

MASTERPLAN STORMWATER AND FLOOD REPORT

SCEGGS DARLINGHURST

Prepared for SCEGGS DARLINGHURST / 24 / 08 / 2018

181375

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1.0 Introduction

1.1 The Site

The proposed site is the SCEGGS Darlinghurst. Its address is 215 Forbes Street, Darlinghurst. Figure 1 shows the area and locality of the site. The total combined area is 13,740m².



Figure 1: SCEGGS Darlinghurst.

1.2 Relevant Documents

- SCEGGS Darlinghurst Masterplan, TKD Architects (July 2018)
- SCEGGS Darlinghurst 2040 Masterplan, TKD Architects (May 2018)
- Sydney DCP 2012
- Flood Map
- 5th of June 2018 Sydney Water Letter (lulu.huang@sydney.com.au)
- DBYD
- DECCW (OEH 2013)
- Stormwater concept
- Erosion and sediment control plan

2.0 Proposed Masterplan Development

The Proposed masterplan consists of 3 separate stages of works. Figure 2 shows the overall masterplan with proposed works in shown in colour.

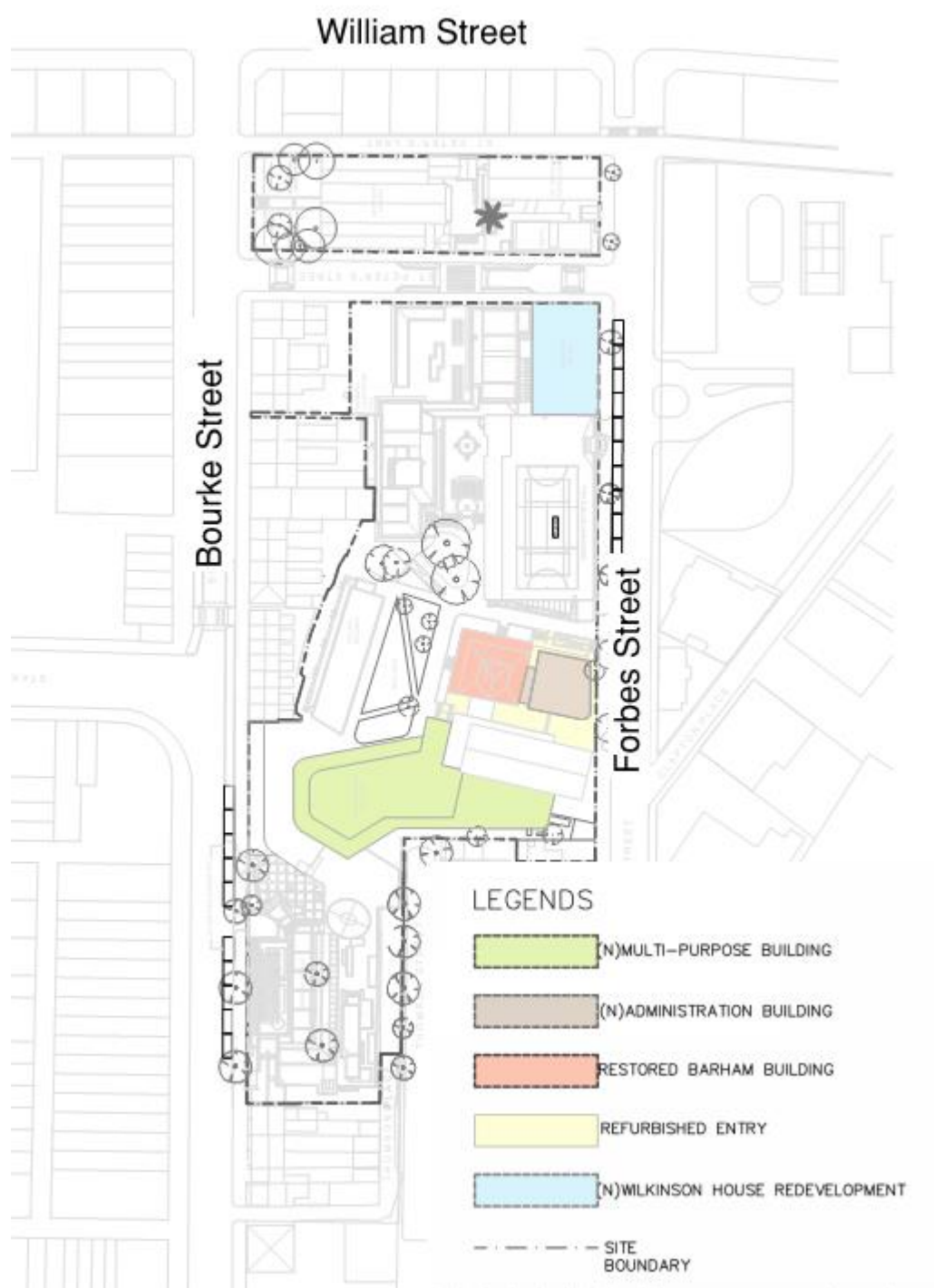


Figure 2: Masterplan Development (TKD Architects, July 2018)

2.1 Stage 1 – Wilkinson Building

The existing Wilkinson building will be demolished to make way for a new Wilkinson Building with a larger footprint and more efficient use of space. The new Wilkinson Building will have a footprint of 455m² as opposed to the old Wilkinson building's 400m². Stage 1 will attempt to gain 4 Green Stars for ecological sustainable design.

