14 Mirrool St, North Narrabeen Redevelopment

Hydraulic Analysis

by

optimal stormwater

LOCAL GOVERNMENT PROCUREMENT APPROVED CONTRACTOR

Awards FOR EXCELLENCE STORMWATER AUSTRALIA WINNER 2021

Date: October 2024

Document History

Issue	Purpose	by	Approved	Date
1	14 Mirrool St, North Narrabeen Redevelopment Hydraulic Analysis Report	AK	MP	28/10/2024

DOCUMENT ACCEPTANCE and RELEASE NOTICE

Project No. 21P54 – This is the Hydraulic Analysis report for the proposed works at 14 Mirrool St, North Narrabeen

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APPROVED: DATE: October 2024
(for release) (Murray Powell, Project Director)

Contents

1. Introduction

Mick Wykrota is currently seeking to redevelop the property at 14 Mirrool St, North Narrabeen, 2101. Northern Beaches Council requires the following development engineering works as part of the development application submission:

- Overland flowpath analysis
  - Catchment plans
  - DRAINS Model showing flows for 1% AEP
  - 1d or 2d HEC-RAS model (cross section at maximum 5m spacing at critical sections)
  - Overland flow study report
  - Amended plans showing the proposed development does not negatively impact neighbouring properties or road reserve (in terms of overland flows)

2. Catchment Analysis

There are two catchments currently flowing into the proposed development, which are approximately 1.6ha and 1.7ha in size, as shown in Figure 1 below.

