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1 IN 100 YEAR A.R.I.

Flood Study

62-82 Harrow Road, Bexley

Prepared by: Alan Denniss
M.Eng.Sc (Hydrology)
Civil Design Engineer
B.E.(Geomatic)(Hons)

C&R Ref: 42/12
1 May 2013

INTRODUCTION

Craig & Rhodes Pty Ltd has been engaged by Momentum Projects to carry out a flood study at 62-82 Harrow Road, Bexley to assist with a Development Application for Aged Care Housing on the site.

The scope of this report is to assess the 1 in 100 year Average Recurrence Interval (A.R.I.) storm flow and determine the resulting overland flowpath and flood water levels that may impact upon the site. From this determine the appropriate building floor levels for the proposed new buildings on the site in accordance with the requirements of Rockdale City Council "Technical Specification Stormwater Management".

A previous flood investigation of the site was undertaken by Paterson Britten & Partners Pty Ltd in May 2007. A desktop review has been undertaken of this report to assess the methodology used and the relevance of the analysis in relation to this proposed new development. It was concluded that the Paterson Britten & Partners report was relevant with the results of their analysis forming the basis of this report.

100 YEAR A.R.I. STORM FLOW

The 1 in 100 year A.R.I. flow and Probable Maximum Flood (PMF) flows in Harrow Road were provided by Council in the 'Flood Advice Letter' dated 26 March 2012.The peak surface flows provided by Council are reproduced in the table below and are the same flows used in the Paterson Britten (PB) study. Paterson Britten under took a hydrological analysis of the catchment area draining to Bowlers Avenue and determined the 1 in 100 year ARI & PMF flows which are also included in the table below. Further the PB study determined that 4.1 m^3/sec of overland flow entered Goyen Avenue from Harrow Road.

Peak Catchment Flows

Location / Storm Event	100 Year ARI	PMF
Flow in Harrow Rd (east side)	4.9 m^3/sec	22 m^3/sec
Flow in Harrow Rd (west side)	1.4 m^3/sec	5.7 m^3/sec
Total Flow in Harrow Road	6.3 m^3/sec	27.7 m^3/sec
Flow along Bowlers Ave	0.6 m^3/sec	2.1 m^3/sec
Flow along Goyen Avenue	4.1 m^3/sec	

1 in 100 YEAR A.R.I. THEORETICAL WATER LEVELS

The results of the PB analysis have been reproduced and are presented in the tables below for the relevant sections along each of the adjoining roads. The corresponding chainages of the sections and the extent of the 100 year overland flow are also shown in the attached plan 4212eo1.

Predicted Flood Level and Flood Planning Level in Bowlers Avenue

Chainage	Water Surface Elevation (m)	Max Water Depth (m)	Flood Planning Level (AHD)
115.97	35.41	0.14	35.55
102.3	35.29	0.20	35.49
67.3	34.95	0.16	35.11
55.7	**34.88**	**0.19**	**35.07**
7.29	34.85	0.48	35.33

Predicted Flood Level and Flood Planning Level in Harrow Road

Chainage	Water Surface Elevation (m)	Max Water Depth (m)	Flood Planning Level (AHD)
60.1	34.68	0.22	34.90
13.8	33.72	0.33	34.05
0	33.57	0.33	33.90

Predicted Flood Level and Flood Planning Level in Goyen Avenue

Chainage	Water Surface Elevation (m)	Max Water Depth (m)	Flood Planning Level (AHD)
49.2	33.52	0.30	33.82
39.8	33.09	0.38	33.47
29.8	32.46	0.41	32.87
14.4	**31.50**	**0.41**	**31.91**
0	31.00	0.71	31.50

PROPOSED DEVELOPMENT FLOOR LEVELS

The proposed development for this site is an Aged Care Housing Facility. The proposed new building will be multi-story containing a basement, ground floor and levels 1 & 2. The building from the ground floor up is two separate wings joined by a covered walkway. The existing clubhouse on the site is to remain and be converted into an administration block.

Rockdale City Council requires the minimum habitable floor level to be above the predicted 1 in 100 year A.R.I. flood water level. This freeboard is to be at least the depth of flow being a minimum of 0.2m and a maximum of 0.5m. The minimum habitable floor level is also referred to as the Flood Planning Level (FPL). The required FPL for each section is also shown in the tables above. Where the FPL varies across the site the highest FPL adjacent to the development is to be adopted.

