

Mainstream Flooding and Overland Flow Impact Study of the 1%, 0.5%, 0.2% AEP and PMF Storm Events

Client: Erilyan Pty Ltd

Property: Northside West Clinic
23-27 Lytton Street, Wentworthville

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For and on behalf of ACOR Consultants Pty Ltd

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- Appendix A LTS Lockley Survey Plan, Reference 40317 002DT, Revision D, dated 12th October 2021.
- Appendix B Team2 Architects Architectural Plans, Reference 903, Revision 1, dated 28th July 2021.
- Appendix C ACOR Flood Maps

1.0 Introduction

ACOR Consultants Pty Ltd (ACOR) has been commissioned to prepare a Flood Investigation Report and Flood Risk Management Plan in accordance with the requirements of the Holroyd Development Control Plan 2013 and Holroyd Local Environmental Plan 2000. The Flood Investigation and Flood Risk Management report is supported by adoption of Council's flood study that investigates the flood behaviour on-site affected by both the overland and mainstream flooding. This includes the analysis of:

- Surface runoff across Finlayson's catchment;
- Flooding towards the lower part of the catchment;
- Impact of flooding on the proposed development and vice versa; and
- Flooding on the subject site

A two-dimensional computer model of the catchment was established to analyse flood behaviour under existing and proposed development conditions. The model provides information on the extent of flood inundation, flood depths and flood velocities throughout the catchment for the 1%, 0.5%, 0.2% AEP and PMF critical duration events. Results from this study form a technical basis for the subsequent flood risk management plan that identifies problem areas and investigates options to reduce the impact and risk of flooding.

1.1 Objective

The objective of the study is to define local overland flow and mainstream flooding in accordance with the Floodplain Development Manual (NSW DIPNR 2005) and Part B Section 8 Part C4 Stormwater of the Holroyd Development Control Plan 2013. It involved the following steps:

- Attend the site to assess the anticipated extent and nature of flooding and identify hydraulic controls likely to impact on flooding behaviour.
- Develop a hydraulic model to determine 1%, 0.5%, 0.2% AEP and Probable Maximum Flood (PMF) flood levels, depths, velocities and hazard categories.
- Review the hydraulic model to ascertain flood impacts on the proposed development at 23-27 Lytton Street, Wentworthville, and neighbouring properties; and
- Provide recommendations to ensure that flood waters do not adversely impact the proposed car park extension & building development on 23-27 Lytton Street, Wentworthville, and neighbouring properties. This will be achieved with the inclusion of increased threshold levels provided by the proposed driveway and the design of flood management and diversion infrastructure.

1.2 Site Description

The subject site (known as Lot 1 in DP 787784) abuts the Finlayson Creek stormwater drainage reserve at the rear of the property and the site frontage is to Lytton Street.

The subject site consists of building infrastructure and existing undercover carpark facilitating Northwest Clinic operations. The proposed development consists of demolition of existing wards along the western side of the building to provide multi-level carpark and hospital wards on upper levels, conversion of existing open carpark along the southern end of the site into an undercover parking space, and some landscaping space with hospital wards on the floor above.

The subject site slopes from Lytton Street at the east to Finlayson Creek reserve at the west with an average slope of 5%. The site is also traversed by a 600mm diameter stormwater drainage pipe below the carpark at the south. There is an existing 1.22m wide drainage easement burdened on the lot and established over the drainage pipe. The development also proposes to divert the pipe with similar sized reinforced concrete pipe along the southern boundary of the site.



Figure 1 Site location (<https://maps.six.nsw.gov.au/>)

1.3 Flood Characteristics

The subject site is impacted by overland flows from the east draining towards the Finlayson Creek drainage reserve at the rear of the property. The catchment upstream of the site is dominated by residential land use. Elevations within the upstream catchment are generally within the range 47 m AHD to 22 m AHD.

The site is impacted by overland flow during the 1% AEP flood event, resulting in partial inundation of the site. Inundation depths vary within overland flow areas.

The 1% AEP overland flow poses a Low flood hazard category to occupants, vehicles and building structure of the surrounding areas.

The 0.2% AEP, 0.5% AEP and PMF events were simulated for local overland flow and mainstream flooding. Peak floodwater levels show the site is not impacted by mainstream flooding in these events.

2.0 Available Data

Council's TUFLOW model for Finlayson's Creek was obtained for this flood study.

Survey information adopted for this study has been collated from the following sources:

- LTS Lockley Survey Plan, Reference 40317 002DT, Revision D, dated 12th October 2021
- LIDAR data obtained from the Department of NSW Governments' cloud-based platform Elvis;
- GIS layers of cadastre and satellite imagery provided by the NSW LPI.

3.0 Methodology

Council has advised that the flood impact assessment for the proposed development should be in accordance with the following:

- Adopt Council's TUFLOW model for Finlayson's Creek and follow Holroyd City LGA Overland Flood Study prepared by Lyall & Associates dated 2017
- Simulate the 1%, 0.5%, 0.2% and PMF flood events for both existing and proposed development scenarios
- Present the flood impacts resulting from the proposed development.

Council issued an RFI, which has been responded to in this report. The RFI items are below.

RFI	Response
13.Address EES Group advice in relation to amending the flood impact statement, particularly: ■ consider the flood risk from the full range of floods up to the probable maximum flood for mainstream and overland flooding. ■ refer the flood strategy to SES for comment. ■ utilise the 0.5 per cent and 0.2 per cent AEP flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.	■ Refer to section 4 of this report. ■ The site is only affected by overland flow of a short duration, not mainstream flooding of Finlaysons Creek. Flow depths are predominantly less than 100 mm on the site, and flood hazard does not change from pre-development to post-development conditions. Refuge in short duration, overland flow events can be found in upper levels of the development. ■ Refer to section 4 of this report.

increased flood risk from climate change and rare to extreme flooding is to be further detailed to ensure no risk to life and property.	Refer to section 4 and 5 of this report.
The following comments are provided in relation to flooding and the flood impact statement prepared by ACOR consultants: - The flood assessment should be amended to consider the flood risk from the full range of floods up to the probable maximum flood for both mainstream and overland flooding. - Shelter in place has been put forward as a solution in times of rare flooding. However, this is a matter for the NSW SES as the responsible flood combat agency. This strategy should be referred to the NSW SES for comment. Flood education, awareness and emergency management plans for occupiers and visitors should also be prepared and referred to the NSW SES for comment. - EES recommends using the 0.5% and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change. - The Flood Impact Study refers to the carparks and proposed safeguards to mitigate the 1% AEP flood, however, the increased flood risk from climate change and rare to extreme flooding is not clear and may pose a risk to life and property.	- Refer to section 4 of this report. - The site is only affected by overland flow of a short duration, not mainstream flooding of Finlaysons Creek. Flow depths are predominantly less than 100 mm on the site, and flood hazard does not change from pre-development to post-development conditions. Refuge in short duration, overland flow events can be found in upper levels of the development. - Refer to section 4 of this report. - Refer to section 4 and 5 of this report.

3.1 Existing conditions TUFLOW model

Catchment wide flood modelling was originally prepared by Lyall & Associates and the same model was made available to ACOR for use in this study. The supplied TUFLOW model was refined with the site-specific survey information to focus on the site area and its vicinity for this study.

1% AEP, 0.5%, 0.2% AEP and PMF hydrological input used in the original flood model was adopted and applied to the existing TUFLOW model in a similar manner. The inflow boundary conditions used in the original models were clipped to only include the relevant inflow boundaries that affected the site. Conversion of the rainfall into ARR 2019 methodology has not been carried out in this study.

The pit and pipe data used in the original model was adopted for this study.

Other model features that were adopted unchanged (as compared to the flood model provided) are noted as below:

- Digital elevation model terrain using a 1-metre resolution Airborne Laser Survey (ALS) data

- 2d-grid orientation and grid cell resolution with 2 metre sides
- Pits and pipe data outside the development site (it is not proposed to modify these structures as part of the development)
- Surface roughness for roads and pavement areas.

Using the above parameters, the 1%, 0.5%, 0.2% AEP & PMF flood events were simulated in TUFLOW to create a base case of the existing scenario flood conditions.

3.2 Proposed conditions TUFLOW model

The existing conditions model was adopted and modified to represent the proposed development conditions.

Proposed conditions amendments are described below:

- The proposed building was modelled as complete obstruction to the flow due to solid continuous walls
- The finished northern and southern carpark surfaces were produced as digital elevation models using the Civil 3D software package and the surfaces were incorporated into the flood model
- A crest is provided at 20.35 m AHD at the top of the northern driveway ramp leading to the proposed western undercover car park
- Incorporation of surface roughness changes due to the proposed development

4.0 Results

This section summarises the results of the hydrologic and hydraulic modelling of overland flows within the catchment. The model was run for the 25 minute duration for the 1%, 0.5% 0.2% AEP and PMF events to assess the local catchment overland flow, as well as the 90 minute duration for the 0.2% AEP and PMF events to assess the mainstream flooding (Finlayson Creek) in the vicinity of the site.

The behaviour of the 1%, 0.5%, 0.2% AEP and PMF floodwaters within the vicinity of the subject site are described in general terms. The impact of overland flow and mainstream flooding on the subject site in existing and proposed conditions are discussed below.

4.1 Map Outputs

The flood depths, levels, velocity and flood hazard category for the 1% AEP event are mapped for the existing (pre-development) and proposed (post-development) site conditions. The 0.5%, 0.2% AEP and PMF flood levels and depths have also been mapped for the existing and proposed site conditions. The flood impact (afflux and change in flood extent) map for the 1% AEP 25 minute duration has been produced. The following flood maps are enclosed under Annexure C.

