FLOOD ADVICE
682 COLERIDGE ROAD, BATEAU BAY

27 June 2024

Prepared for:
Red Bus Services Pty Ltd

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Flood Advice
682 Coleridge Road,
Bateau Bay

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1 Introduction

1.1 Background

Stantec (formerly Cardno) was commissioned by Red Bus Services Pty Ltd to provide flood advice for the proposed re-development of 682A The Entrance Road, Bateau Bay. This Report summarises the available data and existing flood behaviour and provides advice on design considerations in order to avoid flood impacts on adjacent properties and roads. The report also provides an outline Flood Emergency Response Plan.

The location of the study site is shown in **Figure 7**. The site is currently used as a bus depot and is proposed to be rezoned to Low/Medium and Medium Density Residential.

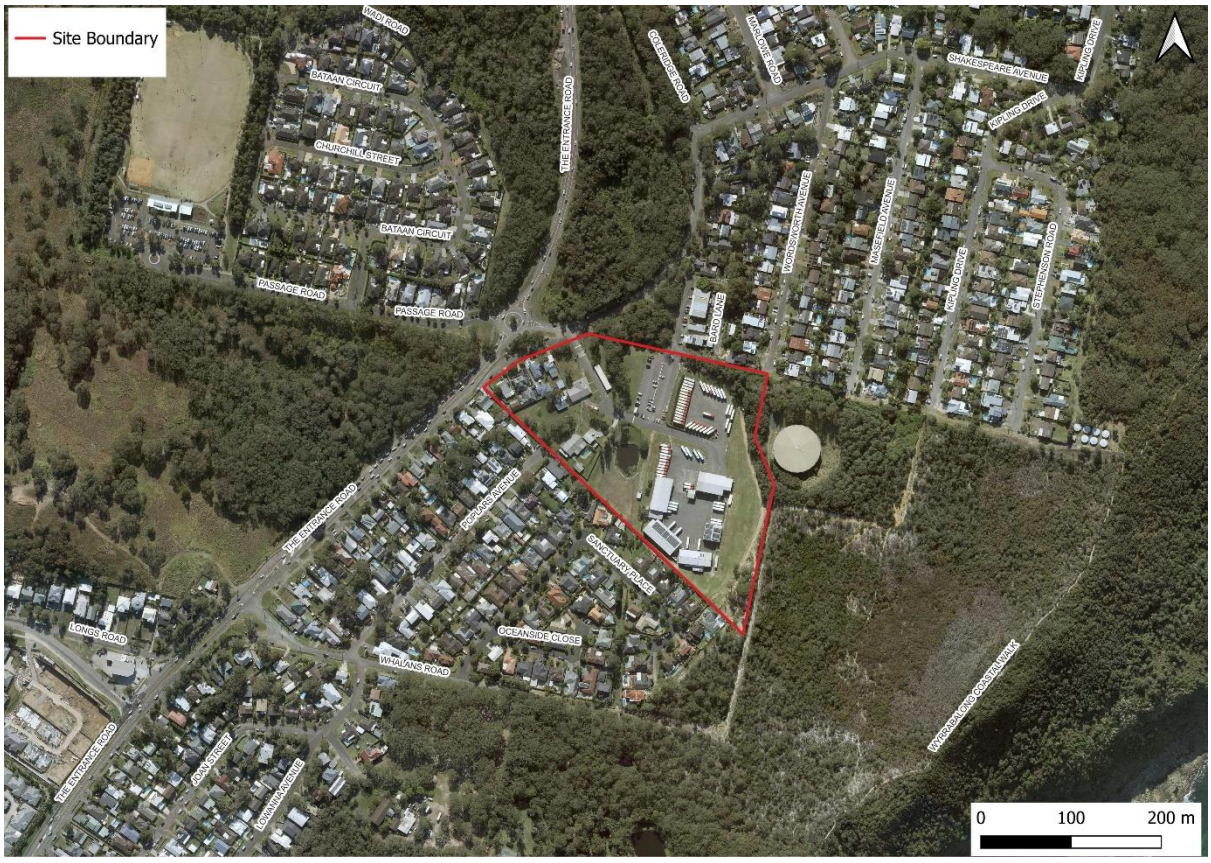


Figure 7 682A The Entrance Road, Bateau Bay

1.2 Scope of Work

The scope of work included:

> Undertaking detailed hydrological and hydraulic modelling to estimate flooding under existing site conditions (Existing Conditions);

> Modelling and mapping of the 50% Annual Exceedance Probability (AEP), 5% AEP, 1% AEP and Probable Maximum Flood (PMF) flood extents, flood levels, depths, velocity and hazards under Existing Conditions;

> Assessing the impacts of Climate Change on the flood behaviour within the site and surrounds;

> Modification of the floodplain model to represent concept development for two scneraios (Conservative Scenario and Realistic Scenario) and the estimation of 50% AEP, 5% AEP, 1% AEP and PMF events under Proposed Conditions and to assess the impacts on flooding;

> Assessment of the compliance or otherwise of the planned development with Council's DCP requirements; and

> Outlining a Flood Emergency Response Plan.

2 Available Studies

2.1 2020 Coastal Lagoon Catchments Overland Flood Study

The final report of the Coastal Lagoon Catchments Overland Flood Study was released on 5 November 2020[1].

As described by MHL, 2020, in part:

> *The Coastal Lagoons Catchments Overland Flood Study has been completed to provide a detailed flooding assessment of Avoca Lagoon, Cockrone Lagoon, Terrigal Lagoon and Wamberal Lagoon. The objective of this study is to improve understanding of flood behaviour and impacts, and better inform management of flood risk in the study area. The study also provides a sound technical basis for any further flood risk management investigation in the area. The previous studies while providing relevant information that relates to the lagoon levels do not provide hazard information in the upper catchments. The lagoons levels are largely dependent upon the berm beach levels and are a key consideration in this project. …..*
>
> *The flood maps appended to this report are presenting the flood levels, depths and velocities for the critical duration and rainfall pattern of a full set of events including the 50%, 20%, 10%, 5%, 2%, 1%, 1 in 200, 1 in 500 AEP and PMF events and represent an envelope of the critical duration/pattern of a selected representative upstream catchment and the critical duration/pattern at the lagoon. The upper catchments are very flashy with very short critical durations of less than 2h to reach the peak level while the downstream catchments (lagoons), have typical critical durations ranging between 2h and 9h. …..*
>
> *Sensitivity analysis highlighted the following points:*
>
> - *The lower catchments of the four lagoons are highly sensitive to the berm level at the time of the flood and maintaining the berm at a set level would minimise the risk of the lagoon reaching very high levels should mechanical opening of the berm not be possible during a storm.*
> - *Tailwater conditions (including sea level rise) typically have minimal impact on most lagoons flooding given the managed berm elevations. Only very large increases in tailwater levels such as the 0.74m sea level rise scenario would influence the lagoon level. The exception is Terrigal Lagoon that has a relatively low managed berm level and changes in tailwater level would have significant impact on the lagoon level as elevated ocean levels would flow into the lagoon. This identifies a significant potential issue with flooding becoming more common in Terrigal with rising sea level.*
> - *Increase in rainfall intensity due to climate change may exacerbate the overland flooding but would typically have a relatively low impact on the lagoon level.*
> - *Changes in roughness or antecedent conditions of the catchment (wet/dry catchment leading to varying losses) could have minor to moderate impacts on the overland flooding.*

[1] MHL (2020) "Coastal Lagoon Catchments Overland Flood Study", Final Report, prepared for Central Coast Council, November, 133 pp + Apps

- *Blockages of structures can have severe impact in areas with no gravity flow that only relies on the drainage network (e.g. ponding area) and maintaining the pits and pipes network is essential to avoid exacerbating the flooding in such location.*
- *Intermittently Closed and Open Lakes and Lagoons (ICOLLs) entrance conditions are sensitive to ocean inundation. These processes need to be carefully considered in conjunction with this study.*

2.2 Hydrology

As described by MHL, 2020, in part:

> *The direct rainfall method was employed in this study. This method applies rainfall directly to the 2D hydraulic model cells which then determine the quantity, direction and velocity of flow on a highly local scale based on detailed surface material and topographic information. Therefore, development of a traditional hydrologic model was not required to complete the study.*
>
> *Although the direct rainfall method negates the need for hydrological models, hydrological models were still developed to:*
>
> - *Provide verification of the direct-rainfall method;*
> - *Identify critical design duration/pattern hyetographs from the ensemble of events specified by AR&R 2019; and*
> - *warning systems or flood information tools (e.g. MHLFIT).*
>
> *The hydrological model selected for this study is WBNM (version 2017). …..*
>
> *The design events modelled in this study include:*
>
> - *Frequent events - 50% AEP, 20% AEP and 10% AEP;*
> - *Rare events - 5% AEP, 2% AEP and 1% AEP;*
> - *Very rare events - 1 in 200 AEP and 1 in 500 AEP; and*
> - *Extreme event - Probable Maximum Flood (PMF).*

The adopted WBNM subcatchment layout for the Wamberal Lagoon catchment is plotted in **Figure 8**. The study site is located adjacent to and outside the Wamberal Lagoon catchment.

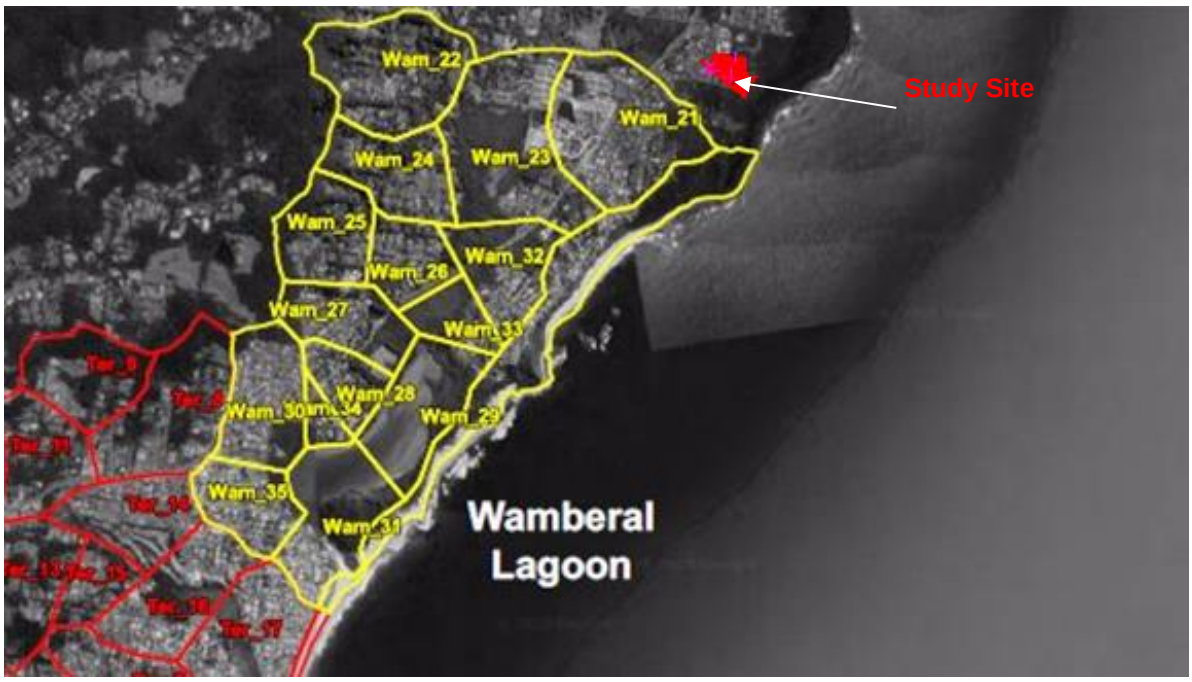


Figure 8 Wamberal Lagoon Subcatchments (after Figure 5.1, MHL, 2020)

2.3 Estimated Peak Design Flows up to 1 in 500 AEP

As described by MHL, 2020, in part:

> *The results of the WBNM model were processed using the Storm Injector software that allows a quick determination of the critical duration and critical patterns for each design storm event for both the upper and lower catchments.*
>
> *The selection of the critical duration for the lower catchment was based on the peak flow out of the lagoon rather than the peak inflow into the lagoon. This approach was adopted to consider the significant effect of the storage on attenuating flows through the lagoon. This would be equivalent to considering the peak water level into the lagoon (since the outflow of the lagoon is directly dependent on the water level).*
>
> *Each design event was modelled for 24 different duration ranging from 10 minutes to 168 hours (except for the PMF that was modelled for eight durations from 15 minutes to 6 hours). Each duration was run for 10 patterns as recommended by AR&R 2019.*

3 Existing Conditions

While there was no hydrological or hydraulic model available for the study area, the modelling of the adjacent Wamberal Lagoon catchment reported in the 2020 Coastal Lagoon Catchments Overland Flood Study (MHL, 2020) provided guidance for the hydrological and hydraulic modelling undertaken for this study.

A 1D/2D TUFLOW floodplain model for the Study Area was assembled guided by the approach and parameters adopted for the 2020 Coastal Lagoon Catchments Overland Flood Study.

3.1 Floodplain Model

3.1.1 Model Extents

The study site has a relatively small contributing upstream sub-catchment. The TUFLOW model extent was defined by the upper ridges of the sub-catchment and was extended around 1.2 km downstream of the site to ensure the flood behaviour within the site is not influenced by the downstream boundary conditions.

Figure 9 shows the hydraulic model extents adopted for this study.

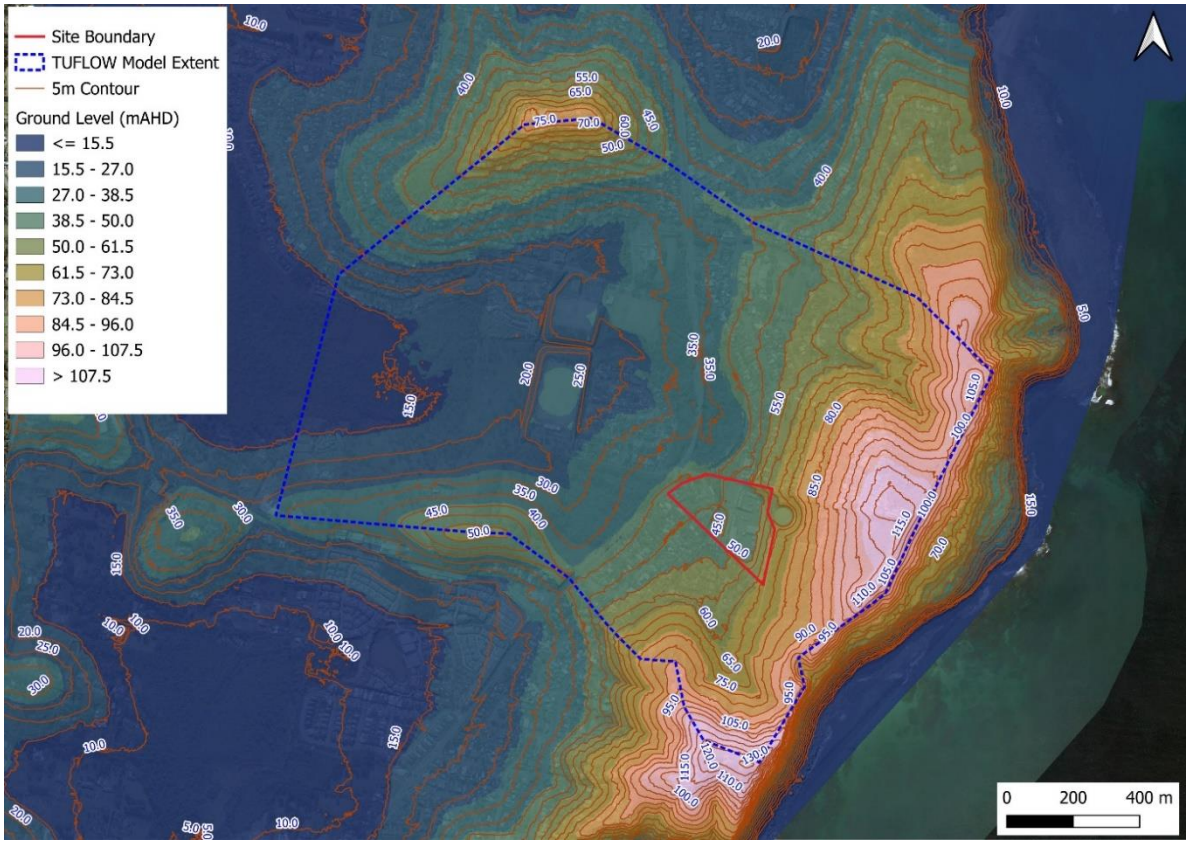


Figure 9 Floodplain (TUFLOW) Model Extent and Ground Level Contours

3.1.2 Model Topography

The existing terrain was created using the following data:

> 2011 Light Detection and ranging (Lidar) data downloaded from the Elevation and Depth - Foundation Spatial Data (ELVIS) website (https://elevation.fsdf.org.au/). Lidar data and terrain level contours for the existing ground level terrain for the subject site and surrounds is shown in **Figure 3**;

> Detailed site survey undertaken by Barry Hunt Associates on 23/10/2020 (provided in **Appendix A**).

A grid size of 1.5 m x 1.5 m was adopted for this study based on the representative widths of the existing flowpaths within the Study Area.

Some existing fences were also included in the model using the Layered Flow Constriction feature in TUFLOW.

3.1.3 Hydraulic Roughness

The spatial distribution of surface roughness was represented in TUFLOW floodplain model based on roughness zones. These were delineated using aerial photography. **Table 1** summarises the surface types and land uses and the adopted hydraulic roughness values.

