Floodplain Management Report

for

2 – 44 O'Connell Street, Kingswood NSW 2747

for TAFE NSW

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Contents

Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Airborne Laser Survey (LiDAR)
ARI	Average Recurrence Interval
BoM	Bureau of Meteorology
DCP	Development Control Plan
EY	Exceedances Per Year
FERP	Flood Emergency Response Plan
FPL	Flood Planning Level
LGA	Local Government Area
LiDAR	Light Detection and Ranging (also see ALS)
m	Measure of length / height / distance (metres)
m AHD	Meters above Australian High Datum
m/s	Measure of velocity (metres per second)
m^3/s	Measure of flow rate (cubic metres per second)
OSD	On-Site Detention
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSD	Permissible Site Discharge
PCC	Penrith City Council (Council)
SES	NSW State Emergency Service
TUFLOW	A 1D and 2D hydraulic modelling software
DRAINS	A 1D hydrological and hydraulic model

1. Introduction

This report has been prepared to accompany a detailed State Significant Development Application (SSDA) SSD_ 8571481 for the development of an educational facility at the TAFE Nepean Kingswood Campus, located at 2-44 O'Connell Street, Kingswood (the site). The legal description of the site is Lot 1 in DP 866081. The site comprises a rectangular lot with an area of approximately 23 hectares.

The purpose of this report is to estimate the flood behaviour across the site and the flood risks and potential mitigation measures of the proposed development in response to the SEARs and Penrith City Council requirements.

Specifically, the SSDA seeks development consent for the construction and operation of the TAFE NSW Construction Centre of Excellence (TAFE CCoE) a multi-level, integrated educational facility designed to accommodate specialised training and education for construction-related TAFE NSW courses (the project). The TAFE CCoE will be a new learning environment with an emphasis on flexibility and adaptability, to encourage cross-disciplinary collaboration, industry engagement and educational excellence. On 27 February 2019, the NSW Government announced the delivery and associated funding for the CCoE.

The proposed development is classified as State Significant Development (SSD) on the basis that it falls within the requirements of clause 4, Schedule 19 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP), being 'development for the purpose of a tertiary institution… that has a capital investment value of more than $30 million'.

The Minister for Planning, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, Industry and Environment (NSW DPIE) for assessment.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) issued for the project. Specifically, this report has been prepared to respond to the following SEARs:

SEARS	Report Section
• 21. Flooding • Identify flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (DIPNR, 2005) and Council flood studies, including the potential effects of climate change, sea level rise and an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation.	• Refer to Section 7 of this report. 1. Flood considerations have been outlined in the Floodplain Management Measures Section of this report. Effects of Climate change have been discussed and addressed. 2. Design solutions for mitigation have been provided.

2. Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Civil Engineering Concept Design Report prepared by Northrop Consulting Engineers dated 2 November 2020 (ref SY202025 01-CR01 Rev 3).
2. Concept Engineering Plans prepared by Northrop Consulting Engineers dated 12 November 2020 (ref SY202025 SKC01.06 Rev 01).
3. Concept Engineering Plans prepared by Northrop Consulting Engineers dated 29 January 2021 (ref SY202025 DAC01.01 to DAC04.24).
4. College, Orth and Werrington Creeks Catchment Overland Flow Flood Study prepared by Catchment Simulation Solutions on behalf of Penrith City Council dated June 2017. The study and associated figures are available from Council's website.

3. Subject Site and Proposed Development

3.1 Subject Site

The Western Sydney Construction Hub is located at the TAFE NSW Kingswood Campus, in the suburb of Kingswood within the Penrith City Council Local Government Area (LGA). The site is located at 2-44 O'Connell Street, Kingswood otherwise known as Lot 1 in Deposited Plan (DP) 866081. This site is bound by the Great Western Highway to the north, the Western Sydney University, Werrington Campus to the east, Residential Properties to the south and O'Connell Street to the west. Figure 1 presents an aerial overview of the subject site in its current state.

Figure 1 – Areal Overview of Subject Site (Obtained from SIX Maps: https://maps.six.nsw.gov.au/)

3.2 Proposed Development

The proposed construction hub is to be located along the western boundary of the site, as presented in the concept architectural site plan prepared by Gray Puksand. An extract of the most recent site plan is depicted in Figure 2.

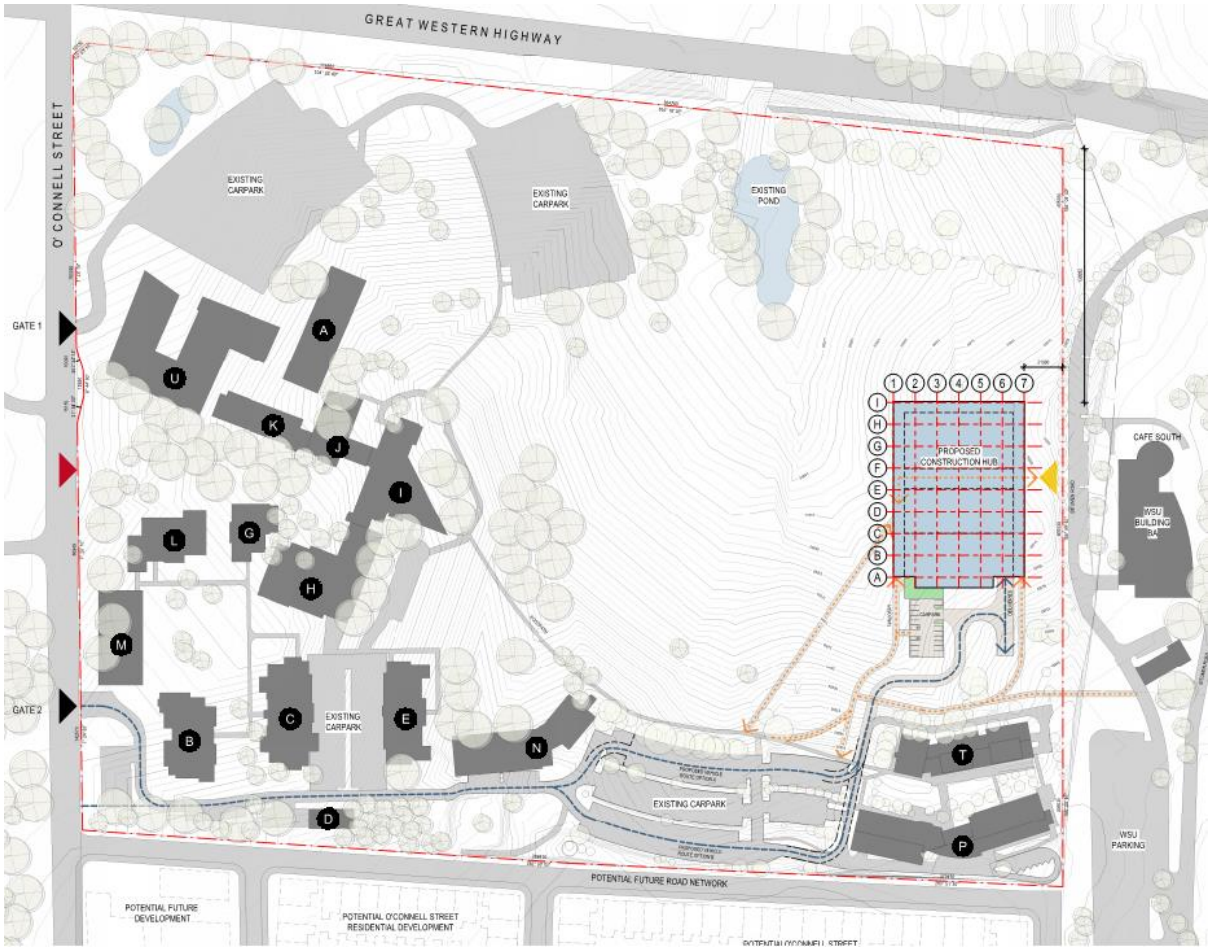

Figure 2 – Proposed Site Plan (Gray Puksand)

The proposed development includes a new construction hub building with additional carparking facility and access road. Additional pedestrian links will also be included as well as additional retaining walls to facilitate the finished design levels.

4. Council Requirements

A meeting was held with Penrith City Council on 2 February 2021 to discuss a range of planning and engineering items. Council's development assessment engineers provided comment that the subject site is affected by flooding controls, and noted that this was primarily due to the flooding that occurs in the proximity of the existing dam/ pond. As the development is located outside of the flood control area, they advised that it would be sufficient to demonstrate that the building is not impacted by the flooding in the proximity of the dam, and any in-ground stormwater system and overland flow paths are suitably designed to convey flow around the proposed development.

A complete summary of the Council requirements have been obtained from Penrith City Council's Development Control Plan (DCP) 2014 and the applicable requirements are summarised below in Table 1. Also presented in Table 1 is a summary of the response for the purposes of this submission.

Table 1 – Council requirements

Item	Reference Clause and Document	Requirement	Response
Submission for DA	• Penrith City Council DCP Chapter 3.5 Section C, Clause 1a)	• Where relevant, a comprehensive flood study incorporating the following is to be submitted with any development application on land identified as fully or partially flood affected: 1. A survey of the main watercourse; 2. A survey of the site; and 3. A detailed flood and drainage investigation which establishes the 1% AEP flood level.	• Refer to Section 7 of this report: 1. Presented in the Detailed Survey. 2. As above. 3. Discussed in the Flood Management Measures Section of this report (Section 6).

Item	Reference Clause and Document	Requirement	Response
Flood Effects	• Penrith City Council DCP 2014 Chapter 3.5, Section C, Clause 1b)	1. The development will not increase the flood hazard or risk to other properties. 2. The structure of the proposed building works shall be adequate to deal with flooding situations. 3. The proposed building materials are suitable. 4. The buildings are site in the optimum position to avoid flood waters and allow safe flood access for evacuation. 5. The proposed redevelopment will not expose any resident to unacceptable levels of risk or any property to unreasonable damage. 6. Compliance with any existing buildings within the *Standard – Construction of Buildings in Flood Hazard Area* and the accompanying handbook developed by the Australian Building Codes Board (2012).	• Refer to the Section 7 of this report: 1. The flood effects assessment concludes the development does not create any significant adverse impacts on adjacent properties. 2. The structure of the proposed building works will be designed to withstand the relevant flooding situations by the Structural Engineer prior to construction. 3. The proposed building will consist of materials able to withstand the effects of immersion below the 1% AEP Flood Level + 500mm freeboard. 4. The proposed building has been situated in a suitable location on site that, with appropriate stormwater infrastructure, will avoid flood waters and enable safe refuge and evacuation. 5. Not applicable. 6. Not Applicable.
Flood Hazard Classifications	• Penrith City Council DCP 2014 Chapter 3.5, Section C, Clause 2a).	1. New Development located outside of floodway's or in high hazard areas.	• Refer to Section 7 of this report: 1. The development footprint has been located outside of areas classified as floodway or high hazard.

Item	Reference Clause and Document	Requirement	Response
Industrial & Commercial Development	• Penrith City Council DCP 2014 Chapter 3.5, Section C, Clause 6.	1. Floor Levels shall be at least 0.5m above the 1% AEP flood or the buildings shall be flood-proofed to at least 0.5m above the 1% AEP Flood. 2. Flood safe access and emergency egress shall be provided to all new developments.	• Refer to Section 6 and 7 of this report. 1. The flood level is above the 1% AEP flood plus 500mm freeboard. 2. Refuge above the PMF is available in the upper levels of the facility with the building to be certified by a structural engineer at construction documentation phase to withstand flood forces up to and including a PMF event.
Storage of Potential Pollutants above 1% AEP Flood	• Penrith City Council DCP 2014 Chapter 3.5, Section C, Clause 12.	1. All potential pollutants that are stored or detained on-site (such as effluent treatment plans, pollutant stores or on-site water treatment facilities) are to be stored above the 1% AEP Flood.	• Refer to Section 7 of this report. 1. All potential pollutants will be stored within the proposed building which will have a floor level above the 1% AEP Flood.
Overland Flow Flooding	• Penrith City Council DCP 2014 Chapter 3.5, Section C, Clause 13.	1. Development is not to obstruct overland flow paths and the applicant is to demonstrate that any overland flow is maintained for the 1% AEP. A merit based approach will be taken when assessing development applications that affect the overland flow.	• Refer to Section 7 of this report. 1. Proposed development does not obstruct overland flow paths by providing stormwater infrastructure to capture and divert stormwater runoff around the development with minimal impacts on the upstream and downstream flood behaviour.

Item	Reference Clause and Document	Requirement	Response
Filling of Land at or Below the Flood Planning Level	• Penrith City Council DCP 2014, Chapter 3.5 Section C, Clause 14.	1. Flood Levels are not increased by more than 0.1m by the proposed filling. 2. Downstream velocities are not increased by more than 15%. 3. The potential for cumulative effects of possible filling proposals in that area is minimal. 4. There are alternative opportunities for flood storage. 5. The development potential of surrounding properties is not adversely affected by the filling proposal. 6. The flood liability of building on surrounding properties is not increased. 7. No local drainage flow/ runoff problems are creased by the filling. 8. The filling does not occur within the drip line of existing trees.	• Not Applicable for this development.

Item	Reference Clause and Document	Requirement	Response
SEARs Assessment Requirements	• SEARs Letter – Application Number SSD-8571481	1. Identify flood risk on-site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (DIPNR, 2005) and Council flood studies, including the potential effects of climate change, sea level rise and an increase in rainfall intensity. 2. If there is a material flood risk, include design solutions for mitigation.	• Refer to Section 7 of this report. 1. Flood considerations have been outlined in the Floodplain Management Measures Section of this report. Effects of Climate change have been discussed and addressed. 2. Design solutions for mitigation have been provided.

5. Existing Flood Behaviour

5.1 Previous Flood Studies

Penrith City Council has previously prepared the College, Orth and Werrington Creeks Catchment Floodplain Risk Management Study which incorporates the subject site.

Figure 3 and Figure 4 present the Flood Planning Area and Peak Design Floodwater Levels for the 1% AEP Flood for the subject site from the results of the study.

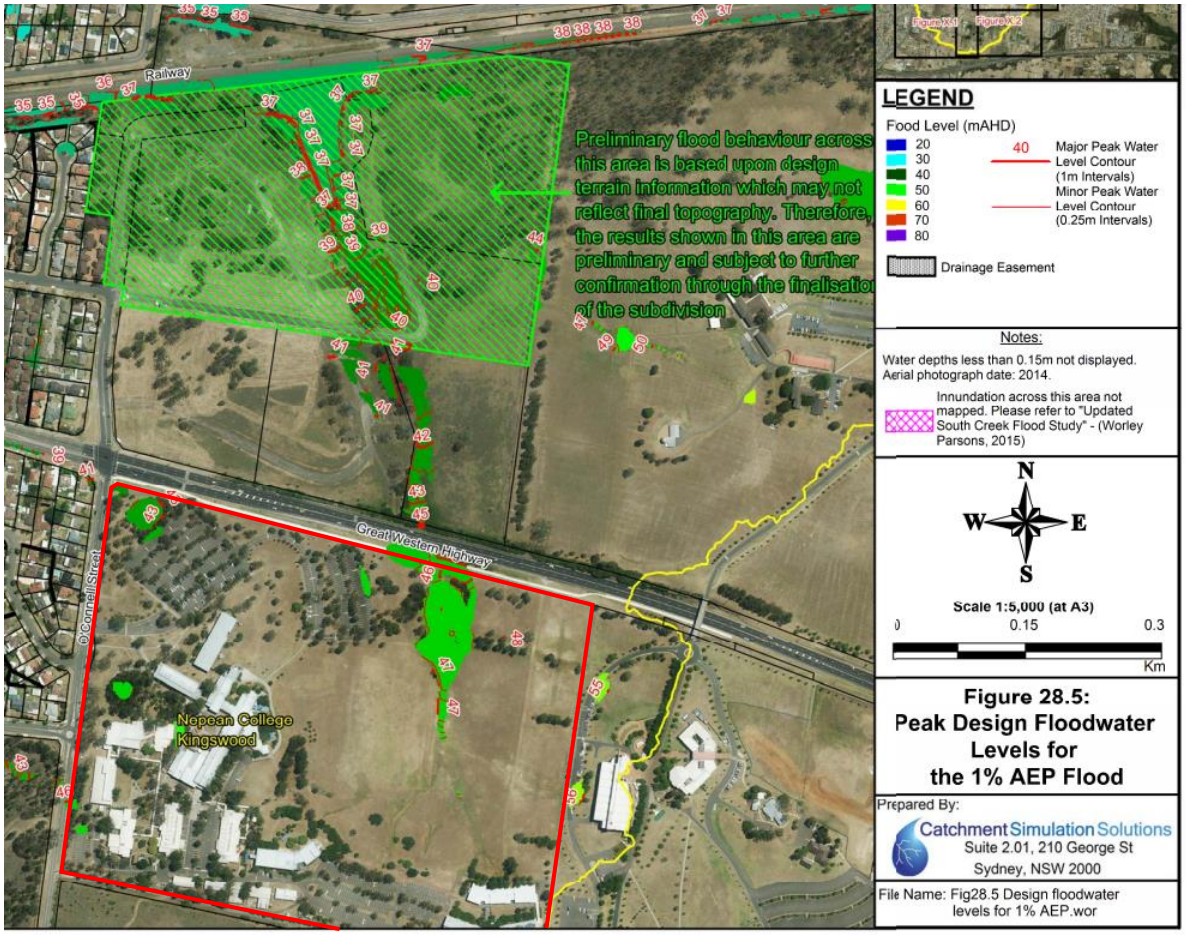

Figure 3 – Peak Design Floodwater Levels for the 1% AEP Flood (Figure 28.5 – College, Orth and Werrington Creeks Catchment Floodplain Risk Management Study)

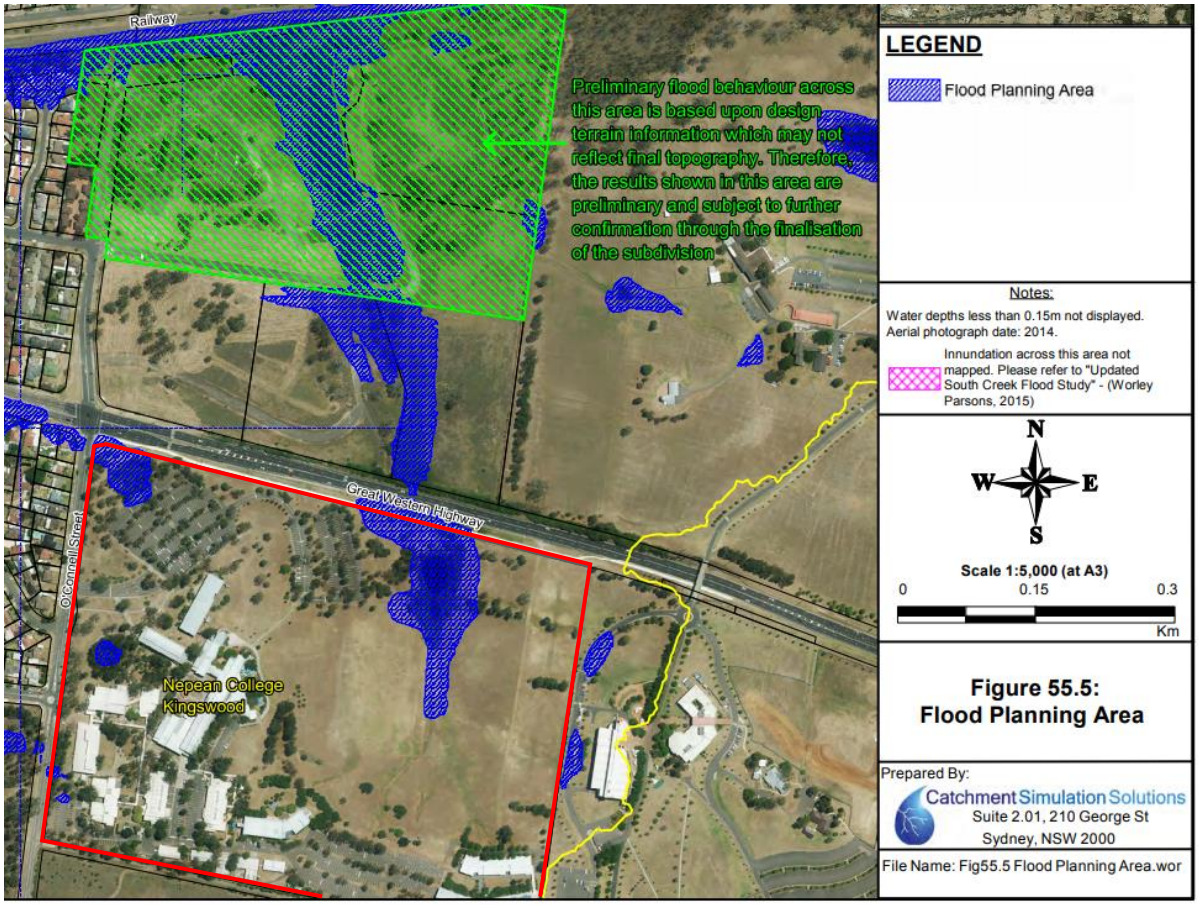

Figure 4 – Flood Planning Area (Figure 55.5 - College, Orth and Werrington Creeks Catchment Floodplain Risk Management Study)

It can be observed that the location of the proposed development does not lie within the extent of the nominated flood planning area, which is confined primarily to the existing pond towards the north.

