TTW Structural Civil Traffic Façade

Civil Engineering Report for SSDA Submission

Grey House Precinct (GHP) Pymble Ladies' College

Prepared for Pymble Ladies' College / 27 August 2021

211007 CAAA

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Contents

1.0 Introduction 3
1.1 Proposal 3
1.2 Site Description 3
1.3 Secretary's Environmental Assessment Requirements 4
1.4 Relevant Documents 4
2.0 Site Context 5
2.1 Existing Structures 5
2.2 Existing Stormwater 5
2.3 Existing Services 5
2.4 Geotechnical Conditions 5
3.0 Early Works Stormwater Diversion 6
4.0 Stormwater Drainage 6
4.1 Stormwater Quantity 6
4.2 Stormwater Quality 7
4.2.1 MUSIC Modelling 7
4.2.2 Event Mean Concentration 8
4.2.3 MUSIC Catchment Breakdown 8
4.2.4 MUSIC Model 9
4.2.5 Results 9
4.3 In-ground Drainage Network 9
4.4 Overland Flow 10
4.5 Erosion and Sediment Control 10
4.6 Flooding 10
Appendix A 12

1.0 Introduction

This report has been prepared to support a State Significant Development Application (SSDA) (SSD-17424905) for the proposed development of Pymble Ladies College – Grey House Precinct to be submitted to the Department of Planning, Industry and Environment (DPIE).

This report addresses general requirements as identified in the Planning Secretary's Environment Assessment Requirements (SEARs) and more specific requirements as set out by Ku-ring-gai Council.

1.1 Proposal

The proposed Grey House Precinct development will deliver a world-class educational and co-curricular facility that fosters leading pedagogical practices, prioritizes student and staff health and wellbeing, embeds flexibility to accommodate future developments in learning and teaching methods, attains best-practice sustainability, respects and enhances the existing built form and natural environs, and positively contributes to a campus public realm that is connected, legible and accessible.

The proposed Grey House Precinct will provide a new home for years 5 and 6, dance, assemblies, events, Out of School Hours Care (OSHC) and Early Learning (ELC). The years 5 and 6 junior school component will provide high quality general and specialist learning, with a focus on STEM. The development will be stitched into the wider campus through convenient and direct connections to the Main Hall, Junior School, Centenary Precinct car park and to Grey House Walk.

1.2 Site Description

The site is located mid-way along the south-east boundary of the Pymble Ladies' College and addresses a key pedestrian entry (Grey House Walk) to the campus from the south-east.

The site has steep topography, sloping from Goodlet House in the north-west, down to the property boundary in the north-east. It is located between the existing gym and Centenary Sports precinct to the west, and existing Junior School buildings to the east. The general site location is shown in Figure 1.1