Table 1 Adopted Roughness (n) Values for Different Surface Types and Landuse

Surface Type / Land Use	Manning n Value
Roads	0.02
Thick Vegetation	0.1
Grass	0.04
Light Vegetation with Houses	0.08
Low to Medium Residential	0.06
Medium Residential	0.08
Open Water	0.015
Parking (Study Site)	0.035

3.1.4 Hydrology

Hydrological modelling was undertaken using a 'Rain on Grid' approach. This means the hydrologic and hydraulic modelling were combined in the TUFLOW 1D/2D model.

Design rainfall data and rainfall losses were obtained from the 2019 edition of Australian Rainfall and Runoff (ARR2019) in accordance with advice from Council.

3.1.5 Boundary Conditions

The existing buildings located on the study site and surrounds were blocked out in the floodplain model. Removing the buildings from the 2D model domain meant that the model would not account for the rain falling on these buildings.

Figure 105 An Example of Removed Buildings and the Compensatory Building Rainfall Polygons

To ensure the rainfall on the study area was not underestimated, the rainfall volume associated with each building was directly applied on the 2D domain using “2d_sa_rf” inflow boundaries. An example of blocked out buildings and compensatory building rainfall polygon is shown in **Figure 105**.

The adopted downstream boundary condition was based on a water level versus flow (stage-discharge) curve. The TUFLOW model can automatically generate the stage-discharge (H-Q) curve based on an input friction slope. The H-Q approach was deemed suitable as the downstream model boundary is sufficiently distance from the study site to have no impact on the flow behaviour cross the study site.

3.1.6 Existing Drainage Network

The existing drainage network within the study site was included in the floodplain model. It was based on the detailed site survey and was represented in the TUFLOW floodplain model as 1D elements. **Figure 116Figure 6** shows the existing drainage network included in the floodplain model.

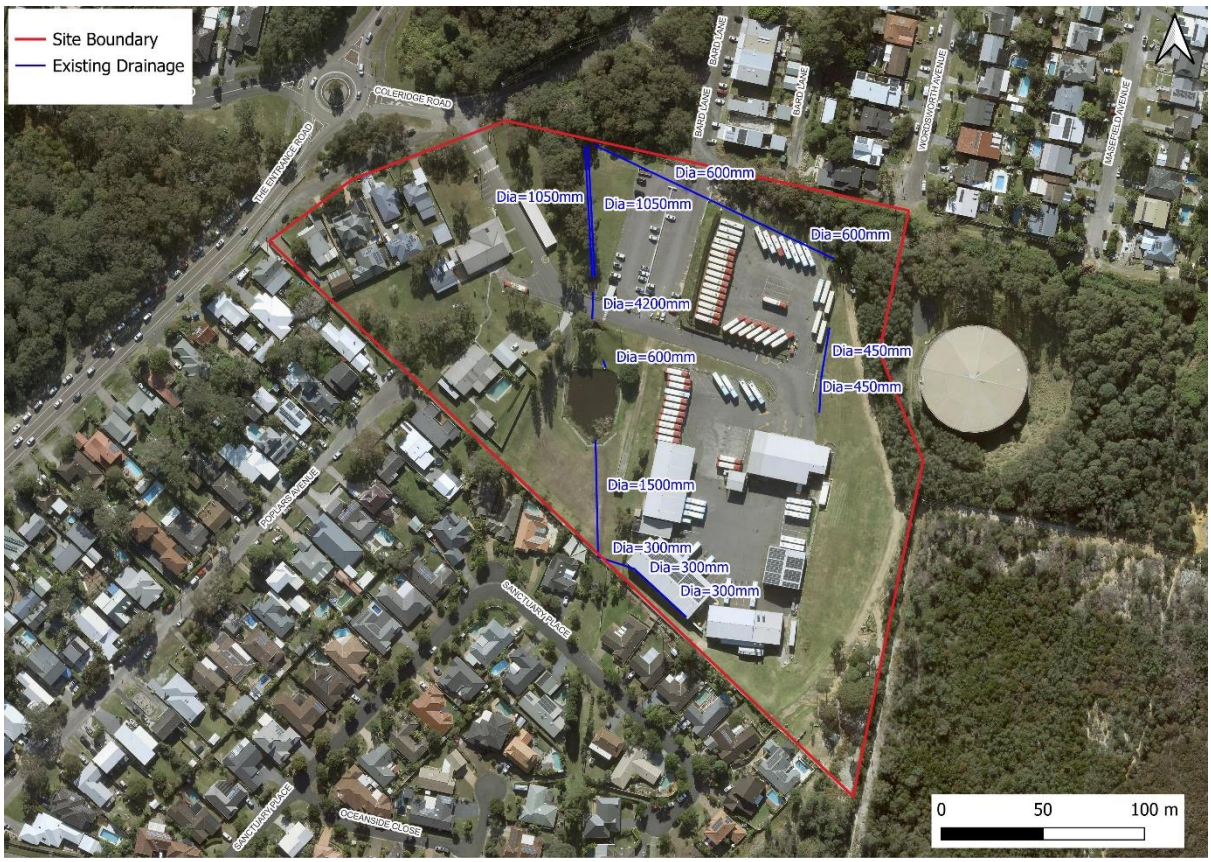


Figure 116 Layout of the Existing Drainage Network included in the TUFLOW Floodplain Model

3.2 Flood Behaviour under Existing Conditions

The floodplain model of Existing Conditions was run for the 50% AEP, 5% AEP, 1% AEP and PMF events. Considering the relatively small size of the upstream catchment the model was run for 15 minutes, 30 minutes, 45 minutes, 60 minutes and 90 minutes duration storm burst in order to identify the critical storm burst duration. Each event was run with 10 temporal patterns. The results were used to identify the critical duration and mean temporal pattern for each event.

Table 2Table 2 shows the critical duration and mean temporal pattern identified for each of the modelled events.

Table 2 Identified Critical Storm Burst Durations and Mean Temporal Patterns for the assessed Events

Event	Critical Duration	Mean Temporal Pattern
50% AEP	60 minutes	TP03
5% AEP	60 minutes	TP03
1% AEP	45 minutes	TP06
PMF	30 minutes	-

The flood hazard categories are adopted from the ARR2019 (Book 6: Flood Hydraulics, Section 7.2.7). The classification is based on depth and velocity and defines six categories based on the stability of children, adults, the elderly and vehicles in floodwaters.

The peak flood depth, peak flood velocity, peak water levels and flood hazard categories (H1-H6) have been mapped for the 50% AEP, 5% AEP, 1% AEP and PMF events under Existing Conditions (refer **Figures BE1** to **BE12** which are attached in **Appendix B).**

The results indicate that:

Flood Depths

> An overland flowpath traverses the site from south to north;
> In the 50% AEP event the site is mostly flood free;
> In the 5% AEP event flood depths of up to 0.55m are observed in the eastern parts of the study site;
> In the 1% AEP event flood depths of up to 0.60m are observed at the eastern parts of the study site. In addition, localized flooding is observed on the western side of the study site; and
> In the PMF, the site is significantly flooded with the flood depths exceeding 1 m at some locations.

Flood Velocities

> In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the access road within the site; and
> In the PMF event, high velocities up to 4.0 m/s are observed within the study site mainly along the overland flowpath and along existing roads.

Flood Hazards

> In the 1% AEP event the majority of site is classified as a H1 hazard category which is safe for people and vehicles with some areas of H2 and H3 hazard category. Hazard category of H5 which is unsafe for people and vehicles was observed along the access road within the site and also along the flow path;
> In the PMF event, significant areas of H5 and H6 hazard category are observed along the access road and along the flowpath; and
> Coleridge Road is unsafe and inaccessible in both 1% AEP and PMF events due to H5 and H6 hazards, respectively.

4 Climate Change Flood Behaviour

As described, in part, by GRID-Arendal (a UNEP Partner):

> *Representative Concentration Pathway(s) (RCPs) are trajectories of greenhouse gas concentrations used for climate modelling in the IPCC Fifth Assessment Report (IPCC 2013). The numerical values of the RCPs (i.e., 2.6, 4.5, 6.0 and 8.5) refer to the possible range of radiative forcing values in the year 2100. RCPs are used to build future climate scenarios based on greenhouse gas emissions from human activities, depending on the efforts taken to limit greenhouse gas emissions (high efforts taken under RCP2.6, low efforts under RCP8.5)*

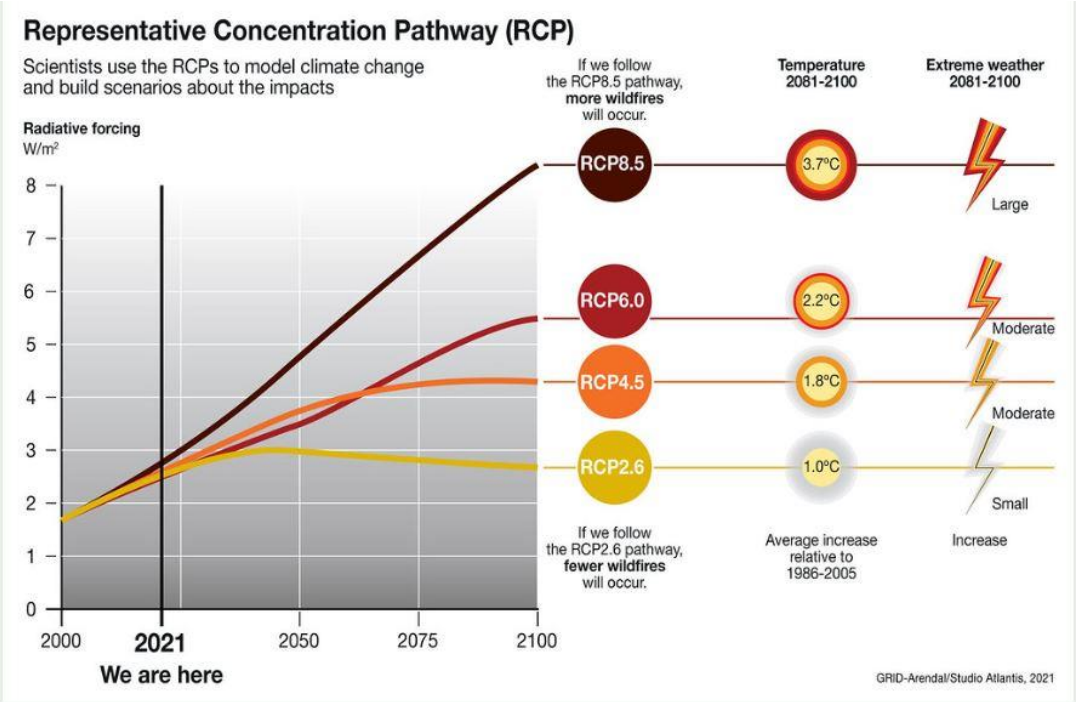


Figure 127 Representative Concentration Pathway (RCP) | GRID-Arendal (grida.no), accessed 3 October 2023

Changes to the climate are expected to have adverse impacts on rainfall intensities. A feature of the ARR DataHub is the guidance provided on the Interim Climate Change Factors under Representative RCP 4.5, RCP 6 and RCP 8.5. The guideline values for Bateau Bay obtained from ARR2019 are shown in **Table 3**. ARR2019 further recommends that consideration be given to the RCP 4.5 and RCP 8.5 scenarios.

As disclosed in **Table 3Table 3** the highest increase in rainfall (19.7%) is associated with RCP 8.5 in 2090. For the purpose of this assessment the following climate change scenarios are adopted:

> 2090 RCP 4.5 (rounded up to 10%)
> 2090 RCP 8.5 (rounded up to 20%)

Table 3 Interim Climate Change Factors for Bateau Bay (Source: ARR DataHub)

Year	RCP 4.5	RCP6	RCP 8.5
2030	0.869 (4.3%)	0.783 (3.9%)	0.983 (4.9%)
2040	1.057 (5.3%)	1.014 (5.1%)	1.349 (6.8%)
2050	1.272 (6.4%)	1.236 (6.2%)	1.773 (9.0%)
2060	1.488 (7.5%)	1.458 (7.4%)	2.237 (11.5%)
2070	1.676 (8.5%)	1.691 (8.6%)	2.722 (14.2%)
2080	1.810 (9.2%)	1.944 (9.9%)	3.209 (16.9%)
2090	1.862 **(9.5%)**	2.227 (11.5%)	3.679 **(19.7%)**

To evaluate the effects of increased rainfall intensity, the hydraulic TUFLOW model was run for the 1% AEP event with 10% and 20% increase in rainfall intensities. The results indicate:

> Under the 10% Climate Change scenario flood level increases of up to 0.08 m are observed within the study site. Flood levels within the existing drainage increase up to 0.12 m;

> Under the 20% Climate Change scenario flood level increases of up to 0.14 m are observed within the study site. Flood levels within the existing drainage increase up to 0.23 m.

The flood behaviour maps as well as the differences in peak water levels between the Climate Change scenarios and current day climate are provided in **Figures CC1** to **CC8** in **Appendix C**.

The results show that impacts of climate change on the study area are minimal. Under the 20% Climate Change scenario, flood depths upstream and through the study site slightly increase (up to 0.14m).

5 Proposed Conditions

The concept subdivision layout is shown in **Figure 138Figure 8**.

In the absence of any concept plan or grading plan, two scenarios were formulated and assessed.

These scenarios are:

> Conservative Scenario: The majority of the development area is blocked out from the model;
> Realistic Scenario: Parts of the development area only are blocked out from the model.

Both scenarios require mitigation measures/considerations to limit adverse impacts on flooding outside the study area.

Figure 149Figure 9 and

Figure **1510** show the various components included the Conservative Scenario and Realistic Scenario, respectively.

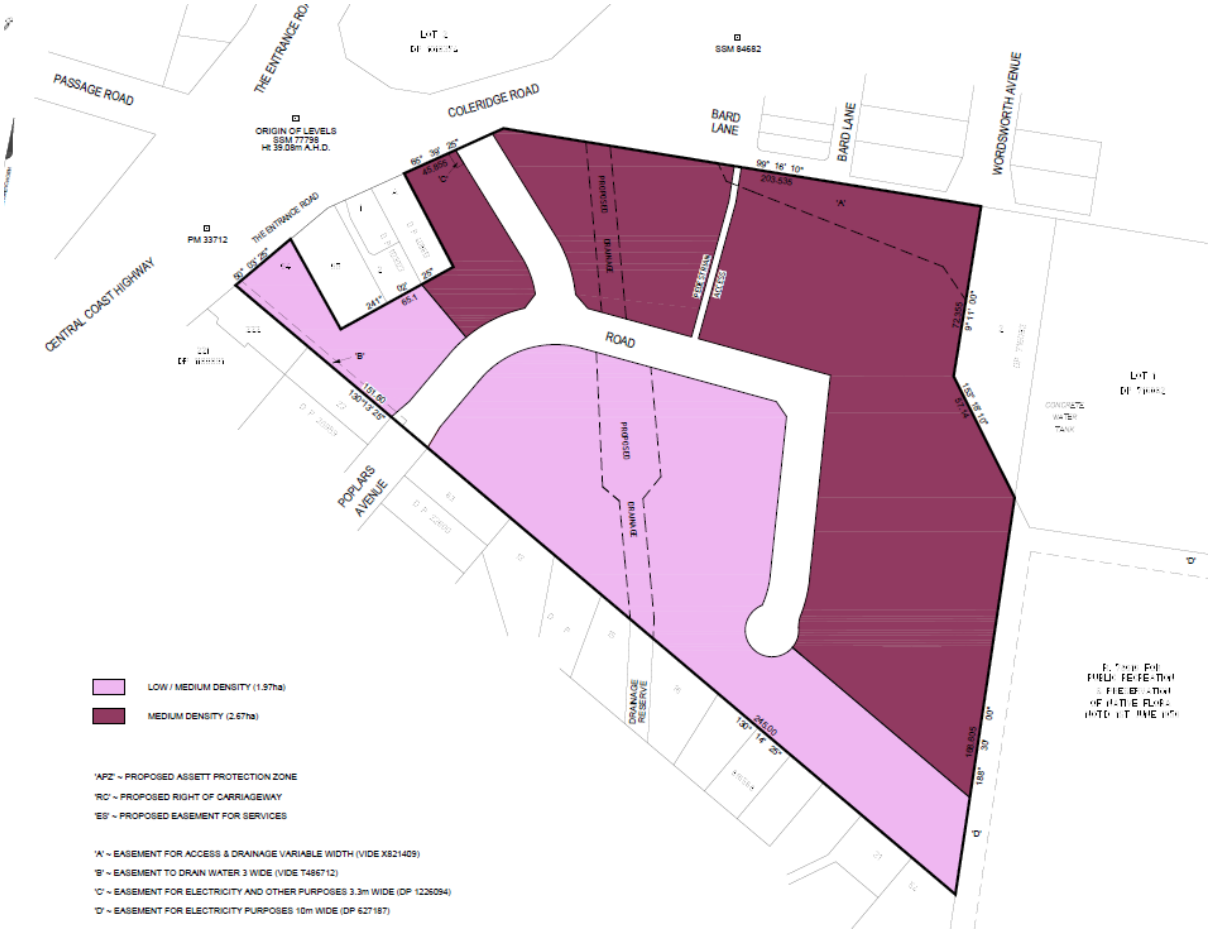


Figure 138 Concept Subdivision Layout

Figure 149 Conservative Scenario Model Elements

Figure 1510 Realistic Scenario Model Elements

In addition to the scenario-specific assumptions and elements, both scenarios were based on the following assumptions:

> Model roughness zones were updated across the study site to reflect the proposed concept development including roads and residential development;

> Existing buildings within the study site were excluded from the model; and

> A preliminary road grading was undertaken to smooth out the terrain and to convey the overland flows along the road.

5.1 Flood Behaviour under Proposed Conditions

5.1.1 Conservative Scenario

The peak flood depth, peak flood velocity, peak water levels and flood hazard categories (H1-H6) in the 50% AEP, 5% AEP, 1% AEP and PMF events have been mapped under the Conservative Scenario. These results are contained in **Figures DC1** to **DC12** which are attached in **Appendix D**.