It is also observed that two small areas along the eastern boundary have also been identified as flood affected, which is attributed to the local surface grading creating sag low points in the topography.

One limitation of the existing flood study is that all water depths less than 0.15m have been excluded from the figures, which can often omit areas which are affected by shallow surface overland flow.

5.2 Flood Modelling

A 2D TUFLOW flood model was developed to determine the flood behaviour for the subject site and to enable assessment of appropriate floodplain management measures.

A hydrological model was developed using the runoff-routing software DRAINS utilising an initial and continuing loss hydrologic model as outlined by the ARR2019 procedures with associated rainfall data obtained from the Bureau of Meteorology.

The subject area was divided into sub-catchments, with the runoff hydrograph from each sub-catchment input into a 2D TUFLOW hydraulic model. A 1m grid cell size was selected to balance the accuracy of the model with the computation times. Storm events representing the 5% AEP, 1% AEP, 1 in 200 AEP and PMF were included in the model for the existing and developed case scenarios.

The developed case scenario was adopted based on an iteration of the concept civil sketch plan which can be found in Appendix A. The proposed layout is yet to be finalised and may be subject to further changes. The purpose of the developed case scenario is to assess the flood impacts of the development and determine appropriate flood management measures. The latest iteration of the site layout and concept civil design has been provided in Appendix C.

The TUFLOW model definition, site topography and sub-catchments can be found in the Flood Figures 1-6 in Appendix B. The flood depth and elevation as well as the hydraulic hazard category for each storm event is presented in the Flood Figures A1 – D4 in Appendix B.

From the results, it is observed that the overland flow traverses the site from upstream catchments to the east and south of the proposed building location. The flow behaviour in the existing case is primarily sheet flow with depths less than 100mm, with minor amounts of concentrated flow within a grass swale and local depressions. The flood behaviour across the subject site is categorised as flood hazard category H1 in accordance with the ARR guidelines (this is the lowest category).

For the determination of the 1% AEP flood planning level the following criteria was adopted to differentiate between flooding for the purposes of the Floodplain Development Manual and surface stormwater drainage:

- Significant areas of surface ponding or stormwater flows in excess of 150mm depth.
- Significant areas of surface flows that would result in a hazard category greater than category H1.

Based on the above criteria, the 1% AEP flood level can be observed in the channel upstream of the existing dam at approximately 47.65m AHD. This level is generally consistent with that observed in the College, Orth and Werrington Creeks Flood Study.

It is noted that the above level is the nominated 1% AEP flood level for the purposes of meeting the design intent of the Floodplain Development Manual. The full extent of the 1% AEP flood levels can be observed in Flood Figures A1 to D4 in Appendix B.

This design approach in relation to the flood level is consistent with the initial advice provided by Council during the meeting on the 2nd February 2021.

6. Floodplain Management Measures

6.1 Flood Effects

The proposed development does not significantly increase the flood hazard or risk to other properties in the 1%AEP. A 200mm increase is calculated in the sag pit located to the east and this does not increase the overall hazard category in this location. Furthermore, it is noted this area is subject to further design with respect to level interface.

The development will incorporate a new stormwater system that will capture and convey the 1% AEP peak flows from the upstream catchment around the proposed development and discharge upstream of the existing pond. Emergency overland flow paths will be incorporated to supplement the underground system and direct water around the proposed building in the event of pit or pipe blockage.

It was also observed that overland flow from the southern upstream catchment was not captured by the stormwater system and spilled toward the access road and a trapped low point.

Recommendations for mitigation measures are presented in Section 7.

6.2 Floor Levels

The floor level for the development is currently proposed at 51.70m AHD. The 1% AEP flood planning level has been nominated at 47.65m AHD as outlined in the Section 5 of this Report. Thus, the proposed development meets the requirement to be above the 1% AEP flood level with 500mm freeboard.

The overland flow from the stormwater system and diversion will be suitable designed during the detailed design stage to ensure adequate freeboard is provided to the floor level, consistent with the level of risk from the runoff generated.

6.3 Building Components

The building is of robust construction, and all structural components will be flood compatible. Similarly, due to the type of building, it is expected flood forces, debris, impact loading and buoyance will not be limiting in the design. This will be confirmed by the structural engineers prior to construction documentation.

6.4 Safety and Evacuation

The proposed development will provide adequate refuge above the PMF level on the upper levels of the development. The duration of the storm event is expected to be short, with isolation expected for less than an hour.

The building is to be designed to withstand flood forces and debris impact in the PMF to facilitate this approach. This will be confirmed by the structural engineers prior to construction documentation.

6.5 Climate Change

Given the location of the subject site, sea level rise is considered to not have any impact on the flood behaviour. Consideration for an increase in rainfall intensity was undertaken by assessing the 1 in 200 AEP storm events as part of the flood model assessment.

It is observed that the increase in rainfall intensity did not have any significant impact on the flood behaviour observed in both the existing and developed cases.

7. Discussion

As previously discussed, the proposed development is currently in design development and the final site layout is yet to be finalised. The flood modelling and assessment undertaken have identified the flooding behaviour of the site and demonstrated how the objectives can be achieved for an example site layout.

7.1 Potential Mitigation Measures

The following items are key elements that are to be considered as part of future concept and detailed designs.

- Provide an underground stormwater network which adequately captures and conveys runoff from the upstream catchment.
- Make provision for secondary overland flow routes for the two main upstream catchments (i.e. the eastern and southern catchments), in the event of blockage for the pit and pipe network. It is recommended that the eastern catchment is directed towards the north to avoid increasing the associated risks of flooding within the southern carpark and loading dock areas. It is noted that the eastern upstream catchment has a peak flow rate of approximately 0.88m^3/s, whilst the southern upstream catchment has a peak flow rate of 1.36m^3/s in the 1% AEP storm event.
- Provide adequate freeboard to the proposed floor level to any expected ponding, or overland flow paths within the loading dock area. This can be achieved by lowering the loading dock pavement levels, raising the proposed floor level of the building or by providing a waterproof hob to the required height along the interface to the building. A suitable freeboard allowance is to be adopted during the detailed design based on the amount of stormwater runoff expected, and a risk assessment of the likelihood of the flood level exceeding the design water level.
- Provide adequate kerbs and hobs at the top of retaining walls to ensure stormwater runoff is directed to the pit and pipe network and reduce the likelihood of overland flows overtopping the walls.
- Undertake risk assessment for locations where pedestrian paths of travel are expected to cross significant overland flow paths to minimise risk to life. Suitable responses may include providing inlet pits upstream of pathways or including culverts or walkway bridges to limit overtopping.
- Prepare emergency response documentation to minimise risk to life in the event of flooding. Measures may include cancellation of activities to exclude staff and students from the risk, early evacuation if extreme weather is predicted, or refuge on-site should rainfall have commenced.

7.2 On-Site Detention

Council has provided correspondence advising that on-site detention will not be required for the proposed development as the site is located outside of the defined area requiring OSD as overleaf in Figure 5. The subject site is shown via the blue hatch with mandatory OSD areas highlighted by the red hatch extent.

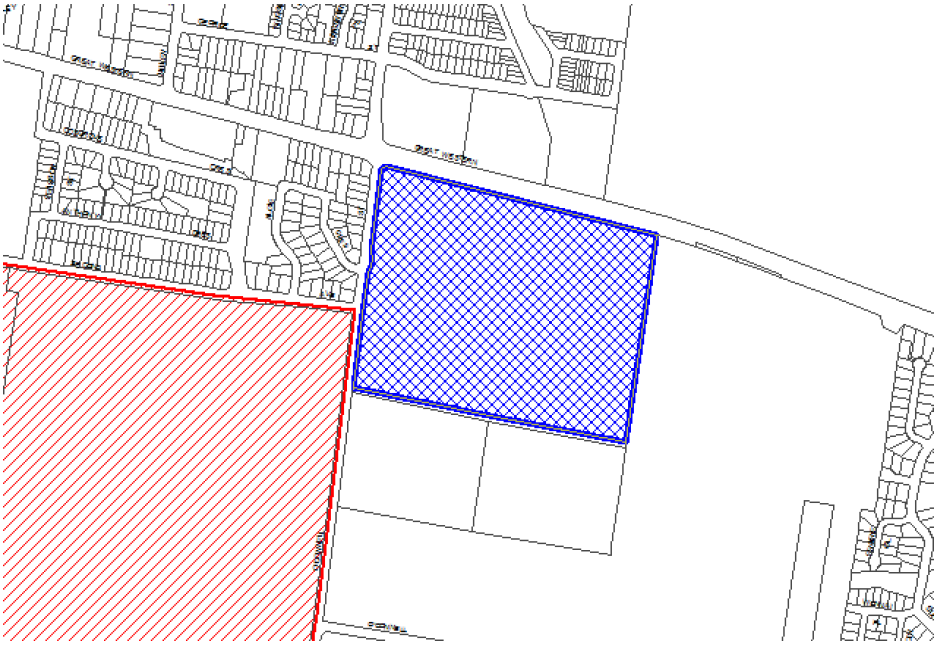

Figure 5 – Mandatory OSD Area (Penrith City Council)

8. Conclusions

Northrop Consulting Engineers were engaged by TAFE NSW to prepare a response to the SEARs and Penrith City Council for the flooding requirements for the proposed Western Sydney Construction Hub at 2-44 O'Connell Street, Kingswood NSW 2747.

It has been presented how the proposed development meets the requirements outlined by Council's DCP as well as addressing the items as identified in the SEARS. Additional discussion and recommendations have been provided to assist with further development of the concept design and detailed design stages.

Limitation statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by TAFE NSW. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

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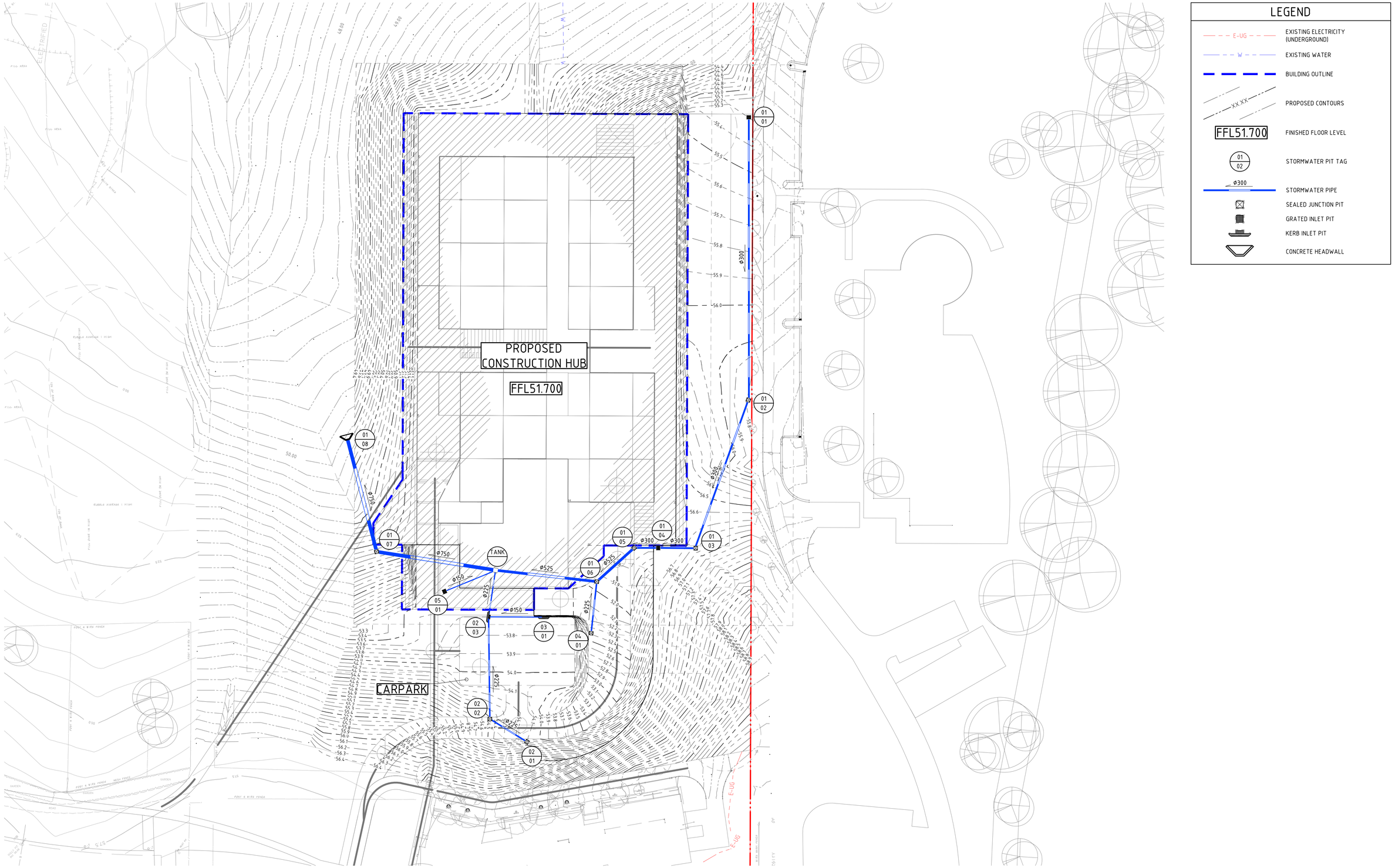
Document Register

Rev	Status	Prepared	Approved	Date
A	Draft	R.Suckling	A. Brien	18 December 2020
B	Test of Adequacy Approval	R. Suckling	A. Brien	11 February 2021

Appendix A – Concept Civil Sketch Plan – (Developed Case Scenario)



LEGEND

- EXISTING ELECTRICITY (UNDERGROUND)
- EXISTING WATER
- BUILDING OUTLINE
- PROPOSED CONTOURS
- FFL51.700 — FINISHED FLOOR LEVEL
- 01 / 02 — STORMWATER PIT TAG
- Ø300 — STORMWATER PIPE
- SEALED JUNCTION PIT
- GRATED INLET PIT
- KERB INLET PIT
- CONCRETE HEADWALL

DRAWN: M. MAI
DESIGNED: J. GILLIGAN
JOB MANAGER: J. GILLIGAN
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR INFORMATION	MM		JG	12.11.20

CLIENT
NSW GOVERNMENT TAFE NSW
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ARCHITECT

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PROJECT
TAFE - WESTERN SYDNEY CONSTRUCTION HUB

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

CONCEPT STORMWATER & GRADING PLAN

JOB NUMBER **202025**
DRAWING NUMBER **SKC01.06** REVISION **01**
DRAWING SHEET SIZE = A1

Plotted By : MICHAEL MAI
Date : 12.11.2020 5:11 PM
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Appendix B – Flood Figures

Legend

Site Boundary

0 300 600 900 Metres

1:15000

Figure 1 - [1]

