required | Electrical loads will need to be assessed | Electrical loads will need to be assessed |

**Stormwater and Rainwater Harvesting**

A new stormwater and rainwater harvesting system is proposed, with rainwater tanks being sized to hold the desired catchment area on the roof. The stored water will undergo council approved rainwater treatment and will only serve non-potable services, mechanical equipment and irrigation. The size of the rainwater harvesting system and the collected roof areas into the tank(s) shall be optimised to maximise water re-use without oversizing the system.

The building will be provided with roof drainage design consisting of gravity and/or siphonic drainage systems and full flow emergency overflows discharging to a visible place via the building facade.

Rainwater will be collected from roof gutters, balconies and terraces via gravity flow or siphonic rainwater downpipe systems. Rainwater drainage strategy is to be further developed in line with the architectural and landscaping design.

Where rainwater is collected for reuse it will be directed to the rainwater harvesting tank, otherwise rainwater will connect directly to the external stormwater drainage network provided by Civil engineer. The on-site detention tank(s) if required and associated stormwater drainage, filtration devices, subsoil, external stormwater drainage system (1 m away from the building line) and overland flow paths will be documented by the Civil Engineer.

**Gas Supply**

No existing reticulated gas supply is available in Moruya. The need for a gas supply will be dependent on the new development's requirements, ESD aspirations and services which require gas for heating systems. This could be needed (but not limited to) to mechanical heating boilers, domestic hot water plant or hot water for commercial kitchen.

If gas is provided, Liquefied Petroleum Gas (LPG) will be used to supply gas requirements to building services. External area for storage tanks will be required, with the gas piping system needing to comply with AS5601-2004.

Alternatively, if all services are supplied from electrical sources, an LPG supply will not need to be installed.

***Kitchen grease waste***

Grease waste is anticipated to be collected from the commercial kitchen and from retail food tenancies producing hot food (quantity and location TBC).

Grease waste will be collected via a dedicated gravity grease waste drainage system and pass through a grease treatment device prior to connection to the Council sewerage infrastructure. Grease treatment capacities will be confirmed subject to the final retail requirements.

***Renal Dialysis RO Water***

The Reverse Osmosis (RO) water will be provided for nominated beds / chairs via portable dialysis station units. The quantity of RO outlets will be confirmed during user group meetings, however the current requirement is for a total of 12 chairs requiring RO provisions.

If Reverse Osmosis (RO) central plant is required, the on-floor plant should be centrally located, and a circulated RO service provided to beds as required.

Pre-testing and regular testing of the water quality is required to ensure compliance with the manufacturer's standard for water entering the machine. If pre-testing shows that the water quality is poor additional pre-treatment or water softening will be required.

***Decontamination shower***

A holding tank and pump out facility will be provided for the decontamination shower(s) within the ambulance bay. The size of the decontamination shower collection pit will be further established once the total number of bays is confirmed.

## 8.10 Fire Services Strategy

### 8.10.1 Introduction

The following section provides a description of the design criteria, systems and proposed design considerations for fire services.

### 8.10.2 Environmental Expectations

The project will aim to achieve high environmental aspirations. This will include minimising fire testing water consumption by reusing of fire test drain water and use of sustainable materials where appropriate to the project.

### 8.10.3 Design Criteria

The following codes and standards will form the basis of the fire services design:

a) Building Code of Australia (BCA) / National Construction Code (NCC) 2019 - TBA

b) AS 1670.1:2018 Fire Detection, Warning, Control and Intercom Systems – System Design, Installation and Commissioning – Fire

c) AS1670.4:2018 Fire Detection, Warning, Control and Intercom Systems – System Design, Installation and Commissioning – Emergency warning and intercom systems

d) AS 2118.1:2017 Automatic Fire Sprinkler Systems Part 1: General Requirements

e) AS 2118.6:2012 Automatic Fire Sprinkler Systems Part 6: Combined sprinkler and hydrant systems in multistorey buildings

f) AS 2419.1-2005 Fire hydrant installations Part 1: System design, installation and commissioning

g) AS2941 – 2013 Fixed fire protection installations – Pump set systems

h) Fire and Rescue NSW requirements

i) NSW Health Infrastructure: Engineering Services Guidelines dated on 26 Aug 2016

j) NSW Health Infrastructure: Design Guidance Note 001 to 040

k) Fire Engineering project specific requirements.