A summary of the results is provided below:

Flood Depths

- The flood depths are similar to Existing Conditions with the site flood free in the 50% AEP event;
- In the 5% AEP and 1% AEP events, minor flooding is observed along some of the proposed roads. It should be noted that this is due to the absence of a detailed grading of the site at this early stage of the project;
- In the 5% AEP and 1% AEP events, ponding is observed within the setback area to the east of the site. It is recommended that during design development, a suitable grading be considered at this location to convey the runoff towards the existing flowpath;
- In the 5% AEP and 1% AEP event,s ponding is observed within the setback area to the south of the site. It is recommended that during design development, drainage works are considered at the location to convey the runoff towards the proposed road; and
- In the PMF, flooding with depths of up to 0.7m is observed along the proposed road connecting Poplars Avenue to Coleridge Road. Other proposed roads are either flood free or experience minor flooding.

Flood Velocities

- In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project; and
- In the PMF, high velocities up to 6.0 m/s are observed within the study site mainly along the overland flowpath and proposed roads.

Flood Hazards

- The majority of proposed roads experience H1 hazards in the events up to and including 1% AEP flood, the only exception being localised areas of the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project;
- In the PMF most proposed roads experience H5 and H6 hazards, similar to the adjacent existing roads.

It should be noted that the Conservative Scenario is extreme (with raised backyards and assuming full blockage of overland flows within the majority of development areas) and it is not likely to be representative of what would happen in reality. However, despite the extreme nature of the scenario, acceptable outcomes have been achieved.

5.1.2 Realistic Scenario

The peak flood depth, peak flood velocity, peak water levels and flood hazard categories (H1-H6) in the 50% AEP, 5% AEP, 1% AEP and PMF events have been mapped under the Realistic Scenario. These results are contained in **Figures ER1** to **ER12** which are attached in **Appendix E**.

A summary of the results is provided below:

Flood Depths

- The flood depths are similar to Existing Conditions, the site is flood free in the 50% AEP event;
- In the 5% AEP and 1% AEP events, minor flooding is observed along some of the proposed roads. It should be noted that this is due to the absence of a detailed grading of the site at this early stage of the project;
- In the 5% AEP and 1% AEP event, ponding is observed within the setback area to the east of the site. It is recommended that during design development, a suitable grading be considered at this location to convey the runoff towards the existing flowpath;

> In the PMF, flooding with depths of up to 0.7m is observed along the proposed road connecting Poplars Avenue to Coleridge Road. Other proposed roads are either flood free or experience minor flooding.

Flood Velocities

> In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project;

> In the PMF, high velocities up to 6.0 m/s are observed within the study site mainly along the overland flowpath and proposed roads.

Flood Hazards

> The majority of proposed roads are experience H1 hazards in the events up to and including 1% AEP, the only exception is localised areas of the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project;

> In the PMF, the majority of proposed roads experience H5 and H6 hazards, similar to the adjacent existing roads.

It should be noted that the while the Realistic Scenario is closer to reality (compared to the Conservative Scenario) it still has limited allowance for lowered backyards and assumes full blockage to the flows within the majority of development areas. These assumptions are not likely to be representative of what would happen in reality. However, despite the relatively conservative nature of the scenario, acceptable outcomes have been achieved.

5.2 Flood Impact Assessment

5.2.1 Conservative Scenario

The flood level and velocity differences in a 1% AEP flood are mapped respectively in **Figures DC13** and **DC14.**

Based on the concept development adopted for assessment purposes, the following impacts were estimated in the 1% AEP flood (refer **Figures DC13** and **DC14**):

1% AEP Flood Levels

> Up to a 0.06 m decrease in flood levels are observed along Coleridge Road;

> Up to a 0.02 m to 0.03 m increases in flood levels are observed along the overland flowpath between Coleridge Road and the Central Coast Highway,

> Up to a 0.03 m decrease in flood level is observed along Passage Road;

> Minor localised increases of up to 0.013 m in flood levels are observed on Battan Circuit, these impacts are considered negligible compared to the existing depth of flooding at this location (more than 0.4 m);

> Minor and very localised increases in flood levels are observed on 16 and 21 Sanctuary Place. It is expected that these minor impacts can be addressed through the re-grading of the site during the detailed design phase.

1% AEP Flood Velocities

> Flood velocities along Coleridge Road and Battan Circuit increase however the hazard category of both roads remains H5 (similar to Existing Conditions); and

> Minor increases in flood velocities (up to 0.02 m/s) and local higher increases of more than 0.05m/s are observed on the open spaces downstream of Coleridge Road.

Coleridge Road Accessibility in a 1% AEP Flood

> Coleridge Road remains unsafe and inaccessible in both 1% AEP and PMF events due to H5 and H6 hazards, respectively (similar to Existing Conditions).

5.2.2 Realistic Scenario

The flood level and velocity differences in a 1% AEP flood are mapped respectively in **Figures ER13** and **ER14.**

Based on the concept development adopted for assessment purposes, the following impacts were estimated in the 1% AEP flood (refer **Figures ER13** and **ER14**):

1% AEP Flood Levels

> Up to a 0.05 m decrease in flood level is observed along Coleridge Road, The Entrance, Battan Road and green spaces downstream of Coleridge Road.

1% AEP Flood Velocities

> Wide-spread flood velocity decreases are noted downstream of Coleridge Road;

> Localised velocity increases are experienced on Coleridge Rd, however the hazard category remains H5 (similar to Existing Conditions).

Coleridge Road Accessibility in a 1% AEP Flood

> Coleridge Road remains unsafe and inaccessible in both 1% AEP and PMF events due to H5 and H6 hazards, respectively (similar to Existing Conditions).

5.2.3 Conclusion

It is concluded that while the Conservative Scenario shows areas of minor localised adverse impacts, and while the Realistic Scenario shows improved flooding conditions, there is potential to identify an intermediate scenario (between the Conservative Scenario and the Realistic Scenario) during design development that achieves a neutral impact downstream of the development. The merit or otherwise of a neutral impact scenario could be further investigated in the later stages of the project once the concept plan and grading plan are available.

6 Compliance with the DCP Requirements

6.1 2022 Central Coast Development Control Plan (DCP)

The flooding requirements are set out in Chapter 3.1 Floodplain Management and water Cycle Management of 2022 Central Coast Development Control Plan. The development will need to comply with a series of controls as outlined below:

"3.1.4.2 *Performance Based Assessment*

Council will consider development proposals that do not meet the prescriptive requirements of this DCP only if a report prepared by a suitably qualified engineering professional accompanies the application and addresses the following:

a. *is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual.*
b. *will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties;*
c. *incorporates appropriate measures to manage risk to life and property from flood;*
d. *will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses;*
e. *is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.*
f. *is consistent with the principles of Ecologically Sustainable Development.*
g. *adequately considers the impact of climate change.*
    - *It is to be noted that with regard to climate change, appropriate benchmarks based on the best available current information have been used in producing the flood risk management studies and plans that inform this document.*
    - *Some prescriptive requirements such as flood planning level requirements may be relaxed if Council can be satisfied that the projected life of the proposed development is for a relatively short-term and therefore does not warrant the imposition of controls that consider impacts beyond the cessation of the proposed development. This will only be considered for uses where the residual risk to the occupation of the development is considered to be low. This may include certain temporary or demountable structures but would not include residential developments.*

3.1.5.3 Requirements for Filling of Flood Prone Land

a. Filling for any purpose (including the raising of a building platform in flood-prone areas) is not permitted in areas identified as Flood Planning Precinct 3 or Flood Planning Precinct 4, unless a Floodplain Risk Management Plan for the catchment has been adopted which allows filling to occur. In Flood Planning Precinct 2, filling will not be permitted unless a report from a suitably qualified engineer has been submitted and approved by Council that certifies that the development will not increase flood affectation elsewhere.

b. Filling of individual sites in isolation, without consideration of the cumulative effects is not permitted. Any proposal to fill a site must be accompanied by an analysis of the effect on flood levels of similar filling of developable sites in the area. This analysis would form part of a flood study prepared by a suitable qualified professional. "

6.2 Compliance of Concept Development

The flood impact assessment described in **Section 5.25.2** indicates that the concept subdivision layout:

> Under the Conservative Scenario, has minimal impact on adjacent road and properties in a 1% AEP flood. The increased flood levels on the open spaces downstream of Coleridge Road are unlikely to result in increased erosion given the dense vegetation which is present (see **Figure Figure 1**). If needed this issue could be further investigated during the concept or detailed design stage.

> Under the Realistic Scenario 1% AEP flooding conditions on the adjacent roads and properties improves.

A cut and fill plan for the site is not available at this stage, however once the cut and fill plan is developed during the detailed design phase the flood impact assessment could be refined if needed.

Figure 11 Existing Vegetation in the vicinity of the Coleridge Road / Entrance Road Intersection

Climate Change impacts on flood behaviour within the site are investigated in **Section 44**. While changes in the flood levels under the climate change scenarios are not significant, it is recommended that during the Concept or Detailed design stage that climate change being considered when defining the applicable Flood Planning levels (FPLs).

7 Flood Emergency Response

7.1 Rate of Rise of Floodwaters

To understand the likely warning times and associated response times during flood events it is necessary to estimate the expected rate of rise of floodwaters in the vicinity of the development.

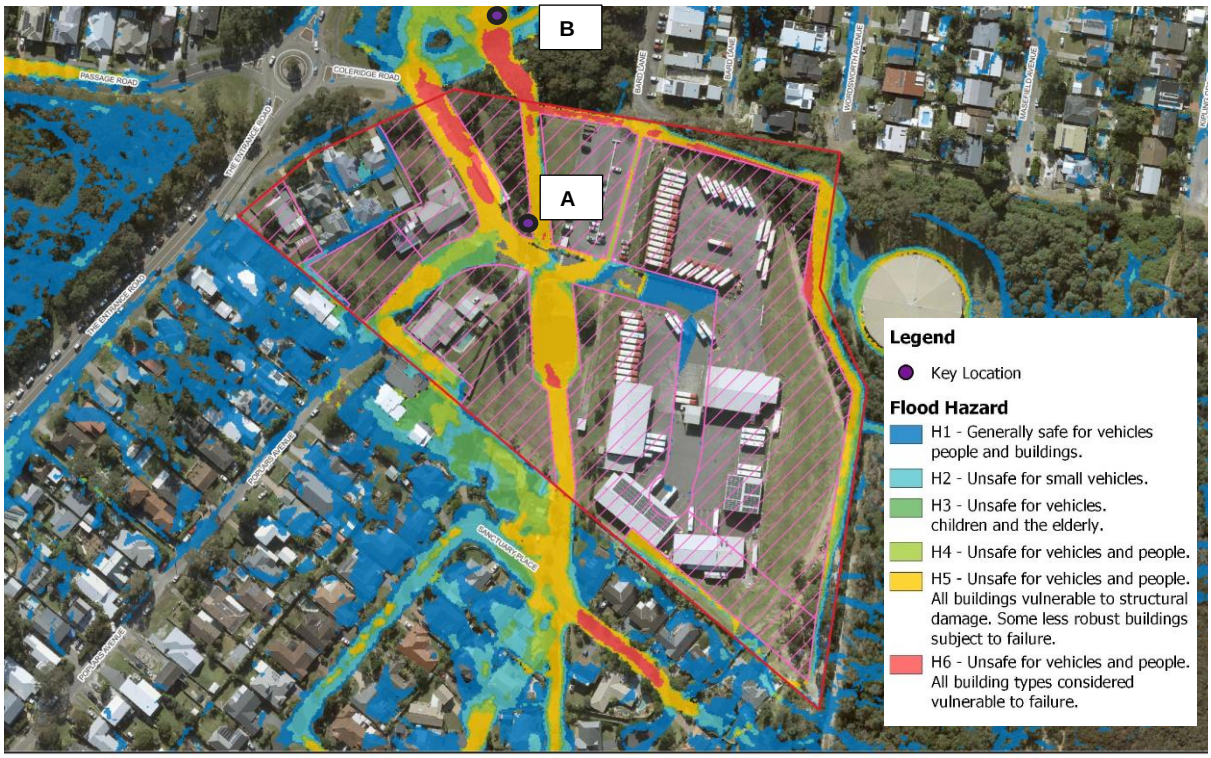


Figure 16 PMF Hazard and Reference Locations

The variation in the rise and fall of flood depths at Locations A and B (refer **Figure 12**) in the 1% AEP and PMF events are plotted respectively in **Figures 13** and **14**.

7.2 Flood Hazards

The 2023 Flood Risk Management Guideline FB03 released on 30 June 2023 by NSW DPE includes a plot of flood hazard vulnerability curves based on six hazard categories H1 – H6 (see **Figure 15**).

The flood hazard categories experienced on the site the 1% AEP and PMF events have been mapped under Existing Conditions and under Proposed Conditions and are attached in **Appendices B, D** and **E**.

The variation in flood hazards at Locations A and B (refer **Figure 12**) in the 1% AEP and PMF events are plotted respectively in **Figures 16** and **17**.

