REPORT

Flood Impact Assessment

Pacific Brook Christian School

Client: Pacific Brook Christian School Ltd.

Reference: PA2391_Pacfic Brook School FIA

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Royal HaskoningDHV

Enhancing Society Together

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Table of Contents

1 Introduction 1

1.1 Background & Description of Proposed Development 1

1.2 Objective of this Report 2

2 Site Description 3

2.1 Site Ground Levels and Details of Proposed Development 4

2.2 Summary of Flood Information and Design Levels 7

3 Relevant Documents 11

3.1 Muswellbrook DCP 11

3.2 Muscle Creek Flood Study (*RHDHV, January 2017*) 11

3.3 Muswellbrook Floodplain Risk Management Study and Plan (*RHDHV, April 2019*) 11

4 Flood Modelling 12

4.1 Model Setup 12

4.2 Existing Scenario 12

4.3 Proposed Scenario 12

4.4 Model Results 12

4.4.1 Peak Flood Levels and Depths 12

4.4.2 Impact of Developments - Changes to Peak Flood Levels 14

5 Summary of Flood Impact Assessment 16

5.1 Impacts to neighbouring properties 16

5.2 Compliance with Council DCP 16

5.3 Flood Evacuation Considerations 17

6 References 17

Table of Tables

Table 1: North West Site - Design Flood Levels (m AHD) (RHDHV, 2019) 8

Table 2: 20yr, 100yr, 500yr ARI and PMF Flood Levels (mAHD) – Existing (Exg) and Proposed (Dev) Scenarios 12

Table 3: Peak Water Level Differences (Proposed (Dev) minus Existing (Exg)) for 100yr and 500yr ARI Events 14

Table 4: Non-Residential Development Controls relating to Flood Prone Land 17

Table of Figures

Figure 1: Site Locality Plan (Aerial image of site boundary) 3
Figure 2: Site Context 4
Figure 3: Ground Floor Concept Masterplan (NBRS-DR-A-SSDA-1000 Rev 6) 5
Figure 4: Modelled – Existing (top) and Developed (bottom) Ground Elevation Data (m AHD) 6
Figure 5: 20yr (blue), 100yr (orange) & PMF (pink) flood extents for Muscle Creek 7
Figure 6: Design Flood Level – Long Section 8
Figure 7: Hydraulic Categorisation (1% AEP) 2019 FRMS&P 9
Figure 8: Hazard Categorisation (1% AEP) 2019 FRMS&P 10
Figure 9: Existing scenario – 1% AEP Flood Depths and Output Location ID 13
Figure 10: Difference in 1% AEP peak flood level between existing and proposed scenarios 15

1 Introduction

1.1 Background & Description of Proposed Development

This report summarises the findings of a Flood Impact Assessment (FIA) undertaken to support the State Significant Development Application (SSDA) for the proposed development of a new school at 72-74 Maitland Street, Muswellbrook.

Pacific Brook Christian School proposes the staged construction of a new school at 72-74 Maitland Street, Muswellbrook. This will involve site preparation work (including remediation), the removal of 96 trees (7 within Stage 1), civil works, infrastructure works, landscaping, signage and construction works in stages over the next 10 years.

The masterplan will support high-quality educational outcomes to meet the needs of students within the local community as follows:

- Administration building and Library;
  - One (1) staff and student amenities block;
- Junior School facilities;
  - Ten (10) General Learning Areas (GLAs);
  - Two (2) Specialist classroom;
  - One (1) Store; and
  - Covered Outdoor Learning Area (COLA)
- Middle School facilities;
  - Seven (7) General Learning Areas (GLAs);
  - One (1) Science classroom; and
  - Covered Outdoor Learning Area (COLA)
- Senior School facilities;
  - Eight (8) General Learning Areas (GLAs);
  - One (1) Specialist classroom;
  - Three (3) TAS classrooms;
  - Two (2) Food Tech classrooms;
  - One (1) Art classroom;
  - One (1) Drama classroom;
  - Four (4) amenities block;
  - Three (3) Store; and
  - Covered Outdoor Learning Area (COLA)
- Hope School (special needs) facilities;
  - Four (4) General Learning Areas (GLAs);
  - One (1) Specialist classroom;
  - Four (4) Shared Withdrawal rooms;
  - One (1) Office;
  - One (1) Staff room;
  - One (1) Interview + Therapy room;
  - Three (4) amenities block;
  - Three (3) Store; and
  - Covered Outdoor Learning Area (COLA)
- Multi-Purpose Hall;
- Maximum student capacity of 656;

- Maximum 65 staff;
- Agricultural teaching facility;
- Maintenance and bus area;
- On-site Parking (67 spaces, inclusive of 1 accessible);
- Bike parking x 36;
- Internal pathways;
- Kiss and drop off areas;
- Bus stop;
- Waste Storage and collection area;
- Signage;
- Bush Chapel
- Removal of 96 trees (total);
- Landscaping (including Bush Chapel);
- Infrastructure works;
- Earthworks;
- Secondary emergency vehicle/ large vehicle access;
- Acoustic and safety fence; and
- Widening of existing vehicular access from Maitland Street

Stage 1 of the masterplan consists of:

- Site remediation;
- Removal of 7 trees;
- Facilities for a maximum of 140 students and 16 staff, including:
    - One (1) administration and staff area;
    - One (1) staff and student amenities block (including one (1) end of trip facility);
    - Five (5) General Learning Areas (GLAs);
    - One (1) Science classroom; and
    - Covered Outdoor Learning Area (COLA)
- Internal pathways;
- On-site Parking (15 spaces, inclusive of 1 accessible);
- Bike parking x 6;
- Kiss and drop off areas;
- Bus stop;
- Bin storage and collection area;
- Signage;
- Infrastructure works; and
- Widening of existing vehicular access from Maitland Street.

1.2 Objective of this Report

The objective of this FIA is to identify whether the proposed changes to the site are likely to have a significant impact on flood behaviour, or if they have the potential to increase the flood affectation of neighbouring properties.

2 Site Description

The site is triangular in shape, with a northwest/southeast alignment and has an area of 2.432 ha. The site is bound by Muswellbrook Golf Course along the north eastern boundary, Maitland Street along the south western boundary and residential properties to the south eastern boundary (see **Figure 1**). The site address is 72-74 Maitland Street and is legally described as Lot 100 in Deposited Plan (DP) 1261496 (see **Figure 2**).

The site is generally level with a slight slope to a watercourse at the north west boundary. This watercourse flows northeast into the adjoining golf course and on to Muscle Creek via a series of dams on the golf course. Muscle Creek flows west into the Hunter River which, at its closest, is 1.3 km north-west of the site. Stormwater management on site is by overland flow.

72-74 Maitland Street was previously used for forestry plantation purposes and is mapped as Muswellbrook State Forest. The site is no longer used for this purpose and currently sits as an empty and underutilised site.

The main vehicular access to the site is from Maitland Street, as well as pedestrian access. Existing vehicular parking on site includes open air at-grade parking spaces facing Maitland Street.

In terms of travel, Muswellbrook is approximately three (3) hours from Sydney, three hours (3) from Dubbo, two (2) hours from Tamworth and 90 minutes from Newcastle.

Figure 1: Site Locality Plan (Aerial image of site boundary)

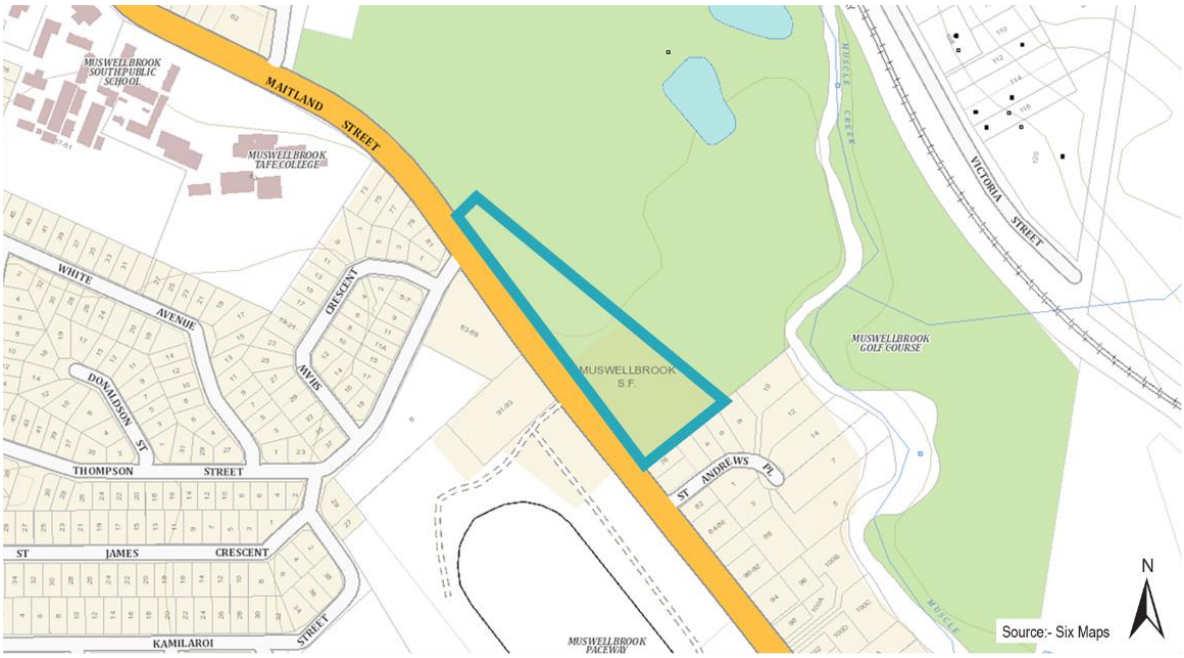

Figure 2: Site Context

2.1 Site Ground Levels and Details of Proposed Development

Details of the proposed development are provided in Section 1.1, while a site layout of the proposed final development is presented in **Figure 3**. The Figure is based on Drawing 10955-NBRS-DR-A-SSDA-1000 (Rev 13) and associated CAD design file was provided by NBRS Architecture. The layout of the building and proposed ground elevation data was extracted from the CAD files and was converted into GIS layers that could be read in by the TUFLOW flood modelling software.

Details of the existing and proposed ground elevation data for the site and surrounding area is presented in **Figure 4**. The raising of the building and also raised forecourt and carpark areas are evident in the Figure. It should be noted that it is only the Maintenance and Bus Shed (and associated driveway) to the north of the site that site that sit in the flood planning area (i.e. 100yr ARI flood extent).