Table 1 Flood maps

Figure number	Figure name	Critical duration storm
FIGURE C1	Catchment Map and Model Boundary Condition	-
FIGURE C2.1	1% AEP max. flood depths and levels – Pre-Development	25 minute duration event
FIGURE C2.2	1% AEP max. flood velocity – Pre-Development	25 minute duration event
FIGURE C2.3	1% AEP max. flood hazard – Pre-Development	25 minute duration event
FIGURE C3.1	1% AEP max. flood depths and levels – Post-Development	25 minute duration event
FIGURE C3.2	1% AEP max. flood velocity – Post-Development	25 minute duration event
FIGURE C3.3	1% AEP max. flood hazard – Post-Development	25 minute duration event
FIGURE C4	1% AEP max. flood afflux – Post-Development	25 minute duration event for mainstream flooding and local overland flow
FIGURE C5	0.5% AEP max. flood depths and levels – Post-Development	25 minute duration event for mainstream flooding and local overland flow
FIGURE C5.1	0.5% AEP max. flood afflux – Post-Development	25 minute duration event for mainstream flooding and local overland flow
FIGURE C6	0.2% AEP max. flood depths and levels – Post-Development	90 minute duration event for mainstream flooding
FIGURE C6.1	0.2% AEP max. flood afflux – Post-Development	90 minute duration event for mainstream flooding
FIGURE C7	PMF max. flood depths and levels - Post-Development	90 minute duration event for mainstream flooding

4.2 Pre-development 1% AEP Overland Flow Behaviour

Flood depths and extents along the site in existing conditions are generally consistent with Lyall & Associates flood study maps, 2017 shown in Appendix C.

Flood waters enter the site near 11 Lytton Street and the site frontage. Flows traverse the surface of the undercover carpark at the northern end of the site and via the driveway at the southern end of the site towards Finlayson Creek. Inundation is largely confined to the existing drainage route passing through the northern carpark of the site.

During this study, the design storm was applied to the entire upstream catchment of the site that extends to Bridge Road to the east, Killeen Street to the south and Jordan Street to the north. The flood model shows there are three major branches of overland flow paths along Lytton Street that traverses through the properties along Lytton Street. The main flow path for the catchment passes through No. 35 and 37 Lytton Street, approximately 60 m south of the subject site, with a peak overland flow of 2.60 m³/s. The total overland flow passing through the subject site is 0.48 m³/s, approximately 0.21 m³/s of which is conveyed south of the existing building, and the remaining 0.27 m³/s enters the subject site via 11 Lytton Street from the North. The 1% AEP overland flow depths in the vicinity of the site are less than 0.25 m.

4.3 Post-development 1% AEP Overland Flow Behaviour

The 1% AEP overland flow velocities are generally between 0.1 – 1.0 m/s, which are in accordance with pre-development conditions.

The proposed development does not result in an increase in flood levels external to the site. The entire incremental flood levels are within the site and in the landscaped area at the rear of the carparks. A change in flood level of up to 150 mm on the site is shown at the rear western end of the northern and the southern carparks. Once the overland flow leaves the site, there is no difference to the existing flood levels external to the site. Regardless of an increase in flood levels on the site, the flood hazard categories within the area are unchanged, which justifies the suitability of the proposal.

The crest provided at 20.35 m AHD at the top of the driveway ramp leading to the proposed western undercover car park has not only protected the entrance of floodwaters to the carpark, but also provided a freeboard of 150 mm above the peak flood level of 20.20 m AHD at that spot. The overland flow traversing the northern carpark continues to the west towards the Finlayson reserve without impacting the proposed carpark area. A low gully line will be provided along the rear car parking bays as indicated below, with the kerb replaced with bollards next to the parking bay to allow for floodwater to flow through unhindered as shown in the figure below.

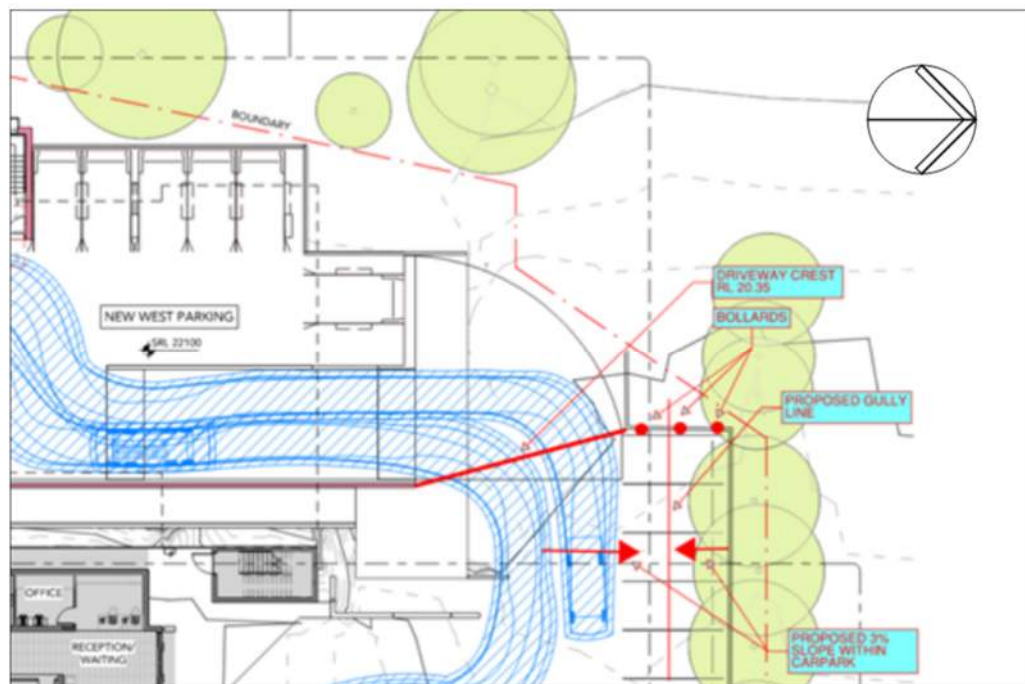


Figure 2 Proposed Northern Carpark Overland Flow Mitigation Strategy

The proposed entrance lobby at the southern face of the existing building, which is a simple change to the existing building, shows an overland flow level at 19.25 m AHD. Based on Council's DCP requirements, the minimum floor level at the lobby can be maintained at the current level of 19.25 m AHD, as it will be impractical to raise the existing level.

Overland flow mitigation is proposed for the southern driveway ramp area, as shown in the figure below. It is noted that under pre-development conditions, this area is subject to overland flow.

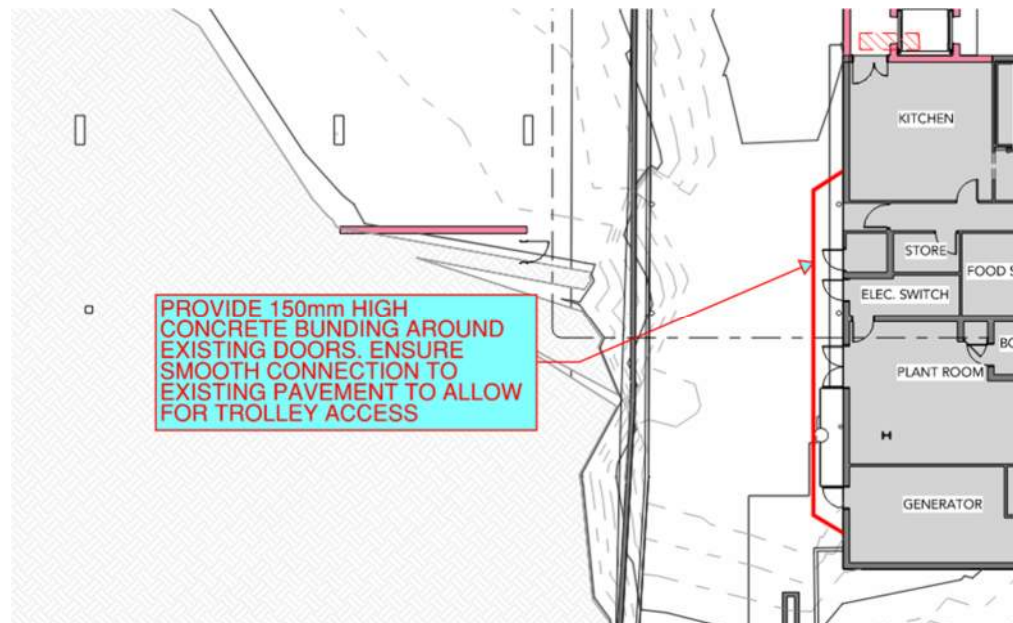


Figure 3 Proposed Southern Driveway Ramp Overland Flow Mitigation Strategy

There are no changes to overland flow offsite along the Lytton Street frontage.

4.4 Post-development 0.5% AEP, 0.2% AEP and PMF events

The 0.5% AEP and 0.2% AEP events were simulated as proxies for assessing sensitivity to an increase in rainfall intensity due to climate change, according to Council's RFI. The critical duration for the 0.5% AEP at the site is the 25 minute duration storm, which considers both local catchment overland flow and mainstream flooding. The critical duration for the 0.2% AEP at the site is the 90 minute duration storm, which considers both local catchment overland flow and mainstream flooding.

The PMF event was simulated for mainstream flooding and overland flow, as requested in Council's RFI. The critical duration at the site is the 90 minute duration storm, which considers both local catchment overland flow and mainstream flooding.

The results presented in the flood maps show isolated afflux at the southern side of the building for the 0.5% AEP, 0.2% AEP and PMF events, which will be mitigated as shown in **Figure 3** above. There are small areas of afflux on the eastern and southern side of the proposed raised area on the southern side of the building, which is contained within the site area and does not pose an increased risk to life or property. The area of 'was dry, now wet' at the southern west of the site (offsite) is within the Finlayson Reserve and does not pose a risk to life or property. There is a small area of afflux at the western end of the carpark at the northern end of the site, which is predominantly within the site area and is of Low flood hazard, and does not pose a risk to life or property. Refer to section 5.1 below for further discussion.

From a safety perspective, the short duration of local overland flow flood events means the upper levels within the existing and the proposed building could provide a safe refuge during such rarer flooding events until overland flow has subsided.

4.5 Provisional Flood Hazard

The degree of Provisional Hazard attributed to flooding at the subject site is a function of Hydraulic Hazard (relating to the depth and velocity of floodwaters) and is adjusted to account for the following factors:

- Size of flood;
- Effective warning time;
- Flood awareness;
- Rate of rise of floodwater;
- Duration of flooding;
- Evacuation problems;
- Effective flood access; and
- Type of development.

Hazard categories are defined as either high, intermediate or low and are based on the guidelines outlined in the Floodplain Development Manual (NSW DIPNR 2005), in particular Figure L.2 of that document.

The hazard category on the site is Low in all simulated flood events up to the PMF for post-development conditions. These flood maps have not been produced. Overland flow poses a Low Hazard to people, vehicles and building infrastructure under pre-development and post-development conditions at 23-27 Lytton Street, Wentworthville.