Locality Plan

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

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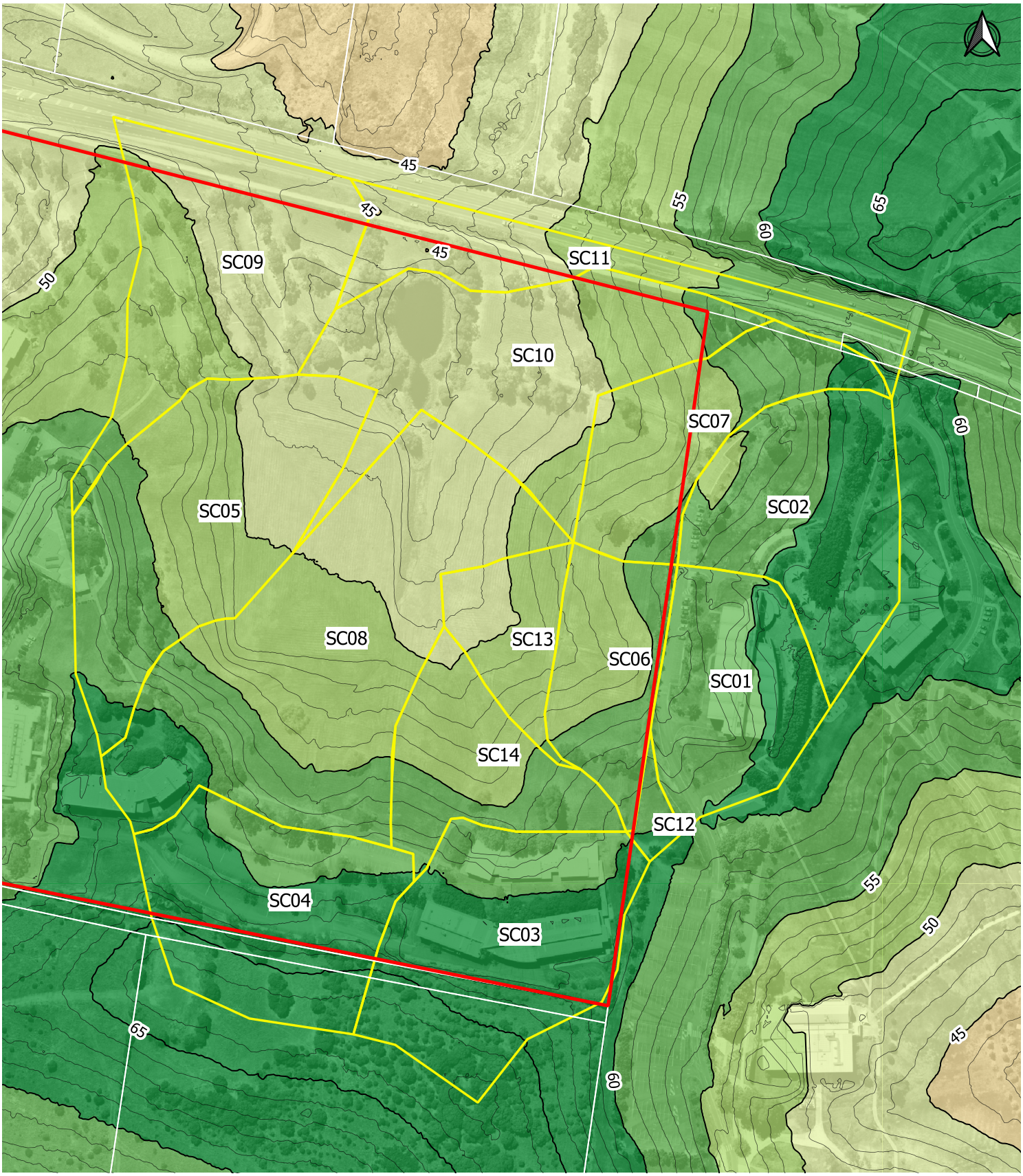

Legend

- Site Boundary
- Catchment
- Minor Contour 1m
- Major Contour 5m

Elevation (AHD)

- < 30m
- 30m - 35m
- 35m - 40m
- 40m - 45m
- 45m - 50m
- 50m - 55m
- 55m - 60m
- > 60m

0 70 140 210 Metres

1:3000

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

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Figure 2 - [1]

Existing Case
Terrain & Catchments

2-44 O'Connell Street
Kingswood NSW
SY202025

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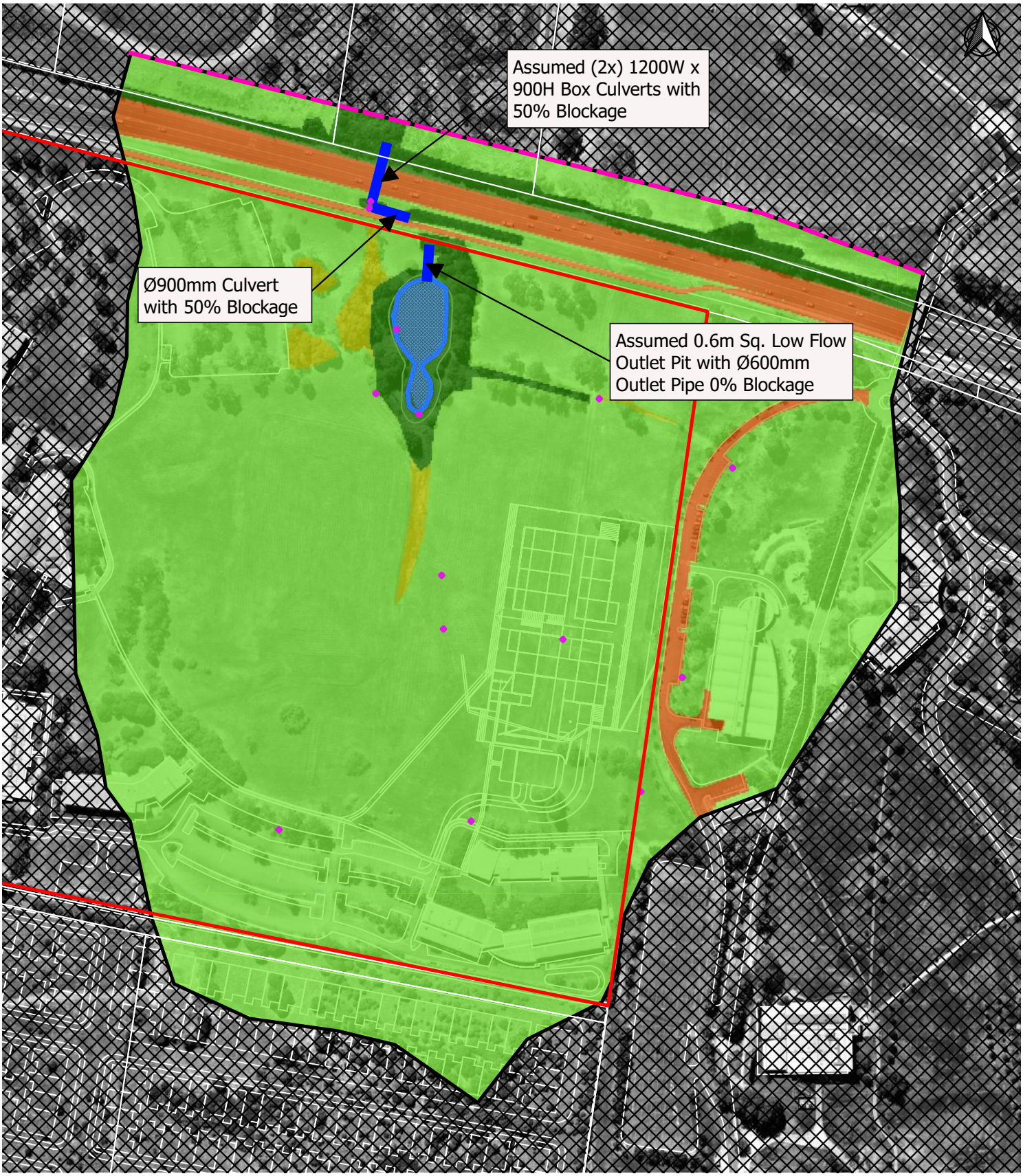

Legend

- Site Boundary
- Hydraulic Structure
- Outlet Boundary
- Water Bodies
- Domain Boundary
- Subcatchment Inlet Boundary

Land Use (Roughness)

- Turf/Grass (0.035)
- Water bodies (0.018)
- Road Pavement (0.020)
- Light Vegetation bushland (0.055)
- Dense Vegetation (0.08)

0 70 140 210 Metres

1:3000

Figure 3 - [1]

Existing Case
TUFLOW Model & Land Use

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

Legend

- Site Boundary
- Catchment
- Minor Contour 1m
- Major Contour 5m

Elevation (AHD)

- < 30m
- 30m - 35m
- 35m - 40m
- 40m - 45m
- 45m - 50m
- 50m - 55m
- 55m - 60m
- > 60m

0 70 140 210 Metres

1:3000

Figure 4 - [1]

Developed Case
Terrain & Catchments

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

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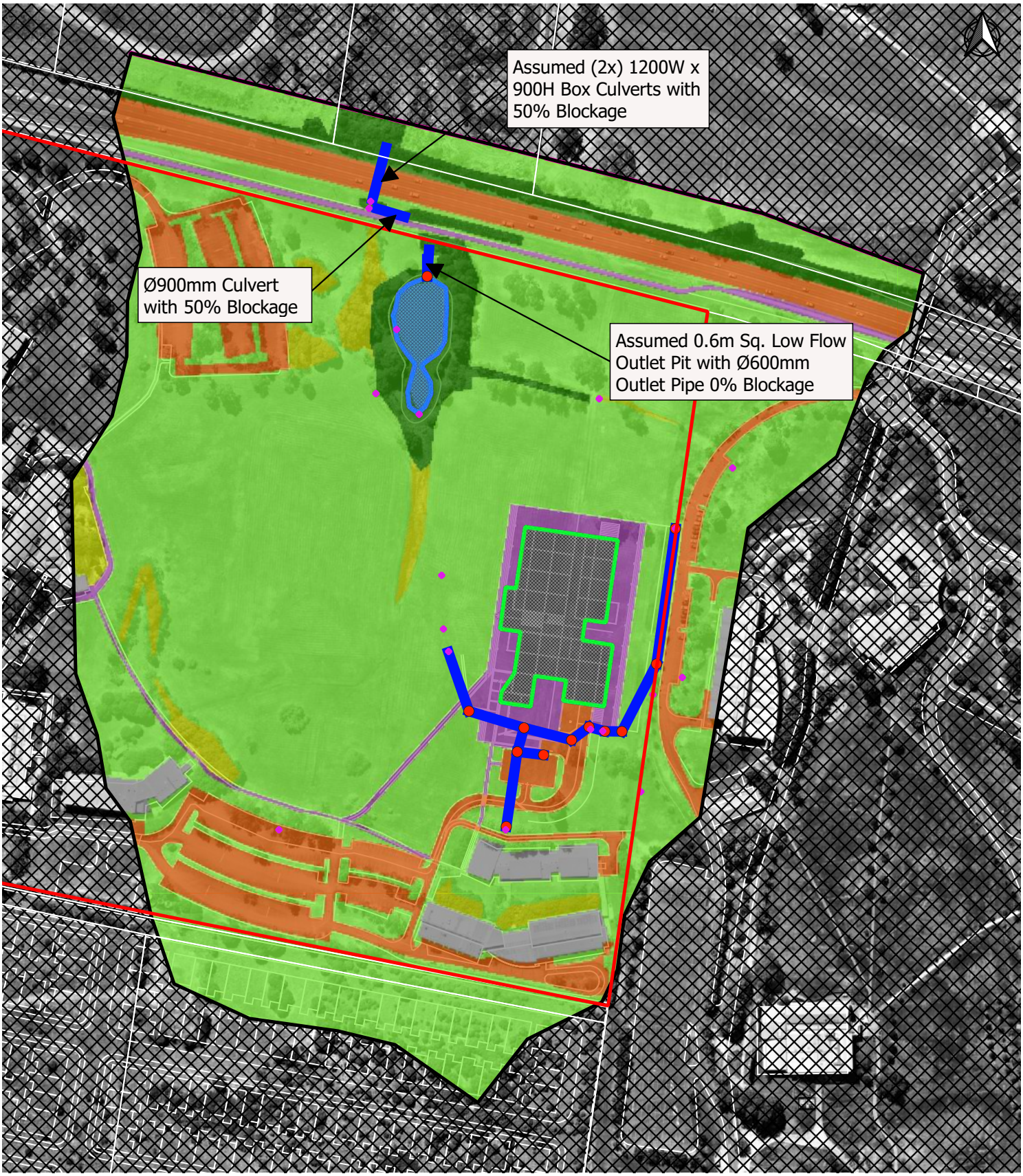


Legend

- Site Boundary
- Hydraulic Structure
- Outlet Boundary
- Water Bodies
- Domain Boundary
- Subcatchment Inlet Boundary
- Stormwater Pit

Land Use (Roughness)

- Turf/Grass (0.035)
- Water bodies (0.018)
- Road Pavement (0.020)
- Light Vegetation bushland (0.055)
- Dense Vegetation (0.08)
- Concrete Pavement (0.015)
- Existing Building (0.300)

0 70 140 210 Metres

1:3000

Figure 5 - [1]

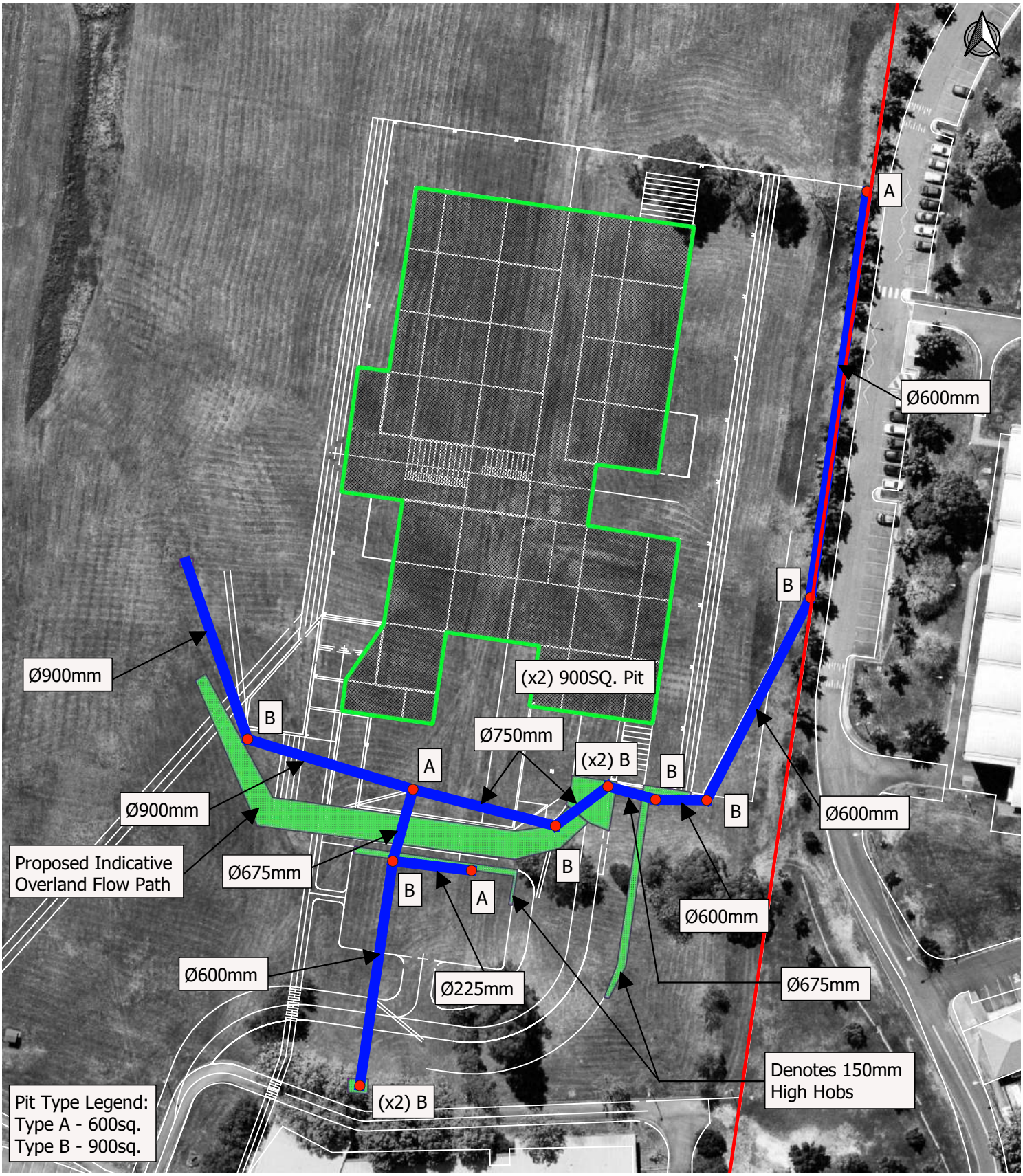
Developed Case
TUFLOW Model & Land Use

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

14/12/2020 X:\PROJECTS\SYDNEY\2020 Jobs\SY202025 - Kingswood Tafe\Figures\Figures.qgzFigures.qgz



Legend

- Site Boundary
- Hydraulic Structure
- Surface Level Adjustment
- Building Extent
- Stormwater Pit

0 20 40 60 Metres

1:1000

Figure 6 - [1]

Developed Case
TUFLOW 1D Hydraulic Network

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

Legend

- Site Boundary
- Existing 5% AEP 1m
- Existing 5% AEP 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

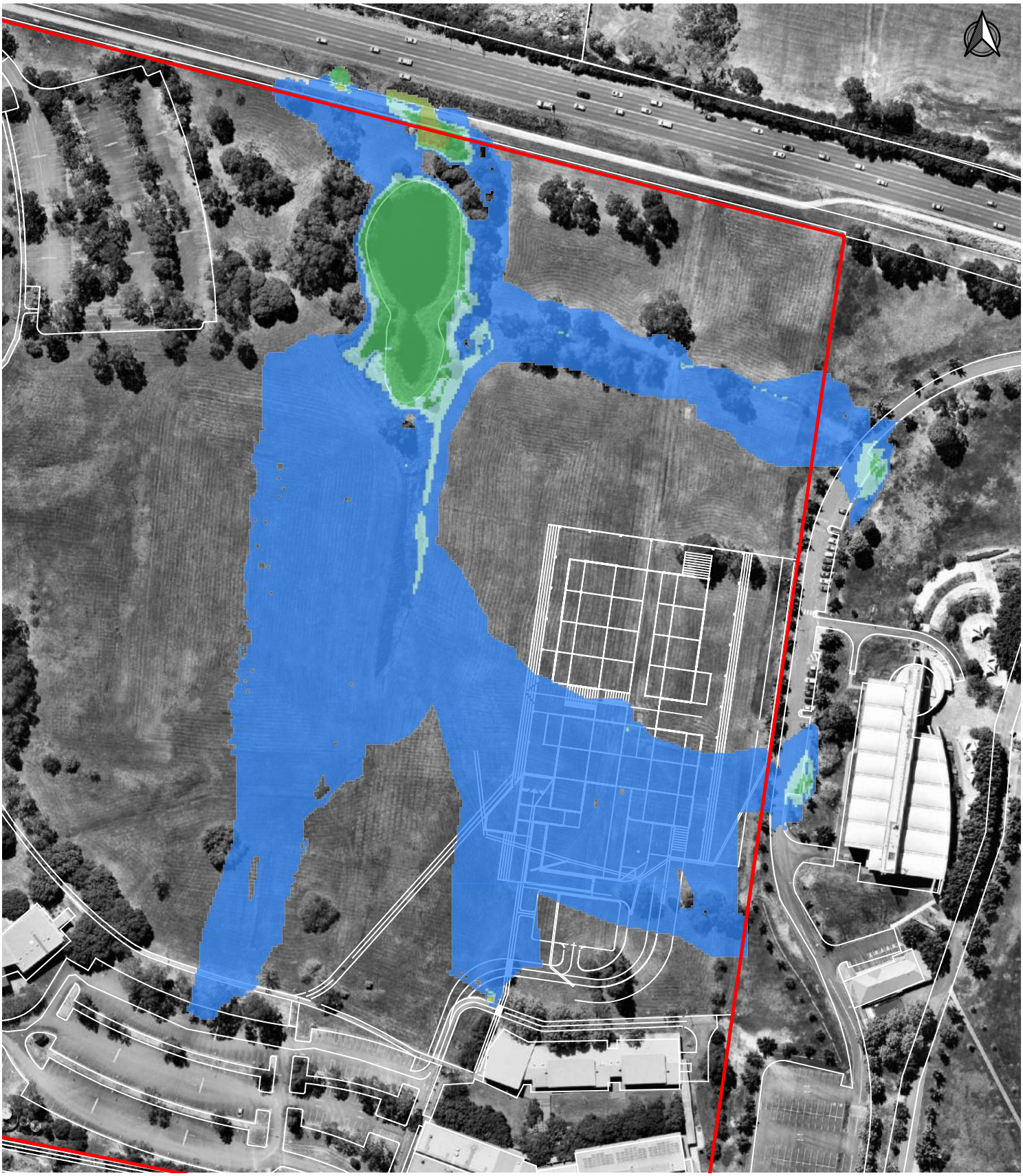
Figure A1 - [1]