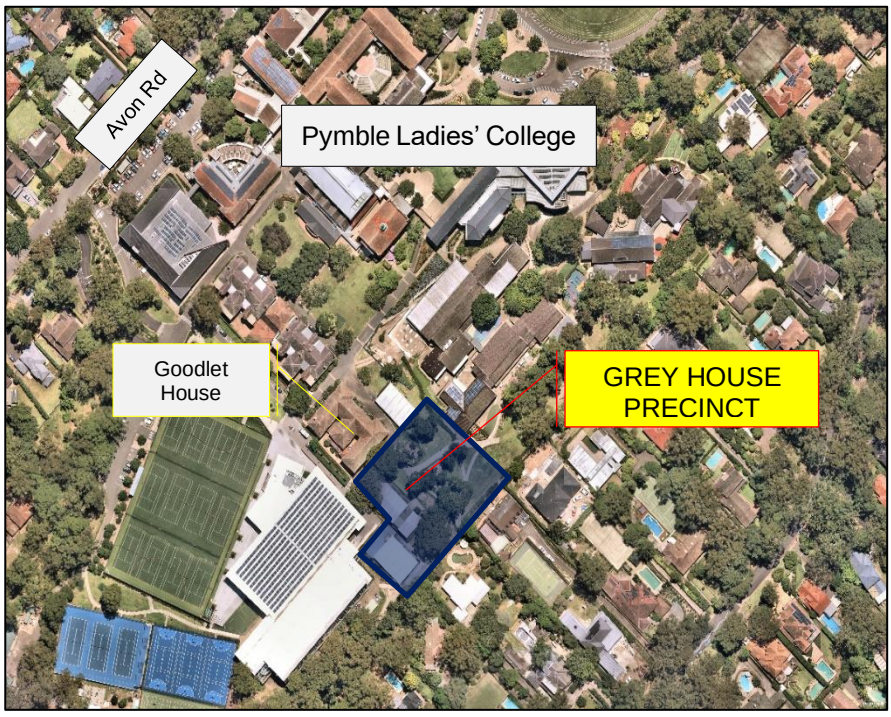

Figure 1.1 Site location

1.3 Secretary's Environmental Assessment Requirements

Under application number SSD-17424905, we have been provided the Secretary's Environmental Assessment Requirements (SEARs) issued on the 15th of May 2021. This report provides response (in part or full where relevant) to the following SEARs:

	SEARs Requirement:	**Addressed in section:**
15	**Stormwater Drainage**	
	Provide a preliminary stormwater management plan for the development that: • is prepared by a suitably qualified person in consultation with Council and any other relevant drainage authority. • details the proposed drainage design for the site including on-site detention facilities, water quality measures and the nominated discharge point. • demonstrates compliance with Council or other drainage authority requirements.	Section 4.1, Section 4.2, Appendix A
	Provide stormwater plans detailing the proposed methods of drainage without impacting on the downstream properties.	Section 4.1, Section 4.2, Appendix A
	Where drainage infrastructure works are required that would be handed over to Council, provide full hydraulic details and detailed plans and specifications of proposed works that have been prepared in consultation with Council and comply with Council's relevant standards.	N/A
16	**Flooding**	
	Identify any flood risk on-site in consultation with Council and having regard to the most recent flood studies for the development area and the potential effects of climate change, sea level rise and an increase in rainfall intensity.	Section 4.6
	Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions to mitigate flood risk where required.	Section 4.6
17	**Soil and Water**	
	Provide details of measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles.	Section 4.5

1.4 Relevant Documents

The site lies within the amalgamated Parramatta City Council LGA and a development control plan (DCP) has been created for the Wentworth Point Precinct which applies to this site. This DCP created in 2014 refers to the Auburn Development Control Plan (DCP) 2010 which also provides guidance on development controls. Further, the Department of Education's 'Education Facilities – Standards and Guidelines' applies to the proposed high school development. All three documents have been reviewed in preparation of this report. Where applicable, the more stringent requirements have been met by the development.

The following documents have been used in preparing this document:

- Australian Rainfall and Runoff 2019
- AS3500.3 Plumbing and Drainage: Stormwater Drainage
- Managing Urban Stormwater – Soils and Construction 'Blue Book', Volume 1, 4th Edition, Landcom
- Ku-ring-gai Council Development Control Plan 2020 – Part 24 Water Management
- Department of Education's Educational Facilities – Standards and Guidelines

2.0 Site Context

TTW has been engaged to prepare the concept stormwater drainage design for the Grey House Precinct (GHP) Pymble Ladies' College at Avon Road, Pymble NSW 2073. This stormwater management plan has been prepared to accompany the stormwater concept plans. The site will undergo some demolition, extension and development of new buildings. The topography grades out from west to east with levels from approximately 121.0m to 108.0m.The general site location is shown in Figure 1.1

2.1 Existing Structures

Most of the proposed site area is undeveloped, contains a network of concrete footpaths and several trees. Two single storey demountable buildings and a single storey marquee at the western portion of the site will need to be removed/demolished.

2.2 Existing Stormwater

Existing stormwater information has been referenced from Qasar Service Report dated 15 March 2021. Some existing underground pipes situated under the proposed building footprint will require diversion.

An existing in-ground stormwater pipe and pit network east of the site is shown in the Ku-ring-gai Council Dial-Before-You-Dig drawings. The concept stormwater plan is intended to connect to this network upon confirmation by the detailed survey.

2.3 Existing Services

The site and its vicinity contain existing services including water, sewer, electricity, gas and stormwater. Subsurface utility locating and detailed survey reports have been provided by Qasar (15 March 2021) and LTS Lockley (report updated 30/03/21), respectively.

Services may be required to be relocated and diverted around the site or removed as part of the works. It is possible that additional unknown services may be encountered during demolition or construction.

2.4 Geotechnical Conditions

The geotechnical investigation for GHP has been carried out in two stages, the first stage dated 8 February 2021 and additional investigation was carried out on 8 April 2021, both results are presented in the Geotechnical report Ref 337755SCrpt2 dated on 26 April 2021 produced by JK Geotechnics.

