

HEALTH INFRASTRUCTURE  
NSW HEALTH

# **Gosford Hospital Redevelopment including Health and Wellbeing Precinct (HWP) Stage 1**

## **Integrated Water Management Plan**

Project No : 7630

Revision : 4– Final draft Issue

Date : 2<sup>nd</sup> June, 2015

**REVISION SCHEDULE**

NO	DATE	DESCRIPTION
1	15 <sup>th</sup> January, 2015	Review Issue
2	26 <sup>th</sup> May, 2015	Review Issue
3	29 <sup>th</sup> May, 2015	Final draft Issue
4	2 <sup>nd</sup> June, 2015	Final Issue

<input checked="" type="checkbox"/> APPROVED	This document is issued for the purpose of the latest revision.
<input type="checkbox"/> UNCONTROLLED	Content in this document may differ from that contained in the latest revision.

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## 1 INTRODUCTION

This Integrated Water Management Plan (IWMP) has been prepared for lodgement with the State Significant Development (SSD) application for the Gosford Hospital Redevelopment.

The IWMP for the Gosford Hospital project covers the Hospital redevelopment in Section 2 and the Health and Wellbeing precinct (HWP) Stage 1 in Section 3. The IWMP addresses the Office of Environment & Heritage letter of 4<sup>th</sup> February 2015 and Items 14 and 15 of Gosford City Council letter of 10<sup>th</sup> February 2015, and includes water cycle management measures that have been incorporated in each development to reduce the overall water consumption and minimise the effects of the rainwater discharge from the sites.

A summary of the stormwater management strategy has been provided within this report for information. Please note, the report should be read in conjunction with the civil Engineer's report developed by the civil consultant, Taylor Thompson Whitting (TTW), included as appendix A of this report.

## 2 GOSFORD HOSPITAL – NEW BUILDING AND REFURBISHMENT

### Water Sensitive Urban Design

The Gosford Hospital redevelopment consists of;

- New building works including demolition and enabling works; and
- Hospital refurbishment works.

The redevelopment will incorporate the following Water Sensitive Urban Design measures;

- Rainwater harvesting for irrigation purposes from the combined rainwater reuse and on site detention system (OSD);
- Water quality treatment devices;
- Water efficient fixtures and fittings; and
- Test drains from the fire sprinklers will discharge to fire services tank.

Potable water for the new building will be supplied from the existing internal Gosford Hospital water main. A potable water storage tank is to be installed to ensure the water supply (limited time period) to the new building should the water mains fail. This tank will be located in the Level 1 plant area. The installation of a water storage tank will also reduce “peaks” in water draw-off with a slower more steady draw-off.

To reduce contamination of the potable water supply, backflow prevention devices will be installed as per the requirements of AS3500.

### Rainwater Harvesting

The rainwater will be harvested from approximately 90% of the roof area of the new building. The remaining roof area including the helipad of the building is trafficable and will not be harvested.

Eaves gutters and downpipes will be sized to drain a 1:20 year ARI event. A rainfall intensity of 200mm of a 5min/20year for the rainwater calculations is based on AS3500.3.2.

Rainwater will be collected via a series of eaves gutters and external downpipe. These down pipes will drain to the onsite OSD tank located in the southwest corner of the building beneath Level 0.

The rainwater tank will form part of the OSD tank. Overflow from the rainwater tank will be directed to the OSD tank.

The rainwater that has been collected will be further treated and reticulated via booster pumps. This water will be used for irrigation around the new building.

### On-site Detention

On-site stormwater detention systems from previously completed redevelopment stages at the Hospital are not proposed to be impacted by this project. Proposed new roads and pavements are located within areas that are currently occupied by pavements and/ or buildings, and stormwater runoff and routing from these paved areas associated with the building have been designed to mimic existing conditions. Additional water quality treatment devices will be installed to treat stormwater runoff prior to discharging to the Council stormwater system. On-site detention is proposed for the new hospital building roof only. Stormwater will be collected from the roof of the new building and conveyed to a combined OSD tank located at Level 0. The on-site detention component of the tank (20m<sup>3</sup>) has been sized in accordance with Section 6.7.7.4 of Council's DCP. Refer to Section 3.4 of the civil Engineer's report for further details on the On-site Detention design.

OSD discharge will be treated via a water quality treatment device to remove suspended solids before discharging to the Council stormwater system.

### Retention of Rainwater for Reuse within the Development

Section 6.7.7.2.4 of the DCP requires that a portion of stormwater runoff is retained on site and discharged slowly over one week. Refer to Section 3.5 of the civil Engineer's report for further details on the design of

the 194m<sup>3</sup> retention component of the combined OSD tank. Per Council guidance, up to 50% of the retention volume can be claimed as part of the detention volume. Therefore, the combined tank has been design to provide 200m<sup>3</sup> of total storage. The tank is proposed to be fitted with a pump and pipe connection to the landscape irrigation system for reuse of retained stormwater.

### **Stormwater Management**

Stormwater discharge from the OSD tank will be controlled by a 400mm diameter orifice to limit post development flow rates to predevelopment flow rates for all storms up to the 1 in 100 year recurrence interval. Refer to Section 3.4 of the civil Engineer's report for further detail. Discharge from the OSD tank will be conveyed via a 450mm diameter pipe through to the Council system in Racecourse Road to the west of the new building. Stormwater pits and pipes will convey stormwater from the proposed roads and pavements to existing pits on the Hospital site. The stormwater conveyance system has been designed to mimic existing stormwater flow conditions.

### **Nutrient Pollution Controls**

Water quality treatment devices will be selected to meet Council pollutant loading reduction criteria prior to each new stormwater discharge point. Refer to Section 3.6 of the civil Engineer's report for additional details on Stormwater Quality Treatment.

### **Water Efficient Fixtures and Fittings**

All fittings and fixtures will be WELS star rated, the installation of water saving taps and outlets to reduce water consumption will be adopted. The following ratings are to be used;

- 4 WELS stars rated dual flush toilets;
- 4 WELS stars rated tapware; and
- 3 WELS stars rated shower.

### **Fire Services**

Fire services test water will be recirculated from the drains located at each level above the fire services tanks back to the tanks. Test water from the fire mains supplying the electric sprinkler pump for the grade one fire services supply will be discharged to the stormwater drainage system.

### 3 HEALTH AND WELLBEING PRECINCT STAGE 1

#### Water Sensitive Urban Design

The Health and Wellbeing Precinct - Stage 1 consist of a multi storey carpark and health/health-related and government administrative offices; and health related retail spaces.

The Health and Wellbeing Precinct – Stage 1 will incorporate the following Water Sensitive Urban Design measures;

- Rainwater harvesting for irrigation purposes from the combined rainwater reuse and on site detention system (OSD);
- Water quality treatment devices;
- Water efficient fixtures and fittings; and
- Test drains from the fire service pumps will discharge to the fire services tank.

Potable water supply for the Health and Wellbeing Precinct will be supplied from the existing water mains located in Holden Street and Showground Road. To reduce contamination of the potable water supply, backflow prevention devices will be installed as per the requirements of AS3500.

#### Rainwater Harvesting

Rainwater harvesting will be provided in accordance with PC A Grade office accommodation guidelines and be supplied for non potable water usage and landscape irrigation.

Any OSD discharge will be treated via a water treatment device to remove suspended solids before discharging to the Council stormwater system.

#### On-site Detention

Stormwater will be collected from the roof and plaza level of the Health and Wellbeing Precinct Stage 1 and conveyed to a combined OSD tank located at ground level of the carpark. The on-site detention component of the tank (150m<sup>3</sup>) has been sized in accordance with Section 6.7.7.4 of Council's DCP. Provision has been made to connect the 1,150m<sup>2</sup> future HWP development area to the proposed tank as required. Refer to Section 3.4 of the civil Engineer's report for further details on the On-site Detention design.

#### Retention of Rainwater for Reuse within the Development

Section 6.7.7.2.4 of the DCP requires that a portion of stormwater runoff is retained on site and discharged slowly over one week. Refer to Section 3.5 of the civil Engineer's report for further details on the design of the 350m<sup>3</sup> retention component of the combined OSD tank. Per Council guidance, up to 50% of the retention volume can be claimed as part of the detention volume. Therefore, the combined tank has been design to provide 350m<sup>3</sup> of total storage. The tank is proposed to be fitted with a pump and pipes to allow for reuse of retained stormwater for landscape irrigation and non-potable uses within the proposed Health and Wellbeing Precinct Stage 1 carpark, Showground Road, Level 6 Pedestrian Plaza and Holden Street Pedestrian Plaza, and potentially within the administrative office buildings.

#### Stormwater Management

Stormwater discharge from the combined OSD tank will be controlled by a 385mm diameter orifice to limit post development flow rates to predevelopment flow rates for all storms up to the 1 in 100 year recurrence interval. Refer to Section 3.4 of the civil Engineer's report for further detail. Discharge from the combined OSD tank will be conveyed via a 450mm diameter pipe through to the Council system in Showground Road.

Stormwater pits and piping will be provided to maintain stormwater connections from existing buildings and from existing and proposed pavements. The existing overland flow path falling from part of Holden Street and part of Beane Street West, will be replaced by a pit and pipe system designed to convey flows from the upstream catchment for up to the 1 in 100 year ARI storm event including provision for up to 50% blockage;

this pipe is proposed to be suspended below Level 6 along the southern wall of the carpark and discharged directly into Council's stormwater system in Showground Road.