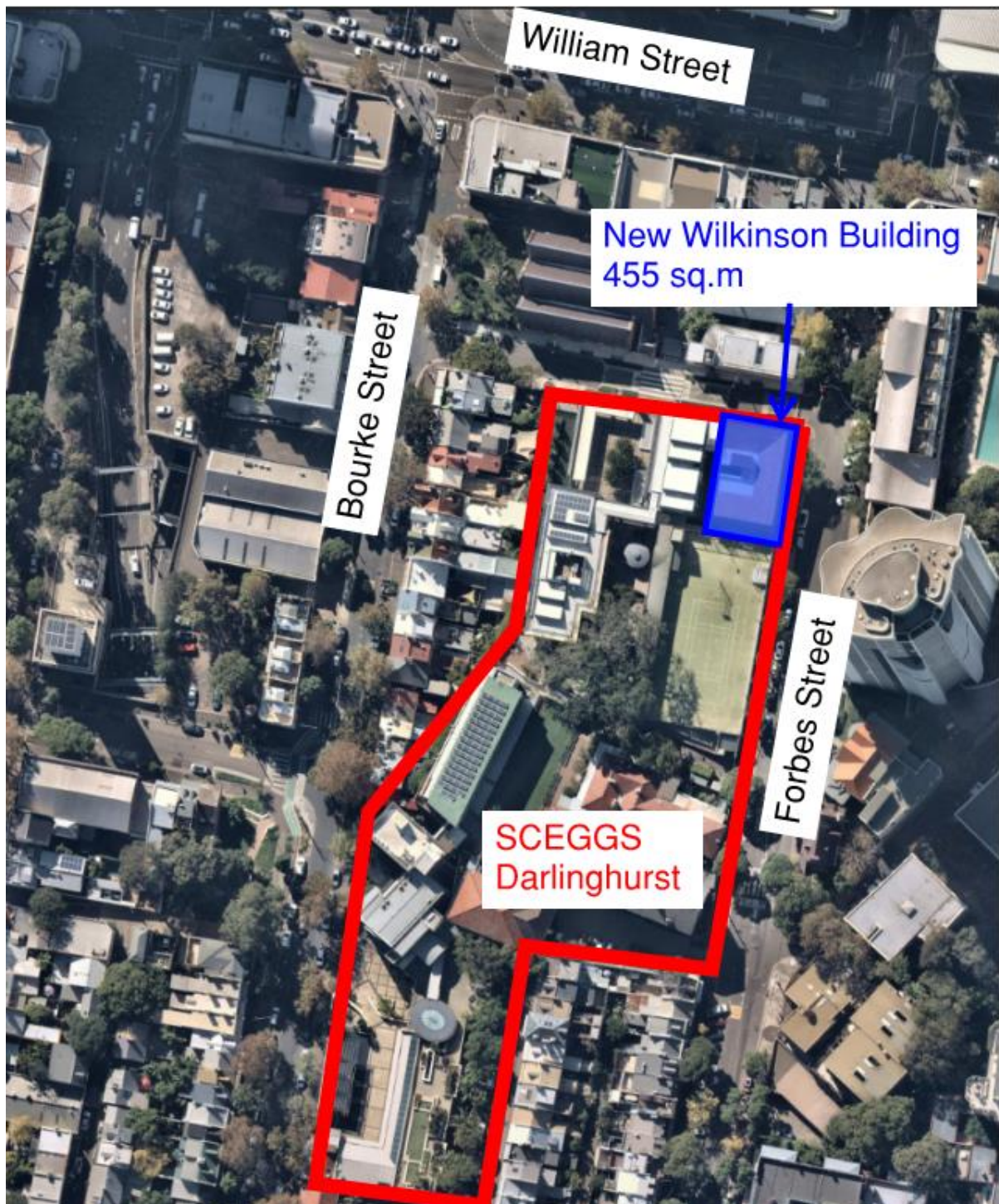


Figure 2: New Wilkinson Building Footprint (TKD Architects)

2.2 Stage 2 – New Multi-Purpose Building

The existing Science Building, Library Building and Gym Building will be demolished to make way for the New Multi-Purpose Building. The extent of the proposed works is shown in Figure 3. The New Multi-Purpose Building will be 7 stories high and include basement parking with ingress and egress from Bourke Street. Some of the levels will be terraced and allow pedestrian movement to other areas of the site.