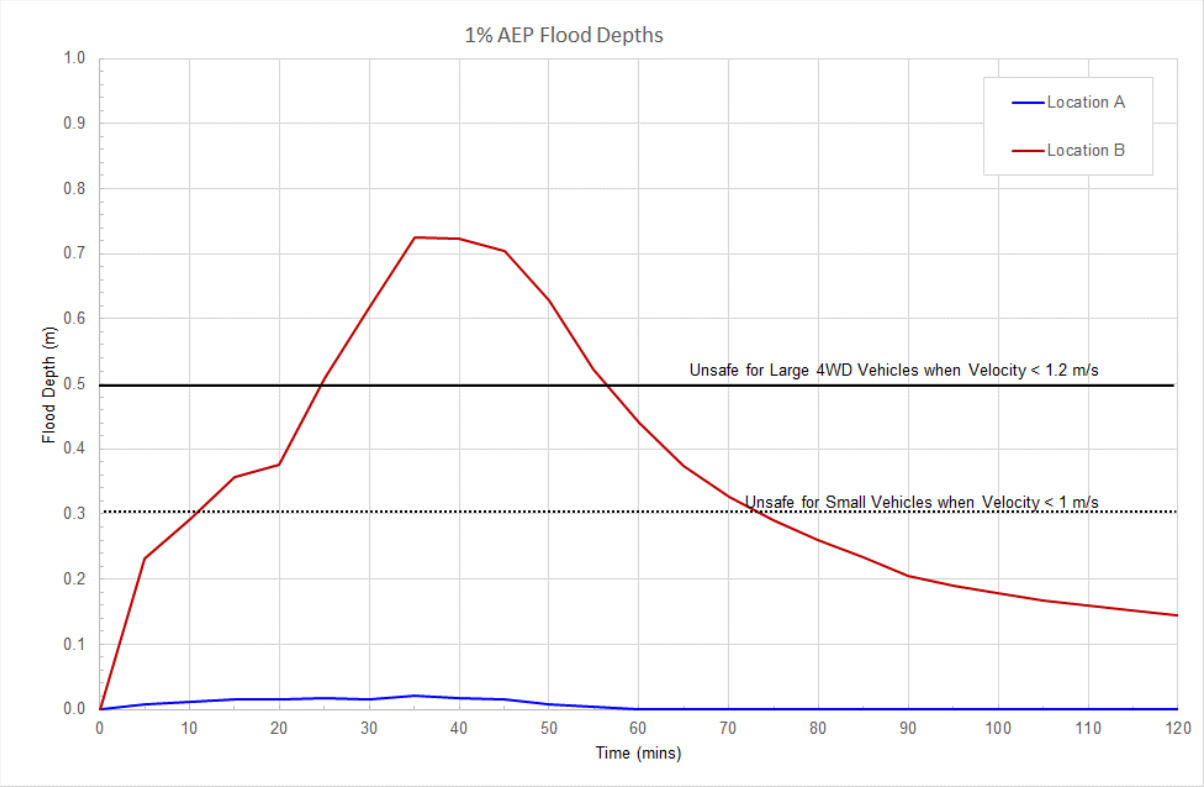


Figure 17 1% AEP Flood Depths at Locations A and B

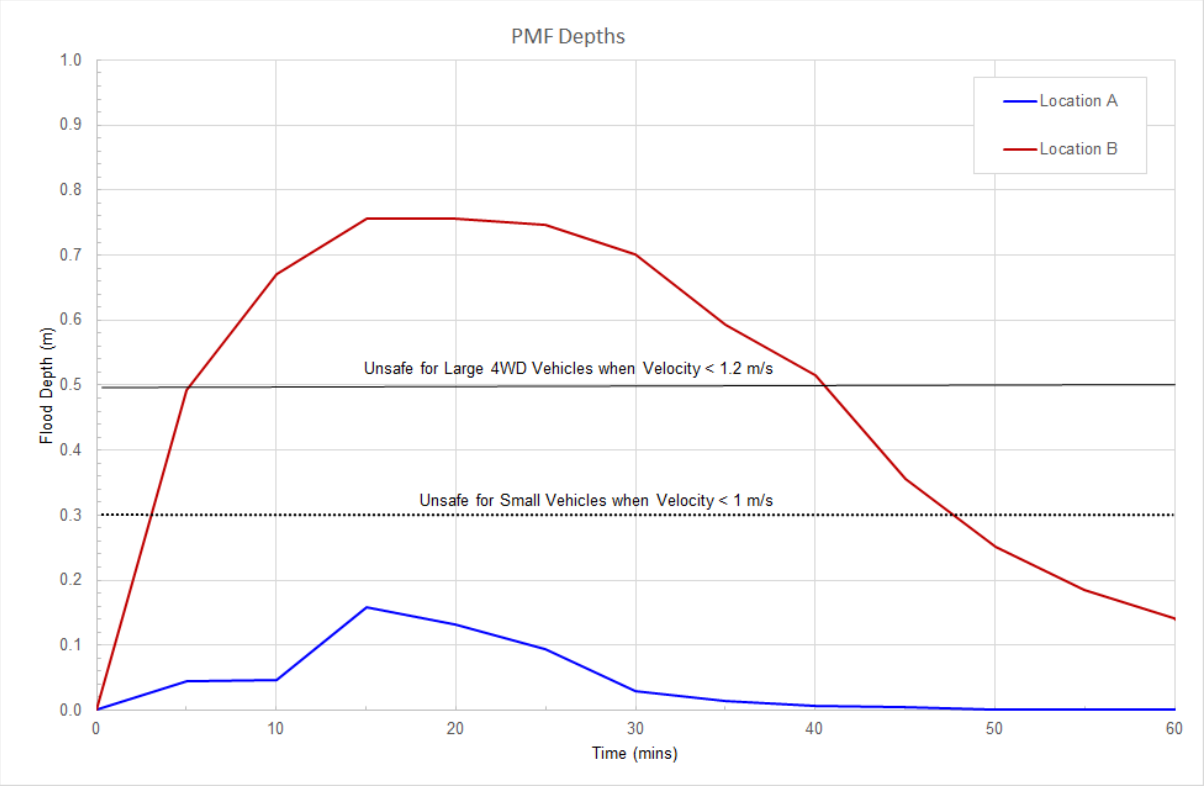


Figure 18 PMF Depths at Locations A and B

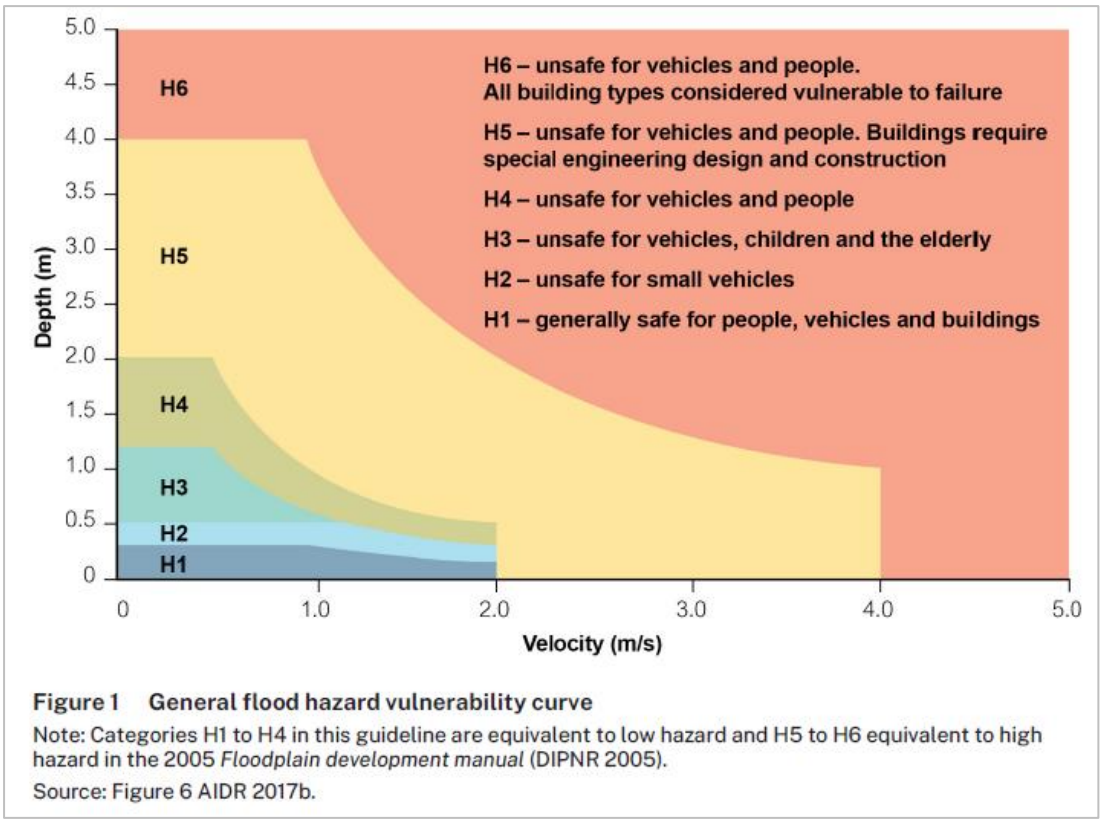


Figure 1 General flood hazard vulnerability curve

Note: Categories H1 to H4 in this guideline are equivalent to low hazard and H5 to H6 equivalent to high hazard in the 2005 *Floodplain development manual* (DIPNR 2005).

Source: Figure 6 AIDR 2017b.

Figure 15 Flood Hazard Categories (Source: 2023 FRMM FB03)

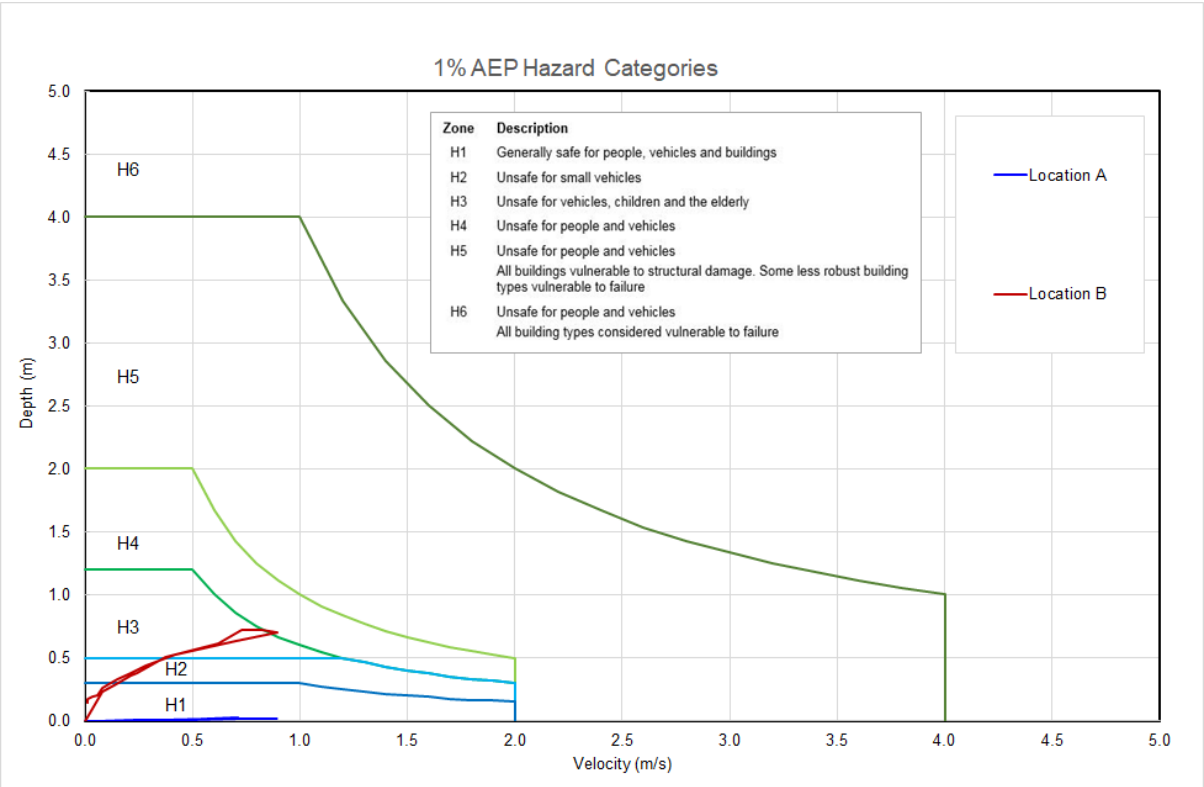


Figure 19 Indicative Risk to Life in the 1% AEP Flood at Locations A and B

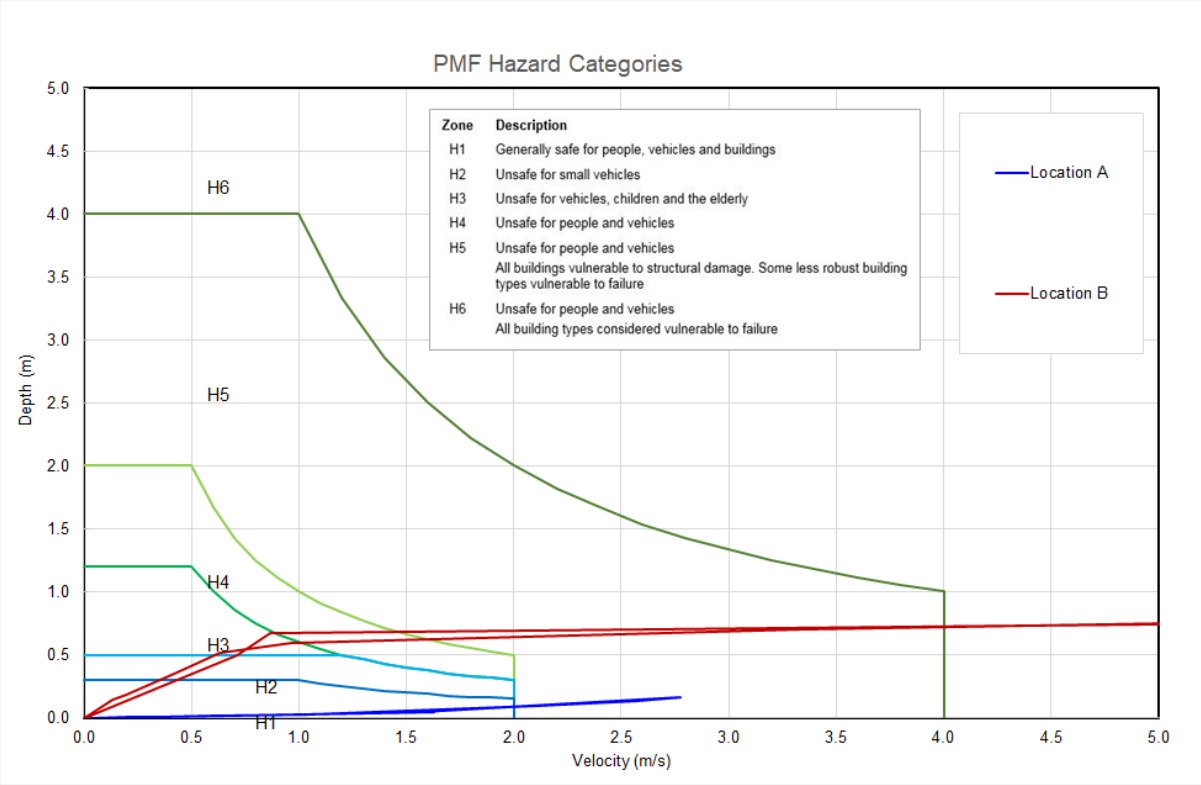


Figure 20 Indicative Risk to Life in the PMF at Locations A and B

7.3 Pedestrian and Vehicular Stability in Floods

The latest edition of Australian Rainfall and Runoff released in 2019 provides guidance on both pedestrian and vehicle stability in floods as does the 2023 Flood Risk Management Guideline FB03 released on 30 June 2023 by NSW DPE.

7.3.1 Pedestrian Stability

The 2023 Flood Risk Management Guideline FB03 released on 30 June by NSW DPE includes a plot of thresholds for the stability of people in floods. This plot is presented in **Figure 18**.

The variation in in flood depths and velocity at Locations A and B (refer **Figure 12**) in the 1% AEP and PMF events are plotted respectively in **Figures 19** and **20**.

7.3.2 Vehicle Stability

The 2023 Flood Risk Management Guideline FB03 released on 30 June by NSW DPE includes a plot of thresholds for vehicle stability in floods. This plot is presented in **Figure 21**.

H1 and H2 categories (refer **Figure 15**) have been adopted as representative categories for vehicular stability respectively for small vehicles and large (4WD) vehicles.

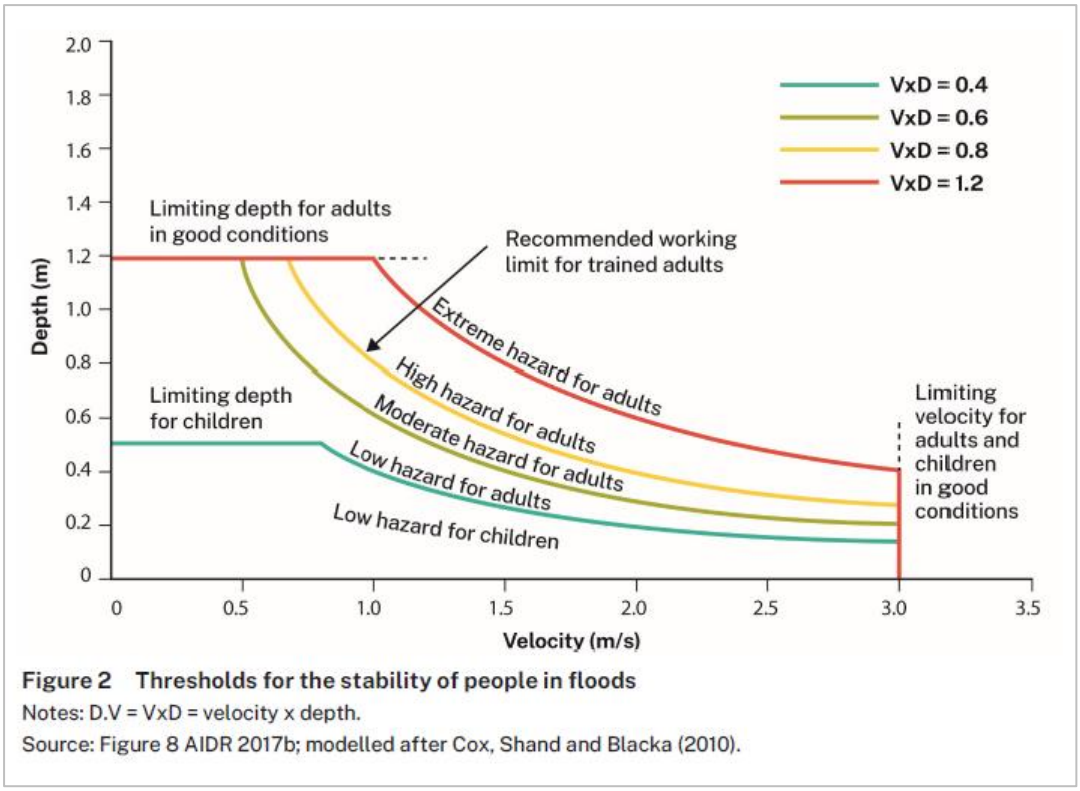


Figure 2 Thresholds for the stability of people in floods
Notes: D.V = VxD = velocity x depth.
Source: Figure 8 AIDR 2017b; modelled after Cox, Shand and Blacka (2010).

Figure 18 Thresholds for the stability of people in floods (Source: 2023 FRMM FB03)