**Nutrient Pollution Controls**

Proprietary stormwater quality treatment devices, will be selected to meet Council pollutant loading reduction criteria prior to each new stormwater discharge point. Refer to Section 3.6 of the civil Engineer's report for additional details on Stormwater Quality Treatment.

**Water Efficient Fixtures and Fittings**

All fittings and fixtures will be WELS star rated, the installation of water saving taps and outlets to reduce water consumption will be adopted. The following ratings are to be used

- 4 WELS stars rated dual flush toilets
- 4 WELS stars rated tapware
- 3 WELS stars rated shower

**Fire Services**

Fire services test water from pump testing will be recirculated back to the fire service tank. Test water from the incoming mains supplying the electric sprinkler pump for the grade one fire services supply will be discharged to the stormwater drainage system.



#### 4 CONCLUSION

The water management systems proposed within this report aims to reduce the overall water consumption of each development and improve water quality of any stormwater discharge. The systems proposed include;

- The rainwater harvesting system which will reduce the total amount of rainwater runoff and provide a reduction in the overall water consumption and water drawn from the Council main;
- The use of water efficient tapware which will provide some benefit in reducing the water consumption;
- The use of water quality treatment devices which will improve the quality of the water discharged to the Council stormwater system; and
- The recirculation of fire services water used in the monthly testing.

#### 5 APPENDICES

Appendix 1: SSD Civil Engineering Report – Gosford Hospital Redevelopment and Health and Wellbeing Precinct Stage 1.

APPENDIX A – CIVIL ENGINEERING REPORT



Civil



TaylorThomsonWhitting



## SSD Civil Engineering Report Gosford Hospital Redevelopment and Health and Wellbeing Precinct Stage 1

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### for NSW Health Infrastructure

22 May 2015

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### **APPENDIX B – ACID SULFATE SOILS REVIEW**

## 1.0 RESPONSE TO SEARS ITEMS

Gosford City Council issued a letter dated 10 February 2015 titled *Request for Secretary's Environmental Assessment Requirements (SEARs) for the Gosford Hospital Redevelopment Holden St Gosford (SSD 6913)*. The following is our response to Item 14.

*14. The development would need to provide information with the application to comply with the following:*

*A Water Cycle Management Plan (WCMP) is to be prepared that complies with the requirements of Chapter 6.7 of Council's DCP 2013. The WCMP will need to include provisions for on-site detention, nutrient pollution controls, retention of rainwater for reuse within the development, a stormwater management plan and operation and maintenance plans. On-site detention is to utilize a run off routing method, and limit post development flows back to predevelopment flows for all storms up to the 1 in 100 year recurrence interval. The Gosford Hospital is located on top of a hill so the stormwater design is to ensure that predevelopment stormwater flows for each catchment area they drain into are not exceeded. (This was a similar requirement to the previous redevelopment of the hospital site some 10-15 years ago.)*

This report includes the Water Cycle Management Plan in accordance with the requirements of Chapter 6.7 of Council's DCP 2013. Please refer to Sections 3.2 through 3.7 for further detail.

Secretary's Environmental Assessment Requirements (SEARs) were issued for Application Number SSD 6913 – Gosford Hospital Health and Wellbeing Precinct Redevelopment on 2<sup>nd</sup> April 2015. The following table summarizes those SEARs relevant to the civil engineering works for the project and provides a brief response. Additional detail can be found in the referenced sections of this report.

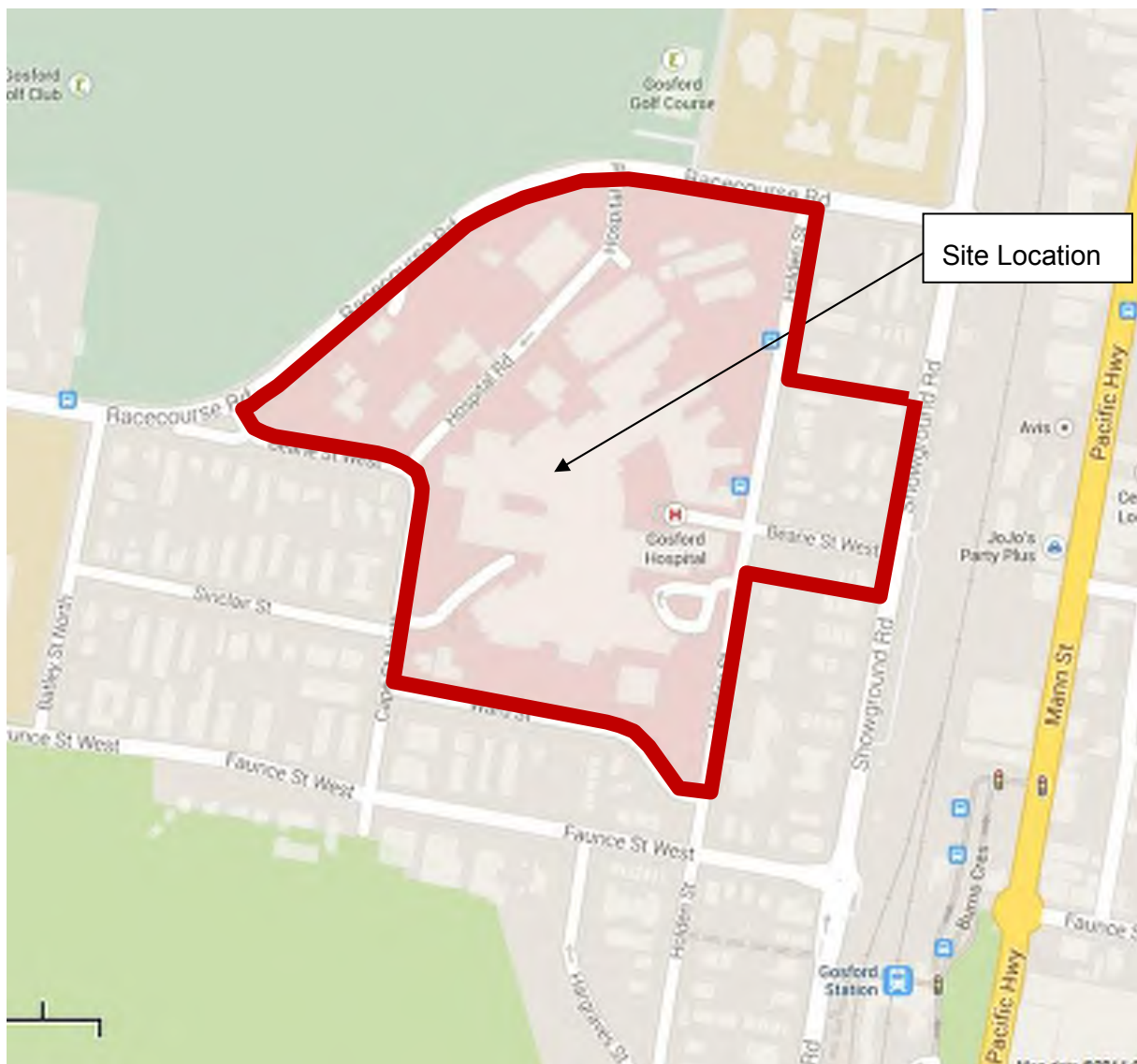
Relevant SEAR	Detailed Description of Relevant SEAR	Response
6. Ecologically Sustainable Development (ESD)	Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.	Proposed development will incorporate water sensitive urban design including retention and reuse of storm water runoff for landscape irrigation and storm water quality treatment to comply with Council pollutant load reduction targets. Refer Sections 3.5 and 3.6 of this report for further detail.
11. Sediment, Erosion and Dust Controls (Construction and Excavation)	Detail measures and procedures to minimise and manage generation and off-site transmission of sediment, dust and fine particles.	TTW have prepared schematic Soil and Erosion Control design in accordance with <i>Managing Urban Stormwater – Soils and Construction Volume 1 2004 (Landcom)</i> . Refer to drawings included in Appendix A and Section 3.7 of this report for additional detail.
15. Drainage	Provide details of the drainage associated with the proposal, including stormwater, drainage infrastructure and OSD, which shall be designed in consultation with Council and must avoid adverse impacts to downstream properties.	TTW have prepared schematic stormwater design in compliance with Council standards and guidelines. Post-development flows for storms up to and including the 1 in 100 year Annual Recurrence Interval (ARI) event are limited to pre-development flows through the use of On-Site Detention (OSD). Therefore, adverse impacts to downstream properties will be avoided. Refer to Sections 3.2, 3.3, and 3.4 of this report and the drawings included in Appendix A for additional detail.
16. Water and Flooding	<p>Assess water quality and hydrology impacts of the development, including the nature and degree of any downstream impacts for both surface and groundwater and any impacts to natural processes and functions.</p> <p>Assess any potential flooding impacts associated with the development and consideration of any relevant provisions of the NSW Floodplain Development Manual (2005), including potential effects of climate change, sea level rise and increase in rainfall intensity.</p>	<p>The development will incorporate Water Sensitive Urban Design features to maintain water quality in accordance with Council pollutant load reduction targets. Therefore, downstream impacts to natural processes and functions are not anticipated. Refer to Sections 3.2 and 3.6 of this report for further detail.</p> <p>The proposed development is located at the top of a catchment area that was the subject of a recent flood study - <i>Gosford CBD Overland Flow Flood Study - Cardno, 2013</i>. TTW have reviewed this report along with detailed survey information for the development site and determined that the site is not currently subject to flooding impacts. Our schematic storm water design has been prepared to maintain existing flow patterns and rates for storms up to and including the 1 in 100 year Annual Recurrence Interval (ARI) event Therefore, flooding impacts associated with the development will be avoided both on-site and downstream. Refer to Sections 3.2, 3.3 and 3.4 of this report and the drawings included in Appendix A for additional detail.</p>

## 2.0 EXISTING CONDITIONS

The proposed redevelopment at Gosford Hospital involves the construction of a major new wing at the hospital, a new multi-deck carpark and office buildings for health and government administrative uses as part of Stage 1 of the Health and Well Being Precinct between Holden Street and Showground Road together with associated on-site and off-site stormwater and road improvements.