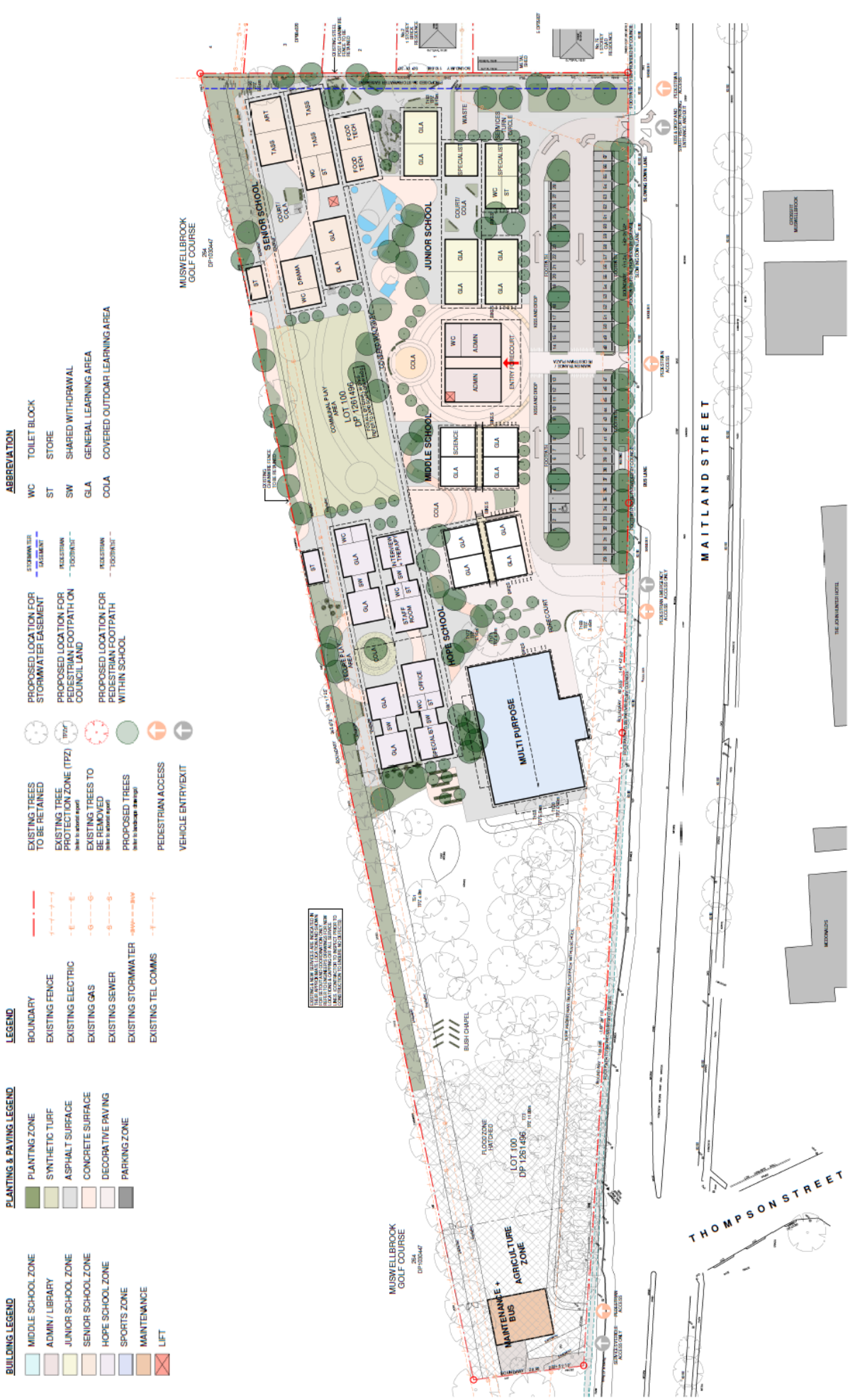

Figure 3: Ground Floor Concept Masterplan (NBRS-DR-A-SSDA-1000 Rev 13)

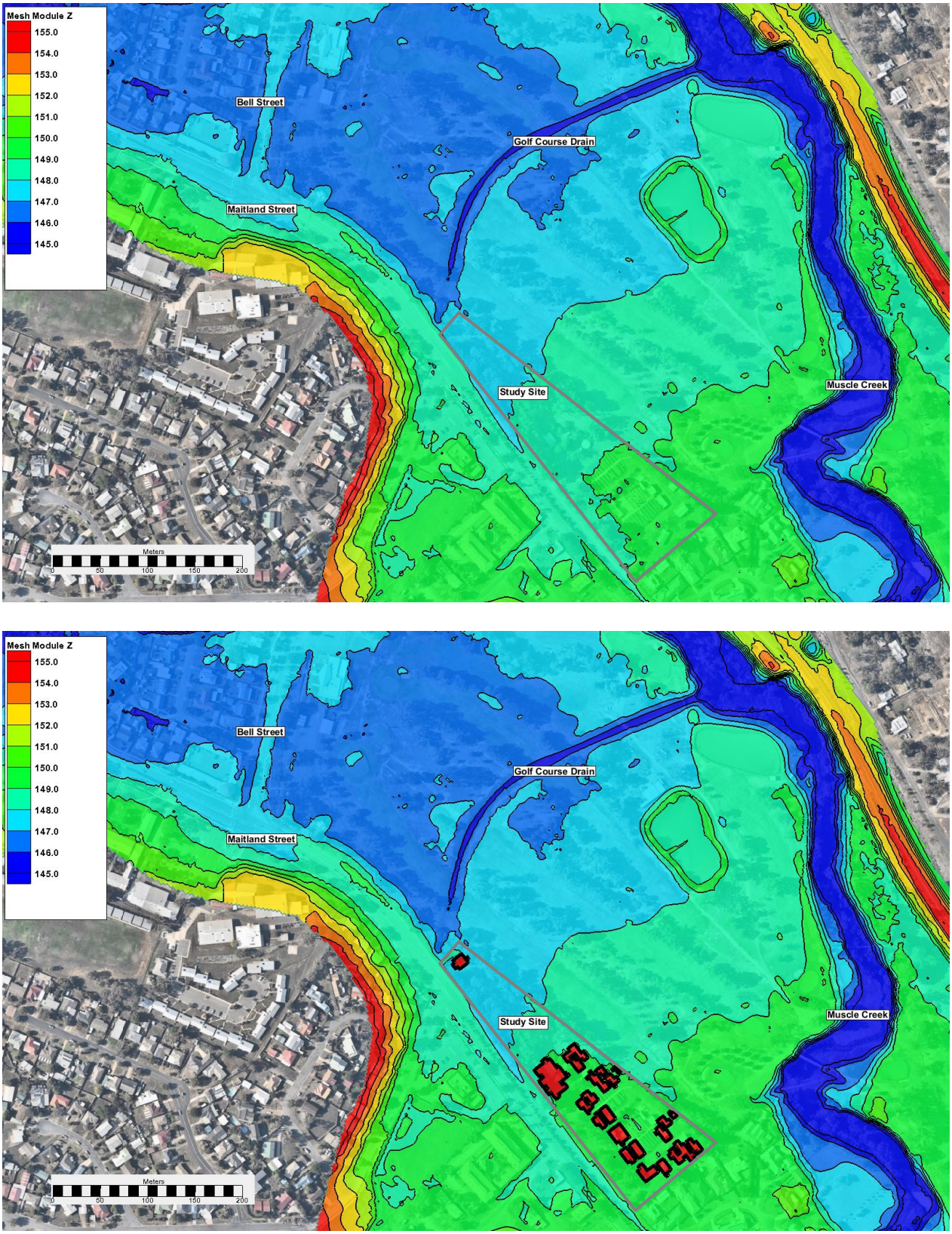

Figure 4: Modelled – Existing (top) and Developed (bottom) Ground Elevation Data (m AHD)

2.2 Summary of Flood Information and Design Levels

Design flood extents (based on RHDHV (2019)) for the study site are presented in **Figure 5**. The results show that all but the lower (north western) portion of the site flood free in the 100yr ARI (1% AEP) design event and while the site is fully inundated during the PMF, though higher ground to the west of the site is less than 200m away.

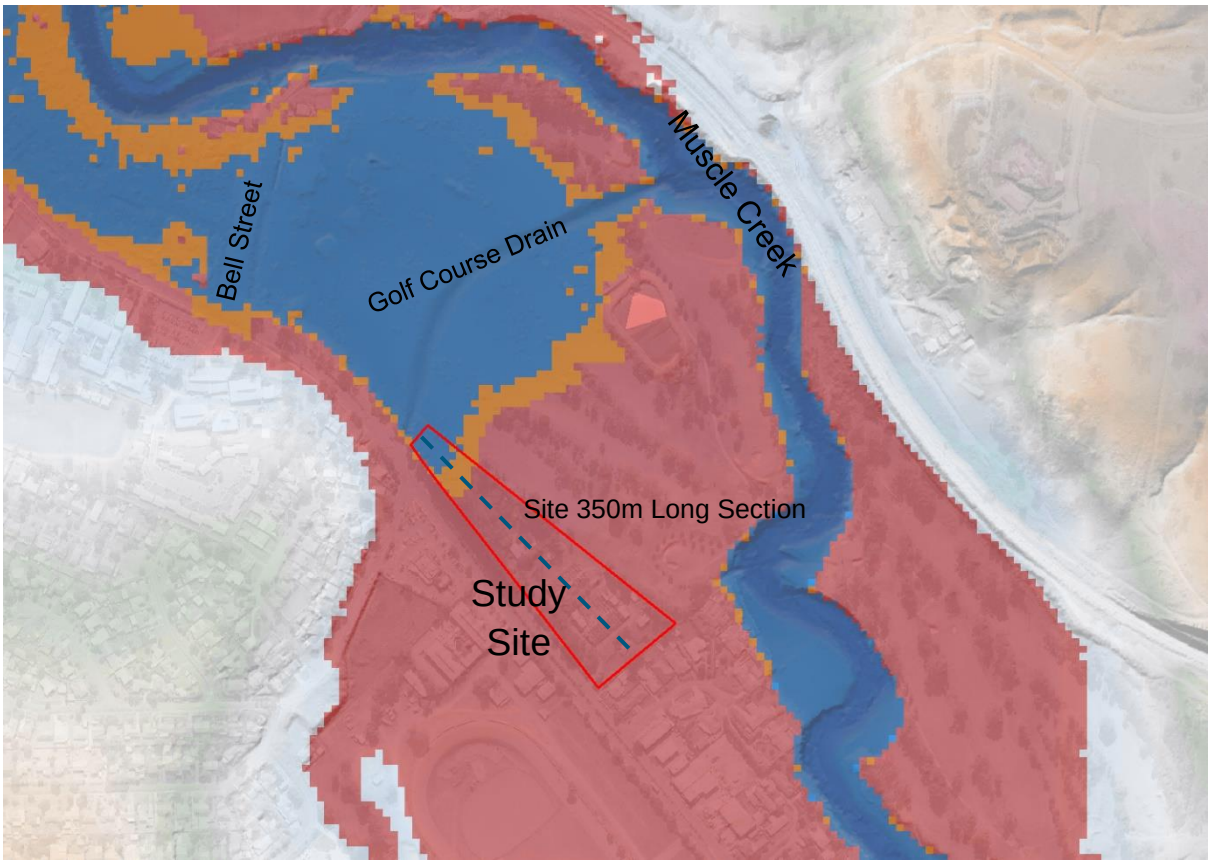

Figure 5: **20yr (blue), 100yr (orange) & PMF (pink) flood extents for Muscle Creek**

A summary of existing flood levels (RHDHV, 2019) are provided in Table 1 for the downstream (north western) part of the site. A long section presenting the site ground levels and design flood levels is presented in Figure 6. The results show that the site ground levels range between 147.1 and 149.5 m AHD and that the 1% AEP (100yr ARI) level is 147.61 m AHD. The results show that the lower part of the site (to the north west) is flooded by tailwater flooding (from a breakout from the Golf Course drain that is held back by Bell Street which has a minimum road crest of 147.1mAHD) and that the depth of flooding in the 1% AEP is approximately 0.5m at the lower part of the site. In the PMF, the site would be flooded by more than 2m depth, however, evacuation to higher ground is available some 200m to the west.