The report details a study of the soil landscape, geological maps and results of eleven (11) bore holes. However only seven (7) bore holes are within the proposed site with valid results, which are BH 201, BH202, BH203, BH204, BH301, BH302 and BH101. Bore hole locations are shown in Figure 1.2.

The site itself was positioned on a north-easterly facing hillside with an overall slope of about 7°. To the east of the site the sloping lawns continued down to the east.

Class 4 and 5 Weathered bed rock was encountered at depth ranging from 1.2m (BH201) to 4m (BH202) below residual silty clay, class 3 or better siltstone bedrock founded at depth of 5m (BH203, BH302, BH301) and depth of 10.2m (BH202).

Ground water monitoring well was installed in BH302 over thirteen days, the ground water was measured at depth of 6m (RL113.7m) below the B.E.L of slab on ground.

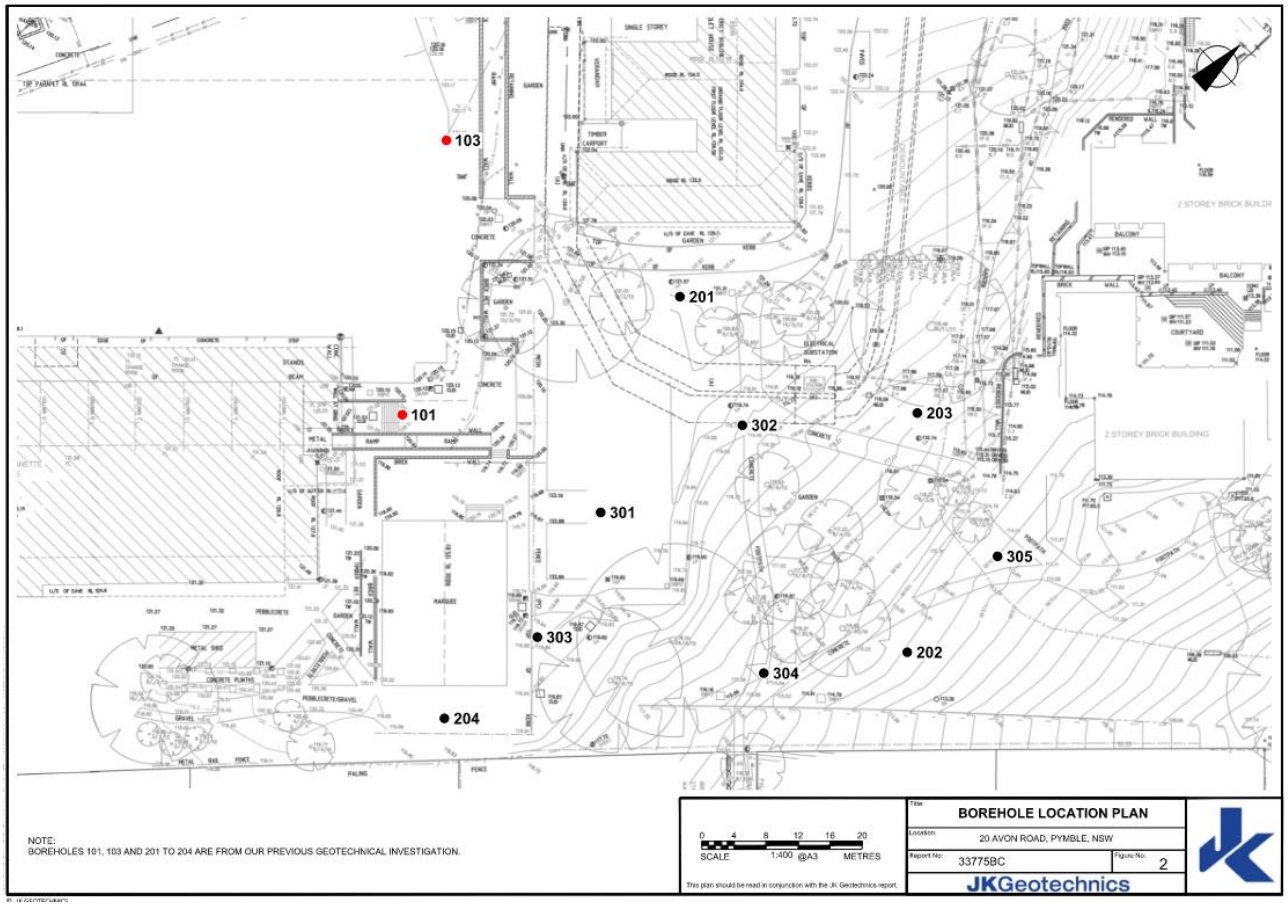

Figure 2.1 Borehole location from JK Report dated 26 April 2021

3.0 Early Works Stormwater Diversion

An existing stormwater pipe and pit network conveying stormwater from upstream and outside of the site area currently passes though the footprint of the proposed building. This line will require diversion and will be implemented as early works.