### 2.1 Site Location

The site comprises of the existing grounds of Gosford Hospital and adjoining land bounded by Holden Street and Showground Road in Gosford NSW.



**Figure 1 – Locality Plan**

A topographic site survey has been prepared by Trehy Ingold Neate. The survey includes location of existing underground services within the proposed development area.



**Figure 2 – Topographic Site Survey**



## 2.2 Proposed Works

The proposed redevelopment at Gosford Hospital involves;

- Construction of a major new wing at the hospital,
- Refurbishment of existing hospital buildings,
- The proposed development extends across Hospital Road and Holden Street. Roadworks within the hospital site are proposed to provide vehicular and pedestrian access to the new buildings and maintain access to existing hospital buildings and adjacent properties along Holden Street.
- Development of Stage 1 of the Health and Wellbeing Precinct consisting of carparking, retail and office buildings for hospital and government related uses between Holden Street and Showground Road.
- Civil engineering works consist of siteworks, roadworks and stormwater improvements to serve the existing and proposed buildings.
- Offsite road works are proposed to be coordinated with Council.



**Figure 3 – Proposed Works Location Plan**

## **3.0 CIVIL ENGINEERING**

### **3.1 Geotechnical Considerations**

A geotechnical report has been prepared by Douglas Partners. A summary of the expected ground conditions is:

#### **3.1.1 Geotechnical Strata**

**Filling:** Comprising a mixture of clay, sand and gravel of varying thickness and in scattered areas. Deposits of filling at the site appear to be associated with the formation of level building pads, or landscaping associated with carpark areas, and are expected to be up to 1 – 2m thick. Two previous test pits excavated adjacent to the Racecourse Road encountered silty sand filling to 0.7m depth.

**Colluvium:** Topsoil and silty sand or clayey sand, and, where present, are typically in the order of 0.5m thick. The colluviums would tend to be deepest towards the northern end of the site.

**Residual Soil:** Mainly natural silty clay or sandy clay. These soils would likely be stiff or very stiff.

**Extremely Weathered Rock:** Generally extremely low and very low to low strength sandstone and siltstone with some ironstained (ferruginous) bands and clay bands. The thickness of this layer is expected to increase toward the north.

**Weathered Rock:** Mainly sandstone of low to medium strength or better. The presence of this material is inferred from other boreholes drilled further to the south where it was encountered in some of the previous cored bores and depths of about 6 – 9m. It is expected that the surface of this unit would become progressively deeper toward the north.

In general, the depth to rock in the area of the proposed multi-storey building is expected to increase toward the north.

#### **3.1.2 Groundwater**

Groundwater is not expected to be an issue, with expected levels of the order of RL11. This is below the proposed lowest floor levels. Some consideration to control inflow for construction methods for piers will be required.

#### **3.1.3 Ground Contamination**

Based on the findings of the desktop review, Douglas Partners considers there is a low to moderate potential for ground contamination, primarily due to past development within the building area. The highest risk relates to placement of filling as part of construction / demolition activities. In this case further testing will be required, with a number of samples taken to comply with a Phase 2 Environmental Assessment.

#### **3.1.4 Acid Sulfate Soils**

Acid sulfate soils are unlikely to be encountered on the site. Therefore, an acid sulfate soils management plan is not required. See Appendix B for additional detail.

### 3.2 Overland Flowpaths and Flooding

Gosford Council Flood Maps for the 1 in 100 year event have been obtained. The maps indicate some localized pockets of flood extent on proposed development site.

The Gosford Council Flood Maps for the redevelopment area are based on flood modeling described in the report “Gosford CBD Overland Flow Flood Study (*Cardno, 2013*)” (Council’s Flood Study). Based on our review of the Council’s Flood Study, localized pockets of flood extent within the hospital boundary appearing on Council flood mapping (see Figure 4 below) appear to be related to anomalies in the Aerial Survey Data (ALS) topographic mapping.

The ALS interpreted hospital building roof levels as ground levels which created the appearance of trapped catchments within the flood model. Detailed topographic survey of the hospital prepared for this project indicates that the proposed building site is located at the top of a hill with overland flow paths draining toward Racecourse Road, Beane Street West and Holden Street. Since, the site is not actually flood affected; a flood study should not be required for the proposed redevelopment.



**Figure 4 – Gosford Council Flood Map Hospital Site**

Access via Racecourse Road and Showground Road could be flood affected based on Council flood mapping. Depth of flooding could be further investigated to confirm depth of water over road in 1 in 100 year flood event. Any investigation would need to include rationalization of pipe capacity through the rail corridor to the east of Showground Road as Council staff indicated that the model used in Council’s Flood Study may have underestimated capacity of the existing conduit.



**Figure 5 – Gosford Council Flood Map Surrounding Area**

Based on existing topography, the Gosford Hospital site drains to the catchment area modelled as West Gosford in Council's Flood Study and the Health and Well Being Precinct site drains to the catchment area modelled as Gosford CBD in Council's Flood Study.

The proposed stormwater design seeks to maintain existing overland flow paths, flow rates and catchment conditions. Therefore, it will not contribute to increase flood risk either on-site or downstream.



**Figure 6 – Catchment Plan and Overland Flow Paths**

### **3.3 Stormwater System Overview and Water Cycle Management Plan**

#### **3.3.1 Part 1: Gosford Hospital Redevelopment**

##### **On-site Detention**

On-site detention systems from previous development within the Hospital are not proposed to be impacted by this project. Proposed new roads and pavements are located within areas that are currently occupied by pavements and/ or buildings and stormwater runoff routing from these paved areas have been designed to mimic existing conditions. Therefore, on-site detention is proposed for the new hospital wing roof only. Stormwater will be collected from the roof of the new wing and conveyed to a combined retention/ detention tank located at Level 0. The on-site detention component of the tank (20m<sup>3</sup>) has been sized in accordance with Section 6.7.7.4 of Council's DCP. Refer to Section 3.4 of this report for further details on the On-site Detention design.

##### **Retention of Rainwater for Reuse within the Development**

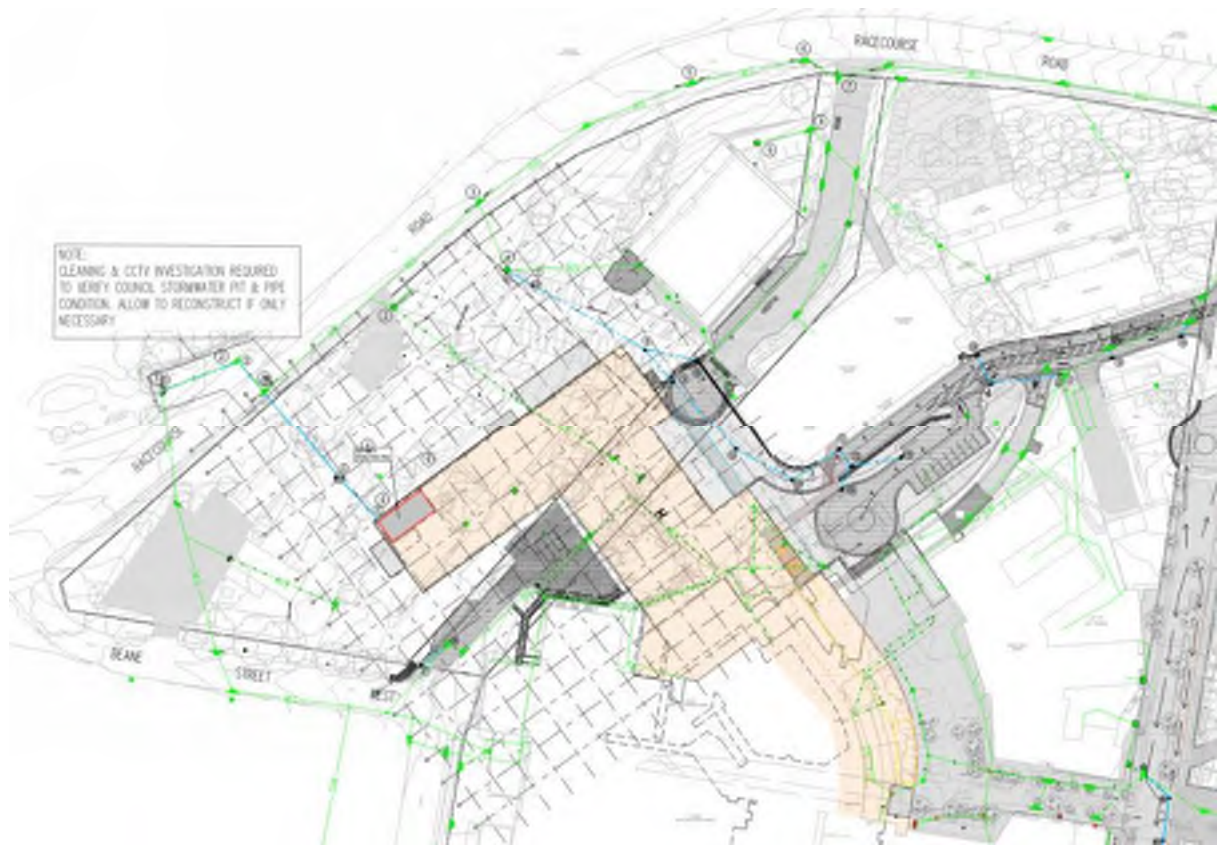
Section 6.7.7.2.4 of the DCP requires that a portion of stormwater runoff is retained on site and discharged slowly over one week. Refer to Section 3.5 of this report for further details on the design of the 194m<sup>3</sup> retention component of the combined retention/ detention tank. Per Council guidance, up to 50% of the retention volume can be claimed as part of the detention volume. Therefore, the combined tank has been design to provide 200m<sup>3</sup> of total storage. The tank is proposed to be fitted with a pump and pipe connection to the landscape irrigation system for reuse of retained stormwater.

