APPENDIX I

Civil and Structural Report

Wagga Wagga Base Hospital Redevelopment

Structural and Civil Scheme Design Report
Acute Hospital

January 2013

NSW Health

Mott MacDonald

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Contents

Chapter	Title	Page
Executive Summary		i
1	Introduction	2
2	Site Data	3
2.1	Geotechnical Investigations and Reports	3
2.1.1	Site Classification	3
2.1.2	Foundations Main Acute Hospital Building	3
2.1.3	Foundations CEP/Mortuary and Asset Management Building	5
2.1.4	Foundations other Structures	5
2.1.5	Unsupported Cut Slopes	5
2.1.6	Retaining Walls and Excavation Retention	6
2.1.7	Soil Exposure Classification	6
2.1.8	Site Contamination	7
2.2	Existing Conditions	7
2.2.1	Detail Survey	7
2.2.2	Stormwater	7
2.2.3	Road Network	7
3	Loadings	8
3.1	Floor Loads	8
3.2	Earth Pressures	9
3.3	Hydrostatic Pressures	9
3.4	Wind Loads	9
3.5	Earthquake Loads	9
3.6	Lateral Loading System	10
3.7	Dynamic Performance of Floor Slabs	10
3.7.1	Footfall	11
3.7.2	Equipment and Plant	13
4	Regulatory	14
4.1	BCA	14
4.1.1	Portion A – CEP/Mortuary and Asset Management	14
4.1.2	Phases 2/3 – Acute Hospital	15
5	Building Construction	16
5.1	Portion A CEP/Mortuary & Asset Management	16
5.2	Phases 2/3	16
5.2.1	Acute Hospital Floor Slab Options	17
5.2.2	Future Flexibility Provisions for Phase 2 – Acute Hospital	19
5.2.3	Waterproofing of External Concrete Slabs over Habitable Areas	19
5.2.4	Helipad system	20

5.2.5 Facade 20

6 Proposed Development 21

6.1 Stages 2 and 3 21
6.2 Flooding 21
6.3 Site Grading 21
6.4 Road Network 21
6.5 Stormwater 22
Appendix A. Structural Scheme Design Drawings 23
Appendix B. On-site Detention & Overland Flow 24

Executive Summary

The Stage 2/3 redevelopment involves the following:

- Construction of the Acute Hospital
- Demolition of the existing Hospital tower building

Construction of a new forecourt carpark located where the existing Hospital tower building stands.

A detailed assessment of flood risk was prepared by WMA Water in March 2011 and this was used in setting the finished floor levels for the Stage 2/3 works. This report was prepared in consideration of any relevant provisions of the NSW Floodplain Development Manual (2005) and included the potential effects of climate change and increases in rainfall intensity.

Mott Macdonald was not involved in the setting of floor levels for the hospital redevelopment. A finished floor level of 183.545m AHD has been adopted for the new Stage 2/3 works. The floor level of 183.545m AHD provides a freeboard of approximately 1.145m over the 1000YR ARI flood level based on the information provided in figure 4 of the report by WMA. The flood report by WMA acknowledges that the floor level for the hospital redevelopment is not above the PMF level for the site.

Stormwater drainage for Stage 2/3 has been designed in accordance with Wagga Wagga City Councils Engineering Guidelines for Subdivisions and Developments. Council's general guideline for developments is to ensure that the post development runoff is no greater than the predevelopment runoff. For Stage 2/3 this will be achieved by the provision of an underground detention tank located at the southern end of the proposed Acute Hospital. The detention tank will not only reduce post development flows to pre development flows but also reduce the 1 in 100 year flow to a 1 in 10 year flow.

The detention tank captures runoff from the Acute Hospital roof and also the adjacent hardstand trafficable areas. The outlet pipe of the detention tank will discharge into an existing 450 diameter pipe that discharges into the underground stormwater network in Docker Street. The existing site area where the Acute Hospital is to be built currently discharges into the existing 450 diameter pipe so the overall drainage strategy remains unchanged in this area.

An overland flow path was designed as part of the Stage 1 works and utilises the internal road network to direct runoff towards Edward Street. This overland flow path remains unchanged for the Stage 2/3 development.

Runoff generated by the proposed forecourt carpark will be directed towards a series of stormwater inlet pits and then be piped underground towards the existing on-site underground stormwater system. Post development stormwater discharge from the proposed forecourt carpark is the same as the pre development stormwater discharge. This is due to the fact that the effective hardstand area remains unchanged. Consequently no on-site detention is required for the forecourt carpark.

1 Introduction

The purpose of this report is to define the structural and civil design parameters adopted for the preparation of design documentation.

This report addresses relating to Portion A works, which are subject to a separate approval process under the provisions of ISEPP, and Phase 2/3 works, which are subject to this state significant development application.

2 Site Data

2.1 Geotechnical Investigations and Reports

Currently two geotechnical investigations and reports have been prepared by Douglas Partners Pty Ltd covering the proposed redevelopment for the Wagga Wagga Base Hospital Redevelopment project.

1. Report on Geotechnical Investigation, Proposed Redevelopment Wagga Wagga Base Hospital, Edward Street Wagga Wagga, Project 72320.00, May 2011
2. Report on Supplementary Geotechnical Investigation, Proposed Redevelopment Wagga Wagga Base Hospital, Edward Street Wagga Wagga, Project 72320.03, October 2011

The scope of the geotechnical investigations is outlined in the reports.

Geoff Young (Douglas Partners Pty Ltd) provided Mott Macdonald (MM) with pile design curves that use that limited CPT data available by email on 5th October, 2012.

A series of test pits were dug in the vicinity adjacent to the proposed site for the new CEP/Mortuary. Mott Macdonald inspected the pits. Stiff clays were observed in all of the test pits. A thin layer of fill was observed in one pit above the natural clays.

Mott MacDonald has briefed Douglas Partners Pty Ltd to undertake further geotechnical investigations to refine the footing options for the project.

2.1.1 Site Classification

The geotechnical report classifies the subsurface profile in accordance with AS2870 “Residential Slabs and Footings”. The site has been given a Class M-D classification providing ‘normal’ moisture conditions. Where ‘abnormal’ moisture conditions occur, a site classification of H-D may apply.

2.1.2 Foundations Main Acute Hospital Building

The Acute Hospital building foundations are required to support column design loads of up to 8500kN (ultimate). Two foundation systems are being investigated:

1. Piles or groups of piles founded in the very stiff to hard clay

   Due to the presence of ground water, the use of CFA piles or cased bored piers has been recommended by the geotechnical engineer. The pile design for costing will assume the use of CFA piles. Mott Macdonald has had discussions with the major piling contractors to confirm that CFA piles are preferred over cased bored piles for the site conditions.

   The pile design for costing will be undertaken using the design curves indicated in Figure 2.1. The following basic geotechnical strength reduction factors will be used to determine ultimate pile capacities.

   - Φ_{gb}=0.61 – Low redundancy systems i.e. single piles
   - Φ_{gb}=0.7 – High redundancy systems i.e. pile groups

   This assumption is based upon assessing the Average Risk Rating to be 1.5<ARR≤2.0 in accordance with AS2159-2009.

Mott Macdonald has discussed the project with major piling contractors in the market. The piling contractors contacted all have CFA rigs that can install 900 diameter piles to around 23m. Two contractors contacted have rigs that can install 900 and 1200 diameter piles to approximately 45m. The reference design for costing by Mott Macdonald assumes the use of a combination of 900 and 1200 diameter piles installed to a maximum depth of 35m.

We have asked Douglas Partners to provide settlement curves for the pile capacities provided. The pile and pile group settlements will be considered in the design of the building structure.

Given the site conditions Mott Macdonald proposes that the final detailed design of the piling system by undertaken by the contractors piling subcontractor. If the piling was agreed to be let as a design and construct contract Mott Macdonald would peer review the design on behalf of the client to ensure capacity and settlement criteria are met.

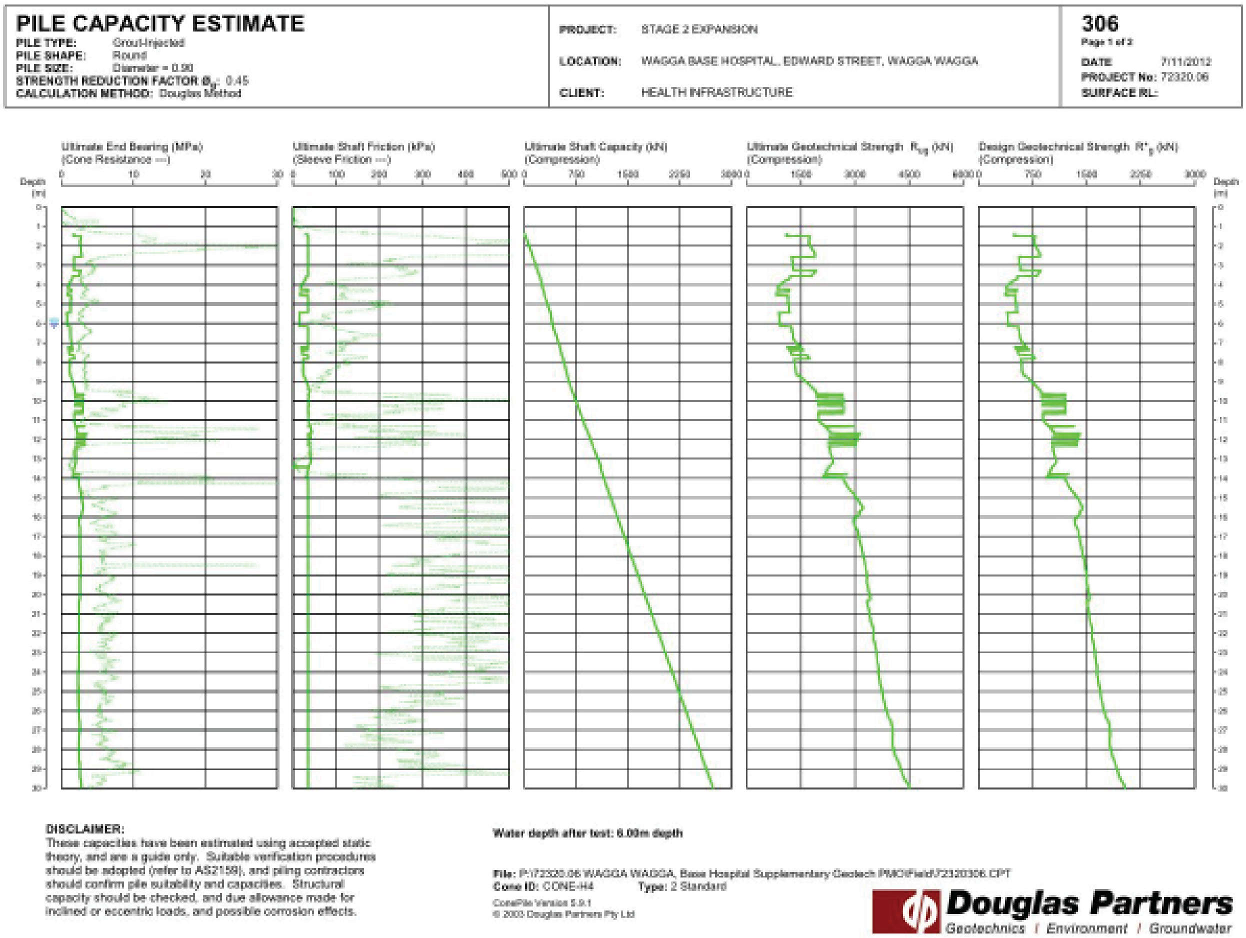


Figure 2.1: Pile Design Capacities for 900 Diameter CFA Pile Determined from CPT Data

3. **Pad footings founding on the Stiff to Hard Clays**

The information in Figure 2.2 provided by Douglas Partners has been used to assess the suitability high level footing for the project. Figure 2.2 indicates the load settlement behaviour of high level pad footings. The size of the pad footings required to limit settlements for the main acute hospital structure to an acceptable limit are considered to be uneconomical. Also, lateral loads due to earthquake result in large tension loads at core and shear wall locations that cannot be resisted by isolated high level footings.