4.0 Stormwater Drainage

4.1 Stormwater Quantity

Stormwater design within the site is required to comply with Ku-ring-gai Council's Development Control Plan (DCP) Principal Section C – Part 24 – Water Management. An On-site Detention Tank (OSD) is required to comply with the Permitted Side Discharge and Minimum Storage Volume values as per Part 24R.3 of the DCP specific for the Blackbutt Creek (BB1) Catchment Area in reference to Part 24R.2. The respective parameters were given at 141 l/s/ha and 302 m³/ha.

With respect to the approximate area of the proposed development at 4,950m², the design OSD requirements are calculated as per Council's DCP Part 24R.4 On-site Detention Calculation Sheet. A summary is shown in Table 4.1.

Table 4.1 Required OSD Parameters

Development Area, m²	4,950
Permitted Site Discharge (PSD), l/s	35
Site Storage Requirement (SSR), m³	90

The rate of discharge is limited to the PSD of 35 L/s through the use of an orifice plate with a diameter of 91mm affixed to the OSD outlet which discharges to the existing Council stormwater network along the eastern boundary of the site.

The OSD tank is sized using DRAINS, that considers the catchment bypassing the OSD tank, with a calculated volume of 160m³ in order to achieve the PSD value as required in the DCP. This is above and compliant to the minimum volume dictated by the SSR rate.

An OSD system has been provided as shown in drawings C05, C06, C07 and C50 in Appendix A of this report.

4.2 Stormwater Quality

Stormwater quality treatment within the site is required to comply with the Ku-ring-gai Council DCP Part 24C.6 – Stormwater Quality Control. Water quality treatment devices must achieve the water quality targets as specified in Table 4.2.

The treatment train is modelled in Model for Urban Stormwater Improvement Conceptualisation (MUSIC) to ensure targets are met.

Table 4.2 Water Quality Reduction Targets

Pollutant	Minimum Reductions Required
Total Suspended Solids (TSS)	85%
Total Phosphorus (TP)	65%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	70%

The WSUD treatment train includes the following measures: Eight (8) Ocean Guard by Ocean Protect to surface inlet pits, one (1) 25kL Rainwater Tank and a stormfilter chamber housing ten (10) 690 PSorb units.

4.2.1 MUSIC Modelling

The effectiveness of the combination of treatment train measures has been assessed using numerical modelling within MUSIC (Model for Urban Stormwater Improvement Conceptualisation version 6). The results of the modelling were compared against the Council's pollutant reduction targets to determine the effectiveness of the proposed measures.

MUSIC simulates the performance of a group of stormwater management measures, configured in series or in parallel to form a "treatment train" against historic rainfall event data sets. It is the industry standard water quality modelling software developed by the MUSIC Development Team of the Cooperative Research Centre for Catchment Hydrology (CRCCH).

The MUSIC User Manual suggests that the time-step should not exceed the time of concentration of the smallest sub-catchment however due consideration must also be made regarding the shortest detention time of nodes within the treatment train.

4.2.2 Event Mean Concentration

MUSIC uses different event mean concentrations (EMC) to determine the pollutant loads generated by different land uses. The standard EMCs adopted within MUSIC were based on research undertaken by Duncan (1999) through the CRCCH and the results are reproduced in Australian Runoff Quality – A Guide to Water Sensitive Urban Design (ARQ). The EMC values used in the MUSIC models for this project were based on the Ku-ring-gai Council MUSIC-link template utilising modified % impervious area, rainfall threshold, soil properties & pollutant concentrations. The below table summarises the parameters used for the development site:

Table 4.3 EMC Inputs for MUSIC

NODE TYPE		MEAN BASE FLOW CONCENTRATIONS Log_{10} (mg/L)			MEAN STORM FLOW CONCENTRATIONS Log_{10} (mg/L)		
		TSS	TP	TN	TSS	TP	TN
General Urban	Mean	1.200	-0.85	0.110	2.150	-0.600	0.300
	Std dev	0.17	0.19	0.12	0.32	0.25	0.19

4.2.3 MUSIC Catchment Breakdown

The catchments were split into the following: roof, pervious and impervious with varying imperviousness ratios.