Existing Case
5% AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

Site Boundary

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

Figure A2 - [1]

Existing Case
5% Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

Legend

- Site Boundary
- Building Extent
- Developed 5% AEP 1m
- Developed 5% AEP 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

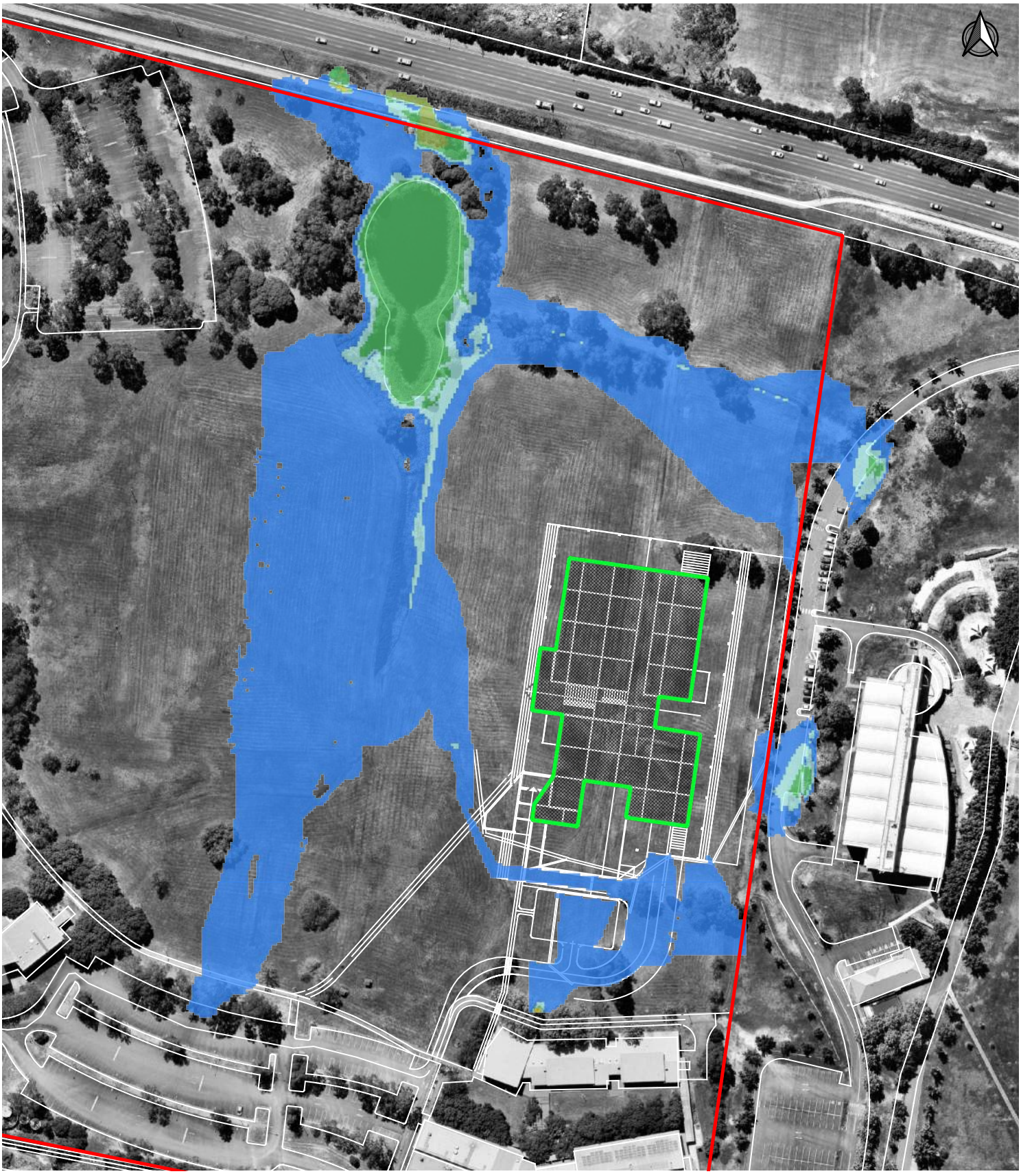
Figure A3 - [1]

Developed Case
5% AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Building Extent

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

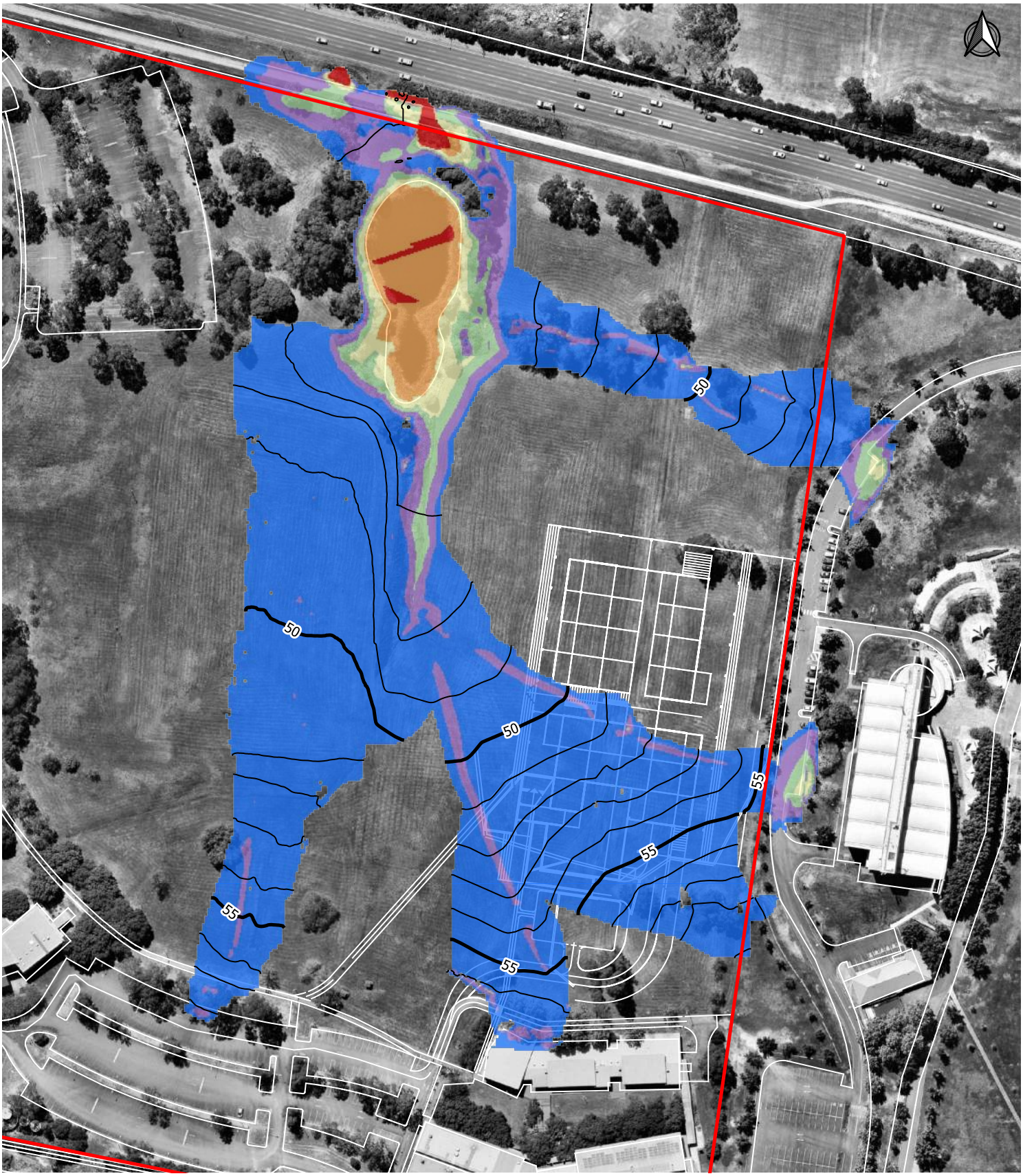
Figure A4 - [1]

Developed Case
5% Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Existing 1% AEP 1m
- Existing 1% AEP 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

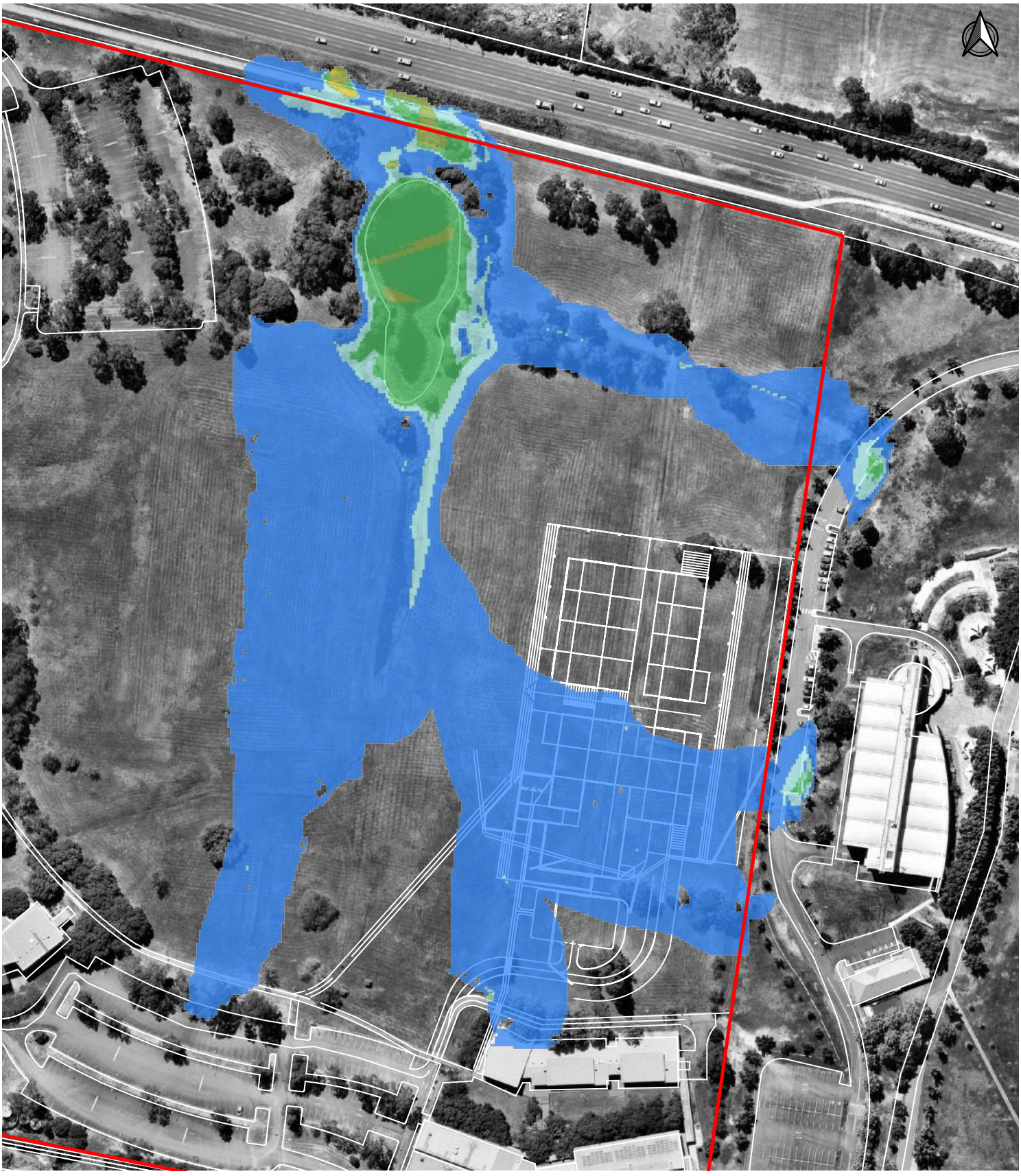
Figure B1 - [1]

Existing Case
1% AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

Site Boundary

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

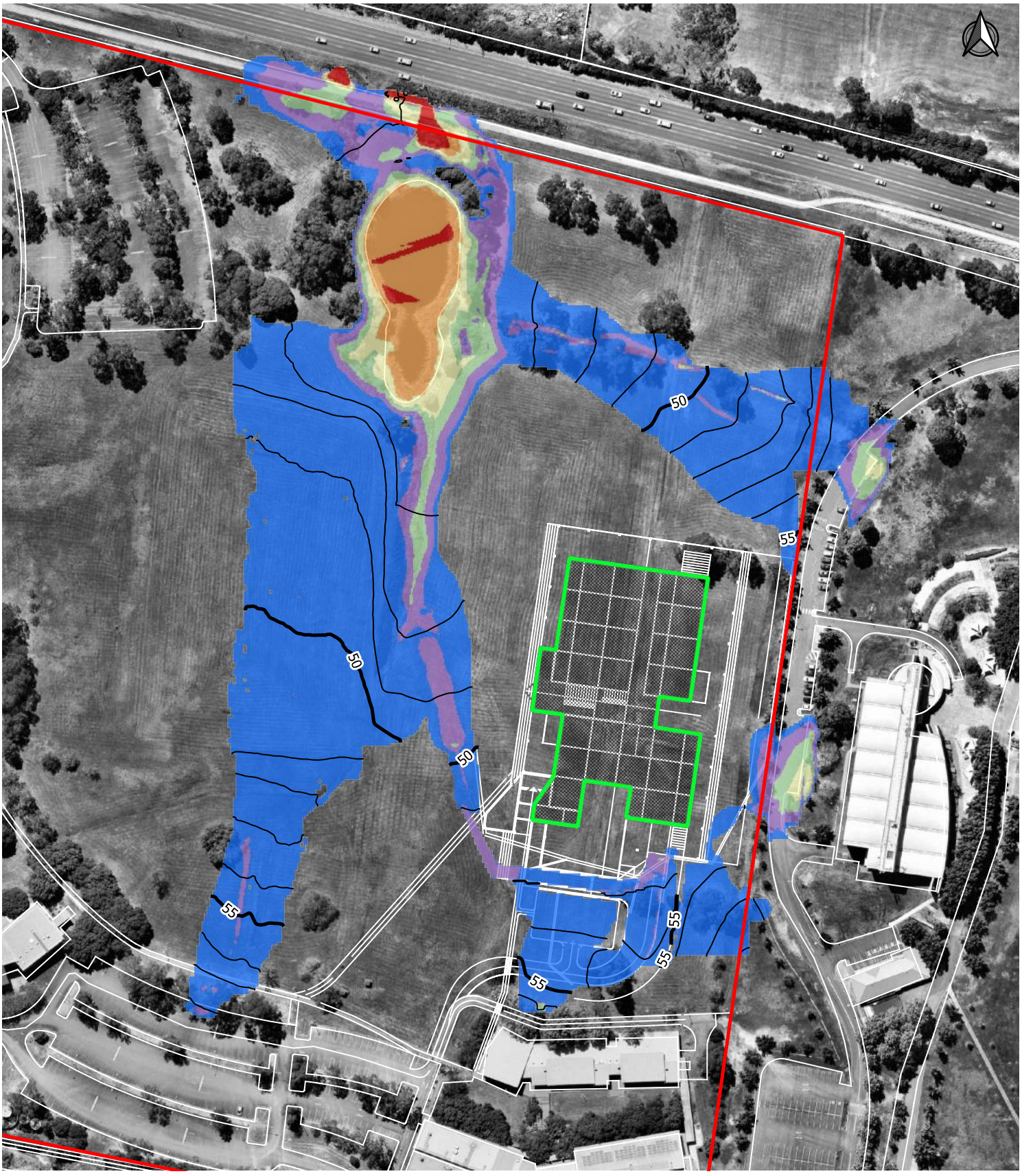
Figure B2 - [1]

Existing Case
1% AEP Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Building Extent
- Developed 1% AEP 1m
- Developed 1% AEP 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