Table 1: North West Site - **Design Flood Levels (m AHD)** *(RHDHV, 2019)*

Design Event (ARI)	Peak Flood Level (m AHD)
Ground Level	147.10
10yr / 10% AEP	147.15
20yr / 5% AEP	147.33
50yr / 2% AEP	147.41
100yr / 1% AEP	147.61
200yr / 0.5% AEP	147.80
500yr / 0.2% AEP	148.03
PMF	150.26

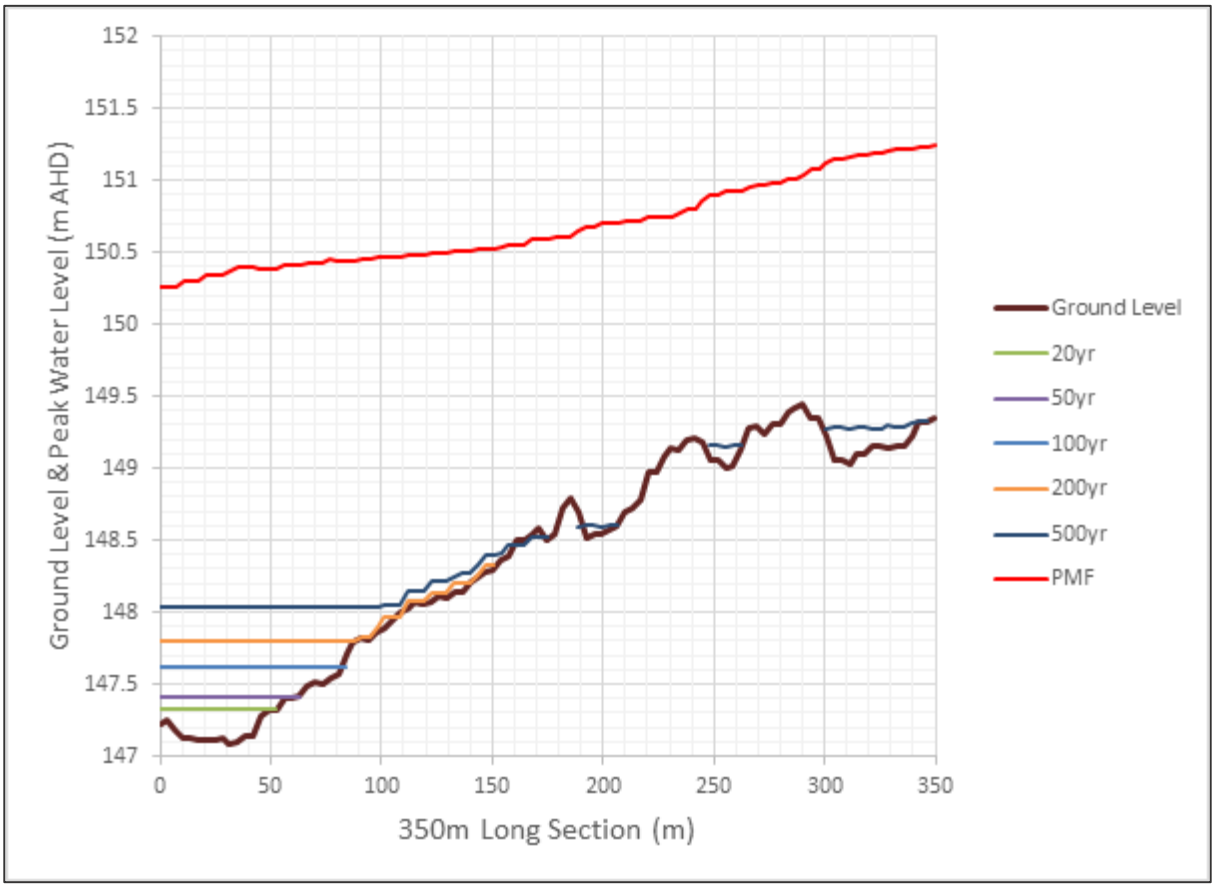

Figure 6: Design Flood Levels (RHDHV, 2019)– Long Section
Note: Long section location provided in Figure 5

Given the 1% AEP flood level is 147.61 m AHD, the flood planning level (i.e. minimum flood level) for the site is 148.11 m AHD (i.e. 1% AEP design level with 0.5m freeboard).

It is important to note that a small portion of the site currently is considered to provide flood storage (see **Figure 7**). Any land filling in this location may result in increased flood levels to downstream properties which may be considered unacceptable. The impact on flood levels due to the proposed development has been quantified in this study and is presented in Section 4.4.2.

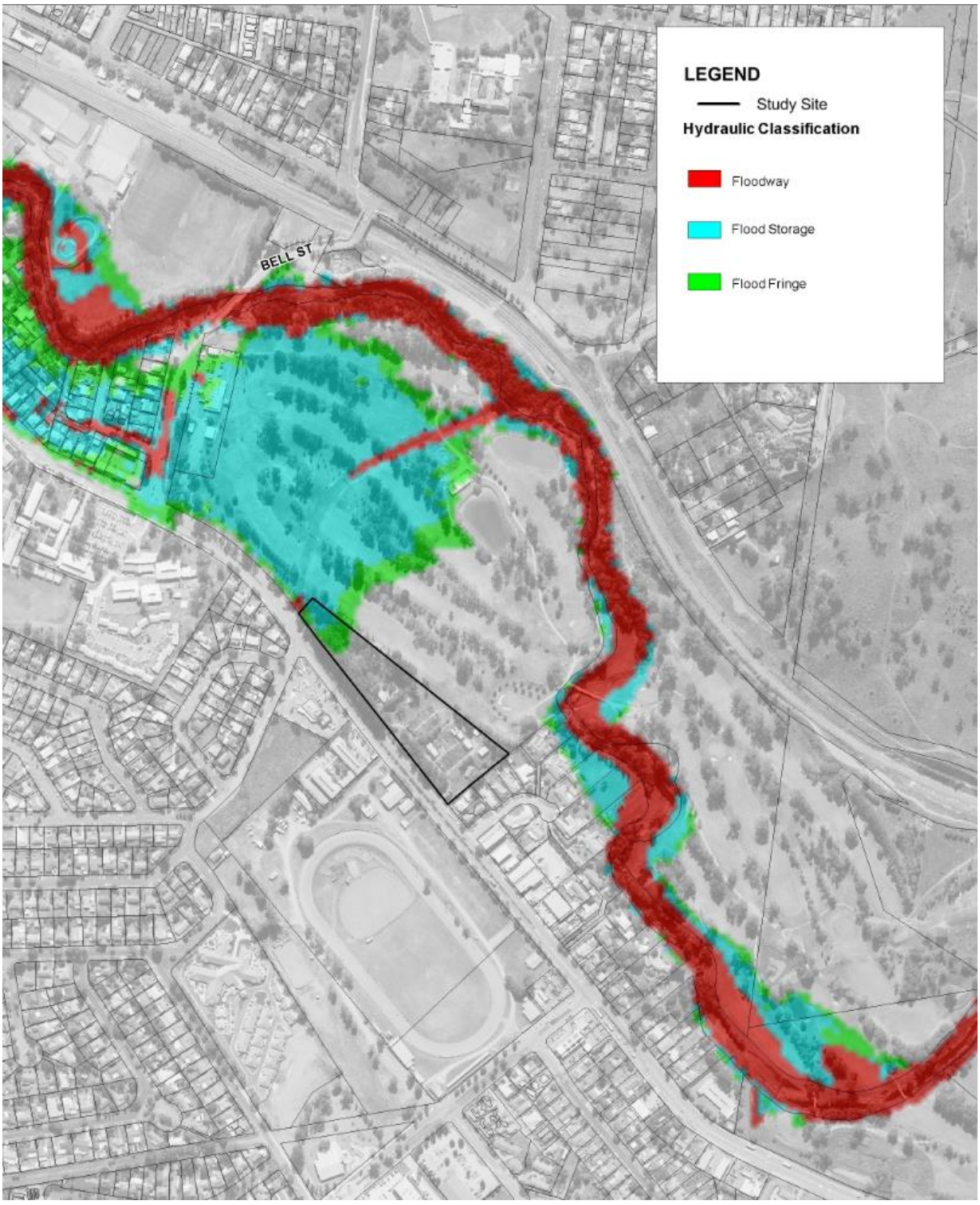

Figure 7: Hydraulic Categorisation (1% AEP) 2019 FRMS&P

Figure 8 presents the hazard categorisation using from the Muswellbrook FRMS&P (RHDHV, 2019). The figure shows that there are no restrictions to the development based on hazard.

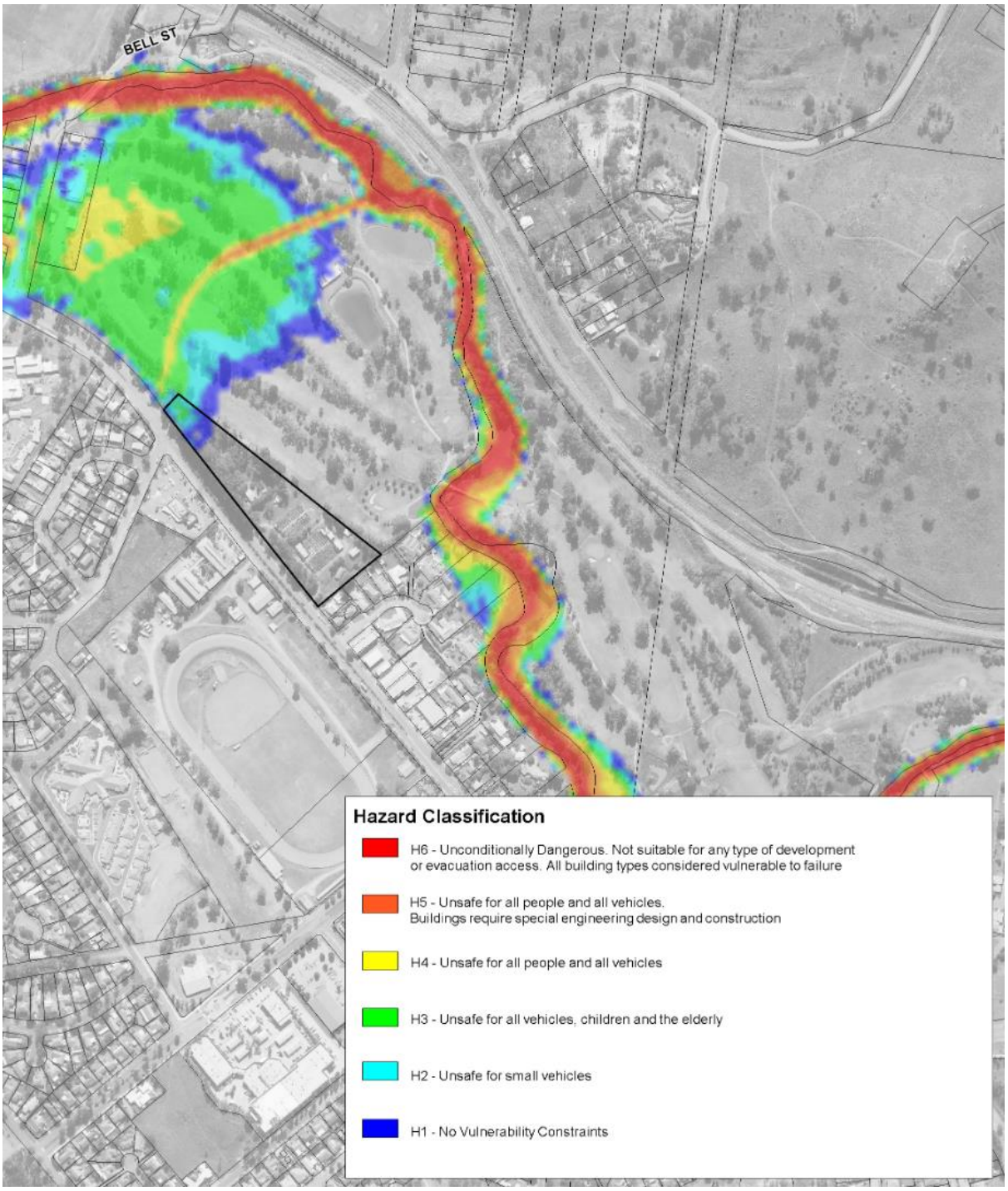

Figure 8: Hazard Categorisation (1% AEP) 2019 FRMS&P

3 Relevant Documents

3.1 Muswellbrook DCP

The following principles outlined in the Muswellbrook Shire Development Control Plan (DCP, April 2009) – Section 13 Flood Prone Land must be adhered to:

- Proposed development will not result in increased flood hazard or flood damage to other properties.
- Proposed development should be of a type, height and scale that is compatible with the existing urban and historic fabric of the area.
- Construction methods and materials for that part of the development below the 1% AEP flood levels should conform to the flood proofing code.
- Proposed development should be able to withstand the force of flowing floodwaters, including debris and buoyancy forces.

3.2 Muscle Creek Flood Study (*RHDHV, January 2017*)

RHDHV prepared the Muscle Creek Flood Study in 2017 as part of the Hunter River (Muswellbrook to Denman) Flood Risk Management Study (FRMS). The key objective of the study was to assess flooding within the township of Muswellbrook that occurs from runoff from the Muscle Creek Catchment. The results and key recommendations from this study were assessed in conjunction with Hunter River flood model results as part of the FRMS.

The Muscle Creek Flood Study includes:

- A description of the assessment methodologies and the data used to inform the assessment.
- Detailed flood maps that depict the extent and nature of flooding on the Lower Muscle Creek Floodplain for the 50, 20, 10, 5, 2, 1, 0.5 and 0.2 % AEP and Probable Maximum Flood (PMF) events.
- A preliminary assessment of flood risks.
- Information on potential flood mitigation measures that could be assessed further as part of the FRMS.