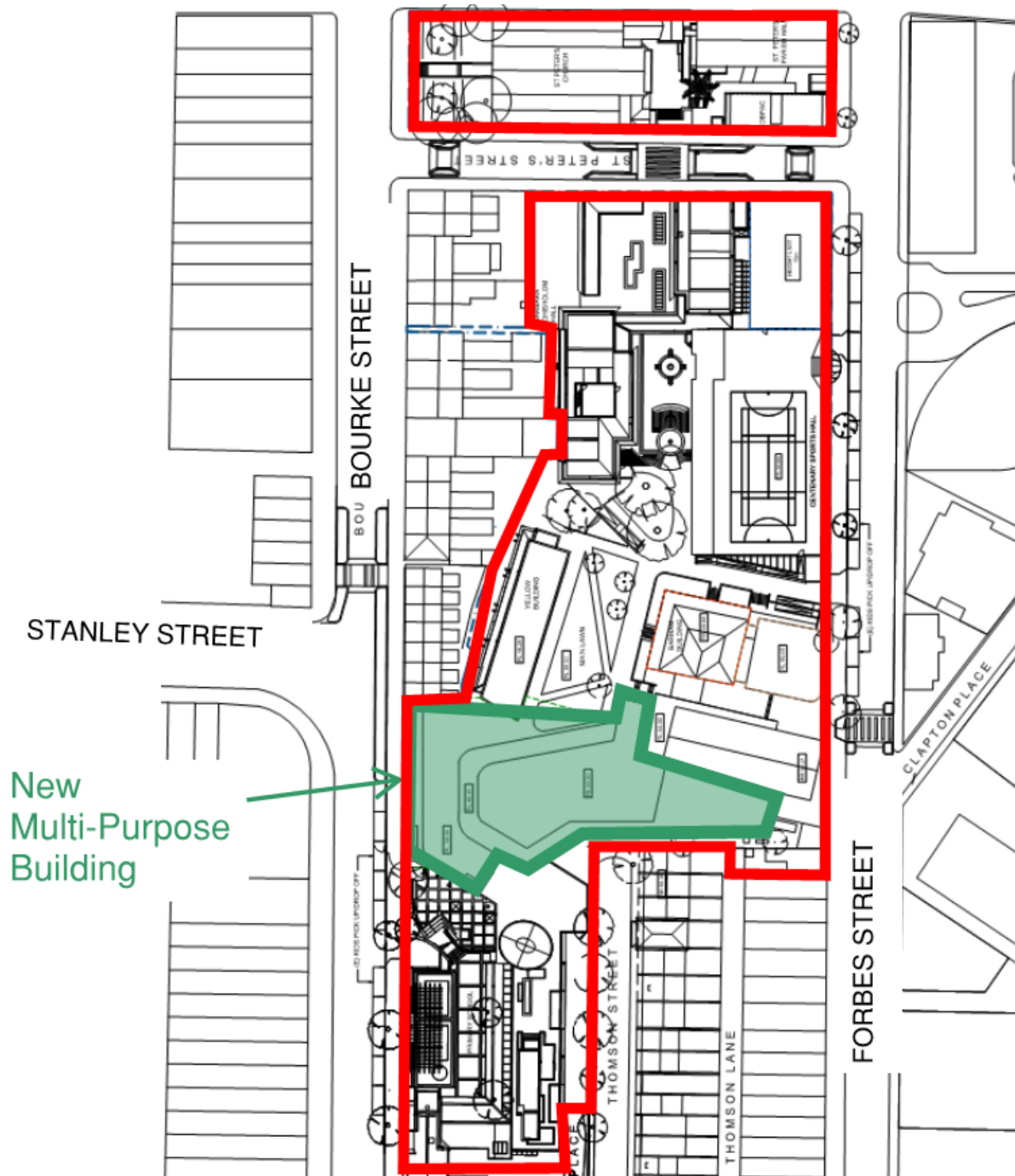


Figure 3: New Multi-Purpose Building (SCEGGS Darlinghurst 2040 Masterplan, 2018)

2.3 Stage 3 – Administration Building and Barham

The New administration Building will be 4 levels. The Barham building will be restored and refurbished with consideration to the heritage aspects of the building. Figure 4 shows the location of the Buildings.

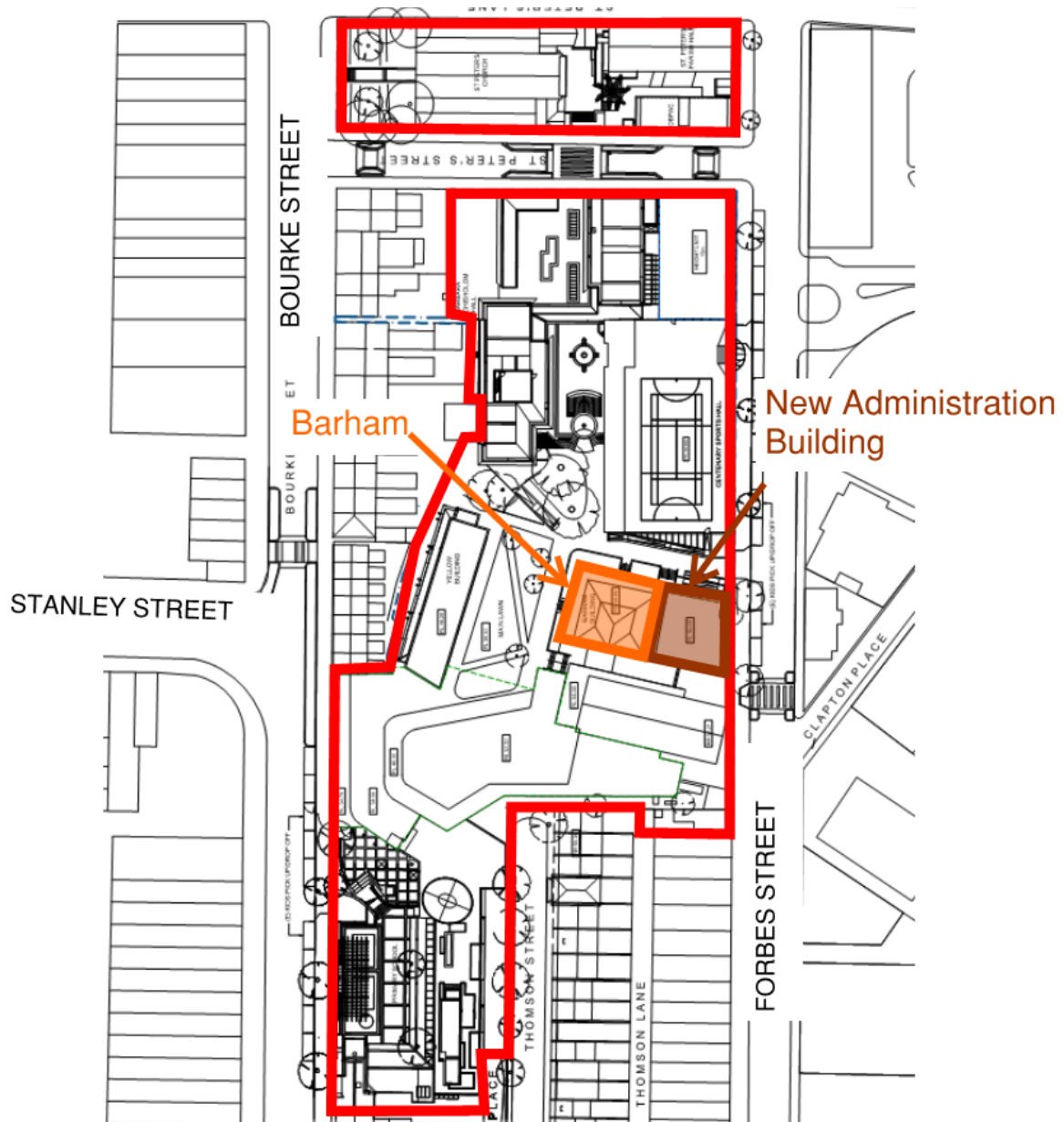


Figure 4: Barham and Administration Buildings (SCEGGS Darlinghurst 2040 Masterplan, 2018)