Table 4.4 MUSIC Model Catchment Breakdown

CATCHMENT	AREA (m^2)	% IMPERVIOUS	TREATMENT
Roof	2,060	100	25kL RWT, SF Chamber, 11 x 690 PSORB Storm Filters
Landscaping on suspended slab	780	50	SF Chamber, 11 x 690 PSORB Storm Filters
External areas	1,070	75	4 x Ocean Guard, SF Chamber, 11 x 690 PSORB Storm Filters
External areas [bypass]	1,030	70	4 x Ocean Guard

4.2.4 MUSIC Model

The MUSIC model layout is shown below.

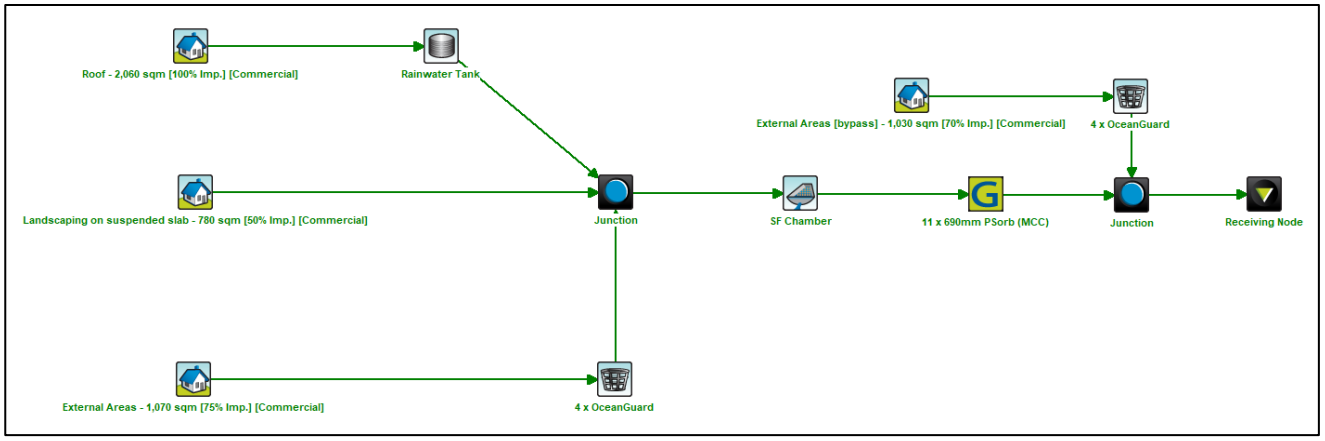

Figure 4.1 MUSIC Model Layout

4.2.5 Results

The results of the modelling are summarised below with the pollutant loads expressed in kilograms per year. The reduction rate is expressed as a percentage and compares the pollution from the post developed site to that of the existing developed state of the site to determine whether the reduction targets have been achieved.

Table 4.5 Pollutant Reduction Comparison Table

Pollutant Type	MUSIC Model Pollutant Reduction	Council Pollutant Reduction Target *(Average Annual Load)*
Gross Pollutants (GP)	100%	*70%*
Total Suspended Solids (TSS)	85.8%	*85%*
Total Phosphorus (TP)	71.3%	*65%*
Total Nitrogen (TN)	52.3%	*45%*

The results table shows that the proposed treatment train will achieve the reduction targets for full range of pollutants. Through the implementation of the proposed water quality measures stormwater discharge from the site can be effectively managed to ensure that there is no detrimental effect to the water quality downstream of the subject site.

The proposed stormwater concept as documented is subject to DPIE's approval through the state significant development approval (SSDA) process.

The Stormwater Quality measures (Water Sensitive Urban Design WSUD) provided are shown in drawings C05, C06, C07 and C50, refer to Appendix A of this report.

4.3 In-ground Drainage Network

The in-ground stormwater system shall be designed in accordance with:

- Australian Standards 3500.3
- Ku-ring-gai Council's Development Control Plan Principal Section C – Part 24 – Water Management
- Australian Rainfall and Runoff

Stormwater will be required to be conveyed to the proposed stormwater outlet at the eastern boundary of the site.

