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28 June 2017

Le Mottee Group
Unit 4/199 Adelaide Street
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Attention: Kate Wheeler

RE: FLOOD ASSESSMENT FOR 792 SEAHAM ROAD, SEAHAM SUBDIVISION PLANNING CONCEPT

BMT WBM was requested to undertake a flooding assessment to assist in the concept subdivision planning for potential development of 792 Seaham Road, Seaham. Specifically, the assessment will involve consideration of the peak flood levels and flood behaviour at the site for the 1% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) design events. Flooding constraints at the site and potential flood impacts associated with the subdivision will be assessed. The following provides a summary of the analysis and results.

Study Area and Catchment

The locality of the site is shown in Figure 1. The site is situated in the rural outskirts of Seaham, which is located on the western floodplain of the Williams River, just upstream of Nelsons Plains and adjacent to Brandy Hill. The Williams River flows in a southerly direction and is a major tributary of the Hunter River. The Williams River joins the Hunter River at Raymond Terrace, approximately 10 km downstream of the site.

Site topography, as defined by the available topographic data, is shown on Figure 2. Most of the site is elevated above the floodplain at over 5.0 m AHD, with elevations peaking at around 15.0 m AHD. Low-lying floodplain areas of the Williams River are located to the east and north-west of the site, where elevations of 1.0 m AHD are typical.

Model Background

Existing hydraulic models developed for previous investigations in the area have been utilised for this assessment. These include:

- Williams River Flood Study (BMT WBM, 2009), and
- Williamtown / Salt Ash Floodplain Risk Management Study and Plan (FRMS&P) (BMT WBM, 2017).

The hydraulic model developed for the Williams River Flood Study (2009) extends from just upstream of Dungog to Newcastle Harbour. The site at 792 Seaham Road is included in the model domain.

The Williamtown / Salt Ash FRMS&P (2017) provides the most recent estimation of flood behaviour for the lower Hunter River floodplain downstream of Nelsons Plains. The modelling undertaken for the study incorporates the following key updates:

- Model topography defined by 2013 LiDAR data set acquired by NSW Land and Property Information.
- Improved estimate of Hunter River design flood flows compared to previous investigations through revised flood frequency analysis (FFA) at Raymond Terrace.
- Additional climate change scenario modelling to establish design flood conditions consistent with design flood planning levels in Port Stephens Council's current planning policy.

Although the site at 792 Seaham Road is not included in the Williamtown / Salt Ash hydraulic model, design flood information can be used to confirm the appropriateness of levels derived in the Williams River Flood Study. Due to the largely flat flood level gradient experienced on the Williams River floodplain between Seaham weir and Nelsons Plains, the modelled flood level at the upstream limit of the 2017 model (i.e. Nelsons Plains) can be readily extended upstream to the site.

Design Flood Results

Table 1 provides a summary of the peak design flood levels modelled at various locations on the Williams River floodplain in the vicinity of the site.

Table 1 Modelled Peak Design Flood Levels near the Site

Design Event	Location	Peak Flood Level (m AHD)	Source
1% AEP + 20% rainfall increase	Seaham	5.6	BMT WBM (2009)
1% AEP + 2100 SLR + 20% rainfall increase	Nelsons Plains	5.4	BMT WBM (2017)
PMF	Site	9.7	BMT WBM (2009)

Peak design flood conditions estimated at the site for this study have been informed from the Williams River Flood Study results and confirmed against the updated Williamtown / Salt Ash FRMS&P results for consistency with Councils most current flood information. Therefore, an average value from both the 1% AEP values presented in Table 1 has been adopted for this assessment.

Port Stephens Council's current planning policy adopts the 1% AEP design event incorporating the 2100 climate change scenario (projected 2100 sea level rise plus a 20% increase in rainfall intensities), plus 0.5 m freeboard as the Flood Planning Level (FPL).