The 1% AEP flood extent as documented in the Muscle Creek Flood Study shows that only a small part of the site is inundated due to flooding of Muscle Creek (refer to **Figure 5**).

3.3 Muswellbrook Floodplain Risk Management Study and Plan (*RHDHV, April 2019*)

The Muswellbrook Floodplain Risk Management Study and Plan (FRMS&P) was provided to Muswellbrook Shire Council in 2019 and was prepared to reduce risk to life and property by identifying, assessing and comparing various risk management options, whilst considering opportunities for environmental enhancement as part of the mitigation works.

The FRMS&P documents flooding behaviour (as per the Muscle Creek Flood Study), property inundation assessment, consideration of floodplain management options and response modification measures.

4 Flood Modelling

4.1 Model Setup

The model developed within the *Muscle Creek Flood Study* has been used as the basis for the flood modelling for the purpose of this FIA. Hydrologic modelling was undertaken using XP-RAFTS and two-dimensional hydraulic modelling was undertaken using TUFLOW.

4.2 Existing Scenario

The existing scenario was modelled utilising the base TUFLOW model prepared for the Muscle Creek Flood Study.

4.3 Proposed Scenario

The proposed scenario flood model was developed by adding the proposed ground level changes and building outlines (as described in Section 2.1 and presented in **Figure 4**) to the TUFLOW model.

4.4 Model Results

Model simulations were undertaken for the existing and proposed scenarios for the 5% AEP (20yr ARI), 1%AEP (100yr ARI), 0.2%AEP (500yr ARI) and the probable maximum flood (PMF) design flood events. It should be noted that the 500yr ARI peak Muscle Creek discharge (flow) was 37% higher that the 100yr ARI peak discharge. Given that it is estimated that climate change may increase design rainfall depths in the order of 30%, the 500yr ARI event gives an indication of what a future 100yr ARI event may look like if rainfall depths increase by 37%.

4.4.1 Peak Flood Levels and Depths

Maps of peak flood levels (points) and depths (coloured grids) are presented in Appendix A for the 20yr, 100yr, 500yr ARI and PMF Flood events for the existing (Exg) and proposed development (Dev) scenarios. **Figure 9** presents the data shown in Figure - Exg 100yr (Appendix A), which shows the 1% AEP (100yr ARI) flood depths (as a coloured grid) and flood levels (at 10 points).

A summary of peak water levels for the 20yr, 100yr, 500yr ARI and PMF events at 10 locations (as defined in **Figure 9**) is presented in **Table 2.**

Table 2: 20yr, 100yr, 500yr ARI and PMF Flood Levels (mAHD) – Existing (Exg) and Proposed (Dev) Scenarios

Point/ID	Exg_20yr	Dev_20yr	Exg_100yr	Dev_100yr	Exg_500yr	Dev_500yr	Exg_PMF	Dev_PMF
1	149.593	149.597	149.933	149.933	150.410	150.410	153.678	153.671
2	148.924	148.924	149.551	149.551	150.122	150.122	152.508	152.512
3	148.286	148.285	148.918	148.918	149.504	149.504	151.790	151.847
4	147.511	147.511	148.073	148.073	148.509	148.509	150.587	150.611
5	146.716	146.713	147.477	147.477	147.964	147.964	150.141	150.150
6	**dry**	**dry**	**dry**	**dry**	**149.171**	**149.248**	**151.177**	**151.223**
7	**dry**	**dry**	**dry**	**dry**	**148.480**	**148.455**	**150.540**	**150.472**
8	**147.354**	**147.354**	**147.609**	**147.609**	**148.007**	**148.006**	**150.302**	**150.095**
9	147.349	147.349	147.594	147.594	147.979	147.979	150.105	150.104
10	144.972	144.983	145.879	145.879	146.456	146.456	148.564	148.563

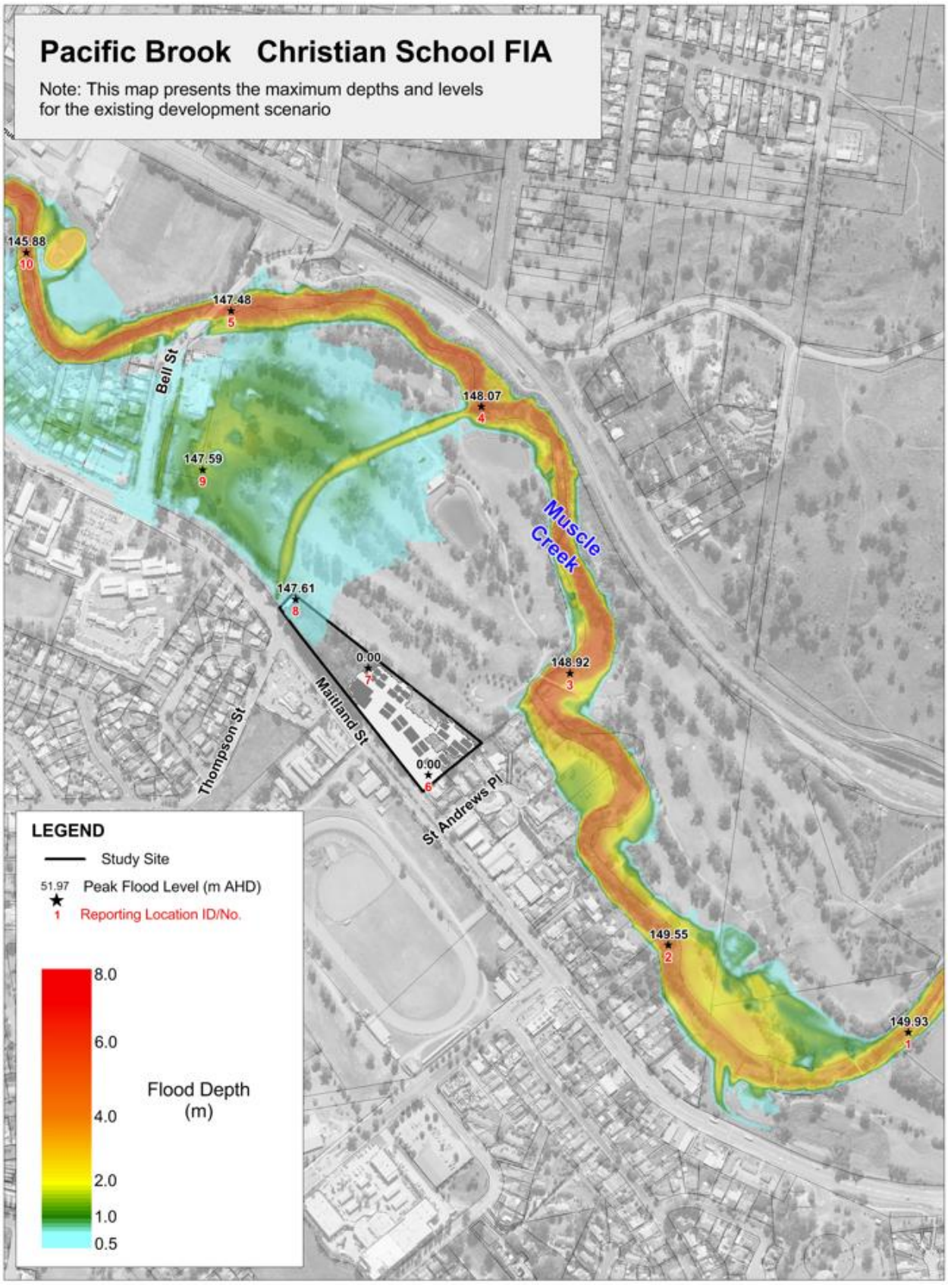

Figure 9: Existing scenario – 1% AEP Flood Depths and Output Location ID

An examination of the flood maps presented in Appendix A and flood levels summarised in **Table 2,** show that with the exception of the north-western portion of the site (which is flooded by a tailwater that forms when water enter the golf course through a drain (located near point 4) and is trapped behind Bell Street), the site is largely flood free in the 5% AEP (20yr ARI) and 1% AEP (100yr ARI) design flood events. The bus/maintenance building which is situated in the area that is flooded, experiences 5% AEP (20yr ARI) flood levels of 147.35 mAHD and 1% AEP (100yr ARI) flood levels of 147.61 mAHD.

In the 0.2%AEP (500yr ARI) flood event, Figure Exg-500yr and Dev-500yr (Appendix A) show that the site is affected by shallow (less than 0.5m deep) overland flow as water breaks the banks of Muscle Creek. In the PMF event, flood depths of greater than 2m are expected across the study site and the entire Muscle Creek floodplain is inundated.

4.4.2 Impact of Developments - Changes to Peak Flood Levels

The impact of the proposed development on flood levels has been quantified by subtracting the peak flood level predicted in the proposed development scenario from those predicted in the existing scenario. Maps presenting the flood impact for the 1% AEP (100yr ARI) and 0.2% AEP (500yr ARI) are presented in Appendix A, while a summary of water level differences at 10 locations (as defined in **Figure 9**) is presented in **Table 3**.

Figure 10 reproduces that impact map presented in Appendix A (Fig - Diff 100yr) and shows that there are no areas where flood levels are increased by more than 1 cm. A comparison of flood differences at point 8 (adjacent to the proposed bus/maintenance building) shows that the water level difference is less than 1 mm. While ground level changes (including the driveway and bus/maintenance shed building pad) have reduced the available flood storage, because the flooding is due to a tailwater and the level is controlled by flood waters “weiring” over Bell Street, the minor loss of flood storage has not resulted in any increase in flood levels for the 1% AEP (100yr ARI) design flood event.

During the 500yr event, the proposed development interacts with the overland flow path that is predicted and changes peak flood levels by up to 10 cm (refer Map presented in Fig - Diff 500yr in Appendix A). It should be noted that flood impact is extremely localised and extends no further than 15m from the property boundary.

Table 3: Peak Water Level Differences (Proposed (Dev) minus Existing (Exg)) for 100yr and 500yr ARI Events

Point/ID	Diff_100yr (m)	Diff_500yr (m)
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	dry	0.0766
7	dry	-0.0247
8	0	-0.0011
9	0	0
10	0	0

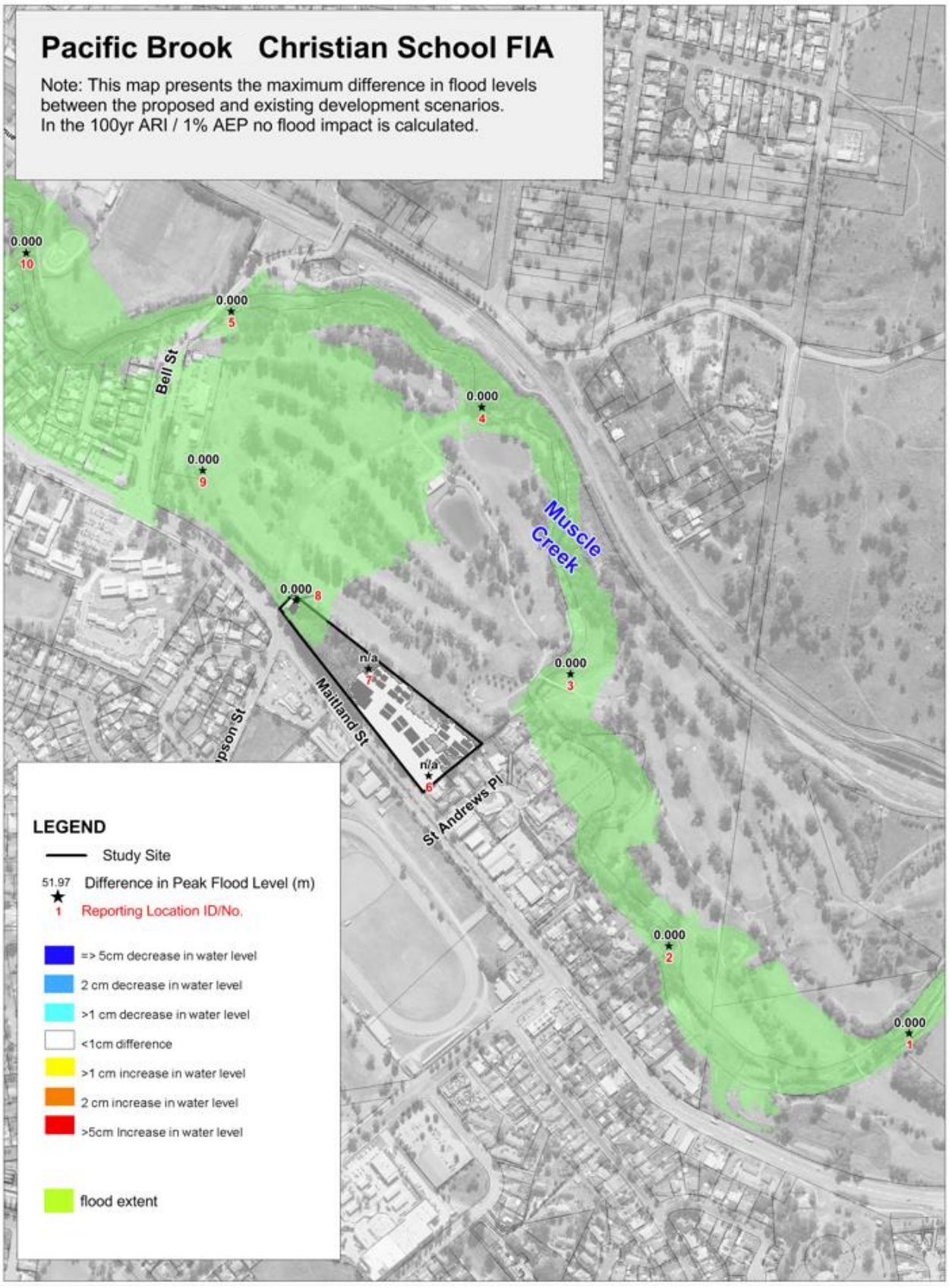

Figure 10: Difference in 1% AEP peak flood level between existing and proposed scenarios