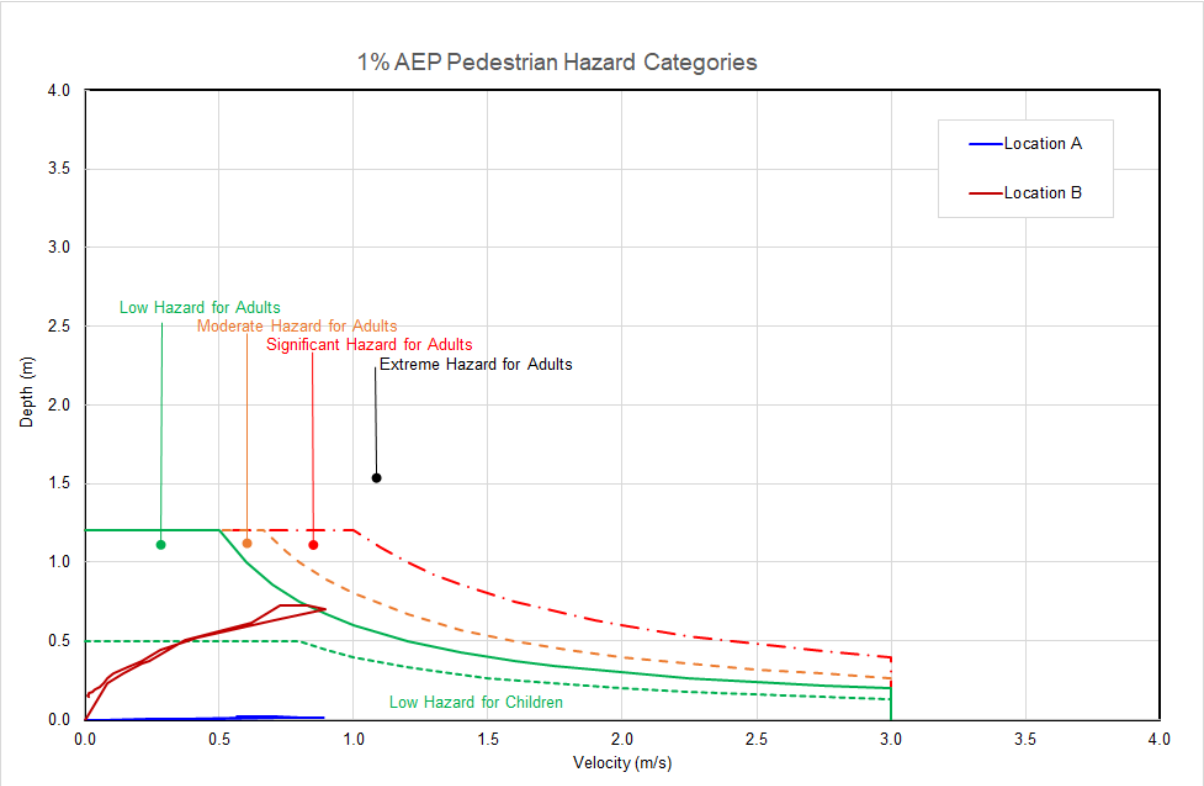


Figure 21 1% AEP Pedestrian Hazard Categories at Locations A and B

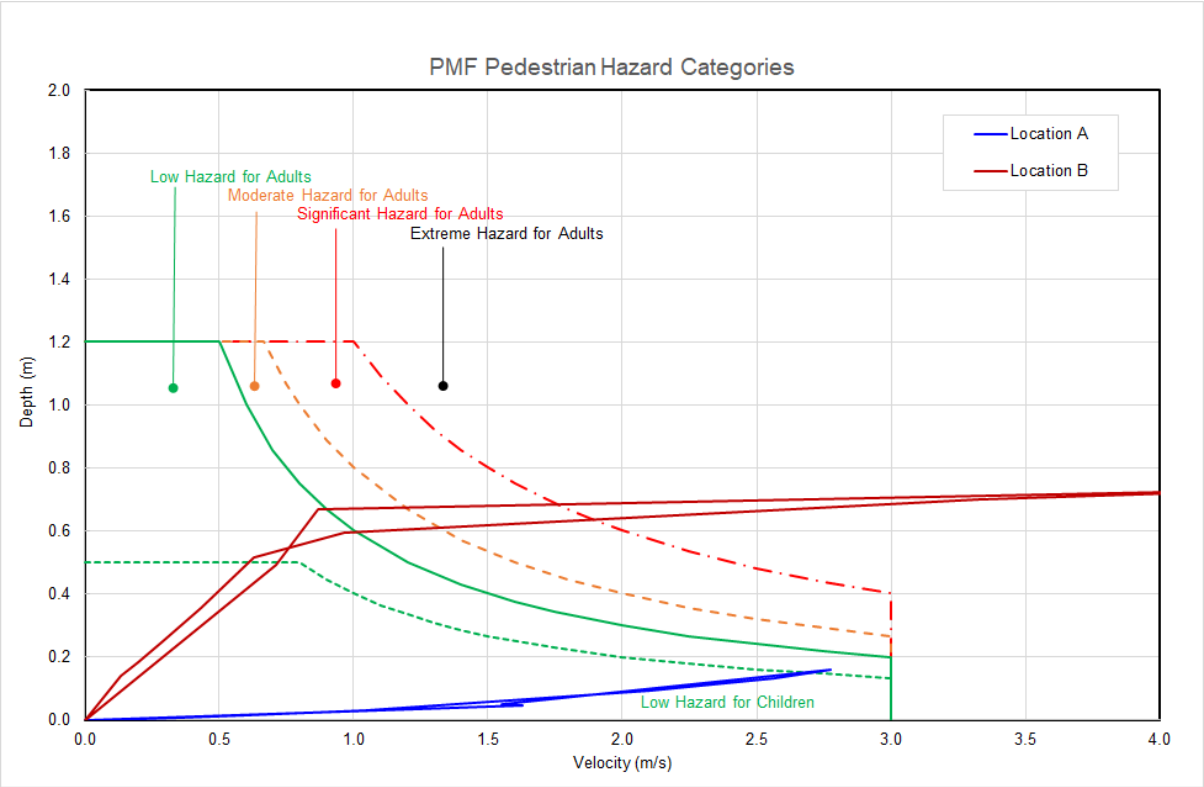


Figure 20 PMF Pedestrian Hazard Categories at Locations A and B

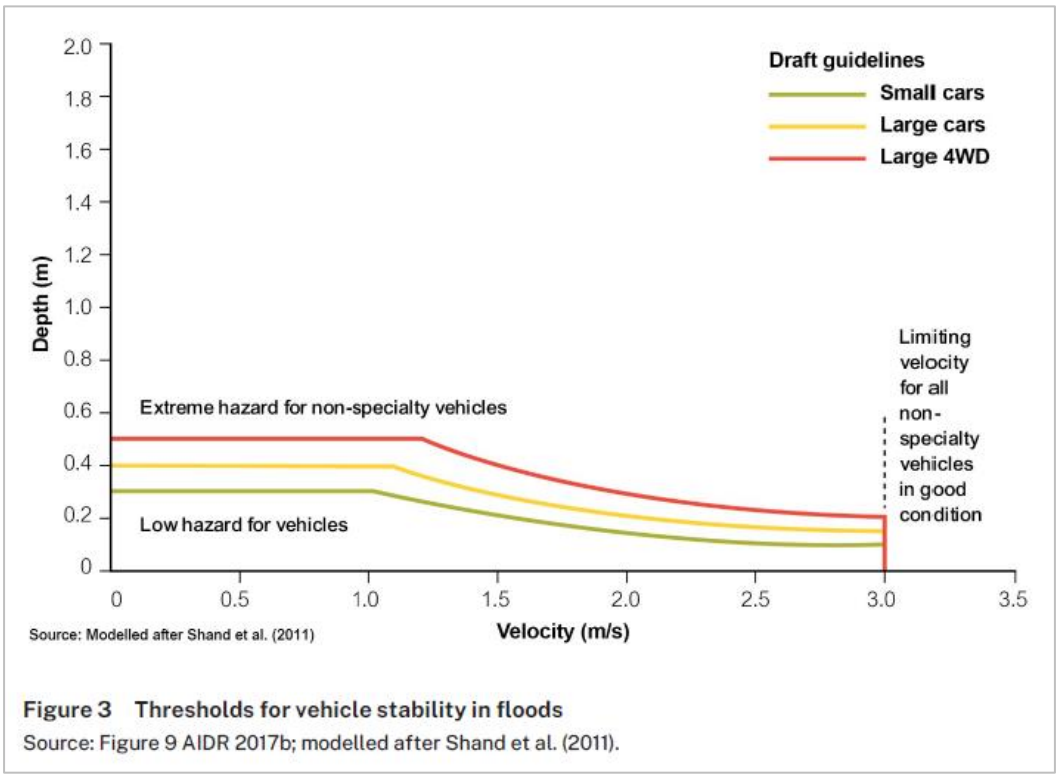


Figure 3 Thresholds for vehicle stability in floods
Source: Figure 9 AIDR 2017b; modelled after Shand et al. (2011).

Figure 21 Thresholds for the stability of vehicles in floods (Source: 2023 FRMM FB03)

7.4 Durations of Unsafe Conditions

Based on the criterion for pedestrian and vehicular stability, the periods of time that conditions would be unsafe for children and adults and small and large vehicles in the 1% AEP flood and the PMF at the Locations A and B are given in **Table 4.**

The elapsed time from start of the storm burst until unsafe conditions are reached at the Locations A and B in the 1% AEP flood and the PMF are summarised in **Table 5.**

Table 4 Durations (mins) that it is unsafe for small and large vehicles, children and adults

Duration **(mins)** it is Unsafe for:

	Small Vehicles	Large Vehicles	Small Vehicles	Large Vehicles
Location	1% AEP		PMF	
Location A	0	0	15	15
Location B	60	35	45	35

Duration **(mins)** it is Unsafe for:

	Children	Adults	Children	Adults
Location	1% AEP		PMF	
Location A	0	0	5	0
Location B	35	10	35	20

Table 5 Elapsed Time (mins) from Start of Storm Burst until Unsafe Conditions are Reached

Elapsed Time from Start of Storm Burst until Unsafe Conditions Reached **(mins)**:

	Small Vehicles	Large Vehicles	Small Vehicles	Large Vehicles
Location	1% AEP		PMF	
Location A	0	0	15	15
Location B	15	25	5	10

Elapsed Time from Start of Storm Burst until Unsafe Conditions Reached **(mins)**:

	Children	Adults	Children	Adults
Location	1% AEP		PMF	
Location A	0	0	15	0
Location B	25	40	10	15

7.5 Flood Warning Times

As presented in Error! Reference source not found. above**,** the available flood warning times before unsafe conditions are experienced at Locations B or Location A are very short. Under these circumstances there would be no time to safely evacuate residents from the development via Coleridge Road and residents would be safer sheltering in place.

7.6 Draft Shelter in Place Guideline

The draft Shelter in Place Guideline released by the NSW Department of Planning and Environment advises:

Evacuation is the Primary Response Strategy for Flooding

- *Horizontal evacuation at street level is achieved by vehicle before any roads are cut by floodwaters.*
- *It is a risk management strategy used to reduce loss of life or lessen the effects of an emergency on a community.*
- *Evacuation requires an understanding of the full range of flood behaviour up to the probable maximum flood (PMF), which is reflected in flood plans developed by the NSW SES and Floodplain Risk Management Studies by councils.*

Shelter-In-Place (SIP)

- *Shelter-in-place is the movement of occupants to a building or the occupants remaining in a location that provides vertical refuge on the site or near the site above the PMF level before their property becomes flood-affected.*
- *Currently, SIP in infill developments is being approved on an ad hoc basis (part of a merit- based assessment of each development), while it is not considered an acceptable flood management approach in greenfield areas or large-scale urban renewal.*
- *There are limited applications of SIP as a policy for floodplain management internationally and it is not widely practised in Australia, although some councils such as Tweed, Northern Beaches and Parramatta have SIP provisions in their development control plans.*

When SIP is Appropriate

- *SIP is an emergency management response, especially* ***when the flood warning time and flood duration are both less than six hours*** *(typically called flash floods).*
- *These flooding events are dangerous because of the short timeframes, as well as the flood speed and depth.*
- *Under such circumstances, evacuation via vehicle may not possible. SIP is the last resort evacuation option for development in greenfield and infill areas.*

Where to apply SIP

- *SIP is a refuge occurring above the PMF level. Thus, the height of PMF would determine the application of SIP regardless of development types, i.e. infill or greenfield development.*
- *For example, if the height of PMF of a site is above two storeys, SIP in a one- or two-storey building would not be viable. However, SIP might apply in high-density development on the site because the refuge or habitable floor level could be built above PMF.*
- *Note that SIP should not determine development scale or density. Rather, the height of PMF in a location is used to inform where SIP could be applied.*

What considerations are needed for SIP to be successful

Councils can develop SIP-related controls for their development control plans (DCP) and apply those controls when assessing Development Applications.

7.7 Flood Emergency Response Plan

A basic Flood Emergency Response Plan for the for the development is as follows.

7.7.1 Flood Threat

A summary of the flood threat (under Realistic Conditions) is summarized as follows:

Flood Depths

> The flood depths are similar to Existing Conditions, the site is flood free in the 50% AEP event;

> In the 5% AEP and 1% AEP events, minor flooding is observed along some of the proposed roads. It should be noted that this is due to the absence of a detailed grading of the site at this early stage of the project;

> In the 5% AEP and 1% AEP event, ponding is observed within the setback area to the east of the site. It is recommended that during design development, a suitable grading be considered at this location to convey the runoff towards the existing flowpath;

> In the PMF, flooding with depths of up to 0.7m is observed along the proposed road connecting Poplars Avenue to Coleridge Road. Other proposed roads are either flood free or experience minor flooding.

Flood Velocities

> In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project;

> In the PMF, high velocities up to 6.0 m/s are observed within the study site mainly along the overland flowpath and proposed roads.

Flood Hazards

> The majority of proposed roads are experience H1 hazards in the events up to and including 1% AEP, the only exception is localised areas of the proposed road connecting Poplars Avenue to Coleridge Road. This is attributed, in part, to the lack of a grading plan at this stage of the project;

> In the PMF, the majority of proposed roads experience H5 and H6 hazards, similar to the adjacent existing roads.

7.7.2 Responsibilities

While in a flood emergency the NSW State Emergency Service (SES) has responsibilities including to:

> Direct the evacuation of persons and/or communities at risk of flood inundation, and

> Issue evacuation warnings for individual communities that describe possible local effects, suggested actions and evacuation arrangements.

It is expected that residents will be responsible for implementing the actions identified herein and should not rely on the SES for any evacuation warnings. These actions would include monitoring the SES website and any flood warnings, maintaining regular communication with any resident's association and initiating actions as identified below.

7.7.3 Preparedness

Residents shall be advised of the potential flood threat in their locality, and recommended management and procedures in case of a flood event. They should comply with all lawful directions.

7.7.4 Warning

While in a flood event, the SES will prepare, authorise and distribute evacuation warnings it is expected that the short warning times mean that in the case of major and extreme flash floods that there would be insufficient time to evacuate any residents and/or visitors from the development and that instead residents and/or visitors would need to shelter in place.

7.7.5 Response

1. Floods experienced by the proposed development are considered as "flash floods" and no warning system is available. Storms leading to major flooding are typically 2 hours long, however shorter storms as little as a 1 hour long can produce significant flooding. Once the storm passes floodwaters usually disappear rapidly.
2. During floods local and major streets and roads will be cut by floodwaters. Traveling through floodwaters on foot, or in a vehicle can be very dangerous as the water may be polluted, obstructions can be hidden under the floodwaters, or you could be swept away. It is recommended that staying within your home as much as practical as this is the safest option. If you need to leave your home then do so prior to the flood because the available warning time is very short once a major storm hits (see Table 5).

3. Develop your own family flood plan and be prepared if flooding should occur while the kids are coming home from school or when you are returning from work. Talk to Council to determine the safer travel routes that are less likely to be cut by floodwaters.
4. If the flooding approaches the garage floor level (but only if safe to do so) relocate any items that may be damaged by water, or poisons, or wastes to as high a level as possible.
5. If the flooding approaches the habitable ground floor level:
    (i) gather medicines, special requirements for babies or the elderly, mobile phones, first aid kit, special papers and any valuables into one location,
    (ii) put on strong shoes, raise any items within the home that may be damaged by water (e.g. photo albums) to as high a level as possible, with electrical items on top. Turn off and disconnect any large electrical items such as a TV that cannot be raised.
    (iii) place wet towels across the bottom and lower sides of external doors to slow down the entry of water through the door.
6. In the very rare event that floodwaters may enter the ground floor collect items from 5 (i) above and move to an upper level in your home. Do not evacuate your home unless instructed to do so by the SES or the Police. Remember floodwaters are much deeper and can flow much faster outside.
7. In the case of a medical emergency ring 000 as normal, but explain about the flooding.
8. A laminated copy of your flood plan should be permanently attached (glued) on an inside cupboard door in the kitchen and laundry and to the inside of the electrical meter box.
9. Your flood management plan should be reviewed every 5 years, particularly with the potential changes in storm intensity due to climate change.

7.7.6 Recovery

The NSW SES will issue an ‘all clear’ message when the immediate danger to life and property has passed. Also visually monitor conditions on the local roads and only drive on a local road once any flooding has subsided and the road surface is visible.

8 Conclusions

This Report summarises the available data, existing flood behaviour and provides advice on design considerations in order to avoid flood impacts on adjacent properties and roads. The report also outlines a Flood Emergency Response Plan.

A 1D/2D TUFLOW hydraulic model was established for the study site to investigate the flood behaviour under the Existing Conditions and Proposed Conditions. The flood model was developed using the available data including detailed site survey, proposed design, 2011 Lidar data and aerial images.

Hydrological modelling was undertaken using a 'Rainfall on Grid' approach. This means the hydrologic and hydraulic modelling were combined in the TUFLOW 1D/2D model. Design rainfall inputs were obtained from ARR2019.

The Existing Conditions model was run for the 50% AEP, 5% AEP, 1% AEP and PMF flood events for 15 minute, 30 minute, 45 minute, 60 minute and 90 minute storm burst durations and 10 Temporal Patterns for each duration. The identified critical duration and mean temporal patterns for each event are presented in Table 2**Table 2Table 2**.

The impacts of climate change on the flood behaviour within the study site was assessed through increasing rainfall intensities by 10% (CC10) and 20% (CC20). The results showed that:

> Under the 10% Climate Change Scenario increased flood levels of up to 0.08 m are observed within the study site. Flood levels within the existing drainage increase up to 0.12 m;

> Under the 20% Climate Change Scenario increased flood levels of up to 0.14 m are observed within the study site. Flood levels within the existing drainage increase up to 0.23 m.

In the absence of any concept plan or grading plan, two scenarios were modelled and tested:

> Conservative Scenario: the majority of the development area is blocked out from the model;

> Realistic Scenario: only some parts of the development area is blocked out from the model.

The assessment showed that the conservative scenario shows negligible flood impacts outside study area, while realistic scenario generally improves flooding conditions outside the study area. There is potential for an intermediate scenario (between the Conservative Scenario and the Realistic Scenario) to achieve a neutral impact downstream if appropriate. This needs to be further investigated in the later stages of the project once the concept plan and grading plan are available.

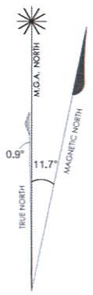
While both conservative and realistic scenarios had limited allowance for backyards and assume full blockage to the flows within the majority of development areas, acceptable outcomes were achieved in both scenarios.

The 1%AEP and PMF flood depth hydrographs were extracted at two reference locations at and around the site and showed that the duration of inundation in both the 1% AEP and PMF events is short (less than 1 hour).

It was concluded that Shelter-in-place is the recommended flood emergency response strategy for the study site.

Appendix A Site Survey

A1



COLERIDGE ROAD

ORIGIN OF LEVELS
SSM 77798
Ht 39.08m A.H.D.