The FPL of the western wing of the proposed building adjacent to Harrow Road & Bowlers Avenue varies from RL 35.07 at Chainage 55.7 in Bowlers Avenue to RL 34.05 at Chainage 13.8 in Harrow Road. Hence the FPL to be adopted for the western wing is **RL 35.07.**

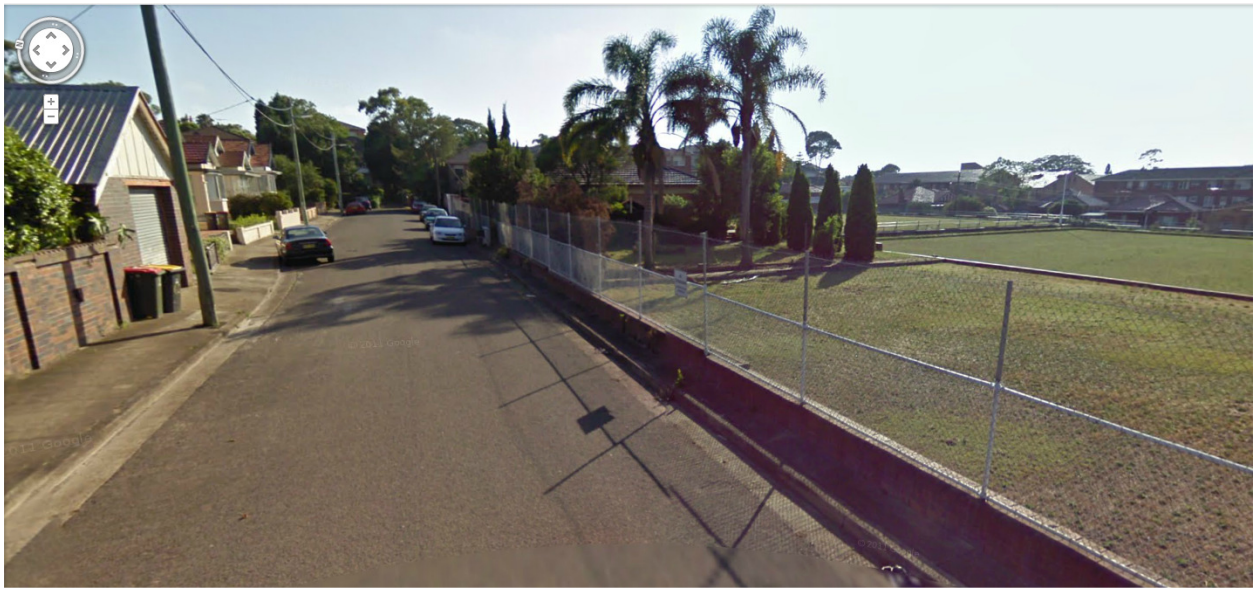
The highest FPL in Goyen Ave adjacent to the eastern wing is at Chainage 14.4. The FPL to be adopted for this wing is **RL 31.91**

The proposed development has a basement level containing a plant room, store rooms, workshop, food storage room and car parking. To protect the basement from flood water inundation the crest in the accessway ramp needs to be set at a minimum elevation of **31.50m AHD.**

The existing bowling clubhouse has a floor level of RL 34.55 and is below the footpath level in Bowlers Avenue being generally around RL 35.00 (see attached detail survey plan). The 1 in 100 year ARI flow in Bowlers Avenue is contained within the road and footpath area and does not enter into the site.