4.4 Overland Flow

Overland flow paths will be required for larger storm events and in the event that the piped in-ground stormwater system fails due to a blockage or other obstruction. Overland flow paths will need to be sufficient to convey the 100 year ARI storm event.

An Overland flow path has been provided as shown in drawings C05, C06 and C07 as shown in Appendix A of this report.

4.5 Erosion and Sediment Control

During construction while the site is disturbed, erosion prevention and sediment control measures will be required. Erosion and sediment control measures will be required to comply with

- Ku-ring-gai Council's Development Control Plan Principal Section C – Part 24 – Water Management
- Landcom's Managing Urban Stormwater: Soils and Construction

An Erosion and Control Plan has been provided, refer to drawing C02 in Appendix A of this report.

4.6 Flooding

Through consultation with Ku-ring-gai Council, TTW has confirmed that the proposed area of works for the Grey House Precinct (GHP) at Pymble Ladies' College does not fall within the Flood Planning Area as shown the Ku-ring-gai Council Online Map. A screenshot of Council's online map is show below.

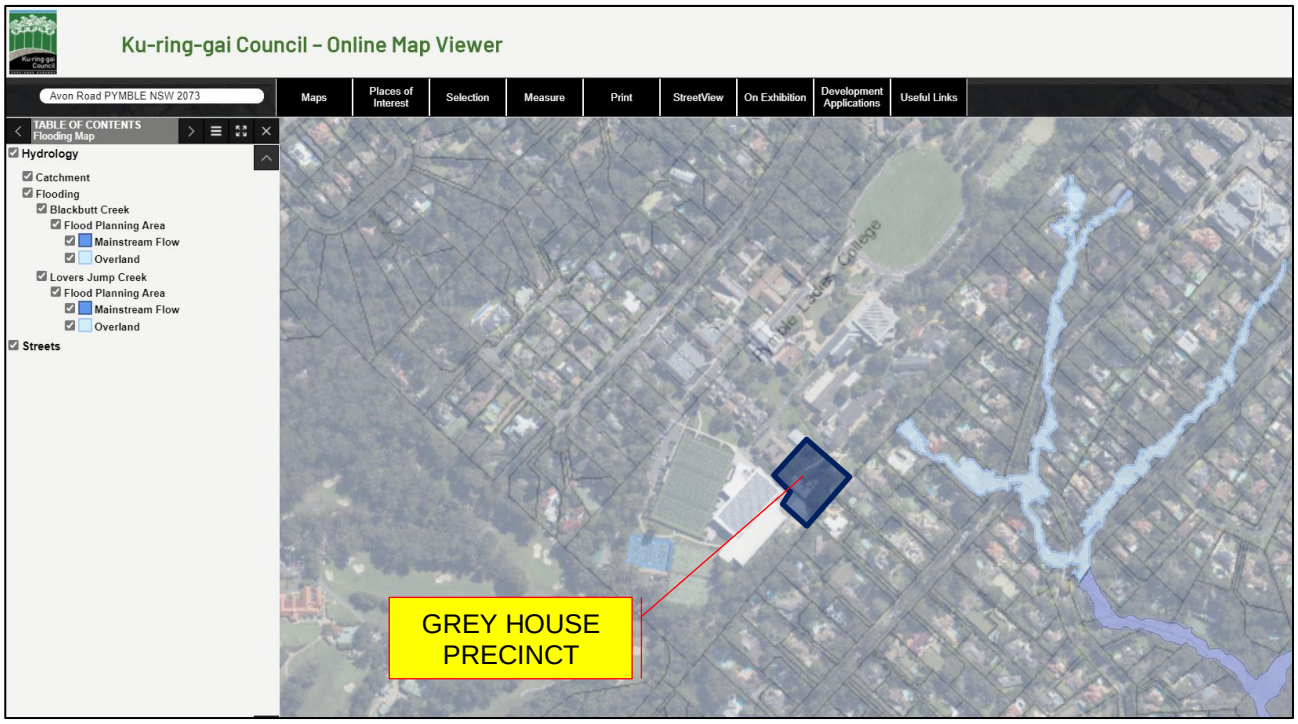

Figure 4.2 Ku-ring-gai Council Online Flood Map

As such, a Flood Certificate is not required for the project. This has been confirmed with Council's Water and Catchment Program Leader – Sophia Findlay.

It is further recommended that the Building FFL is set at a minimum of 0.3m above the surrounding surface levels.

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Appendix A

Stormwater Concept Plan