The design flood levels adopted for the site at 792 Seaham Road are presented in Table 2. The Flood Planning Area (FPA) extent and PMF inundation extent is presented in Figure 3

Table 2 Adopted Peak Design Flood Levels at the Site

Design Event	Peak Flood Level (m AHD)
1% AEP + 2100 SLR + 20% rainfall increase	5.5
FPL (2100 1% AEP + 0.5 m)	6.0
PMF	9.7

Flooding Constraints for Development

A concept layout plan for the subdivision of the site was provided by Le Mottee Group and has been reproduced as Figure 4. The main constraints for development at the site are:

- Habitable floor levels, and
- Emergency response.

These components are discussed below.

Habitable Floor Levels:

The principal constraint for the development of flood prone land for residential development is that the habitable floor levels should be set at an elevation above that of the FPL. For the site at 792 Seaham Road the FPL is 6.0 m AHD.

With reference to Figure 3, just under 50% of the site is within the FPA. These locations within the FPA (located along the eastern and western site boundaries) would be subject to flood planning controls. The proposed subdivision layout is such that each lot has a portion of land elevated above the FPL (see Figure 4).

Habitable dwellings can be constructed outside of the FPA or property floor levels can be set above the FPL through either bulk earthworks or dwellings of a pier construction, if required. The introduction of fill material to the site would reduce the available floodplain storage. It would therefore be necessary to investigate the likely flood impacts of such a development through hydraulic modelling as part of a Flood Impact Assessment. However, it is anticipated that such impacts would be minor due to the location of the site at the edge of the floodplain.

Emergency Response:

While the habitable floor level controls seek to minimise damages from major flood events, flood emergency response measures are required to reduce the risk to life presented by extreme floods. Emergency response measures include shelter in place and flood evacuation procedures. Evacuation to flood-free land is the preferred response, with shelter in place typically utilised in locations where sufficient flood warning time is not available. The nature of flooding at 792 Seaham Road is from large mainstream catchments, where sufficient flood warning is expected to be available. Therefore, flood evacuation is the preferred emergency response.

Flood warnings for the Williams and Hunter Rivers at Raymond Terrace are provided by the Bureau of Meteorology and responded to by the NSW SES. The NSW State Flood Plan provides details on flood

trigger levels at Raymond Terrace and the target flood warning times. Evacuation to Seaham through Brandy Hill (via Brandy Hill Drive and Clarence Town Road) would remain open up to a flood level of 4.0 m AHD, when the corner of Seaham Road and Brandy Hill Drive becomes cut by flood water. This would correlate to a peak flood level at the Fitzgerald Bridge (Seaham Road) at Raymond Terrace of over 3.5 m AHD, which is classed in the NSW State Flood Plan as a major flood level for the Hunter River system. A target warning time of at least 18 hours is expected to be provided, allowing residents sufficient time to make informed decisions around evacuation from flood prone areas on the site or evacuation to larger town centres if required.

In the event that sufficient warning time was not provided and residents were required to respond to rising flood waters, safe evacuation to flood-free land within the site should be possible. The nature of the site topography is such that the land rises up from the floodplain, with a central portion of the site remains flood-free at the PMF, as shown in Figure 3.

With reference to Figure 4, the proposed configuration of the subdivision is such that the central lots (lot 15, 16 and 17) are elevated on the top of the hill and will remain flood-free at the PMF. The proposed ring road provides access to each perimeter lot from higher ground. This means the evacuation pathway for these residents will remain open as long as their lot remains flood-free. However, the proposed road does not provide access to lot 18 located to the north-east of the site.

The access to lot 18 appears to be via an existing driveway that traverses a relatively low-lying area below 2.0 m AHD and does not provide for satisfactory flood evacuation. It may be required to provide an alternative access from lot 18 to the proposed ring road in order to satisfy the flood emergency response conditions.