CONCLUSION

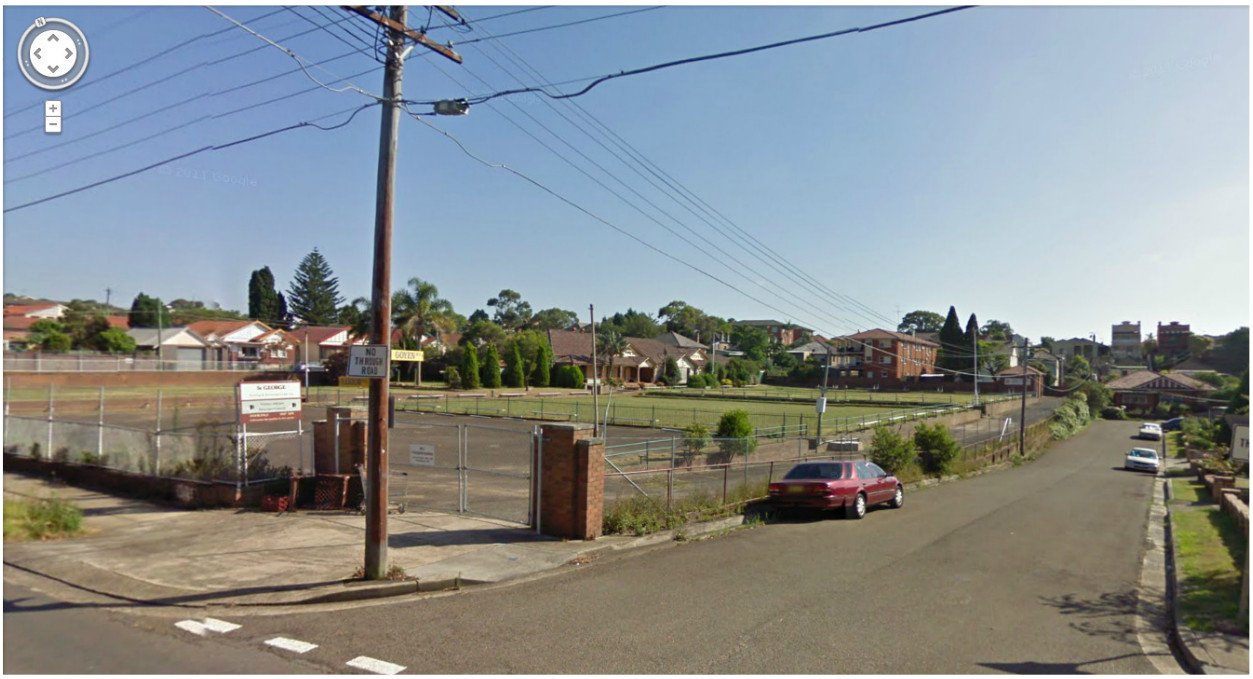
The existing site is protected from inundation of flood waters in a 1 in 100 year storm event by a low brick wall that borders Bowlers Avenue and Harrow Road as seen in the photos below.



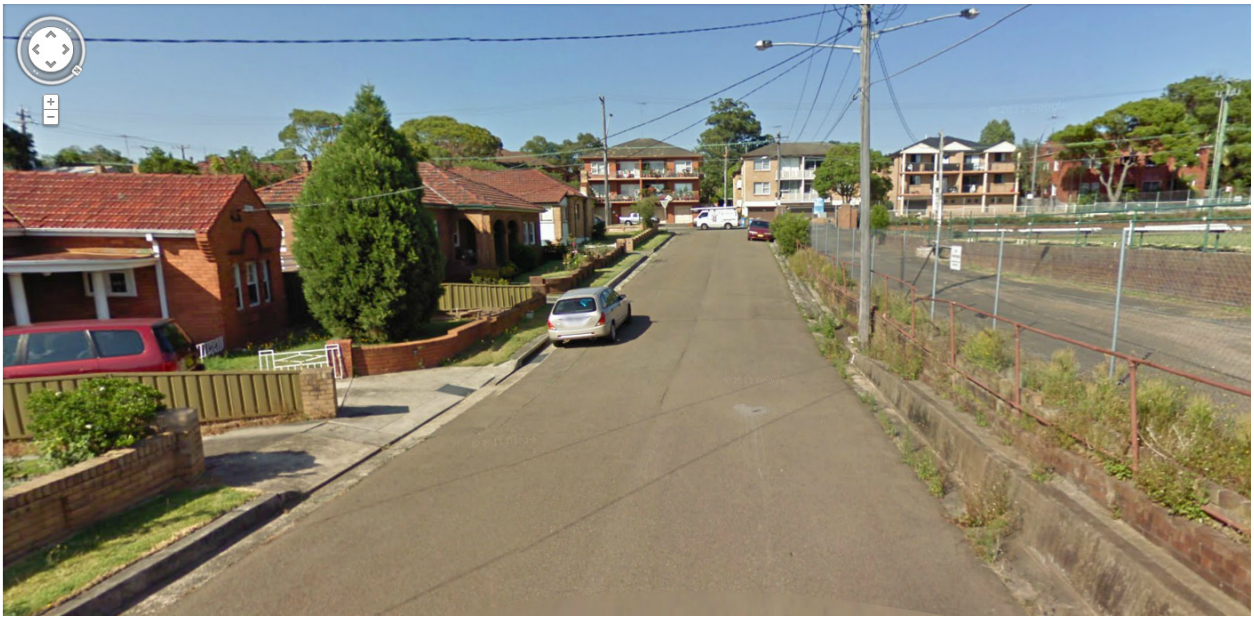
Looking North East along Bowlers Avenue.