##### **Stormwater Management**

Stormwater discharge from the combined retention/ detention tank will be controlled by a 400mm diameter orifice to limit post development flow rates to predevelopment flow rates for all storms up to the 1 in 100 year recurrence interval. Refer to Section 3.4 of this report for further detail. Discharge from the combined detention/ retention tank will be conveyed via a 450mm diameter pipe through to the Council system in Racecourse Road to the west of the new wing. Stormwater pits and pipes will convey stormwater from the proposed roads and pavements to existing pits on the Hospital site. The stormwater conveyance system has been designed to mimic existing stormwater flow conditions.

##### **Nutrient Pollution Controls**

Proprietary stormwater quality treatment devices will be selected to meet Council pollutant loading reduction criteria prior to each new stormwater discharge point. Refer to Section 3.6 of this report for additional details on Stormwater Quality Treatment.



**Figure 7 – Gosford Hospital Redevelopment Stormwater System**

### **3.3.2 Part 2: Health and Wellbeing Precinct Stage 1**

#### **On-site Detention**

Stormwater will be collected from the roof and plaza level of the Health and Wellbeing Precinct Stage 1 and conveyed to a combined retention/ detention tank located at ground level. The on-site detention component of the tank (150m<sup>3</sup>) has been sized in accordance with Section 6.7.7.4 of Council's DCP. Provision has been made to connect the 1,150m<sup>2</sup> future development area to the proposed tank at a later time. Refer to Section 3.4 of this report for further details on the On-site Detention design.

#### **Retention of Rainwater for Reuse within the Development**

Section 6.7.7.2.4 of the DCP requires that a portion of stormwater runoff is retained on site and discharged slowly over one week. Refer to Section 3.5 of this report for further details on the design of the 350m<sup>3</sup> retention component of the combined retention/ detention tank. Per Council guidance, up to 50% of the retention volume can be claimed as part of the detention volume. Therefore, the combined tank has been design to provide 350m<sup>3</sup> of total storage. The tank is proposed to be fitted with a pump and pipes to allow for reuse of retained stormwater for landscape irrigation and non-potable uses within the proposed Health and Wellbeing Precinct Stage 1 office and retail buildings.

#### **Stormwater Management**

Stormwater discharge from the combined retention/ detention tank will be controlled by a 385mm diameter orifice to limit post development flow rates to predevelopment flow rates for all storms up to the 1 in 100 year recurrence interval. Refer to Section 3.4 of this report for further detail. Discharge from the combined detention/ retention tank will be conveyed via a 450mm diameter pipe through to the Council system in Showground Road.

Stormwater pits and piping will be provided to maintain stormwater connections from existing buildings and from existing/ proposed pavements. The existing overland flow path falling from west to east down Beane Street will be replaced by a pit and pipe system designed to convey flows from the upstream catchment for up to the 1 in 100 year ARI storm event including provision for up to 50% blockage; this pipe is proposed to be suspended below Level 6 along the southern wall of the carpark.

#### **Nutrient Pollution Controls**

Proprietary stormwater quality treatment devices will be selected to meet Council pollutant loading reduction criteria prior to each new stormwater discharge point. Refer to Section 3.6 of this report for additional details on Stormwater Quality Treatment.





**Figure 8 – Health and Well Being Precinct Stormwater System**

### **3.4 Stormwater Detention**

The Gosford DCP (Section 6.7.7.4) requires On-Site Detention (OSD) to limit the post development flows to existing flows for all storms from the 1 in 2 year Annual Recurrence Interval (ARI) storm up to and including 1 in 100 year ARI event. DRAINS was used to demonstrate that the DCP requirement can be met through provision of OSD tanks.

#### **3.4.1 Part 1: Gosford Hospital Redevelopment**

Existing OSD on the Hospital site associated with the existing multi-deck carpark, Cancer Centre, Mental Health and Main Hospital building are not proposed to be impacted by the proposed redevelopment.

A catchment area for the affected area of the Gosford Hospital site was calculated to be 5,740 m<sup>2</sup>. The existing impervious fraction for this area is 77% and the proposed impervious fraction is 88%. Preliminary stormwater modelling indicates an OSD tank with a storage capacity of 20m<sup>3</sup> and a 400 mm diameter orifice on the outlet will be required.

Table 1 New hospital wing discharge rates

Average Recurrence Interval	Existing (l/s)	Developed with OSD (l/s)
2-year	173	173
5-year	224	218
10-year	255	246
20-year	296	281
50-year	310	297
100-year	347	347

### 3.4.2 Part 2: Health and Wellbeing Precinct Stage 1

A catchment area for the Health and Well Being Precinct site was calculated to be 10,605 m<sup>2</sup>. The existing impervious fraction for the area is 19.4% and the proposed impervious fraction is 90.0%.

The modelling indicates the tank requires a storage capacity of 150m<sup>3</sup> with a 385mm diameter orifice on the outlet.

Table 2 Carpark site discharge rates

Average Recurrence Interval	Existing (l/s)	Developed with OSD (l/s)
2-year	231	230
5-year	312	279
10-year	373	306
20-year	452	342
50-year	484	370
100-year	544	496

### 3.5 Stormwater Retention

The DCP 6.7.7.2.4 requires that a portion of stormwater runoff is retained on site and discharged slowly over one week.

#### 6.7.7.2.4 Deemed to Comply

Show on the Water Cycle Management Plan the Stormwater Retention Volume, which can be calculated by the formula below, or interpolated from Table 2, with the exception of pools and outdoor spas.

$$V = 0.01A(0.02F)^2$$

V = Stormwater Retention Volume (m<sup>3</sup>)  
A = Total Site Area (m<sup>2</sup>)  
F = Fraction Impervious (%)

#### Figure 9 – Excerpt from DCP 6.7.7.2.4

It is anticipated that there will be no internal re-use of rainwater within the hospital interior. Rainwater will be utilised for the irrigation of landscaped areas and may also be re-used for non-potable uses within the proposed Health and Wellbeing Precinct Stage 1 office and retail buildings.

The DCP states “A maximum of 50% of the volume of Rainwater/ Stormwater Retention Tanks can be claimed as part of the OSD volume”. The OSD volumes from Section 3.3 can be claimed in the retention tanks with a secondary outlet.

#### 3.5.1 Part 1: Gosford Hospital Redevelopment

The retention volume for the new Gosford Hospital wing calculated from the equation in section 6.7.7.2.4 in the DCP and based on a building area of 4,860 m<sup>2</sup> for this development is 194 m<sup>3</sup>.

The south eastern part of the proposed new wing has been ignored from this calculation as the proposed building covers existing building and hardstand. It is assumed the proposed roof in this area will discharge to the existing stormwater system with existing controls.

In order to achieve the DCP objective of releasing the water slowly within 7 days, an orifice size of 20mm should be used on this storage. This would be prone to blockage.

#### 3.5.2 Part 2: Health and Wellbeing Precinct Stage 1

The retention volume for the Health and Wellbeing Precinct calculated from the equation in section 6.7.7.2.4 in the DCP and based on a 90.0% impervious site area of 10,605 m<sup>2</sup> is 350 m<sup>3</sup>. This retention volume could potentially be adjusted in detailed design if the proposed impervious site area is reduced.

In order to achieve the DCP objective of releasing the water slowly within 7 days, an orifice size of 40mm should be used on this storage. This would be prone to blockage in our opinion.

### 3.6 Stormwater Quality

In order to comply with the DCP, the development must achieve the stormwater quality targets outlined in Table 3.

Table 3 Stormwater Quality Targets

POLLUTANT/ ISSUE RETENTION CRITERIA	RETENTION CRITERIA
Suspended solids and gross pollutants	80% reduction compared to the developed unmitigated site
Total phosphorus	45% reduction compared to the developed unmitigated site
Total nitrogen	45% reduction compared to the developed unmitigated site

The proposed on-site detention/ retention tanks will provide some pollutant loading reduction toward meeting the above targets. Proprietary tertiary stormwater treatment devices, such as Humes Jellyfish or a SPEL Filter can be specified for the Gosford Hospital and the Health and Wellbeing Precinct sites to fully meet the stormwater quality targets. It is recommended that the tertiary treatment device be located downstream of the detention/ retention tanks to reduce the peak flow through the device and optimise the efficiency. Green roofs and landscaping could also be incorporated at the detailed design stage.

