MONTEFIORE AGED CARE FACILITY

SIR MOSES MONTEFIORE JEWISH HOME

100-120 KING STREET, RANDWICK

BUILDING D

SUPPLEMENTAL FLOOD & STORMWATER REPORT

Prepared for:

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1. INTRODUCTION

This development is for the extensions to the Sir Joseph Montefiore Jewish Home Aged Care facility (Montefiore) in the Sydney suburb of Randwick by construction of Building 'D' in the south-east corner of the site. The entire Montefiore site covers an area of 2.93 Ha and is bounded to the north by Govett Lane, to the east by Dangar Street and to the south by King Street, Randwick. The western boundary fronts a residential unit development and further to the west is the State Transit Randwick Bus Depot.

Montefiore was constructed on land previously used as a transport depot and the initial stages were substantially completed in late 2006. This report examines the flood and stormwater detention aspects of the project in relation to design criteria established at the commencement of the project in 2004 in consultation with Randwick Council and examines recent flood modelling carried out by or on behalf of Council.

The initial development comprised construction of about 50% of the total site area and Emerson Associates Pty. Ltd., the author of this report, designed the detention system and Council diversion pipeline for that original development, determined the flood levels in surrounding street and developed an agreed flood strategy in conjunction with Council.

The topography of the original transport depot formed a natural drainage depression sloping towards the west between Govett Lane to the north and King Street to the south and carried a drainage pipe in a Council Easement discharging through the site and through downstream properties.

The adjacent downstream property, constructed at about the same time as the Montefiore development, does not contain an overland flow path and so the Montefiore site cannot allow for overland flow discharge through its western boundary (except in an emergency) and therefore must exclude overland flow ingress from the surrounding streets.

As part of the initial construction, extensive flood modeling was carried out on the site and in the surrounding streets covering a total catchment area of about 38 Ha. A drainage system, including a Council diversion pipeline through the site, was then designed to meet specific Council requirements including:

- Site discharge to be limited by detention to the equivalent flow produced by a 1 hour 5 year ARI storm for the undeveloped site assessed at 323 l/sec,
- Combined flow from the site discharge and Council pipeline discharge to be limited to the capacity of downstream pipework within the Bus Depot assessed at 1030 l/sec,
- Total detention storage capacity to be arbitrarily increased by 50% using air space over external basins to allow for the lack of an overland flow path through the downstream property, and

- Council pipeline to be oversized and limited in capacity by a removable orifice plate and a flow diversion pipeline to King Street so that the flow through the site can be increased in the future by removal of the orifice plate if and when downstream pipework in the Bus Depot is upgraded.
- Flood waters in surrounding streets to be excluded from the site.

Whilst external roads are subject to overland flow, and low points in Dangar Street and Govett Lane are subject to ponding in major storm events, the site itself is no longer part of an overland flow route and is not subject to external flood threat. Internal stormwater runoff is controlled by detention tanks with any overland runoff not within the pipe system traveling via the internal road network to the open detention basin at the low part of the site.

2. ORIGINAL DEVELOPMENT

The Council diversion pipeline through the site was designed to run from King Street on the south of the site in a drainage easement along the south and west boundaries and to discharge at a point along the western boundary to pipework installed in the adjoining development. Initial installation involved stepping around the existing childcare facility in the south west corner of the site with a temporary pipeline to be upgraded when the childcare facility was eventually demolished.

The pipe sizing of the Council pipeline is designed for a flow suitable for its catchment which is greater than the flow limit downstream. Flow is restricted in the downstream pipework by an orifice plate fixed to the outlet of a pit adjacent to King Street with an overflow diversion pipe to drainage facilities in King Street.

The orifice plate can be removed to allow a future increase in flow within the pipeline, and hence reduced overland flow in King Street, subject to future downstream upgrading of the Council pipeline through the Bus Depot and other downstream properties.

A section of this pipeline downstream of the orifice plate and overflow pit stepping around the existing child-care facility was installed as a temporary pipe within a temporary easement pending redevelopment of the child-care facility, at which time it was proposed to install the final pipe route along the south and west boundaries.