Looking North West along Harrow Road.

The only overland flood flow through the site occurs at the intersection of Harrow Road and Goyen Avenue where the low brick wall ends. Water flows down the existing driveway through the site before spilling back into Goyen Avenue. Along Goyen Avenue the flow is kept out of the site by a retaining wall along the boundary of the site.



Intersection of Harrow Road & Goyen Avenue



Looking West along Goyen Avenue.

The photo above shows this retaining wall and the trapped low point in Goyen Avenue where the stormwater ponds before overtopping the crest in the driveway of No.2 and continuing along the overland flow path through this property.

For the proposed development the low brick retaining walls bordering the site could be removed and replaced with landscapping that batters from the buildings to the property boundary. This would require the site to be filled around the western wing.

To minimise any increase in the flood water level at the intersection of Harrow Road and Goyen Avenue, the proposed levels of the Pastoral Lawn should not be any higher than the current existing site levels in this area.

Whilst the proposed development will increase the impervious area of the site, the requirement for On-site Detention Storage will compensate for this and the development will not increase the impact of the 1 in 100 year ARI flow on the adjoining properties.

1 in 100 Year ARI Site Overland Flow Plan

Site Detail Survey Plan

APPENDIX A

Paterson Britten & Partners Pty Ltd

Flood Investigation Report

A3

BOWLERS AVENUE

CH.7 29 WL 34.85 FPL 35.33
CH.55 7 WL 34.88 FPL 35.07
CH.67 3 WL 34.95 FPL 35.11
CH.102 3 WL 35.29 FPL 35.49
CH.115 97 WL 35.41 FPL 35.55

EXISTING RETAINING WALL ALONG BOUNDARY

CH.60 1 WL 34.68 FPL 34.90

HARROW ROAD

EXISTING RETAINING WALL ALONG BOUNDARY

CH.13 8 WL 33.72 FPL 34.05

PROPOSED WEST WING

EXISTING CLUB HOUSE

PROPOSED GARDEN

PROPOSED COVERED WALKWAY

PROPOSED GARDEN

PROPOSED EAST WING

PROPOSED PATH

PROPOSED CHAPEL GROVE

PROPOSED PASTORAL LAWN

PROPOSED DROP-OFF

RAMP TO BASEMENT

EXISTING RETAINING WALL ALONG BOUNDARY

CH.49 2 WL 33.52
CH.39 8 WL 33.09
CH.29 8 WL 32.46
CH.20 25 WL 31.86
CH.14 4 WL 31.5 FPL 31.91
CH.0 0 WL 31.0 FPL 31.5

GOYEN AVENUE

No. 2 No. 3

LEGEND

- 1 IN 100 YEAR ARI STORM FLOOD EXTENTS
- DIRECTION OF OVERLAND FLOW
- CH.0 0 — SECTION LOCATION & CHAINAGE
- WL 31.0 — 100 YEAR PREDICTED WATER LEVEL
- FPL 31.5 — FLOOD PLANNING LEVEL

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1:500 @ A3

DIAL 1100 BEFORE YOU DIG

Project:
1 IN 100 YEAR ARI OVERLAND FLOW
62-82 HARROW ROAD, BEXLEY

Principal: MOMENTUM PROJECTS

Scale	Date	Council Ref.
1:500	6/05/2013	
	Datum A.H.D.	L.G.A. ROCKDALE

Calc's	Drawn.	Proj.Man.	Client Ref:
A.D.	F.G.	A.D.	

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ISO 9001 Approved Company

Our Ref. 042-12

Dwg File Ref. [Rev] - Sheet Ref.

042-12G E01 [00] - 01 OF 01

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ROCKDALE
CITY COUNCIL
On Historic Botany Bay

26 March 2012

Our Ref: F08/691, 12/020594
Contact: Jamie Milner 9562 1645

Alan Denniss
Craig and Rhodes
PO Box 233
EPPING NSW 2121

Dear Sir / Madam

Re: Flood Advice Letter for 62-82 Harrow Road, Bexley

When lodging a Development Application you must enclose a copy of this letter with a separate Flood Study

I refer to your application requesting flooding information for the above property. Council has not notated this property as being affected by a 1 in 100 year Annual Recurrence Interval (ARI) flow. The 1 in 100 year ARI storm means there is a 1% chance of a storm of this size, or higher occurring in a period of one (1) year. However Council has identified that this property may be affected by surface flows.