5.0 Flood Risk Management

Based on the foregoing, we offer the following response having due regard for the requirements of the Holroyd Development Control Plan 2013 Part B Section 8 Part C4 Stormwater and Holroyd Local Environmental Plan 2013 Part 5.21 Flooding and the Floodplain Development Manual (NSW DIPNR 2005).

Based on the Holroyd DCP Table 7, the site falls within 'Redevelopment' land use category and within Medium Flood Risk Precinct. Based on this, the following major flood controls will be applicable to this development.

5.1 Floor Levels

The entrance lobby to the existing building along the southern face is currently proposed at 19.25 m AHD where the floodwaters peak at 19.21 m AHD, slightly under the existing floor level. Since the proposed entrance lobby is just a change of use and the peak water surface during 1%

AEP flooding is below the existing floor level, and it is impractical to raise the existing floor levels to Flood Planning Level (FPL) of 19.71 m AHD, the design floor level control 6 under Council's DCP Part J Section 8 allows to maintain the floor level as high as practicable subject to Council approval. Therefore, we believe the 19.25 m AHD at the proposed entrance lobby is suitable.

The proposed undercover carpark at 22.73 m AHD at the southern side of the site is not affected by flooding. The peak floodwater next to the area has been estimated at 22.20 m AHD, which is 0.53 m below the proposed car park level.

A peak flood level of 20.20 m AHD was estimated at the entrance to the western undercroft car park. The proposed driveway crest at top of the entrance ramp at 20.35 m AHD will prevent an ingress of floodwaters during the 1%, 0.5%, 0.2% AEP and PMF flood events. The crest has been provided to achieve 150 mm freeboard as per Council's DCP requirement.

The undercroft carpark at the northern end of the site is partially affected by flooding during the pre-developed condition. During the post-developed scenario, some minor grading of the new segment of carpark with provision of a low gully line across the rear parking bays and bollards next to the end parking bay will assure the floodwaters get captured within the northern carpark and leave the site without any impediments.

5.2 Building Components and Method

All building components below the 1% AEP flood level plus 500 mm freeboard are to be constructed from flood compatible building materials. Flood affected building components for the proposed development that needs such flood compatible materials are floors and walls near the lobby entrance to the existing building, new undercover carpark & its associated structure along the western part of the site.

The suitable wall structure materials include solid brickwork, blockwork, concrete, timber stud walls constructed from Class 1 (highly durable), Class 2 (durable) or H3 treated timber.

Extensive guidance on flood compatible building materials and methods is provided in 'Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas' (HNFMSC 2006).

5.3 Structural Soundness

Proposed building structures with flood exposure should be capable of withstanding the forces of the 1% AEP floodwaters, including hydrostatic, hydrodynamic, debris impact and buoyancy forces.

Due to the nature of the proposed works including concreting, it is unlikely that structural soundness will be required. Any slabs should be designed to be capable of withstanding the forces imposed by the 1% AEP floodwaters, including hydrostatic, hydrodynamic, debris impact and buoyancy forces. The concrete design should be certified by a practicing Civil Engineer.

5.4 Fencing

Due the flooded nature of the site, a mixture of light / open style fences and solid flood walls must be provided around all boundaries to provide a safe passage for floodwaters.

5.5 Evacuation

The proposed hospital building provides multiple levels above the ground level where evacuation can be facilitated. Floor levels of 27.50 m AHD are available on the first floor of the dwelling, which would provide adequate shelter in place scenarios for existing and the proposed buildings.

Upper floor levels within the existing and the proposed building can provide safe refuge during the rarer events such as PMF flooding. The proposed lifts and access stairs to upper levels will provide reliable evacuation routes during such flood events.

5.6 Climate Change

The 0.5% AEP and 0.2% AEP events were simulated as proxies for assessing sensitivity to an increase in rainfall intensity due to climate change, according to Council's RFI. Refer to the results section of this report for discussion.

6.0 Conclusion

The subject site (23-27 Lytton Street, Wentworthville) is subject to overland flooding. It has been confirmed through the flood study undertaken, that flood waters enter the site through the boundary with 11 Lytton Street (adjacent lot to the north) and drain towards the Finlaysons Creek drainage reserve at the rear of the property and into Finlaysons Creek.

The site is impacted by flooding during the 1% AEP flood event, resulting in partial inundation of the site. Inundation depths are predominantly less than 100 mm and less than a maximum of 250 mm.

The selection and development of the 1% AEP flood model has been described in Sections 2 to 4 of this report. Flood modelling results were presented and discussed in Section 4. Flood risk management measures are described in Section 5.

Floodwaters which enter the site traverse through the paved areas within the carpark and through the existing driveway of the site without entering the existing building. There are very minor deviations to such floodwaters seen during the post-developed condition within the site boundary.

There is an existing drainage easement and 600 mm diameter drainage pipe that runs via open carpark at the southern side of the site, which is proposed to be diverted along the southern boundary (Refer to Stellen Consulting Stormwater Plans – DR-200 through to DR-201 Rev. B for details). The diverted pipe size will match up with the existing and it has been demonstrated from the proposed diversion has not compromised the existing capacity of the drainage system.

The 1% AEP and floods up to the PMF produced low hazard categories throughout the entire site.

Minor flood impacts are identified external to the site and are on Council drainage reserve, and do not pose a risk to life or property. The increase in flood levels identified is limited to within the subject site, and are mitigated as presented in this report.

Based on the forgoing, we are of the view the proposed works generally meets the intent of the provisions for sites affected by flooding outlined within Holroyd Development Control Plan 2013.

7.0 References

Cumberland Council. Holroyd Development Control Plan 2013.

Cumberland Council. Holroyd Local Environmental Plan 2013.

Lyell & Associates. Holroyd City LGA Overland Flood Study 2017.

Hawkesbury-Nepean Floodplain Management Steering Committee (HNFMSC). (2006). Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas. Available from http://www.ses.nsw.gov.au/content/documents/pdf/resources/Building_Guidelines.pdf

New South Wales Department of Infrastructure, Planning and Natural Resources (NSW DIPNR). (2005). Floodplain Development Manual: the management of flood liable land.

Pilgrim D H (Ed.). (1998). Australian Rainfall and Runoff. Institution of Engineers Australia. Barton ACT.

8.0 Glossary

Terminology in this Glossary has been derived or adapted from the Floodplain Development Manual (NSW DIPNR 2005), where appropriate.

Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, expressed as a percentage.
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average recurrence interval (ARI)	The long-term average number of years between the occurrence of a flood as big as or larger than the selected event.
Catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
Design flood	A flood event to be considered in the design process.
Flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
Flood hazard	A measure of the floodwaters potential to cause harm or loss. Full definitions of hazard categories are provided in Appendix L of the Floodplain Development Manual (NSW Government, 2005). In summary: High: conditions that pose a possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty wading to safety; potential for significant structural damage to buildings.

- Low: conditions such that people and their possessions could be evacuated by trucks; able-bodied adults would have little difficulty wading to safety.

Flood planning area	The area of land below the FPL and thus subject to flood related development controls.
Flood planning levels (FPLs)	Combinations of flood levels (derived from significant historical flood events or floods of specific ARIs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans.
Floodplain, flood-prone land	Land susceptible to inundation by the probable maximum flood (PMF) event, i.e. the maximum extent of flood liable land.
Floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain.
Freeboard	Provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. (See Section K5 of Floodplain Development Manual).
Geographical information systems (GIS)	A system of software and procedures designed to support the management, manipulation, analysis and display of spatially referenced data.
Hydraulics	The term given to the study of water flow in a river, channel or pipe, in particular, the evaluation of flow parameters such as stage and velocity.
Hydraulic category	A classification of floodwater hydraulic behaviour. The categories are:

- Floodway: those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.
- Flood storage: those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. Loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation.
- Flood fringe: remaining area of flood-prone land after floodway and flood storage areas have been defined

Hydrograph	A graph that shows how the discharge changes with time at any particular location.
Hydrology	The term given to the study of the rainfall and runoff process as it relates to the derivation of hydrographs for given floods.
Local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
Mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
Peak discharge	The maximum discharge occurring during a flood event.
Probable maximum flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location.
Probability	A statistical measure of the expected frequency or occurrence of flooding.

Risk

Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. For this study, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.

Runoff

The amount of rainfall that actually ends up as stream or pipe flow, also known as rainfall excess.

APPENDIX A

**LTS Lockley Survey Plan, Reference 40317 002DT, Revision D, dated 12th
October 2021.**

LEGEND

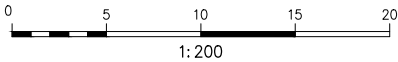
BENCH MARK	▲
COMMS PIT	COM
TELSTRA PIT	TEL
TELSTRA PILLAR	TP
LIGHT (MOUNTED)	ELP
ELECTRICITY PIT	EPIT
ELECTRICITY BOX	EL
POWER POLE	PP
BOLLARD	BOL
COLUMN	COL
PIT WITH CONCRETE LID	CLID
PIT WITH METAL LID	MLID
STREET SIGN	SS
GRADED INLET PIT	GIP
KERB INLET PIT	KIP
SEWER INSPECTION POINT	SIP
SEWER VENT	SEV
SEWER MANHOLE	SMH
STOP VALVE	SV
IRRIGATION CONTROL VALVE	ICV
HYDRANT	HYD
WATER TAP	TAP
GAS VALVE	GV
WINDOW	W
DOOR	D
VEHICLE CROSSING	(VC)
PRAM CROSSING	(PC)
GAS PIPE	G
TELSTRA	T
COMMUNICATIONS (DBYD)	C
WATER PIPE	W
STORMWATER	SW
SEWER	S
ELECTRICITY (OVERHEAD)	P
ELECTRICITY (UGROUND)	E

EASEMENT NOTES

- Ø EASEMENT FOR ELECTRICITY PURPOSES (VIDE M955707)
- EASEMENT FOR DRAINAGE 1.22 WIDE (VIDE G307375)