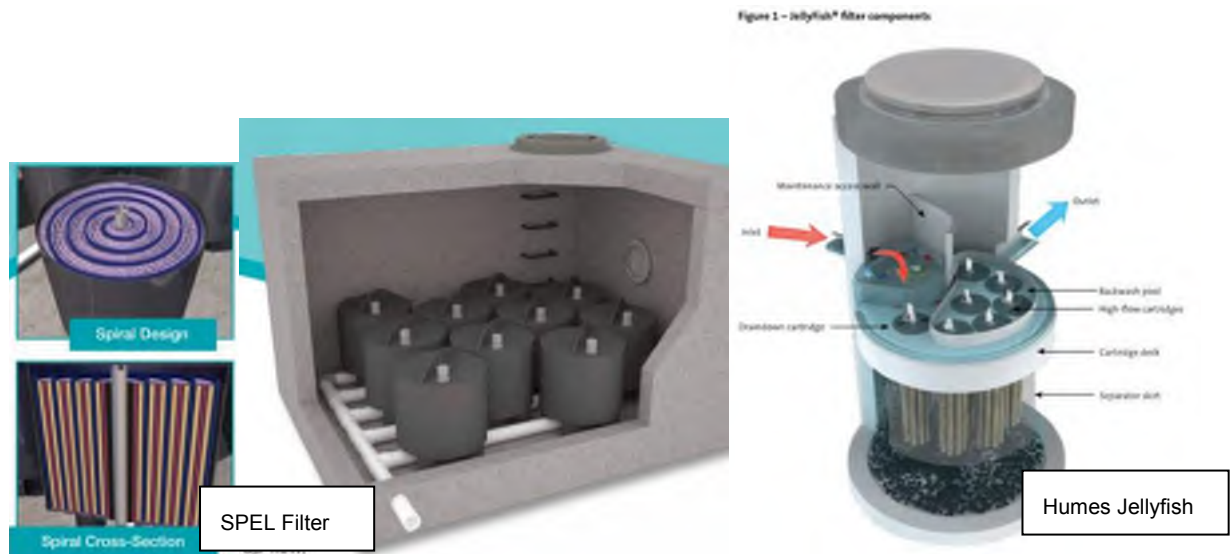
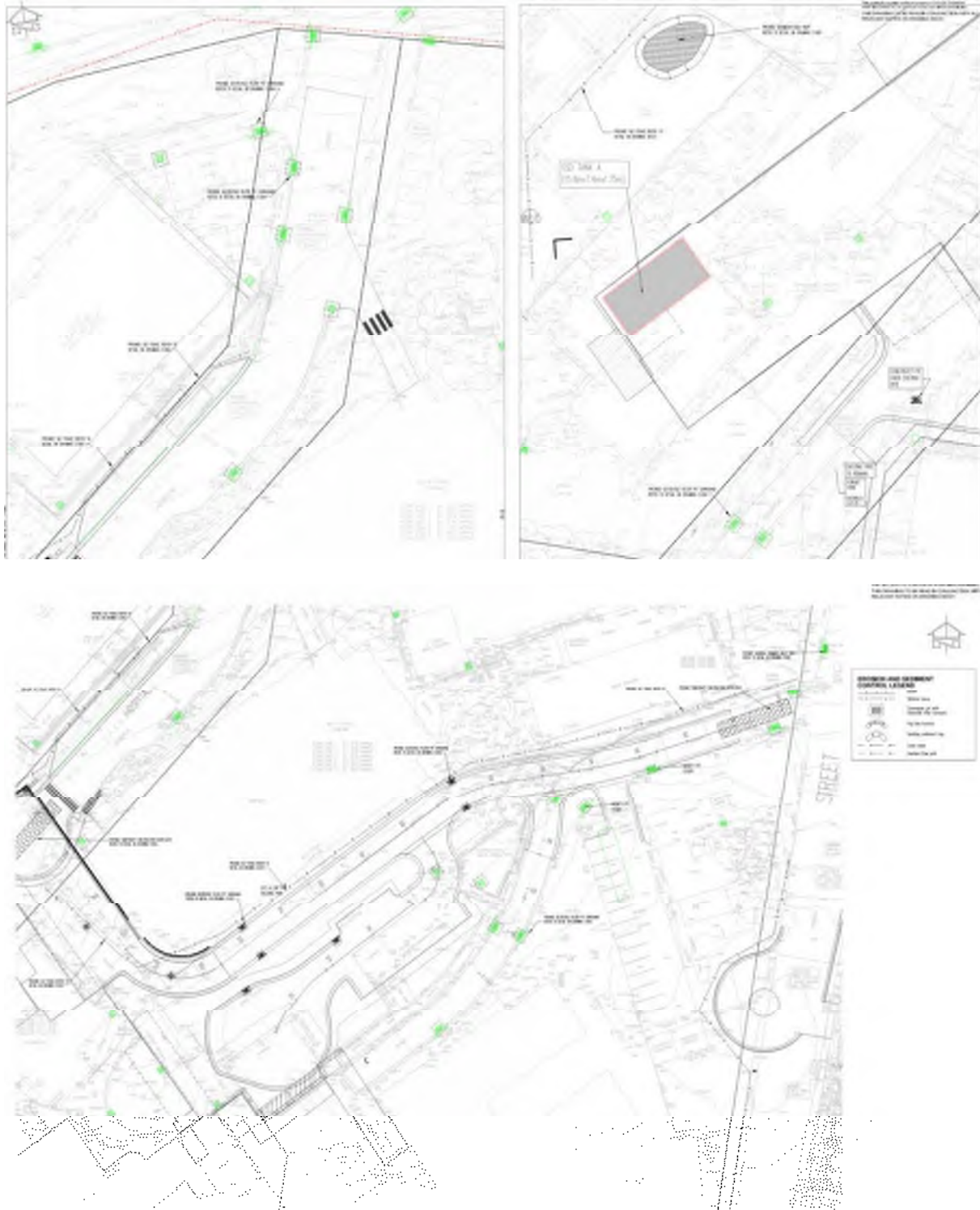


Figure 10 – Proprietary Stormwater Quality Treatment Devices

### 3.7 Erosion and Sediment Control

Construction works are to be carried out in accordance with the “Blue Book” erosion and sediment control requirements. TTW have prepared preliminary erosion and sediment control plans for the proposed development.



**Figure 11 – Erosion and Sediment Control Plans Gosford Hospital Redevelopment**

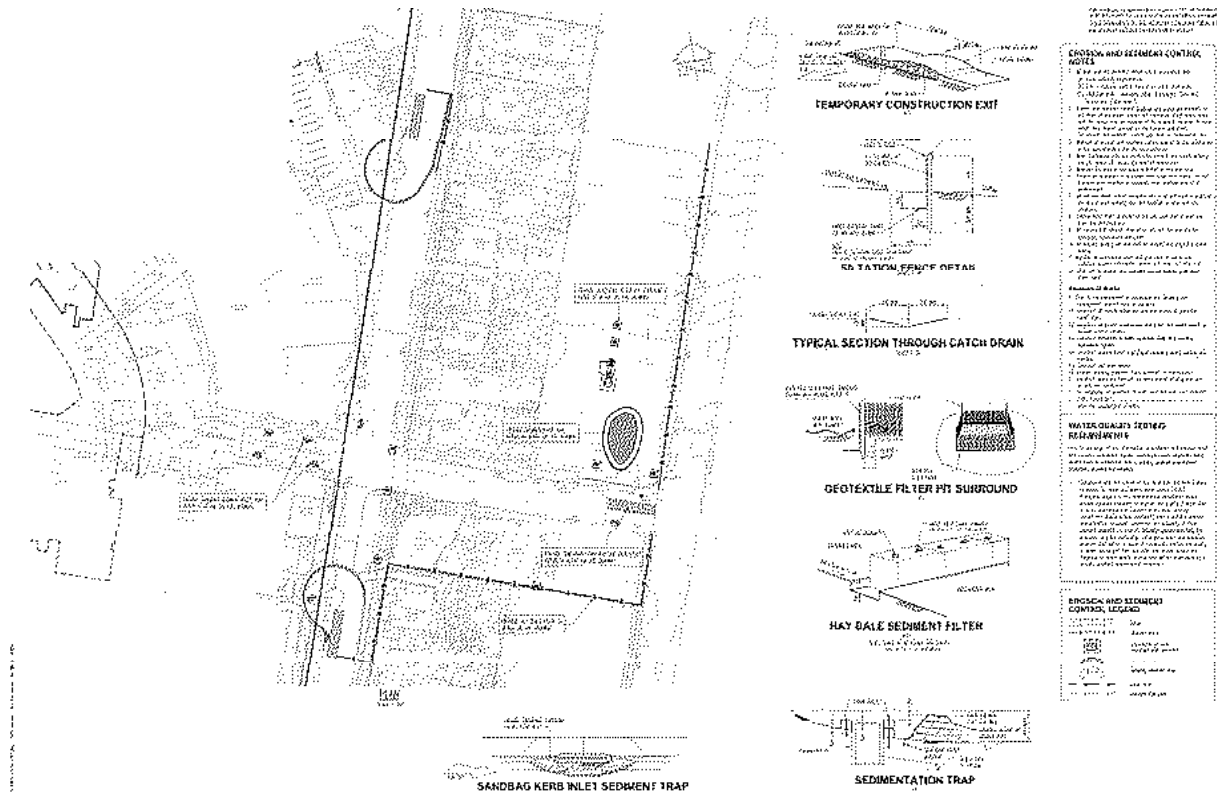


Figure 12 – Erosion and Sediment Control Plans Health and Wellbeing Precinct

### 3.8 Road System Design

Road system improvements are proposed within the hospital site to achieve the following;