BARD LANE

BARD LANE

WORDSWORTH AVENUE

99° 16' 10"
203.535

65° 39' 25"
45.855

SHEET 2

SHEET 3

'A'

THE ENTRANCE ROAD

CENTRAL COAST HIGHWAY

50° 03' 25"
13.64

32° 23' 55"
40.575

241° 02'
66.7

14.935

15' 25"

25"

64

65

222

221
DP 1180891

'B'

SHEET 4

LOT 3
DP 716082
5.26ha

SHEET 5

72.355
11° 00"
9°

153° 18' 10"
57.14

DP 716082

LOT 1
DP 716082

POPLARS AVENUE

SHEET 6

SHEET 7

R. 78616 FOR
PUBLIC RECREATION
& PRESERVATION
OF NATIVE FLORA
NOTI'D 1ST JUNE 1956

DRAINAGE RESERVE

190° 14' 25"
245.00

168.605
188° 30' 00"

SHEET 8

LEGEND

- DENOTES BOTTOM OF BANK
- DENOTES TOP OF BANK
- DENOTES EDGE OF BITUMEN
- DENOTES FENCELINE
- DENOTES STORMWATER REF
- DENOTES OVERHEAD POWER IN VICINITY
- DENOTES UNDERGROUND POWER IN VICINITY
- UEB DENOTES UNDERGROUND POWER BOX
- P.P. DENOTES POWER POLE
- S.P. DENOTES SERVICE POLE
- DENOTES GASMAIN IN VICINITY
- SMH DENOTES SEWER MANHOLE
- DENOTES SEWER RISING MAIN IN VICINITY
- DENOTES SEWERMAIN IN VICINITY
- DENOTES FIBRE OPTIC MAIN IN VICINITY
- DENOTES TELSTRA MAIN IN VICINITY
- PIT DENOTES TELSTRA PIT
- H- HEIGHT
- S- SPREAD DENOTES TREE
- D- DIAMETER
- DENOTES EDGE OF VEGETATION
- W.M. DENOTES WATER METER
- HYD DENOTES HYDRANT
- S.V. DENOTES STOP VALVE
- DENOTES WATERMAIN IN VICINITY
- DENOTES BITUMEN CARRIAGEWAY
- DENOTES CONCRETE PATH
- DENOTES GRAVEL CARRIAGEWAY

ORIGIN OF LEVELS
SSM 77798 Ht 39.08m A.H.D.

0 7.5 15 30 45 30

SCALE 1: 750

'A' ~ EASEMENT FOR ACCESS & DRAINAGE VARIABLE WIDTH (VIDE X821409)

'B' ~ EASEMENT TO DRAIN WATER 3 WIDE (VIDE T486712)

'C' ~ EASEMENT FOR ELECTRICITY AND OTHER PURPOSES 3.3m WIDE (DP 1226094)

DIAL 1100 BEFORE YOU DIG

IMPORTANT NOTES:

1. THIS PLAN HAS BEEN PREPARED FOR THE CLIENT LISTED ON THIS PLAN ONLY, FOR THE PURPOSE OF SHOWING PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING THE FUTURE DEVELOPMENT DESCRIBED HEREON AS THE PROJECT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

2. UTILITY SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. IF NOT ABLE TO BE LOCATED, KNOWN SERVICES HAVE BEEN SHOWN FROM THE RECORDS OF RELEVANT AUTHORITIES OR SERVICE PROVIDERS WHERE AVAILABLE.

PRIOR TO EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR CONFIRMATION OF LOCATION OF SERVICES.
**** DIAL BEFORE YOU DIG (CALL 1100) ****

3. THE BOUNDARIES SHOWN HEREON ARE APPROXIMATE ONLY AND WERE DETERMINED FROM EXISTING TITLE DIMENSIONS. AS SUCH THESE DIMENSION COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING TO BOUNDARY OR FOR PRESCRIBED SETBACKS WITHOUT FURTHER SURVEY INVESTIGATION OF THE BOUNDARIES.

4. FOR ANY CONSTRUCTION ACTIVITIES PROPOSED IN CLOSE PROXIMITY TO THE BOUNDARIES OR PRESCRIBED SETBACKS. IT IS RECOMMENDED THAT THOSE BOUNDARIES BE MARKED TO AVOID THE POSSIBILITY OF ENCROACHMENT.

	AMENDMENTS	DATE
A	ORIGINAL ISSUE	27/10/20

REGISTERED SURVEYOR

DRAWN KDM DATE 27/10/20

SURVEYED RD DATE 23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND
LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL, TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE. 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au
bha

LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST

CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD

PROJECT: COMMERCIAL DEVELOPMENT

PLAN: SHEET LAYOUT

LOT 3 DP 716082 AREA 5.26ha

DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:750(A1)

CAD REF: 55283DETAIL SHEET 1 OF 8

A1

0 2 4 8 12 16
SCALE 1: 200

G.D.A. NORTH
0.9°
11.7°
TRUE NORTH
MAGNETIC NORTH

LEGEND

BB	DENOTES BOTTOM OF BANK
TB	DENOTES TOP OF BANK
	DENOTES EDGE OF BITUMEN
/	DENOTES FENCELINE
	DENOTES STORMWATER PIPE
E	DENOTES OVERHEAD POWER IN VICINITY
UE	DENOTES UNDERGROUND POWER IN VICINITY
UEB	DENOTES UNDERGROUND POWER BOX
P.P.	DENOTES POWER POLE
S.P.	DENOTES SERVICE POLE
GAS	DENOTES GASMAIN IN VICINITY
SMH	DENOTES SEWER MANHOLE
RM	DENOTES SEWER RISING MAIN IN VICINITY
S	DENOTES SEWERMAIN IN VICINITY
FOM	DENOTES FIBRE OPTIC MAIN IN VICINITY
T	DENOTES TELSTRA MAIN IN VICINITY
PIT	DENOTES TELSTRA PIT
H-	HEIGHT
S- SPREAD	DENOTES TREE
D-	DIAMETER
	DENOTES EDGE OF VEGETATION
W.M.	DENOTES WATER METER
HYD	DENOTES HYDRANT
S.V.	DENOTES STOP VALVE
W	DENOTES WATERMAIN IN VICINITY
	DENOTES BITUMEN CARRIAGEWAY
	DENOTES CONCRETE PATH
	DENOTES GRAVEL CARRIAGEWAY

CARPORT
RESIDENCE
METAL FENCE
VERANDAH
FIBRO SHED METAL ROOF
PREFAB TOILET BLOCK
DEMOUNTABLE BUILDING
BRICK BUILDING METAL ROOF No. 682A
CONCRETE PATH
CONCRETE PATH
KIOSK
KEYPAD
SPEED HUMP
SPEED HUMP
TOP OF KERB
TOP OF KERB
TOP OF KERB
TOP OF KERB
TOP OF KERB
GATE
SIGN
L.P.
PAVED AREA
GARDEN
AWNING OVER CAR PARKING
SECURITY FENCE
RET WALL
RETAINING WALL
RET WALL
JUNCTION
BUS PARKING
BUS PARKING
BUS PARKING
IRR TAP
S.V.
P.P.
PIT
SMH (DBYD)
SWP (DBYD)
GAS
UE
T
BB
W
S
E

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DIAL 1100 BEFORE YOU DIG

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	AMENDMENTS	DATE
A	ORIGINAL ISSUE	27/10/20

REGISTERED SURVEYOR

DRAWN KDM DATE 27/10/20
SURVEYED RD DATE 23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL., TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE, 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au
bha

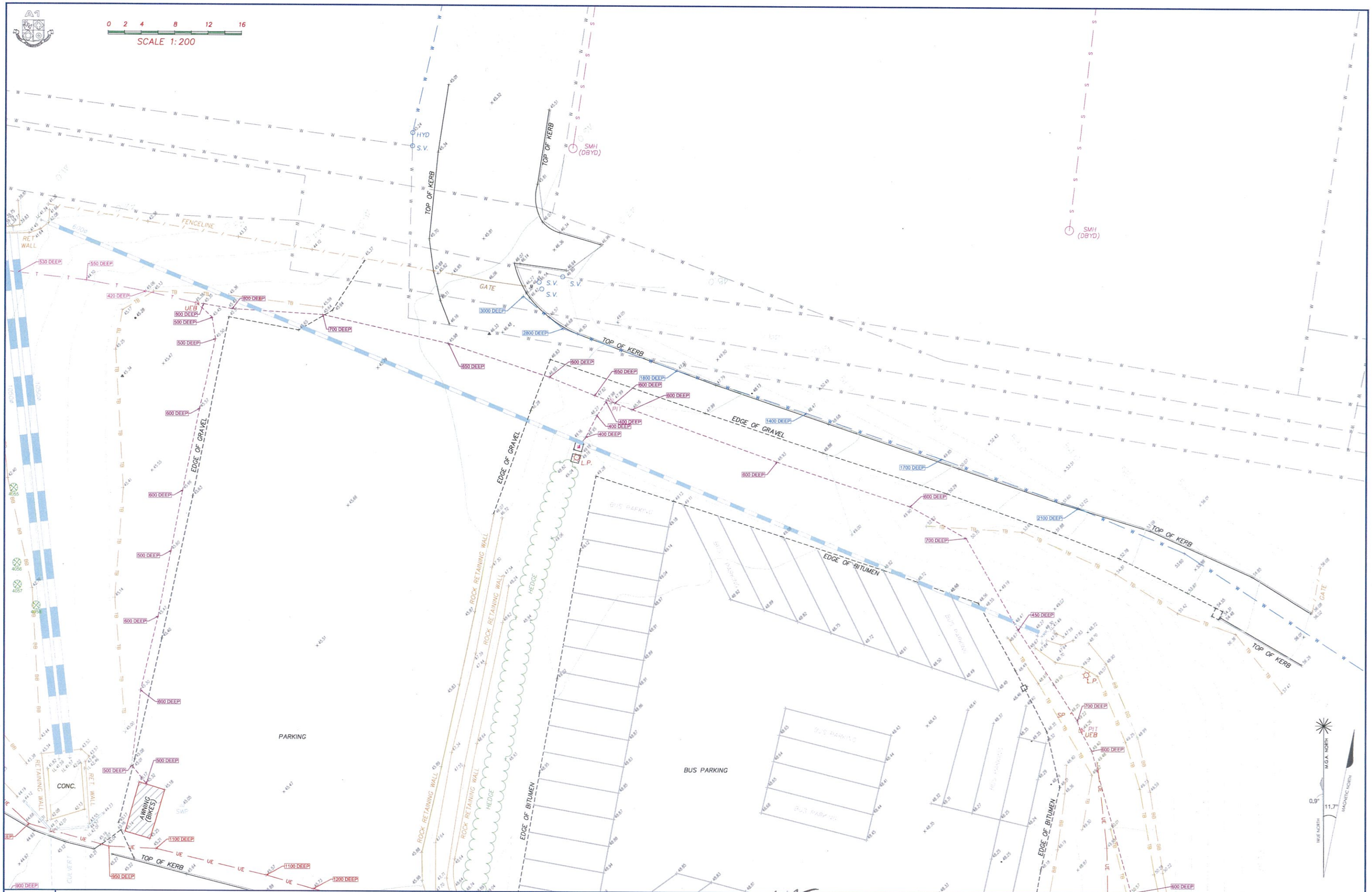
LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST
CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD
PROJECT: COMMERCIAL DEVELOPMENT

PLAN: DETAIL AND CONTOUR SURVEY
LOT 3 DP 716082 AREA 5.26ha
DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:200(A1)
CAD REF: 55283DETAIL SHEET 2 OF 8

A1

0 2 4 8 12 16

SCALE 1: 200



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PLAN: DETAIL AND CONTOUR SURVEY

LOT 3 DP 716082 AREA 5.26ha

CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD

DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:200(A1)

PROJECT: COMMERCIAL DEVELOPMENT

CAD REF: 55283DETAIL SHEET 3 OF 8

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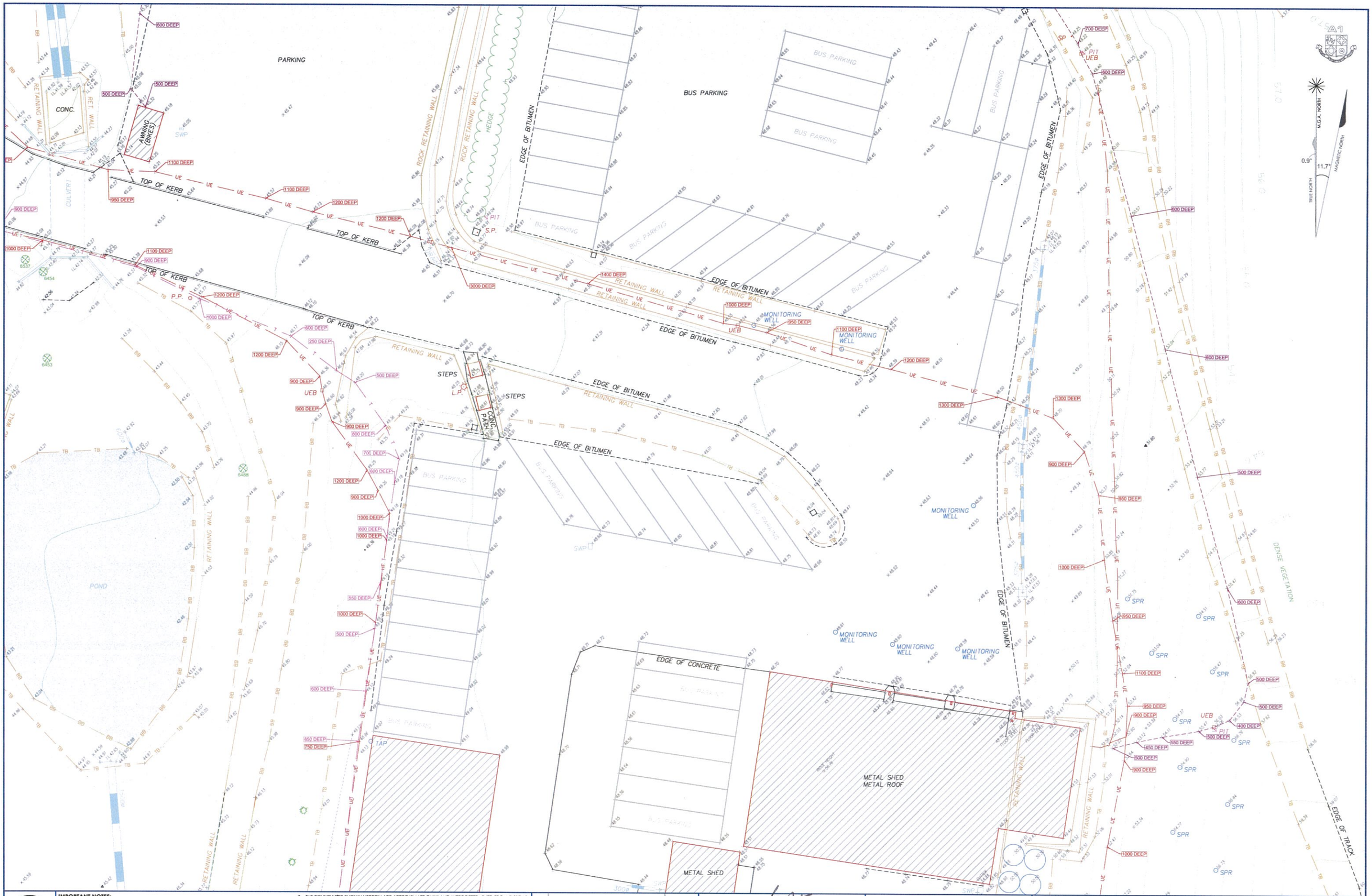
LOCALITY:	67 POPLARS AVENUE BATEAU BAY L.G.A. CENTRAL COAST	PLAN:	DETAIL AND CONTOUR SURVEY
		LOT 3 DP 716082	AREA 5.26ha
CLIENT:	THE ENTRANCE RED BUS SERVICE PTY LTD	DATUM:	AUSTRALIAN HEIGHT DATUM
			SCALE 1:200(A1)
PROJECT:	COMMERCIAL DEVELOPMENT	CAD REF:	55283DETAIL
			SHEET 4 OF 8



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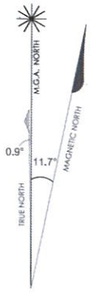
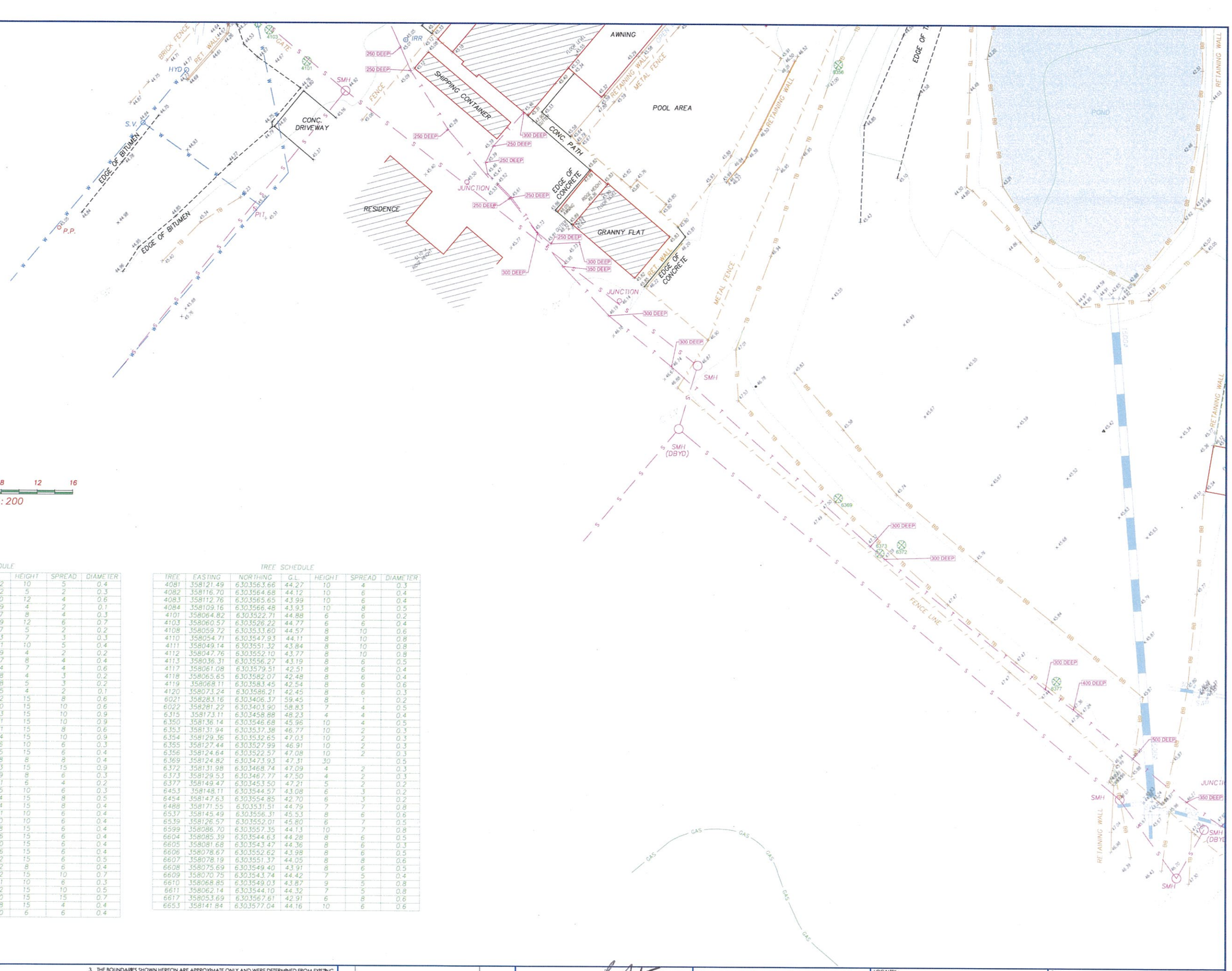
CAD REF:	55283DETAIL
SHEET	5 OF 8