Conclusion

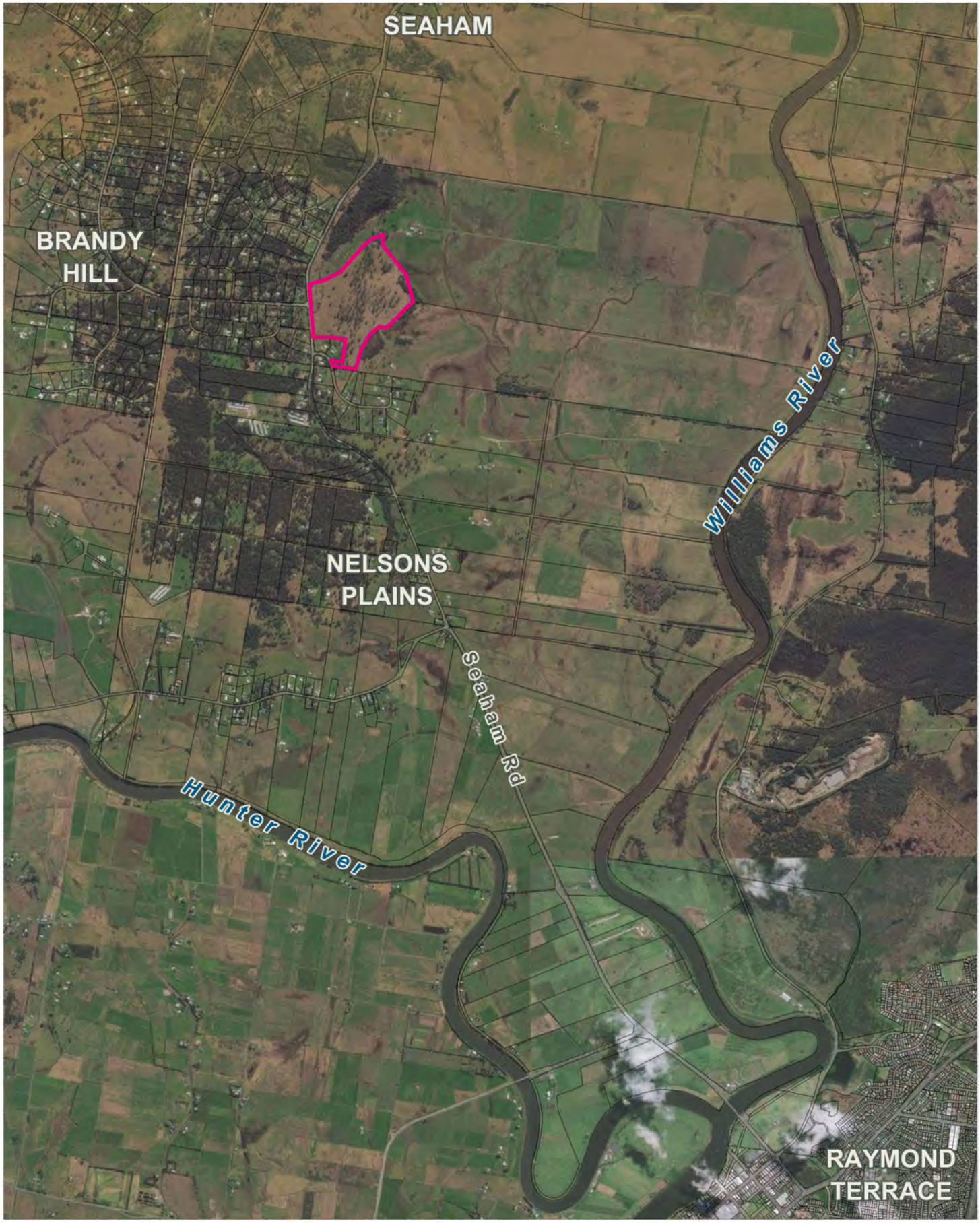
Much of the site is elevated below the FPL of 6.0 m AHD and as such, all lots within the proposed subdivision have land that will be subject to flood planning controls. However, the layout configuration provides land within each lot that is elevated above the FPL, in order to satisfy minimum habitable floor level requirements.

Sufficient flood warning time should be available to evacuate the site in the event of a major flood. In addition, the proposed lot and road layout typically provides rising access to flood-free land on site. However, it may be required to provide an alternative access from lot 18 to the proposed ring road in order to satisfy the flood emergency response conditions

We trust that this report satisfies your requirements. If you have any further questions regarding any aspect of this report then please do not hesitate to contact the undersigned.