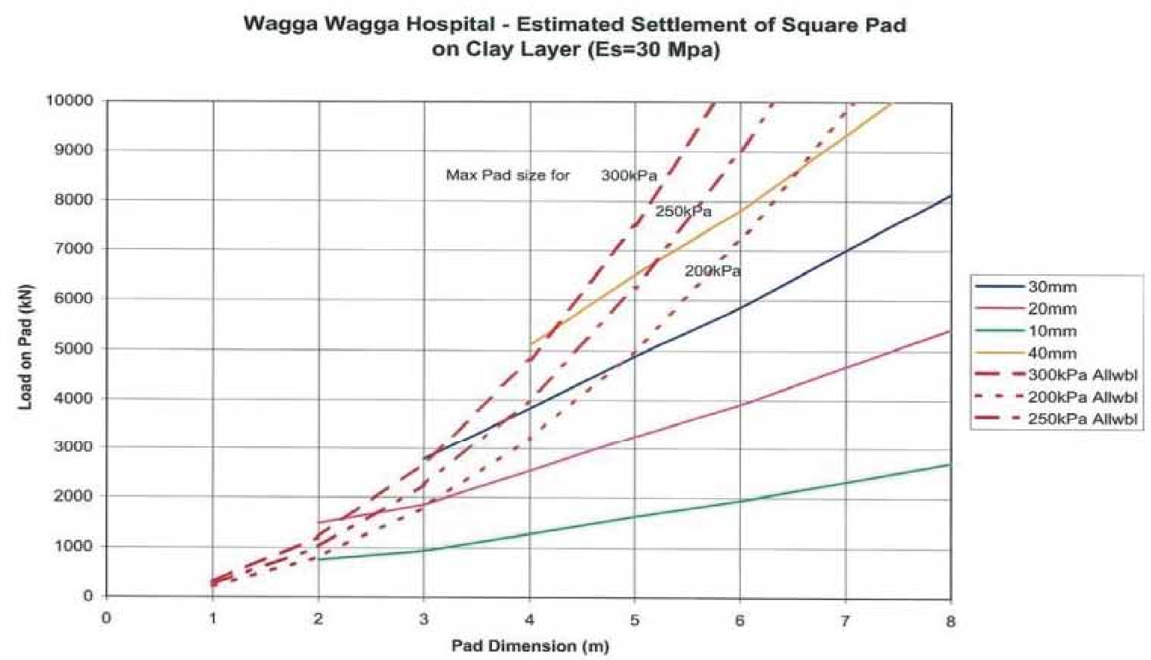


Figure 3: Pad Settlement Design Chart

Figure 2.2: Pad Settlement Design Chart

2.1.3 Foundations CEP/Mortuary and Asset Management Building

Structures associated with the CEP/Mortuary and Asset Management buildings will be founded on high level foundations subject to confirmation by Douglas Partners. All the existing low rise buildings on the site are founded on high level footings and are performing adequately.

2.1.4 Foundations other Structures

Pad footings founded on the residual clay materials will be adopted for lightly loaded structures and elements such as water tanks and access ramps.

2.1.5 Unsupported Cut Slopes

Batter slopes are to be as detailed in Table 2.1.

Table 2.1: Recommended Cut Slope Batters

Material	Height	Temporary Batter	Permanent Batter*
Existing filling and stiff clay	<2 m 2-3 m	1H:1V 1.5H:1V	1.5H:1V 2H:1V
Very stiff / hard clay	<2 m 2-4 m	0.75H:1V 1H:1V	1.5H:1V 2H:1V

** Semi-permanent and permanent batters are to be protected against erosion by shotcrete pinned to the face or battered to 3H:1V or flatter to allow grassing, stone pitching or other suitable methods*

Note: This table has been adapted from Table 5 presented in the referenced Douglas Partners geotechnical report

2.1.6 Retaining Walls and Excavation Retention

Design of retaining walls will be based on the following earth pressure distributions:

For flexible walls σ_z (kPa) = $K_a z + K_a q$

For rigid or propped walls σ_z (kPa) = $6H + K_a q$

where:

σ_z horizontal earth pressure at depth z (measured from the top of the retaining wall), kPa

K_a dimensionless coefficient of active earth pressure

σ bulk unit weight of soil, kN/m^3

q uniform distributed vertical surcharge acting on the top of the soil, kPa

H effective vertical wall height, m

Design values for the required earth pressure parameters are given in Table 2.3.

Table 2.2: Earth Pressure Parameters

Material	K_a	(kN/m^3)	C (kPa)
Clays – stiff / very stiff	0.35	20	50

If compacted fill is to be placed behind walls, a minimum lateral earth pressure of 20 kPa is to be applied in conjunction with the above earth pressures.

2.1.7 Soil Exposure Classification

The geotechnical report indicates that soil conditions at the site are alkaline. Therefore, the site exposure classification is assessed to be non-aggressive in accordance with AS2159 – 2011.

In ground structures other than piles will be designed for the following exposure classifications in accordance with AS3600-2009:

- A1 – Members protected by damp-proof membranes
- A2 – Members not protected by damp-proof membranes

2.1.8 Site Contamination

The contamination investigation that has been undertaken to date is limited. Douglas Partners have recently been engaged to undertake further contamination investigation works.

2.2 Existing Conditions

2.2.1 Detail Survey

A detailed site survey has been carried out by Riverland Surveyors. The survey has picked up existing buildings, services and site levels. The survey is lacking in detail for existing underground and additional survey is being organised by Hansen Yuncken. The additional survey will focus mainly on underground services and pick up where all underground services run including invert levels and pipe sizes. This is vital in order to design not only the relocation of services but to also avoid any clashes with new services.

2.2.2 Stormwater

The site grades generally in a northern direction towards Edward Street. The existing underground stormwater network in Edward Street is undersized and is not capable of handling a 1 in 10 year ARI discharge from the Hospital Site. Therefore is it critical that the redevelopment of the site incorporates satisfactory overland flow paths to prevent any flooding and/or ponding occurring.

2.2.3 Road Network

Wagga Wagga Base Hospital is located on the southern side of Edward Street south east of the intersection of Edward Street with Docker Street. The site is bounded by Edward Street, Docker Street, Rawson Lane and Murray Street.

Direct access to the Hospital is via a number of surrounding roads. These roads are Edward Street, Docker Street, Rawson Lane, Yathong Street, Yathong Lane, Yabtree Lane and Doris Roy Lane.

Edward Street, Doris Roy Lane, Yathong Street and Yabtree Lane provide access to the existing on-site carparking located in the northern portion of the site as well as short term drop off traffic. Rawson Lane and Yathong Street provide access for heavy vehicles.

3 Loadings

3.1 Floor Loads

Floor loadings will be taken from AS/NZS 1170.1:2002. The loads for particular floor types are given in Table 3.1.

NSW Health Design Guidance Note No.1 identifies that internal areas are to have a 40mm thick integral, unreinforced sacrificial topping above the minimum 20mm cover required for internal areas. The design guide nominates two Structural Design Criteria. Structural Design Criteria 2 indicates that for limit state design the 40mm topping is to be included as an additional super imposed dead load. The NSW Health Design Guidance Note No.1 also identifies the minimum SDL for floor structures

The 40mm thick integral, unreinforced sacrificial topping will not be provided in plant room or roof areas unless specifically requested by the client.

Floor Type	Live Load (kPa)	Ceilings, Services Load, Partitions, Floor Finishes (kPa)	40mm Sacrificial Concrete Topping
Laboratories, offices	3	1.8	1
Stairs, ramps	4	1.8	NA
Corridors and foyer areas	4	1.8	1
Operating theatres	3	1.8	1
Imaging including X-Ray and MRI rooms	5kPa (TBC on receipt of equipment weights)	1.8	1
Wards	2	1.8	1
Plant rooms	7.5	1.8	NA
Freezer rooms	5	4.25 (1.8 SDL + 100mm Topping)	NA
Kitchens	5	1.8	1
Stores and Compactuses on suspended slabs	10	1.8	1
Loading docks	15	NA	NA

Figure 3.1: Floor Loads

3.2 Earth Pressures

Refer to section 2.1.6

3.3 Hydrostatic Pressures

Ground slabs and lift pits are above any ground water level and need not be designed to resist hydrostatic uplift pressures

3.4 Wind Loads

The overall wind pressures will be calculated using AS1170.2:2002. Relevant information has been outlined in Table 3.2.

Location	Region A1
V_u	48m/s
V_s	37m/s
M_s	1.0
M_t	1.0
M_d	1.0
Terrain Category	3

Figure 3.2: Wind Load Parameters

3.5 Earthquake Loads

The overall earthquake loads will be calculated using AS1170.4:2007 and the Building Code of Australia. Relevant information has been outlined in Table 3.3.

Importance Level	4
Probability Factor, K_p	1.8
Hazard Factor, Z	0.09
Sub-Soil Class	D_e
Earthquake Design Category	III
Structural Ductility Factor, μ	2
Structural Performance Factor, S_p	0.77

Figure 3.3: Earthquake Load Parameters

3.6 Lateral Loading System

It is intended that lateral loads resulting from wind and earthquake will be resisted by shear walls or similar vertical concrete elements and moment resisting frame actions.

3.7 Dynamic Performance of Floor Slabs

The floor structures will be designed to meet the criteria identified in NSW Health Design Guidance Note No.1 as a minimum.

The dynamic performance of floor will be assed using information in the Concrete Centre Design Guide for Footfall Induced Vibration of Structures (2006) and AISC 2003.

AISC 2003 proposes vibration criteria considered suitable for various types of sensitive equipment. This information is reproduced in Table 3.4.

Category (From ASIC, 2003)	Facility/Equipment/Use	Vibrational Velocity µm/sec (RMS)
1	Computer systems; Operating Rooms; Surgery; Bench microscopes at up to 100x magnification	200
2	Laboratory robots	100
3	Bench microscopes at up to 400x magnification; Optical and other precision balances; Coordinate measuring machines; Metrology laboratories; Optical comparators; Microelectronics manufacturing equipment – Class A***	50
4	Micro surgery, eye surgery, neuro-surgery; Bench microscopes at magnification greater than 400x; Optical equipment on isolation tables; Microelectronics manufacturing equipment – Class B***	25
5	Electron microscopes at up to 30,000x magnification; Microtomes; Magnetic resonance imagers; Microelectronics manufacturing equipment – Class C***	12
6	Electron microscopes at greater than 30,000x magnification; Mass spectrometers; Cell implant equipment; Microelectronoids manufacturing equipment Class D***	6
7	Microelectronics Manufacturing equipment – Class E***; Unisolated laser and optical research systems	3

Figure 3.4: Vibration Criteria for Sensitive Equipment

The following sources of vibration will be considered in the design of the floor structures:

- Footfall
- Equipment and plant. Generally isolation mounts should be provided for all plant that may be a possible source of vibration

3.7.1 Footfall

The Footfall response will be checked in accordance with the Concrete Centre Design Guide, with a further check based on the recommendations made within and Murray, Allen and Ungar in the AISC, 2003.

The footfall frequencies and corresponding response factors defined within the NSW Health Design Guidance Note No.1 which the different floor areas will be checked for compliance with the Concrete Centre Design Guide are given in Figure 3.7.

Facility/Equipment/Use	Health Brief requirement (Response Factor)	Footfall frequency (Hz)	Typical Slab type in Appendix A
Generally procedure rooms, laboratories and general surgery	2	2.5	Type ‘A’
Operating theatres will be designed to be suitable for neurosurgery	1	2.5	Type ‘D’
Imaging suites at ground level	1	2.5	Type ‘E’
Plant areas	NA	NA	Type ‘B’
Roof areas	NA	NA	Type ‘C’

Figure 3.5: Footfall response factor design parameters – Concrete Centre method

A typical plot of the floor plate response factor from the analytical model for various footfall forcing frequencies is shown in Figure 3.8. The plot shows the contribution from each of the first four harmonics together with the overall response.

