Hawthorn Geddes
engineers & architects ltd

In reply please quote: Job No: 12488 R1

25th June 2021

Traverse Ltd

Email: kent@traverseltd.co.nz

FLOOD ASSESSMENT
PROPOSED SUBDIVISION OF 51 TE MAIKA ROAD, NGUNGURU
(LOT 14 DP 374000)

Purpose

The purpose of this report is to summarise the flood assessment undertaken for the proposed development of 51 Te Maika Road, Ngunguru (Lot 14 DP 374000), identify the effects of the proposed development, and provide recommendations.

This report is suitable for use as supporting information for a resource consent application.

General

The property of 51 Te Maika Road, Ngunguru is located at the end of Te Maika Road, on the northern side of the road. It is situated within the low-lying land of a valley which drains to the Ngunguru estuary. A drain has formed through the centre of property which conveys stormwater runoff towards the land drains in the neighbouring site, before discharging under Te Maika Road via a 900dia culvert, and ultimately to the Ngunguru estuary.

It is proposed to subdivide the subject property into 32 residential lots. Development of the site will include filling of the proposed lots to elevate the site above predicted flood levels and the relocating and culverting of the existing open drain that currently conveys flows through the site.

Previous reporting established the proposed lot levels and extent of filing, along with associated minimum finished floor levels. Lots 1-10 are proposed to be filled to a minimum of RL 3.4m OTP and an associated minimum finished floor level for habitable dwellings is proposed at RL3.9m OTP.

A flood assessment has been undertaken for the catchment, of which the proposed development is to be located, to estimate the current and future predicted flood levels and to establish the effects on flooding as a result of the proposed filling and increased stormwater runoff associated with the subdivision. A HEC RAS 2D model of the catchment and a HydroCAD model has been built to complete this assessment. This is a comparative assessment using synthesised rainfall hyetographs and the models have not been calibrated for existing events as no data is available for the catchment.

Flood Assessment

An assessment of the catchment, of which the development is proposed to be located, has been undertaken using topographical maps, GoogleEarth and Northland Regional Council (NRC) LiDAR information. The catchment extends from Matapouri Road to the north, down towards the end of Te Maika Road and is bound to the east and south by the ridges of several small valleys. The total catchment is approximately 66.0ha and consists of some 12.5ha of pasture across the low-lying land and 53.5Ha of native bush and shrub to the surrounding valleys.

A weighted CN 62 has been evaluated for the catchment based on a hydrologic soil group B and taking into consideration the current land coverage within the contributing catchment. Runoff rates were modelled using HydroCAD with a Type 1A rainfall profile and applying rainfall data from HIRDS V4 for the 100-year ARI and 100-year with 20% allowance for climate change.

The catchment has been modelled using a 2D approach in HEC-RAS v 6.0. NRC LiDAR data and design fill levels provided by Reyburn & Bryant for the proposed development were used to generate terrain models for the current and post developed catchment. Rain on grid on a 10m grid for the catchment and a 2m grid for the proposed development area was generated, using boundary condition inputs as described above, and current and future predicted tide elevations for the downstream boundary conditions. The models include the 900 dia culvert located under Te Maika Road and the post development model also incorporates the future proposed 1350 dia culvert and the channel of the relocated drain.

The HEC RAS model has been run with three different scenarios for both the current and the post development catchment to compare and establish the effects on flooding as a result of the development. The three scenarios are:

- 100-year ARI rainfall event with the current MHWS tide condition of 0.989m OTP
- 100-year ARI rainfall event with a MHWS tide condition plus storm surge (CFHZ0 from Tonkin & Taylor Coastal Flood Hazard Assessment for Northland Region 2019-2020 – noting that elevations in the report are in NZVD2016 and have been converted) of 1.989m OTP

- 100-year ARI rainfall event plus 20% allowance for climate change with a MHWS tide condition plus storm surge and predicted 100-year sea level rise of 1.2m (CFHZ2 from Tonkin & Taylor Coastal Flood Hazard Assessment for Northland Region 2019-2020 – elevation conversion applied) of 3.189m OTP

The attached figures A-L show the modelled flood elevations and depths for the above scenarios for both the current and post development catchment. The model identifies two areas to be affected as a result of the development. These being the area immediately upstream of the proposed fill area (proposed wetland area of the development) and that on the neighbouring property to the east (Lot 15 DP 374000).

The increase in flood area upstream of the development, for the post development catchment, has been created due to a basin being formed from the filling of the site. The outlet to this basin (being the relocated drain channel) is set approximately 1.5m above the floor of the basin and consequently, stormwater runoff from the upper catchment will pond in this basin until elevations reach that of the drain channel and can discharge. The model shows the extent of this flooding to be limited to within the parent title boundary (Lot 14 DP 374000) of the development and therefore, it will not have an effect on upstream properties.

The model shows an increase in flood elevations on the neighbouring property as a result of the proposed development. Due to a loss of flood storage volume within the catchment, associated with the filling of the development, the flood volumes from the development site have been displaced to the neighbouring property. The model indicates an increase in flood elevation on the neighbouring site of some 70mm for the 100-year ARI rainfall event with the current MHWS tide condition and 80mm for the 100-year ARI rainfall event with the current MHWS tide condition plus storm surge. Refer to Figures M and N.

Therefore, it is confirmed that the current proposal does have an effect on flooding outside of the parent title to the proposed development. However, for the 100-year ARI rainfall event with 20% allowance for climate change, MHWS tide plus storm surge and predicted 100-year sea level rise condition the model shows no measurable increase in flood levels on the neighbouring site. Refer to Figure O. It is noted that for this scenario condition the valley floor to the catchment is already flooded in the predevelopment condition.

Attenuation

The purpose of attenuation is to reduce peak discharges from a development to ensure that downstream properties are not adversely affected by the increase in stormwater runoff. Consequently, the provision of attenuation results in a delay to peak discharges.

