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Overland Flow Assessment for 93-107 Cecil Ave & 9-10 Roger Ave, Castle Hill

Dear Brittney

1. Introduction

Stellen Consulting was engaged to assess the proposed new development at 93-107 Cecil Ave & 9-10 Roger Avenue in reference to potential risks arising from overland flow.

The following documentation has been used in the preparation of this overland flow assessment report:

- Google Earth and SIX Maps aerial imagery
- Site specific survey information by SDG Land Development Solutions (REF: 6864, REV C)
- DEM with a resolution of 1m obtained from ELVIS by Geoscience Australia

2. Site Description

The subject site, located at 93-107 Cecil Avenue and 9-10 Roger Avenue, Castle Hill, is irregular in shape and consists of 18 residential lots, covering a total area of approximately 17,610m². It has a primary frontage along Cecil Avenue, with a secondary frontage along Roger Avenue, which serves two lots and is a cul-de-sac connecting to Francis Street. The southwestern boundary of the site borders a church and St. Paul's Cemetery. Figure 1 displays the subject site (red boundary) and location plan.

The site falls from the north-west to the south-east by approximately 14 metres.

The development proposal involves the demolition of existing buildings, and replacing them with a mixed use, multi-storey development.

3. Overland Flow Assessment

3.1 Approach

The following steps were taken to quantify the potential overland flow:

- Calculate the total size of the catchments and determine their characteristics.
- Create a DRAINS model to determine the peak flows.
- Evaluate the risk of overland flooding by analysing model results, available data, and observations from a site visit.

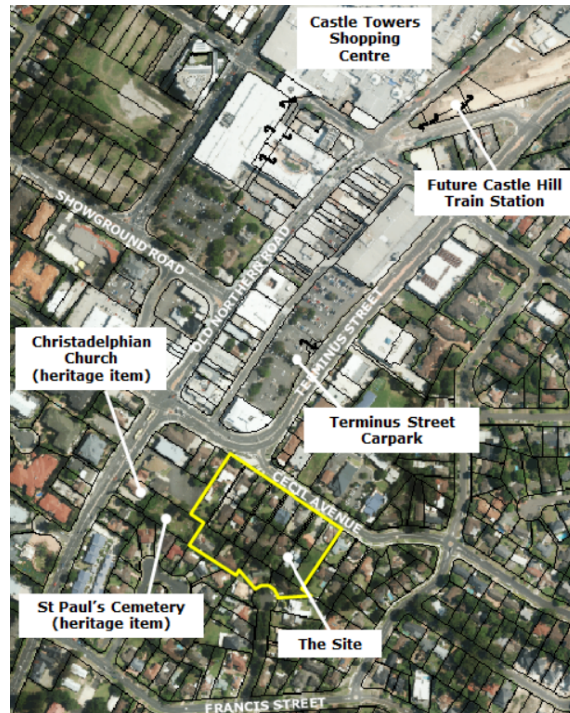


Figure 1 - Aerial view of the site and surrounding locality

3.2 Catchment Delineation

The catchments were delineated using a combination of DEM data, DBYD stormwater drainage information, Google Earth imagery, and site observations.

Refer to the Catchment Plans in Appendix A, which depicts the extent of the catchments and indicative potential flow paths.

3.2 Hydrologic and Hydraulic Modelling

A DRAINS hydrologic model was established for the catchment to estimate peak flows. The model used the Bureau of Meteorology (BOM) 2016 Design Rainfall Data as input. This rainfall data was based on the site's latitude and longitude. The impervious percentages used in the model are based on Table 4.6 of the Design Guidelines for Subdivision/Developments, 2011, The Hills Shire Council.

The following design parameters were adopted in the model:

- Impervious area depression storage = 1 mm
- Supplementary area depression storage = 1 mm
- Pervious area depression storage = 5 mm
- Soil Type = 3
- AMC = 3
- BOM IFD storm durations: 5min to 2hr

3.3 Model Results & Findings

Table 1 presents the details of the catchments and their predicted peak flows for the 1% Annual Exceedance Probability (AEP) flood event.

Table 1 - Catchment areas and peak flows

Catchment ID	Area (ha)	Peak Flow (m ³ /s)
1	6.272	3.090
2	0.176	0.108
3	0.824	0.467
4	0.077	0.050

In the context of the subject site, catchments 1, 2, 3, and 4 contribute to overland flows that bypass the site and flow along established paths (refer to Appendix B for the potential flow paths). Specifically:

- Flows from catchment 1 (which includes part of the site) and catchment 3 are directed towards the overland flow path along the low point at Roger Avenue. As a result, these catchments do not directly impact the site itself.
- Catchment 4 flows down Cecil Avenue towards Terminus Street, while Catchment 2 flows south-eastward along Cecil Avenue towards the Orange Grove intersection.

The road capacity along Cecil Avenue was evaluated based on its characteristics, which include a road width of approximately 4.5m and a fall of about 8%. Using the QUDM (2017) Road Flow Capacity Table, Chart No. A3-5, the capacity of the road was estimated to be approximately 0.487 m³/s. Since the peak flow from catchment 2 is only 0.108 m³/s, the flow will be contained within the road and catchment 2 is not predicted to contribute to overland flow that would impact the site during the 1% AEP flood event.