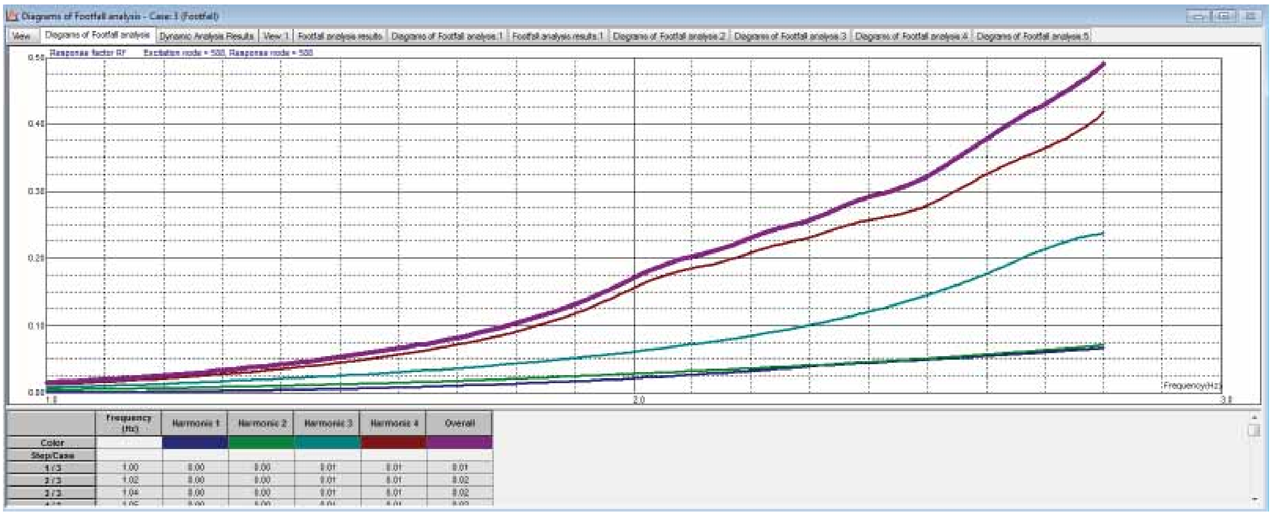


Figure 3.6: Typical response factor plot from the analytical model

The most critical areas, such as the operating theatres and imaging suites will also be checked in accordance with the recommendations made by Murray, Allen and Ungar in the AISC, 2003. The performance is driven by peak (rms) velocity levels excited by walking speeds considered realistic for the local area under consideration.

Figure 3.9 shows the parameters the structure will be checked against. A footfall frequency of 1.25Hz represents a moderate walking pace, whilst a frequency 1.5Hz is representative of a moderate to fast pace.

Facility/Equipment/Use	Max velocity level ((µm/sec) (RMS)	Footfall frequency (Hz)	Walking Type
Operating theatres will be designed to be suitable for neurosurgery	25	1.5	Moderate / Fast
Imaging suites at ground level	12.5	1.25	Moderate

Figure 3.7: Footfall response factor design parameters – Murray method

In accordance with ASIC, 2003, for design purposes the idealised footfall impulse is defined as:

$$F(t) = \frac{F_m}{2}\left[1 - \cos\left(\frac{\pi t}{t_0}\right)\right]$$ for $t < t_0$

$$F(t) = F_m$$ for $t_0 < t < t_p$

3.7.2 Equipment and Plant

Machinery and equipment that emits vibration is either to:

(a) be supported on mounts which reduce vibrations emitted to acceptable levels; or

(b) be located at a sufficient distance from the operating theatres to prevent disturbance to the equipment

Levels of vibration cannot be quantified accurately. It is recommended that after commissioning of the base building plant, prior to occupation, on-site vibration testing be undertaken to determine levels of vibration produced by the different types of mechanical plant and equipment.

4 Regulatory

4.1 BCA

The BCA report gives the provisions listed in Sections 4.1.1 and 4.1.2.

4.1.1 Portion A – CEP/Mortuary and Asset Management

Note: These works are subject to a separate approval under ISEPP

Construction type – Type C

Floor Level	Use	BCA Class
Level 1	Mortuary	8
Level 1	Administration	9a TBC
Level 1	Workshops	9b TBC
Level 1	Central energy Plant	8
Level 2	Central energy Plant	8

Figure 4.1: Building Classification

Building Element	FRL
External Walls (load-bearing)	90/90/90
External Columns	90/-/-
Load Bearing Fire Walls	90/90/90
Other load-bearing walls/beams/trusses/columns	90/-/-
Floors	NA
Switchroom Walls (load-bearing)	120/120/120
Medical Gas (load-bearing)	240/240/240
Steel framed & metal sheeted roofs not providing fire separating function	No FRL

Figure 4.2: Minimum FRL as specified by BCA

4.1.2 Phases 2/3 – Acute Hospital

Construction type – Type A

Floor Level	Use	BCA Class
Ground level	Imaging and Emergency Departments	9a, 6
Level 1	Operating Theatres and Laboratories	9a
Level 2	Critical Care Unit and Plant	9a
Level 3	Womens Health Care and Paediatrics	9a
Level 4	Patient Wards	9a
Level 5	Patient Wards	9a
Level 6	Plant	9a
Level 7	Helipad	9a

Table 4.3: Building Classification

Building Element	FRL
External Walls (load-bearing)	120/120/120
External Columns	120/-/-
Load Bearing Fire Walls	120/120/120
Shafts (non load-bearing)	-/120/120
Other load-bearing walls/beams/trusses/columns	120/-/-
Floors	120/120/120
Steel framed & metal sheeted roofs not providing fire separating function	No FRL
Steel Columns supporting Steel framed & metal sheeted roofs not providing fire separating function	120/-/- (TBC)

Table 4.4: Minimum FRL as specified by BCA

5 Building Construction

5.1 Portion A CEP/Mortuary & Asset Management

Note: These works are subject to a separate approval under ISEPP

Item	Type of Construction
Footings	Reinforced concrete pad footings, Reinforced concrete strip footings
Ground floor slab	Reinforced slab on ground (to suit site classification nominated by geotechnical engineer)
Suspended slabs	TBC
stair and shear walls	In-situ reinforced concrete, core-filled reinforced concrete block
Columns	Reinforced concrete
External non-load bearing walls	Precast concrete, masonry, light weight steel framed
Internal non-load bearing walls	Non-load bearing blockwork, light weight steel framed
Internal non-load bearing walls fire walls	Non-load bearing blockwork, light weight steel framed
Roof	Metal deck

Figure 5.1: Portion A CEP/Mortuary and Asset Management Type of Construction

5.2 Phases 2/3

Item	Preferred Type of Construction	Option (if applicable)
Footings	Main Structure Phase 2 - CFA piles Phase 3 - Reinforced concrete pad footings, Reinforced concrete strip footings	Main Structure Phase 2 - Cased bored pile
Ground floor slab	Suspended ultrafloor slab with access under imaging suites Reinforced slab on ground other areas (to suit site classification nominated by geotechnical engineer)	Suspended reinforced concrete slab on permanent metal deck formwork with access under imaging suites
Suspended slabs	Banded post-tensioned concrete generally with some non-stressed reinforced concrete slabs	Banded non-stressed reinforced concrete, flat Plate post-tensioned concrete, flat slab post-tensioned concrete

Item	Preferred Type of Construction	Option (if applicable)
Lift, stair and shear walls	In-situ concrete	NA
Columns	Reinforced concrete	NA
External non-load-bearing walls	Light weight steel frame (steel studs), curtain wall system	NA
Internal non-load-bearing walls	Non-load bearing blockwork, light weight steel framed	NA
Internal non-load-bearing walls fire walls	light weight steel framed	Non-load bearing blockwork
Internal load-bearing walls fire walls	Core-filled reinforced block	NA
Roof	Post-tensioned concrete generally with some non-stressed reinforced concrete slabs Metal deck roof over roof top plant areas	Non-stressed reinforced concrete Metal deck roof over roof top plant areas
Helipad	Post-tensioned concrete slab	Proprietary aluminium Helideck

Figure 5.2: Phases 2/3 Type of Construction

5.2.1 Acute Hospital Floor Slab Options

Appendix A contains drawings that indicate the suspended slab options considered for each floor usage. Appendix A also contains sketches indicating the extent of the proposed floor usages.

Typical Slab Type ‘A’ - Other floor areas including wards etc.

Typical Slab Type ‘B’ - Plant areas

Typical Slab Type ‘C’ - Roof areas

Typical Slab Type ‘D’ - Operating theatres will be designed to be suitable for neurosurgery

Generally procedure rooms, laboratories and general surgery

Typical Slab Type ‘E’ - Imaging suites at ground level

Typical Slab Type ‘F’ - Helipad

Typical Slab Type ‘G’ - Slabs on Ground

Slab Options Type 'A', 'B', 'C', 'D', 'E', 'F'	Advantage	Disadvantage
1 – Flat Slab + Drop Panels	▪ Thinner slab away from drop panels compared to banded system.	▪ Less efficient structural solution, higher material cost than banded solution ▪ Room to reticulate services reduced at drop panel locations
2 – Flat Plate	▪ Simplified formwork ▪ No beams or drop panels which may aid with services reticulation	▪ Least efficient structural solution, highest material cost ▪ Requires proprietary punching shear reinforcement. ▪ Difficult to provide for future penetration at column locations
3 – Banded Slab **(Preferred Option)**	▪ Most efficient structural solution, lowest material cost ▪ Enables use of permanent metal deck formwork which does not require stripping and requires less propping	▪ Room to reticulate services reduced at band locations
4 – Banded Slab & Flat Slab + Drop Panels Combination	▪ No real advantages over Banded or Flat slab + drop panel systems	▪ Room to reticulate services reduced at band and drop panel locations ▪ Most complicated formwork of all options

Figure 5.3: Phase 2 – Acute Hospital Floor Suspended Slab Options

Slab Options Type 'G'	Advantage	Disadvantage
1 – 180 thick slab on ground to suit site classification M-D in accordance with AS2870-2010	▪ Simplified earth works ▪ Simple construction	▪ Filling may be required in some areas to build up levels
2 – Waffle pod slab on ground to suit site classification M-D in accordance with AS2870-2010	▪ Less filling required in areas that are to be built up	▪ More difficult to trench and rectify in future ▪ More materials therefore higher cost

Figure 5.4: Phase 2 – Acute Hospital Ground Floor Slab Options

5.2.2 Future Flexibility Provisions for Phase 2 – Acute Hospital

Future Flexibility Provision	Future Flexibility Provision Measure	Status
Ground floor slab access Medical Imaging Are Acute Hospital	To allow installation of future equipment, crawl space access is to be provided under areas of the ground floor slab supporting imaging equipment. To avoid the use of lost formwork two system are being investigated Ultrafloor proprietary precast system supported on reinforced block piers & Ultrafloor bearers or reinforced block cross walls 4. Reinforced concrete slab supported on permanent metal deck formwork and reinforced block cross walls	Requirement for access to subfloor to be confirmed by client
Allowance for future setdowns and chasing of floors in all occupied areas other than plant rooms	Provide an additional 50mm cover to all top reinforcement including post-tensioning (i.e. typical internal cover to be 70mm not 20mm as typical for internal floor structures). Slabs to be designed so that the additional 50mm can be removed without compromising strength and deflections.	Requirement for additional cover to internal floor structures to be confirmed by client
Allowance for future additional riser a all column locations	Floor structures to be designed to allow for 1 additional future riser at all column locations.	Requirement for additional services riser at all column locations to be confirmed by client

5.2.3 Waterproofing of External Concrete Slabs over Habitable Areas

It is assumed that waterproofing of concrete slabs over habitable areas will be provided by a torch-on sheet membrane or similar specified and detailed by the project architect.

Where the waterproofing is provided by an applied membrane unless advised requested by the client no additional waterproofing measures will be adopted including:

- Concrete additives such as Caltite, Xypex etc.
- Steel reinforcement/post-tensioning above that required for strength, deflections and moderate crack control.