The internal drainage design for the original Montefiore development required strict flow limits as the discharge was into the Council pipeline and the resultant peak flow, when combined with the flow downstream of the orifice plate in the Council diversion pipeline, had to conform to the flow limit placed on the downstream Council pipework.

The flow limit for the downstream pipework was set at 1030 l/sec and the Montefiore site discharge limit was set at 323 l/sec. The flow in the Council pipeline downstream of the orifice plate was set to allow this limit to be achieved with excess flow discharging to King Street.

The Montefiore site has no overland flow path from the lowest portion of the site and Council required 50% additional detention capacity to allow the on-site storage of stormwater in the event of an exceedence of the 100 year ARI design criteria or a blockage or failure in the downstream pipework.

Total detention provided in the original construction was around 1590 cu.m. of primary storage for the 100 year ARI storm event and a further informal 795 cu.m. of storage as air space above the open detention area (R-1) near the outlet to allow for the 50% additional detention required in the approval.

All discharge from the site is by gravity to the Council pipeline at the point where it leaves the site.

3. PROPOSED DRAINAGE WORKS

The works proposed under the approved Part 3A Concept Plan for the Residential Scheme includes the construction of 3 new accommodation buildings labelled 'D', 'E' and 'F' along the southern half of the site. These buildings will be constructed over shared basement car parking and will incorporate a child care facility and a retail plaza at ground level. Existing buildings on site include 'A', 'B' and 'C' and will not be affected by the new development.

The proposed drainage system for the initial phase involving Building 'D' will require Building 'D' roofwater and ground level areas higher than RL 44.45 m AHD discharging directly to Basin 'M-1' together with the following works:

- Adjustment of the orifice diameter for the outlet from detention tank 'M-1',
- Mounding and walling along Danger Street to preclude flood levels, and
- Protection to residential and commercial floor levels along the King Street frontage to Council DCP 2013 requirements.

The detention system will at all times maintain the existing approval conditions. All discharge from the proposed detention system will be by gravity flow. The construction of Building 'D' will not require any changes to the detention system apart from slightly increasing the orifice diameter in Basin 'M-1' as this basin already serves this area. When Building 'E' is constructed, above-ground Basin 'M-1' will be removed and replaced with new below-ground Basin 'M-1A'.

4. FLOOD LEVELS

The 'original' flood report for roads surrounding the site prepared by ourselves as part of the initial design in 2004 was based on detailed surveys around the site, with data for the catchment derived from orthophoto maps (to give topography), Council records (for stormwater infrastructure) and physical inspections of the catchment.

Rainfall was calculated from AR&R (1987), hydrology was determined using ILSAX, and hydraulics were modelled in HEC-RAS, to give a reasonable approximation of the flood levels around the site.

Since then, Randwick Council has engaged consultants to carry out 2-D flood modelling to produce a report titled 'Kensington – Centennial Park Flood Study' by consultants WMAwater and dated April, 2013.

Their report used spot levels from aerial survey to acquire topography and mapping, Mike-Storm and DRAINS for hydrology and TUFLOW for hydraulic modelling. The results are provided in the form of small scale aerial photo mapping with shading representing flood depth and contours representing 1 metre flood level intervals.

There appears to be general consensus between the Council flood maps and the original flood study for this site allowing for the limitations of attempting to apply the generalised flood data from the mapping to a specific site. Limitations are:

1. Small scale raster mapping,
2. Vertical accuracy +/- 0.150 m, and
3. No property boundaries information shown.

Another major limitation in relation to the Council flood study at this site is that flow was assumed in the study to pass through the Montefiore site with deep ponding at several locations which contradicts Council policy of abandoning the floodway through this site and adjoining downstream sites to the west by maintaining flood waters on the public street system.

The original flood report applied a uniform overland flow calculated by ILSAX to a road cross section based on accurate survey levels and modelled with HEC-RAS, whereas the Council study uses an aerial spot level grid (vertical accuracy +/-150mm) and 2-D software to model the flow across the terrain. In spite of this, the studies give similar results in relation to Building 'D' in that the flood protection measures identified as necessary to protect against the 1% AEP flood in the original flood study successfully protect against flood levels shown in the Council study.