Council's most recent flood study for the area identified the following flows in Harrow Road :

Eastern side (adjacent to 62-82 Harrow Road)

- **1 in 100 year ARI flow: 4.9 m^3/sec**
- **Probable Maximum Flood (PMF) 22.0 m^3/sec**

Western side (adjacent to 39 Harrow Road)

- **1 in 100 year ARI flow: 1.4 m^3/sec**
- **Probable Maximum Flood (PMF) 5.7 m^3/sec**

The Flood Risk Exposure of the site varies and has been assessed as:

- **partly Overland Flooding : Flow Margin : Low Hazard**
- **partly above the flood planning level**

For the design of all new developments, alterations and additions on this land a civil/hydraulic engineer is to be engaged to assess the impacts of these overland flows before and after development using a Mannings Equation or model such as HEC-RAS. This flow is likely to travel through adjacent properties as well. The development is not to increase the water level or hazard on adjoining properties. Opportunities should be taken to design a development that is preferably clear of the overland floodway and acts to reduce the impacts of these flows, possibly by removing inappropriate travel paths and/or reducing the hazard.

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ABN 66 139 730 052

The study will be required to assess the flows entering Goyen Avenue, and water level surface profiles in Goyen Avenue considering the potential blockage of the flow path from dwellings in Goyen Avenue.

The corresponding minimum habitable floor level will have a freeboard above the 1 in 100 year flow level. The freeboard will be at least the depth of flow with a minimum of 0.2m and a maximum of 0.5m. The minimum habitable floor level is referred to as the Flood Planning Level (FPL). The minimum unprotected garage, outbuilding, or parking level is the 1 in 100 year flow level, however levels lower than this are permitted providing they are physically protected to the Flood Planning Level. Where flow levels as determined by hydraulic modelling vary across the site, the highest flow level adjacent to the development is to be used in determining the minimum floor level.

Any pool, steps, rainwater tank, hot water system or similar obstructing the overland flow path is not to be constructed within the floodway.

All new internal or front fencing including the gates along the overland flow path are to have flow through fencing (lattice not permitted). Flow through fencing or louvers are to be extended for the full width of 1% flow and to a minimum height of 1% A.E.P. flood level.

The following conditions also apply.

1. Any portion of the building or structure lower than the FPL shall be built from flood compatible materials.
2. All services associated with the development shall be flood proofed to the FPL.
3. No filling is permitted on the site.

Council plans indicate that the property is impacted by an existing 750 mm diameter pipe. Council will not allow construction over the pipe and it will need to be relocated clear of the site along Harrow Road and down Goyen Avenue. Any Development Application will need to be accompanied by design documentation for the realigned route of the new pipe together with design calculations. Where computer modelling is used to assess the pipe this should be undertaken with DRAINS and a copy of the file provided with the submission.

The new pipe is to be designed to carry the 1 in 20 ARI (5% AEP) flow. The pipe design is to be assessed using Hydraulic Grade Line (HGL) analysis by:

1. Determining the equivalent 1 in 20 year ARI standard pipe size for the existing pipe based on the design 1 in 20 year flow with zero overflow;
2. Using the theoretical 1 in 20 year pipe size both upstream and downstream calculate the new pipe size for the now longer relocated pipe with turning pits such that there is no increase in HGL levels. This will usually require a pipe larger than the theoretical pipe to account for the additional pit and pipe losses.

Pits are required upstream and downstream of the new pipe to allow access for maintenance. HGL analysis is also required to assess the interaction of the new 20 year ARI pipe with the existing drainage system. Where this analysis indicates surcharge the pit lids are to be sealed and bolted down. All other pits are to be grated with child proof locks. An additional standard inlet pit with lintel is to be provided in Harrow Road near the corner in Goyen Avenue. Council has a DRAINS model of the catchment and this can be made available subject to the payment of a licensing fee in accordance with Council's adopted fees and charges.

Should you require any further information, please contact Council's Coordinator City Assets, Mr Jamie Milner on 9562 1645.

Yours faithfully

Jamie Milner
COORDINATOR CITY ASSETS