The proposed development is located at the lower end of the catchment with an almost direct discharge to the tidal environment. The provision of attenuation for the development in this location within the catchment is likely to result in the peak discharge of the catchment coinciding with the peak discharge from the attenuated site, potentially exacerbating the effects of the increase in runoff created by the development. It should also be noted that for the 100-year ARI rainfall event downstream of the development is in flood and no benefit will be gained by the provision of attenuation. Therefore, it is not considered appropriate to provide attenuation for this development.

Furthermore, noting the need to upgrade the Te Maika Place culvert, the necessity for attenuation to minimise the effect of increase peak runoff can be negated in full with the increased culvert capacity.

Recommendations

To resolve the increase in flood elevations on the neighbouring site, as a result of the proposed filling, it is recommended that the existing 900 dia culvert under Te Maika Road be upgraded to provide sufficient capacity to convey the upstream flood flows. The model shows at a 1.5m (W) x 1m (H) box culvert will be required to ensure that there is no increased effect on flood elevations on the neighbouring property. This includes an allowance of a 300mm flow depth in the invert of the culvert to provide fish passage.

It should be noted that the provision of a culvert at this size maintains the present level of constraint to the wider catchment discharge without providing improvement. WDC may wish to take the opportunity to remedy existing flooding conditions upstream by providing additional capacity over and above that identified here.

Conclusion

It is concluded that that the current development proposal will result in an effect on flooding outside of the parent title of the proposed development property without further works. However, provided that the above recommendation to upgrade the existing 900 dia culvert under Te Maika Road is undertaken, flooding effects will be minimised to be limited to within the parent title boundary. In the context of the WDC District Plan rule 56.2.3, subject to the culvert upgrade, the proposed works will not have an effect on flood levels in upstream or downstream properties.

The lot levels (building platforms) as modelled, with a minimum level of RL3.4m OTP will not be subject to inundation for the assessment events. Subject to this filling being completed, in terms of s.106 of the Resource Management Act, the land is:

a. Not likely to be subject to inundation from flooding from fluvial or tidal sources;

b. Not likely to be subject to material damage associated with flooding from any source.

Subject to the recommendations regarding the Te Maika Place culvert upgrade being implemented, in terms of s.106:

c. The filling of the lots is not likely to accelerate, worsen or result in material damage to other land.

It is also considered that the provision of attenuation for the development should not be a requirement as it will not provide any benefit to downstream properties and would more than likely exacerbate the effects created by the increase in stormwater runoff from the development.

Limitation

This report has been prepared solely for the benefit of our client Traverse Ltd and the Whangarei District Council in relation to the resource consent application for which this report has been prepared. The comments in it are limited to the purpose stated in this report. No liability is accepted by Hawthorn Geddes engineers & architects ltd in respect of its use by any other person, and any other person who relies upon any matter contained in this report does so entirely at their own risk.