In accordance with Council DCP 2013, commercial premises such as the retail and café must be protected to the 1% AEP flood, underground car parking to 300 mm above the 1% AEP flood and critical facilities such as nursing homes and retirement villages to 500 mm above the PMF.

In this site, 1% AEP flood waters are prevented from entering the site at the central driveway to a level 300 mm above the estimated flood level and a crest is added to the underground car park entry, the commercial floor spaces on the south-east corner of the site are protected to the 1% AEP flood level, and critical facilities are located at 3rd floor level with no direct contact with potential flood waters.

The Council flood study shows 1% AEP flood levels along the King Street Building 'D' façade less than 250 mm deep. This also applies to the flood levels in Dangar Street at the 'Central Driveway' near the northern face of Building 'D'. To prevent flow down this driveway, the driveway must crest to a level 300 mm greater than the peak 1% AEP flood levels. The original report identified

a crest level of 45.37m AHD to preclude the PMF level determined in the original flood study from entering the site and this level has been retained.

Because the Council flood levels are based on overland flow through the site, the levels are subject to change along the bounding roads (King Street, Dangar Street and Govett Lane) should the model be re-run without overland flow through the site. This would affect flood levels in the local area but probably have no significant effect on the overall model in other areas.

For those reasons, the original flood report levels will be used in the design of flood protection measures for Building 'D' with reference and comparison to the Council report.

5. CONCLUSION

This stormwater plan conforms to design criteria established in conjunction with Randwick City Council and to conditions imposed for the original development in 2005 and 2006.

The requirements in relation to Building 'D' will be an increased orifice diameter for Basin 'M-1' whilst still maintaining the site discharge limit.

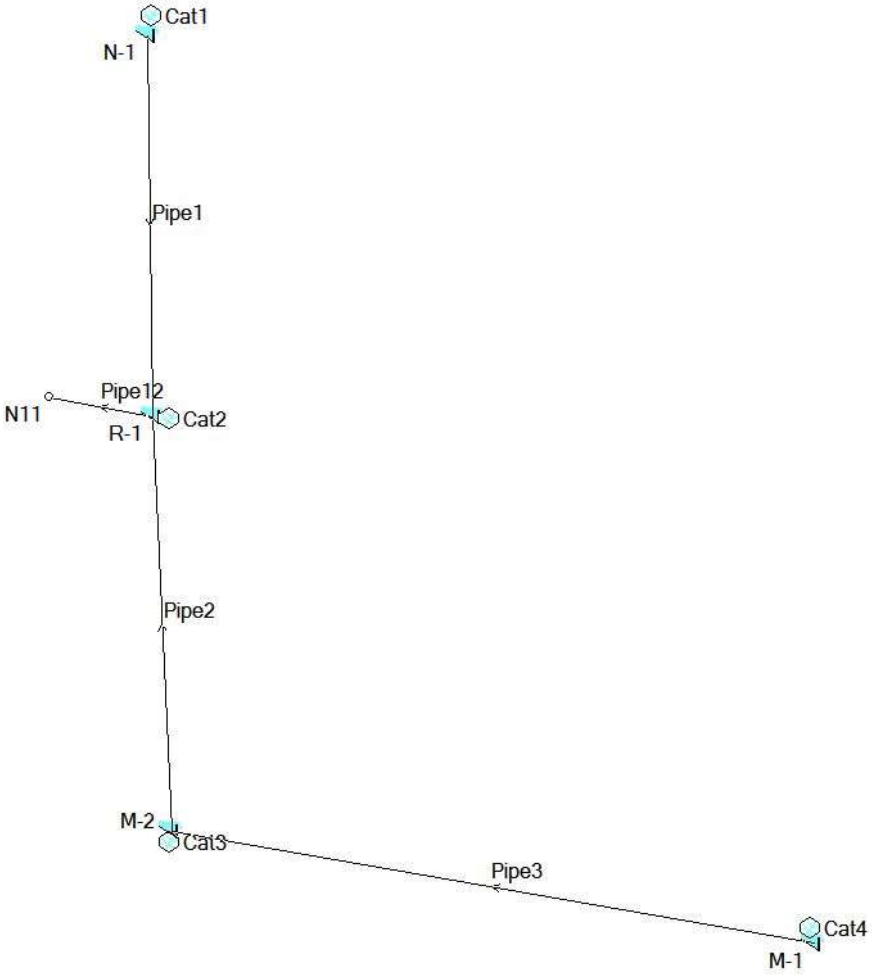
In relation to flood affectation, the site must preclude flood waters as no overland flow path exists within the site or sites to the west and any inflow would overwhelm the storage capacity provided for the site runoff.

