OVERLAND FLOW ANALYSIS (1% AEP) FOR PROPOSED SERVICE STATION AT 353 MAIN STREET, LITHGOW NSW

Request for:
Main Street Cap Pty Ltd

Neilly Davies & Partners Pty. Ltd.
ABN: 711 216 235 50
1 July 2024

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1 INTRODUCTION

Our client (Main Street Cap Pty Ltd) has engaged Neilly Davies & Partners Pty Ltd to carry out the Overland Flow Analysis / Reporting / Recommendations for the proposed Service Station at 353 Main Street, Lithgow, NSW 2790. A hydraulic analysis and investigation have been accordingly carried out to determine 1% AEP (100-year ARI) flood extent, overland flow path for both existing and developed cases and its implications on the proposed development.

This assessment report has been prepared based on the following documents and aims to report the observations of the assessment with necessary recommendations according to Lithgow City Council regulations.

- Existing site survey (Enclosed as Appendix A)
- Site layout plan of the proposed development (Enclosed as Appendix B)
- Lidar data obtained from (https://elevation.fsdf.org.au)
- Meteorological data from BOM.
- Council Mapping
- Lithgow Flood Study Review Volume 1 – Report - 2017
- Lithgow Flood Study Review Volume 2 – Figures - 2017

The following terminology has been used in the report and are as described below:

- Finished Floor Level (FFL)
- Annual Exceedance Probability (AEP)
- Average Recurrence Interval (ARI)
- Flood Planning Level (FPL)
- Estuary Planning Levels (EPL)
- Probable Maximum Flood (PMF)
- Local Government Area (LGA)

2 SITE CONDITION

The proposed site is currently vacant and covered by short grass. The site is located in a medium density residential area at the low point and north of Enfield Avenue. The site is bounded by residential development to south, west, Enfield Avenue to east and Main Street to north.

The aerial survey data (Lidar) indicates the general terrain fall is from south to the north of the subject site. The upstream section of catchments is developed and has an average slope of 20% which slows down to 4% in the urbanized areas at downstream. The contour shows there are two major overland flow paths from south and south east of subject site which merge together at the intersection of Enfield Avenue and Main Street. These overland flows form the tributary of Farmers Creek. A box culvert under rail and Barton Street convey flow to a circular pipe discharging into Farmers Creek. **Figure 1** shows the proposed property location.