3.0 Stormwater Management

The Sydney DCP requires a local drainage management plan for the proposed site because it is larger than 1,800m². The Local drainage management plan is to address the hydrology of the locality, distribution of soil types, expected rise in ground water level, water conservation and on-site detention, water quality, pedestrian safety and the integration of drainage management responses and open space areas.

3.1 On Site Detention

Section 3.7 of the DCP states that stormwater volumes during an average rainfall year are to be the lesser of:

- 1.) 70% of the volume if no measures were applied to reduce stormwater volume.
- 2.) Equivalent to the volume generated if the site were 50% pervious.

The Wilkinson Building is isolated from the other stages of works and it is not feasible to connect the discharge from the Wilkinson building to the same OSD tank as the future stages of work. A DRAINS model was set up for the Stage 1 works and Table 1 shows that the Wilkinson Building will require an OSD tank that is 6m³ in volume and has an orifice of 225mm in order to meet DCP requirements for site discharge.

Table 1: Permissible and Proposed Discharge for Wilkinson Building

	PSD	Proposed Site
1-year ARI	9.1 l/s	9 l/s
100-year ARI	23 l/s	19 l/s

This is a relatively small volume and it is possible to connect the discharge of the Wilkinson Building to the existing OSD tank for the Car Park to the West. The existing OSD tank was designed by HughesTrueman in 2008 and the Stormwater DA Report is in Appendix A. The data for the size of the OSD tank and it's contributing catchment was used to produce a new DRAINS model which includes the catchment from the Wilkinson Building and the layout is in Appendix B. The current design of the OSD tank does not have sufficient capacity to accommodate the discharge from the Wilkinson Building and the OSD tank will overflow. The current orifice plate is 98mm in diameter and this needs to increase in diameter for the existing OSD tank to have sufficient capacity. Table 2 shows the permissible as well as proposed site discharge of the combined Carpark building and the Wilkinson Building with an enlarged orifice.

Table 2: Permissible and Proposed Discharge for combined Carpark and Wilkinson Buildings

	PSD	Proposed Site
1-year ARI	31 l/s	22 l/s
100-year ARI	79 l/s	49 l/s

Further information regarding the as-built dimensions of the OSD tank and size of the pipe connecting the OSD tank to the street drainage is required.

Stage 2 and 3 will discharge to the same OSD tank. A DRAINS model was set up to calculate the dimensions required of the OSD tank to meet the DCP specifications. The layout for this DRAINS model is in Appendix D. The OSD tank is required to be 70m³ with an orifice of 260mm. Table 3 compares the permissible site discharge to the proposed site discharge.

Table 3: Permissible and Proposed Site Discharge for combined Stages 2 & 3

	PSD	Proposed Site
1-year ARI	66.5 l/s	65 l/s
100-year ARI	247 l/s	141 l/s

3.2 Water Quality

The proposed site is required to meet City of Sydney's water quality targets as set out in section 3.7.3 of the Sydney DCP 2012. It is proposed to treat the stormwater from the Stage 1 works at the Wilkinson Building separately to the Stage 2 & 3 works. MUSIC was used to model the proposed works and estimate the pollutant reductions that result from the proposed treatment trains. A MUSIC template was created that uses the rainfall data from Sydney Airport, the potential evaporation-transpiration data for Sydney and a 6 minute time interval.

The proposed treatment train for the new Wilkinson Building consists of a proprietary filter and the existing OSD tank in the Carpark Building. Stormwater will be collected from the roof of the Wilkinson Building and be treated by a Stormwater360 Jellyfish 7.5 L/s filter (or equivalent) before entering the detention tank and then discharging to the street drainage on St Peter's Street. Table 4 compares the water quality target pollutant reductions as set out in the DCP to the expected pollution reductions from the proposed treatment train.

Table 4: Water Quality

Pollutant	Target (% reduction)	Proposed Site (% reduction)
Gross Pollutants	90	98
Total Suspended Solids	85	87
Total Phosphorous	65	70
Total Nitrogen	45	48

The proposed treatment train for stages 2 & 3 of the Masterplan consists of 2 Stormwater360 Enviropod gross pollutant traps to be fitted to stormwater pits, a Stormwater360 Jellyfish 12.5 L/s filter and an OSD tank. Table 5 compares the water quality

targets set out in the DCP to the expected pollutant reductions achieved by the proposed treatment train.

Table 4: Water Quality

Pollutant	Target (% reduction)	Proposed Site (% reduction)
Gross Pollutants	90	99
Total Suspended Solids	85	88
Total Phosphorous	65	68
Total Nitrogen	45	57

3.3 Rainwater Tanks

City of Sydney Council do not mandate rainwater tanks.

If rainwater tanks are to be incorporated in the design, then appropriate measures must be taken to ensure the captured stormwater is cleaned to exclude contaminants such as litter, sediment and oil.

3.4 Green Star

The client has expressed interest in Ecologically Sensitive Design (ESD) and wish to achieve a 4-star Green Star Rating. Stormwater management can gain up to 4 points.

1 point is available where post-development peak discharge does not exceed pre-development peak discharge. The proposed development will not be increasing the area of impervious surfaces and so this point should be easily achieved.