A summary of the key design criteria is as follows:

| Item | Parameter |
|---|---|
| Fire hydrants type | Attack Hydrants |
| Fire hydrants flow rate | 2 x hose streams @ 5 L/s each when boosted by on-site pumps<br>2 x hose streams @ 10 L/s each when boosted by fire brigade pumps<br>(As per AS 2419.1-2005) |
| Fire hydrants flow velocity through pipes (after booster) | ≤ 4 m/s in compliance with AS 2419.1-2005 |
| Residual Pressure at Hydrant outlets | 700 – 1200 kPa, in compliance with AS 2419.1-2005. |
| Largest Fire Compartment | > 1000 m2 and < 10 000 m2 |
| Fire Sprinklers Hazard Classifications | Hospital – Light Hazard<br>Plant rooms – OH1<br>(As per AS 2118.1-2017 Appendix A) |
| Fire Sprinkler spray densities | Light Hazard – 70kPa and K=8.0 or larger for 6 x most hydraulically unfavourable sprinklers<br>OH1 – 6 sprinkler heads at 60L/min each<br>OH2 - 12 sprinkler heads at 60L/min each<br>OH3 – 18 sprinkler heads at 60L/min each |
| | Wall-wetting sprinklers (requirement TBD) – 75 L/min per sprinkler for worst case of 18 x sprinklers, resulting in flow rate of 1350 L/min.<br>(As per AS 2118.1-2017 sections 9, 10 & 3) |
| Fire alarm and detection systems | To AS 1670.1 – 2018 |
| Sound System & Intercom System for Emergency Purposes | To AS1670.1 – 2018 |
| | -2001 |

**Hydrant and Fire Sprinkler**

A new combined fire hydrant and sprinkler infrastructure is proposed, with water supply for fire services obtained by new connection into Eurobodalla Council pipework and a dedicated storage tank as a secondary source if the water demand in Council network cannot provide full demand for fire services supply. This would also include new fire booster and pumps.

At the time of writing this report, the authority mains pressure and flow demands are not known but will be required to finalise the design of the new water supply and pump specifications. Depending on authority mains pressure and flow one of the following will be selected:

| Mains Pressure and Flow to meet design criteria | Fire Services Requirements |
|---|---|
| Adequate pressure and flow | No requirements for water storage tanks |
| Adequate flow but low pressure | Provide single Diesel or Electric Pump |
| Adequate pressure but limited | Provide on-site storage tank min 25kl completed with dual fire pump set |
| Neither adequate flow nor pressure | Provide on-site full Fire Storage tanks between 288-300kL (TBA) |

A new fire hydrant ring main is proposed to serve the site with external hydrants located around the hospital and with the fire brigade booster to be placed at the entryway to the site or the buildng. For the ring main being supplied from the Princes Highway a performance solution could be developed to allow for the relocation of the booster to be placed in front of the hospital. The fire services strategy needs to be agreed and developed in consultation with the BCA Consultant and FRNSW.