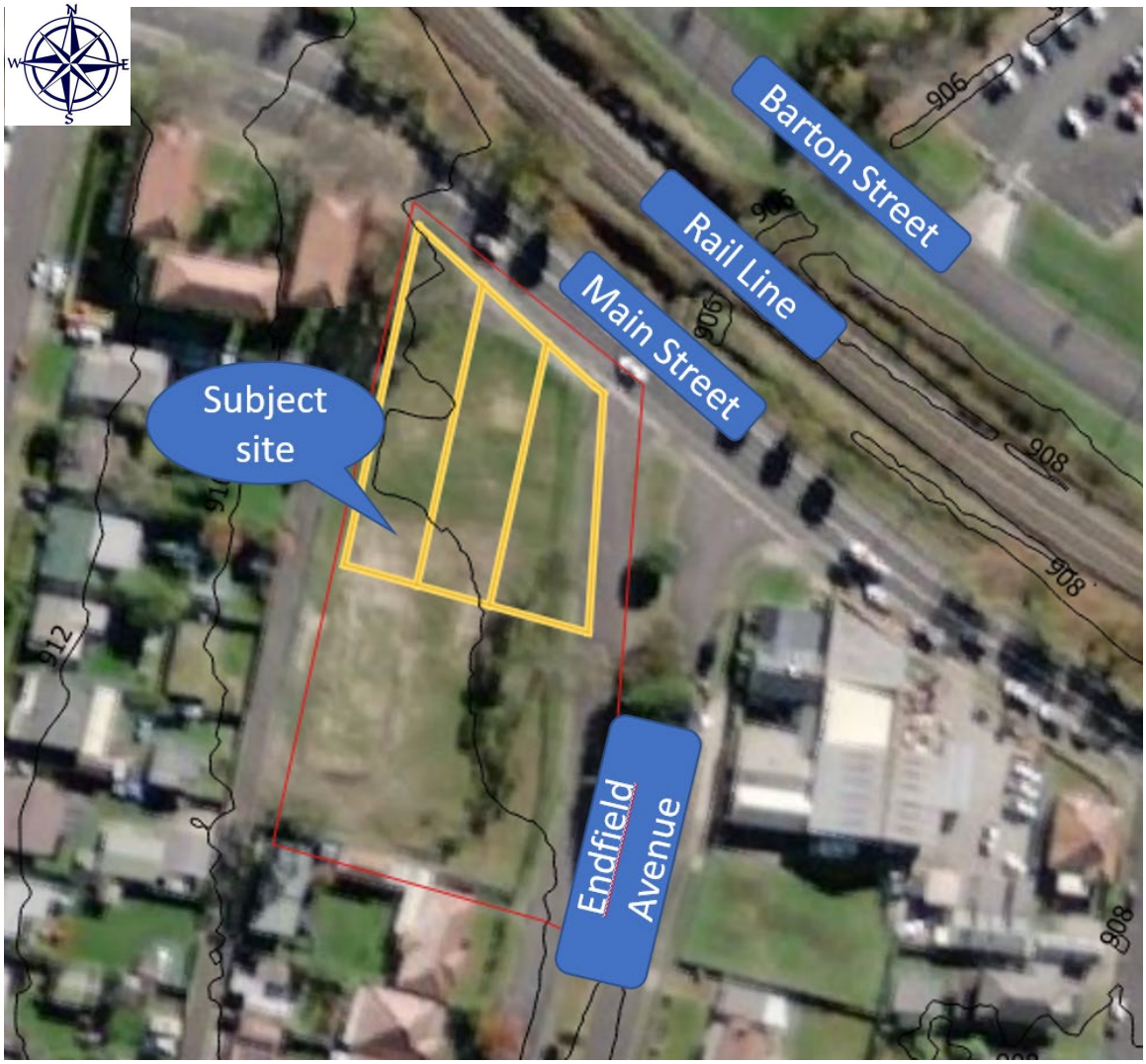

Figure 1: Location of the Property

3 MODEL INPUTS

The following information were used for undertaking this flood assessment:

- Existing site survey data (**Appendix A**)
- Site layout plan of the proposed development (**Appendix B**)
- Lidar data obtained from (https://elevation.fsdf.org.au)
- Council Mapping.
- Inflows from Table F1 of Lithgow Flood Study Review Volume 1 – Report - 2017

The references used in the development of the project are as follows:

- Australian Rainfall and Runoff Guideline
- Hec-Ras user manual.

4 SCOPE OF WORK

Conduct Overland Flow Analysis, Assessment & Reporting and includes the following as listed below:

- Develop a 2-dimensional Hec-Ras model to estimate flood level and extent due to overland flow (i.e., existing & proposed case scenario)
- Assess the flood level within the property, property adjoining, and road reserve based on the flood behavior with respect to proposed development.

5 CATCHMENT HYDROLOGY

It should be noted that modelling the entire drainage network upstream and immediately downstream of the site is outside the scope of this assessment. **Figure 2** shows the extent of catchments and overland flow directions reporting to the subject site.

It was acknowledged that drainage systems comprised of extensive pit and pipe network, box culvert and detention basins to mitigate the flood impact at Main Street.

The hydrological assessment results for Lithgow Flood Study was used to determine the volume of overland flow at two discharge points of **Q41** and **Q41**.