5 Summary of Flood Impact Assessment

This report details a flood impact assessment for the proposed development of a new school at 72-74 Maitland Street, Muswellbrook. The document is intended to provide information regarding flood planning levels and to quantify the potential flood impact of the proposed development.

Based on the modelling undertaken in this study, the minimum site floor level is 148.11 m AHD (i.e. 1% AEP design level with 0.5m freeboard). This matches the existing flood planning levels provided in RHDHV (2019).

This investigation shows that the majority of the site is flood free in the 1% AEP design flood. While the PMF flood event is shown to completely inundate the site by more than 2m depth, flood free higher ground is located within 200m to the west.

While ground levels changes (including the driveway and bus/maintenance shed building pad) have reduced the available flood storage, because the flooding is due to a tailwater and the level is controlled by flood waters “weiring” over Bell Street, the minor loss of flood storage has not resulted in any increase in flood levels for the 1% AEP (100yr ARI) design flood event.

During the 500yr event, the proposed development interacts with the overland flow path that is predicted and changes peak flood levels by up to 10 cm. It should be noted that flood impact is extremely localised and extends no further than 15m from the property boundary.

5.1 Impacts to neighbouring properties

As presented in **Figure 10,** the proposed development will have no impact on flood levels in the 1% AEP (100yr ARI) design flood event. While there is a small localised impact in the 0.2% AEP (500yr ARI) event, the DCP only requires impact for the 1% AEP event to be less than 0.1m.

5.2 Compliance with Council DCP

Section 13 of Council’s Development Control Plan outlines controls that apply to all flood prone land within the Muswellbrook LGA. Of specific relevance to the proposed development is Section 13.4 (Non-Residential Development).

A summary of the relevant controls relating to the proposed development at the site is presented below in **Table 4**.

Table 4: Non-Residential Development Controls relating to Flood Prone Land

Development control in Section 13.4 of Muswellbrook Shire DCP	RHDHV response to development control
a) The floor level of all habitable areas of the proposed development shall be at least 0.5m above the 1% AEP flood level, except in the case of a change of use of an existing building.	It is noted that the 1% AEP flood level is 147.61 mAHD. It is recommended to adopt a minimum site floor level of 148.11 m AHD (i.e. 1% AEP design level with 0.5m freeboard).
b) The development will not result in increased flood hazard or flood damage to other properties or increase afflux by more than 0.1m.	As presented in the flood mapping included in **Appendix A**, the proposed development will not result in increased flood hazard or damage to other properties. Flood afflux due to the proposed development would be no greater than 1 mm in the 1% AEP event.
c) The construction methods and materials for that part of the development below the 1% AEP flood levels shall conform to the flood proofing code.	The construction methods and materials are yet to be defined but will need to meet the Council flood proofing code (as provided in the DCP).
d) The proposed development can withstand the force of flowing floodwaters, including debris and buoyancy forces.	The Structural designs for the proposed buildings are yet to be defined and will need to be designed appropriately to withstand flood forces.
e) Provision shall be made for the safe storage and/or timely removal of goods, material, plant and equipment in the event of a flood.	It is understood that there will be no storage of toxic or corrosive materials below the 1% AEP flood level within the site.

5.3 Flood Evacuation Considerations

Section 13 of the Muswellbrook DCP (Flood Prone Land) requires that 'an evacuation plan for users of the development is prepared (to the satisfaction of Council) and maintained throughout the life of the development.' Whilst not explicitly stated in the Muswellbrook DCP, flood evacuation typically takes into consideration the extent and depth of flooding in all events up to the Probable Maximum Flood (PMF).

The flood model results summarised in **Section 4.4** indicate the depth of flooding due to the PMF is approximately 2.0 metres at the study site (refer to Dev PMF (In Appendix A)). Early flood evacuation should be considered with evacuation to high ground on Thompson Street available within approximately 200m of the site boundary.

It should be noted that many of the proposed buildings have a 2nd storey with a Level 1 floor level at 152.5 m AHD. Given this is above the peak PMF level of 151.22 mAHD, provided the building is constructed to withstand PMF flood forces, shelter-in-place could be considered.

6 References

Royal HaskoningDHV (2017), **Muscle Creek Flood Study**, Prepared by Royal HaskoningDHV on behalf Muswellbrook Shire Council, January 2017

Royal HaskoningDHV (2019), **Muswellbrook FRMS&P**, Prepared by Royal HaskoningDHV on behalf Muswellbrook Shire Council, 8th April 2019

Appendix A

Flood Mapping

Figure Exg 20yr – 5% AEP (20yr ARI) peak flood depths and level – existing scenario
Figure Exg 100yr – 1% AEP (100yr ARI) peak flood depths and level – existing scenario
Figure Exg 500yr – 0.2% AEP (500yr ARI) peak flood depths and level – existing scenario
Figure Exg PMF – PMF peak flood depths and level – existing scenario

Figure Dev 20yr – 5% AEP (20yr ARI) peak flood depths and level – developed scenario
Figure Dev 100yr – 1% AEP (100yr ARI) peak flood depths and level – developed scenario
Figure Dev 500yr – 0.2% AEP (500yr ARI) peak flood depths and level – developed scenario
Figure Dev PMF – PMF peak flood depths and level – developed scenario

Figure Diff 100yr – Flood Impact / Difference in 1% AEP (100yr) peak flood levels
Figure Diff 500yr – Flood Impact / Difference in 0.2% AEP (500yr) peak flood levels

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Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the existing development scenario

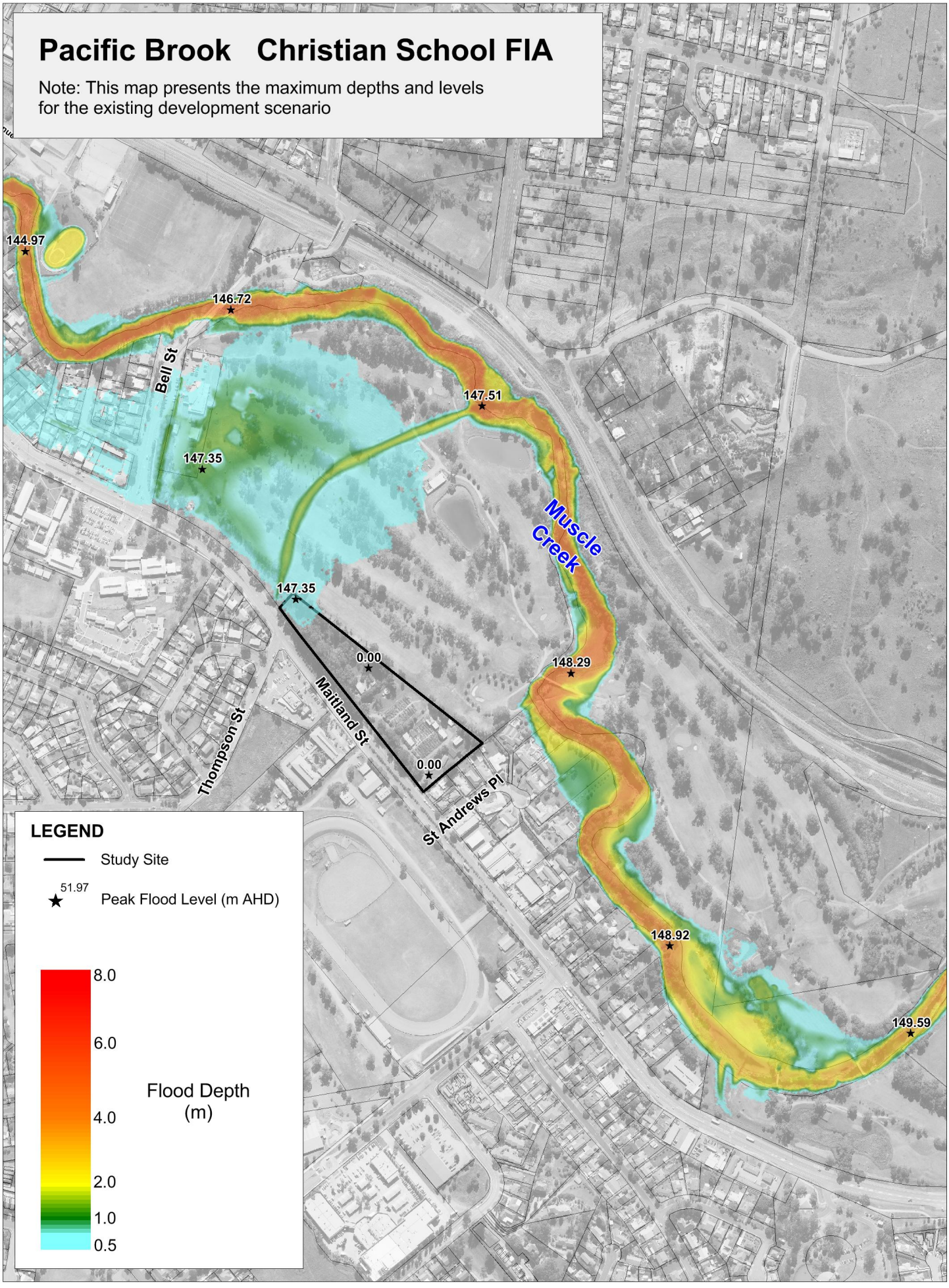

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FIGURE Exg 20yr

EXISTING PEAK FLOOD DEPTH (20yr EVENT)

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Existing_020yr_A3_v1a.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the existing development scenario