Yours faithfully,

James Blackburn
Hawthorn Geddes
engineers & architects ltd

Report prepared by: Stacey Gibson

Encl: Figures A - O – HEC RAS outputs

cc: Richard Smales – Reyburn & Bryant

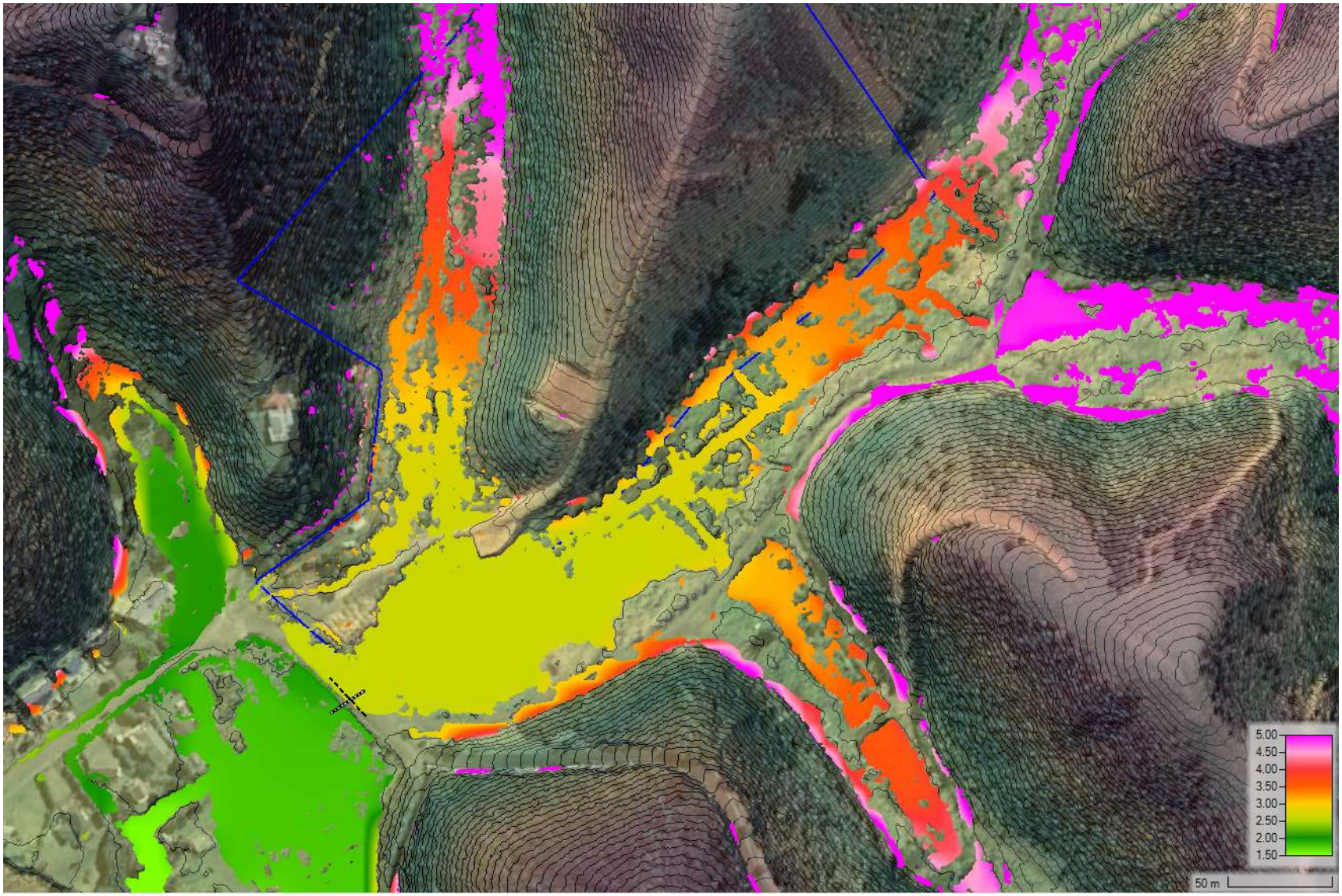

Figure A: Maximum WSE - Pre-development - 100yr +MHWS