5.2.4 Helipad system

The helipad will be designed in accordance with the following documents:

Ambulance Service of NSW, Guidelines for Helicopter Landing Sites in NSW, Prepared by AviPro Rev 6th October, 2011

5. International Civil Aviation Organisation (ICAO), Heliport Manual 3rd Edition 1995

We have been advised by the client that the helipad is to be designed for an aircraft of maximum load of 7 tonnes. This will be confirmed once a helipad consultant has been appointed by the client.

The final construction system for the helideck is yet to be confirmed. We are currently considering a number of structural options which will be discussed with the helipad consultant.

5.2.5 Facade

Refer to separately issued report by Mott Macdonald

6 Proposed Development

6.1 Stages 2 and 3

The Stage 2/3 redevelopment involves the following:

1. Construction of the Acute Hospital
2. Demolition of the existing Hospital tower building
3. Construction of a new forecourt carpark located where the existing Hospital tower building stands.

6.2 Flooding

A detailed flood report for the Wagga Wagga Base Hospital was prepared by WMA Water in March 2011. This report was used in setting the finished floor levels for the hospital redevelopment.

Mott Macdonald was not involved in the setting of floor levels for the hospital redevelopment. A finished floor level of 183.545m AHD has been adopted for the new Stage 2/3 works. The floor level of 183.545m AHD provides a freeboard of approximately 1.145m over the 1000YR ARI flood level based on the information provided in figure 4 of the report by WMA. The flood report by WMA acknowledges that the floor level for the hospital redevelopment is not above the PMF level for the site.

6.3 Site Grading

The internal road network was designed as part of the Stage 1 works and was designed to provide an overland flow path to direct overland flow towards Edwards Street. The Stage 2/3 works utilises this overland flow path and it remains unchanged with the Stage 2/3 works.

The overland flow path is shown on the attached drawing MMD-313119-C-DR-00-OF-0001.

The site generally grades in a northerly direction and the overland flow path directs flow in a southerly direction from the intersection of Lewis Drive and Rawson Lane towards Yathong Street. It then flows east along Yathong Street and then north along the New Lewis Drive. At the intersection of New Lewis Drive and Yabtree Street it heads west along Yabtree Road where it will discharge into the existing Lewis Drive and then into Edwards Street

6.4 Road Network

Access to Stages 2/3 will be via Lewis Drive (both off Edward Street and Rawson Lane), Yathong Street and Yabtree Street. A dedicated right turn bay will be provided in Edwards Street for entry into Lewis Drive.

Egress will be via Rawson Lane, Yathong Street, Yabtree Street and Doris Roy Lane. Egress from Lewis Drive to Edward Street will be limited to left out only.

Edward Street, Yathong Street, Yabtree Street and Rawson Lane will provide access to on-site carparking as well as short term drop off traffic.

Access for ambulances to the emergency drop off point is via Yathong Street and Lewis Drive South. Both these roads are two way roads and will provide entry and exit for emergency vehicles.

Emergency vehicles can access Lewis Drive South via Rawson Lane and also a one way Lane from Brookong Avenue

All new carparks are to be designed with the following pavement composition:

- 100mm DGB 40 subbase
- 150mm DGB 20 base course
- 40mm AC10 seal.

6.5 Stormwater

Wagga Wagga City Councils Engineering Guidelines for Subdivisions and Developments recommends that the stormwater drainage is to be in designed in accordance with the following design criteria:

Minor System Drainage (Undergound Piped Network) 1 in 10 year ARI.

Major System Drainage (Overalnd Flow Path) 1 in 100 year ARI.

No formal meeting with Wagga Wagga City Council was carried out as part of the overall Stage 2/3 stormwater strategy. The Mott MacDonald local office in Wagga Wagga has been dealing with Council for over 20 years and our experience with Council policy is that post-development stormwater flows have to be reduced to pre-development flows. This is the strategy that has been adopted for Stages 2/3 and has been achieved with the adoption of an on-site detention tank.

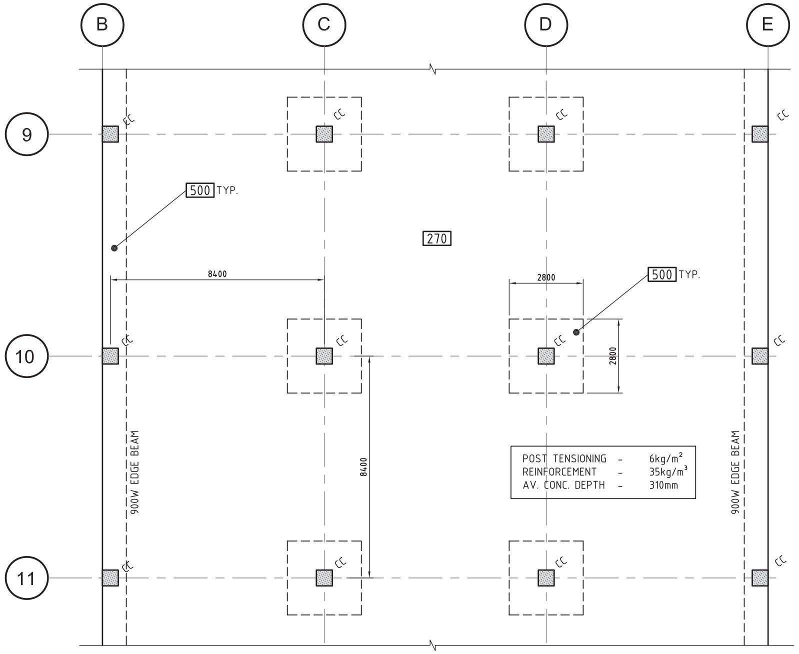
All roof water from the Acute Hospital drains towards the southern end of the Acute Hospital where it discharges into a detention tank. This tank will reduce peak 1 in 100 year flows to peak 1 in 10 year flows. The detention tank will discharge via a 375 diameter pipe (1 in 10 year capacity) in a westerly direction and discharge into an existing 450 diameter pipe that discharges into Docker Street. The detention tank caters not only for the Acute Hospital but also for the adjacent carparking and also for 1 in 10 year flows from Lewis Drive South. This detention tank will hold the 1 in 100 year storm event so no overland flow will be generated. However, if a pipe or pit becomes blocked, the overland flow path provided as part of the Stage 1 works will be utilised. The overland flow path remains unchanged from the Stage 1 works

As well as the above detention tank two other detention tanks have also been provided as part of Stage 1 works. These on-site detention reduces peak flows from the Mental Health building and portions of the existing carparks and also the new carpark that was constructed in the north west portion of the site.

Runoff generated by the proposed forecourt carpark will be directed towards a series of stormwater inlet pits and then be piped underground towards the existing on-site underground stormwater system. Post development stormwater discharge from the proposed forecourt carpark is the same as the pre development stormwater discharge. This is due to the fact that the effective hardstand area remains unchanged. Consequently no on-site detention is required for the forecourt carpark.

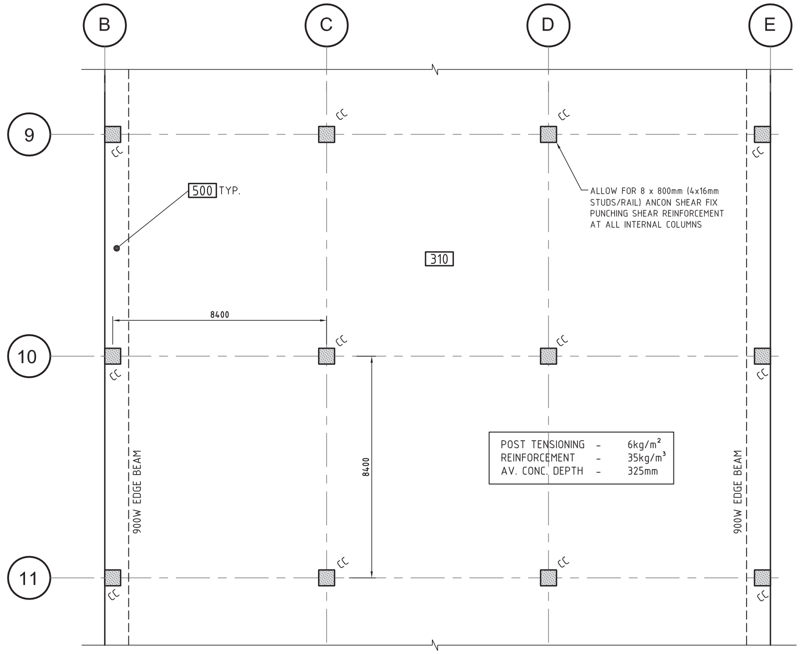
The on-site detention locations are shown on the attached drawing MMD-313119-C-DR-00-OD-0001.

Appendix A. Structural Scheme Design Drawings



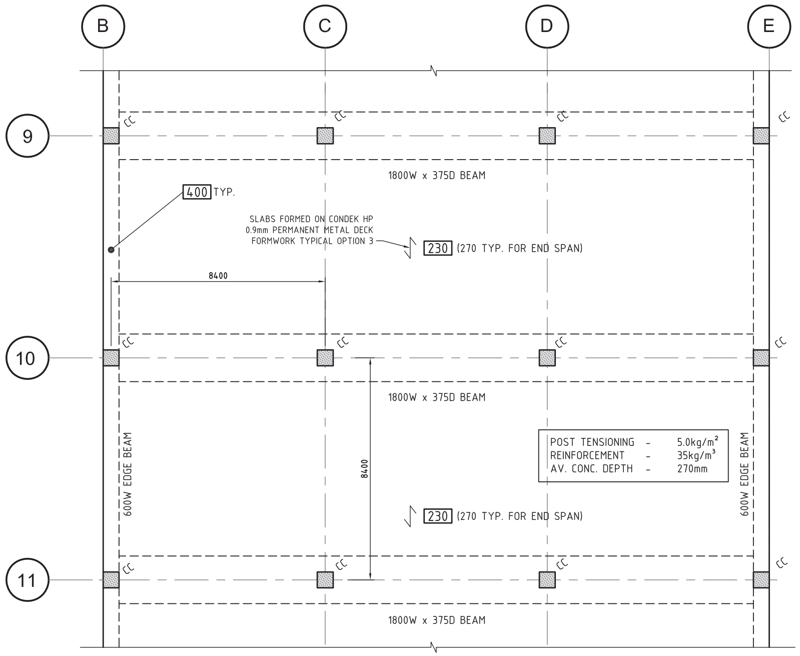
TYPICAL SLAB TYPE 'A' CONSTRUCTION - OPTION 1

SCALE 1:100



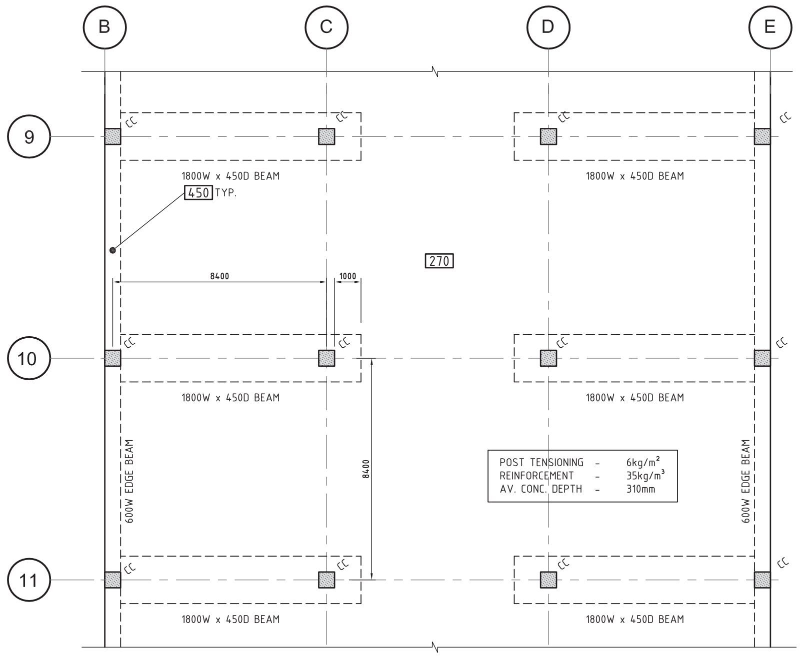
TYPICAL SLAB TYPE 'A' CONSTRUCTION - OPTION 2

SCALE 1:100



TYPICAL SLAB TYPE 'A' CONSTRUCTION - OPTION 3 (PREFERRED)