A1





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SCALE 1: 200

TREE SCHEDULE

TREE	EASTING	NORTHING	G.L.	HEIGHT	SPREAD	DIAMETER
156	358074.57	6303638.69	39.92	10	5	0.4
157	358064.58	6303633.63	40.22	5	2	0.3
320	358083.46	6303608.07	41.60	12	4	0.6
331	358082.63	6303634.08	40.39	4	2	0.1
332	358077.43	6303636.52	40.17	8	4	0.3
333	358076.88	6303637.66	40.09	12	6	0.7
334	358076.08	6303636.61	40.17	5	2	0.2
335	358074.41	6303636.34	40.13	7	3	0.3
336	358073.71	6303636.14	40.21	10	5	0.4
337	358071.41	6303634.04	40.39	4	2	0.2
338	358069.98	6303634.25	40.37	8	4	0.4
339	358070.03	6303635.45	40.34	7	4	0.6
340	358068.98	6303634.48	40.28	4	3	0.2
341	358068.25	6303634.34	40.38	5	3	0.2
342	358066.25	6303633.10	40.35	4	2	0.1
4028	358109.18	6303639.08	40.42	15	8	0.6
4029	358109.34	6303641.30	40.30	15	10	0.6
4030	358111.84	6303641.86	40.33	15	10	0.9
4031	358123.47	6303643.44	40.31	15	10	0.9
4032	358128.41	6303642.33	40.71	15	8	0.6
4033	358127.25	6303636.83	40.94	15	10	0.9
4034	358127.97	6303632.75	41.26	10	6	0.3
4035	358127.55	6303629.62	41.45	15	6	0.4
4036	358135.10	6303634.93	41.48	8	8	0.4
4041	358132.89	6303629.21	41.73	15	15	0.9
4042	358132.07	6303626.43	41.89	8	6	0.3
4043	358132.53	6303623.68	42.01	6	4	0.2
4044	358136.98	6303622.66	42.15	10	6	0.3
4045	358135.59	6303619.46	42.14	15	8	0.5
4046	358138.11	6303619.13	42.14	15	8	0.4
4047	358132.15	6303617.54	42.01	10	6	0.4
4048	358133.34	6303616.58	42.10	10	6	0.4
4049	358134.48	6303615.80	42.18	15	6	0.4
4050	358141.84	6303617.38	42.26	15	6	0.4
4051	358141.39	6303616.53	42.20	15	6	0.4
4052	358135.41	6303612.79	42.36	15	6	0.4
4053	358136.41	6303613.14	42.32	15	6	0.5
4054	358140.90	6303607.96	42.32	8	6	0.4
4055	358143.84	6303609.81	42.52	15	10	0.7
4056	358144.25	6303600.89	42.61	10	6	0.3
4057	358144.33	6303598.27	42.72	15	10	0.5
4058	358146.57	6303595.78	42.90	15	15	0.7
4063	358134.55	6303590.31	43.38	15	4	0.4
4072	358129.50	6303604.79	42.60	6	6	0.4

TREE SCHEDULE

TREE	EASTING	NORTHING	G.L.	HEIGHT	SPREAD	DIAMETER
4081	358121.49	6303563.66	44.27	10	4	0.3
4082	358116.70	6303564.68	44.12	10	6	0.4
4083	358112.76	6303565.65	43.99	10	6	0.4
4084	358109.16	6303566.48	43.93	10	8	0.5
4101	358064.82	6303522.71	44.88	6	6	0.2
4103	358060.57	6303526.22	44.77	6	6	0.4
4108	358059.72	6303533.60	44.57	8	10	0.6
4110	358054.71	6303547.93	44.11	8	10	0.8
4111	358049.14	6303551.32	43.84	8	10	0.8
4112	358047.76	6303552.10	43.77	8	10	0.8
4113	358036.31	6303556.27	43.19	8	6	0.5
4117	358061.08	6303579.51	42.51	8	6	0.4
4118	358065.65	6303582.07	42.48	8	6	0.4
4119	358068.11	6303583.45	42.54	8	6	0.6
4120	358073.24	6303586.21	42.45	8	6	0.3
6021	358283.16	6303406.37	59.45	8	1	0.2
6022	358281.22	6303403.90	58.83	7	4	0.5
6315	358173.11	6303458.88	48.23	4	4	0.4
6350	358136.14	6303546.68	45.96	10	4	0.5
6353	358131.94	6303537.38	46.77	10	2	0.3
6354	358129.36	6303532.65	47.03	10	2	0.3
6355	358127.44	6303527.99	46.91	10	2	0.3
6356	358124.64	6303522.57	47.08	10	2	0.3
6369	358124.82	6303473.93	47.31	30		0.5
6372	358131.98	6303468.74	47.09	4	2	0.3
6373	358129.53	6303467.77	47.50	4	2	0.3
6377	358149.47	6303453.50	47.21	5	2	0.2
6453	358148.11	6303544.57	43.08	6	3	0.2
6454	358147.63	6303554.85	42.70	6	3	0.2
6488	358171.55	6303531.51	44.79	7	7	0.8
6537	358145.49	6303556.31	45.53	8	6	0.6
6539	358126.57	6303552.01	45.80	6	7	0.5
6599	358086.70	6303557.35	44.13	10	7	0.8
6604	358085.39	6303544.63	44.28	8	6	0.5
6605	358081.68	6303543.47	44.36	8	6	0.3
6606	358078.67	6303552.62	43.98	8	6	0.5
6607	358078.19	6303551.37	44.05	8	8	0.6
6608	358075.69	6303549.40	43.91	8	6	0.5
6609	358070.75	6303543.74	44.42	7	5	0.4
6610	358068.85	6303549.03	43.87	9	5	0.8
6611	358062.14	6303544.10	44.32	7	5	0.8
6617	358053.69	6303567.61	42.91	6	8	0.6
6653	358141.84	6303577.04	44.16	10	6	0.6

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PROJECT: COMMERCIAL DEVELOPMENT

PLAN: DETAIL AND CONTOUR SURVEY

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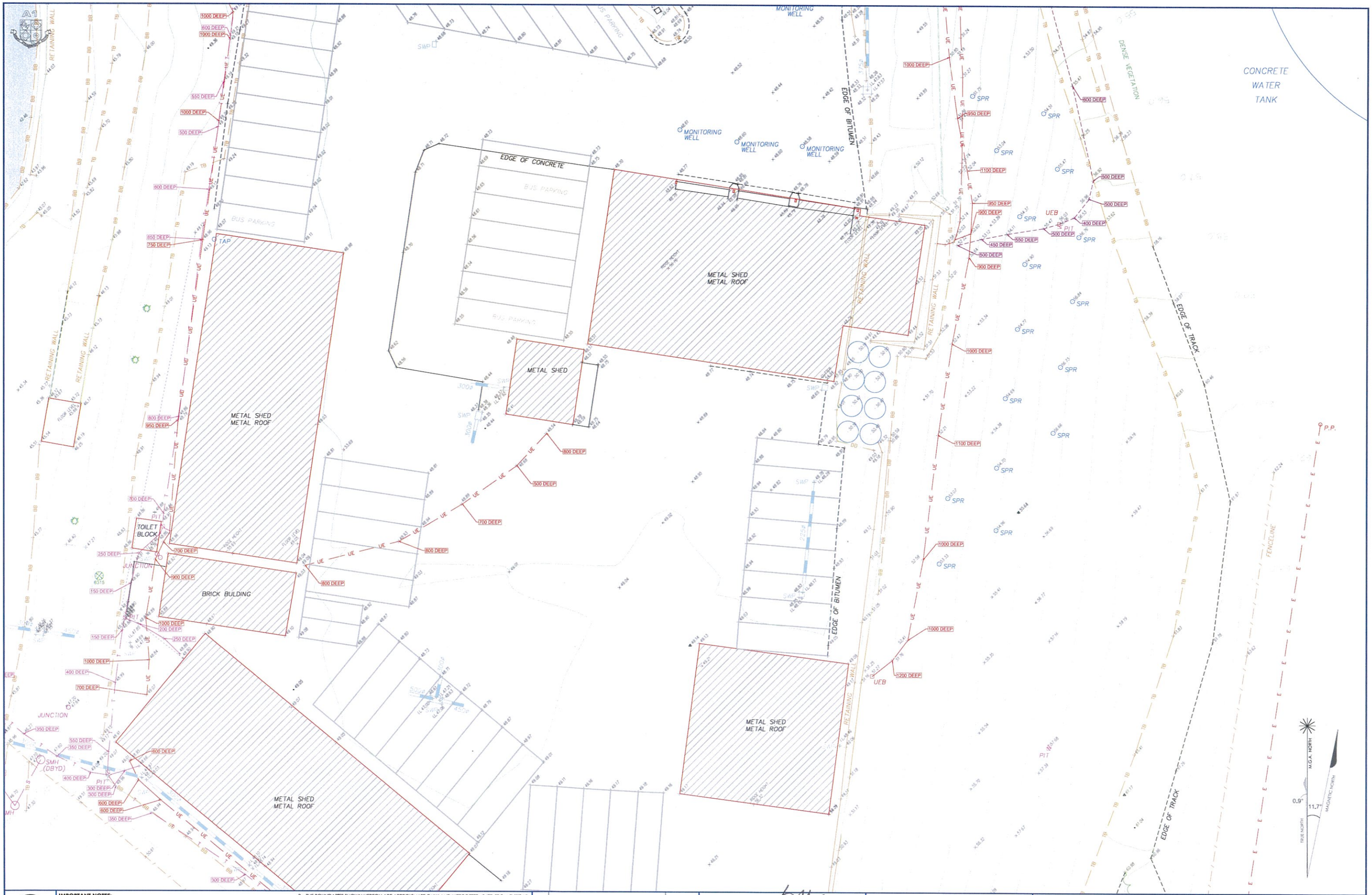
DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:200(A1)

CAD REF: 55283DETAIL SHEET 6 OF 8



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CLIENT:	THE ENTRANCE RED BUS SERVICE PTY LTD	DATUM	AUSTRALIAN HEIGHT DATUM
			SCALE 1:200(A1)
PROJECT:	COMMERCIAL DEVELOPMENT	CAD REF:	55283DETAIL
			SHEET 7 OF 8

METAL SHED
METAL ROOF

METAL SHED
METAL ROOF

SHIPPING CONTAINER

RETAINING WALL

RET. WALL

EDGE OF TRACK

EDGE OF TRACK

FENCELINE

SHEET METAL FENCE

PALING FENCE

SHEET METAL FENCE

SHEET METAL FENCE

TIMBER FENCE

SHEET METAL FENCE

SHEET METAL FENCE

GAS

PIT

PIT

TAP

P.P.

300 DEEP

600 DEEP

900 DEEP

350 DEEP

400 DEEP

500 DEEP

700 DEEP

0 2 4 8 12 16

SCALE 1: 200

M.G.A. NORTH

MAGNETIC NORTH

TRUE NORTH

0.9°

11.7°

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****** DIAL BEFORE YOU DIG (CALL 1100) ******

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4. FOR ANY CONSTRUCTION ACTIVITIES PROPOSED IN CLOSE PROXIMITY TO THE BOUNDARIES OR PRESCRIBED SETBACKS, IT IS RECOMMENDED THAT THOSE BOUNDARIES BE MARKED TO AVOID THE POSSIBILITY OF ENCROACHMENT.

DIAL 1100 BEFORE YOU DIG

	AMENDMENTS	DATE
A	ORIGINAL ISSUE	27/10/20

REGISTERED SURVEYOR

DRAWN KDM DATE 27/10/20

SURVEYED RD DATE 23/10/20

Barry Hunt Associates

REGISTERED SURVEYORS AND
LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL, TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE, 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au

LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST

CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD

PROJECT: COMMERCIAL DEVELOPMENT

PLAN: DETAIL AND CONTOUR SURVEY

LOT 3 DP 716082 AREA 5.26ha

DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:200(A1)

CAD REF: 55283DETAIL SHEET 8 OF 8

Appendix B Existing Conditions Flood Behaviour

PASSAGE ROAD
PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
BARD LANE
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
POPLARS AVENUE
POPLARS AVENUE
POPLARS AVENUE
SANCTUARY PLACE
42.5
42.5
43.5
43.5
43.5
46.5
46.5
47.5
47.5
47.5
48.0
52.0
52.0
63.0
50.0
50.0
49.5
64.5
65.5
N

682 Coleridge Roas, Bateau Bay, FIA

Existing 50% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE1

Stantec

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE2

Stantec

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE3

Stantec

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

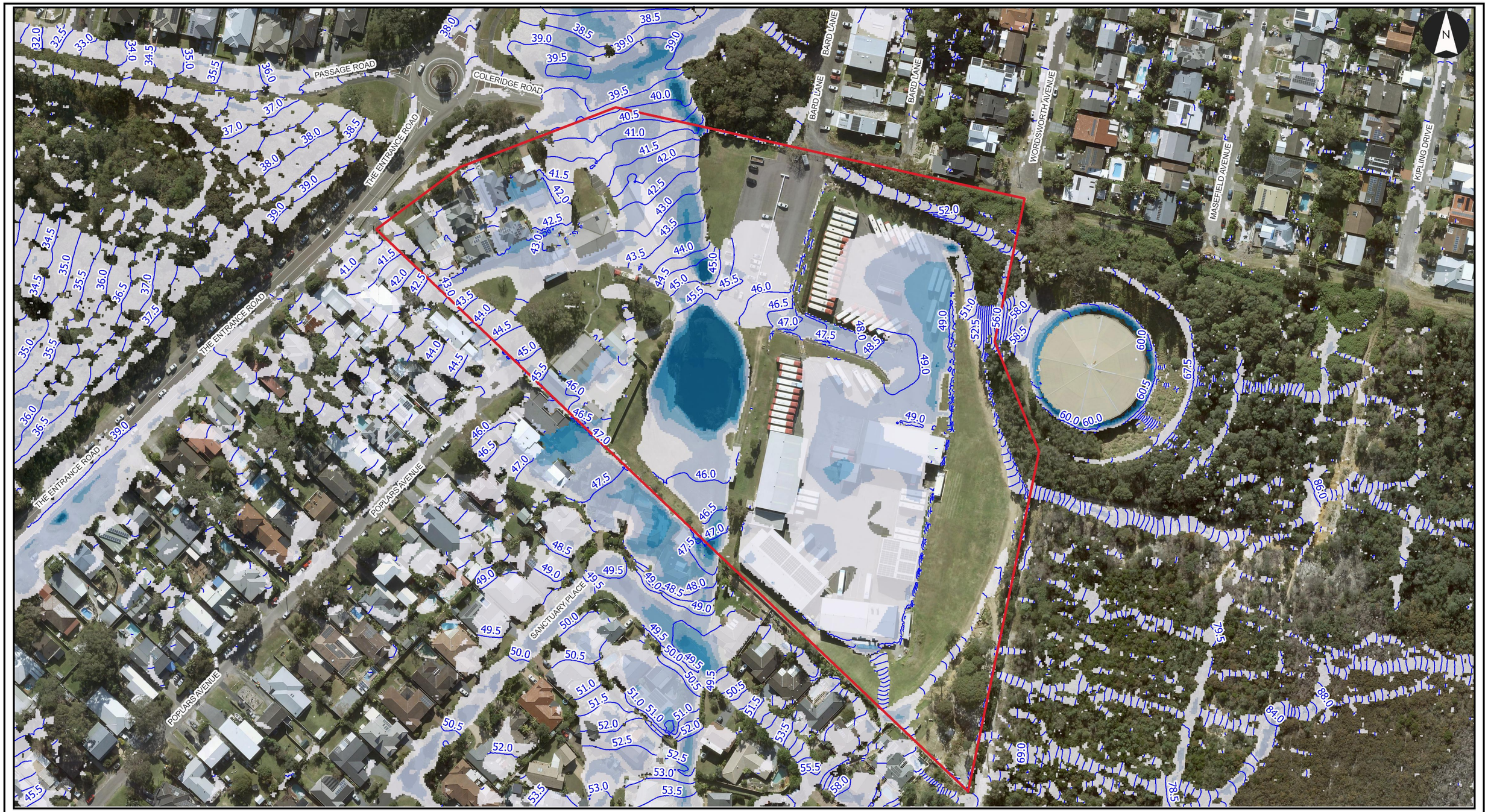
- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE4