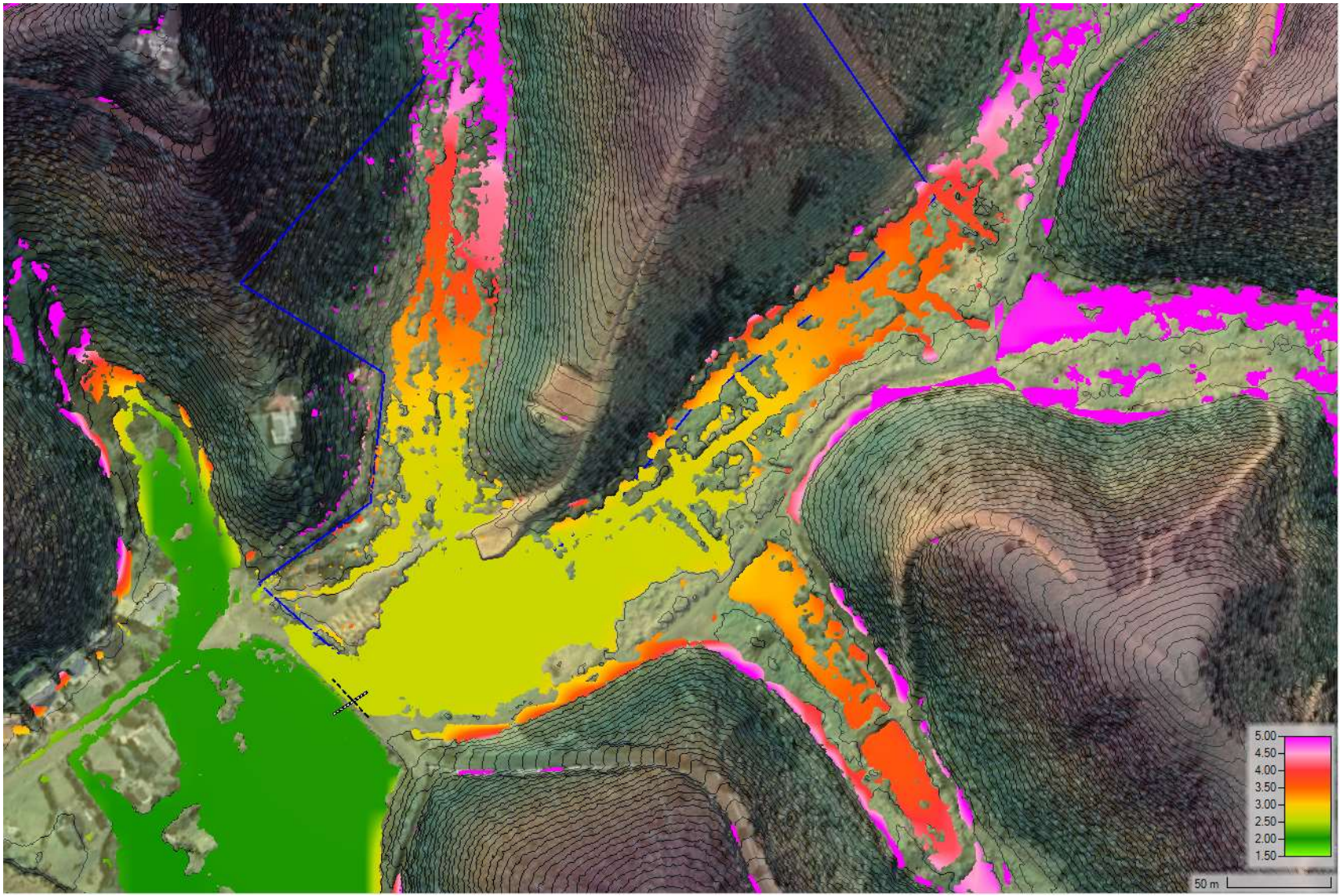

Figure B: Maximum WSE - Pre-development - 100yr + MHWS + Storm surge

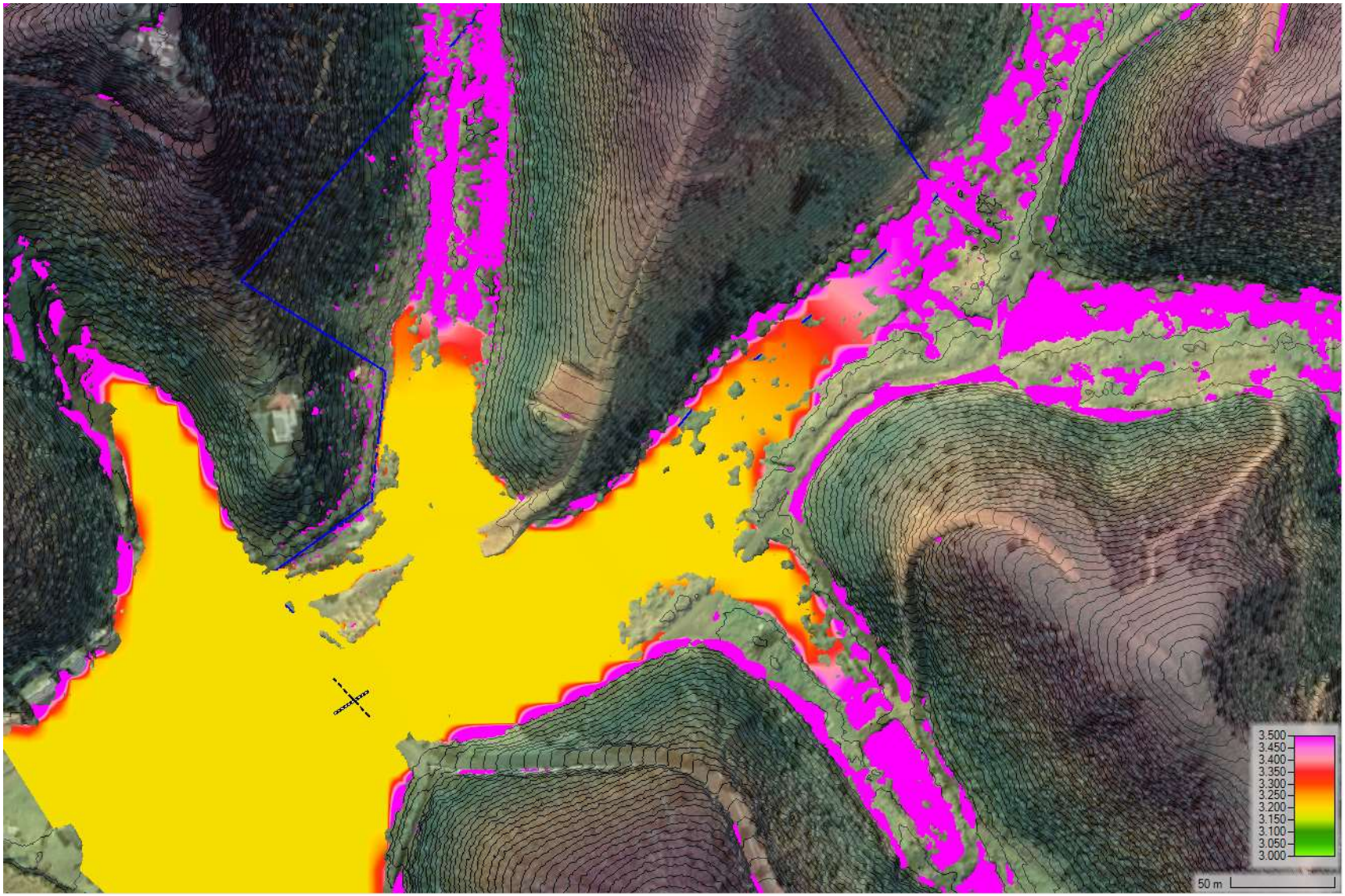

Figure C: Maximum WSE - Pre-development - 100yr+20%cc + MHWS + Storm surge + 1.2m SLR