Yours Faithfully
BMT WBM

Stephanie Lyons
Flood Engineer



Title:
Study Site Locality

Figure: **1**

Rev: **A**

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Approx. Scale

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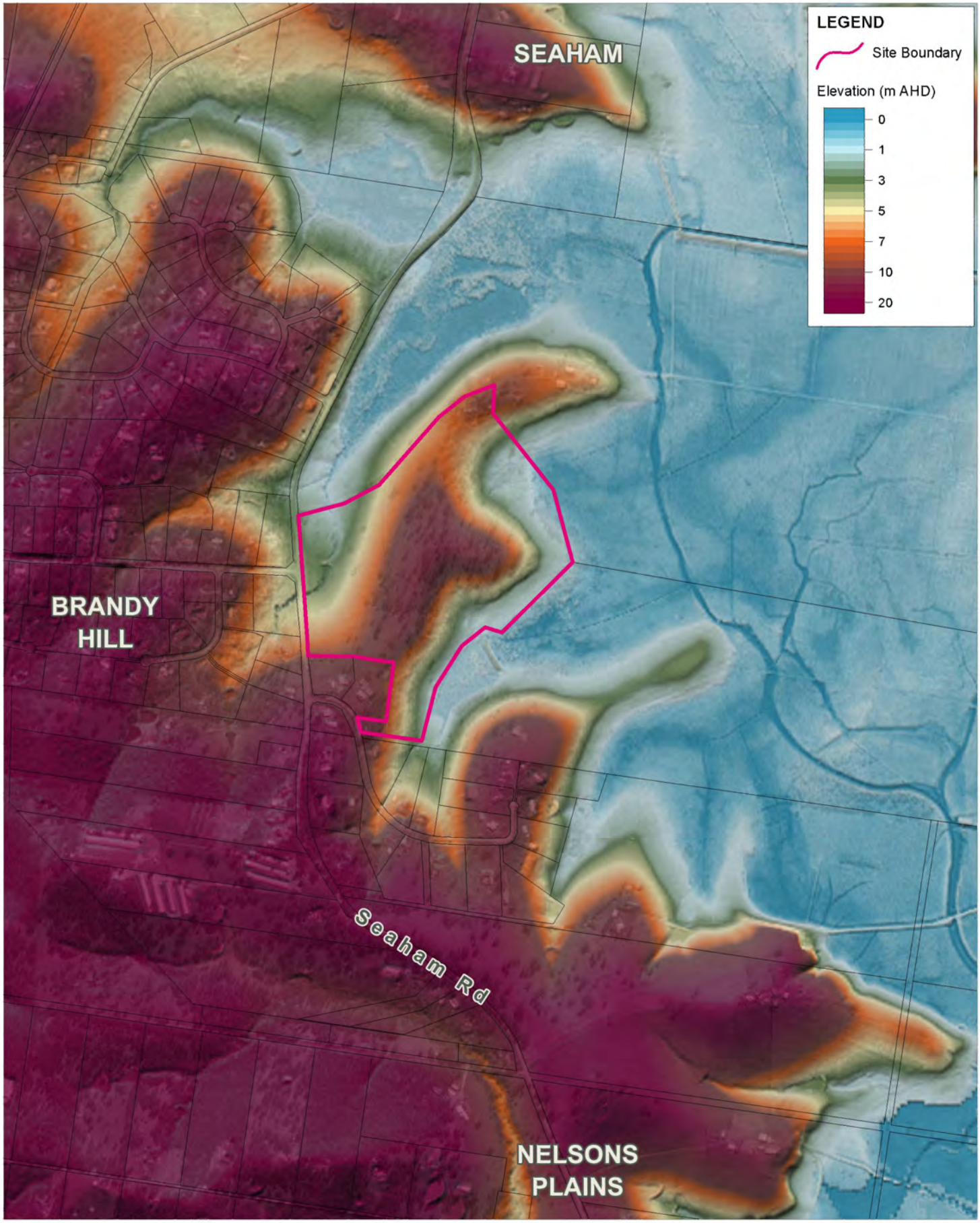