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Existing 50% AEP Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE5

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE6

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE7

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

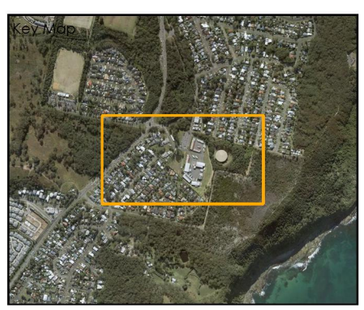
- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

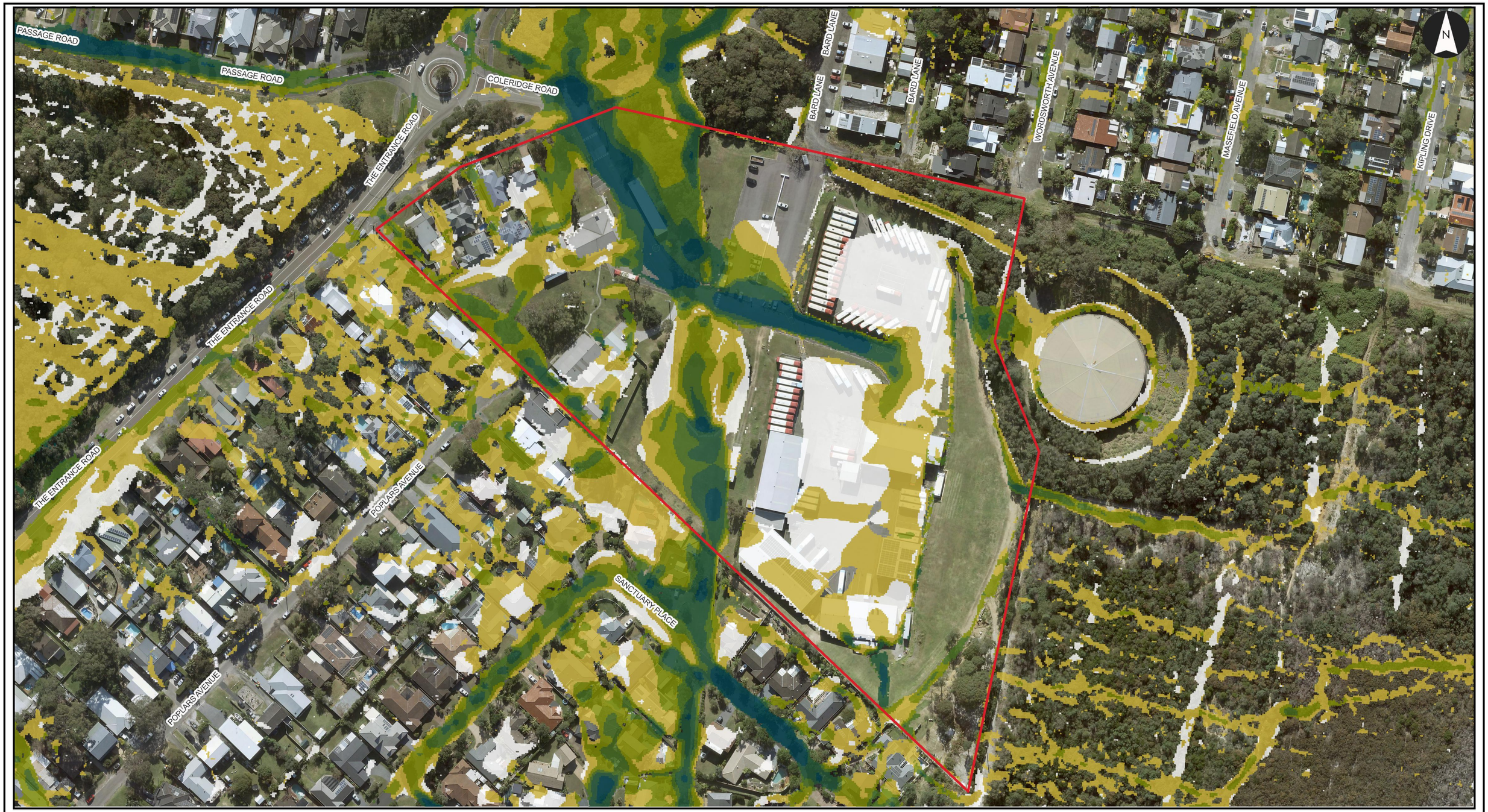
Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800





682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE8

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

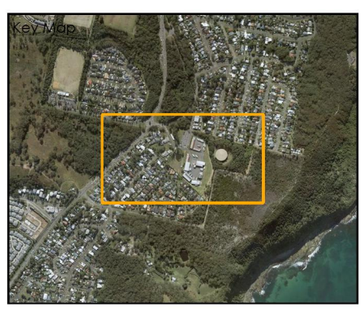
- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



PASSAGE ROAD
PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
POPLARS AVENUE
POPLARS AVENUE
POPLARS AVENUE
SANCTUARY PLACE
BARD LANE
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
N

682 Coleridge Roas, Bateau Bay, FIA
Existing 50% AEP Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE9

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE10

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE11

Stantec

Legend

- Site Boundary

Flood Hazard

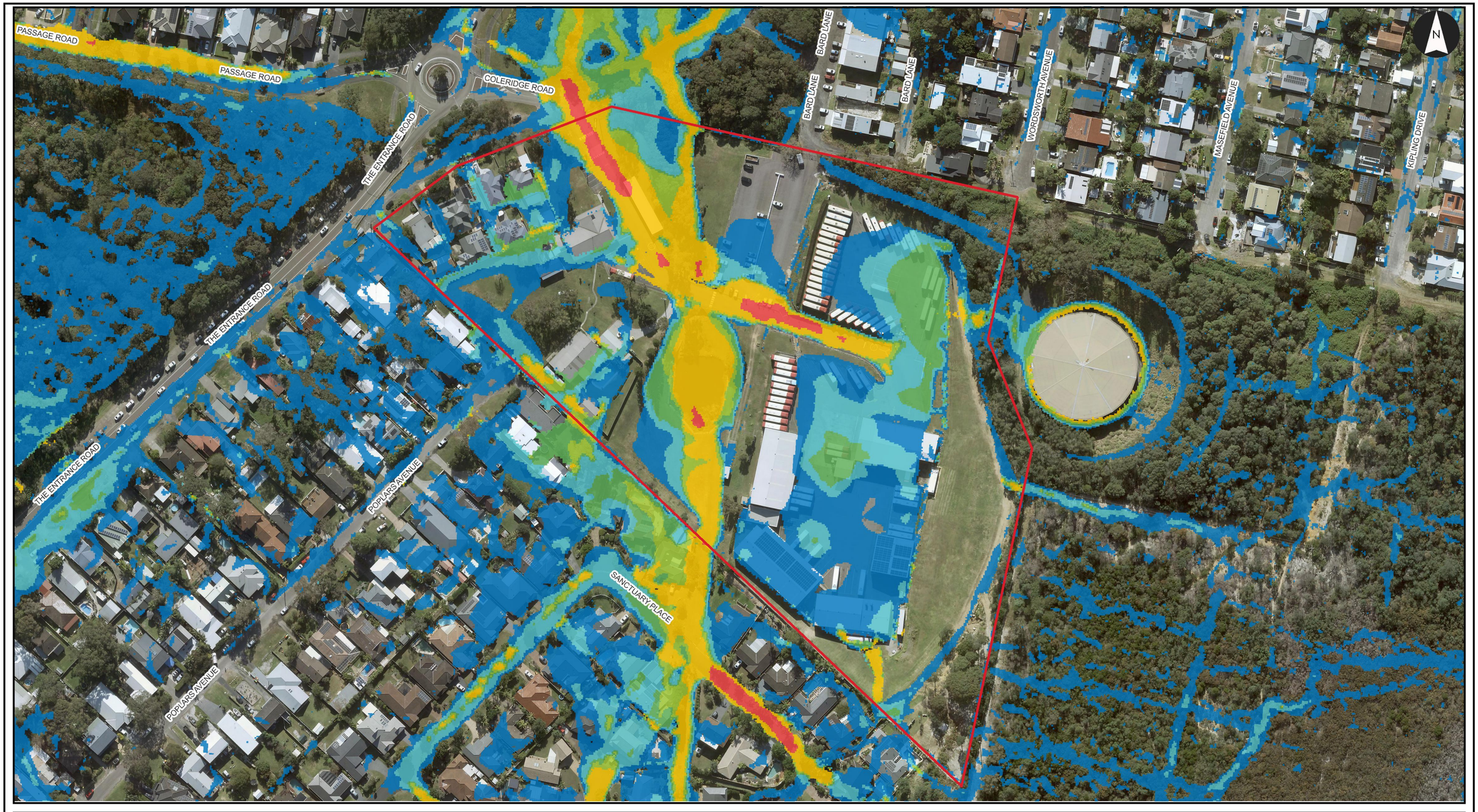
- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: BE12

Stantec

Legend

- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Appendix C Climate Change Flood Behaviour

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC1

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

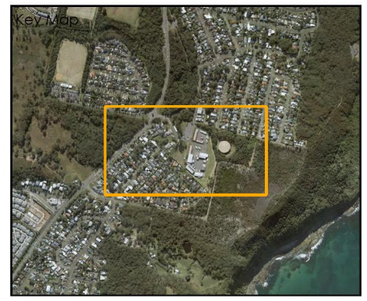
- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



Stantec

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC2

Stantec

Legend

- Site Boundary
- 0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 Flood Velocity

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC3

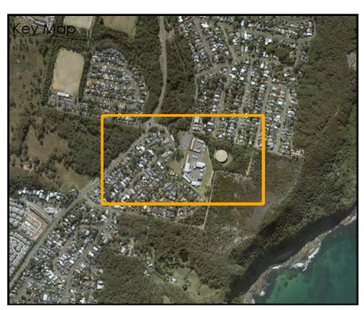
Stantec

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC4

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

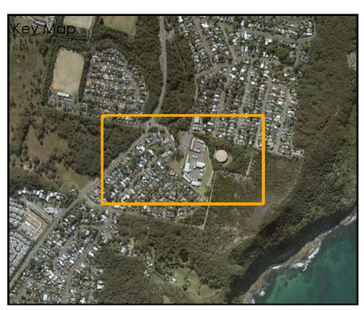
- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800



PASSAGE ROAD
PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
POPLARS AVENUE
POPLARS AVENUE
SANCTUARY PLACE
BARD LANE
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
N

682 Coleridge Roas, Bateau Bay, FIA
Climate Change CC10 Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC5

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PASSAGE ROAD
PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
POPLARS AVENUE
POPLARS AVENUE
SANCTUARY PLACE
BARD LANE
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
N

682 Coleridge Roas, Bateau Bay, FIA
Climate Change CC20 Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC6

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PASSAGE ROAD
PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
THE ENTRANCE ROAD
POPLARS AVENUE
POPLARS AVENUE
SANCTUARY PLACE
BARD LANE
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
N

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 less 1%AEP Water Level Difference

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC7

Stantec

Legend

Site Boundary

Wet/Dry Analysis

- Was Wet, Now Dry
- Was Dry, Now Wet

Water Level Difference (m)

- < -0.50
- -0.50 to -0.20
- -0.20 to -0.10
- -0.10 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.50
- > 0.50

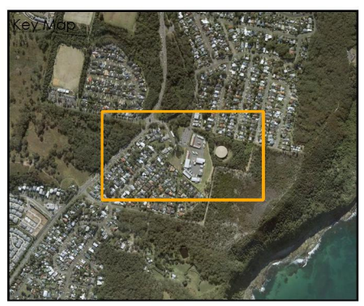
Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map



682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 less 1%AEP Water Level Difference

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: CC8

Stantec

Legend

Site Boundary

Wet/Dry Analysis

- Was Wet, Now Dry
- Was Dry, Now Wet

Water Level Difference (m)

- < -0.50
- -0.50 to -0.20
- -0.20 to -0.10
- -0.10 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.50
- > 0.50

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Appendix D Future Flood Behaviour _ Conservative Scenario

50% AEP Future _ Conservative Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC1

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

5% AEP Future _ Conservative Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC2

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
POPLARS AVENUE
SANCTUARY PLACE

N

1% AEP Future _ Conservative Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC3

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Conservative Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC4

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

50% AEP Future _ Conservative Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC5

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

5% AEP Future _ Conservative Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC6

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

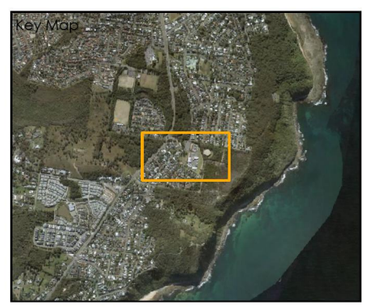
Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map



1% AEP Future _ Conservative Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC7

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Conservative Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC8

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

50% AEP Future _ Conservative Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC9

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

PASSAGE ROAD
COLERIDGE ROAD
THE ENTRANCE ROAD
BARD LANE
BARD LANE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
POPLARS AVENUE
SANCTUARY PLACE
N

5% AEP Future _ Conservative Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC10

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

1% AEP Future _ Conservative Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC11

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Conservative Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC12

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

WADI ROAD
BATAAN CIRCUIT
CHURCHILL STREET
BATAAN CIRCUIT
BATAAN CIRCUIT
PASSAGE ROAD
PASSAGE ROAD
THE ENTRANCE ROAD
COLERIDGE ROAD
MARLOWE ROAD
SHAKESPEARE AVENUE
KIPLING DRIVE
KIPLING DRIVE
WORDSWORTH AVENUE
MASEFIELD AVENUE
KIPLING DRIVE
STEPHENSON ROAD
BARD LANE
WYRRABALONG COASTAL WALK
THE ENTRANCE ROAD
POPLARS AVENUE
SANCTUARY PLACE
OCEANSIDE CLOSE
WHALANS ROAD
WHALANS ROAD
LOWANNA AVENUE
LOWANNA AVENUE
JOAN STREET
THE ENTRANCE ROAD
THE ENTRANCE ROAD
LONGS ROAD
LONGS ROAD
BELLEVUE ROAD
BELLEVUE ROAD
THE ENTRANCE ROAD
SEASPRAY DRIVE
N

1% AEP Conservative Scenario Less Existing Flood Level Difference

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC13

Stantec

Legend

- Building Footprint
- Site Boundary

Wet/Dry Analysis

- Was Wet, Now Dry
- Was Dry, Now Wet

Water Level Difference (m)

- < -0.20
- -0.20 - -0.10
- -0.10 to -0.05
- -0.05 to -0.03
- -0.03 to -0.02
- -0.02 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.03
- 0.03 to 0.05
- 0.05 to 0.10

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

50 0 50 100 150 200 m

Scale at A3: 1:4500

Key Map

1% AEP Conservative Scenario Less Existing Velocity Difference

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: DC14

Stantec

Legend

- Building Footprint
- Site Boundary

Velocity Difference (m/s)

- <= -0.50
- -0.50 - -0.20
- -0.20 - -0.10
- -0.10 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- > 0.50

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

50 0 50 100 150 200 m

Scale at A3: 1:4500

Key Map

Appendix E Future Flood Behaviour _ Realistic Scenario

50% AEP Future _ Realistic Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER1

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

5% AEP Future _ Realistic Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER2

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

1% AEP Future _ Realistic Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER3

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Realistic Scenario
Depth and Water Level Contour

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER4

Stantec

Legend

- Building Footprint
- Site Boundary
- 0.5m Water Level Contour

Peak Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

50% AEP Future _ Realistic Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER5

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

5% AEP Future _ Realistic Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER6

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

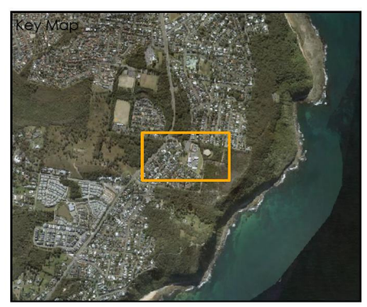
Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map



1% AEP Future _ Realistic Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER7

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Realistic Scenario
Flood Velocity

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER8

Stantec

Legend

- Building Footprint
- Site Boundary

Peak Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

50% AEP Future _ Realistic Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER9

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

5% AEP Future _ Realistic Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER10

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

1% AEP Future _ Realistic Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER11

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

PMF Future _ Realistic Scenario
Flood Hazard

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER12

Stantec

Legend

- Building Footprint
- Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

1% AEP Realistic Scenario Less Existing Flood Level Difference

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER13

Stantec

Legend

- Building Footprint
- Site Boundary

Wet/Dry Analysis

- Was Wet, Now Dry
- Was Dry, Now Wet

Water Level Difference (m)

- < -0.20
- -0.20 - -0.10
- -0.10 to -0.05
- -0.05 to -0.03
- -0.03 to -0.02
- -0.02 to -0.01
- -0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.03
- 0.03 to 0.05
- 0.05 to 0.10

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

50 0 50 100 150 200 m

Scale at A3: 1:4500

Key Map

1% AEP Realistic Scenario Less Existing Velocity Difference

Project: 682A Coleridge Road FIA

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2024-06-18)
Figure No: ER14

Stantec

Legend

- Building Footprint
- Site Boundary

Velocity Difference (m/s)

- <= -0.50
- -0.50 - -0.20
- -0.20 - -0.10
- -0.10 - -0.05
- -0.05 - -0.01
- -0.01 - 0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- > 0.50

Notes:
1. Map displayed in EPSG:28356

References:
1. Base Map: Matromap

50 0 50 100 150 200 m

Scale at A3: 1:4500

Key Map