NOTES

- THE BOUNDARIES HAVE NOT BEEN MARKED
- ALL AREAS AND DIMENSIONS HAVE BEEN COMPILED FROM PLANS MADE AVAILABLE BY THE OFFICE OF LAND & PROPERTY INFORMATION (NSW) AND ARE SUBJECT TO FINAL SURVEY
- ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM PM2432 R.L. 23.21 (A.H.D.) IN LYTTON STREET.
- CONTOUR INTERVAL 0.5m
- CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
- KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
- NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
- 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
- NO INVESTIGATION OF CERTIFICATE OF TITLE HAS BEEN MADE IN THIS AREA
- SHOWS APPROXIMATE POSITION OF ROAD LINEMARKING AND IS INDICATIVE ONLY
- BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1" FOR TRUE NORTH BEARINGS



D	00/00/00	-	00
C	12/10/21	TRANSLATED TO GDA94	002
B	20/09/21	DTM'S MERGED AND AMENDED	002
A	01/09/20	DETAIL UPDATED	002
Revision	Date	Description	Reference

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:
.....
Registered Surveyor NSW



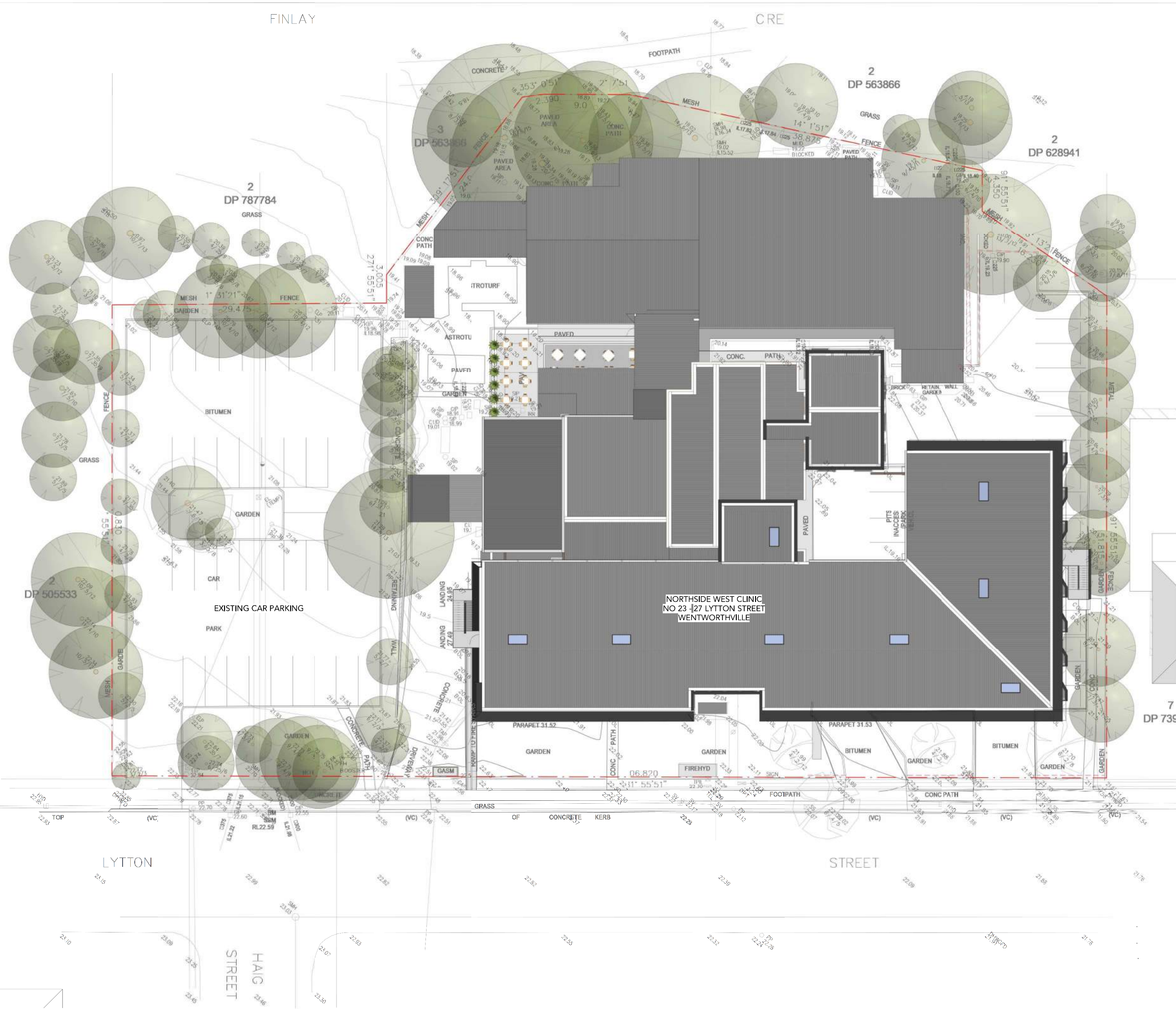
Suite 1, Level 1,
810 Pacific Highway
Gordon NSW 2072
LOCKED BAG 5
GORDON NSW 2072
P 1300 587 000
F 02 9499 7760

Client **RAMSAY HEALTHCARE**
Drawing title
**PLAN OF DETAIL AND LEVELS OVER LOT 1 IN DP787784
KNOWN AS NORTHSIDE WEST CLINIC AT
No.23-27 LYTTON ST, WENTWORTHVILLE.**

datum AHD	project number	reference number
site Area 6655m ²	scale 1:200 @A1	40317 002DT date of survey 28/10/2013
LGA HOLROYD	SHEET 1 OF 1	SHEETS 1

APPENDIX B

**Team2 Architects Architectural Plans, Reference 903, Revision 1, dated 28th
July 2021.**

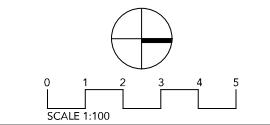


DRAWING STATUS:		
PRELIMINARY		
Rev	Revision Description	Date
1	Preliminary Issue	28.07.21

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2. All dimensions and levels are in millimeters unless noted otherwise. No dimension shall be construed by calling the drawing.
3. All dimensions to be checked on site with any discrepancies referred to team 2 architects before proceeding with work.
4. All work to be carried out in accordance with the requirements of the principal certifying authority, current ncc & Australian standards.



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ARCHITECTS

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St Leonards NSW 2065
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Reg NSW: 9940

MELBOURNE Suite 204/9-11 Clarendon Street,
South Yarra VIC 3161
ABN: 72 104 833 507
Reg Vic: 19340

Northside West Stage 2

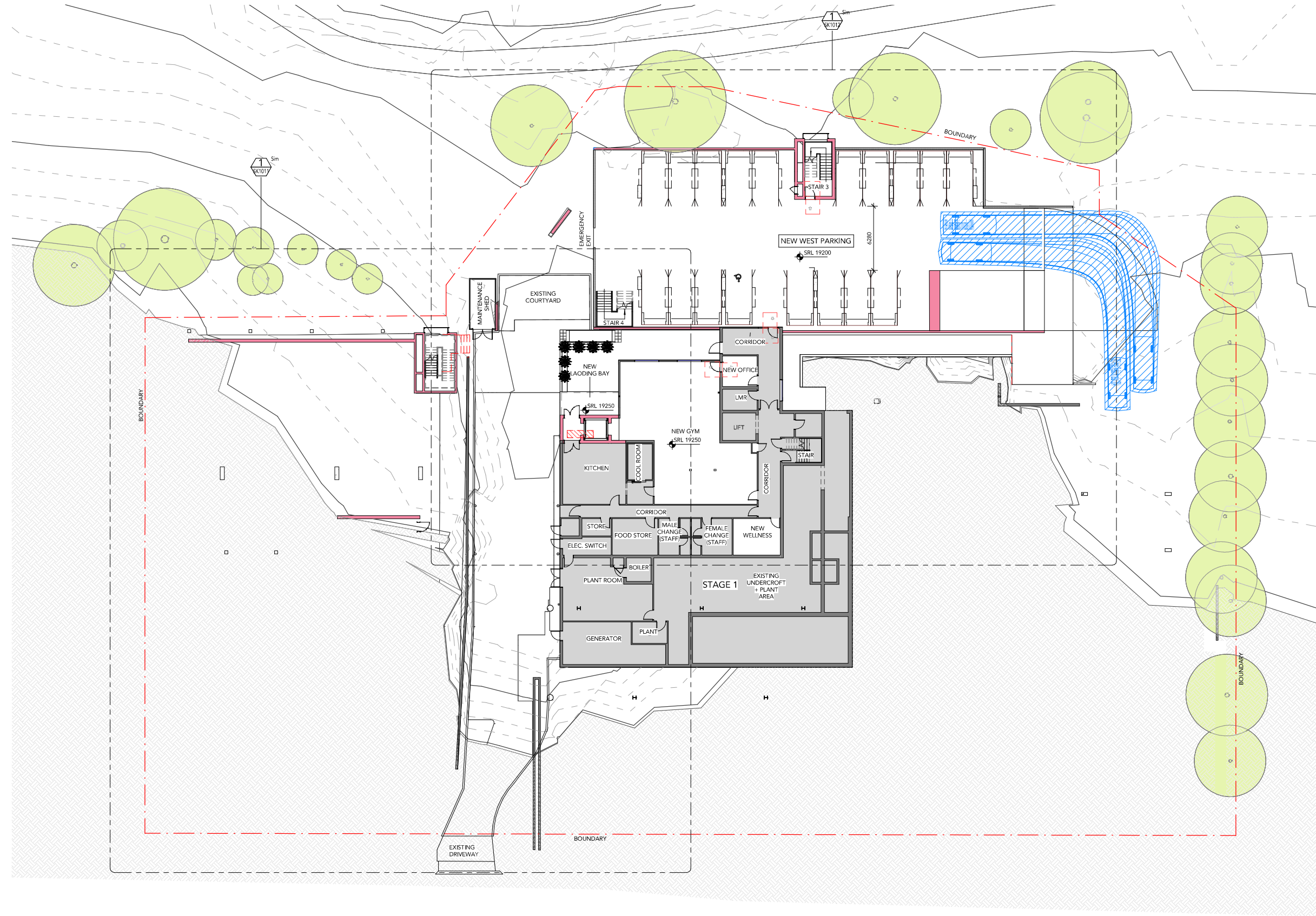
Wentworthville, NSW 2145

SITE PLAN - EXISTING

903	1 : 200	AK	VM
-----	---------	----	----

DA0010 1

1 DA Site Plan - Existing
Scale: 1 : 200



DRAWING STATUS:

PRELIMINARY

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21

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2. All dimensions and levels are in millimeters unless noted otherwise. No dimension shall be construed by calling the drawing.
3. All dimensions to be checked on site with any discrepancies referred to team 2 architects before proceeding with work.
4. All work to be carried out in accordance with the requirements of the principal certifying authority, current ncc & Australian standards.