Title:
Existing Site Topography

Figure: **2**

Rev: **A**

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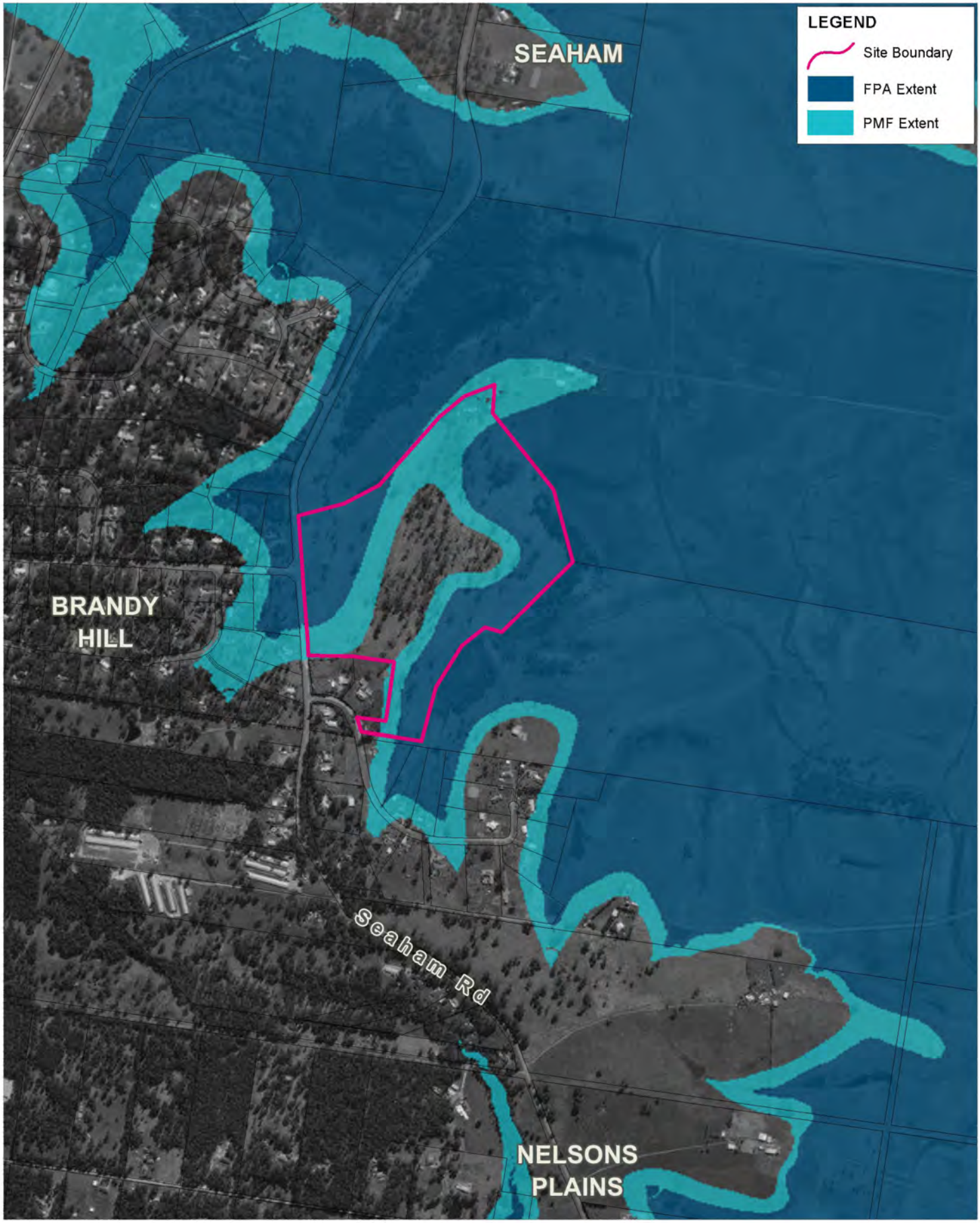