Additionally, the site is situated atop a hill, with the lowest point at the boundary being 116.5m AHD, which is 2.66 meters higher than the downstream low point at Roger Avenue (113.84m AHD). This elevation difference ensures overland flooding from these catchments do not impact the site.

4. Conclusions

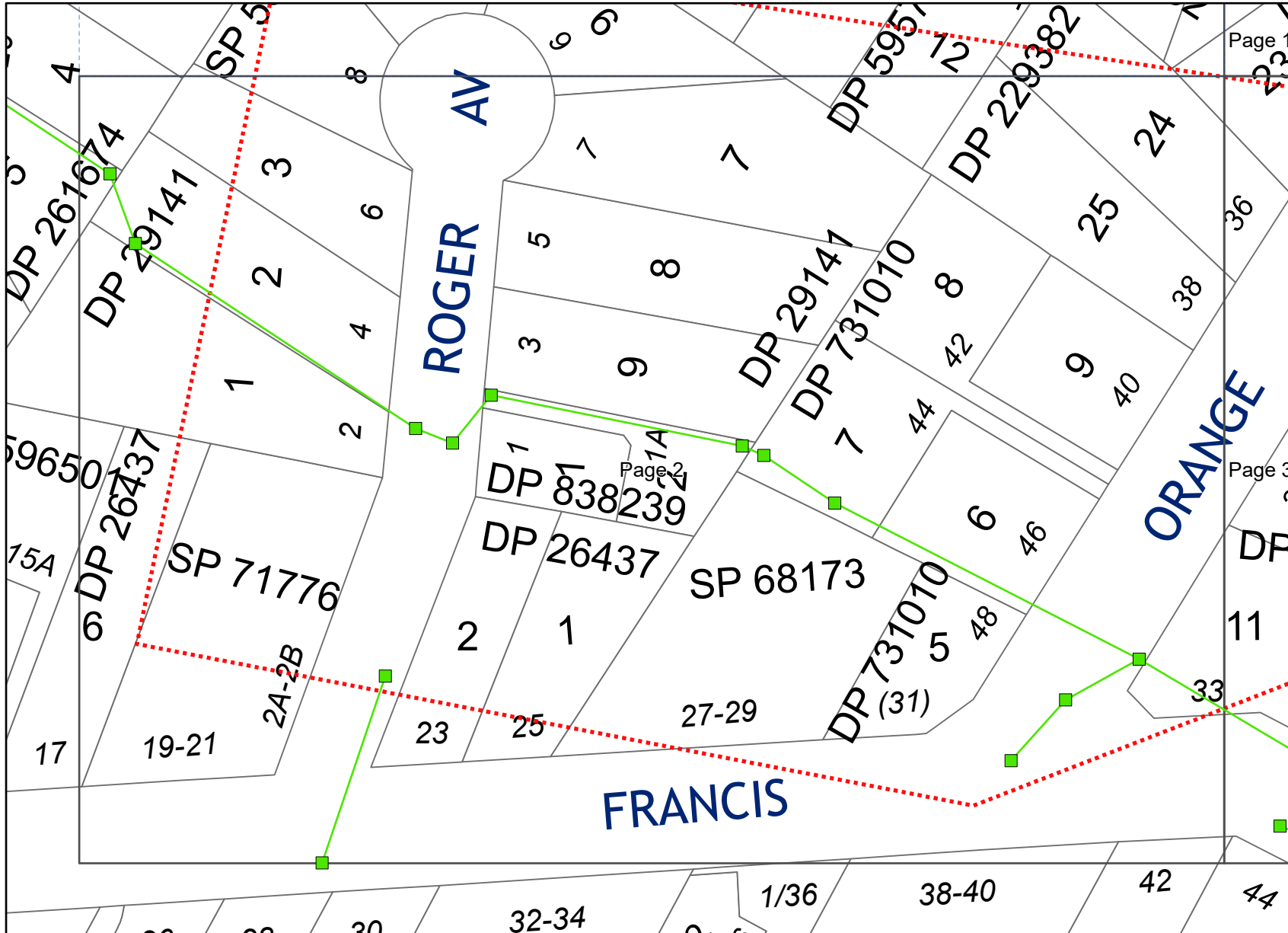
The overland flow analysis indicates that the site is well-positioned to avoid significant overland flooding during the 1% AEP flood event. Key conclusions drawn from the results include:

- The site is situated atop a hill and upstream catchments are predicted to bypass it.
- The lowest point on the site (116.5m AHD), is sufficiently high above the downstream low point at Roger Avenue, ensuring that overland flows from catchments 1 and 3 do not affect the site.
- The road capacity along Cecil Avenue is sufficient to manage the peak flow from catchment 2 (0.108 m³/s), as the road can handle up to 0.487 m³/s, well above the expected flow from this catchment.

In conclusion, the site's topography, positioned atop a hill, combined with established flow directions bypassing the site, indicates that it is unlikely to be affected by overland flooding from upstream catchments during the 1% AEP flood event. Therefore, the site is not predicted to be subject to overland flooding from upstream catchments.

APPENDIX A - CATCHMENTS PLAN





Legend

- BYDA Enquiry
- Stormwater Pipe
- Stormwater Pit
- Stormwater Swale

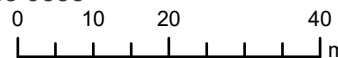
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