SCALE 1:100



TYPICAL SLAB TYPE 'A' CONSTRUCTION - OPTION 4

SCALE 1:100

P:\St Leonards\Projects\31xxxx\313119\313119 - Wagga Wagga Base Hospital\06 CAD\6_4 Working drawings\Structural\Autocad\Drawings\MMD-313119-S-DR-01-XX-SK01.dwg Oct 8, 2012 - 5:39PM hoc55952

Notes

- DESIGN LIVE LOAD = 4.0 kPa MAX.
- DESIGN SDL = 1.0 kPa
- SLAB THICKNESSES INDICATED INCLUDE A 50mm TOPPING ZONE FOR FUTURE FLEXIBILTY
- SLAB OPTIONS INDICATED ALLOW FOR PROVISION OF FUTURE PENETRATIONS 1 SIDE OF COLUMN ONLY. LOCATIONS TBC

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
1	13/09/12	JK	Issued For Information	JRW	JRW

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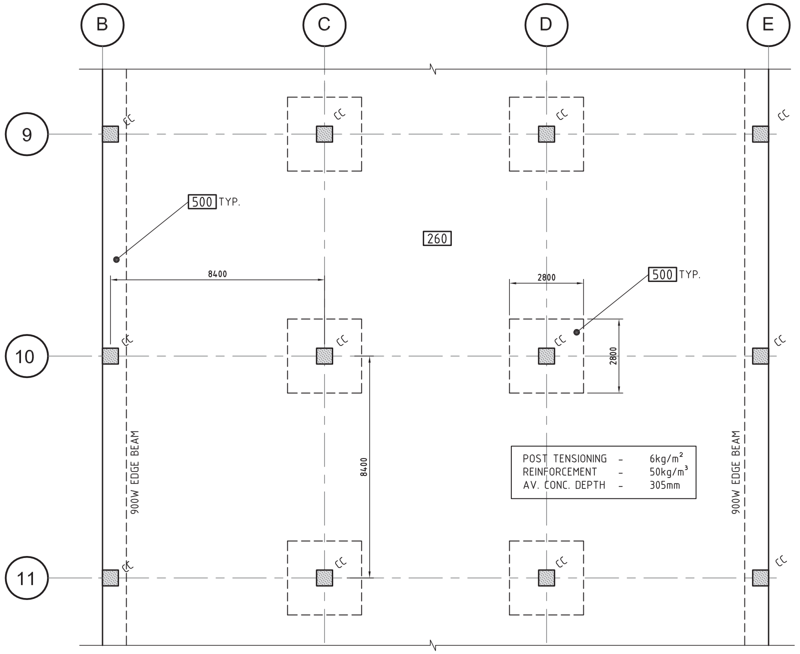
Client
Wagga Wagga Hospital
Redevelopment
Edward Street, Wagga Wagga
NSW, 2650

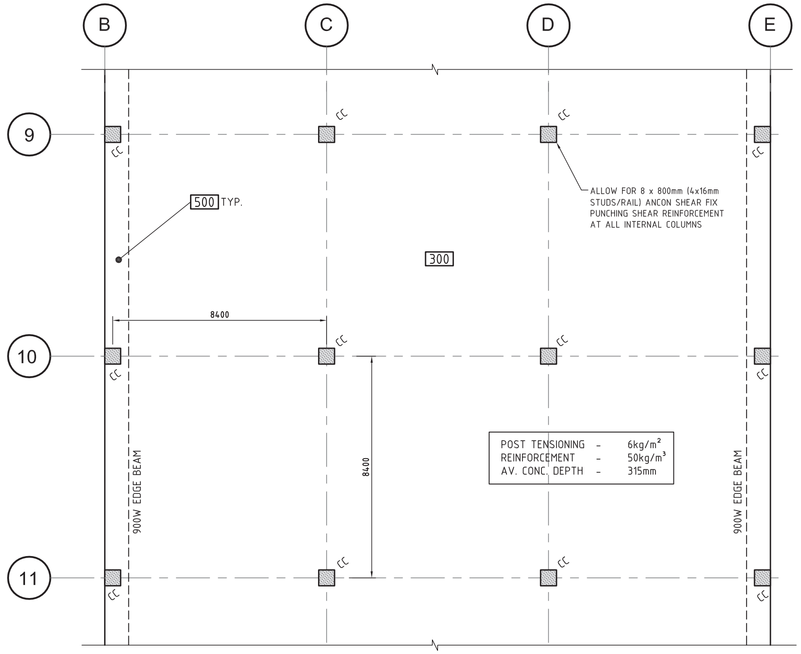
Title
SUSPENDED SLAB OPTIONS
TYPICAL INTERNAL AREAS
ACUTE HOSPITAL

Designed	JRW	Eng check	-
Drawn	JK	Coordination	-
Dwg check	-	Approved	J Williams
Scale at A1: 1:100	Status: PRE	Rev: P1	

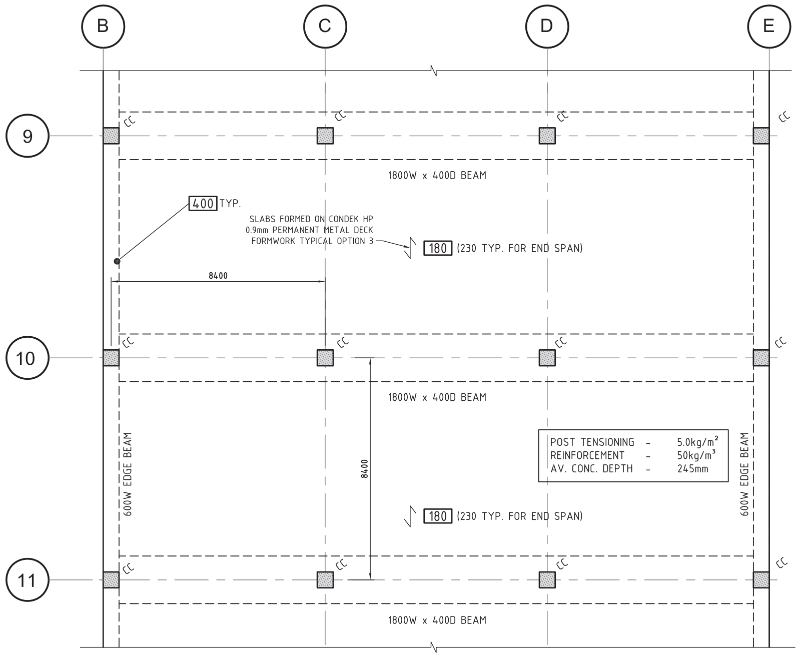
Drawing Number
MMD-313119-S-DR-01-XX-SK01



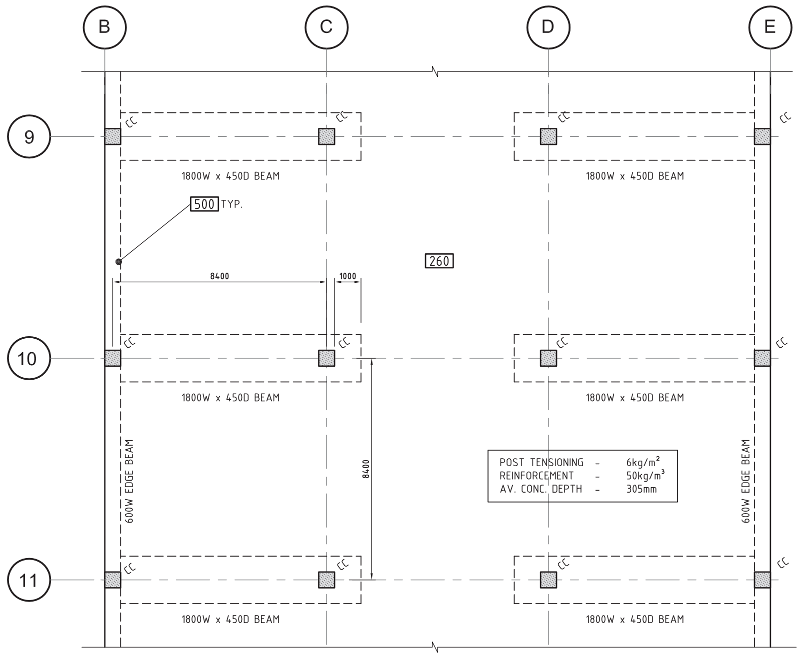
TYPICAL SLAB TYPE 'B' CONSTRUCTION - OPTION 1
SCALE 1:100



TYPICAL SLAB TYPE 'B' CONSTRUCTION - OPTION 2
SCALE 1:100



TYPICAL SLAB TYPE 'B' CONSTRUCTION - OPTION 3 (PREFERRED)
SCALE 1:100



TYPICAL SLAB TYPE 'B' CONSTRUCTION - OPTION 4
SCALE 1:100

Notes

- DESIGN LIVE LOAD = 7.5 kPa
- DESIGN SDL = 1.5 kPa
- SLAB OPTIONS INDICATED ALLOW FOR PROVISION OF FUTURE PENETRATIONS 1 SIDE OF COLUMN ONLY. LOCATIONS TBC

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
1	13/09/12	JK	Issued For Information	JRW	JRW

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Client
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Redevelopment
Edward Street, Wagga Wagga
NSW, 2650

Title
SUSPENDED SLAB OPTIONS
PLANT AREAS
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1 1:100		Status PRE		Rev P1

Drawing Number
MMD-313119-S-DR-01-XX-SK02

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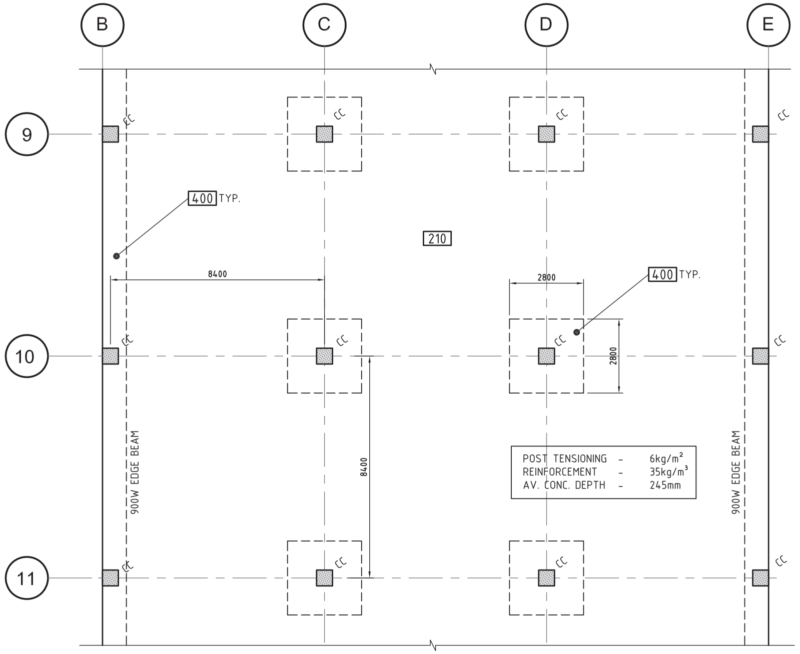
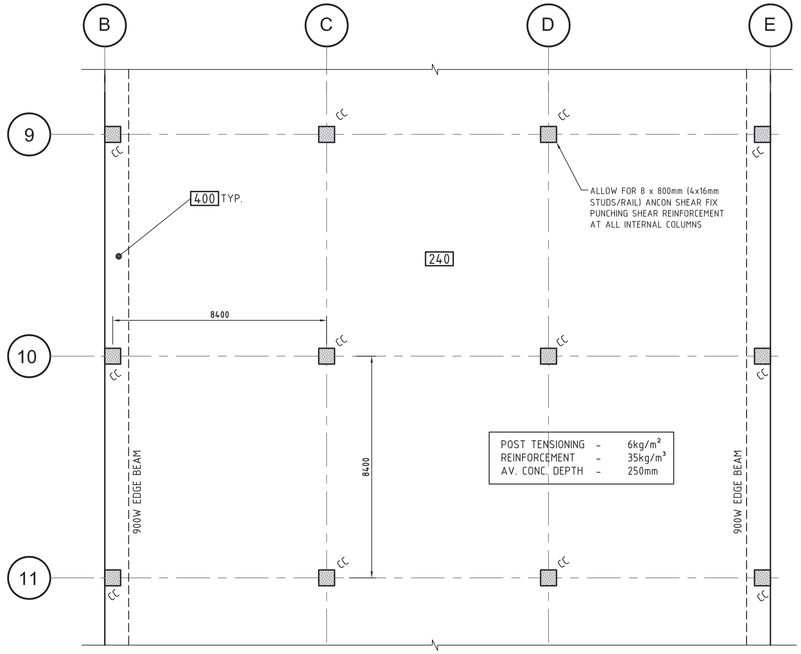