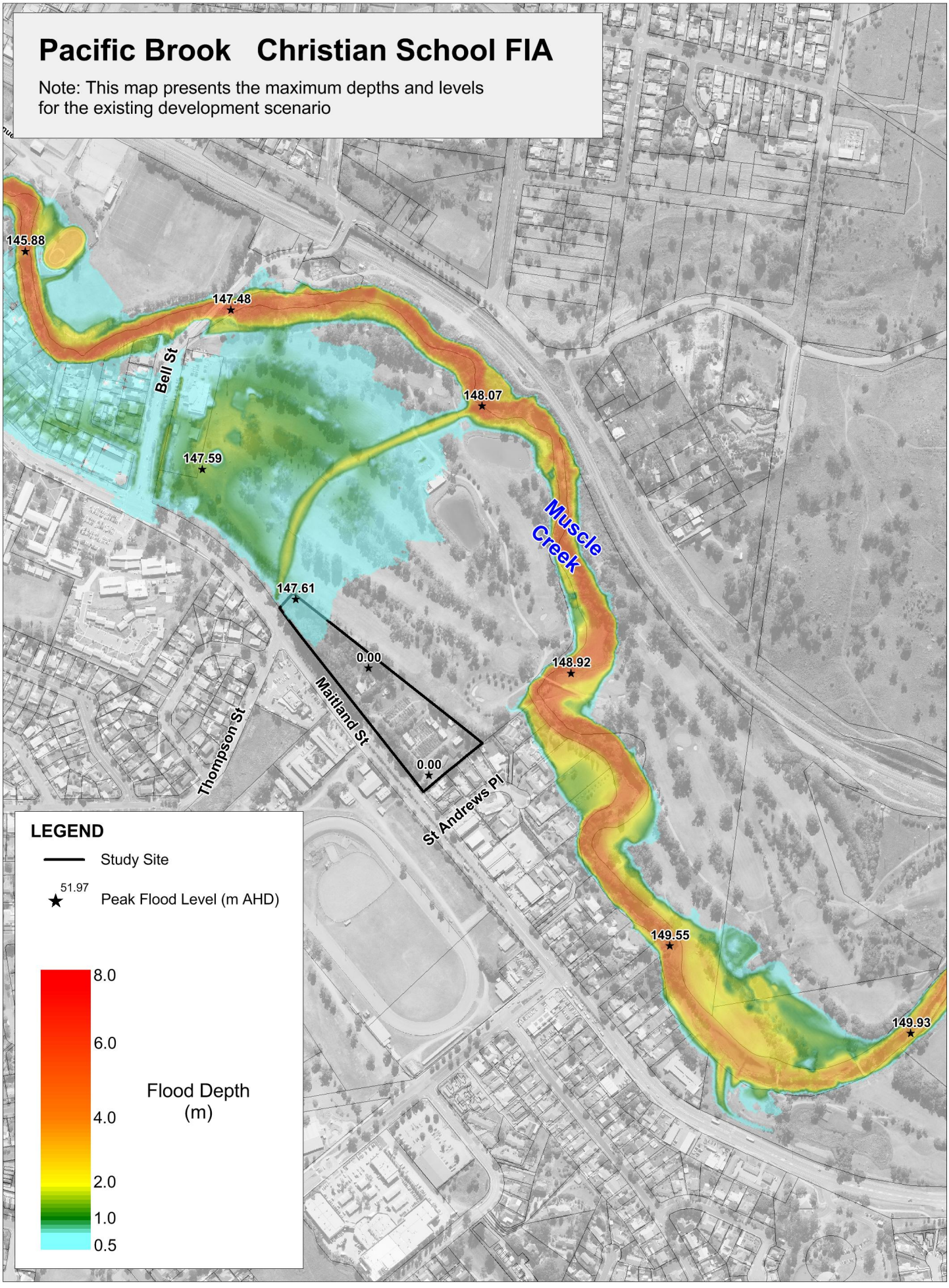

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FIGURE Exg 100yr

EXISTING PEAK FLOOD DEPTH (100yr EVENT)

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Existing_100yr_A3_v1a.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the existing development scenario

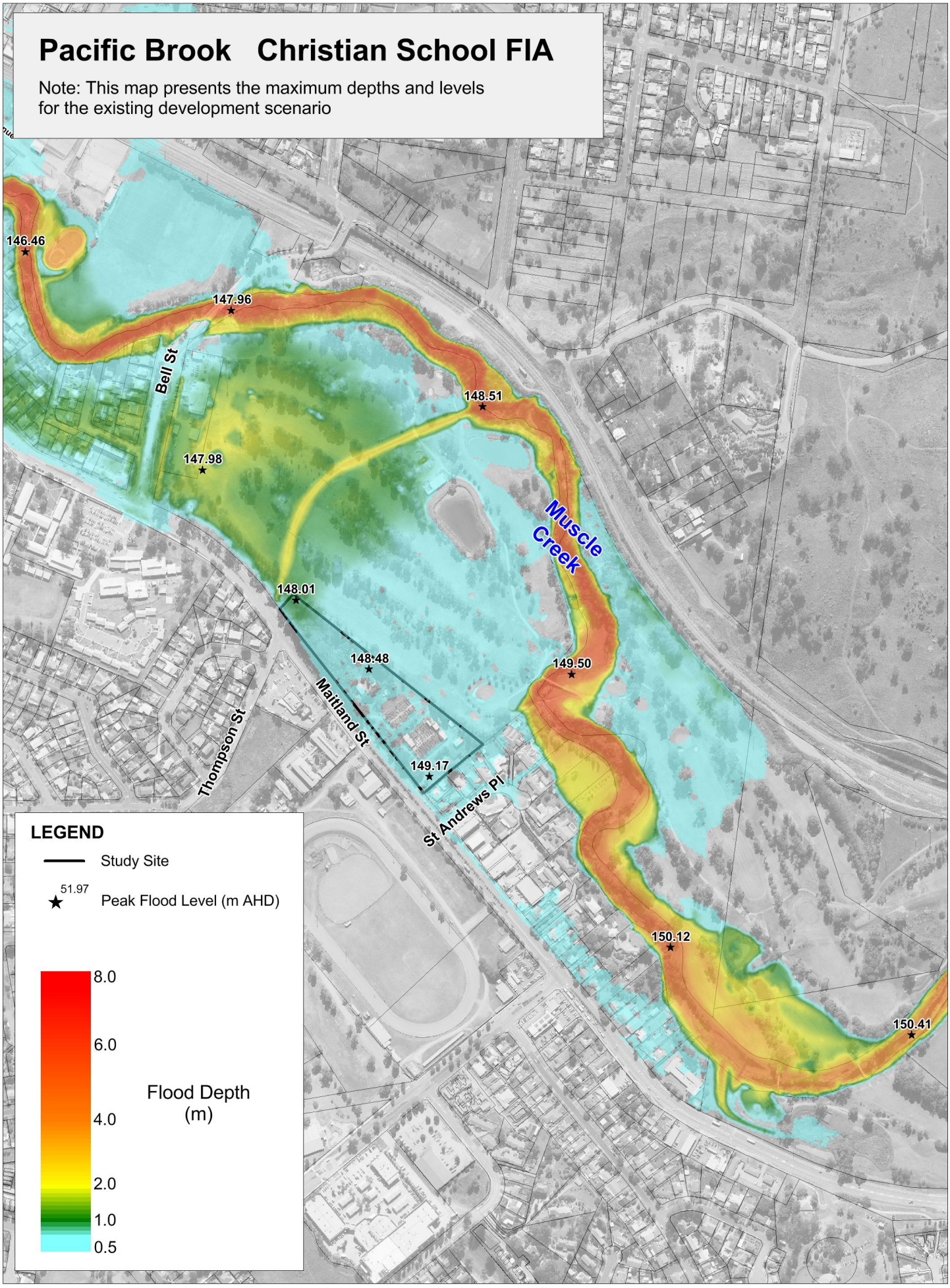

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FIGURE Exg 500yr **EXISTING PEAK FLOOD DEPTH (500yr EVENT)**

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000 PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Existing_500yr_A3_v1a.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels from the existing development

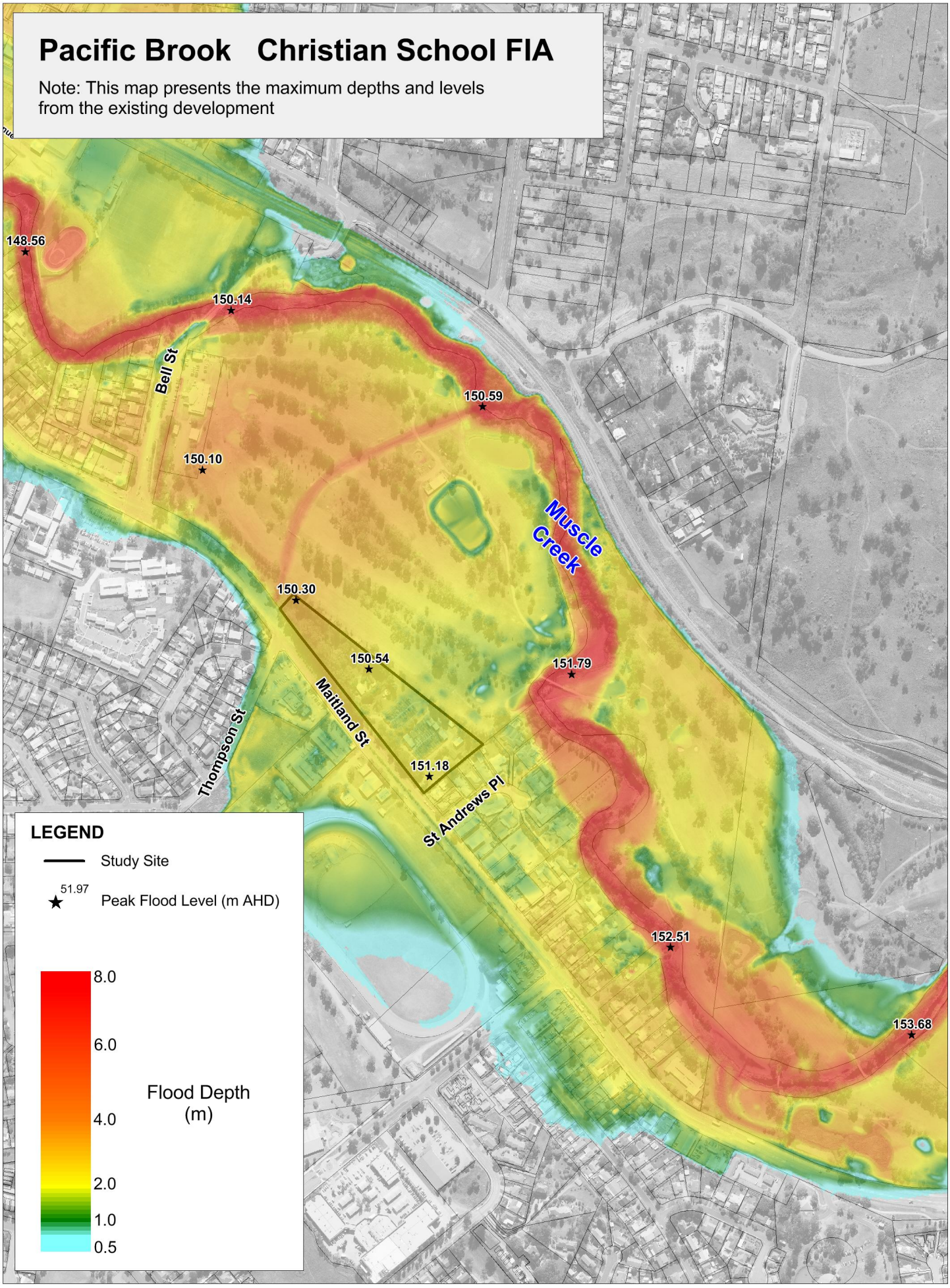

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FIGURE Exg PMF

EXISTING PEAK FLOOD DEPTH (PMF EVENT)

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Existing_PMF_A3_v1a.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the proposed development scenario