#### *Hospital Road*

- Hospital Road north and south of the new wing is proposed to be closed.
- Linemarking will be updated to allow for two-way traffic from Racecourse Road to the northern portion of Hospital Road maintaining access to the existing multi-deck carpark, health services building and nurses h/o. Improvements to the intersection with Racecourse Road require consultation with Council and RMS. Refer to traffic report for further detail.
- A cul-de-sac to the north of the new Hospital wing has been designed to allow vehicles including passenger cars (B-99), commuter buses (Toyota Coaster) and 8.8m Service Vehicles (MRV) to turn around.
- The pavement and kerb within the existing Hospital Road layback in front of the health services building is proposed to be reworked to improve grades for unloading of 8.8m service vehicles (MRV).
- South of the new Hospital wing, Hospital Road is proposed to terminate in a paved multi-use vehicle area. Normally, this paved area will be dedicated to patient transport operation including parking within two standard car spaces, a bariatric ambulance unloading space and a standard ambulance unloading space.
- The southern portion of Hospital Road will be expanded to 7m allow for two-way traffic and a lay-by space for a 12.5m fuel truck to park and fill the proposed underground diesel tanks. Traffic management will be required approximately every three months to briefly suspend patient transport operation while the fuel truck utilizes the shared multi-use vehicle area to turn-around and exit the Hospital site.
- The multi-use vehicle area south of the new Hospital wing also provides for infrequent maintenance access to the proposed electrical sub-station at Level 1. During sub-station servicing, traffic management will be required to suspend patient transport operation within the multi-use vehicle area. The proposed sub-station access requires authority coordination by the electrical engineer during design development.

#### *Emergency vehicle access*

- Emergency vehicle access to the proposed ambulance parking at L3 of the new wing will be provided from Holden Street via an access road and ramp. The access road includes a dedicated lane for in-bound emergency vehicles. There is space at L3 for up to 8 bariatric ambulances to park with up to 4 unloading simultaneously.
- Emergency vehicle access to the existing mental health unit will be provided from Holden Street to a new Sally Port adjacent to the mental health unit. Access to the Sally Port has been tested for B-99 passenger vehicles and bariatric ambulances.

#### *Carparking within Hospital*

- Some new on-grade parking and vehicular access will be provided at L3 north of the proposed new hospital wing with access from Holden Street. A cul-de-sac in front of the L3 drop-off area allows for turning of B-99 passenger vehicles and commuter buses (Toyota Coaster).

- Provision will be made to maintain access via Holden Street from Racecourse Road for properties to the north of the Health and Wellbeing Precinct Stage 1. A cul-de-sac is provided north of the proposed shared use zone associated with the Health and Wellbeing Precinct to allow vehicles to turn around.

### ***Holden Street***

- The Hospital will assume responsibility for Holden Street between Racecourse Road and Faunce Street West.
- The portion of Holden Street between the Hospital and the Health and Wellbeing Precinct Stage 1 will be converted to a shared use zone for pedestrians and infrequent emergency and services vehicles.
- Provision will be made to maintain access via Holden Street from Faunce Street West for properties to the south of the Health and Wellbeing Precinct Stage 1. A cul-de-sac is provided south of the proposed shared use zone associated with the Health and Wellbeing Precinct to allow vehicles up to a 12.5m truck (HRV) to turn around.
- Provision will be made to maintain access via Holden Street from Racecourse Road for properties to the north of the Health and Wellbeing Precinct Stage 1. A cul-de-sac is provided north of the proposed shared use zone associated with the Health and Wellbeing Precinct to allow vehicles up to an 8.8m truck (MRV) to turn around.
- The cul-de-sacs within Holden Street north and South of the Health and Wellbeing Precinct Stage 1 allow for a commuter bus to turn around. Alternatively, commuter bus access could be provided through the shared use zone.
- We have provided access for a 12.5m Truck (HRV) to the existing Hospital sub-station from the southern Holden Street cul-de-sac. Coordination with service authority by electrical engineer will be required during detailed design.

### ***Beane Street West***

- Beane Street West through the Health and Wellbeing Precinct Stage 1 will be closed. Services within this portion Beane Street West corridor will be diverted as required to accommodate the road closure.

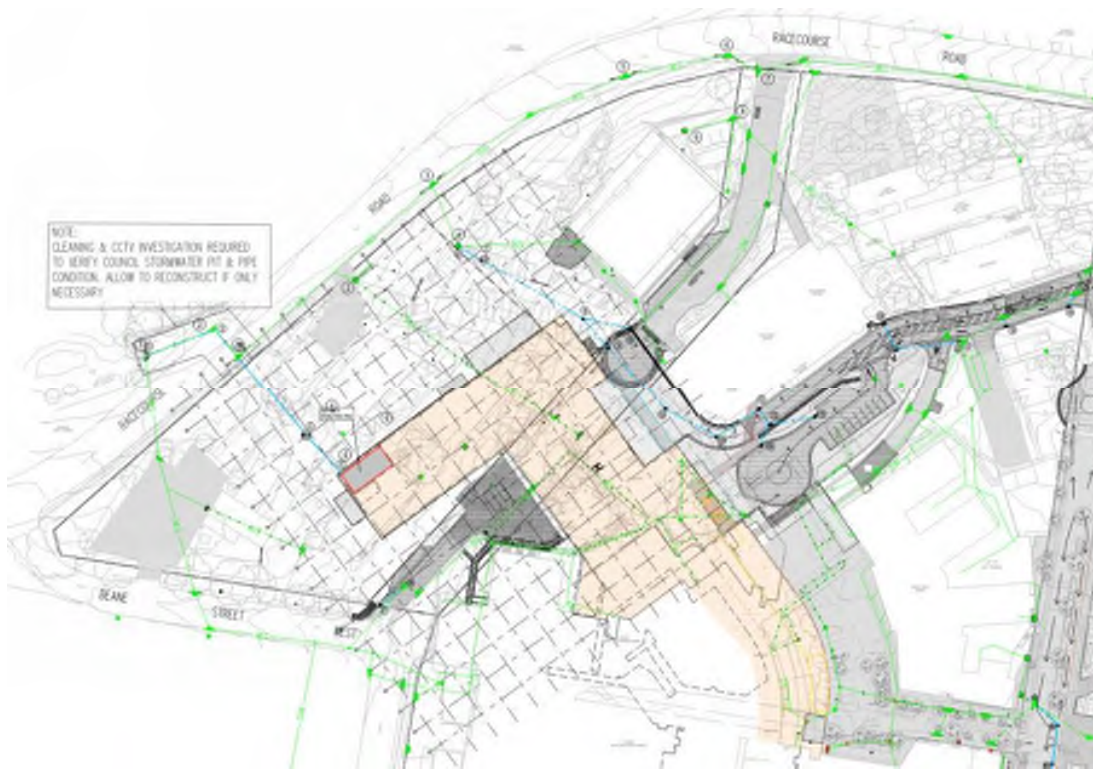
### ***Health and Wellbeing Precinct Vehicular Access***

- Access to the proposed Health and Wellbeing Precinct Stage 1 carpark is proposed from Showground Road and the northern Holden Street cul-de-sac. The proposed loading bay can be accessed from Holden Street by trucks up to 8.8m (MRV). A bus stop is proposed on Showground Road adjacent to the Health and Wellbeing Precinct Stage 1.

