Our Ref: projects/4277

DesignFlow

Economic Development Queensland
C/- RPS Australia East Pty Ltd
Att: Ms Chiara Towler
PO Box 1559
FORTITUDE VALLEY QLD 4006

4 August 2020

Dear Chiara

Re: Further Issues Response – Stormwater and Flooding
Oxley PDA
DEV2020/1099

Please find below the additional information requested in the EDQ further Issues Letter (DEV2020/1099) dated 23 July 2020. The intent is that these responses resolve the outstanding issues raised by EDQ relating to the *Oxley Priority Development Area Stormwater Management Plan – Version 3* (DesignFlow, 2020) (the SMP). It is understood from discussions with EDQ throughout the further issues process that the approval of the SMP will be conditioned upon an updated SMP with revised hydraulic model to be submitted for compliance assessment prior to operational works. This will ensure all updated design elements of the development and open space are captured and all flood impacts external to the site are resolved in full.

- *7 (a): Bioretention basin batters at 1:4 slope is not compliant with BCC standards – requirement for non-standard asset acceptance is sought.*

In accordance with Section 7.5.7.3 and 7.5.7.6 of Brisbane City Council (BCC) Planning Scheme Policy (SC6.16 Infrastructure Design PSP – Ch 7 Stormwater Drainage), bioretention basin internal batters (incorporating minor detention) are designed to be 1:6 (max) where interfacing with public open space and pathways, and 1:4 in all other areas (landscaped). Non-standard asset acceptance is not required.

- *7 (b): 4m emergency egress pathway requires demonstration of flood immunity.*

The 4m emergency egress pathway cannot reasonably achieve flood immunity as it connects to Cliveden Avenue which does not have flood immunity (< 1 year ARI). This emergency access is intended for bushfire emergency access and not for flood access as the intended and preferred route in flooding is uphill and away from Cliveden Avenue (i.e. away from rising floodwaters within the site towards Seventeen Mile Rocks Road via internal roads).

Relocating the 4m Cliveden Avenue path connection further west (uphill) from the existing access to be outside the 100 year ARI flooded zone is not recommended for the following reasons:

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1. Would result in connection at a location where Cliveden Avenue longitudinal grade is at approximately 11 % (1 in 9), before steepening further to close to 16% (1 in 6) which is unsuitable for pedestrian and wheelchair access.

2. Requires access up 1:6 natural slope from site to interface with Cliveden Avenue road reserve

3. Access east from this location on Cliveden Avenue directs people downhill towards the low flood immunity part of the street (towards Blackheath Road intersection).

4. Requires access to cross the major floodway within site downstream of the primary detention basin necessitating an elevated access way (with major storm culvert capacity).

5. Changes the flood distribution onto Cliveden Avenue which alters the current detailed design flood model outcomes whereby afflux at all locations within and downstream of Cliveden Avenue has been reduced to at or below pre-development flood levels.

The proposed alternative strategy for providing flood immune pedestrian access/egress is to include a 1.5m footpath connection (DDA compliant) east across the open space zone to Blackheath Road to link with existing path route eastward. This route is flood immune within the site in events up to (and including) the 20 year ARI. Appropriate flood warning signage and depth boards will be included in the northern area of the site where floodwaters interact with the open space/drainage reserve and Cliveden Avenue to maintain public awareness. All vehicle emergency access is to be via Seventeen Mile Rocks Road during flood events as this road cannot be cut-off by flood waters (for site access).

- *7 (c): Opportunities should be explored to co-locate the sediment basin and bioretention basin to reduce the spatial requirement for these assets and to maximise the open space area.*

Given the size of the catchment (11.5ha made up of 6.7ha site catchment plus 4.8ha external catchment), the sediment pond is required upstream of the bioretention in accordance with the *Bioretention Technical Design Guidelines (Version 1.1)*. (Water by Design, 2014). The sediment pond ensures energy dissipation, coarse sediment management prior to stormwater flows entering the bioretention basin. Experience in delivering similar systems and asset audits for local authorities has confirmed the sediment pond provides an important protection for the bioretention for large catchments, greatly improves stability and minimises maintenance requirements. For these reasons, the sediment pond has been retained in the design.

In terms of park function, the spatial requirement has been optimised and integrated with the parkland function. The bund between the sediment pond and bioretention basin has been aligned to co-located with the DDA pathway that links the development to Cliveden Avenue/Blackheath Road. The level difference and maximum grade limitations on this pathway dictate the location of this path/bund north of the road frontage to the park.