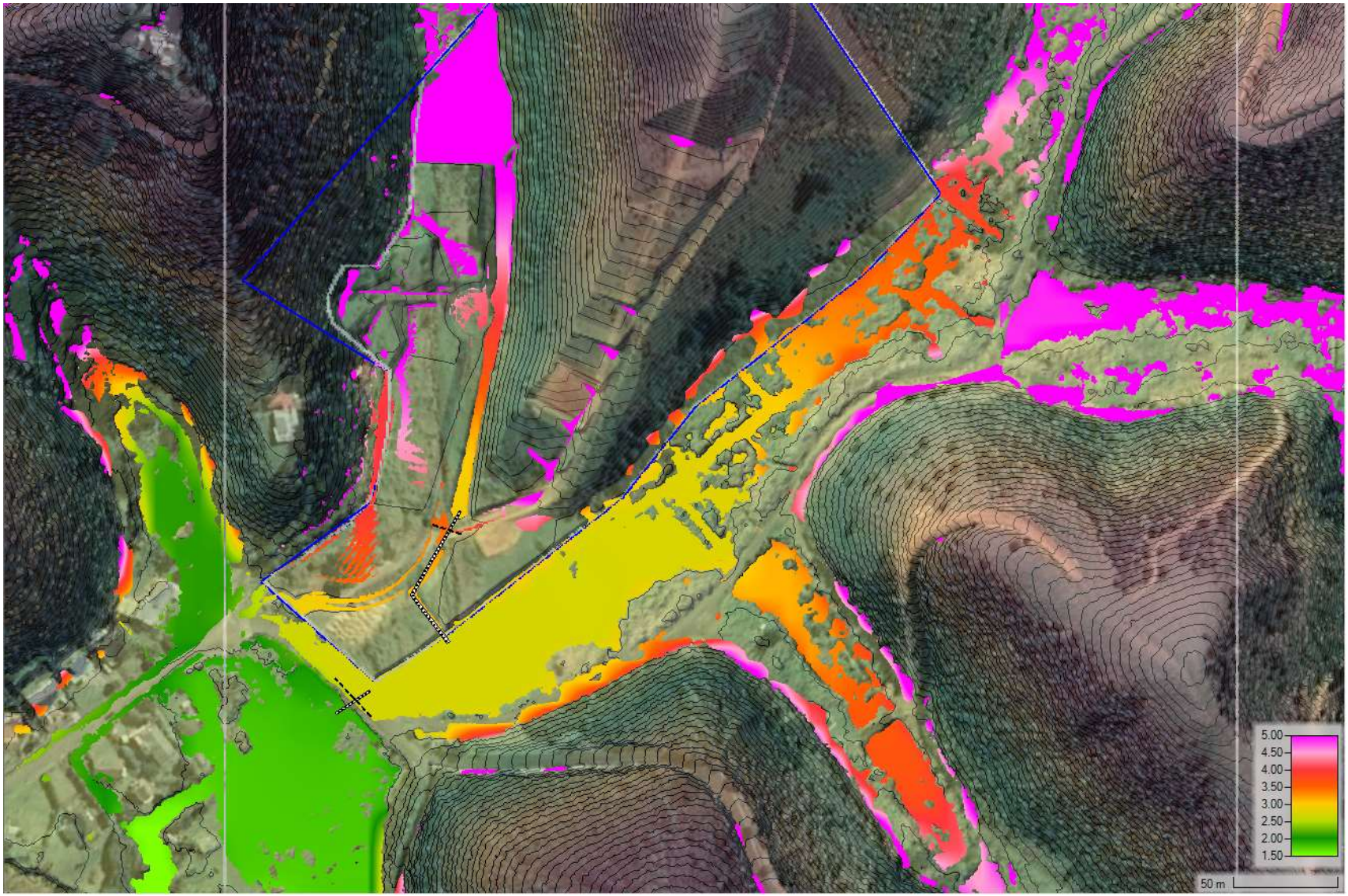

Figure D: Maximum WSE - Post-development - 100yr +MHWS

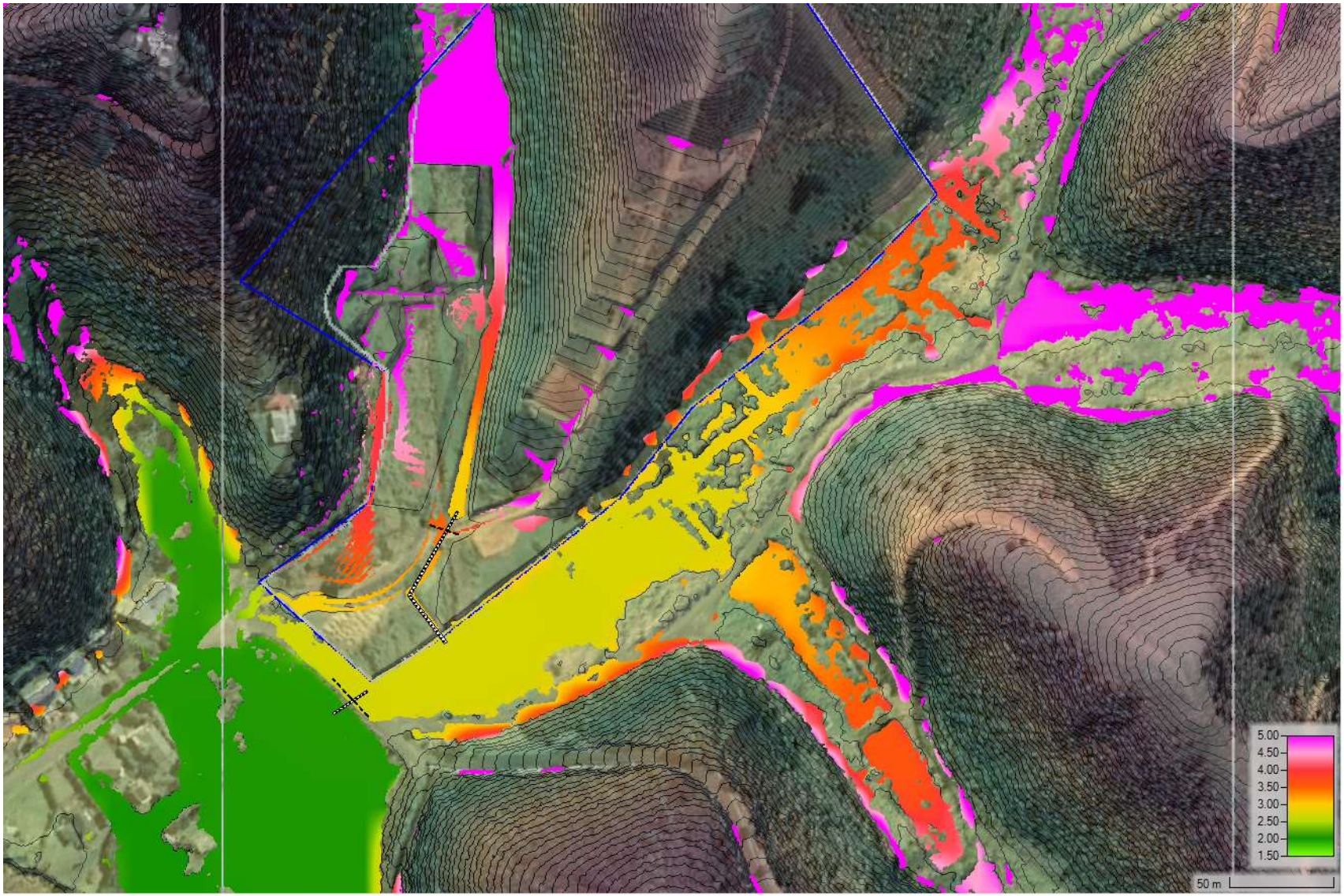

Figure E: Maximum WSE - Post-development - 100yr + MHWS + Storm surge

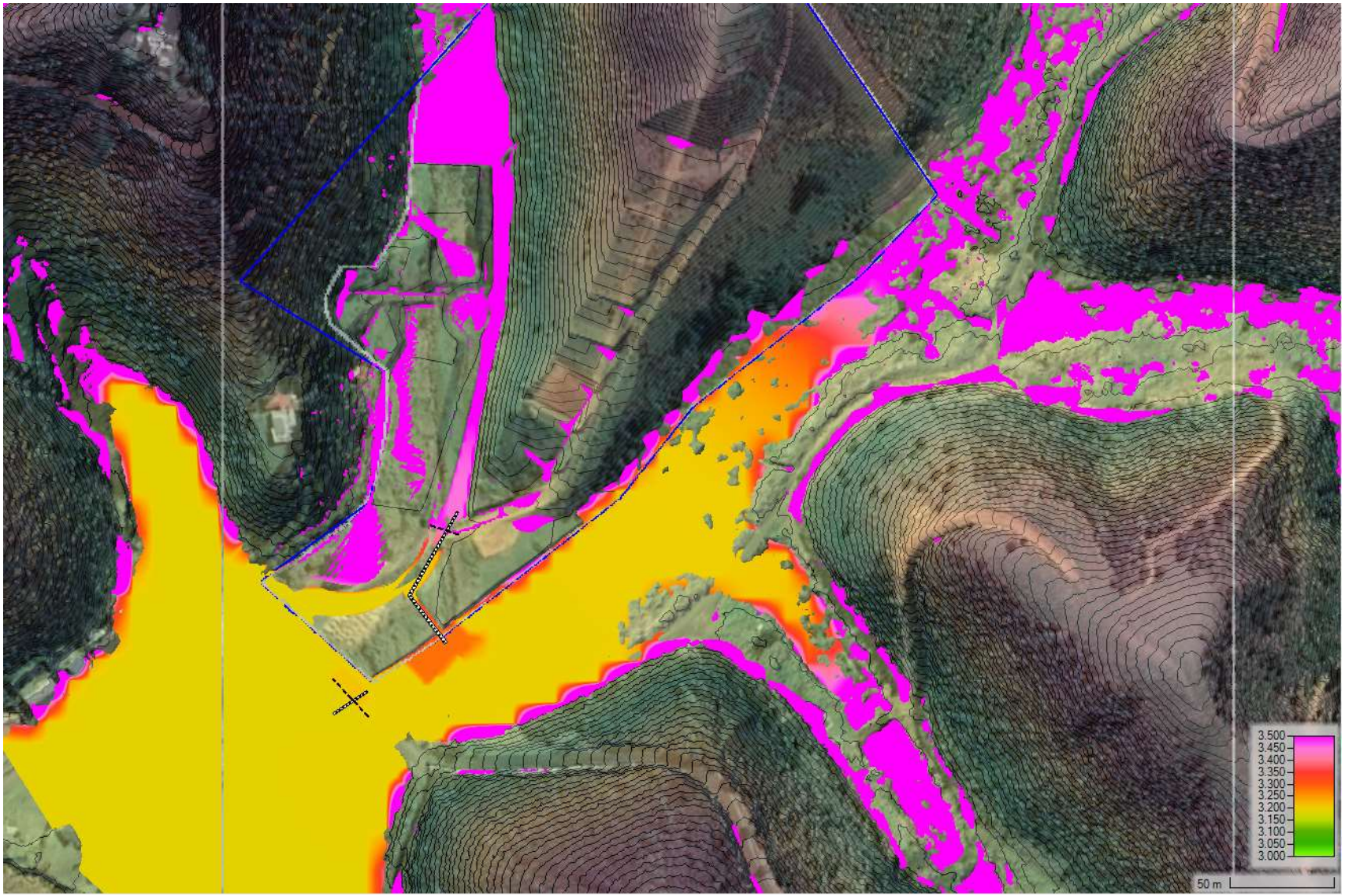

Figure F: Maximum WSE - Post-development - 100yr+20%cc + MHWS + Storm surge + 1.2m SLR