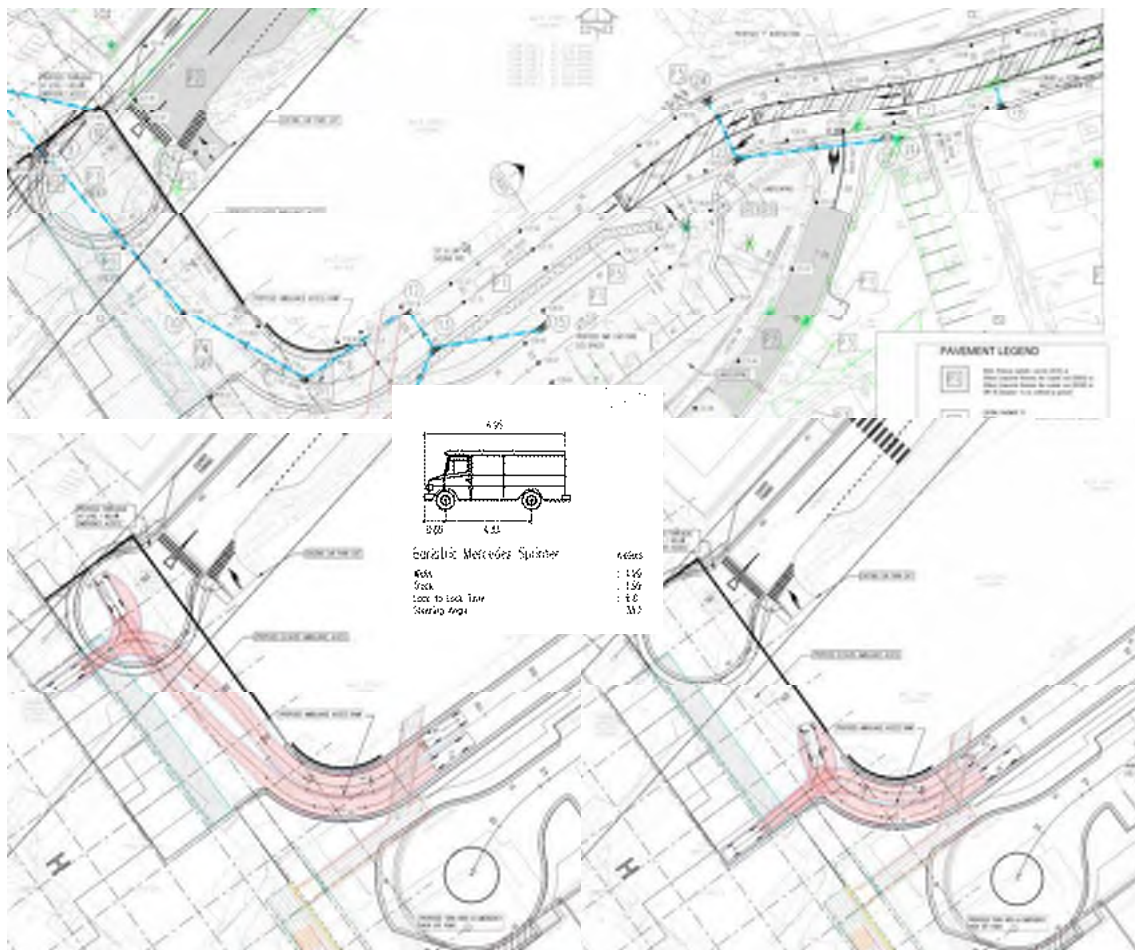
### ***Health and Wellbeing Precinct Pedestrian Access***

- Pedestrian connections will be improved from Gosford Station through to the new main hospital entry via Health and Wellbeing Precinct Stage 1. Improvements include provision of pedestrian plaza between the new main hospital entry and Health and Wellbeing Precinct and upgrades to footpaths and pedestrian crossings within Showground Road to be negotiated with Council and RMS. Lifts within the Health and Wellbeing Precinct Stage 1 building will provide vertical pedestrian transport from Showground Road at RL12.0 up to the new pedestrian plaza level at RL29.5.





**Figure 13 – Hospital Siteworks Overview Plan**



**Figure 14 – Emergency Vehicle Access to L3 – Bariatric Ambulance**

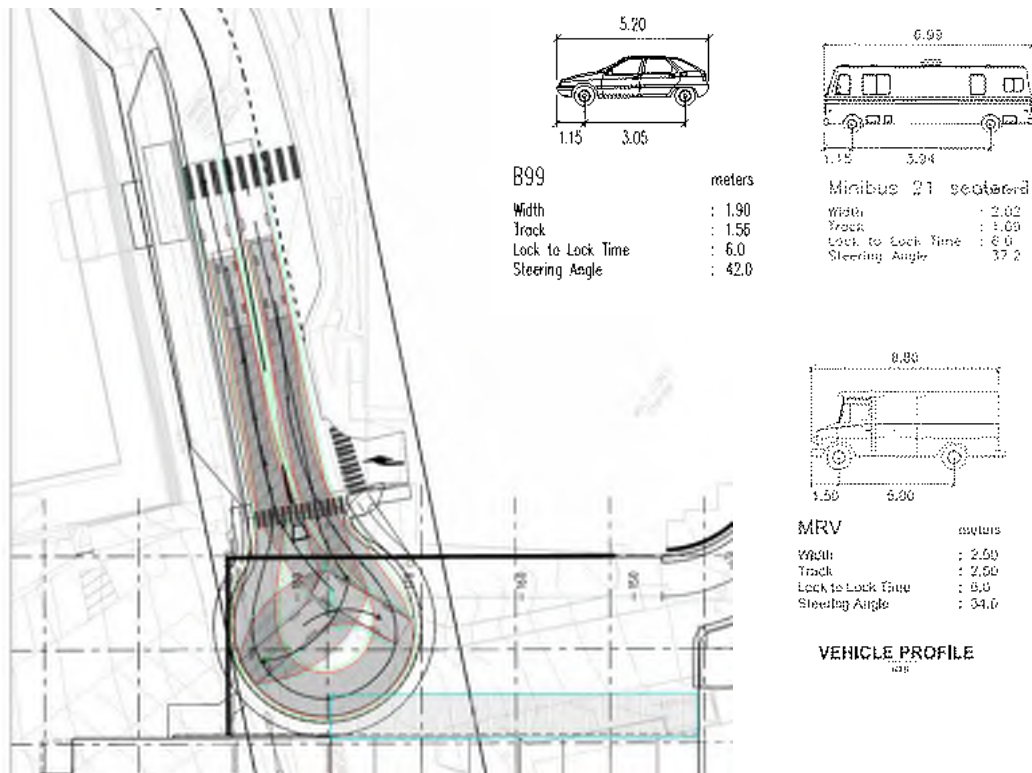


Figure 15 – Hospital Road North of New Wing – B99, Commuter Bus and MRV Turning

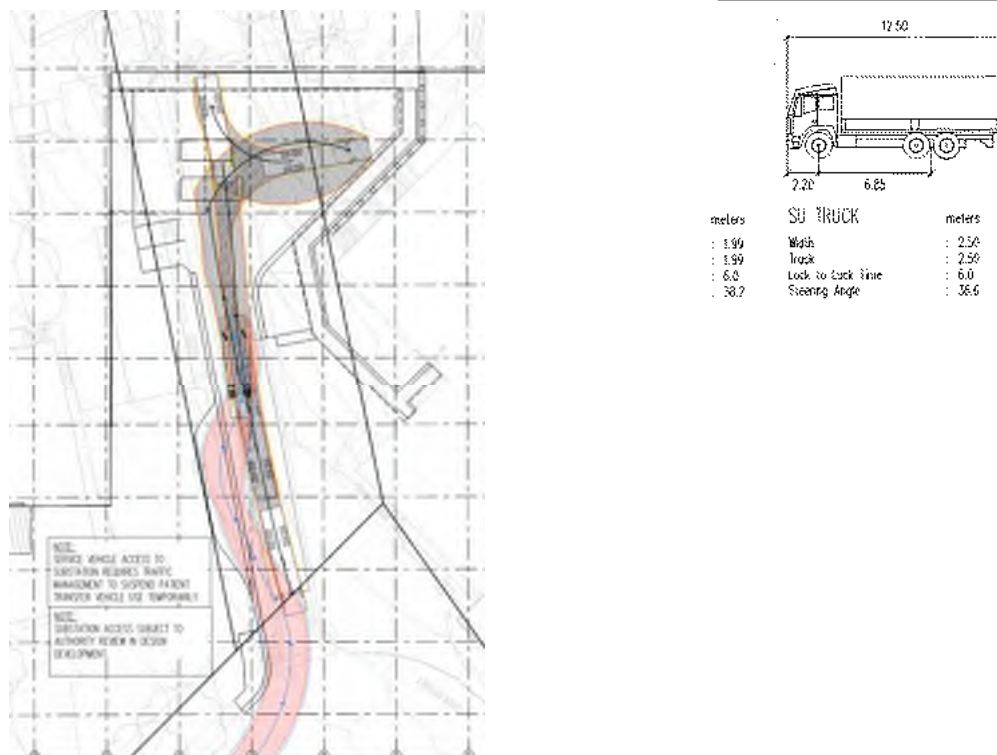
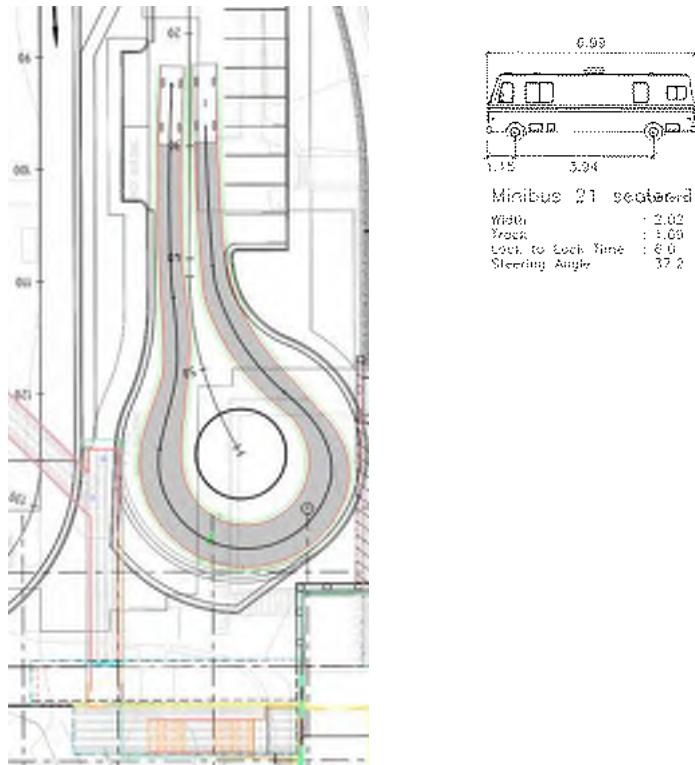
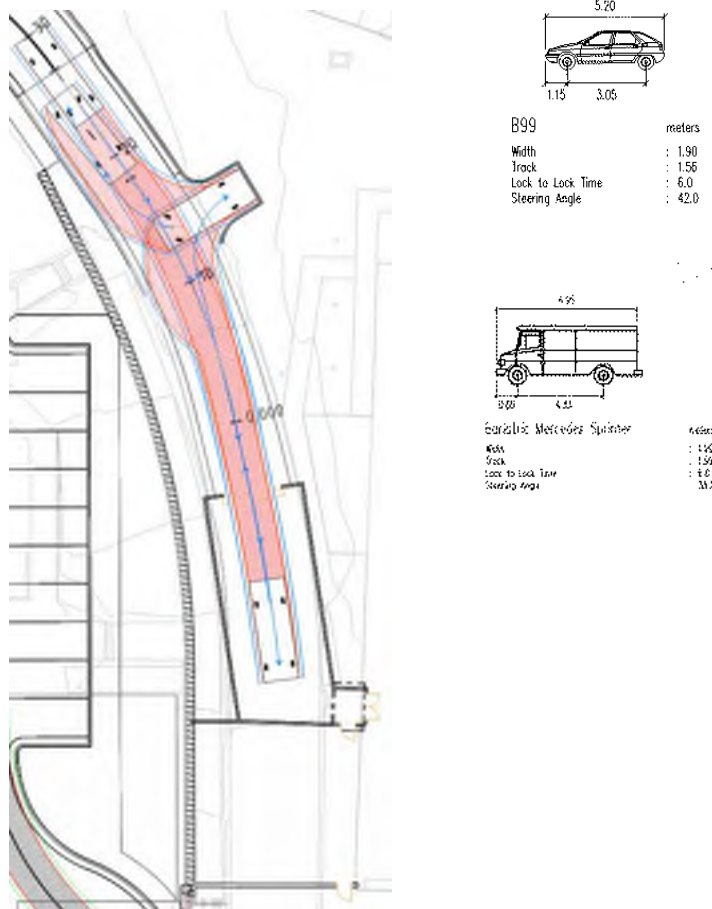