Flood levels previously determined for this site are similar to those contained within the Council 'Kensington-Centennial Park Flood Study' released recently and no alterations to the original flood precautions are required to conform to this study.

7. APPENDICES

The following diagrams, calculation results and drawings are appended hereto:

1. DRAINS Building 'D' layout diagram.
2. DRAINS Building 'D' result sheet.
3. Drawings:
    a. 1144-SW04-A - BUILDING 'D' FLOOD & STORMWATER CONTROLS
    b. 1144-SW05-A - BUILDING 'D' FLOOD LEVELS



DRAINS Building 'D' Layout Diagram

DRAINS results prepared 24 November, 2016 from Version 2015.10

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe3	0.03	2.34	41.206	38.532	2 hours storm, average 62 mm/h, Randwick
Pipe2	0.075	0.35	38.103	37.977	1 hour storm, average 99 mm/h, Randwick
Pipe12	0.059	1.48	36.593	36.495	6 hours storm, average 29.5 mm/h, Randwick
Pipe1	0.053	0.48	38.445	37.977	10 minutes storm, average 216 mm/h, Randwick

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

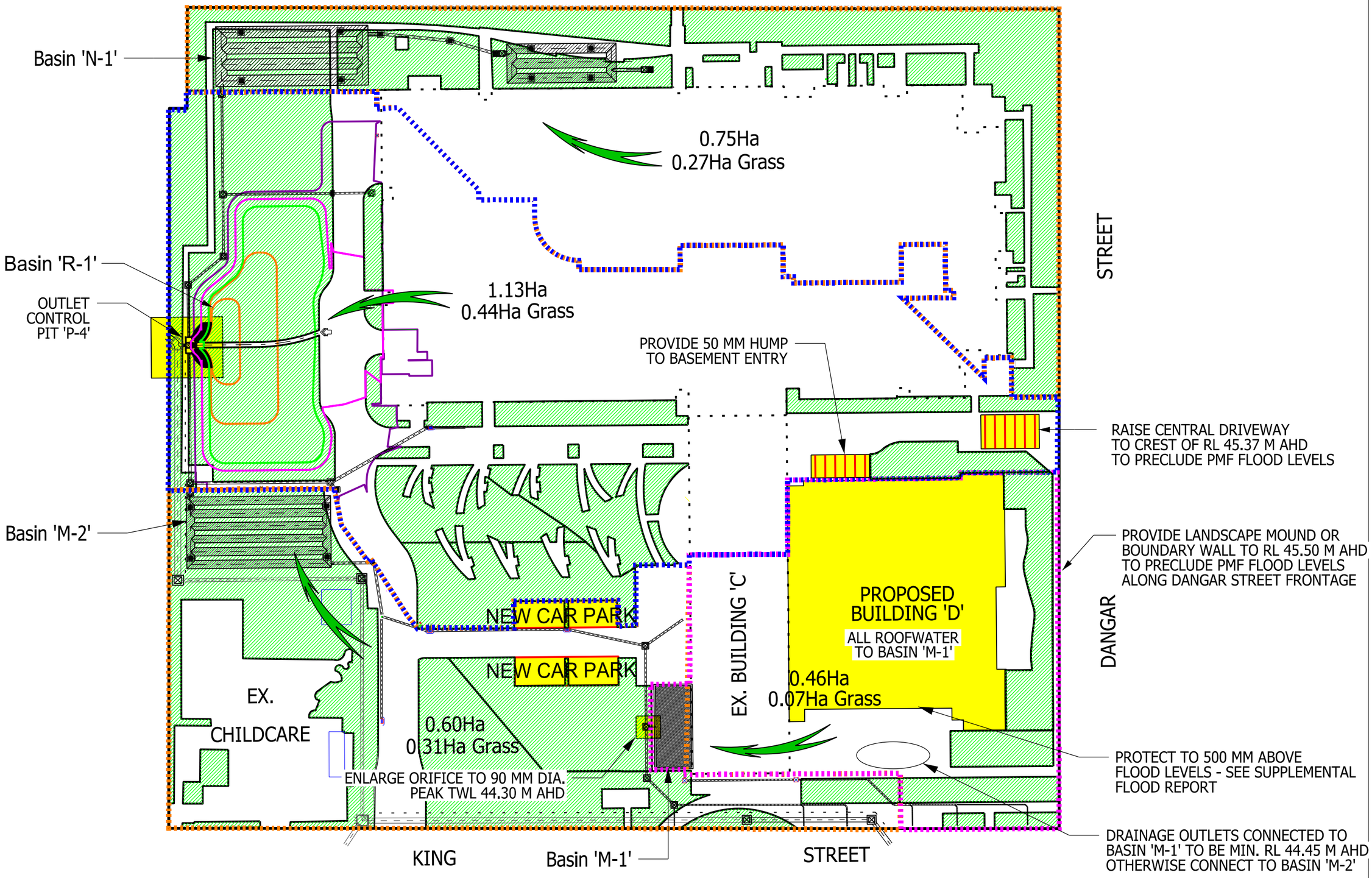
DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
M-1	44.33	351.1	0.03	0.03	0
M-2	38.53	320	0.075	0.075	0
R-1	37.96	1588.5	0.059	0.059	0
N-1	39.47	381.2	0.053	0.053	0