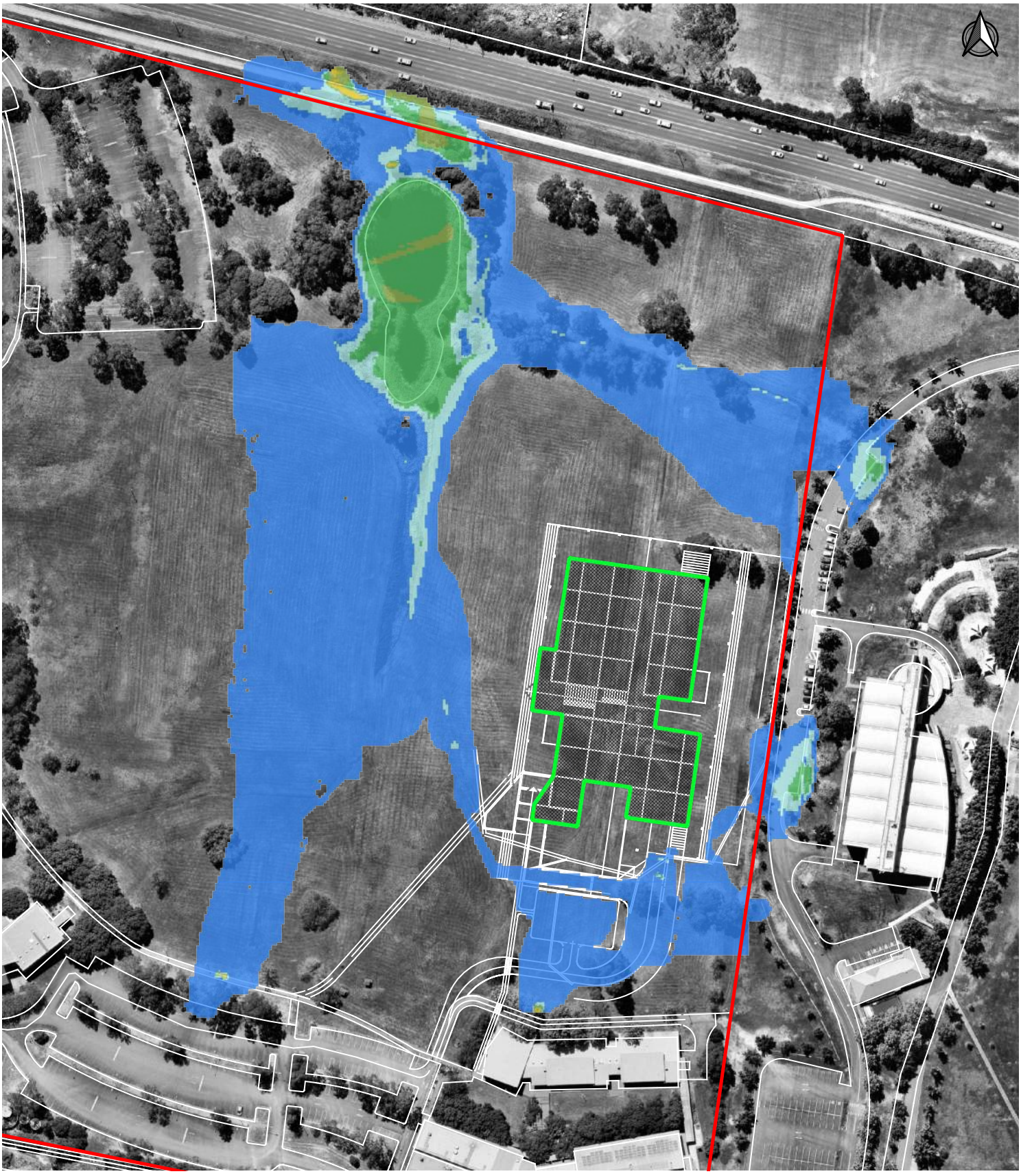
Figure B3 - [1]

Developed Case
1% AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Building Extent

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

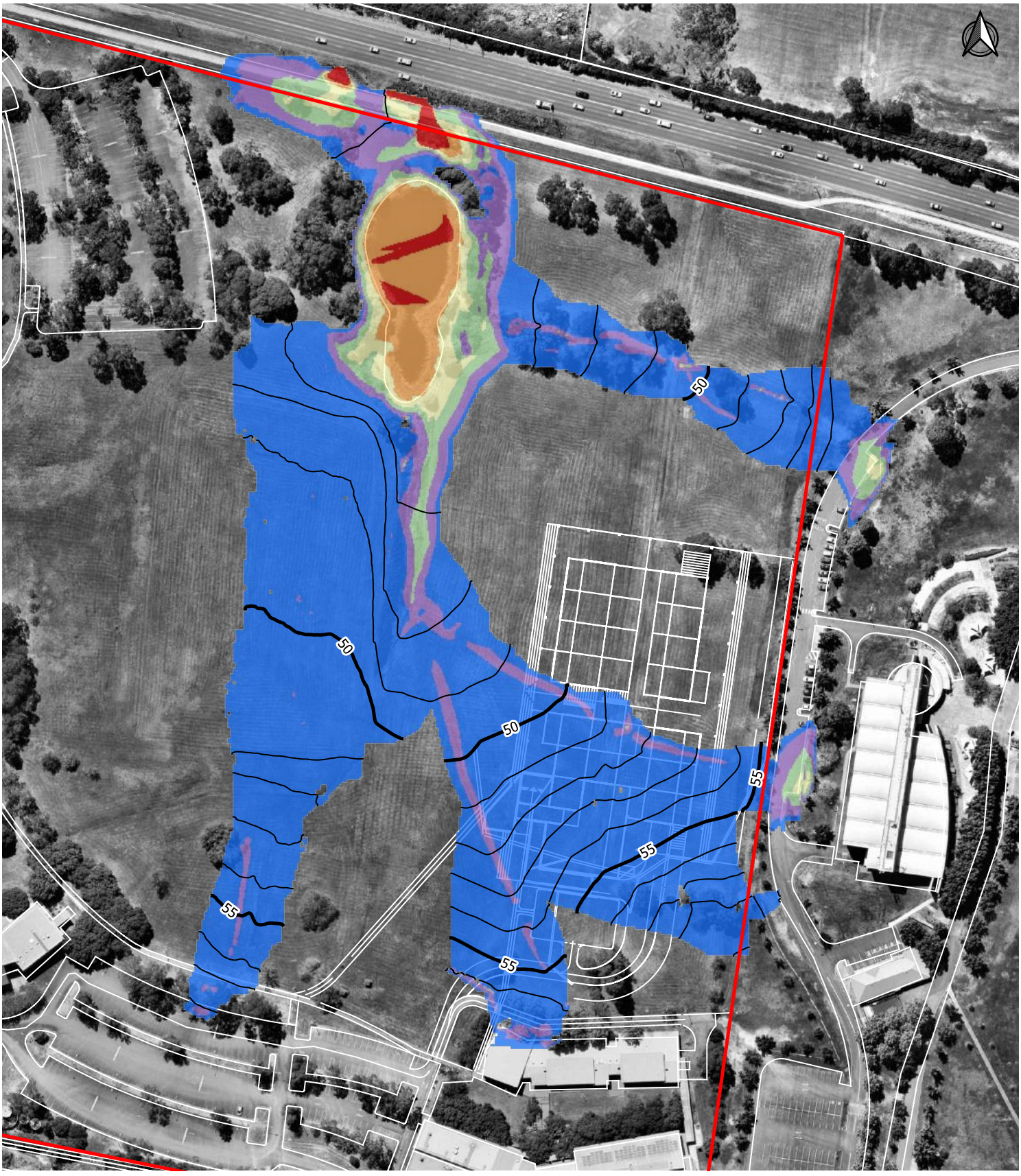
Figure B4 - [1]

Developed Case
1% AEP Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Existing 1in200 1m
- Existing 1in200 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

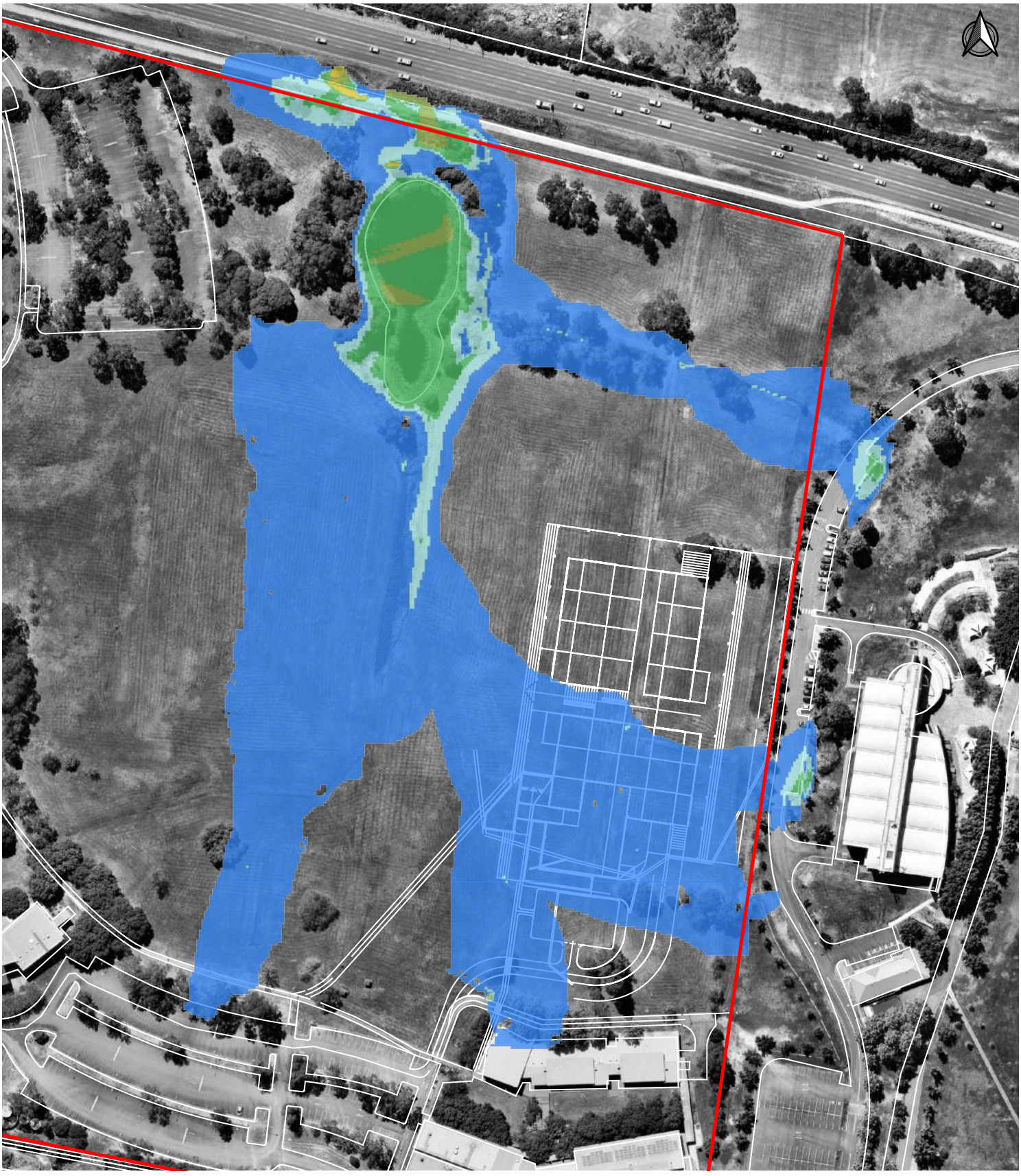
Figure C1 - [1]

Existing Case
1 in 200 AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

Site Boundary

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

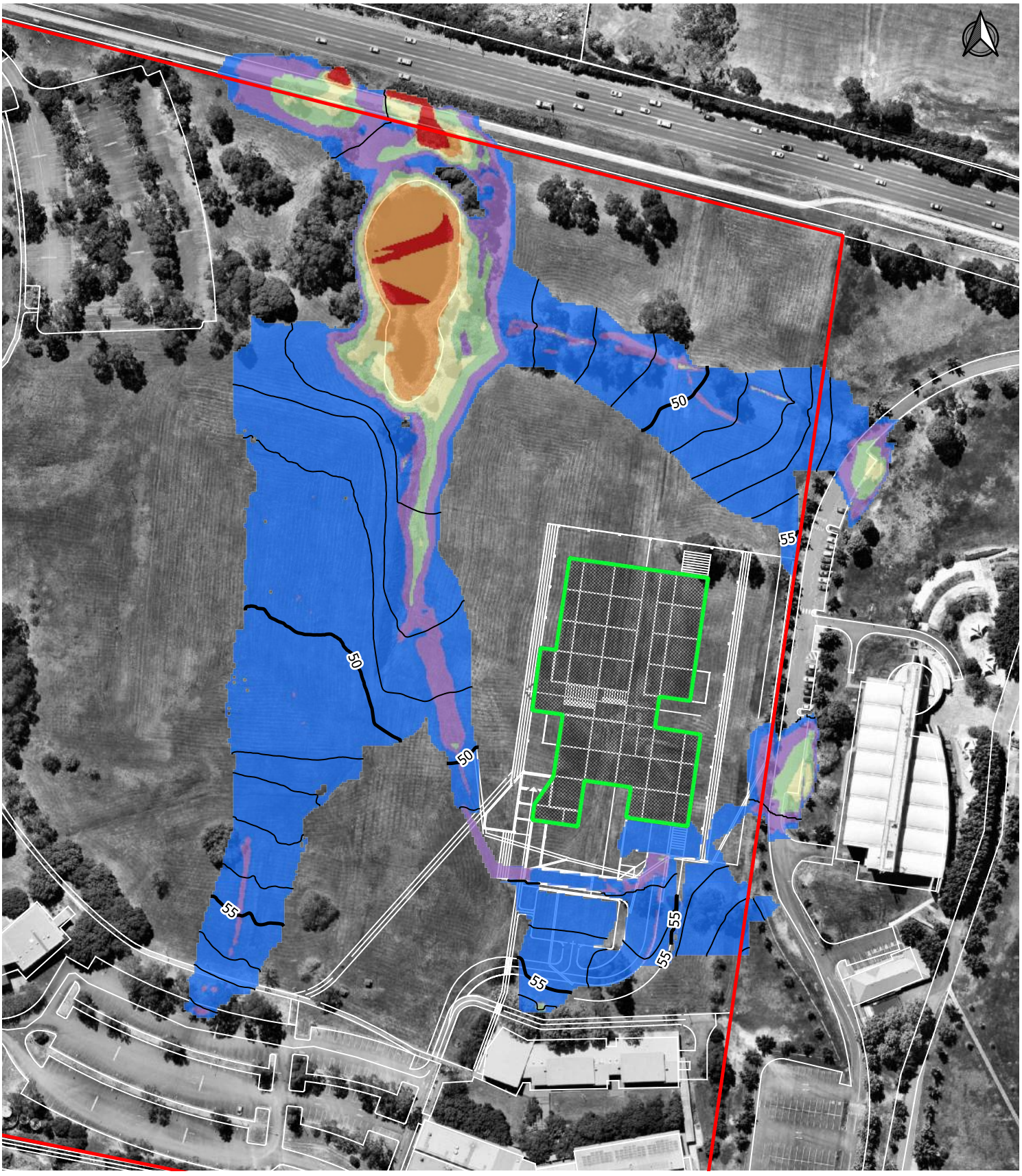
Figure C2 - [1]

Existing Case
1 in 200 AEP Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Building Extent
- Developed 1in200 AEP 1m
- Developed 1in200 AEP 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

Figure C3 - [1]

Developed Case
1 in 200 AEP Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

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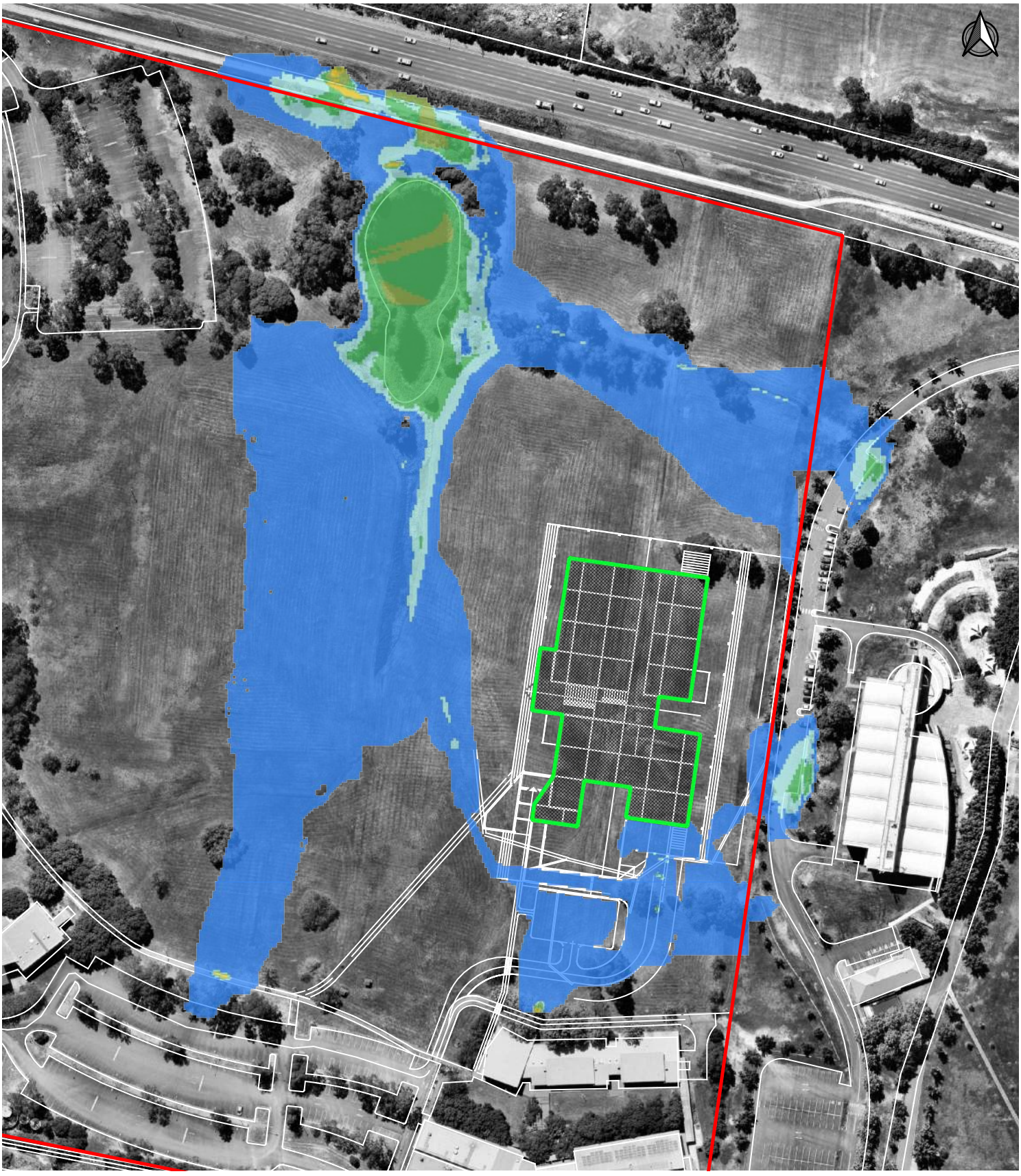