➢ *8. Provide Time of Submergence calculations to confirm that the trafficability of Cliveden Avenue is not adversely affected by the proposed stormwater management arrangement and movement of the access road.*

The time of submergence calculations for the minor and major flood events are provided in Table 1 with a discussion following.

Table 1: Cliveden Avenue time of submergence

	2 year ARI			100 year ARI		
	PRE	DEV	Diff.	PRE	DEV	Diff.
Tim of Submergence (min)	74	96	22	93	105	12
Max Depth (m)	0.130	0.126	-0.004	0.251	0.240	-0.011
Max Depth*Velocity (m^2/s)	0.12	0.11	-0.01	0.34	0.31	-0.03

Notes:

1. Data taken at crown/centreline of road for the critical duration event
2. PRE = pre-development, DEV = post development (mitigated case), Diff = difference between PRE and DEV

The 2 year ARI inundation depth is reduced by 4mm from pre-development while the duration of submergence increases by 22 minutes (~30% longer). The depth*velocity (d*V) product remains relatively unchanged (low hazard). This extended duration of submergence (post development) remains below the 200mm depth and 0.3 m^2/s d*V product limits provided in QUDM Table 7.4.3 so does not adversely affect the trafficability.

The 100 year ARI inundation depth is reduced by 11mm from pre-development while the duration of submergence increases by 12 minutes (~13% longer). The d*V product remains relatively unchanged. This extended duration of submergence (post development) is only marginal and not considered to adversely impact the trafficability as the major event (PRE and DEV) exceeds 200mm depth limitation for major storm transverse flow from QUDM Table 7.4.5 (representative of causeway) and is therefore not trafficable to normal vehicles. The d*V does remain at approximately the QUDM limit of 0.3m^2/s (Table 7.4.5).

Overall, the minor increase in time of submergence is not considered to represent adverse impact to trafficability (noting this assessment is based on design storm, not real storms). In emergency situations, the road can still be passable by appropriately equipped rescue vehicles given depths are, at worst, 240mm deep in a 100 year ARI flood and the d*V product remains low.

Note: The immunity of Cliveden Avenue is currently very low (<1 year ARI) and does not meet BCC standards. If the road met Council standards then the submergence times listed above (and any changes resulting from development) would be significantly lower. The responsibility for ensuring appropriate immunity for Cliveden Avenue is BCC's responsibility.

➢ *Advice – Waterway Stability*

The final hydraulic assessment (detailed design) to be submitted for compliance assessment will illustrate no adverse impacts for all events from 1 to 100 year ARI downstream of the site.

- *13: A 1.5m footpath along Cliveden Avenue is required to be constructed as frontage works. Amend plans to include this pathway to provide external pedestrian network connectivity.*

Given the flood characteristics at the interface of the site with Cliveden Ave, any changes in surface levels has flood afflux implications.

The BCC design intent for Cliveden Avenue path connection is unclear unknown at this at this stage and therefore represents design implications for the subject site flood management strategy. In order to accommodate such a path, it is likely that the existing roadside table drain would need to be removed and verge profile modified to achieve compliant footpath cross-fall. This would result in changes to the flood distribution across Cliveden Avenue which will compromise the current detailed design flood model outcomes whereby afflux at all locations within and downstream of Cliveden Avenue has been reduced to at or below pre-development flood levels. In absence of formalised kerb and channel with piped drainage, a footpath constructed on the road verge would also be subject to sheet runoff from the road leaving it unsafe for pedestrian use (particularly in shaded areas where algal growth may occur on concrete following rainfall and/or seepage flows).

- *20 (a): Demonstrate that a maximum of 30% of the parkland to be provided for Stage 1 is below the 5 year ARI. Where it cannot be demonstrated that compliance can be achieved, consideration should be given to providing a greater area of parkland for Stage 1 from the area shown on the Master Plan.*

The park area (Stage 1B and 2 combined) has 16.5% of the total area below the 5 year ARI flood level as illustrated in Figure 1 (Attachment 1). The design has been resolved such that flows up to the 5 year ARI from the piped stormwater drainage network discharge through the sediment pond/bioretention basin. Only local surface flows from the open space zone (up to 5 year ARI) flow towards the open space flood bund. In major events, flows in excess of the sediment pond/bioretention basin system capacity and overland flow from the development discharge overland through the open space zone. Stage 1B (interim) park area contains the stormwater treatment systems and contains the 5 year ARI within these basins (and discharge structures). Pathways are above the 5 year ARI flood level.