Additional points are available for stormwater pollution control only if the peak discharge point is achieved. Table 2 sets out these points. 2 points are awarded if column B is achieved, 3 are awarded if column C is achieved.

Table 2: Green Star pollution reduction targets

Green Star – Design & As Built v1.2

26 Stormwater

Table 26.2 Pollution Reduction Targets

Pollutant	Reduction Target (% of the typical urban annual load)		
	A	B	C
Total Suspended Solids (TSS)¹	80%	80%	90%
Gross Pollutants	85%	90%	95%
Total Nitrogen (TN)²	30%	45%	60%
Total Phosphorus (TP)²	30%	60%	70%
Total Petroleum Hydrocarbons³	60%	90%	90%
Free Oils³	90%	90%	98%

Notes:

1 Load based on the following particulate size distribution (by mass): 20% <20 µm; 20% 20-60 µm; 20% 60-150 µm; 20% 150-400 µm; 20% 400-2000 µm.

2 Load includes particulate and dissolved fraction.

3 This requirement is not applicable where the site contains less than a total of 200m² of uncovered areas where vehicles are likely to transit and/or park e.g. roads, loading docks, refuelling bays, car parking etc.

The targets for petroleum and oils are not applicable to the proposed development because there will be less than 200m² of uncovered areas where vehicles are likely to transit or park.

3.5 Connection to Street Drainage

The stormwater collected from the Wilkinson Building will flow to the existing OSD tank in the Carpark Building to the west of the Wilkinson Building. From here it will discharge to an existing stormwater drainage system that runs along St. Peter's Street.

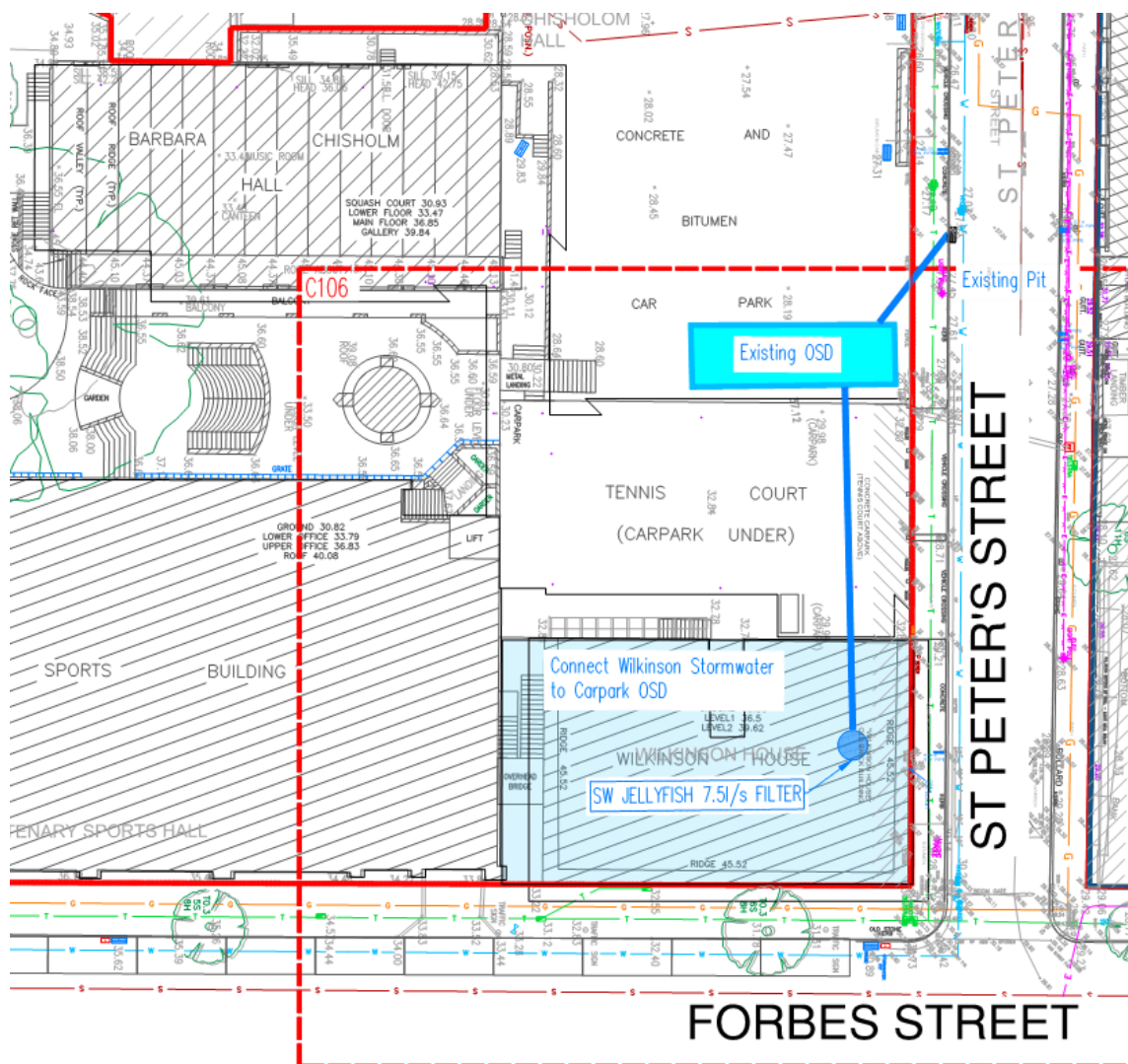


Figure 5: Connection to existing pit on St Peter's Street

The stormwater collected from the Stage 2 and Stage 2 works will flow to a new OSD tank before discharging to an existing kerb inlet pit on Bourke Street.