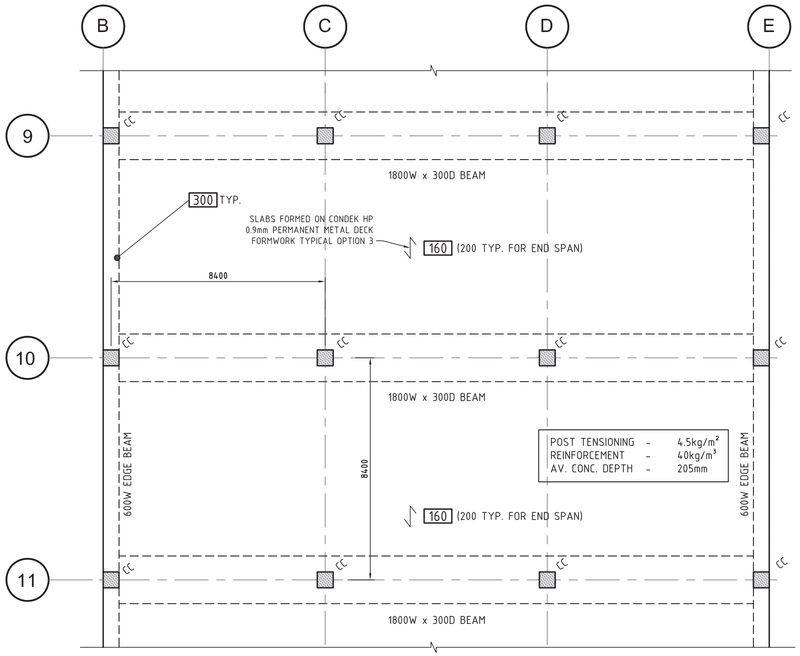
TYPICAL SLAB TYPE 'C' CONSTRUCTION - OPTION 1 (PREFERRED)

SCALE 1:100



TYPICAL SLAB TYPE 'C' CONSTRUCTION - OPTION 2

SCALE 1:100



TYPICAL SLAB TYPE 'C' CONSTRUCTION - OPTION 3 (PREFERRED)

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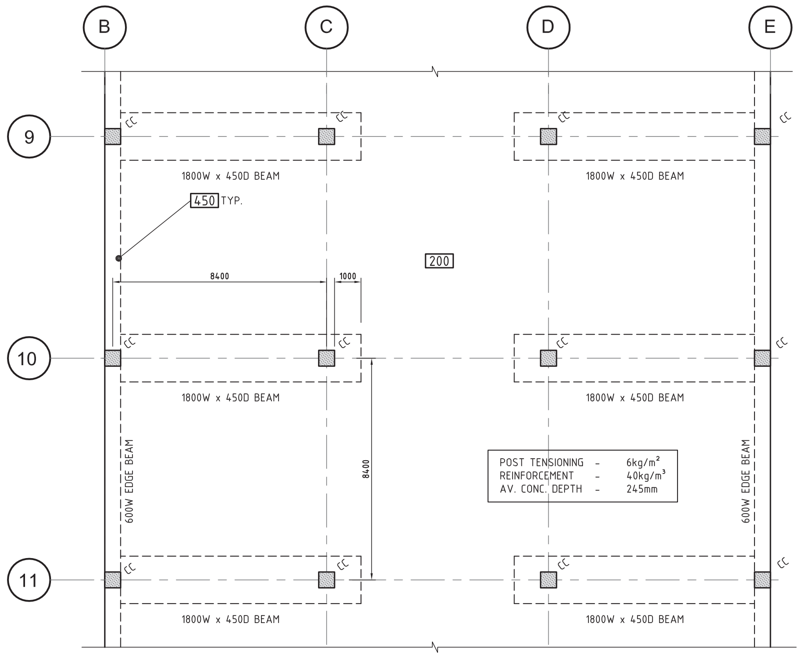

TYPICAL SLAB TYPE 'C' CONSTRUCTION - OPTION 4

SCALE 1:100

Notes

- DESIGN LIVE LOAD = 1.0 kPa
- DESIGN SDL = 2.5 kPa
- SLAB OPTIONS INDICATED ALLOW FOR PROVISION OF FUTURE PENETRATIONS 1 SIDE OF COLUMN ONLY. LOCATIONS TBC

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
1	13/09/12	JK	Issued For Information	JRW	JRW

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Redevelopment
Edward Street, Wagga Wagga
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Title
SUSPENDED SLAB OPTIONS
ROOF AREAS
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1: 1:100		Status: PRE	Rev: P1	

Drawing Number
MMD-313119-S-DR-01-XX-SK03

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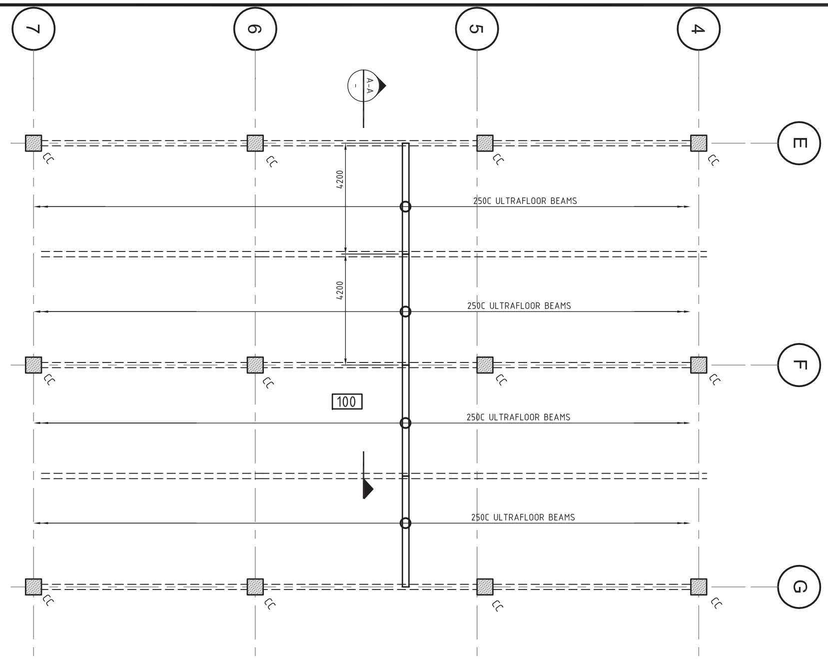
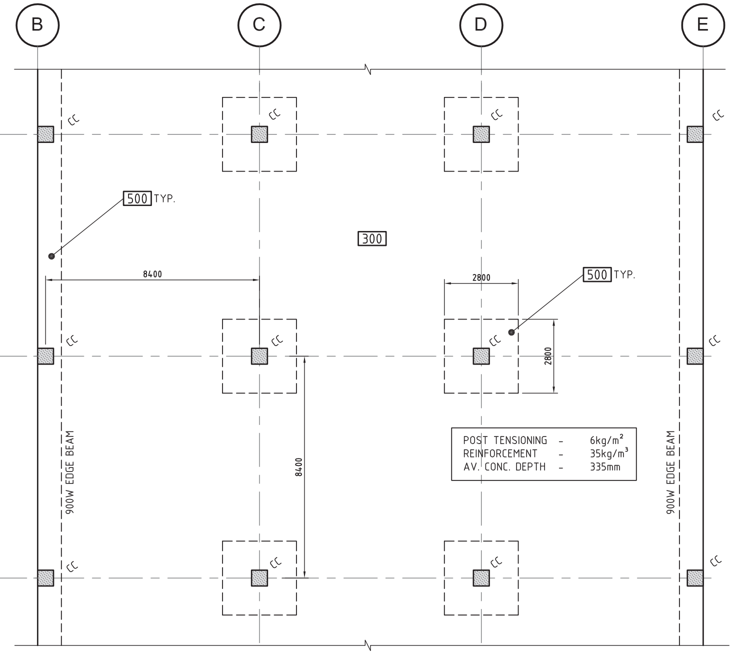


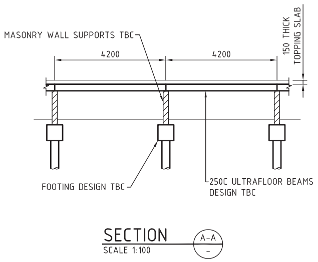
TYPICAL TYPE 'E' ACCESSIBLE FLOOR (IMAGING DEPARTMENT)

SCALE 1:100



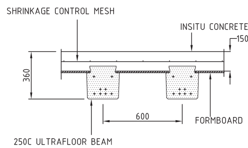
TYPICAL SLAB TYPE 'D' CONSTRUCTION – PROCEDURE CENTRE OPTION 1

SCALE 1:100

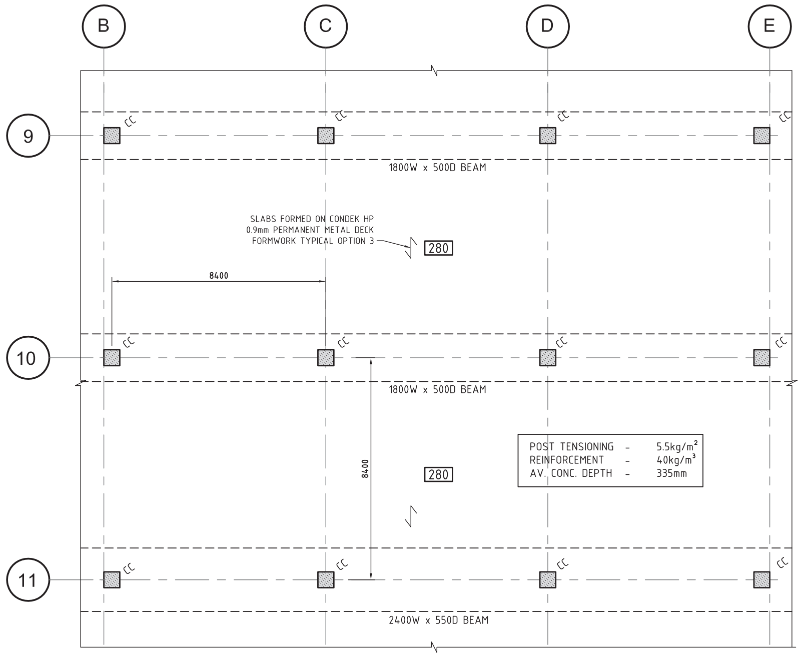


SECTION A-A

SCALE 1:100



TYPICAL ULTRAFLOOR 250C/400 SECTION



TYPICAL SLAB TYPE 'D' CONSTRUCTION – PROCEDURE CENTRE OPTION 2 (PREFERRED)