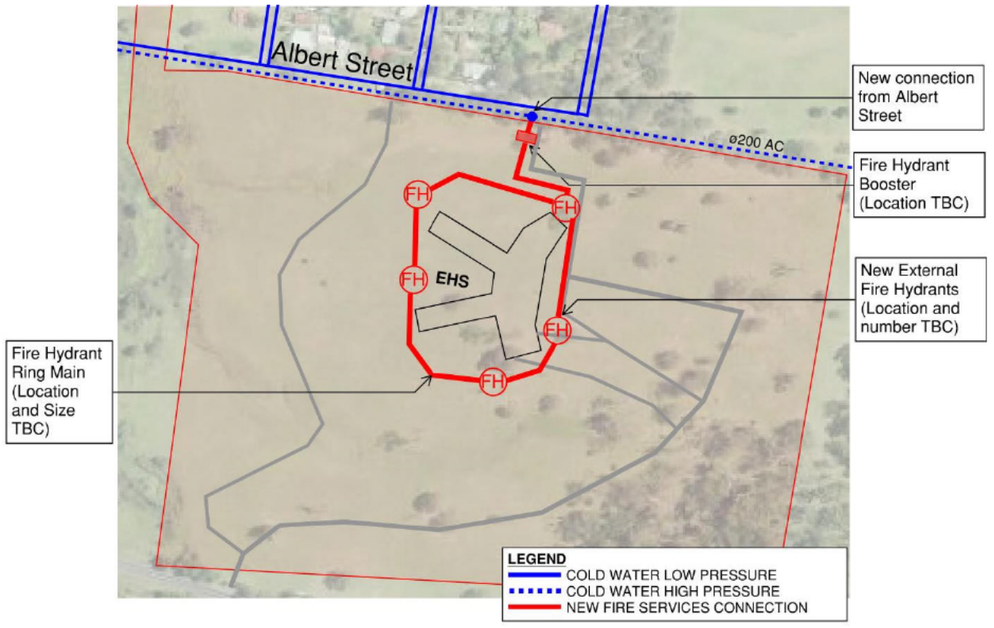



Figure 11: **Option A** - New Fire Services connection from Albert Street with external and internal hydrants to achieve a full coverage

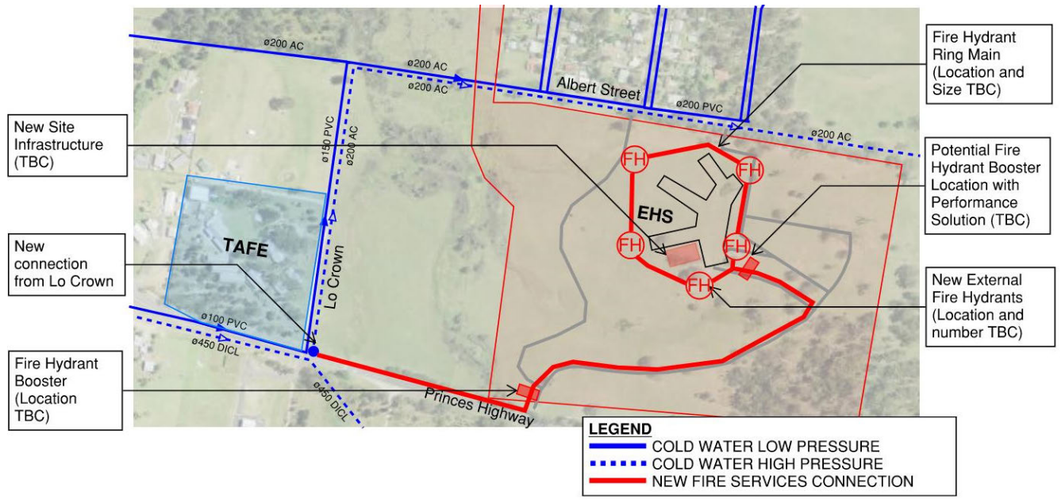



Figure 12: **Option B** - New Fire Services connection from Lo Crown / Princess Highway – location of the fire brigade booster and hardstand area to be agreed with the BCA Consultant and FRNSW.

### Fire Detection and EWIS Systems

A fire detection and alarm system shall be installed within the building in accordance with the requirements of the NCC 2019, AS1670.1-2018, AS1668.1-2018 and FRNSW requirements.

The system shall incorporate smoke detection throughout and where applicable shall initiate the smoke control system within the building and shall monitor all devices connected to fire hydrants, fire sprinkler and fire pump systems.

A new fire network, with dedicated FIP and EWIS panel will have appropriate detection and alarm devices connected to them respectively. The Fire Detection Control and Indicating Equipment (FDCIE), will be located on the ground floor for easy brigade access.

### Fire Brigade Access

The fire brigade access to all new boosters around the site shall be maintained at all times during construction and after completion of the new building.

This requirement is essential as, in the event of a fire, fire fighters will need to be able to park the fire truck on a hardstand within 8m from the booster in order to connect into it.

Fire Brigade Hardstand Area

Designated *hardstand* areas are to provide a safe working space for firefighters to exit the vehicle and move around the fire appliance to remove and use equipment, including connecting fire hoses to the *fire appliance* (see Figure 13).