Figure 16 – Hospital Road South of New Wing – 12.5m Truck Fueling Bay & Substation Access



**Figure 17 – L3 Drop-off Access – Commuter Bus Turn-Around**



**Figure 18 – MHU Sally Port – B99 Vehicle and Bariatric Ambulance Access**



Figure 19 – Holden Street and Showground Road – B99 and Commuter Bus Turning Paths

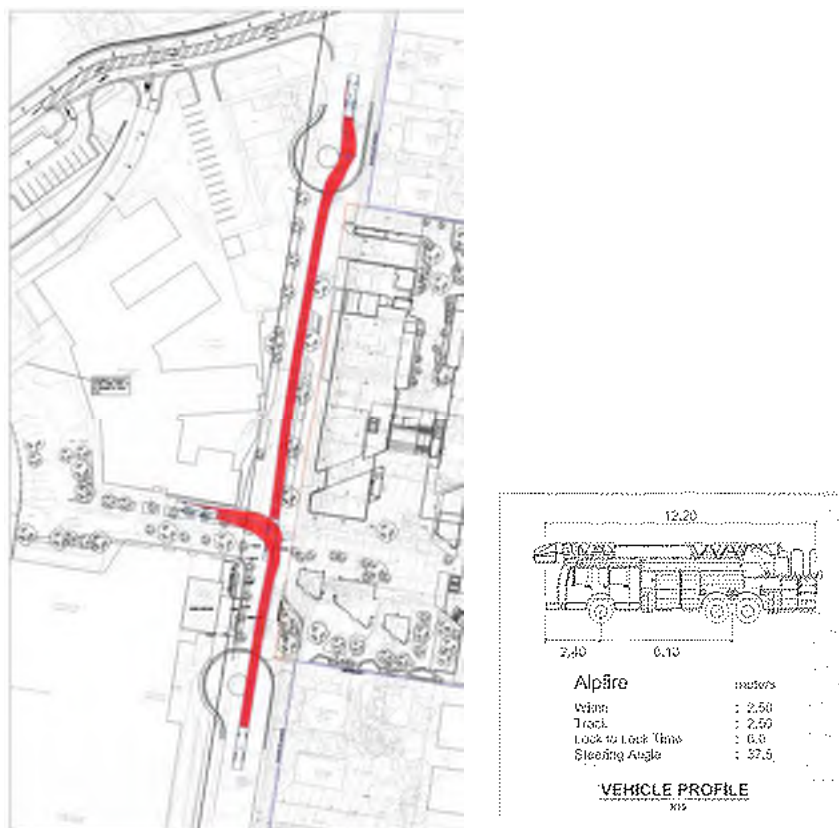


Figure 20 – Holden Street – Fire Truck Access

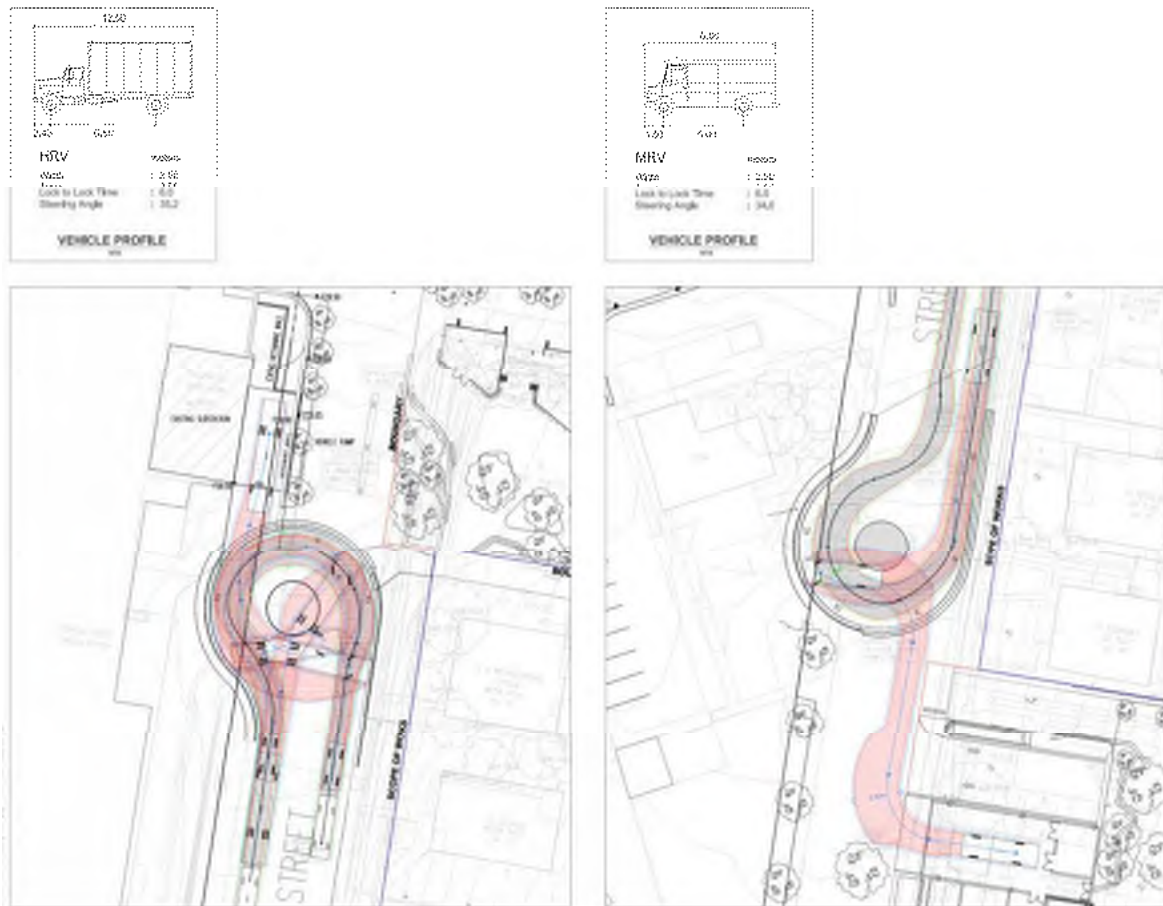


Figure 21 – Holden Street – HRV/ MRV Access

### 3.9 Services Coordination

The proposed development extends across portions of Hospital Road, Holden Street and Beane Street West. Services within Racecourse Road and Showground Road may be impacted by road improvements to serve the proposed development. Existing services within the development area have been located according to site survey and available Dial Before You Dig information.

Existing services within Hospital Road include gas services, sanitary sewer main, stormwater pits and piping, underground telecommunications and underground electrical.

Existing services within the Holden Street, Beane Street West and the Health and Well Being Precinct Stage 1 area include water main, stormwater pits and pipes, sanitary sewer main, underground electrical and telecommunications infrastructure.

Existing services within Racecourse Road and Showground Road include stormwater pits and piping, electrical poles and overhead wiring, communications pits and conduits, sanitary sewer manholes and piping, and water main.



**Figure 22 – Existing Services Plans**

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## **APPENDIX A**

# **Schematic Design Civil Engineering Drawings**

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