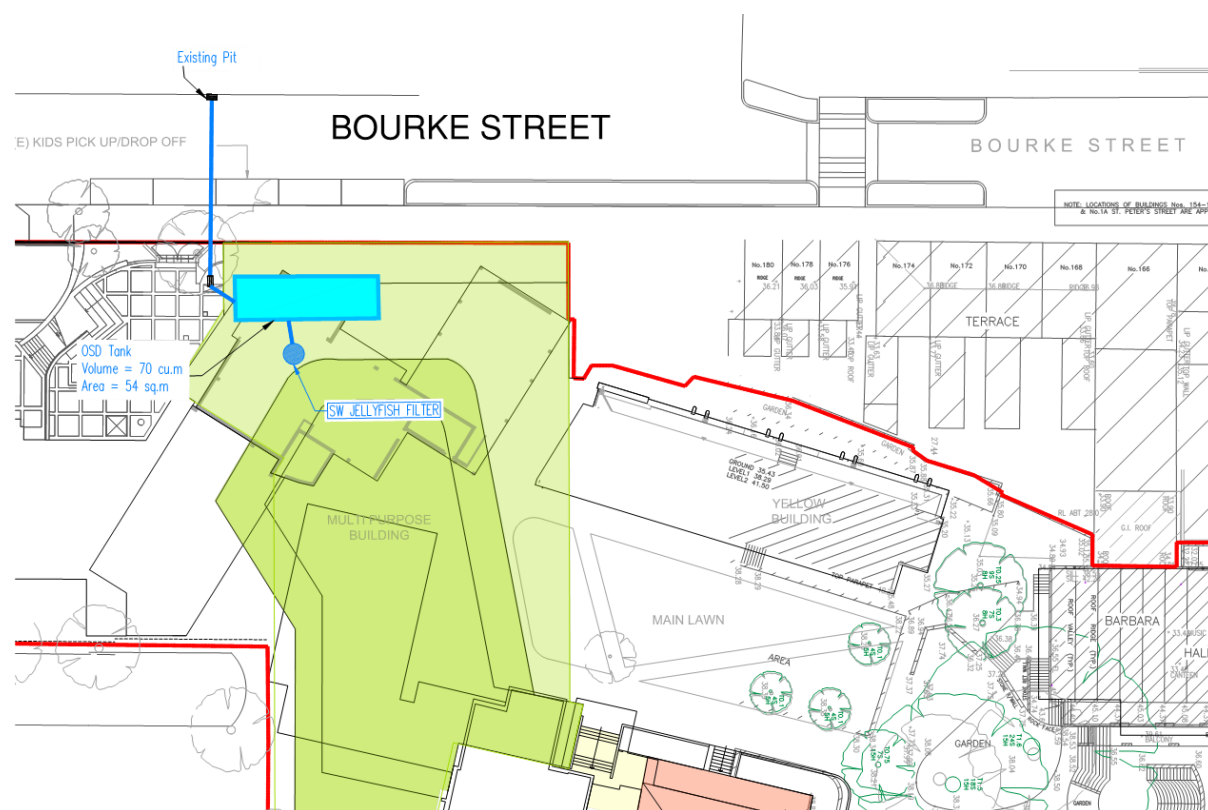


Figure 6: Connection to existing pit on Bourke Street

Detailed survey is required to determine the size and invert level of the existing stormwater network along Bourke Street.

4.0 Flood Management

The proposed site is located within the Woolloomooloo floodplain and is towards the top of the catchment with only minor levels of flooding during the 100-year ARI flood event. WMA water prepared a Woolloomooloo Flood Study for City of Sydney Council in 2016. Figure 8 is an extract from Figure 18 in the Woolloomooloo Catchment Flood Study and shows the extent of flooding around the proposed site during the 100-year ARI.



Figure 8: Peak depth of the 100-year ARI flood event (WMA water, 2016)

4.1 Flood Planning Levels

Clause 7.15 of the Sydney Local Environment Plan defines the Flood Planning Level as “the level of a 1:100 ARI flood event plus 0.5m freeboard.” The extent of the proposed site is too large for a single Flood Planning Level to be relevant to all buildings. The Flood Planning Level for each of the proposed buildings has been taken as the 100-year flood level at the closest point that floodwaters may enter the site plus 0.5 metres.

There is a minor amount of flooding on Forbes Street. In front of the Wilkinson building there appears to be less than 100mm of ponding according to the 100-year ARI flood event map. This amount of flooding will be contained within the kerb and gutter system on the west side of Forbes Street. The flood planning level for the Wilkinson Building is taken as the invert of the kerb on Forbes Street plus 0.5m. The invert level of the kerb in front of the current Forbes Street entrance to the Wilkinson House Building is approximately 31.78m AHD. This

gives a Flood Planning Level of RL32.38m AHD for this entrance of the Wilkinson Building. The ground floor of the Wilkinson Building has a finished floor level of RL33.5m AHD.

The flooding on Bourke Street in front of the proposed site during the 100-year ARI flood appears to be less than 100mm according to the 100-year ARI flood event map. This flooding will be contained within the kerb and gutter system of Bourke Street. Accordingly, the Flood Planning Level for the proposed site along Bourke Street is a maximum of 100mm above the invert of the kerb plus 500mm freeboard. The driveway from Bourke Street into the proposed basement carpark is required to have a crest above the Flood Planning Level. The invert level of the kerb in front of the proposed exit driveway is approximately RL28.15m AHD. This gives a Flood Planning Level of RL28.75m AHD for the crest of the exit driveway. The invert level of the kerb in front of the proposed entry driveway is approximately RL27.92m AHD. This gives a Flood Planning Level of RL28.52m AHD for the crest of the entry driveway.

The 100-year ARI flood event map shows flood depths on the northern end of Thomas Street pond up to 1m in depth. It is likely that the floodwaters will flow through the permeable fence and over the retaining wall that bounds the SCEGGS. The flood water will flow through the school property and onto Bourke Street.