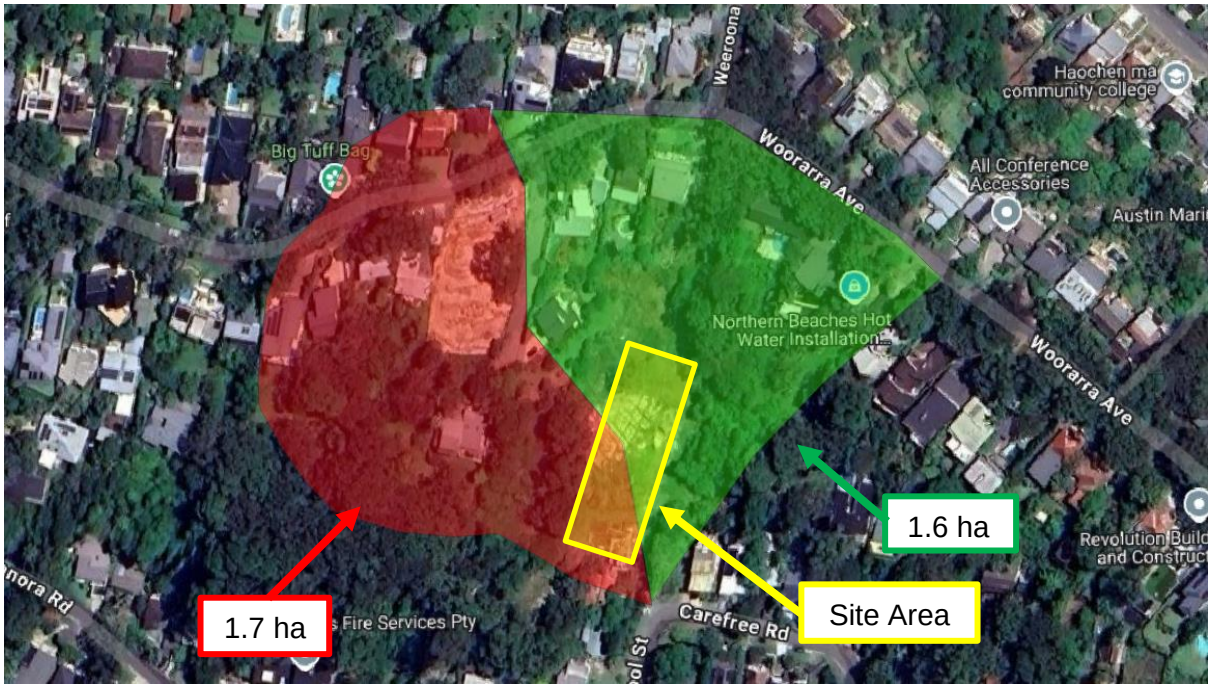

Figure 1: Plan view of the local area

Both catchments are dominated by pervious area, and are residential. Flows from the left-hand side catchment are overland until they enter the drainage network in Mirrool St via a 900x900mm grated pit. The right-hand side is piped from Woorarra Ave, until it exits via a headwall into the creek section, then re-enters the pipe via a headwall, and connects to the drainage at Mirrool St. The catchment area coming down the 375mm pipe from Woorarra is less than 0.1ha. Most flow is coming overland.

3. Hydraulic Analysis - DRAINS

The catchment was modelled using DRAINS to assess the hydraulic impact of the of the stormwater at this site. We used DRAINS using the well-recognised Initial Loss – Continuing Loss (IL-CL) model from *Australian Rainfall and Runoff (ARR)* to determine flows from a catchment based on local characteristics. Hydrological data for North Narrabeen was obtained from the Bureau of Meteorology (BOM) website and the ARR Data Hub (www.data.arr-software.org).

Land usage is predominately residential with some bushland. Peak flows were calculated assuming an approx. 15% effective impervious area (based on aerial photography). The event modelled was the 1% AEP storm event.

The model and results are shown in
Figure 2 and Figure 3 below:

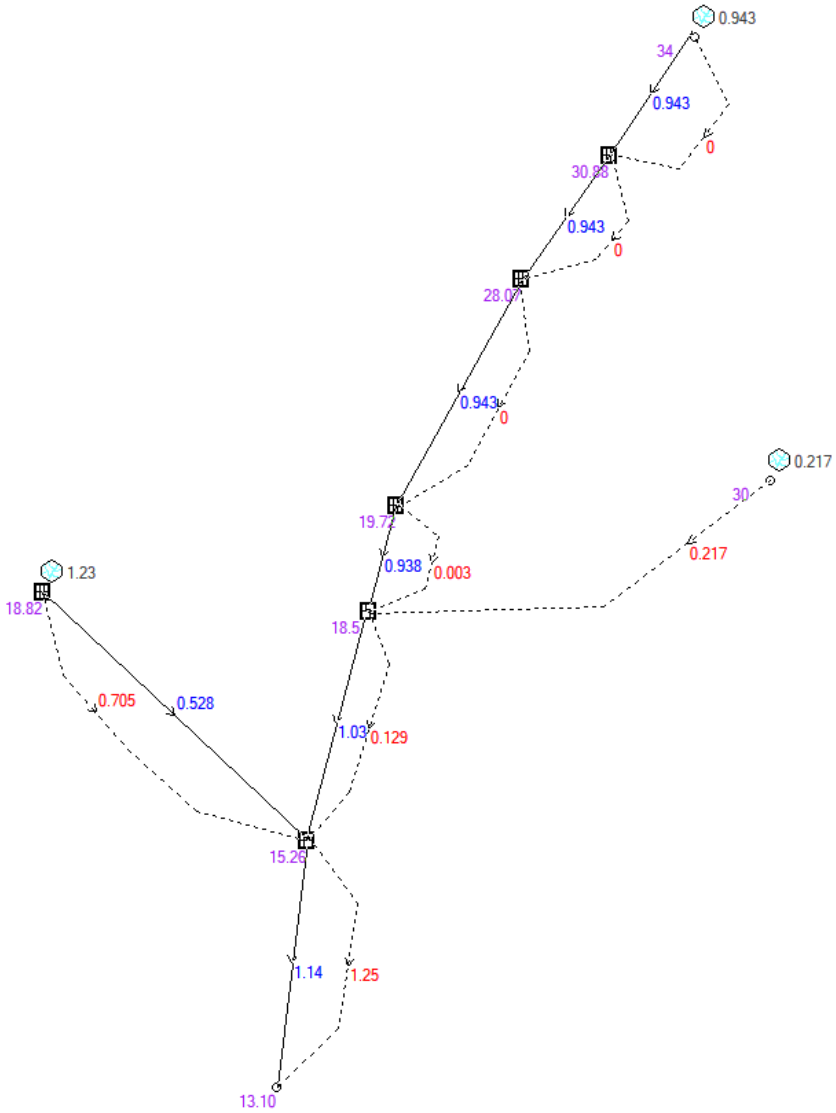

Figure 2: Plan view of the DRAINS model (1% AEP)

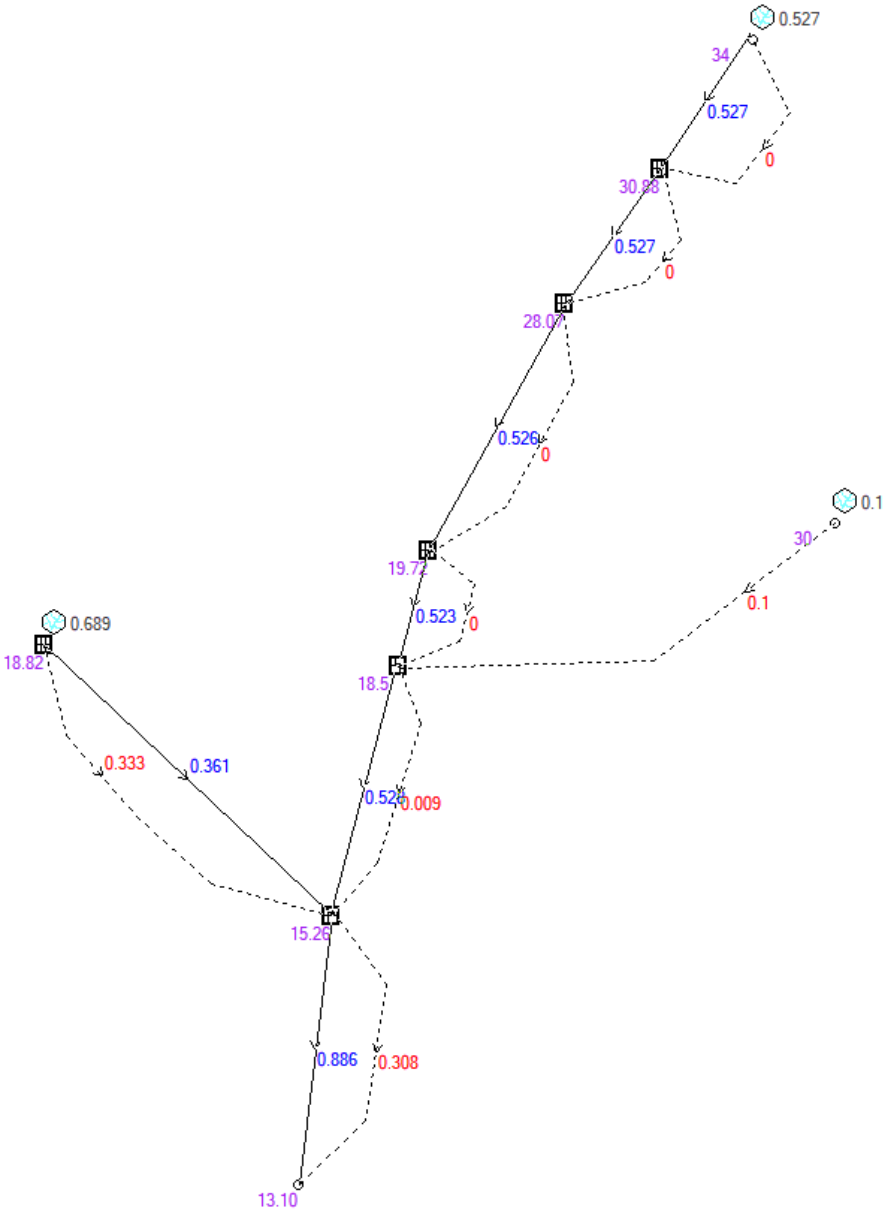

Figure 3: Plan view of the DRAINS model (20% AEP)

3.1. Modelling Outcomes

Table 1 below summarises the overland and piped flows in the existing scenario.