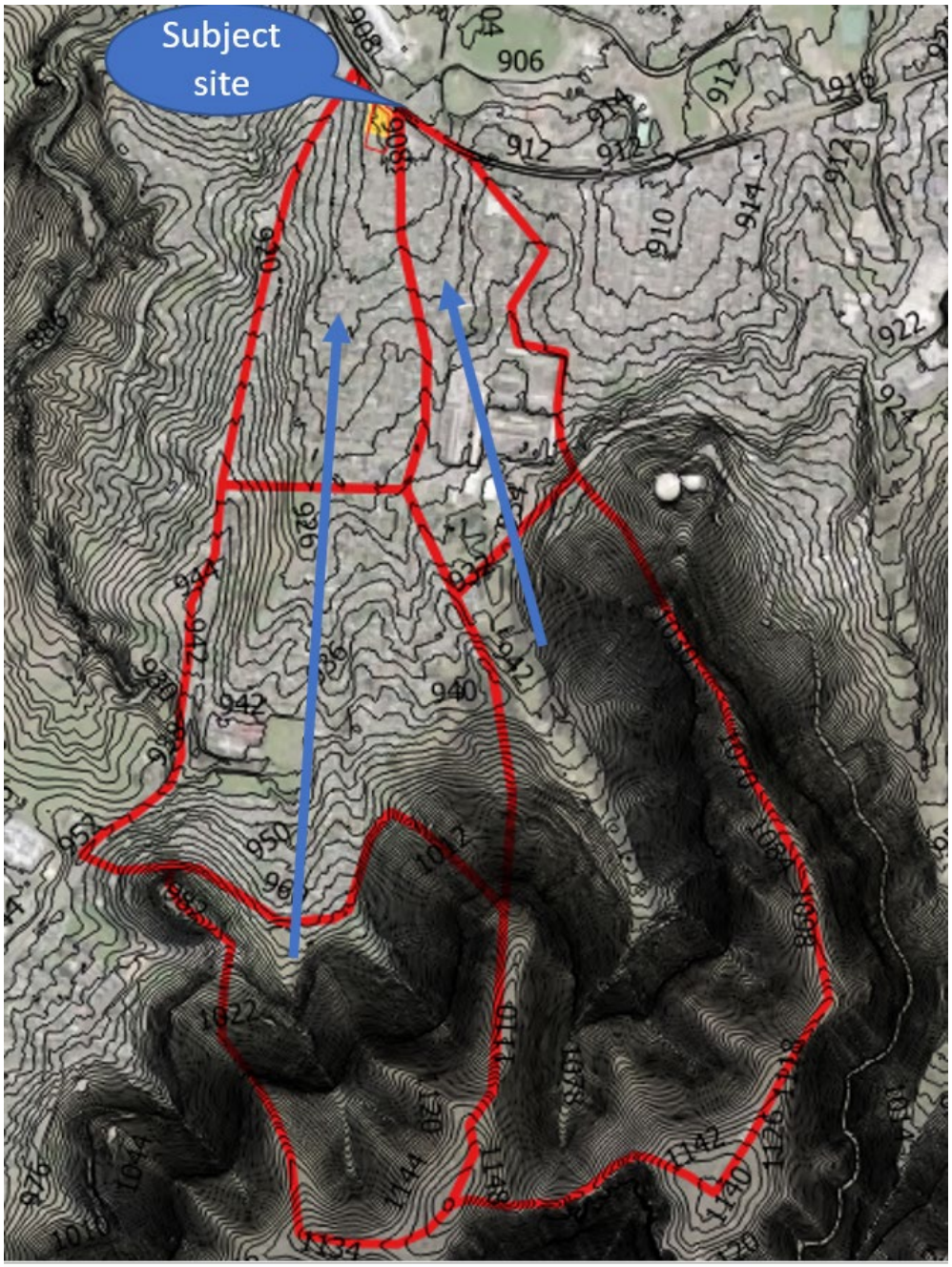

Figure 2: Extent of Catchment

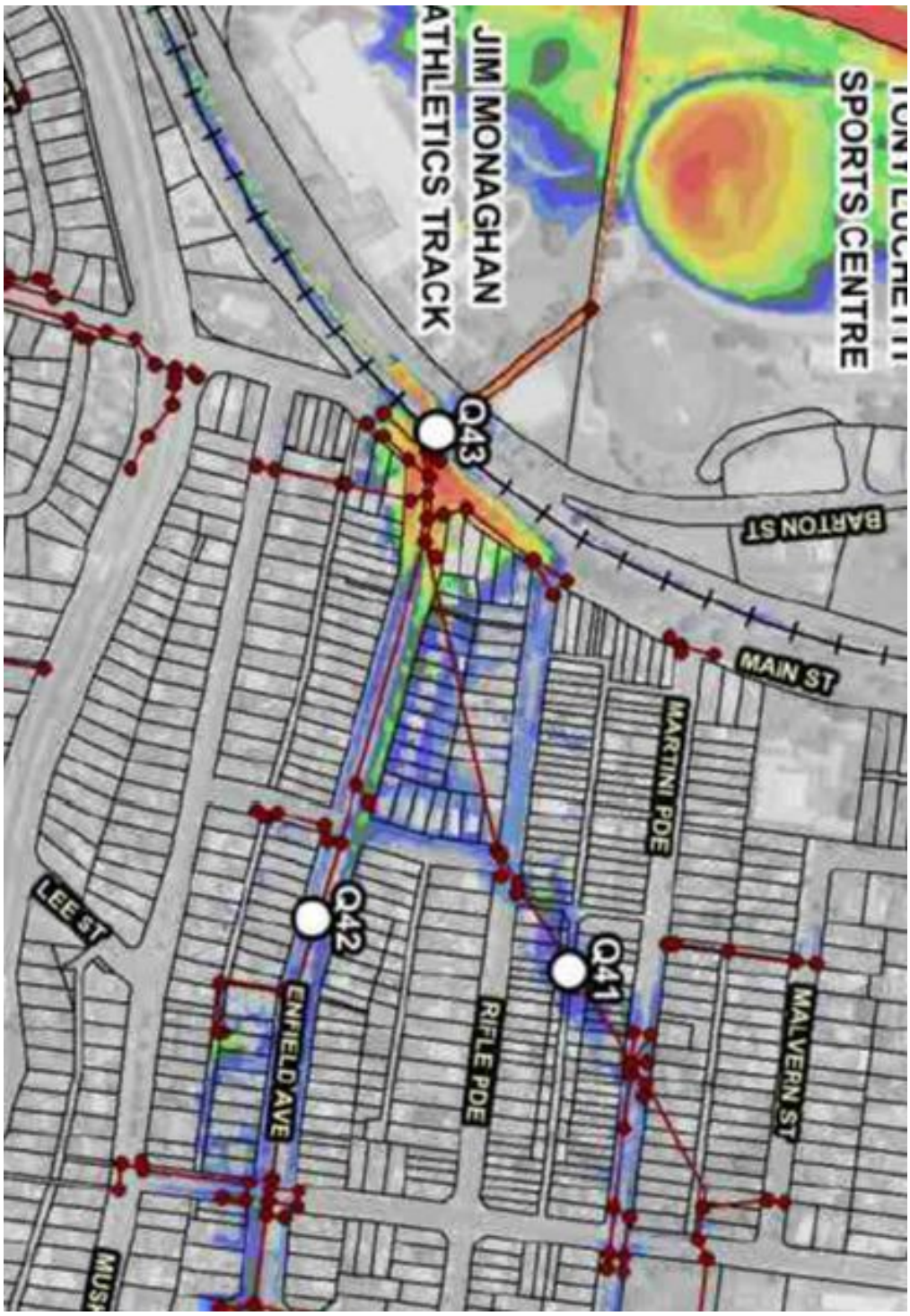

Figure 3: Overland Flow from Lithgow Flood Study

6 HYDRAULIC MODEL

A two-dimensional model was built to estimate the flow depth at the subject site using the most up to date version of Hec-Ras (V6.2). The hydraulic model in Hec-Ras was built with 1m grid using Lidar data. The model extent covers the subject site and surrounding areas and extends to north of Barton Street. Avenue. The Manning's roughness for the 2d domain was determined based on land use for medium urbanized area and adjoining streets. The values of 0.028 and 0.045 were adopted for paved and grassed areas, respectively. Extent of hydraulic model (2d domain) is shown in **Figure 4**.

The 1m lidar data was used to form the base case scenario. The feature survey as well as aerial imagery was used to modify the tin and include the existing houses. The existing buildings were modelled as a physical block using Ras Mapper terrain modification tools. The survey information for culverts under rail line and Barton Street was not available. These culverts have been modelled based on information in Lithgow Flood Study and Lidar data.

The proposed site plan was used to modify the digital terrain in Ras Mapper which includes proposed building and concrete medians and kerbs within the site for the developed case. It was assumed that the finished surface level will match the exiting natutral ground to minimize the impact on flood. The assumptions made for existing culverts at downstream were applied to both cases.

Figure 4: Extent of 2D Model

7 HYDRAULIC RESULTS

The flood results for 1% AEP for both existing and proposed cases are shown in **Figure 5** and **Figure 6** respectively. The afflux map for 1% AEP is given in **Figure 7**.