CONTINUITY CHECK for AR&R 100 year, 1.5 hours storm, average 76 mm/h, Randwick

Node	Inflow (cu.m)	Outflow (cu.m)	torage Chang (cu.m)	Difference %
M-1	474.95	300.92	173.59	0.1
M-2	832.75	610.09	222.1	0.1
R-1	2141.97	611.68	0	71.4
N11	611.68	611.68	0	0
N-1	715.72	475.33	236.32	0.6

DRAINS Building ‘D’
Results



ISSUE	BY	AMENDMENT	DATE
B	JE	REMOVED NOTE BASIN R-1	24/11/2016
A	JE	INITIAL ISSUE	21/08/2015

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CLIENT	SIR MOSES MONTEFIORE JEWISH HOME	PROJECT No. 1144	SCALE 1:750	DATE AUGUST 2016	
PROJECT	STORMWATER CONCEPT PLAN - RESIDENTIAL SCHEME	DESIGNER/DRAWN JE	DRAWING No. 1144-SW- 04		ISSUE B
DRAWING	BUILDING 'D' FLOOD AND STORMWATER CONTROLS	CHECKED JE			

LEGEND:

COUNCIL FLOOD LEVELS:

EMERSON ASSOC. FLOOD LEVELS:

NOTE:
RESIDENTIAL AND COMMERCIAL FLOORS TO BE PROTECTED TO 500 MM ABOVE FLOOD LEVELS.

ALL FLOOD LEVELS SHOWN ARE 100 YEAR ARI (PALE SHADING IS APPROX. PMF EXTENT)

A	JE	INITIAL ISSUE	30/08/2016
ISSUE	BY	AMENDMENT	DATE

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PROJECT	STORMWATER CONCEPT PLAN - RESIDENTIAL SCHEME	DESIGNER/DRAWN JE	DRAWING No. 1144-SW- 05		ISSUE A
DRAWING	BUILDING 'D' FLOOD LEVELS	CHECKED JE			