Table 1 - DRAINS results

14 Mirrool St Hydraulic Analysis Report			
Event	Total Flows at Mirrool St (m^3/s)	Overland Flow at Mirrool St (m^3/s)	Piped Flows at Mirrool St (m^3/s)
1% AEP	2.39	1.25	1.14
20% AEP	1.194	0.886	0.308

As seen, the 1% AEP (or 1 in 100yr storm) experiences 1.25m^3/s of overland flow, whilst piped flows reach up to 1.14m^3/s. The main point of surcharge for the overland flows is pit SPP58808, as seen in the long section of the DRAINS model in Figure 4 below. This is where the two subcatchment flows join.

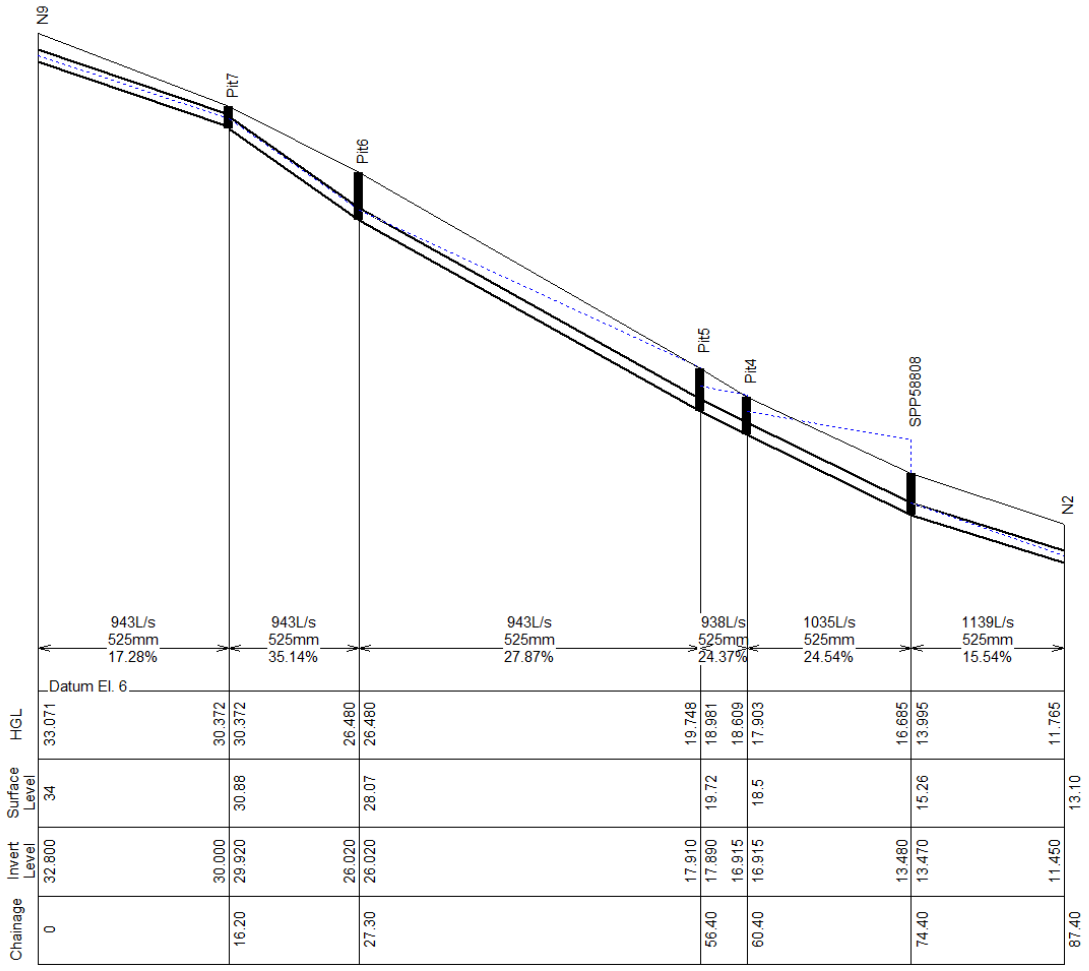

Figure 4: Long Section of the 1% AEP Event

This surcharge can be attributed to two main factors:

- The lessening of the grade at this pit. The grade reduces from 24.54% to 15.54% at this pit, which results in a loss of capacity in the system in this location, and
- This pit also acts as the junction for the two upstream catchments. There is an additional 450mm dia. pipe which is receiving a 1.7ha catchment feeding into the pit, which understandably overloads the capacity of the drainage line already running through the pit.

What we note is that the pipe capacity running north to south down the Mirrool St road reserve area is fine for all events up the 1 in 100 yr event. However, the creek section and overland flow above the inlet could cause blockages at the inlet headwall, and some of this piped flow may actually be coming overland. If that's the case, then more flow from the western catchment would be able to enter the pipe at the bottom of the driveway. Overland flow is considered below

4. Hydraulic Analysis – HEC-RAS

Council normally requires a HEC-RAS computer model of the upstream overland flowpath, and the proposed flow through the site.

The catchment is not large and 1.5ha of the 1.6ha sends flow from the properties on Woorarra into the road reserve area, in a diffuse overland flow. There is no notable or detectable specific overland flow path upstream of the 375mm pipe outlet headwall. As such, it can't be modelled. But we don't need to.

What is important here is the safe conveyance of ALL water whether its coming overland or via pipe into the creek. In the event of a pipe blockage at the inlet headwall to the existing system, all the upstream flow will need to be conveyed safely overland down to Mirrool St.