LEGEND

NOT IN SCOPE



ERILYAN



0 1 2 3 4 5
SCALE 1:100

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Reg VIC: 19340

Northside West Stage 2

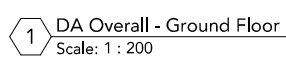
Wentworthville, NSW 2145

OVERALL SITE PLAN - LOWER

GROUND 903 As @A1 IK VM

DA0100 indicated 1

1 DA Overall - Lower Ground
Scale: 1 : 200



903	As	@A1	IK	VM
Drawing #: DA0101		indicated		Rev: 1

APPENDIX C

ACOR Flood Maps

**FIGURE
C1**



CATCHMENT PLAN

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



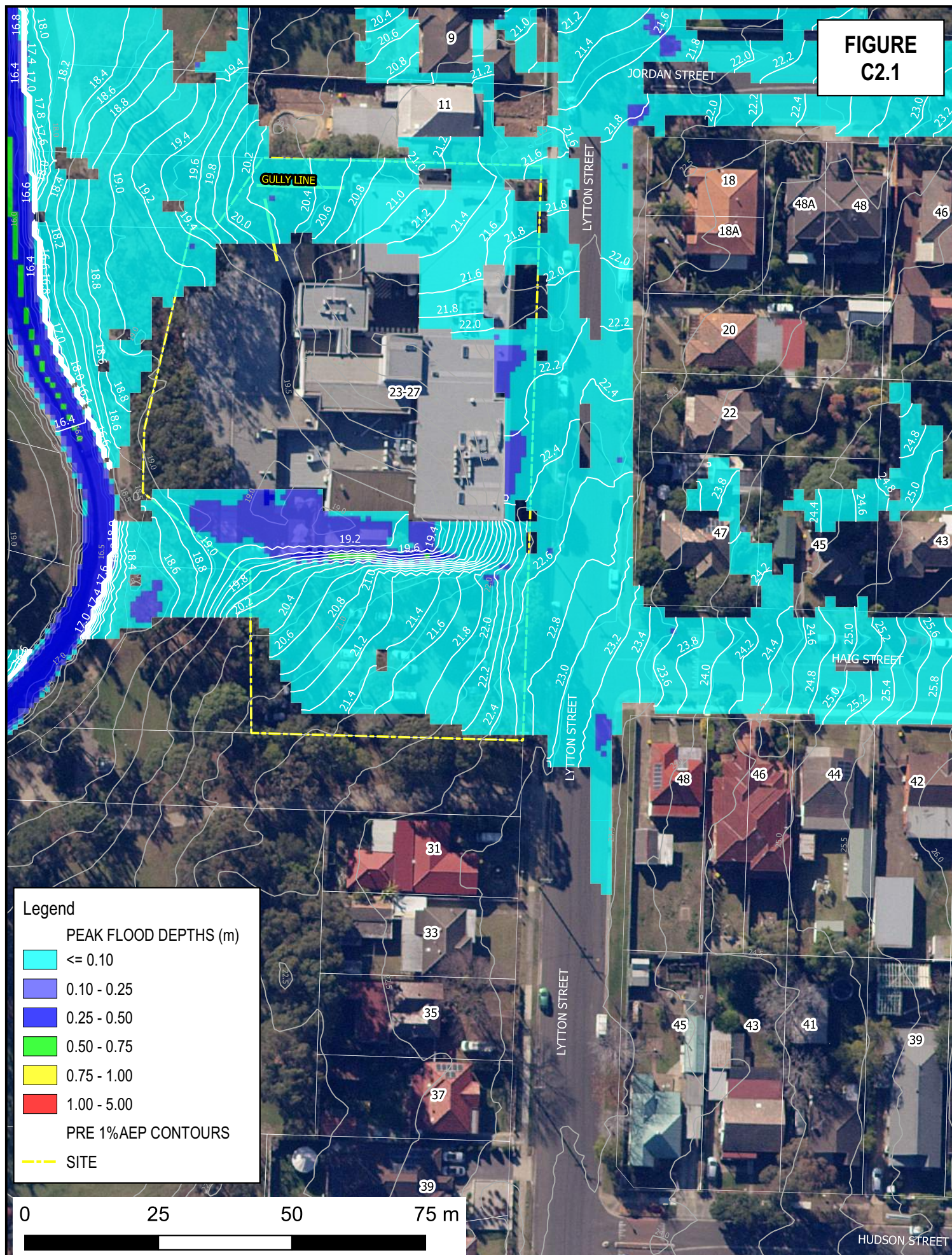
ACOR Consultants Pty Ltd

Suite 2, Level 1, 33 Herbert Street
St Leonards NSW 2065

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ENGINEERS | MANAGERS | INFRASTRUCTURE PLANNERS | DEVELOPMENT CONSULTANTS

**FIGURE
C2.1**



1% AEP MAX FLOOD DEPTHS AND LEVELS - PRE DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



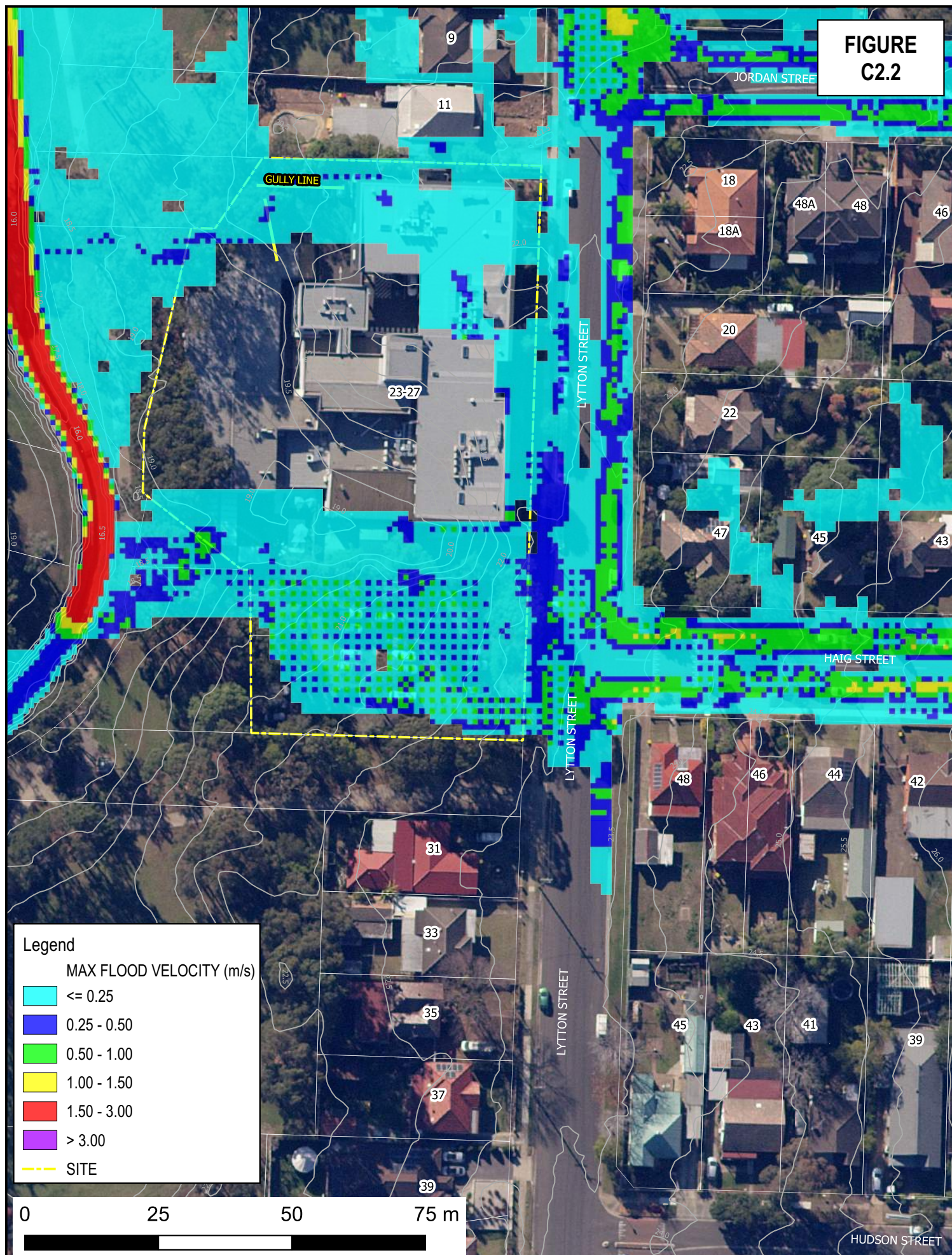
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**FIGURE
C2.2**



1% AEP MAX FLOOD VELOCITY - PRE DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