Legend

- Site Boundary
- Building Extent

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

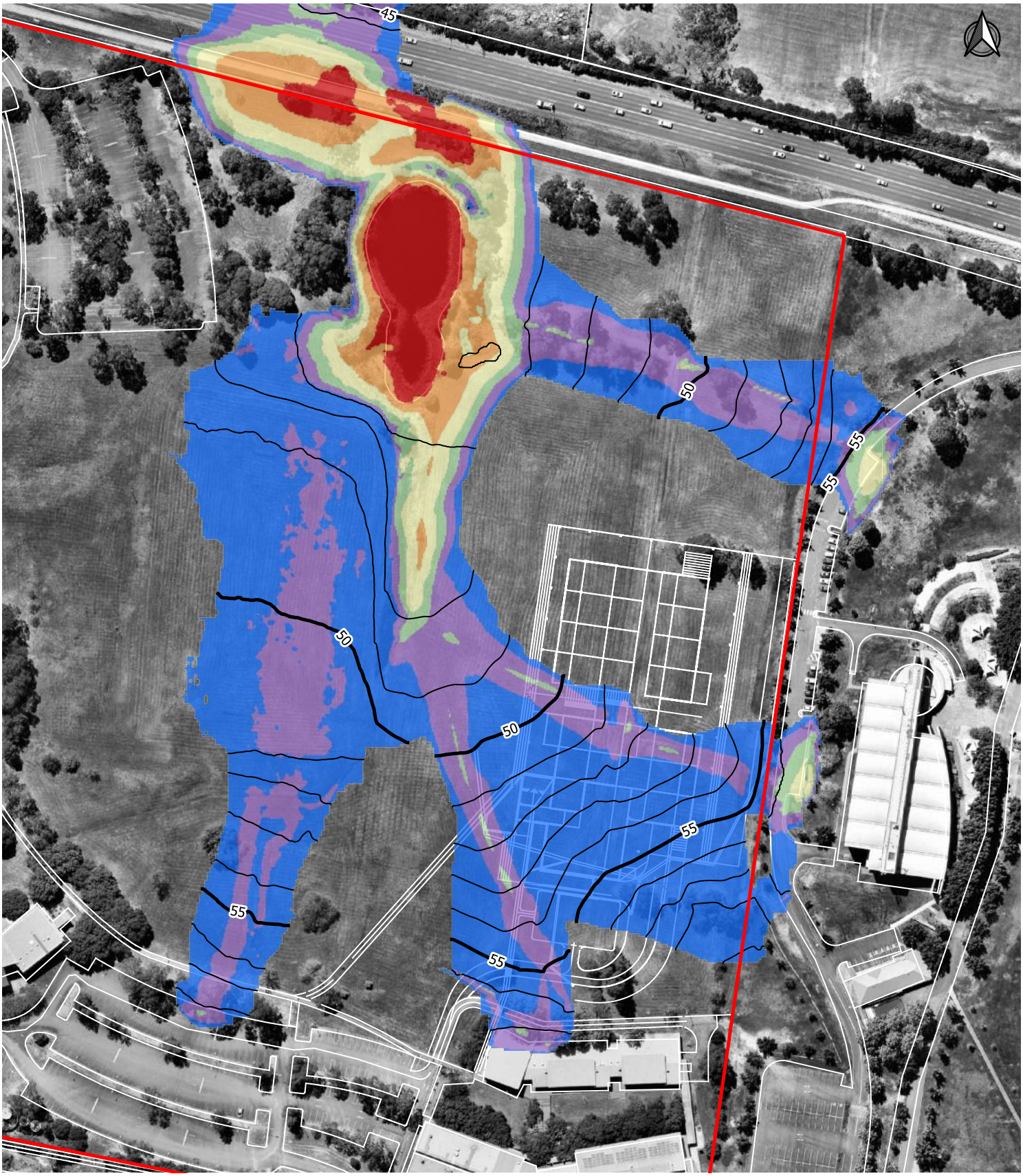
Figure C4 - [1]

Developed Case
1 in 200 AEP Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Existing PMF 1m
- Existing PMF 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

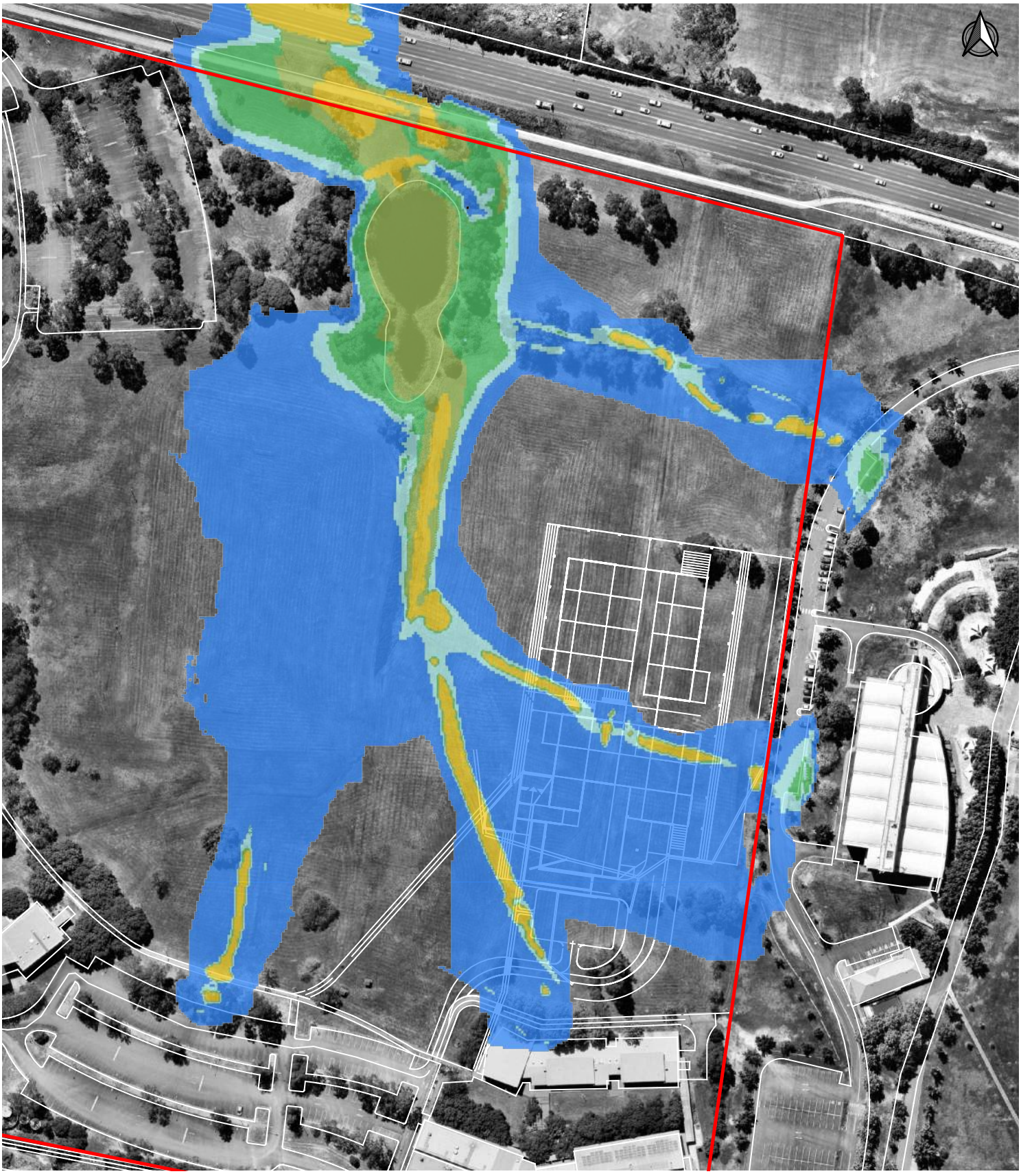
Figure D1 - [1]

Existing Case
PMF Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

Site Boundary

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

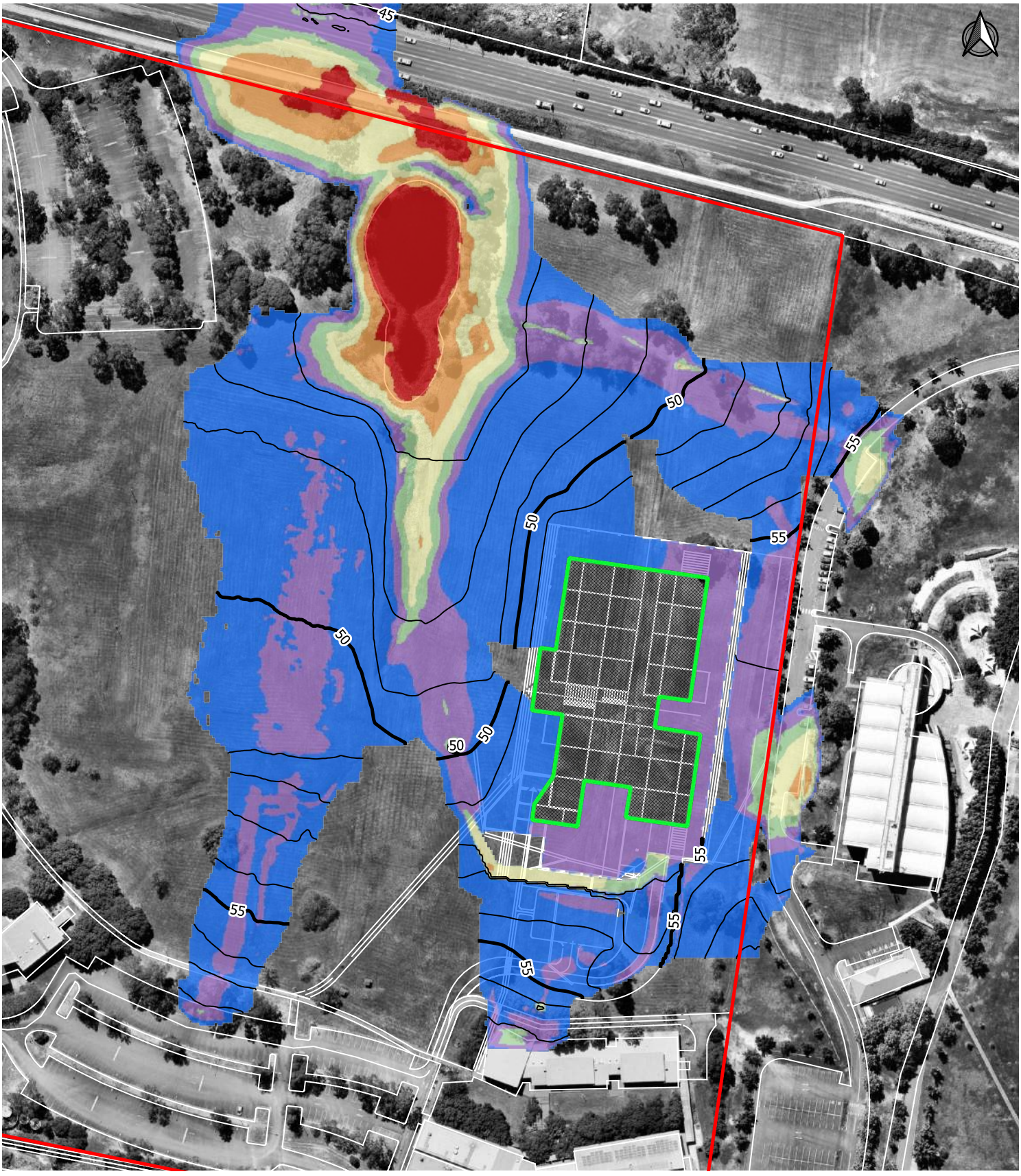
Figure D2 - [1]

Existing Case
PMF Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020



Legend

- Site Boundary
- Building Extent
- Developed PMF 1m
- Developed PMF 5m

Flood Depth

- 0.0 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 0.8
- 0.8 - 1.2
- >1.2

0 40 80 120 Metres

1:2000

Figure D3 - [1]

Developed Case
PMF Flood Depth and Elevation Contours

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

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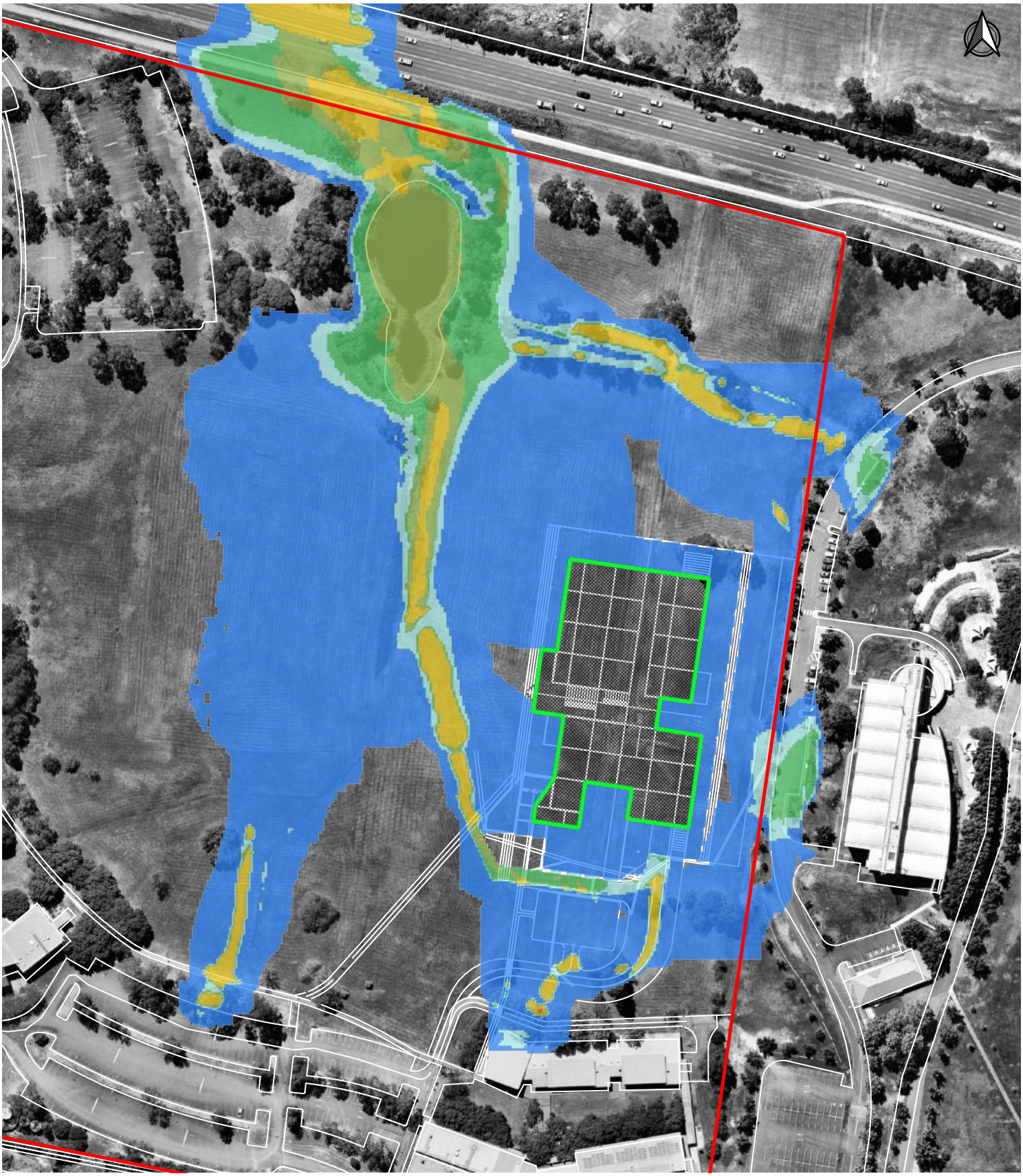


Legend

- Site Boundary
- Building Extent

Hydraulic Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 40 80 120 Metres

1:2000

Figure D4 - [1]

Developed Case
PMF Hydraulic Hazard Category

2-44 O'Connell Street
Kingswood NSW
SY202025

NORTHROP

Data Source: Aerial - Nearmap, 2020, Cadastre - NSW LPI 2020

Appendix C – Concept Civil Engineering Plans

TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

SCHEMATIC DESIGN
CIVIL ENGINEERING PACKAGE

SOURCE : NEARMAP.COM.AU (©2021)

LOCALITY PLAN

CIVIL DRAWING SCHEDULE

DWG No.	DRAWING TITLE
DAC01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DAC02.01	SEDIMENT AND SOIL EROSION CONTROL PLAN
DAC02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS
DAC03.01	BULK EARTHWORKS CUT TO FILL PLAN
DAC04.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN
DAC04.21	STORMWATER LONGITUDINAL SECTIONS - SHEET 01
DAC04.22	STORMWATER LONGITUDINAL SECTIONS - SHEET 02
DAC04.23	STORMWATER LONGITUDINAL SECTIONS - SHEET 03
DAC04.24	STORMWATER LONGITUDINAL SECTIONS - SHEET 04

DRAWN: C.PASKE DESIGNED: J.GRINSELL JOB MANAGER: J.GILLIGAN VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR INFORMATION - 50%	CP		JG	29.01.21

CLIENT

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

GRAY PUKSAND

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE

SCALE 1:2500@ A1 0 20 40 60 80 100 120m

NORTHROP
Sydney
Level 11 345 George Street, Sydney NSW 2000
Ph (02) 9241 4188 Fax (02) 9241 4324
Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

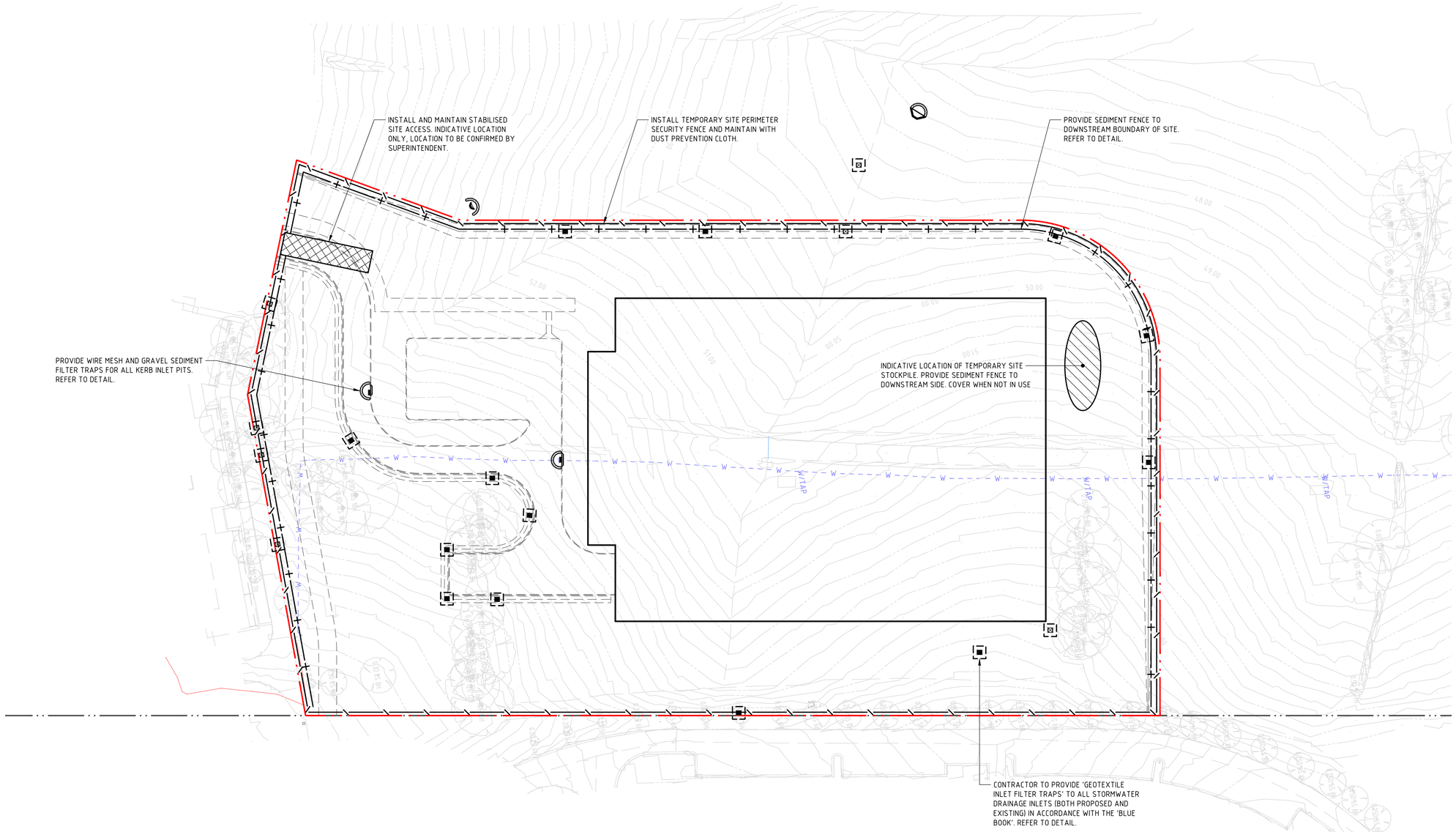
COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN

JOB NUMBER 202025

DRAWING NUMBER DAC01.01

REVISION 01

DRAWING SHEET SIZE = A1



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- EXISTING CONTOURS
- SEDIMENT FENCE
- SECURITY FENCE
- MESH AND GRAVEL INLET FILTER
- GEOTEXTILE INLET FILTER
- STABILISED SITE ACCESS
- STOCKPILE

DRAWN: C. PASKE
DESIGNED: J. GRINSELL
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR INFORMATION – 50%	CP		JG	29.01.21

CLIENT
NSW GOVERNMENT TAFE NSW

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ARCHITECT
GRAY PUKSAND

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SCALE 1:500@A1 0 5 10 15 20 25m

NORTHROP
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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

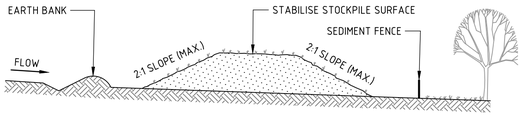
SEDIMENT AND SOIL EROSION CONTROL PLAN

JOB NUMBER **202025**

DRAWING NUMBER **DAC02.01**

REVISION **01**

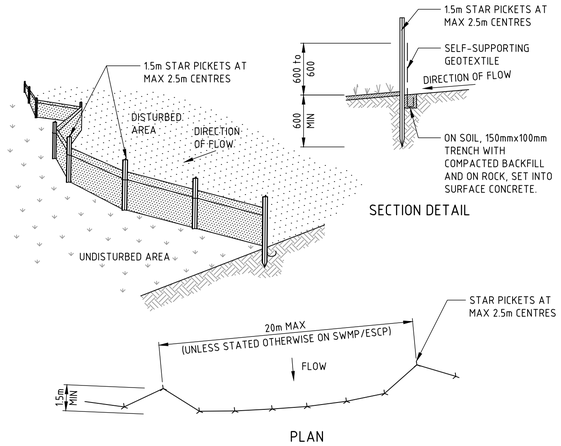
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

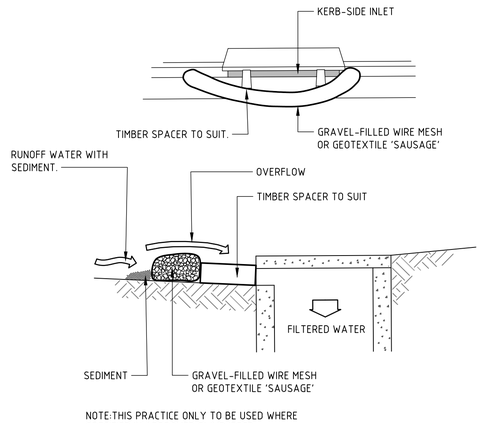
STOCKPILES (SD 4-1)



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

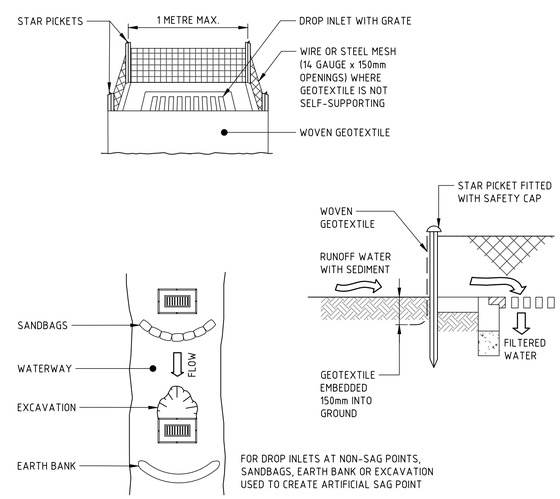
SEDIMENT FENCE (SD 6-8)



CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

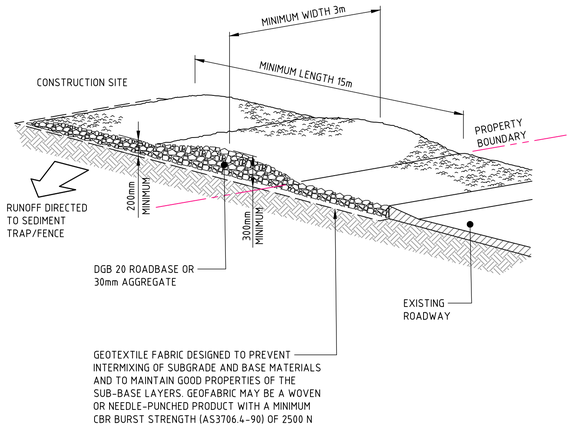
MESH AND GRAVEL INLET FILTER (SD 6-11)



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER (SD 6-12)



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS (SD 6-14)

DRAWN: C. PASKE
DESIGNED: J. GRINSELL
JOB MANAGER: J. GILLIGAN
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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ARCHITECT: GRAY PUKSAND

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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

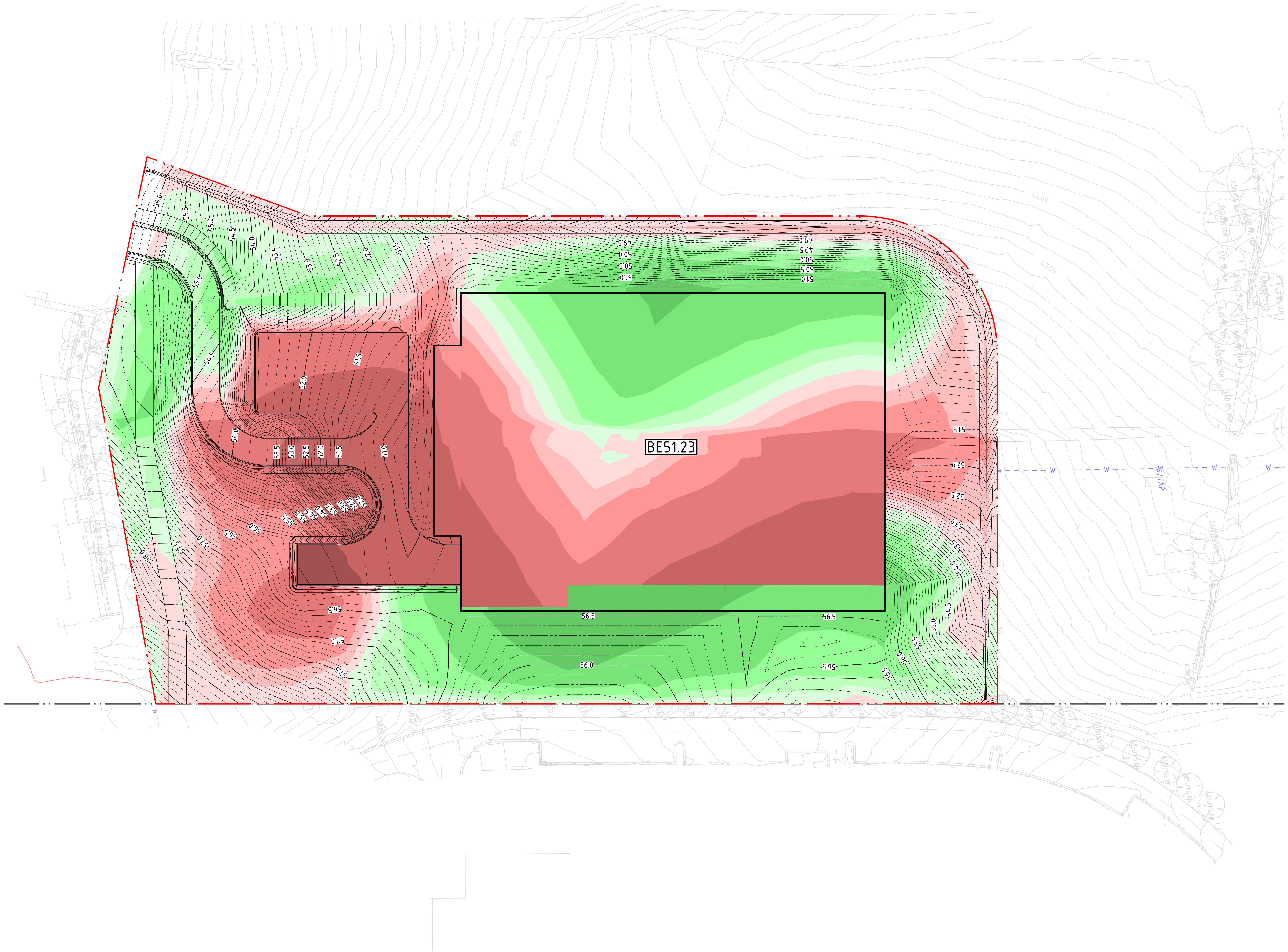
SEDIMENT AND SOIL EROSION CONTROL DETAILS

JOB NUMBER: 202025

DRAWING NUMBER: DAC02.11

REVISION: 01

DRAWING SHEET SIZE = A1



LEGEND

[red dash-dot line]	PROPOSED BOUNDARY LINE
[grey dash-dot line]	EXISTING BOUNDARY LINE
• BEXX.XX	BULK EARTWORKS SPOT HEIGHT
+ eRLXX.XX	EXISTING SPOT HEIGHT
BEXX.XX	BULK EARTHWORKS PAD LEVEL
X.X →	DIRECTION OF GRADE
[batter symbol]	BATTERS
XX.XX	CONTOURS

DEPTH OF CUT

	– 99m TO – 15m
	– 15m TO – 10m
	– 10m TO – 5m
	– 5m TO – 2m
	– 2m TO – 1m
	– 1m TO – 0.5m
	– 0.5m TO – 0.25m
	– 0.25m TO – 0.0m

DEPTH OF FILL

	0.0m TO 0.25m
	0.25m TO 0.5m
	0.5m TO 1m
	1m TO 2m
	2m TO 5m
	5m TO 10m
	10m TO 15m
	15m TO 99m

GENERAL NOTES:

1. CUT –14,518 cu.m
2. FILL 8,360 cu.m
3. BALANCE –6,158 cu.m

NOTE: A SITE STRIP OF 200mm HAS BEEN CONSIDERED. APPROX VOLUME 4.380m³.

DRAWN: C. PASKE DESIGNED: J. GRINSELL JOB MANAGER: J. GILLIGAN VERIFIER:

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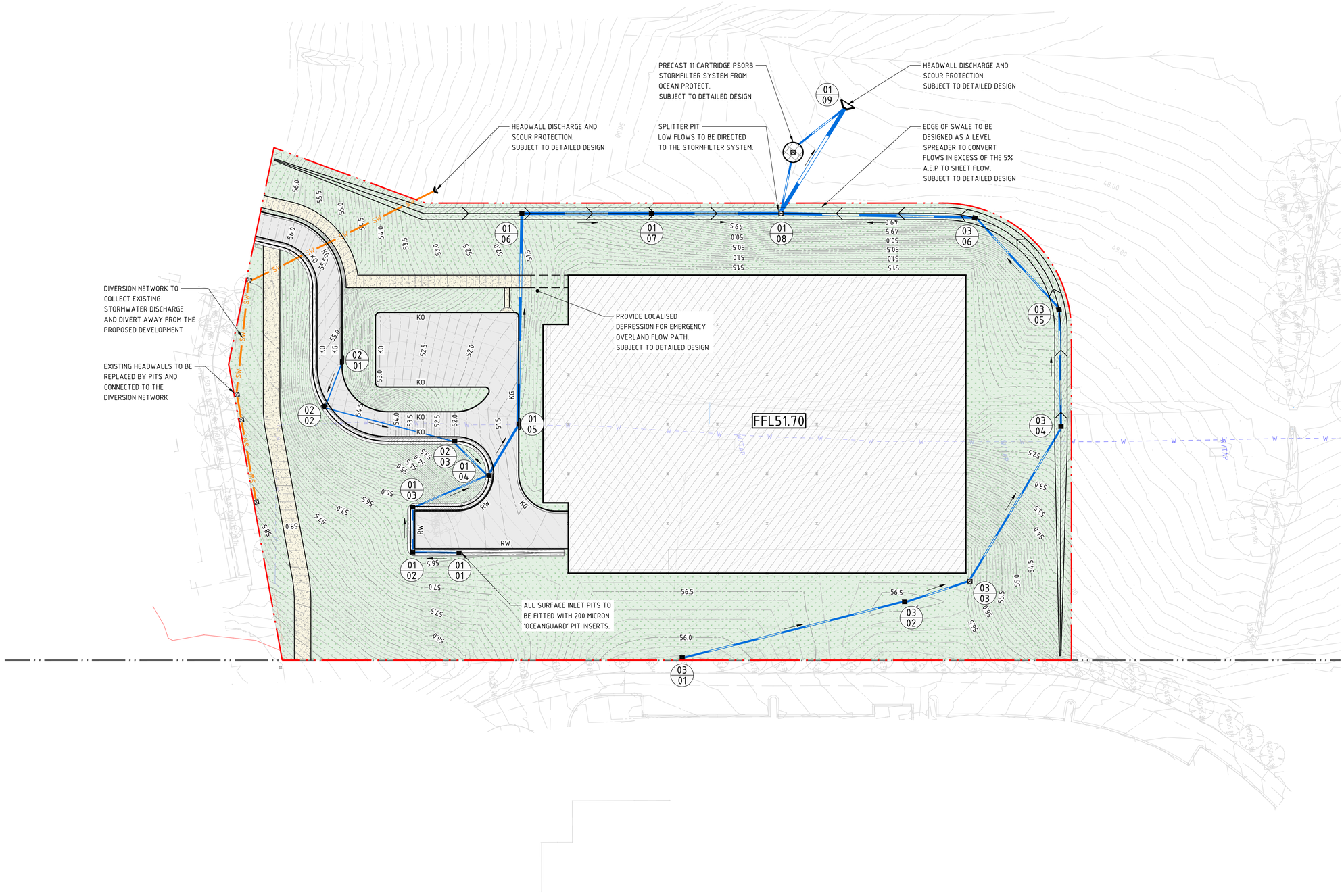
PROJECT: TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

DRAWING TITLE: CIVIL ENGINEERING PACKAGE — BULK EARTHWORKS CUT TO FILL PLAN

JOB NUMBER: 202025

DRAWING NUMBER: DAC03.01 REVISION: 01

DRAWING SHEET SIZE = A1



LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- PROPOSED KERB
- EXISTING KERB
- SAWCUT AND PAVEMENT INFILL
- KO — KERB ONLY
- KG — KERB AND GUTTER
- IK — INTEGRAL KERB
- DD — DISH DRAIN
- VC — VEHICULAR CROSSING
- KR — KERB RAMP
- WS — WHEEL STOP
- MTE — MATCH TO EXISTING
- • RLXX.XX — PROPOSED SPOT HEIGHT
- × eRLXX.XX — EXISTING SPOT HEIGHT
- FFLXX.XX — PROPOSED FINISHED FLOOR LEVEL
- BATTERS
- XX.XX — CONTOURS
- EXISTING CONTOURS
- DRAINAGE SWALE
- DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
- GRATED INLET PIT (NEW / EXTG)
- KERB INLET PIT (NEW / EXTG)
- JUNCTION PIT (NEW / EXTG)
- 1/A — STORMWATER PIT TAG STRUCTURE No / LINE ID
- CONCRETE HEADWALL

DRAWN: C PASKE
DESIGNED: J GRINSELL
JOB MANAGER: J GILLIGAN
VERIFIER:

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PROJECT
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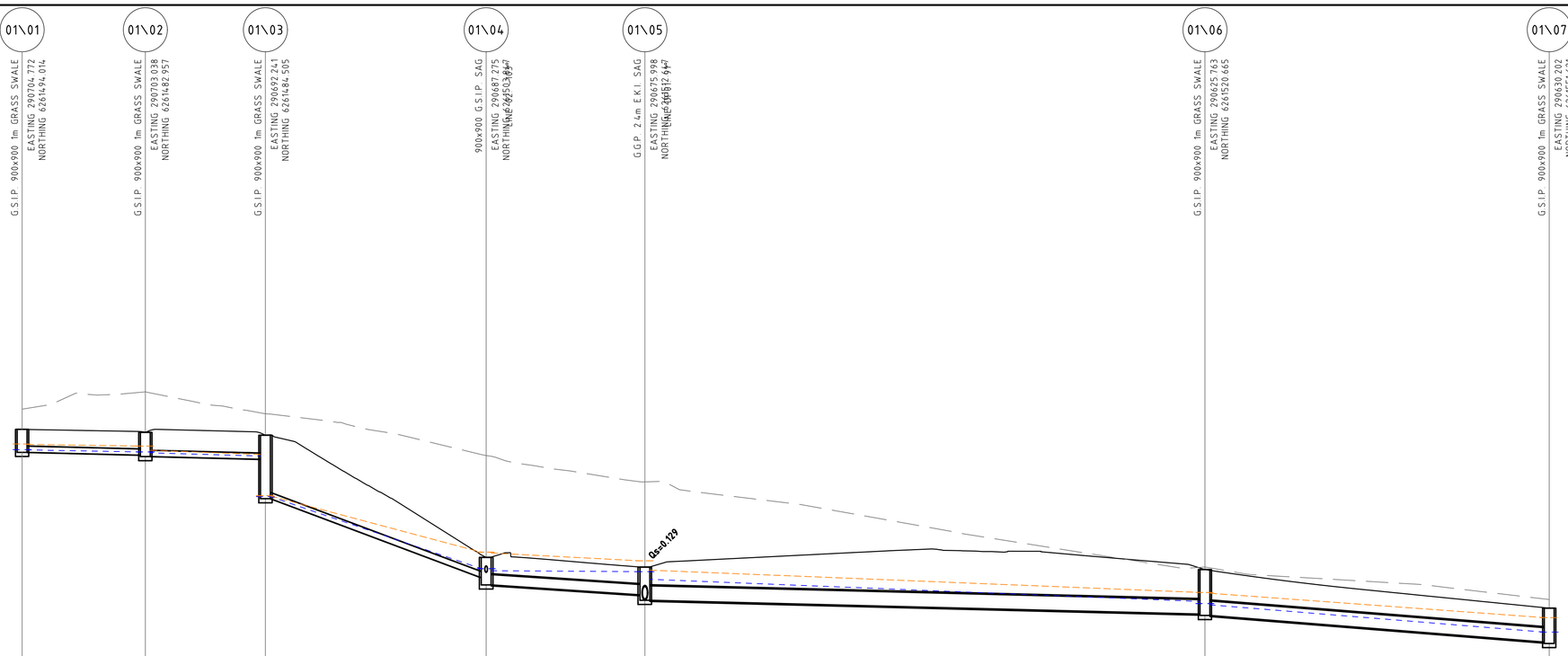
DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN

JOB NUMBER 202025
DRAWING NUMBER DAC04.01
REVISION 01
DRAWING SHEET SIZE = A1



PIPE CLASS	UPVC	UPVC	UPVC	RRJ2	RRJ2	RRJ2	
PIPE GRADE (%)	1.0%	1.0%	15.0%	2.7%	1.0%	3.2%	
PIPE SIZE (mm)	225	225	225	375	525	525	
MINIMUM COVER (m)	0.60	0.72	0.60	0.60	0.65	0.68	
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=0.79	Vf=1.00	Vf=3.42	Vf=2.02	Vf=2.26	Vf=3.06	
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=0.82	Vf=1.16	Vf=3.54	Vf=2.07	Vf=2.52	Vf=3.07	
Q (5% A.E.P.) - PIPE FLOW (L/s)	Q=11	Q=26	Q=41	Q=117	Q=477	Q=476	
Q (1% A.E.P.) - PIPE FLOW (L/s)	Q=19	Q=43	Q=70	Q=219	Q=537	Q=536	
DATUM RL	37.0						
H.G.L. (5% A.E.P.)	55.548 55.539	55.466 55.466 55.433	55.319 55.316 53.846	51.225 51.225 51.152	51.117 51.117 50.839	50.035 49.958 49.912	48.922 48.922
H.G.L. (1% A.E.P.)	55.755 55.738	55.678 55.678 55.527	55.371 55.376 53.868	51.825 51.825 51.795	51.511 51.511 51.171	50.362 50.362 50.333	49.447 49.447
FINISHED SURFACE	56.286	56.179	56.073	51.637	51.282	51.193	49.791
NATURAL SURFACE	57.018	57.647	56.852	55.335	54.378	51.286	50.105
PIPE INVERT LEVEL	55.451	55.348 55.298	55.198 53.769	50.896 50.635	50.276 50.076	49.577 49.527	48.558
DEPTH TO INVERT	0.836	0.831 0.881	0.876 2.305	0.740 1.001	1.006 1.206	1.616 1.666	1.233
CHAINAGE	0.000	11.193	22.100	42.150	56.570	107.441	138.713

LINE 01

DRAWN: C. PASKE
DESIGNED: J. GRINSELL
JOB MANAGER: J. GILLIGAN
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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SCALE 1:250@ A1 0 2 4 6 8 10 12m
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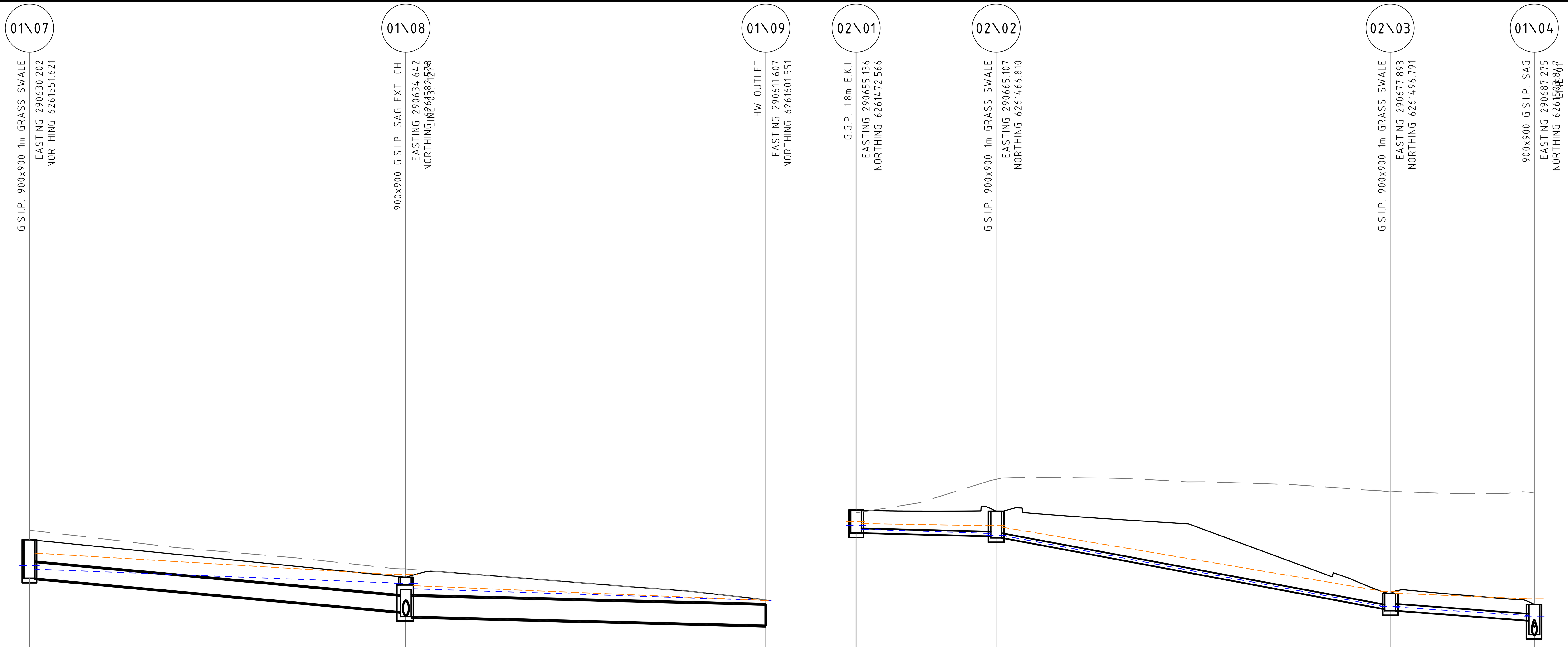
PROJECT
TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
MINOR STORMWATER LONGITUDINAL SECTIONS - SHEET 01

JOB NUMBER 202025
DRAWING NUMBER DAC04.21
REVISION 01
DRAWING SHEET SIZE = A1



PIPE CLASS			RRJ2			RRJ2		
PIPE GRADE (%)			3.7%			1.0%		
PIPE SIZE (mm)			525			675		
MINIMUM COVER (m)			0.60					
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)			Vf=2.48			Vf=1.85		
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)			Vf=2.64			Vf=2.36		
Q (5% A.E.P.) - PIPE FLOW (L/s)			Q=502			Q=662		
Q (1% A.E.P.) - PIPE FLOW (L/s)			Q=570			Q=844		
DATUM RL		33.0						
H.G.L. (5% A.E.P.)	48.922 48.922	48.810		48.344 48.344	48.158		47.773 47.773	47.773
H.G.L. (1% A.E.P.)	49.447 49.447	49.344		48.622 48.645	48.261		47.773 47.773	47.773
FINISHED SURFACE	49.791			48.540			47.794	
NATURAL SURFACE	50.105			48.821			47.794	
PIPE INVERT LEVEL	48.558	48.508		47.392	47.237		46.943	46.943
DEPTH TO INVERT	1.233	1.283		1.148	1.303		0.851	0.851
CHAINAGE	138.713			169.986			199.895	

LINE 01

PIPE CLASS			UPVC			UPVC			UPVC		
PIPE GRADE (%)			1.0%			7.5%			3.0%		
PIPE SIZE (mm)			150			150			225		
MINIMUM COVER (m)			0.60			0.40			0.40		
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)			Vf=0.72			Vf=2.27			Vf=1.74		
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)			Vf=0.90			Vf=2.31			Vf=1.86		
Q (5% A.E.P.) - PIPE FLOW (L/s)			Q=11			Q=22			Q=39		
Q (1% A.E.P.) - PIPE FLOW (L/s)			Q=15			Q=33			Q=60		
DATUM RL		37.0									
H.G.L. (5% A.E.P.)	54.258	54.137		53.999 53.938	53.936		51.563 51.568	51.550		51.263 51.225	51.152
H.G.L. (1% A.E.P.)	54.384	54.326		54.255 54.255	54.209		52.063 52.063	52.008		51.825 51.825	51.795
FINISHED SURFACE	54.778			54.735			51.995			51.637	
NATURAL SURFACE	54.683			55.796			55.377			55.335	
PIPE INVERT LEVEL		54.011		53.904	53.854		51.478	51.428		51.096	50.635
DEPTH TO INVERT		0.767		0.831	0.881		0.517	0.567		0.540	1.001
CHAINAGE	0.000			11.631			44.360			56.347	

LINE 02

DRAWN: C.PASKE DESIGNED: J. GRINSELL JOB MANAGER: J. GILLIGAN VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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SCALE 1:250@ A1 — 0 2 4 6 8 10 12m
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PROJECT: TAFE NSW CONSTRUCTION CENTRE OF EXCELLENCE

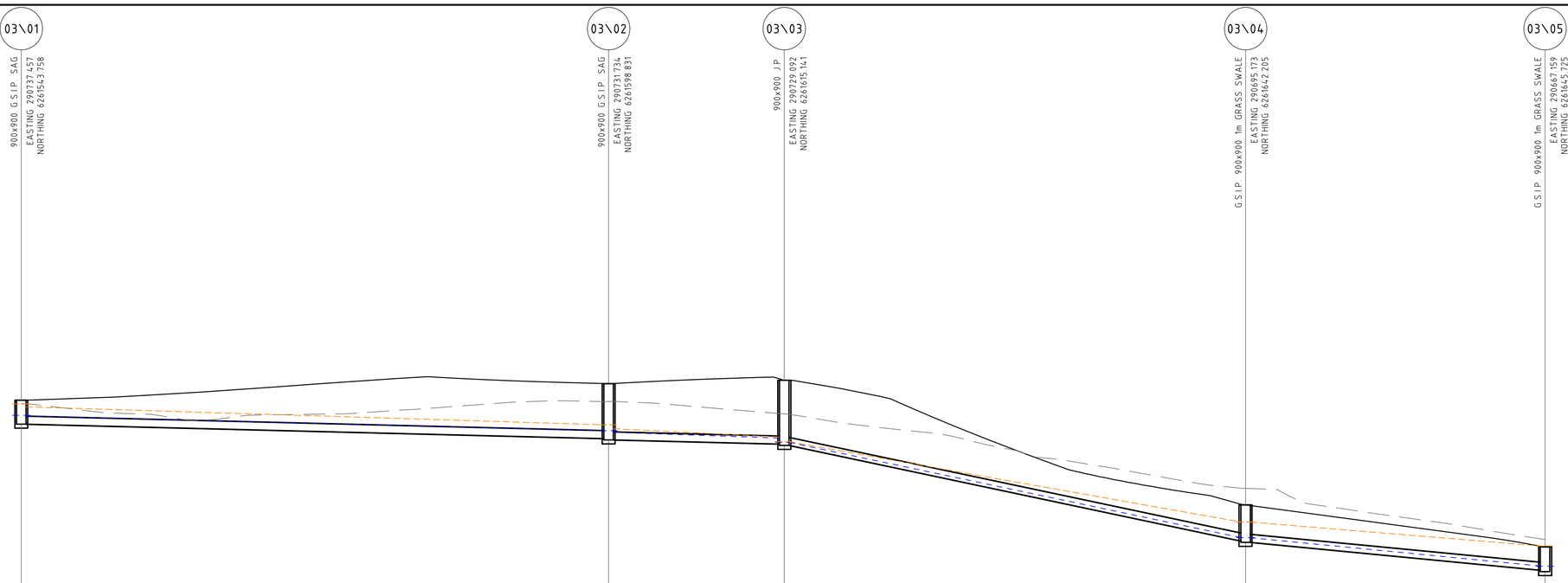
DRAWING TITLE: CIVIL ENGINEERING PACKAGE — MINOR STORMWATER LONGITUDINAL SECTIONS - SHEET 02

JOB NUMBER: 202025

DRAWING NUMBER: DAC04.22

REVISION: 01

DRAWING SHEET SIZE = A1



PIPE CLASS	UPVC	UPVC	UPVC	UPVC
PIPE GRADE (%)	1.0%	1.0%	8.5%	3.8%
PIPE SIZE (mm)	300	300	300	300
MINIMUM COVER (m)	0.60	1.82	0.99	0.60
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=1.14	Vf=1.38	Vf=3.32	Vf=2.52
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)	Vf=1.21	Vf=1.79	Vf=3.33	Vf=2.54
Q (5% A.E.P.) - PIPE FLOW (L/s)	Q=63	Q=89	Q=89	Q=104
Q (1% A.E.P.) - PIPE FLOW (L/s)	Q=85	Q=124	Q=125	Q=146
DATUM RL	36.0			
H.G.L. (5% A.E.P.)	55.211 55.186	54.627 54.627	54.568 54.351 54.191	54.191 50.595 50.595	50.589 49.524 49.514
H.G.L. (1% A.E.P.)	55.638 55.529	54.851 54.851	54.705 54.391 54.215	54.212 51.183 51.183	51.182 50.279 50.279
FINISHED SURFACE	55.781	56.404	56.532	51.829	50.244
NATURAL SURFACE	55.648	55.730	55.270	52.451	50.521
PIPE INVERT LEVEL	54.875	54.330 54.280	54.124 54.074	50.465 50.415	49.364
DEPTH TO INVERT	0.906	2.074 2.124	2.408 2.458	1.364 1.414	0.880
CHAINAGE	0.000	55.397	71.963	115.482	143.723

LINE 03

VERIFIER:
JOB MANAGER: J. GILLIGAN
DESIGNED: J. GRINSELL
DRAWN: C. PASKE

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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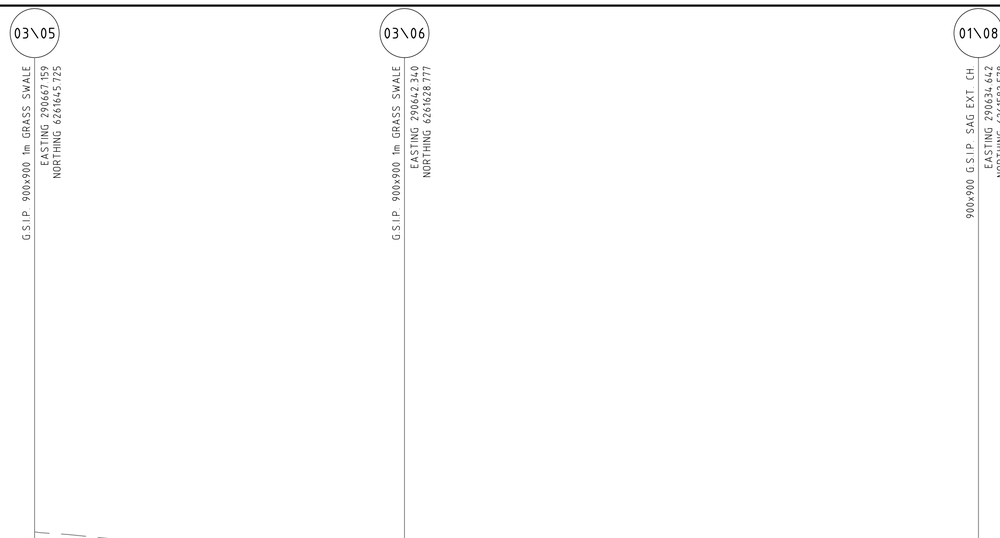
DRAWING TITLE
CIVIL ENGINEERING PACKAGE
MINOR STORMWATER LONGITUDINAL SECTIONS - SHEET 03

JOB NUMBER 202025
DRAWING NUMBER DAC04.23
REVISION 01
DRAWING SHEET SIZE = A1



PIPE CLASS		UPVC	RRJ2
PIPE GRADE (%)		4.6%	1.0%
PIPE SIZE (mm)		300	450
MINIMUM COVER (m)		0.60	0.60
Vf (5% A.E.P.) - FULL PIPE VELOCITY (m/s)		Vf=2.62	Vf=0.84
Vf (1% A.E.P.) - FULL PIPE VELOCITY (m/s)		Vf=2.63	Vf=1.18
Q (5% A.E.P.) - PIPE FLOW (L/s)		Q=118	Q=133
Q (1% A.E.P.) - PIPE FLOW (L/s)		Q=167	Q=188
DATUM RL		33.0	
H.G.L. (5% A.E.P.)	49.524 49.514	49.473	48.525 48.525 48.452	48.344 48.344 48.158
H.G.L. (1% A.E.P.)	50.279 50.279	50.275	48.908 48.899 48.846	48.622 48.645 48.261
FINISHED SURFACE	50.244		48.847	48.540
NATURAL SURFACE	50.521		49.164	48.821
PIPE INVERT LEVEL	49.364	49.311	47.950 47.746	47.287 47.237
DEPTH TO INVERT	0.880	0.932	0.897 1.101	1.253 1.303
CHAINAGE	143.723		173.912	220.762

LINE 03

DRAWN: C. PASKE
DESIGNED: J. GRINSELL
JOB MANAGER: J. GILLIGAN
VERIFIER:

NOT FOR CONSTRUCTION

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SCALE 1:100 @ A1 0 1 2 3 4 5m

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DRAWING TITLE
CIVIL ENGINEERING PACKAGE
MINOR STORMWATER LONGITUDINAL SECTIONS - SHEET 04

JOB NUMBER 202025
DRAWING NUMBER DAC04.24
REVISION 01
DRAWING SHEET SIZE = A1