SCALE 1:100

Notes

- MAXIMUM FLOOR RMS VIBRATIONAL VELOCITY = 25ums⁻¹ FOR MODERATE FOOTFALL IN ACCORDANCE WITH AISC VIBRATION GUIDE IN PROCEDURE ROOMS AND OPERATING THEATRES
- MAXIMUM FLOOR RMS VIBRATIONAL VELOCITY = 12ums FOR MODERATE FOOTFALL IN ACCORDANCE WITH AISC VIBRATION GUIDE IN IMAGING AREAS
- SLAB THICKNESSES INDICATED INCLUDE A 50mm TOPPING ZONE FOR FUTURE FLEXIBILTY

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
1	13/09/12	JK	Issued For Information	JRW	JRW

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Client
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Redevelopment
Edward Street, Wagga Wagga
NSW, 2650

Title
SUSPENDED SLAB OPTIONS
PROCEDURE ROOMS, OPERATING
THEATRES & IMAGING SUITES
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1: 1:100		Status: PRE		Rev: P1

Drawing Number
MMD-313119-S-DR-01-XX-SK04

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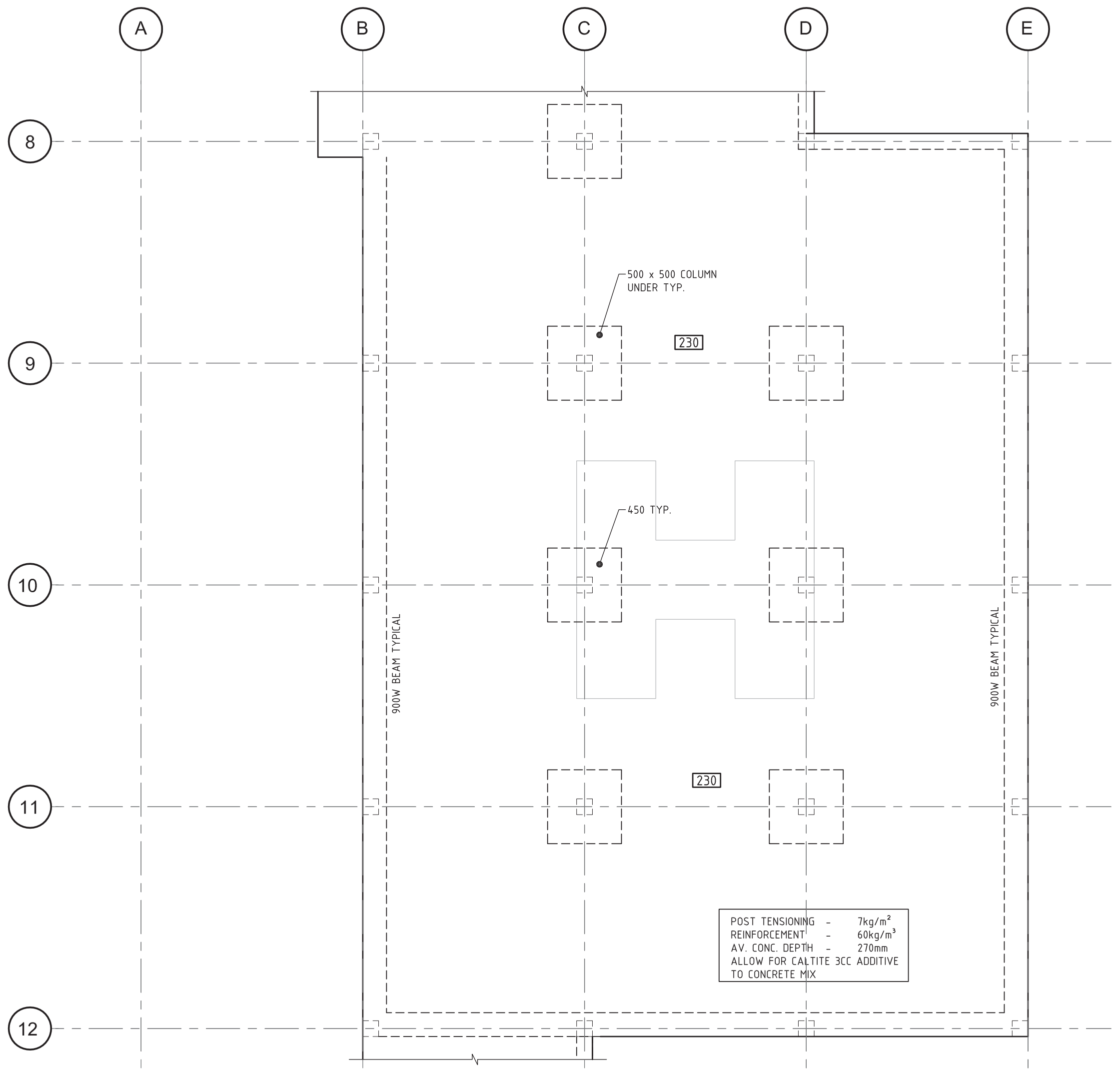

TYPICAL TYPE 'F' ROOF/HELIPAD SLAB PLAN

SCALE 1:200

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
-	NYI	JK	Issued For ...	JRW	JRW

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Client
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Redevelopment
Edward St. Wagga Wagga
NSW, 2650

Title
SUSPENDED SLAB OPTIONS
HELIPAD
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1: 1:200		Status: PRE		Rev: P1

Drawing Number
MMD-313119-S-DR-01-XX-SK05

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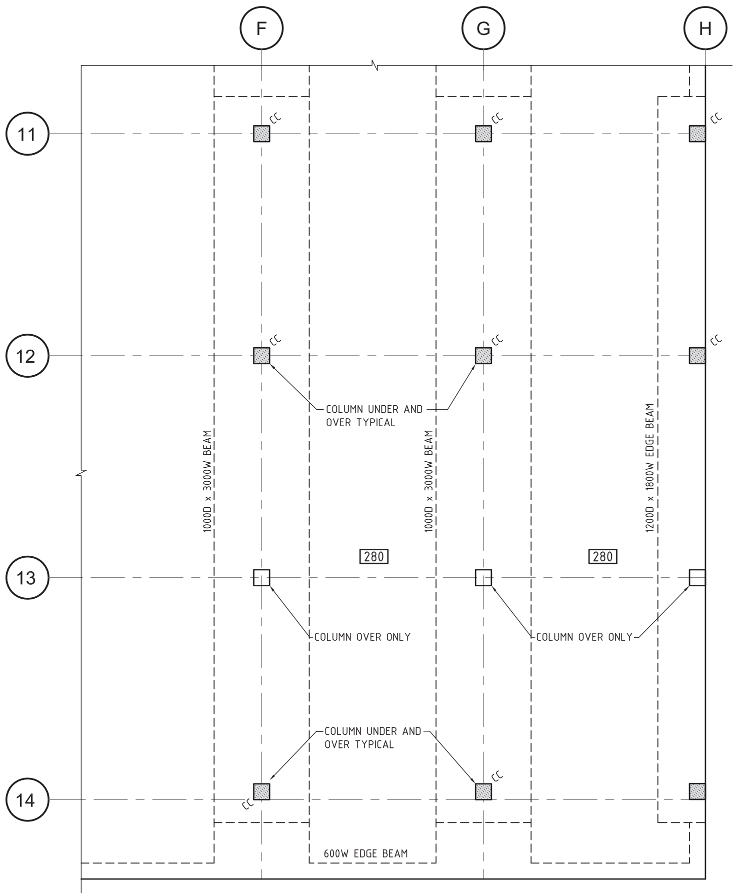
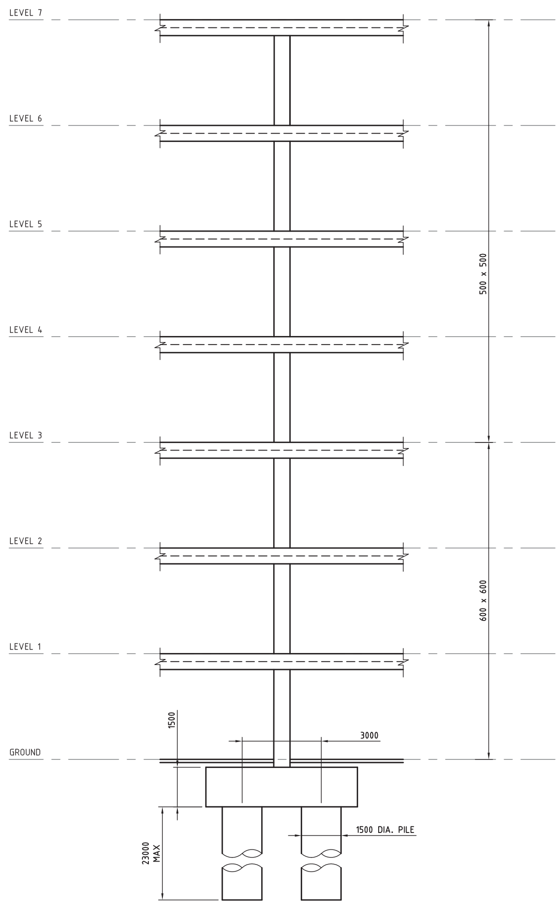


LEVEL 1 SLAB PLAN (OVER AMBULANCE BAY)

SCALE 1:100



TYPICAL FOOTING/COLUMN CONSTRUCTION – OPTION 1

SCALE 1:100

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
1	13/09/12	JK	Issued For Information	JRW	JRW

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Client
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Redevelopment
Edward Street, Wagga Wagga
NSW, 2650

Title
SUSPENDED SLAB OPTIONS
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1: 1:100		Status: PRE		Rev: P1

Drawing Number
MMD-313119-S-DR-01-XX-SK06

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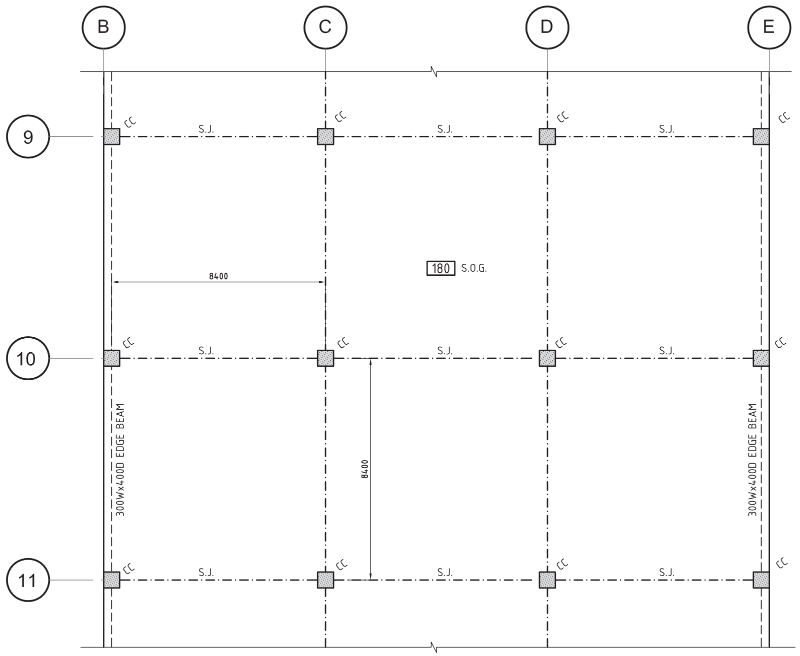
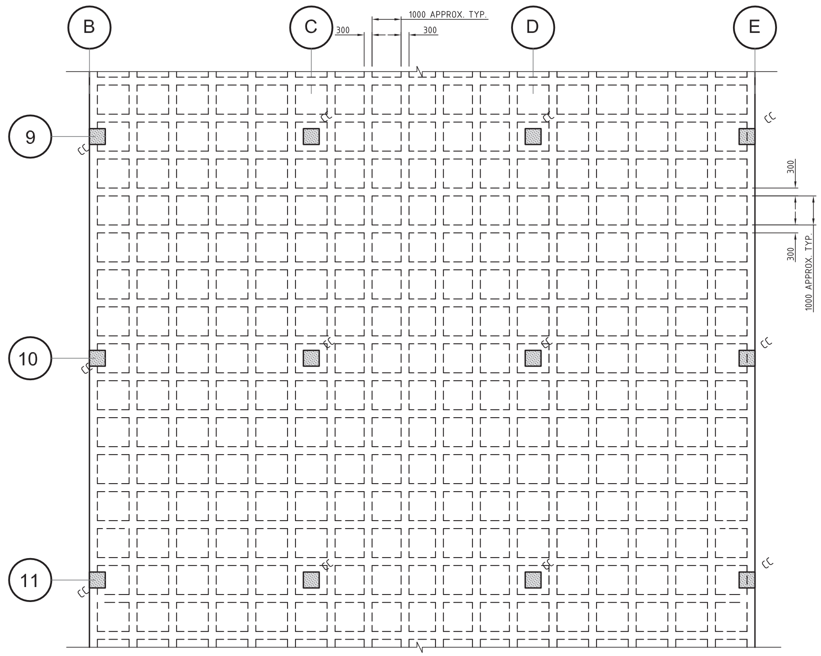