Title:
Flood Planning Area and PMF Inundation Extent

Figure: **3**

Rev: **A**

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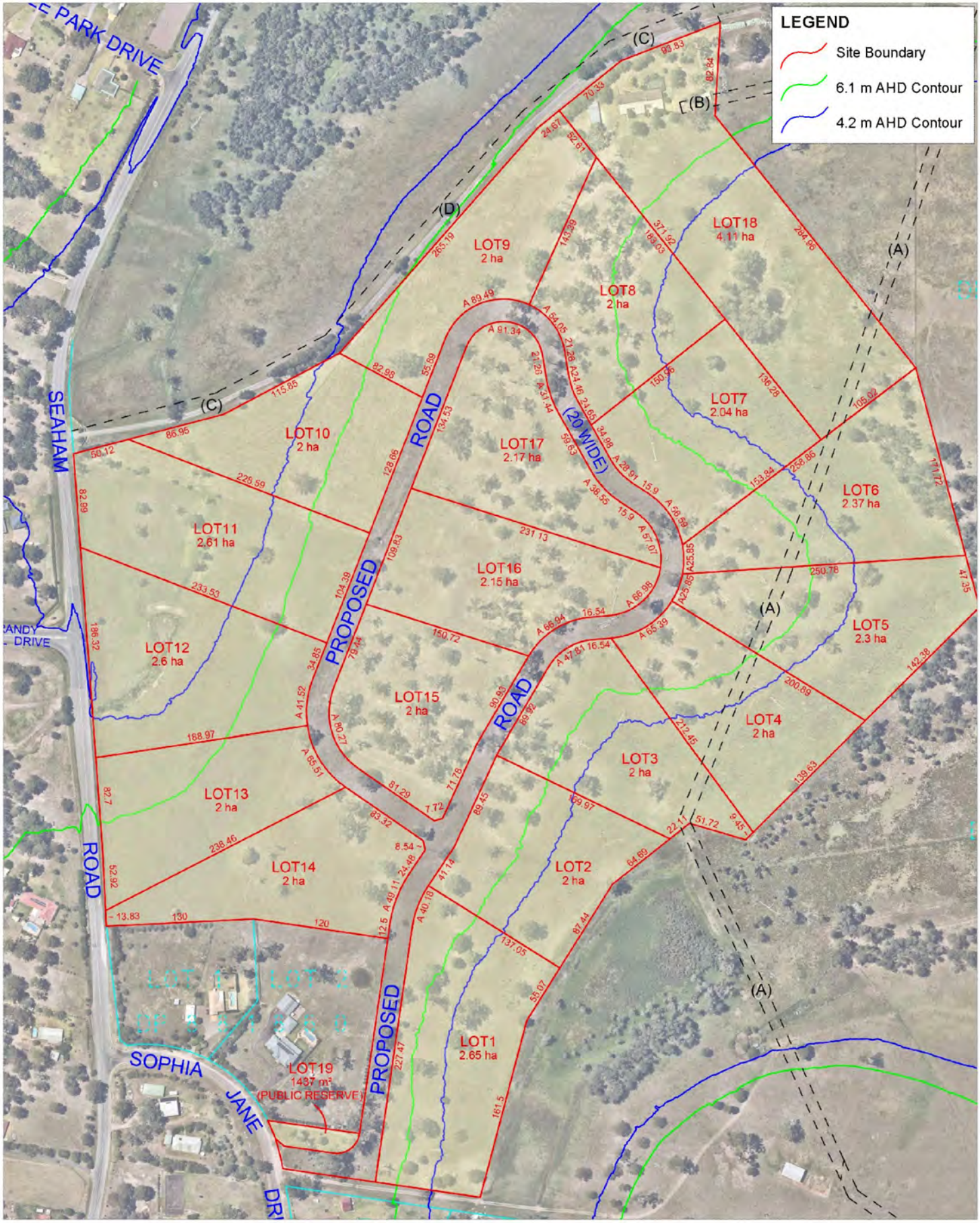

Title:

Concept Lot Layout

Figure: 4

Rev: A

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