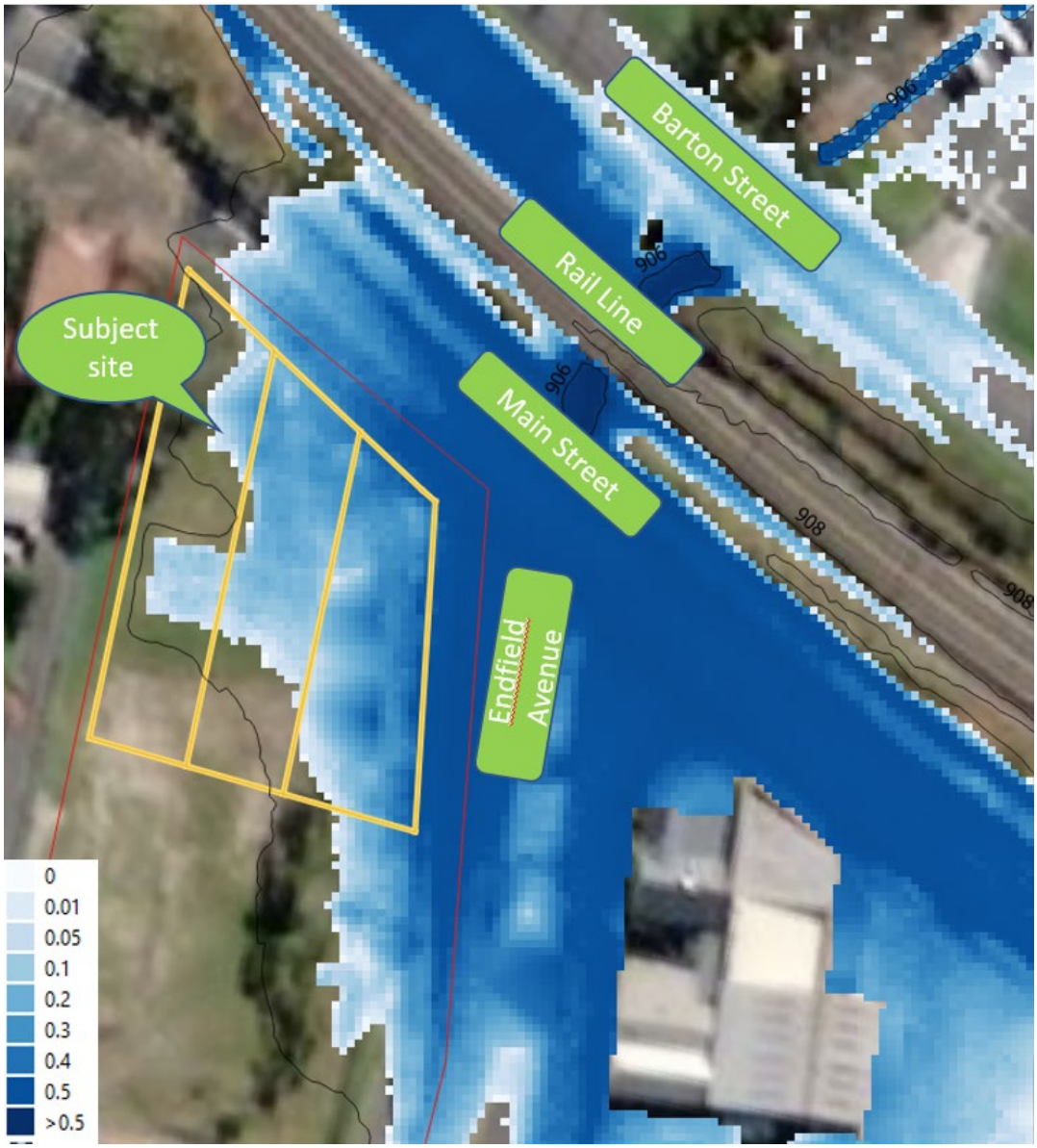

Figure 2 – Existing Case – Max Depth – 1%AEP

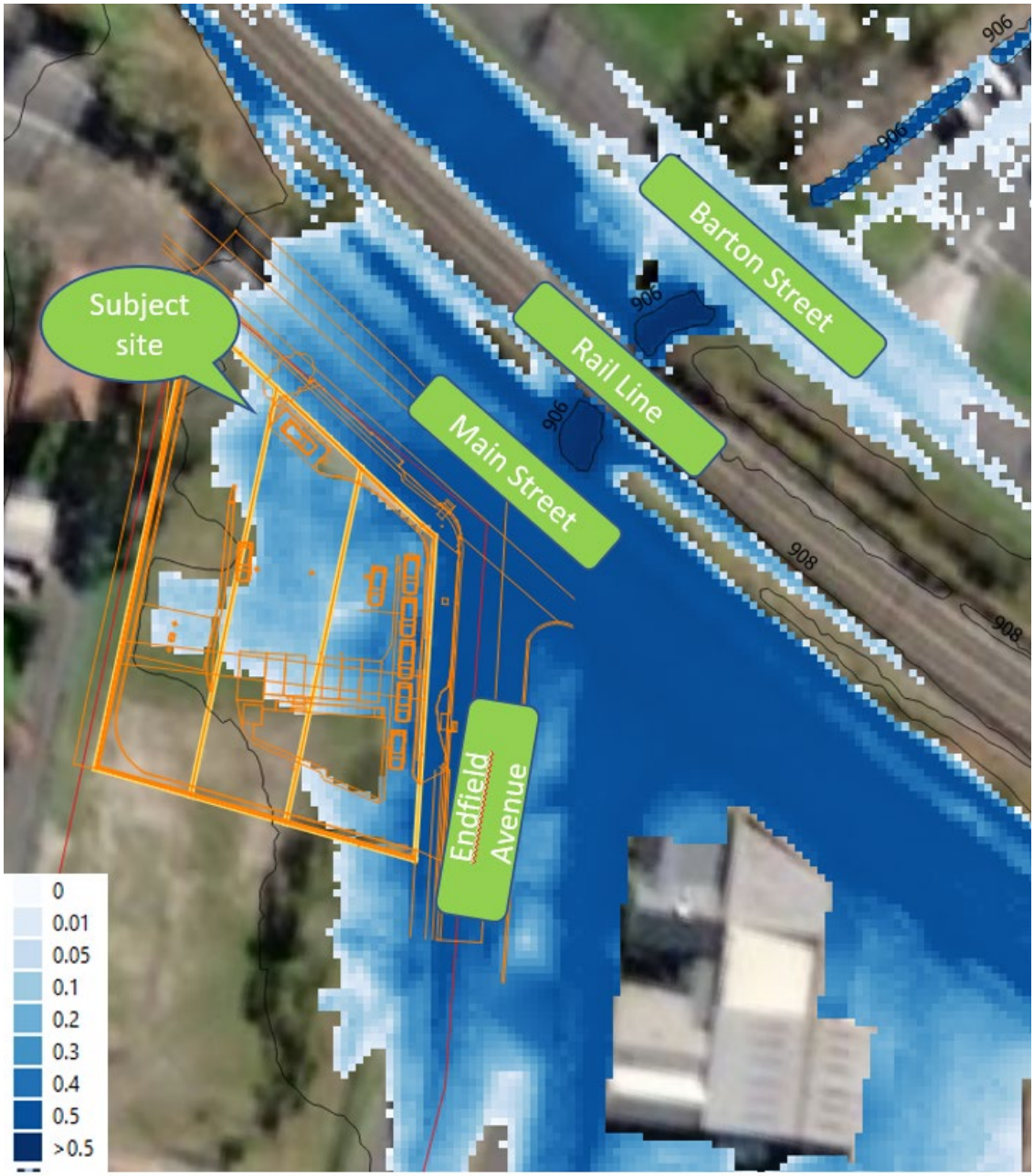

Figure 3 – Developed Case – Max Depth – 1%AEP

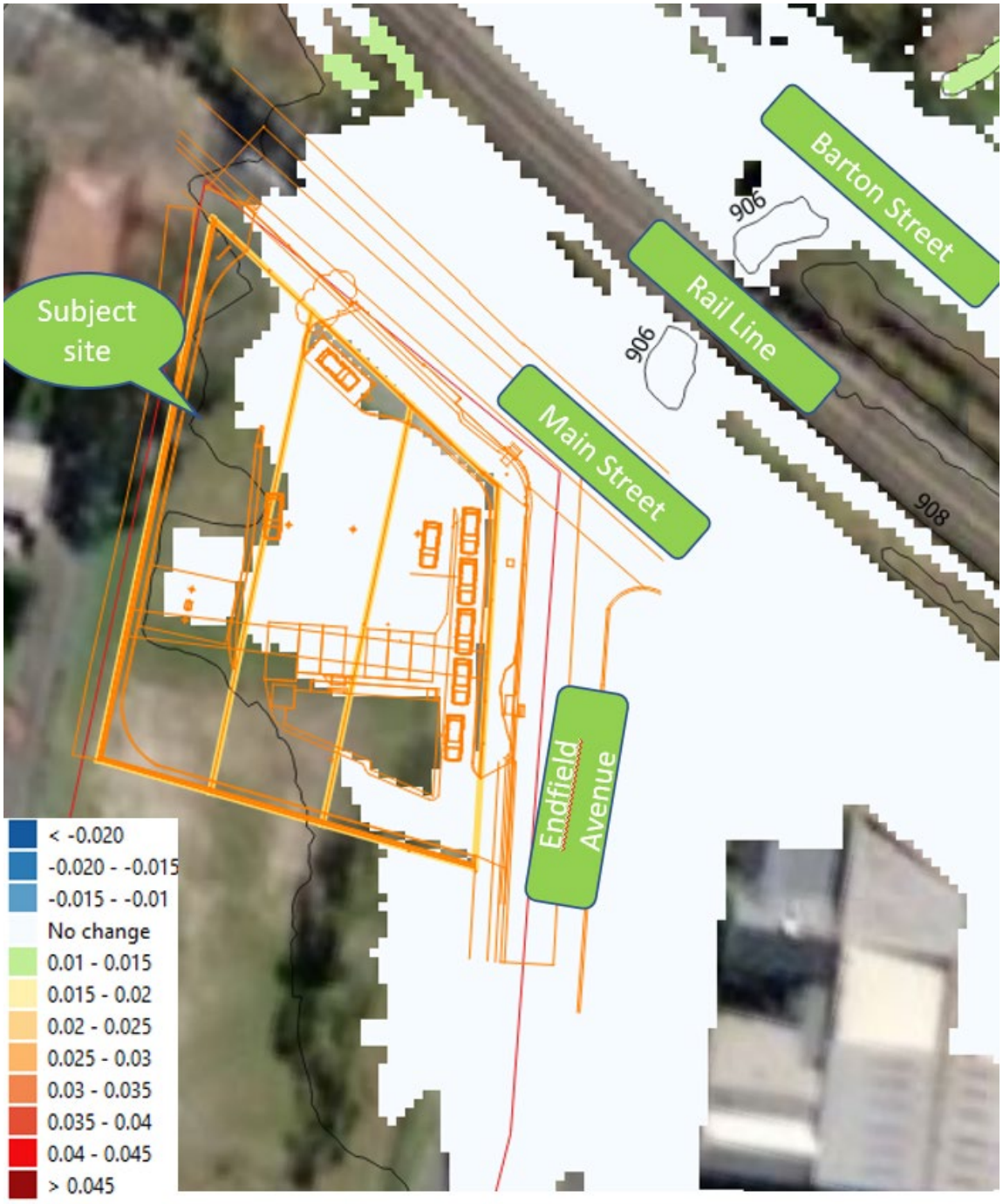

Figure 4 – Afflux Depth – 1%AEP

The results of the flood assessment for the investigated event are summarized below:

1.0% AEP:

- The afflux within the subject site is around **5mm** (unchanged).
- The flood level in Endfield Avenue and Main Street and rail corridor are unchanged.
- The flood level within southern properties are unchanged,
- The maximum flood level within the developed site is **907.75m AHD.**
- The maximum flood depth at eastern side of lot and along Endfield Avenue is **0.5m** and on western side of site is **0.1m.**

The summary of minimum habitable flood levels are shown in **Table 1** below.

Table 1 – Summary of Flood Results

Item	1% AEP Flood Level (m AHD)	1% AEP Flood Depth (m)	Freeboard (m)	Min Habitable Floor Level (m AHD)
Proposed development	907.75	0.1 to 0.5	0.5	908.25

8 SUMMARY & RECOMMENDATIONS

A flood and overland flow impact assessment has been carried out for the proposed Service Station at 353 Main Street, Lithgow, NSW 2790. The flow rates for overland flow for 1% AEP were obtained from Lithgow Flood Study. Based on our Overland Flow Study Analysis, we summarize our recommendations as follows:

- The overland flow modelling results undertaken for 1% AEP reveal that the proposed development have not any adverse impact on the Endfield Avenue, Main Street and adjoining lots due to increase of water level.
- The minimum habitable floor levels (Ground Floor) for the proposed development have been provided in **Table 1**.

REFERENCES:

- Australian Rainfall and Runoff Guideline
- Hec-Ras user manual.

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