TYPICAL SLAB TYPE 'G' ON GROUND CONSTRUCTION - OPTION 1 (PREFERRED)

SCALE 1:100

NOTES:
S.J. - SAW CUT JOINT



TYPICAL SLAB TYPE 'G' ON GROUND CONSTRUCTION - OPTION 2

SCALE 1:100

P:\St Leonards\Projects\31xxxx\313119\313119 - Wagga Wagga Base Hospital\06 CAD\6_4 Working drawings\Structural\Autocad\Drawings\MMD-313119-S-DR-01-XX-SK07.dwg Oct 8, 2012 - 5:50PM hoc55952

Notes

Key to symbols

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	03/10/12	NSF	Issued For Information	JRW	JRW

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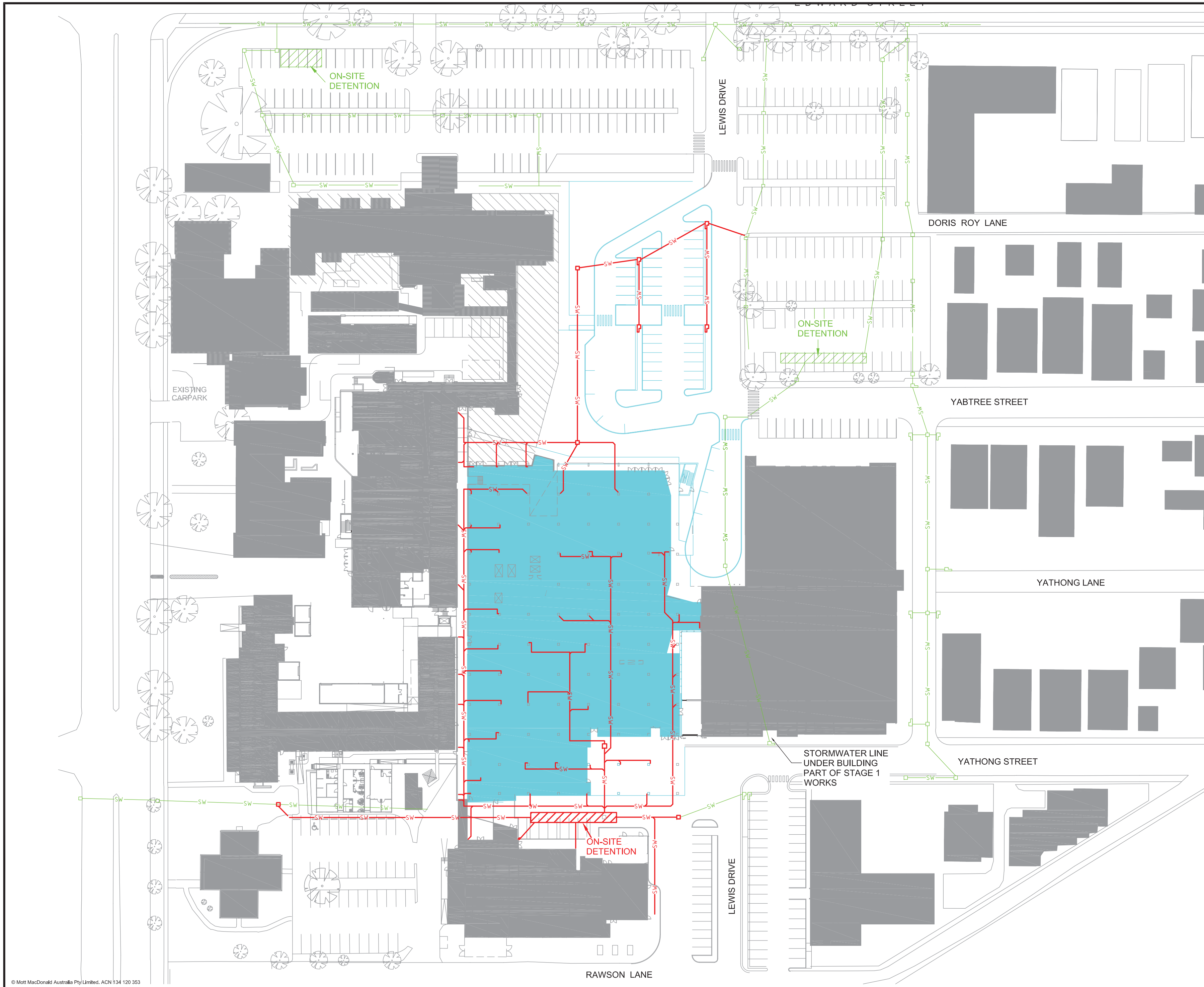
Client
Wagga Wagga Hospital
Redevelopment
Edward Street, Wagga Wagga
NSW, 2650

Title
SLAB ON GROUND OPTIONS
ACUTE HOSPITAL

Designed	JRW		Eng check	-
Drawn	JK		Coordination	-
Dwg check	-		Approved	J Williams
Scale at A1 1:100		Status PRE		Rev P1

Drawing Number
MMD-313119-S-DR-01-XX-SK07

Appendix B. On-site Detention & Overland Flow



Notes

Key to symbols

LEGEND

SW (green)	EXISTING STORMWATER
SW (red)	STAGE 2 AND 3 STORMWATER
(blue fill)	STAGE 2 AND 3 WORKS

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P4	14.12.2012	L.R	Schematic Design	L.R	L.R
P3	7.12.2012	L.R	Schematic Design	L.R	L.R
P2	30.11.2012	L.R	Schematic Design	L.R	L.R
P1	16.11.2012	L.R	Preliminary - Issued for Information	L.R	L.R

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Client
Health Infrastructure
77 Pacific Highway
North Sydney, NSW. 2060

Title
Wagga Wagga Base Hospital
Redevelopment
Edward Street
Wagga Wagga NSW 2650
Stage 2 and 3 Stormwater

Designed	L Ryan	Eng check	L Ryan
Drawn	N. Afrin	Coordination	
Dwg check	H Campbell	Approved	L Ryan
Scale at A1: 1:500	Status: PRE	Rev: P4	

Drawing Number
MMD-313119-C-DR-00-OD-0001

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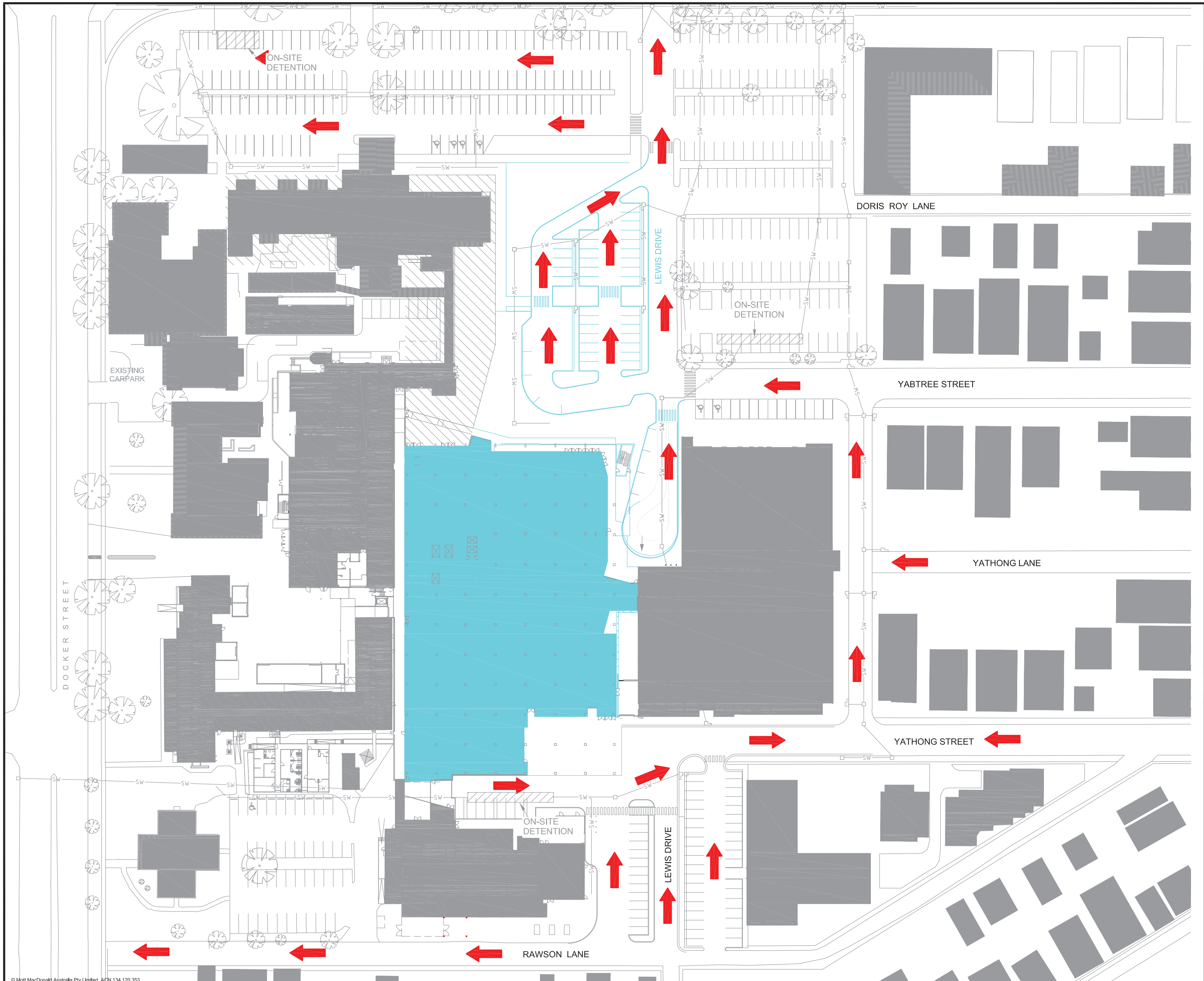

P:\Wagga\Projects\31xxxx\313119\06 CAD\6_4 Working drawings\Civil\Autocad\Drawings\Overland Flow.dwg Dec 14, 2012 - 2:14PM rya55867

Notes

Key to symbols

LEGEND

STAGE 2 AND 3 WORKS

OVERLAND FLOW DIRECTION

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
P3	14.12.2012	L.R	Schematic Design	L.R	L.R
P2	30.11.2012	L.R	Schematic Design	L.R	L.R
P1	16.11.2012	L.R	Preliminary - Issued for Information	L.R	L.R

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Client
Health Infrastructure
77 Pacific Highway
North Sydney, NSW. 2060

Title
Wagga Wagga Base Hospital
Redevelopment
Edward Street
Wagga Wagga NSW 2650
Overland Flow Path

Designed	L Ryan	Eng check	L Ryan
Drawn	N. Afrin	Coordination	
Dwg check	H Campbell	Approved	L Ryan
Scale at A1: 1:500	Status: PRE	Rev: P3	

Drawing Number
MMD-313119-C-DR-00-OF-0001