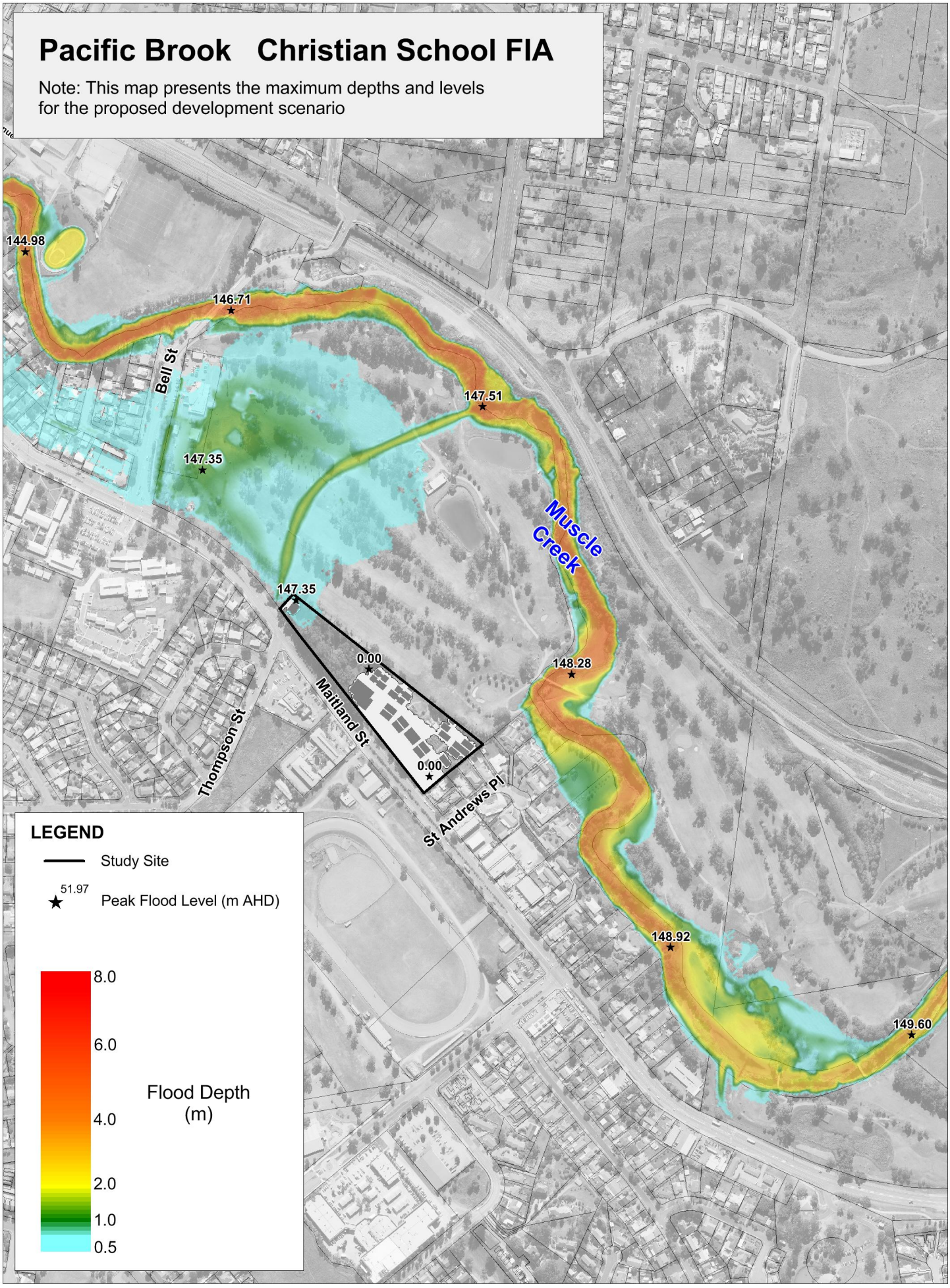

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FIGURE Dev 20yr **PROPOSED PEAK FLOOD DEPTH (20yr EVENT)**

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000 PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Developed_020yr_A3_v1b.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the proposed development scenario

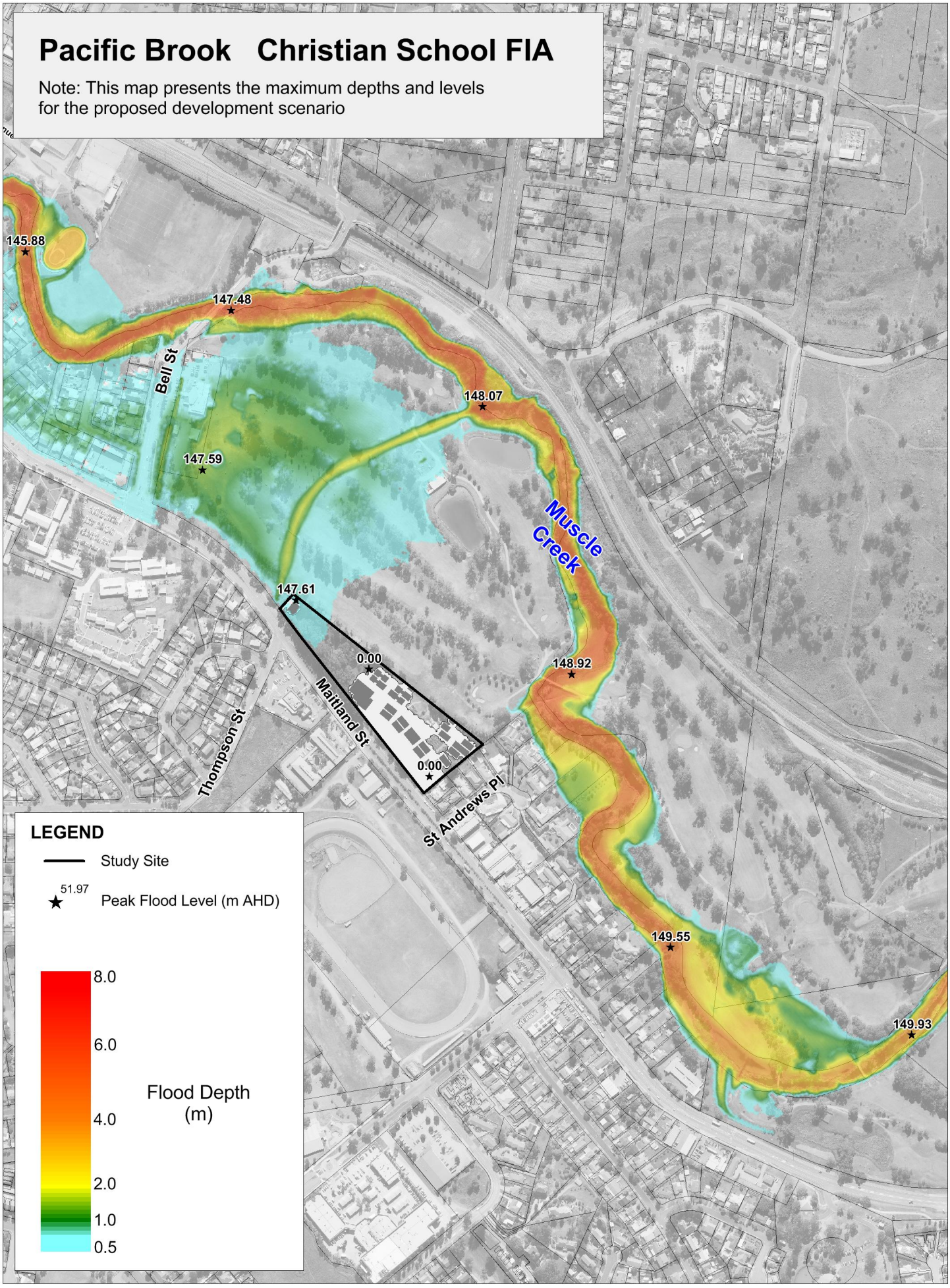

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FIGURE Dev 100yr **PROPOSED PEAK FLOOD DEPTH (100yr EVENT)**

NORTH

0 75 150m
Approx. Scale

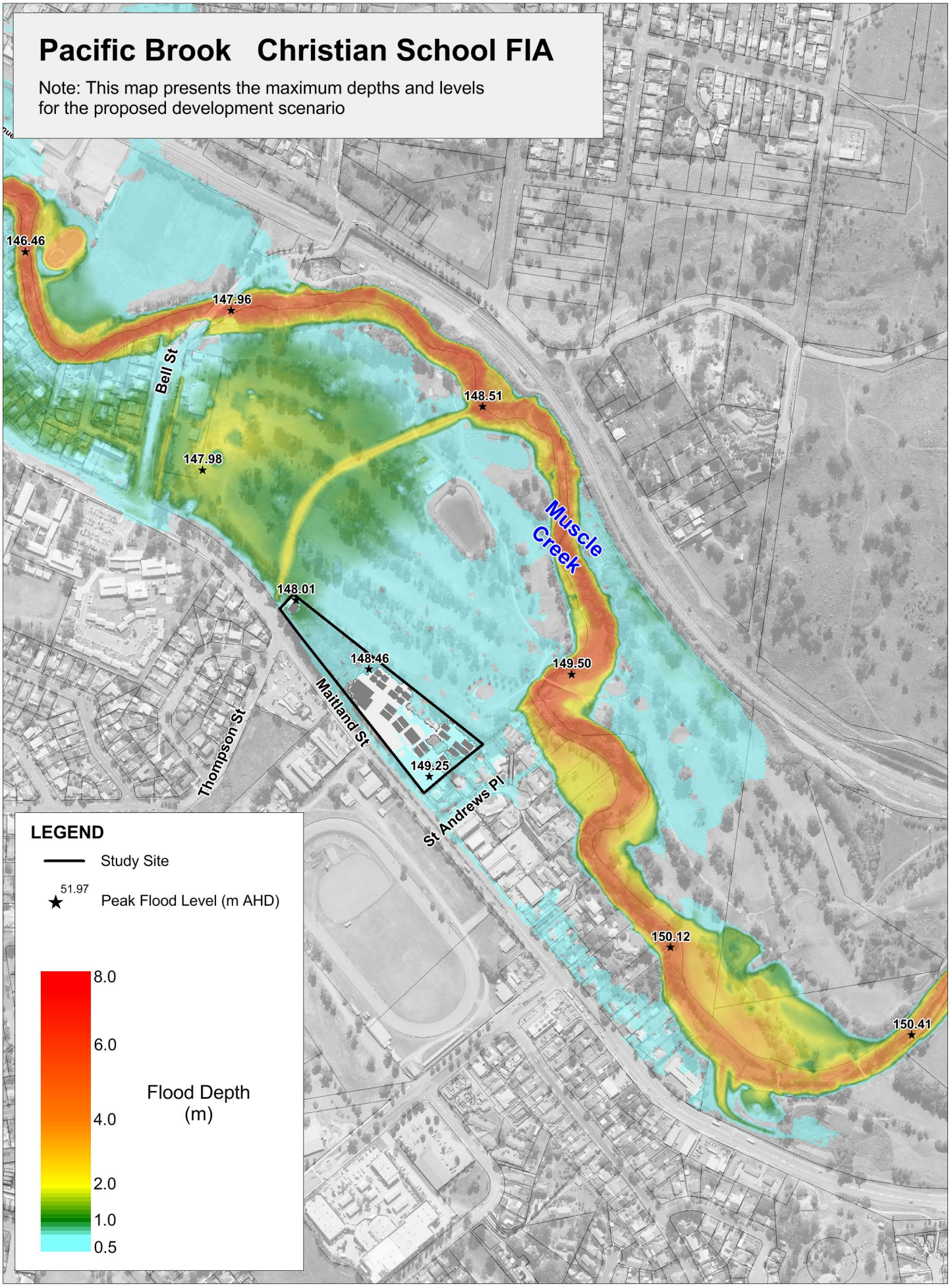
SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Developed_100yr_A3_v1b.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the proposed development scenario



LEGEND

- Study Site
- 51.97 Peak Flood Level (m AHD)

Flood Depth (m)

8.0
6.0
4.0
2.0
1.0
0.5

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FIGURE Dev 500yr **PROPOSED PEAK FLOOD DEPTH (500yr EVENT)**

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000 PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Developed_500yr_A3_v1b.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum depths and levels for the proposed development scenario