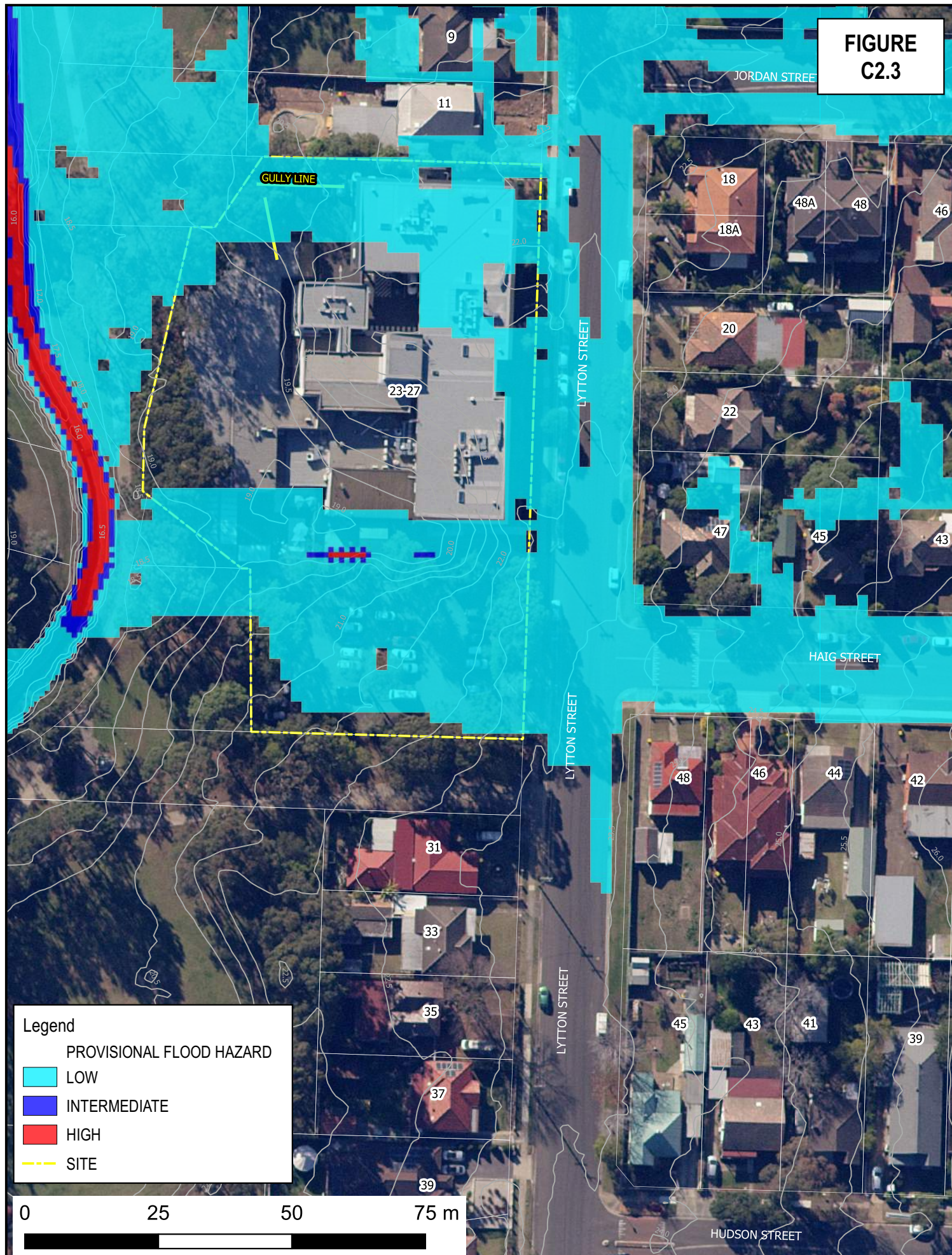
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**FIGURE
C2.3**



Legend

PROVISIONAL FLOOD HAZARD

- LOW
- INTERMEDIATE
- HIGH
- SITE

1% AEP MAX FLOOD HAZARD - PRE DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



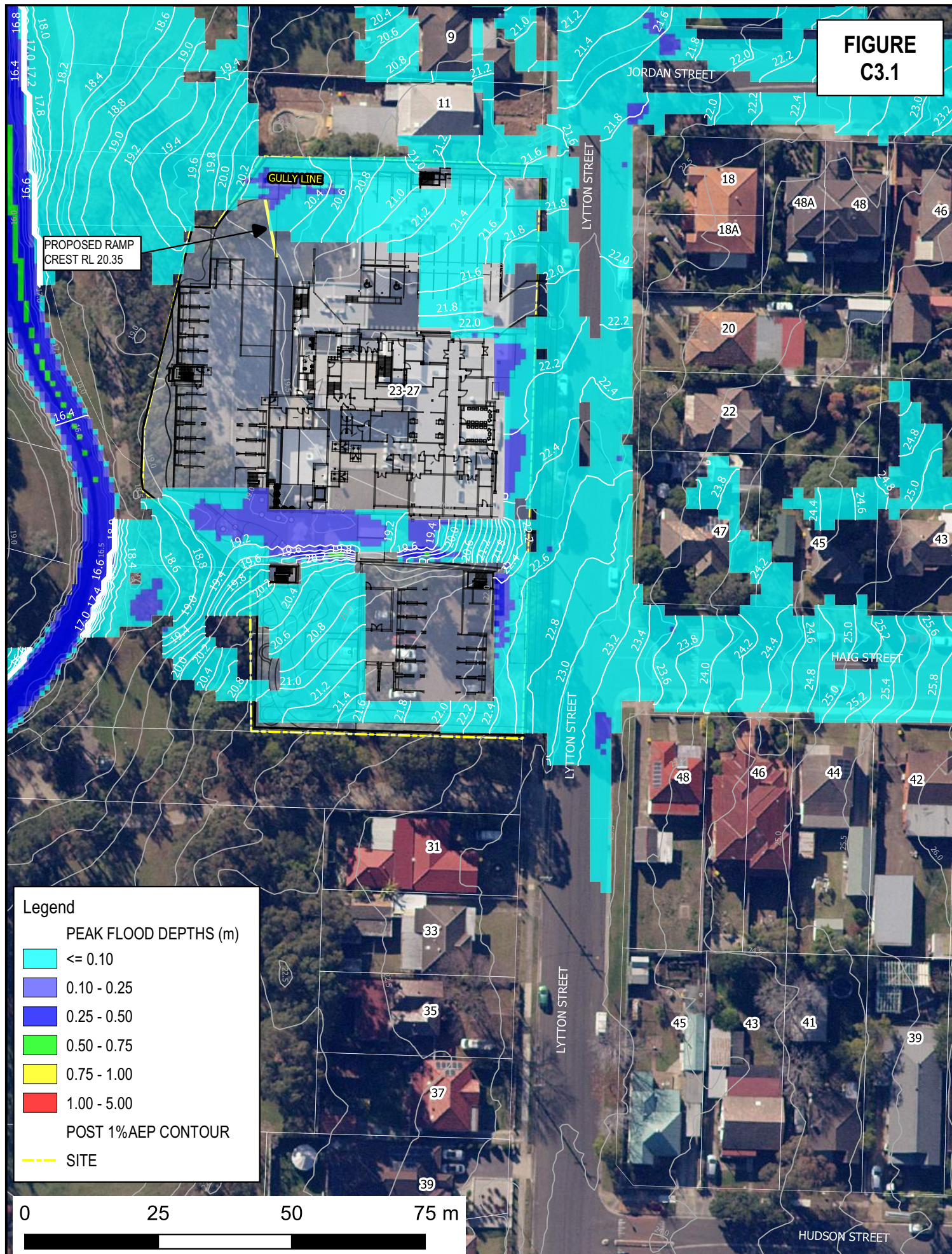
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**FIGURE
C3.1**



1% AEP MAX FLOOD DEPTHS AND LEVELS - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



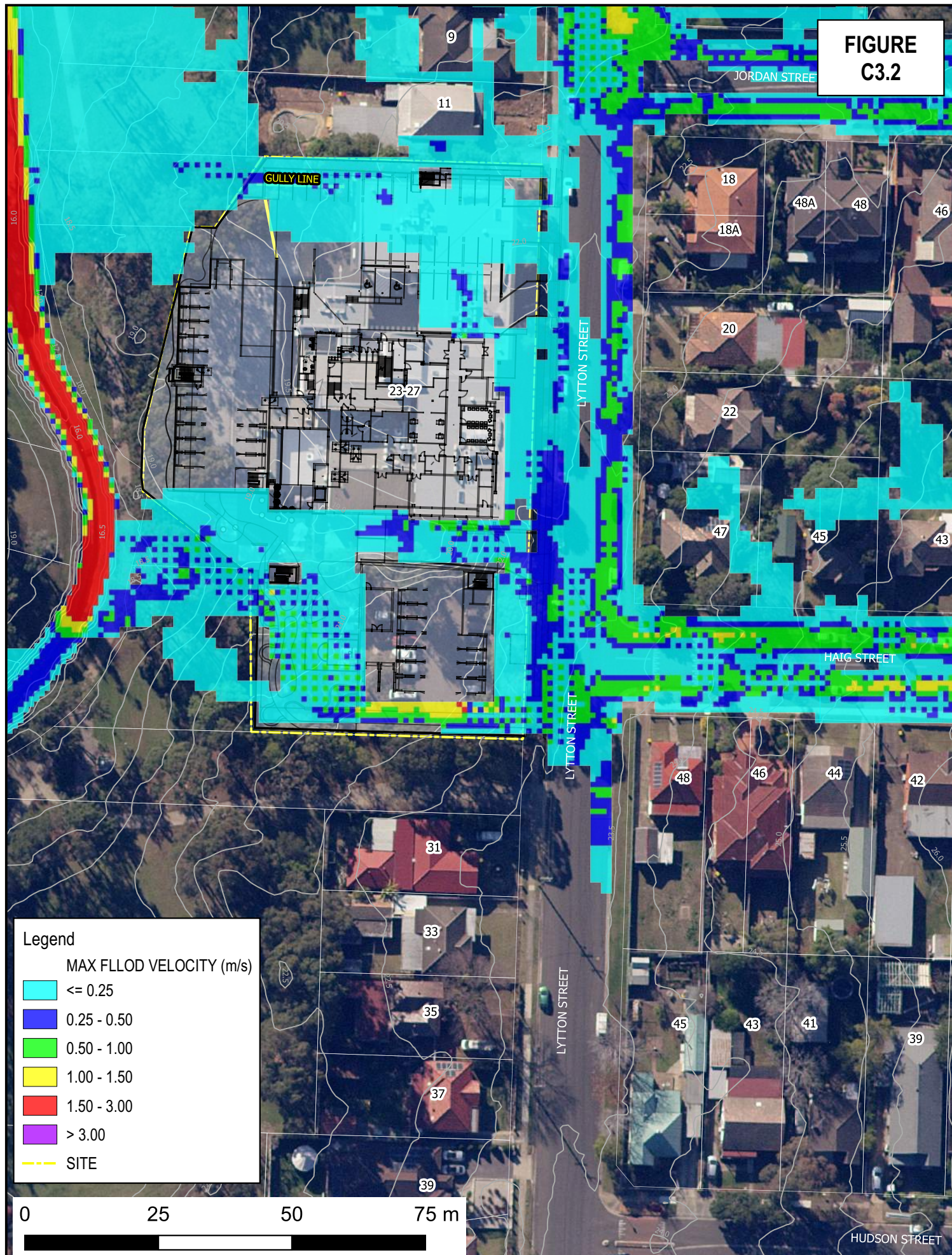
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**FIGURE
C3.2**