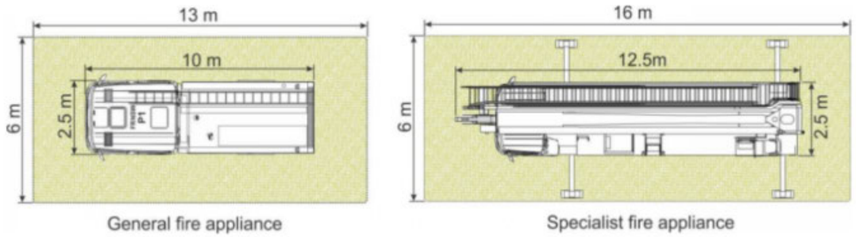



*Figure 13 Minimum working space for hardstand area*

### Hardstand locations

A *hardstand* is to be provided as required by *AS 2419.1—2005 Fire hydrant installations – System design, installation and commissioning*, and as otherwise nominated by the relevant authority having jurisdiction, including:

- within 20 m of any feed fire hydrant
- within 8 m of any fire hydrant booster assembly
- within 50 m of an external attack fire hydrant
- within 20 m of the access door to any external fire pumproom
- in front of any *suction-connection outlet* (e.g. tank, river, lake, dam, sea).

**Note:** The location must also consider other required factors such as firefighter access to the building and maximum hose coverage requirements.

**Appendix D** indicates the full requirements for the fire brigade booster location and access options.

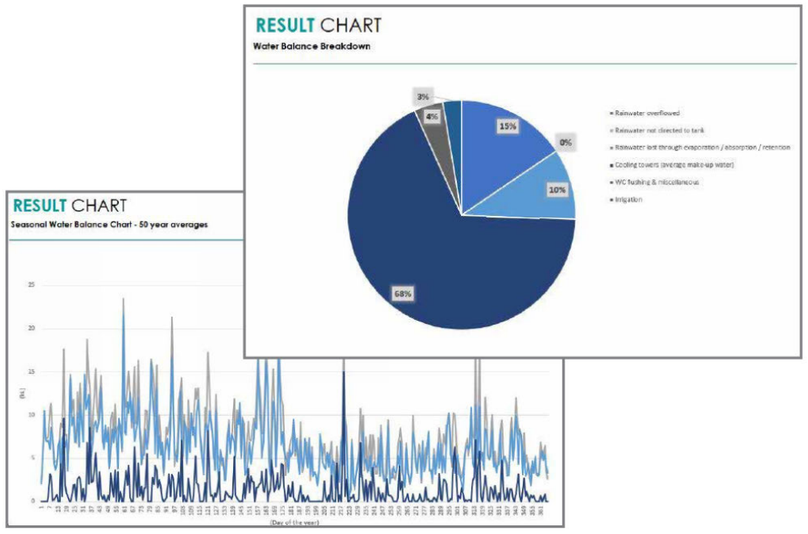
**Sustainable Initiatives and Opportunities**

The new development will be subject to the recently developed HI self-certified ESD process therefore early discussion will be needed to agree and inform budget.

Below are some of the strategies that could be embedded within the ESD Framework and can be presented with pros and cons. Early evaluation of these will be required during feasibility stage to ensure they fit within the budget or if additional funds are available. This early advice can be based on the traffic light scheme (green – orange – red).

RAINWATER HARVESTING AND RE-USE

We see an opportunity to investigate rainwater re-use for irrigation and mechanical purposes (cooling towers supply). Detailed water balance calculations will be needed to provide a full water cycle and a cost benefit analysis would be performed to inform capital costs and pay back periods. Condensate recovery drainage system can be considered to supplement the rainwater harvesting.




FIRE TEST WATER RECYCLING

Measures will also be considered to reduce the amount of water used during regular maintenance of fire protection systems. At this purpose, it is proposed that the water from fire pump testing will be recycled back to the fire tank.

REDUCE POTABLE COLD WATER CONSUMPTION

The proposed design will strive for minimum water main consumption. Water saving initiatives in addition to those already detailed above could include use of ultra-low flow devices and fixtures (subject to Architect/HI approval) and sub-meters provided to all areas/ items where major water consumptions are expected.

GREY AND BLACK WATER SYSTEMS

Greywater is wastewater derived from all water fixtures in a building, excluding WCs, urinals and dirty utility equipment as well as sinks. For the Hospitals this will mostly be derived from hand basins, showers, and laundry tubs. Greywater filtration systems typically include a Membrane Bioreactor unit (MBR), UV filtration, and chlorination. This recycled water can then be used in WC flushing and site irrigation.