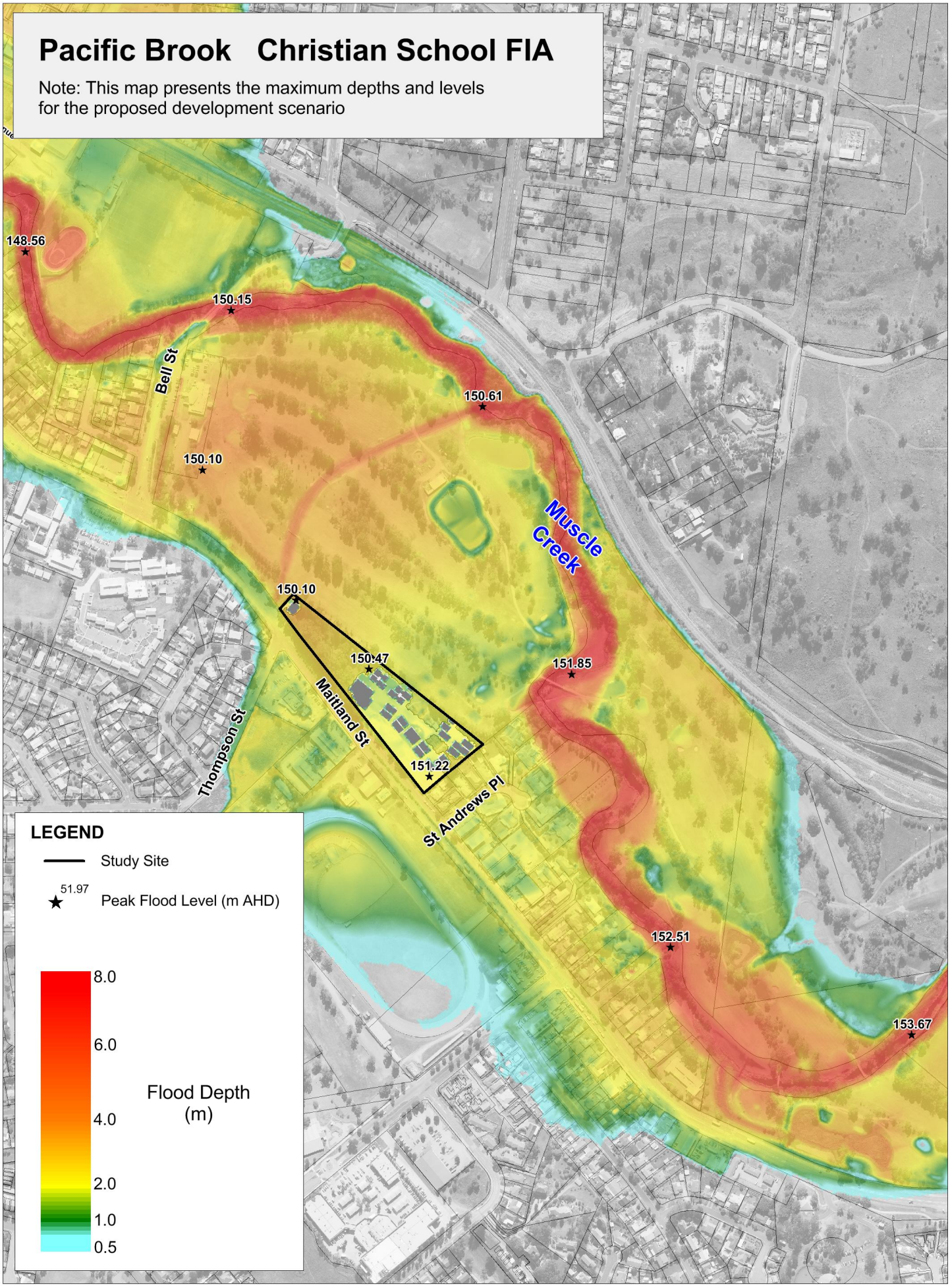

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FIGURE Dev PMF

PROPOSED PEAK FLOOD DEPTH (PMF EVENT)

NORTH

0 75 150m
Approx. Scale

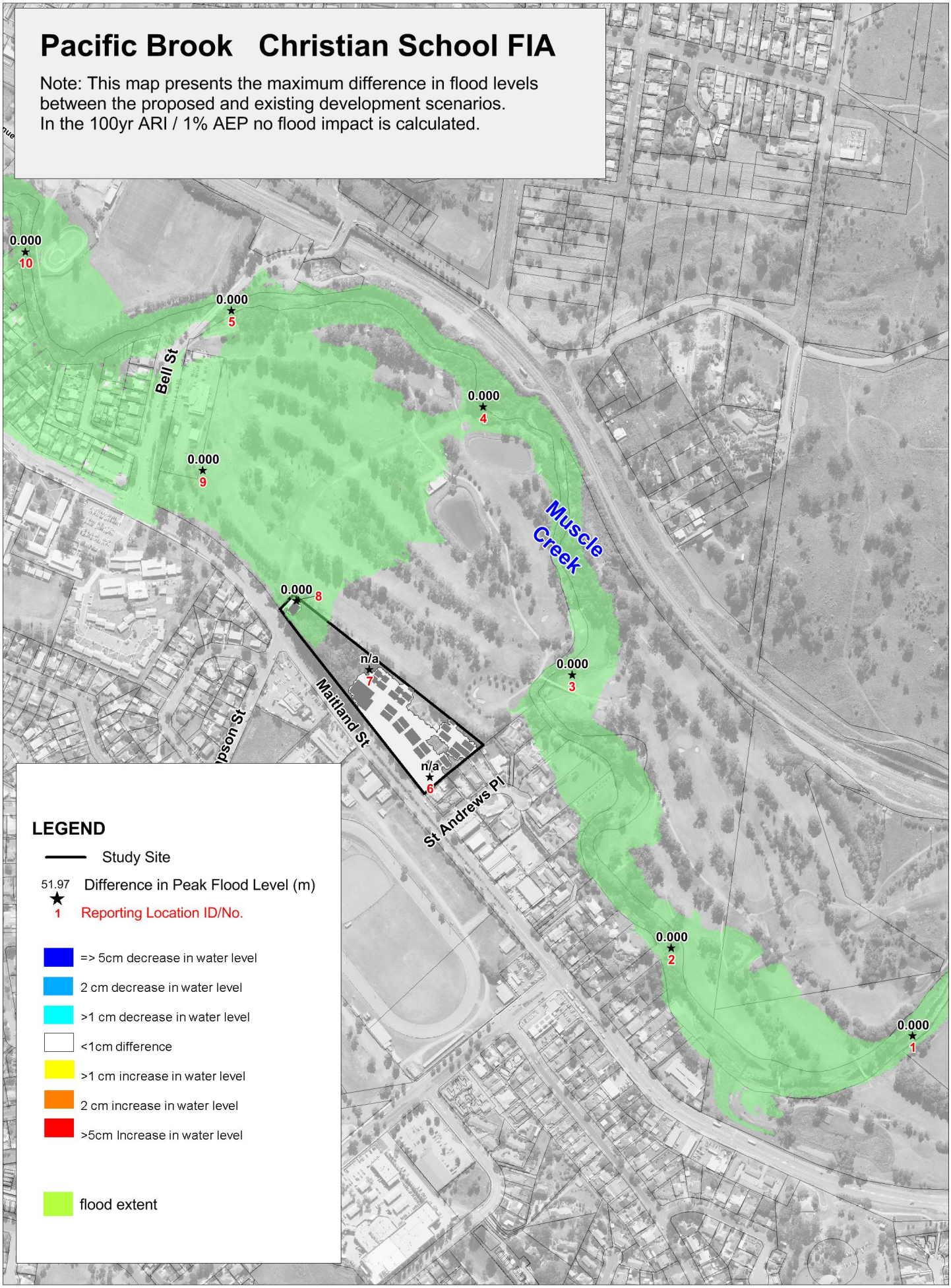
SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Dep_Developed_PMF_A3_v1a.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum difference in flood levels between the proposed and existing development scenarios.
In the 100yr ARI / 1% AEP no flood impact is calculated.



LEGEND

- Study Site
- 51.97 ★ Difference in Peak Flood Level (m)
- 1 Reporting Location ID/No.
- => 5cm decrease in water level
- 2 cm decrease in water level
- >1 cm decrease in water level
- <1cm difference
- >1 cm increase in water level
- 2 cm increase in water level
- >5cm Increase in water level
- flood extent

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FIGURE
Diff 100yr

DIFFERENCE IN PEAK FLOOD LEVEL (100yr EVENT)

NORTH

0 75 150m
Approx. Scale

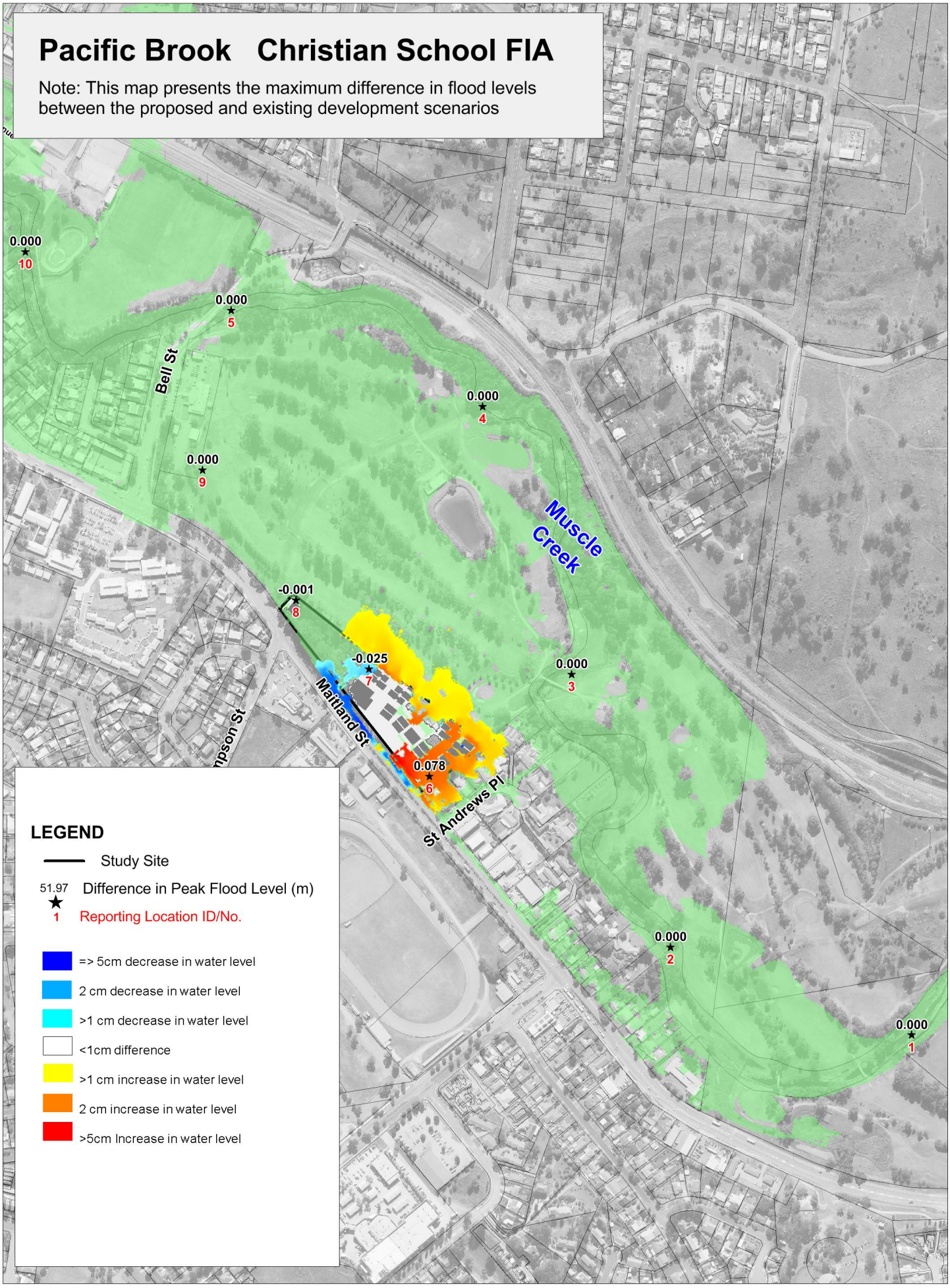
SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Diff_PropMinusExisting_100yr_A3_v1b.WOR

Pacific Brook Christian School FIA

Note: This map presents the maximum difference in flood levels between the proposed and existing development scenarios



LEGEND

- Study Site
- 51.97 ★ Difference in Peak Flood Level (m)
- 1 Reporting Location ID/No.

- => 5cm decrease in water level
- 2 cm decrease in water level
- >1 cm decrease in water level
- <1cm difference
- >1 cm increase in water level
- 2 cm increase in water level
- >5cm Increase in water level

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FIGURE Diff 500yr

DIFFERENCE IN PEAK FLOOD LEVEL (500yr EVENT)

NORTH

0 75 150m
Approx. Scale

SCALE 1:5,000

PAGE SIZE A3

FILEPATH I:\PA2391\Technical_Data\GIS\workspaces\Figure_Diff_PropMinusExisting_500yr_A3_v1b.WOR