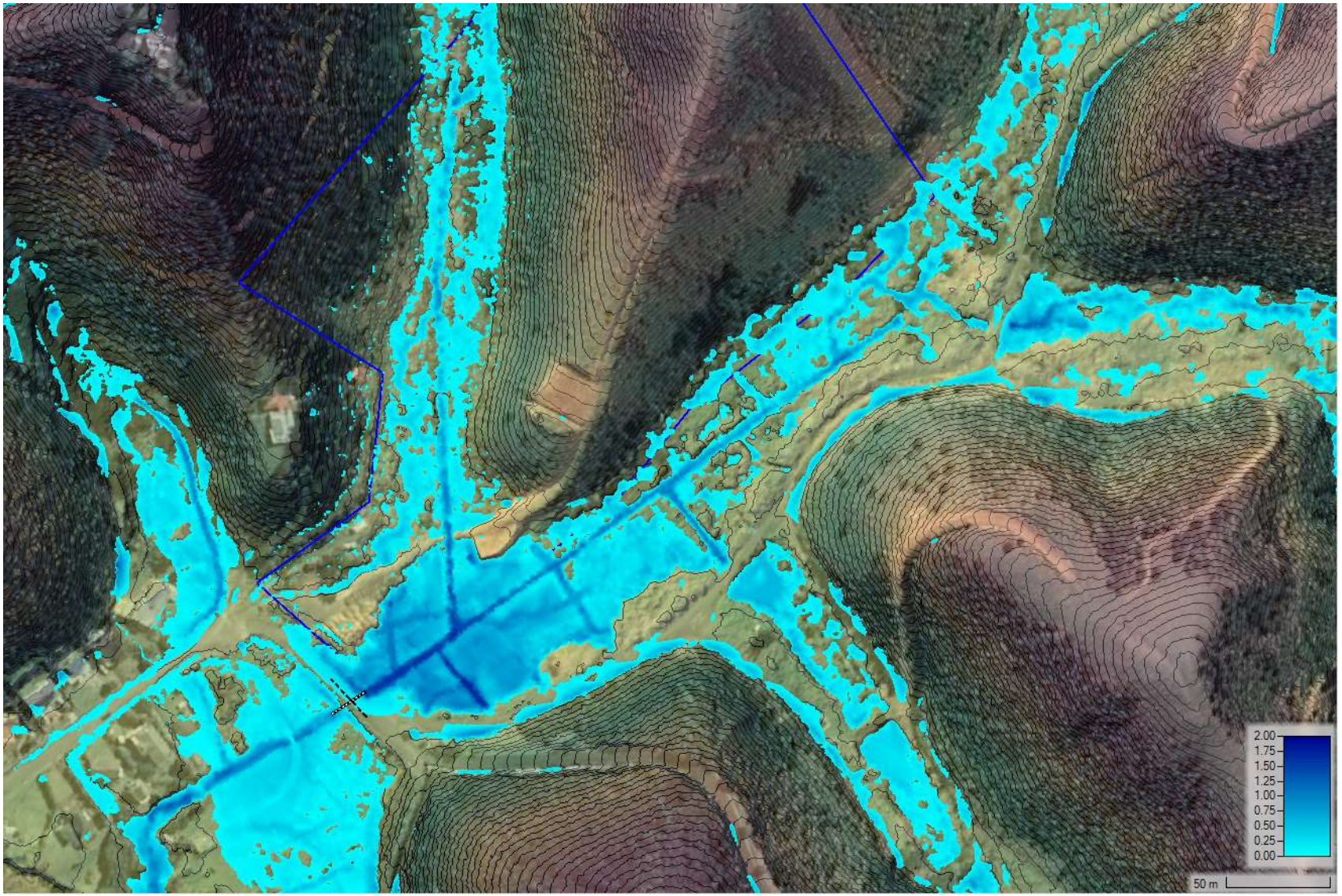

Figure G: Maximum Depth - Pre-development - 100yr +MHWS

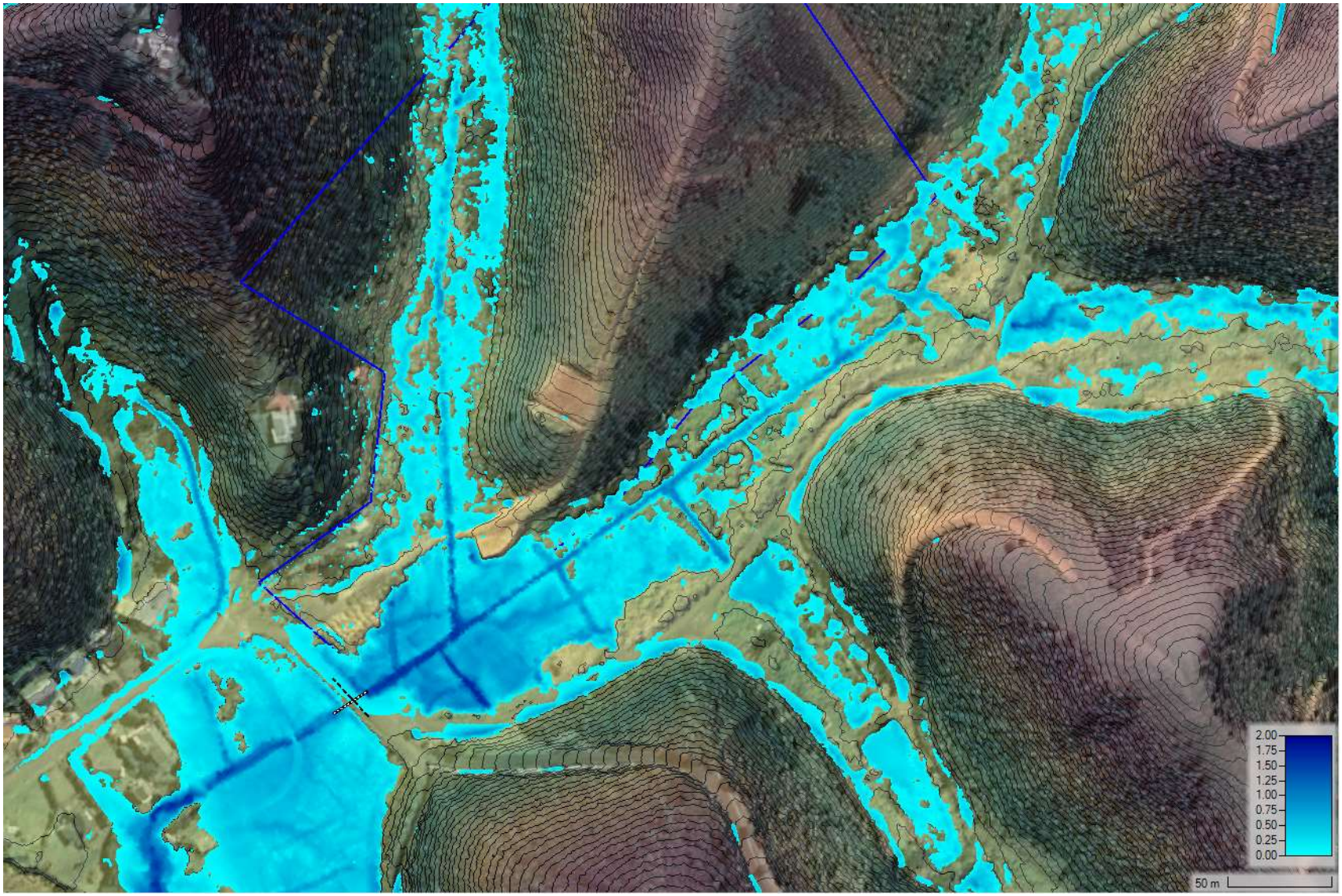

Figure H: Maximum Depth - Pre-development - 100yr + MHWS + Storm surge