Blackwater comprises of the same greywater with the addition of WCs and urinal wastewater. With the addition of faecal matter comes much higher filtration requirements. There may also be need for Reverse Osmosis (RO). This recycled water can then be used in WC flushing and site irrigation.

SOLAR HOT WATER SYSTEM

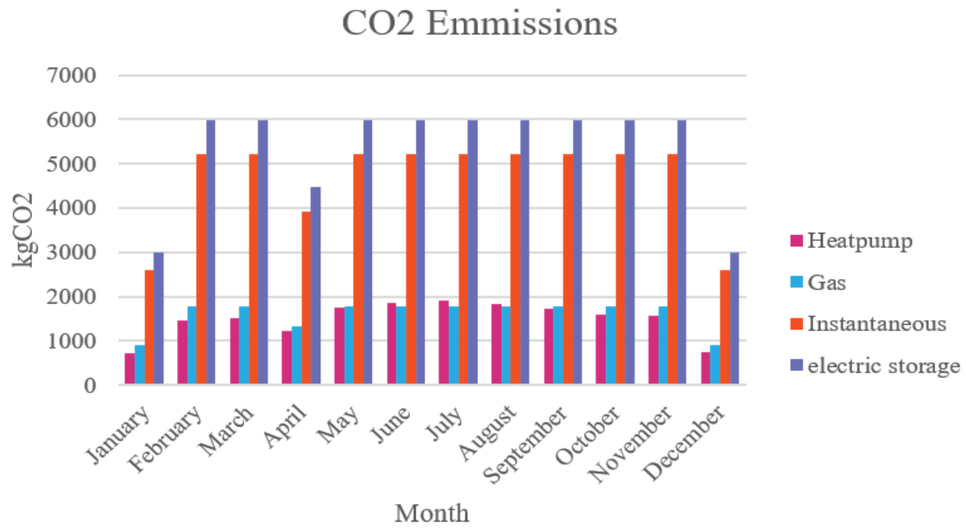
Option of using solar thermal energy will be explored to heat domestic hot water for potable or not potable use, through solar collectors located on roof to estimate saving or electric consumptions.

POTENTIAL CARBON NEUTRAL DESIGN ASPIRATIONS

If the project will have carbon neutral aspirations, it will be important that the design of the new facility will support these ambitions, whilst at the same time providing value for money and robust and resilient solutions.

Alternatives to move to all electric or mainly electric solutions could be explored by the team in order to meet potential carbon neutral targets. To full-fill such aspirations, the domestic hot water (DHW) system would need to change from traditional gas-fired to electrical heaters including options for instantaneous, storage heaters and heat pumps option.

Additional considerations could involve reducing the use of high embodied energy materials such as steel or plastic.




8.10.4 Next Steps

- A more detailed plant massing exercise will be done as part of the next stage to inform the specific services requirements
- The next stage will include the review of any additional information received from Council including pressure and flow and needs for sewer pump station
- A more detailed review of the hydraulic and fire services loads will be undertaken in the next phase to confirm the capacity of the existing infrastructure around the site.
- Coordination with the BCA Consultant to agree on the Fire Brigade access to site and location of the Fire Brigade Booster Valve Assembly. Meeting with FRNSW would be recommended to present the proposed option and strategy.

8.10.5 Further Information Required

- BCA report(s)
- Fire Engineering
- Updated Arch blocking and stacking with the final options.
- Updated Cost Plan
- Coordination with other services including Civil/Structure, Mechanical, Electrical
- Agreement of gas or no gas option to develop hot water heating strategy

— ESD Strategy

— Confirmation from Eurobodalla Council on any specific requirements including

  - Break tank configuration
  - Cold water meter configuration,
  - Filtration system and pre-water treatment
  - Pressure and Flow to determine the system configuration

# 9.0 Part B Appendices

Refer to separate documents.

**9.1 Site Survey**

**9.2 Site Analysis**

**9.3 Site Images**

**9.4 Connecting with Country**

**9.5 Arts Vision**

**9.6 Sketchbook**

**9.7 Mechanical Appendix**

**9.8 Bushfire and Ecology Appendix**

**9.9 Civil and Structural**

**9.10 Electrical ITC Security and Lighting Appendix**

**9.11 Hydraulic and Fire Services**

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