The existing overland flow path has some water coming down the road reserve area, and some entering the private property to the east. The new overland flow path will be directed over the top of the inlet headwall, into a cascading rock lined overland flow channel. The cascades/drops are there to wipe off energy and velocity. The system seeks to introduce turbulence and slow the flow. There will also be a new directional bund to take overland flows from the property to the east, and also direct these into the new overland flow path. During low flows, any seepage or overland flow, will be able to enter the overland flow path, and then join into the piped system via the new sag point (with letterbox grated inlet) next to the second lowest junction pit.

At present, if the capacity of the 525mm pipe under Mirrool is exceeded, water will flow harmlessly overland down Mirrool Street itself. In the new scenario the situation will be exactly the same, because the whole system is limited by the Council pipework under Mirrool, not what's happening in the road reserve area or with the 14 Mirrool proposed redevelopment. OSD tanks will control volume and flow coming from the

property, but its all the existing properties up the hill, that have NO stormwater control and release everything onto the ground, that will be causing the problem.

The overland flow path, mimics the profile of the creek, but is rock lined to control erosion and allow energy dissipation. Please see the attached stormwater drawings for the typical cross section and long section.

5. Conclusion

In conclusion, the main pipeline is able to convey the full 1 in 100 yr flow down to the bottom of the driveway, before the pipe capacity gets exceeded.

On the assumption of an inlet headwall pipe blockage we have conservatively designed an overland flow path with 10 times the capacity of the pipe, and this will allow for erosion control and energy dissipation. It keeps the overland flow over the road reserve and away from private property.

At the bottom of the overland flow path, flow will enter a grated letterbox sag pit, and enter the main pipeline. In the event of a full pipe or a blockage on the grate, it will overflow onto the drive, and then harmlessly out onto Mirrool St (as it has always done).

We conclude that the stormwater design for this redevelopment meets all of Council's expectations and requirements.