



19 June 2017

Paul Nichols
Project Manager Clover Hill
RBWI Pty Ltd ATF RBWI Unit Trust

Our ref: 2219002-35918
Your ref:

Dear Paul,

Clover Hill Subdivision Biodiversity Management Drainage line assessment

1 Introduction

GHD Pty Ltd (GHD) understands RBWI Pty Ltd has exchanged contracts to purchase the Clover Hill Residential Subdivision Project at Escarpment Drive, Calderwood (formerly known as the Blisset Farm, Lot 1 DP 558196). The Clover Hill landholding is approximately 10 hectares. The land is mostly zoned R1 residential, however it also includes approximately 1.5 ha zoned E3 as well as a minor drainage line flowing south east before entering a culvert at Escarpment Drive. Clover Hill is surrounded by lands currently being developed as residential subdivision and is located approximately 1 km from the township of Albion Park.

GHD has been requested by RBWI Pty Ltd to complete an assessment of the drainage line and provide initial strategic advice as to the proposed treatment and management of this drainage line within the site.

2 Methods

GHD's Principal Environmental Consultant (Daniel Williams) completed a site visit to assess the drainage line on 6 June 2017.

Photographs were taken of drainage line features within the survey area with their locations identified using a hand-held GPS.

3 Results

The results of the site visit included the following:

- It was confirmed that the drainage line would be considered a 1st order stream under the Strahler stream classification system.
- The drainage line commences approximately in the centre of the site and flows in south easterly direction until entering a culvert under the newly constructed Escarpment Drive.
- The drainage line is highly degraded throughout and includes only a small section containing native riparian vegetation. This vegetation is limited to a short section of the drainage line associated with the very head waters of the drainage line and exists as a narrow zone approximately 20m long with

native vegetation occupying approximately 4 - 5m either side of the centre line of the drainage line. This section is largely contained within the E3 zone. Vegetation present is degraded and consists of occasional canopy trees and an understorey dominated by Lantana (*Lantana camara*).

- Downstream from this location the remaining drainage line exists as a degraded flow path containing introduced grasses only. This area has been impacted by long term grazing and shows evidence of active erosion and very limited biodiversity or geomorphic values.
- In the south east of the site the drainage line has been impacted by the construction of two small dams to provide a watering option for grazing stock. These dams have significantly altered the flow path and a defined channel no longer exists in this section.
- Below Dam 2 the drainage line exists as an over land flow path consisting of introduced grasses only before entering a culvert under Escarpment Drive.

GHD's also inspected the drainage line to the south east of Escarpment Drive. This inspection indicated the drainage line has been 'piped' from the culvert associated with Escarpment Drive right through to Macquarie Rivulet. A portion of this piped section of the drainage line appears to include a section which may have been classified as a 2nd order stream under the Strahler classification system.

3.1 Photo points

Below is a log of the key photo points associated with the drainage line to give an understanding of its size and condition.



Photo point 1 – Vegetation associated with drainage line head water



Photo point 2 – Middle reach looking south east through to Dam 1



Photo point 3 – Dam 1 including entry flow path



Photo point 4 – Overland flow path below Dam 2 through to culvert under Escarpment Drive



Photo point 5 – Drainage line entering culvert and then piped section through to Macquarie Rivulet.

4 Recommendations

GHD recommends the following in regards the treatment and management of the drainage line within the proposed subdivision.

- Retaining the vegetation associated with the head waters of the drainage line and rehabilitating a Vegetated Riparian Zone (VRZ). This zone would be approximately 10m wide on either side of the drainage line contained within the E3 zone.
- Piping the drainage line from immediately south east of the E3 zone through to the existing culvert associated with Escarpment Drive.
- Constructing an inlet structure, 'soft' engineering in design, at the beginning of the piped section to assist in managing inflows, erosion and water quality. The basin would be rehabilitated using native ephemeral species.

GHD has provided these recommendations having regard to the following:

- The condition of the drainage line on site most notably its low biodiversity and geomorphic values other than the short section associated within the E3 zone at the head water.
- The piping of the drainage line from the culvert associated with Escarpment Drive through to Macquarie Rivulet.
- Planning decisions associated with other 1st order streams within the Calderwood Approval enabling the piping and/or realignment of drainage lines that exhibit limited environmental values to support development outcomes in such locations. GHD understands both 1st and 2nd order drainage lines have been approved to be piped within the Calderwood Development.
- No certainty regarding the long term ownership or management of the drainage line. GHD understands Council has indicated they don't want to take ownership and/or management responsibility for this drainage line. In addition, retention of the drainage line in its current location would lead to multiple lots with rear boundaries adjoin the drainage line. This would result in a fragmented ownership pattern for the drainage line and likely promote management issues such as rubbish dumping and organic waste disposal.
- Development return required from the Clover Hill property considering the development yield impacts associated with retaining the drainage line in its current position as an open channel and the presence of the E3 zone restricting development in approximately 1.5 hectares of the site. The location of the drainage line, being parallel to the most suitable orientation of future access roads, and the natural landform constraints of the site, would mean that retention of the drainage line would reduce potential lot yield considerably.
- The Water Management Act 2000 and associated guidelines of July 2012. GHD notes that technically 'piping' of 1st order streams is not a permitted treatment under these guidelines. However, given planning decisions associated with some 1st and 2nd order streams within the broader Calderwood Approval as well as the very limited biodiversity and geomorphic values associated with the section of drainage line recommended to be piped, it is GHD's opinion the recommendation is in keeping with the surrounding development.

Should you have any further questions in relation to this matter please contact me accordingly?

Sincerely
GHD Pty Ltd

A handwritten signature in black ink, appearing to read 'Dan Williams', with a stylized flourish at the end.

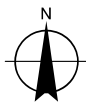
Dan Williams
Principal Environmental Consultant
02 6586 8714

Attachment A: Site map







© Land and Property Information 2015

Paper Size A4
0 10 20 40 60 80
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



LEGEND

-  Photo location and direction
-  Dam

-  Drainage line
-  Cadastre



RBWI Pty Ltd ATF RBWI Unit Trust
Clover Hill Drainage Assessment

Job Number	22-19002
Revision	0
Date	20 Jun 2017

Drainage line assessment

Figure 1