I trust this provides the required information to respond to the further issues. If you have any specific questions or required further clarification, please don't hesitate to contact DesignFlow.

Yours Sincerely

Shaun Leinster
Director
RPEQ: 15637
DesignFlow

Attachments:

Figure 1: 5 year ARI flood inundation within open space zones

ATTACHMENT 1

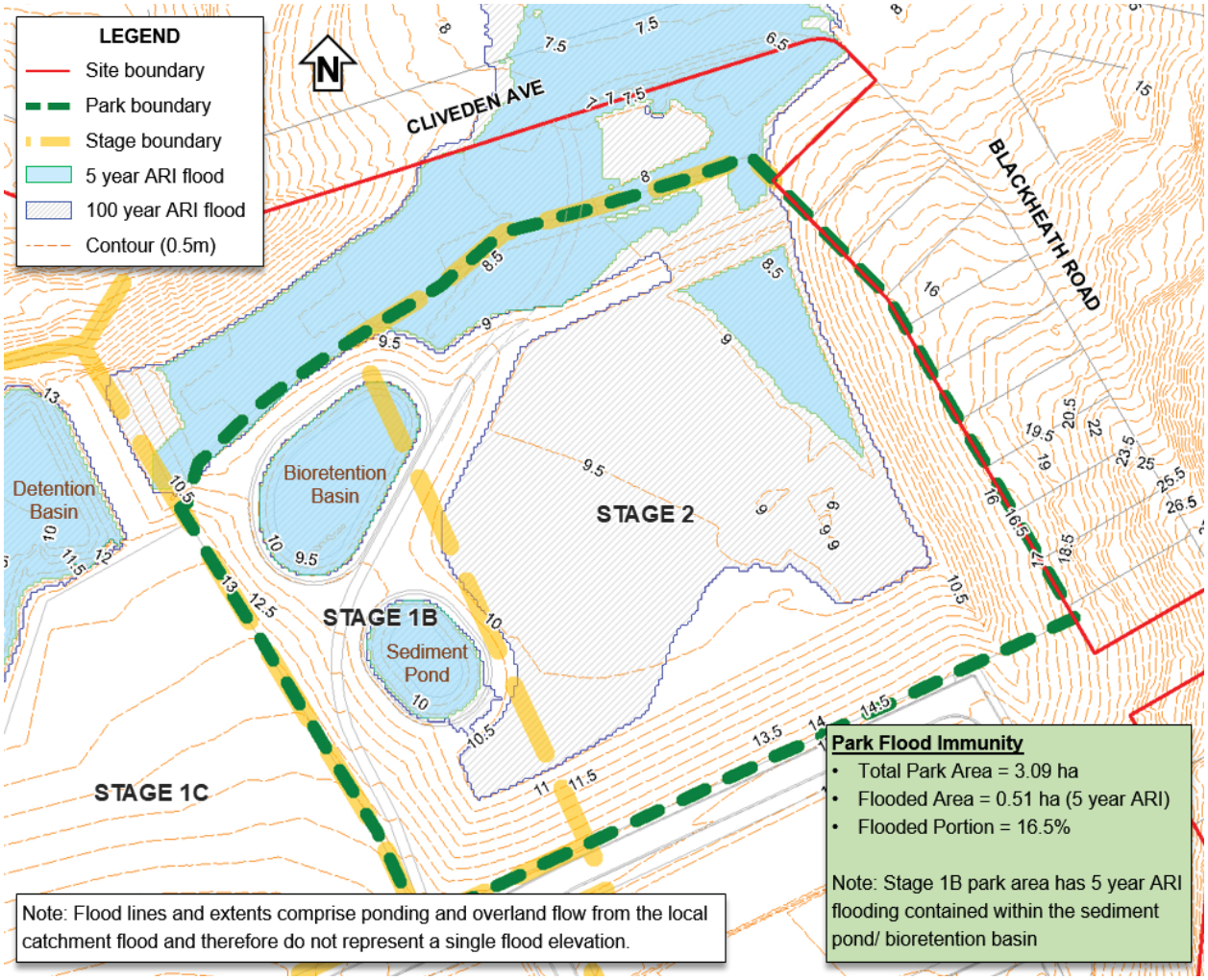

Figure 1: 5 year ARI flood inundation within open space zones