Figure 9: Overland Flow Path from Thomas Street to Bourke Street.

5.0 Conclusion

The SCEGGS Darlinghurst Masterplan will be undertaken in 3 stages. Stage 1 is the knockdown-rebuild of Wilkinson House. Stage 2 is the demolition of the Library, Science and Gym buildings to make room for the new Multi-Purpose Building. Stage 3 includes the restoration of the heritage Barham Building and construction of the new Administration Building.

The stormwater management of Stage 1 will be separate to Stages 2 and 3. The stormwater collected from the Stage 1 works will be treated by a Stormwater360 Jellyfish filter or equivalent and then flow to the existing OSD tank in the Carpark Building before discharging to St Peter's Street. The orifice plate in the existing OSD tank needs to be replaced with an orifice of larger diameter. The existing OSD tank with the new orifice plate will reduce site discharge sufficiently to comply with Council's permissible site discharge as set out in the Sydney 2012 DCP.

The stormwater from stages 2 and 3 will be treated by Stormwater360 Enviropods to be fitted in grated inlet pits and a Stormwater360 Jellyfish filter or equivalent before flowing to the proposed OSD tank adjacent to Bourke Street. The new OSD tank is proposed to be 70m³ and requires an orifice diameter of 260mm to comply with the Council's permissible site discharge rates.

The Flood Planning Level of the site varies. The site has been designed so that entry points to the proposed buildings are above the 100-year flood levels plus a freeboard of 0.5m. An overland flow path has been allowed for at the northern end of Thomas Street. This flow path transverses the SCEGGS site from Thomas Street to Bourke Street.

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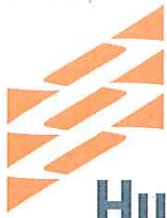
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Appendix A

HughesTrueman Stormwater DA Report



HughesTrueman

HUGHES TRUEMAN PTY LTD
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STORMWATER DA REPORT

SCEGGS School
Darlinghurst

MAY 2008

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1.0 INTRODUCTION

This stormwater management plan has been prepared to describe the proposed management of stormwater for the proposed development at the SCEGGS School on Forbes Street Darlinghurst. The site is bounded by Forbes Street to the east, St Peters Street to the north and other lots to the south and west. The site generally has a fall from south to north.

2.0 EXISTING STORMWATER MANGEMENT

2.1 DEVELOPMENT

The SCEGGS School site is located on Forbes Street Darlinghurst. The site currently consists of masonry structures as well as impervious open space used as a car park.

2.2 WATER QUANTITY MANAGEMENT

There is no current stormwater infrastructure located within St Peters Street. There are also currently no water quantity management devices on the site.

3.0 PROPOSED STORMWATER MANGEMENT

3.1 DEVELOPMENT

It is proposed to construct a new lecture theatre and new classrooms on the proposed site with a 3 level basement carpark underneath.

3.2 WATER QUANTITY MANAGEMENT

A DRAINS model was set up for the site as shown in Figure 1 Appendix B and drawing HDA02. It is proposed to install a stormwater drainage system in St Peters Street. Pipes are to be 375mm diameter RCP with a pit to collect runoff from the proposed building via detention storage and a pit to collect runoff from the existing site catchment via a piped system through the proposed building. The detention basin will be located in the basement of the proposed building. There is assumed to be no road catchment for any of the proposed pits as St Peters Street has a one way cross fall away from the site. Therefore all surcharging from the pits if any is assumed to sheet across to the opposite side of St Peters Street.

The assumed pipe invert levels, lengths and slopes are as follows:

Pipe	From	To	U/S Invert	D/S Invert	Length (m)	Slope
Pipe 1	Pit 1	Pit 2	25	24.6	25	1.6%
Pipe 2	Pit 2	Pit 3	24.6	23	25	6.4%

The site was split up into 3 different catchments, the proposed new building and existing site which run to the proposed stormwater system and the areas draining offsite which bypass the system. This is shown in drawing HDA02.

The catchment areas and percentage impervious for the 2 catchments running to the proposed stormwater system are as follows:

Catchment	Catchment Area (m ²)	% Impervious
Existing Site	4200	90
Proposed Building	1585	100

From this DRAINS model the following hydraulic grade lines for pipes 1 and 2 were determined as shown in Figures 2 and 3.