1% AEP MAX FLOOD VELOCITY - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



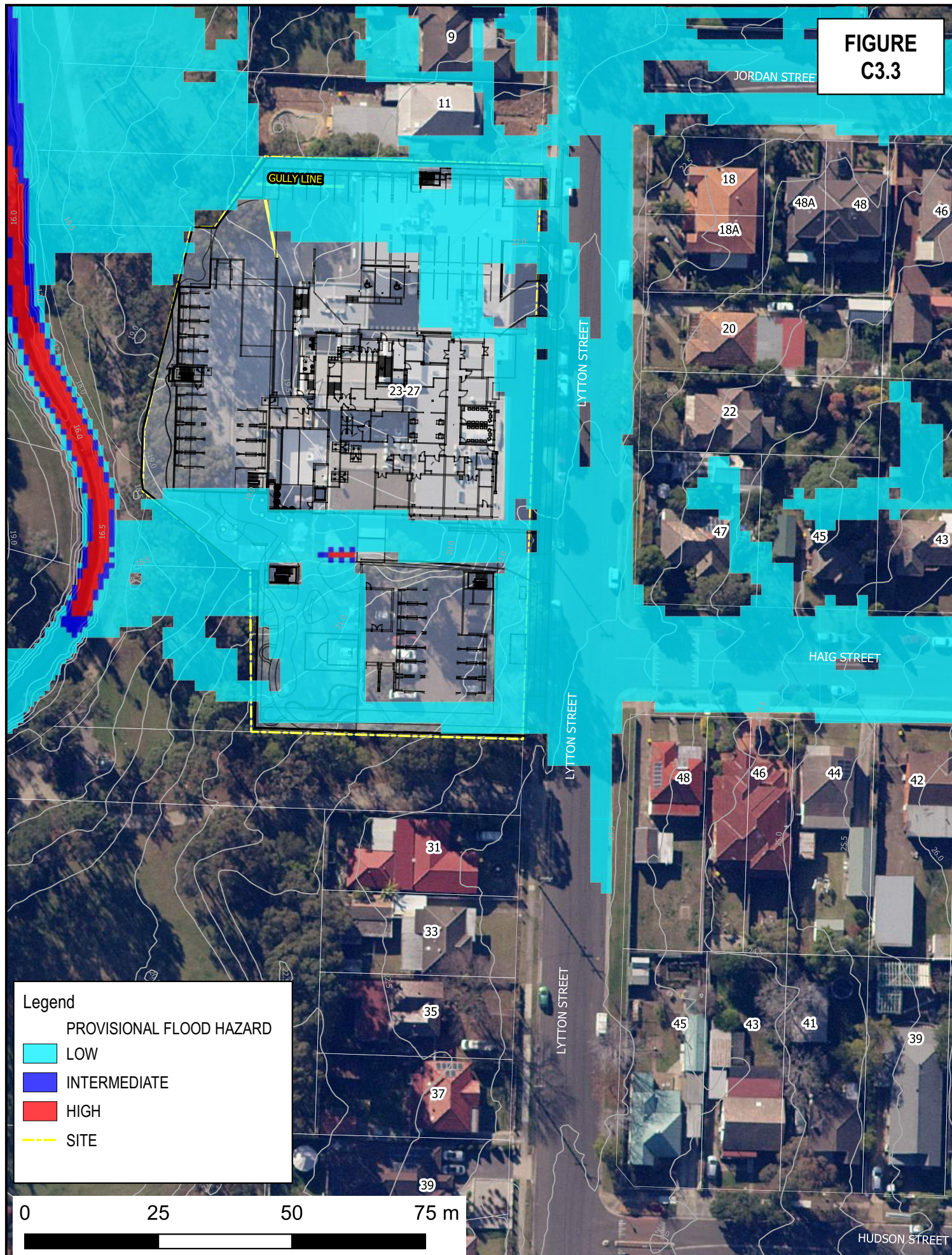
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**FIGURE
C3.3**



1% AEP MAX FLOOD HAZARD - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



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**FIGURE
C4**



1% AEP MAX FLOOD AFFLUX - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



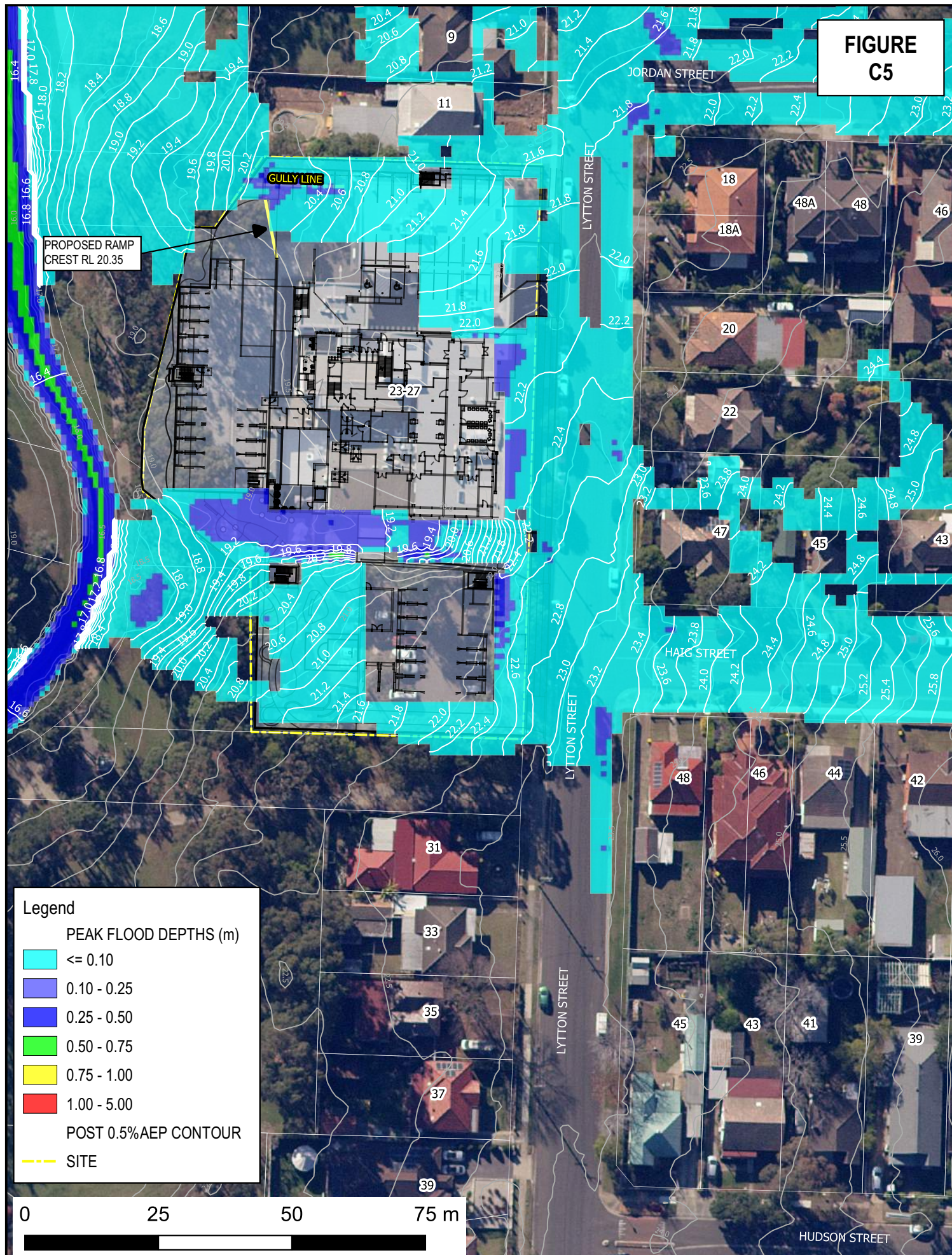
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**FIGURE
C5**



0.5% AEP MAX FLOOD DEPTHS AND LEVELS - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW210629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



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**FIGURE
C5.1**



0.5% AEP MAX FLOOD AFFLUX - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



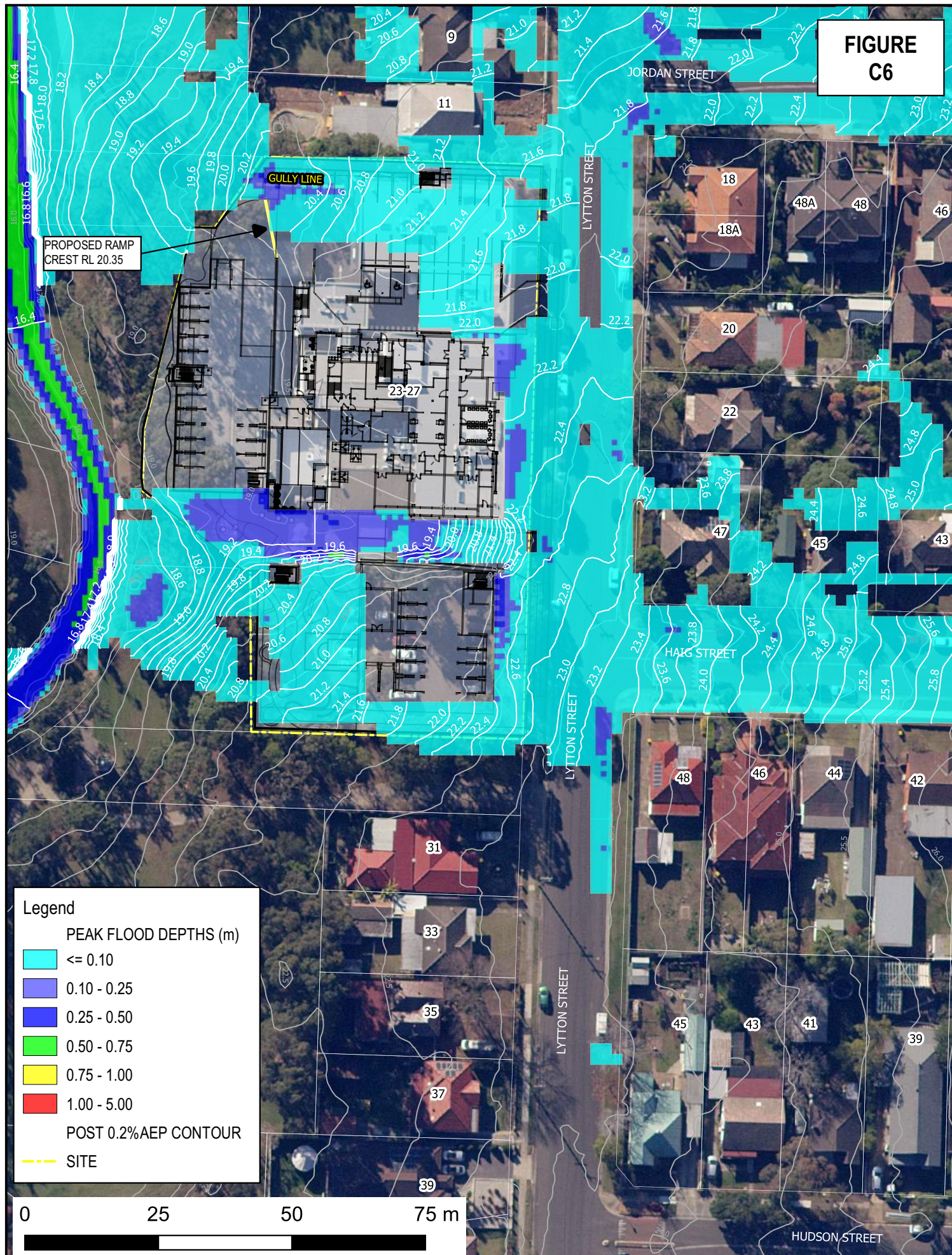
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**FIGURE
C6**