Figure 2: Hydraulic Grade Line in Pipe 1

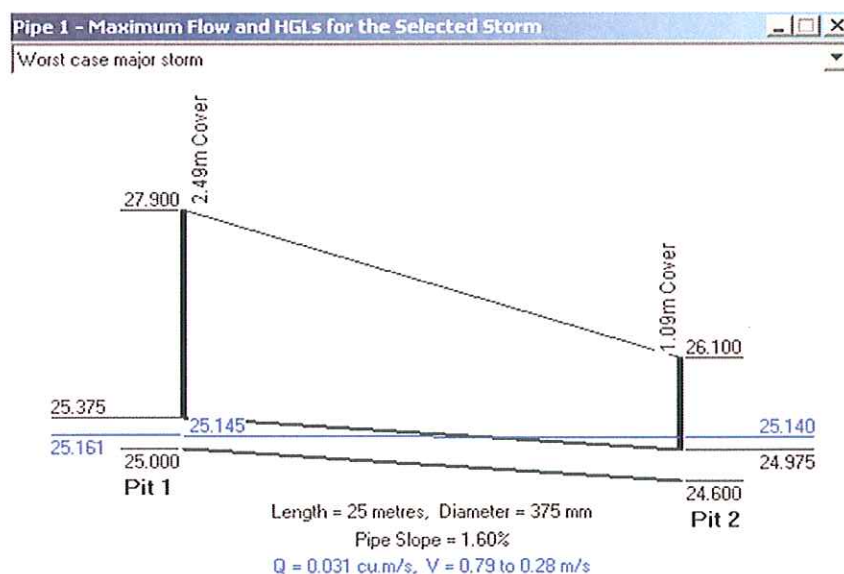
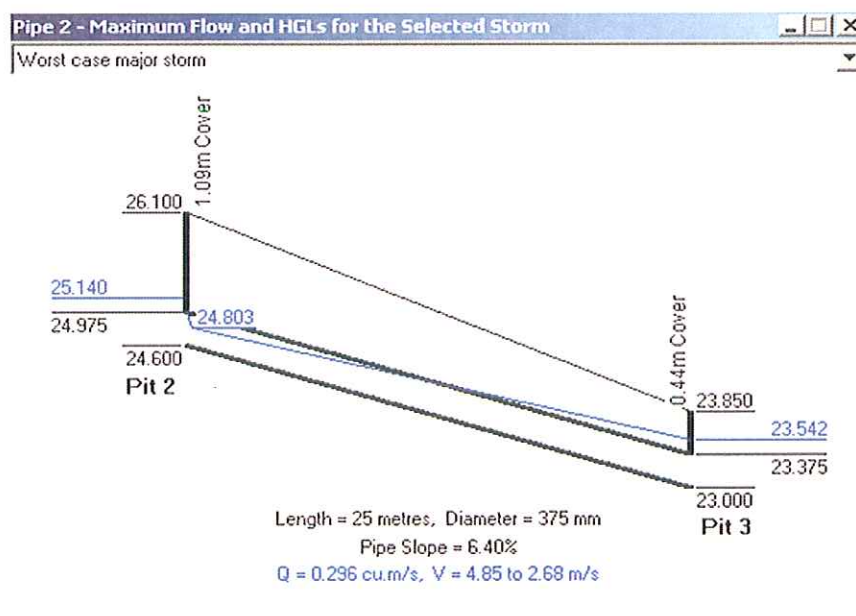


Figure 3: Hydraulic Grade Line in Pipe 2



3.2.1 On-Site Detention Requirements

From Sydney Waters advice letter dated 29th February 2008 it was advised that a minimum on-site detention storage of 67m³ would be required with a maximum permitted site discharge of 31 litres/sec (0.031m³/s) for a 100 year ARI storm.

In the DRAINS model the detention basin was sized to have a volume of 87 m³ and an orifice diameter of 98mm so as to obtain a site discharge of 0.031 m³/s. However as it is proposed to have a combined rainwater reuse tank/detention system and Sydney Water states in there letter that they allow 50% of the required detention requirement to be offset if rainwater tanks are to be used. Therefore a detention tank will have to be installed in accordance with Sydney Water requirements with a volume of 67m³.

Full DRAINS input and Output can be seen in Appendix B.

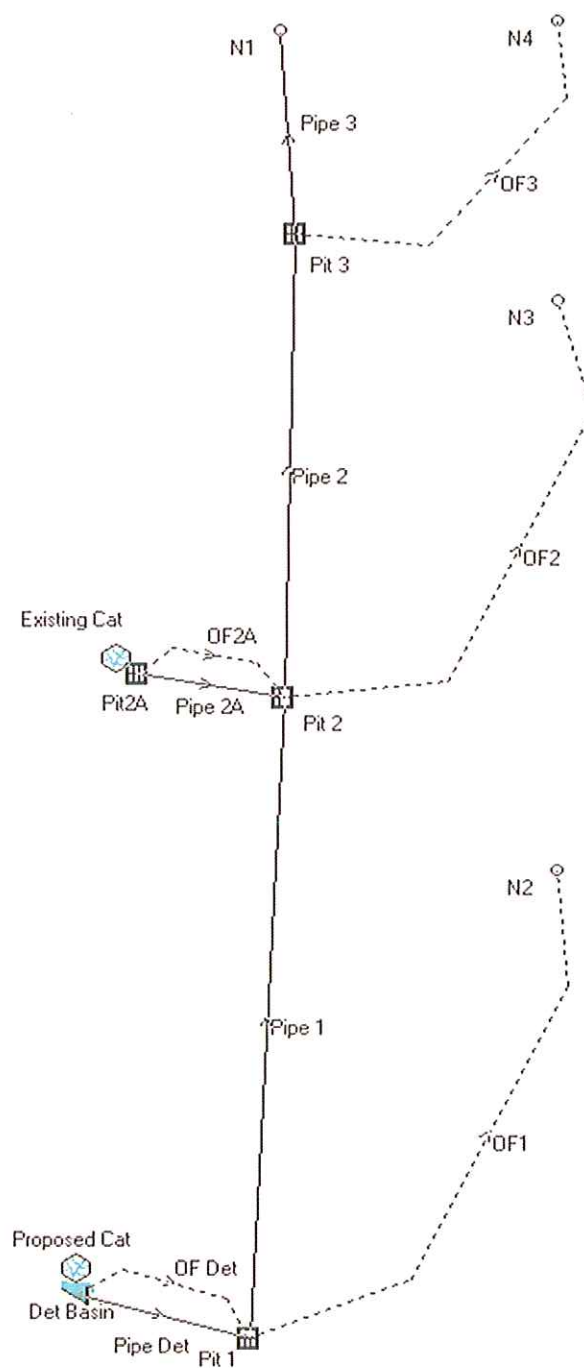
4.0 CONCLUSION

The proposed Development at SCEGGS School Darlinghurst requires an on-site detention basin of 67 m³ in accordance with Sydney Water's on-site detention advice. The basin is to be discharged into a new stormwater system in St Peters Street with a 375mm dia pipe, which connects into the existing trunk main in Bourke Street.

APPENDIX A – DRAWINGS

APPENDIX B – DRAINS DATA

Figure 1: DRAINS Layout for the proposed site



Appendix B

DRAINS MODEL for Stage 1 and Carpark Building