0.2% AEP MAX FLOOD DEPTHS AND LEVELS - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



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**FIGURE
C6.1**



0.2% AEP MAX FLOOD AFFLUX - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



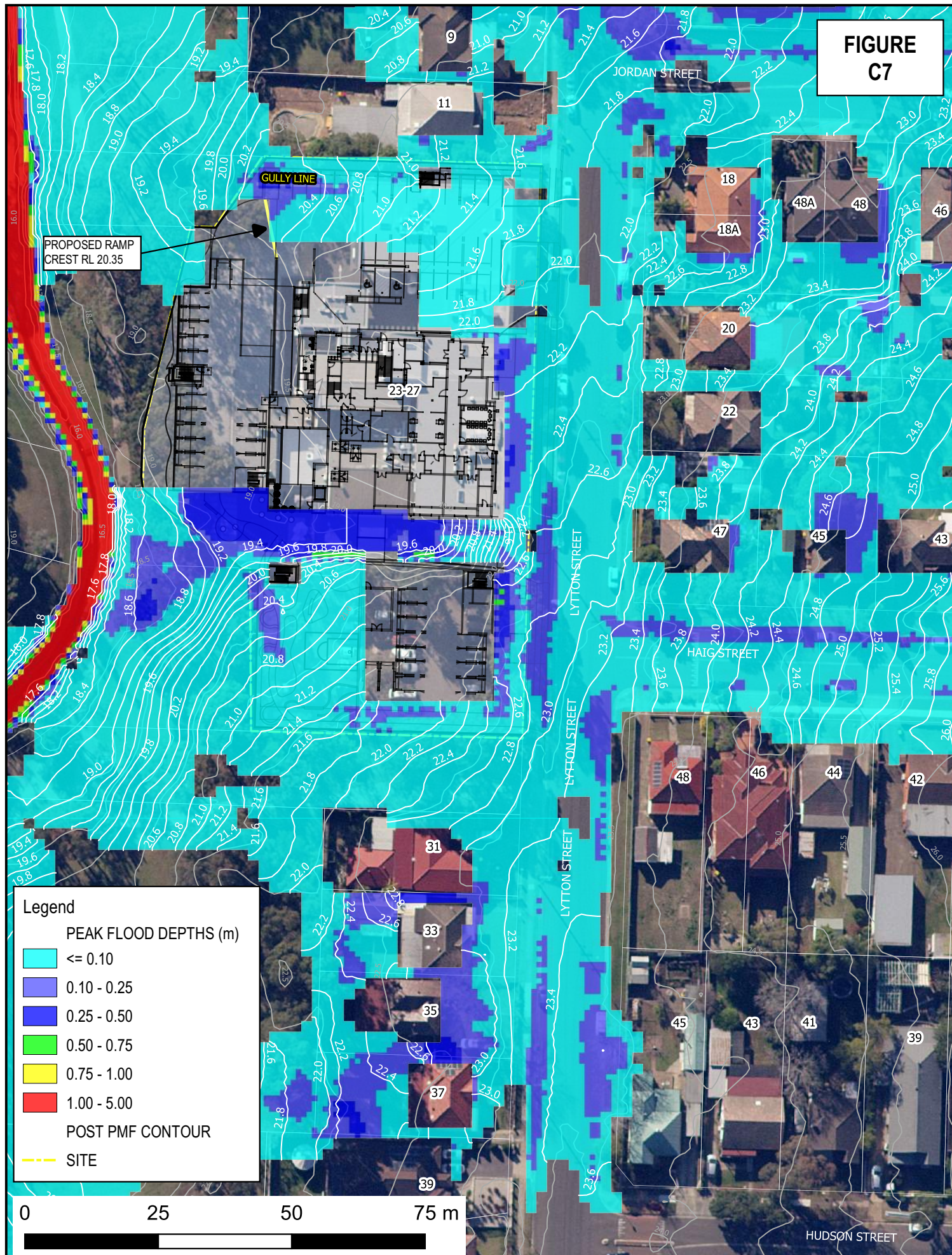
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**FIGURE
C7**



PMF MAX FLOOD DEPTHS AND LEVELS - POST DEVELOPMENT

PROJECT: NORTHSIDE WEST CLINIC FLOOD STUDY - NSW201629
LOCATION: 23-27 LYTON STREET, WENTWORTHVILLE

PREPARED BY ACOR CONSULTANTS PTY LTD



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APPENDIX D

Council Flood Advice Letter



CUMBERLAND
CITY COUNCIL

Ref: EC2022/0440

31 May 2022

Acor Consultants Pty Ltd
Level 1
10/1 Maitland Place
BAULKHAM HILLS NSW 2153

Dear Sir/Madam,

Subject: Flood Levels at 23-27 Lytton Street WENTWORTHVILLE NSW 2145,
Lot 1 DP 787784
Application No: EC2022/0440
Property: 23-27 Lytton Street WENTWORTHVILLE NSW 2145,

Council refers to your request dated 21 April 2022 requesting flood information at the above property.

The above property is shown to be affected by the 1% Annual Exceedance Probability (AEP) flood, according to the information available to Council from the "Finlaysons Creek Overland Flood Study" prepared by Lyall & Associates Consulting Water Engineers in June 2017.

The 1% AEP flood level refers to a flood which has a 1% chance of being equalled or exceeded in any one year and this site has been assessed as a medium flood risk. It should be noted that a flood could occur that is more severe than the 1% AEP flood at any time.

The maximum 1% AEP flood level relevant to the subject property has been determined (see the attached plan) to Australian Height Datum (AHD) as follows:

- | | | |
|-------------------|---|-----------|
| 1. At location A | - | 22.6 mAHD |
| 2. At location B | - | 22.2 mAHD |
| 3. At location C | - | 21.8 mAHD |
| 4. At location D | - | 21.4 mAHD |
| 5. At location E | - | 21.0 mAHD |
| 6. At location F | - | 20.6 mAHD |
| 7. At location G | - | 20.2 mAHD |
| 8. At location I | - | 19.8 mAHD |
| 9. At location J | - | 19.4 mAHD |
| 10. At location K | - | 19.1 mAHD |
| 11. At location L | - | 18.6 mAHD |

The subject property has been identified as Flood Control lot. Under the SEPP (Exempt & Complying Development) 2008 Regulation 3.5(1), a Complying Development Certificate must not be issued for, "Development under this code must not be carried out on any part of a flood control lot, other than a part of the lot that the council or a professional engineer who specialises in hydraulic engineering has certified, for the purpose of the issue of the relevant complying development certificate, as not being any of the following:

16 Memorial Avenue, PO Box 42, Merrylands NSW 2160
T 02 8757 9000 E council@cumberland.nsw.gov.au W cumberland.nsw.gov.au
ABN 22 798 563 329

Welcome *Belong* Succeed

- a) a flood storage area,
- b) a floodway area,
- c) a flow path,
- d) a high hazard area,
- e) a high risk area

Council has determined that part of the flood control lies in one of the five items above – item c; therefore, a CDC cannot be issued on this site. The identified flood items are represented by the darker area within the 1% AEP flood extent on the attached map. If the development is proposed within any part of this zone (dark blue area), a pre and post flood study must accompany the Development Application. Alternatively, if the development is proposed within the uncoloured and/or light blue areas (flood fringe zone), a CDC may be considered for this site. However, the surface flows must not be impeded (blocked) and the redevelopment shall allow the free movement of the flood around any proposed structure(s).

In all cases, flood level on adjacent properties shall not be increased. Supporting documentation is to accompany the development.

Minimum habitable floor levels shall be 0.5m above the flood level at the upstream side of the structure. Minimum non-habitable floor levels (garages, laundry, sheds, etc.) shall be 0.15m above the flood level at the upstream side of the structure. Interpolation between flood levels is allowed.

The relationship between these levels and the ground surface may be determined by a survey of the property undertaken by a Registered Surveyor.

It should be noted that where the development or redevelopment of the property is proposed, reference should be made to the relevant Development Control Plan with regard to flooding and drainage issues. Please include a copy of this letter and map with any Development Application that you may lodge with Council for the subject site.

For modelling purposes, the models (pre and post development flood study) shall be calibrated to Council's 1%AEP Flood levels (or interpolated levels) at least 10 metres upstream and downstream from the property boundaries.

Note:

The brown shaded area on the attached Map represents the flood waters with a depth of flow less than 100mm and does not attract any flood controls. It is presented on the flood map to show the continuity of flooding within the area. However, if development occurs within the brown areas, the structure shall not impede or divert flows to adjacent properties.

Flood levels are not static due to changing circumstances (e.g., revision of the flood model) and accordingly the above flood level is only valid for one year from the above date.

Should you have any enquiries regarding this matter, please contact me on 8757 9512 during normal business hours, Monday to Friday.

Yours sincerely,



Rajan Rajarajan
EXECUTIVE ENGINEER STORMWATER & INFRASTRUCTURE DESIGN