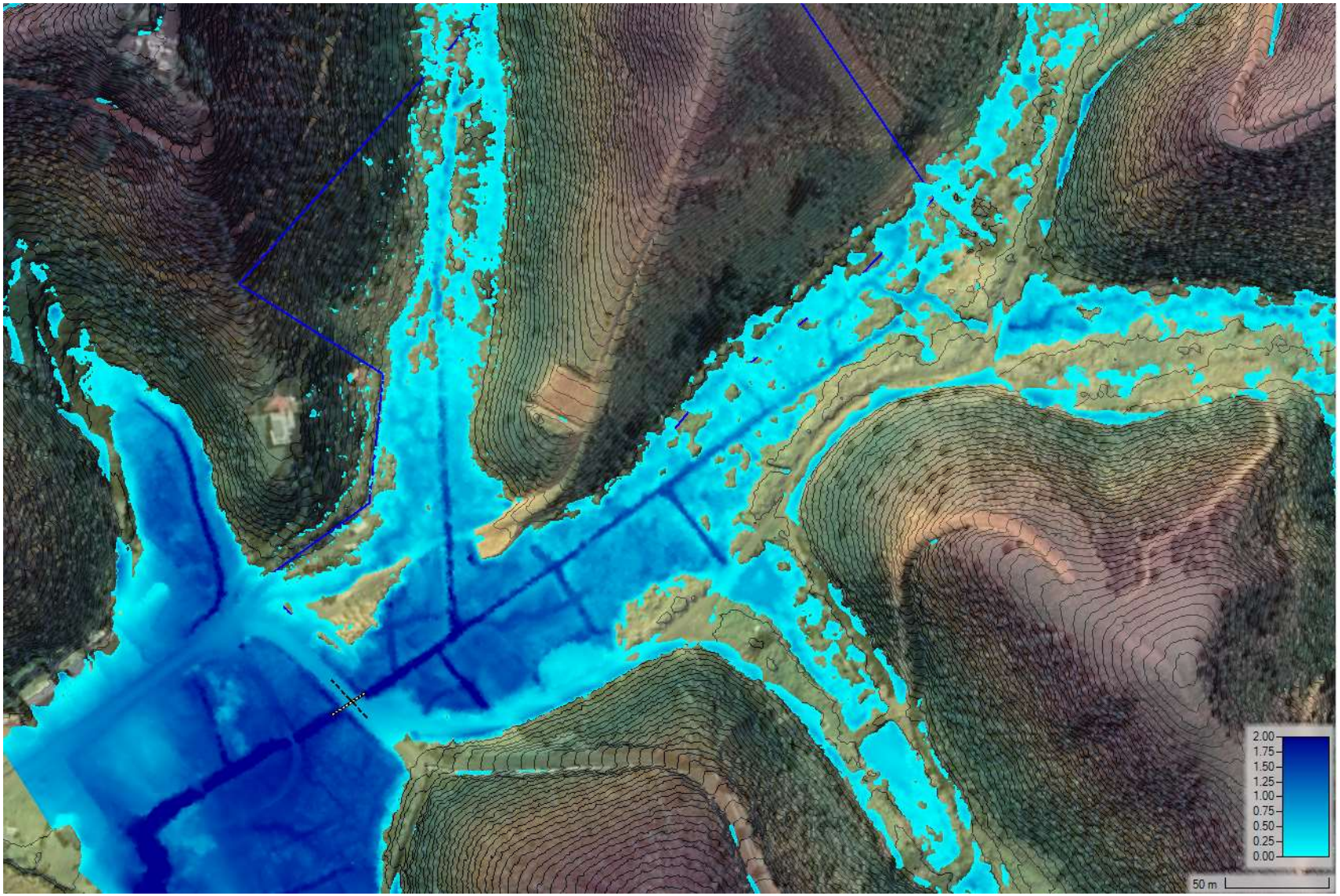

Figure I: Maximum Depth - Pre-development - 100yr+20%cc + MHWS + Storm surge + 1.2m SLR

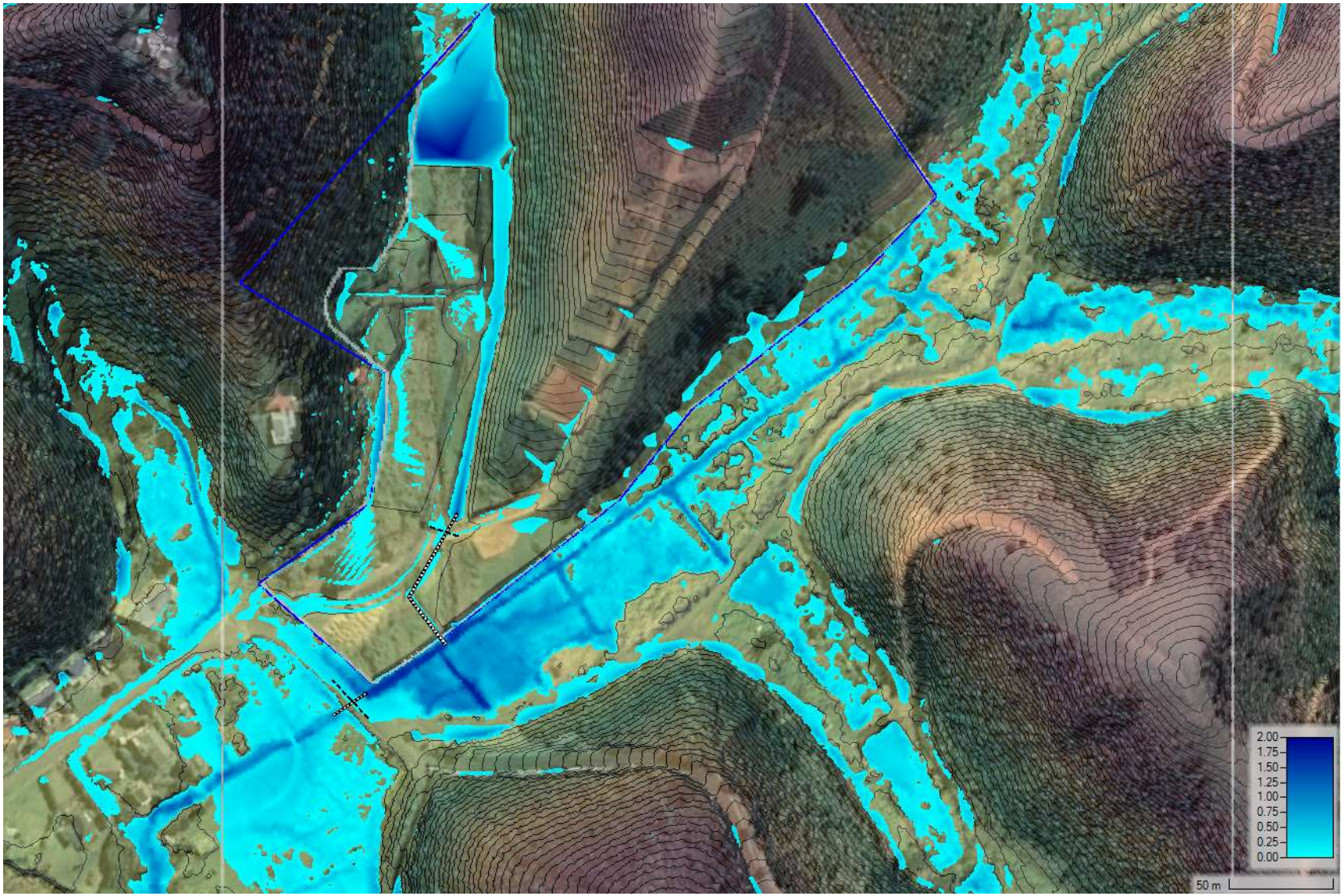

Figure J: Maximum Depth - Post-development - 100yr +MHWS

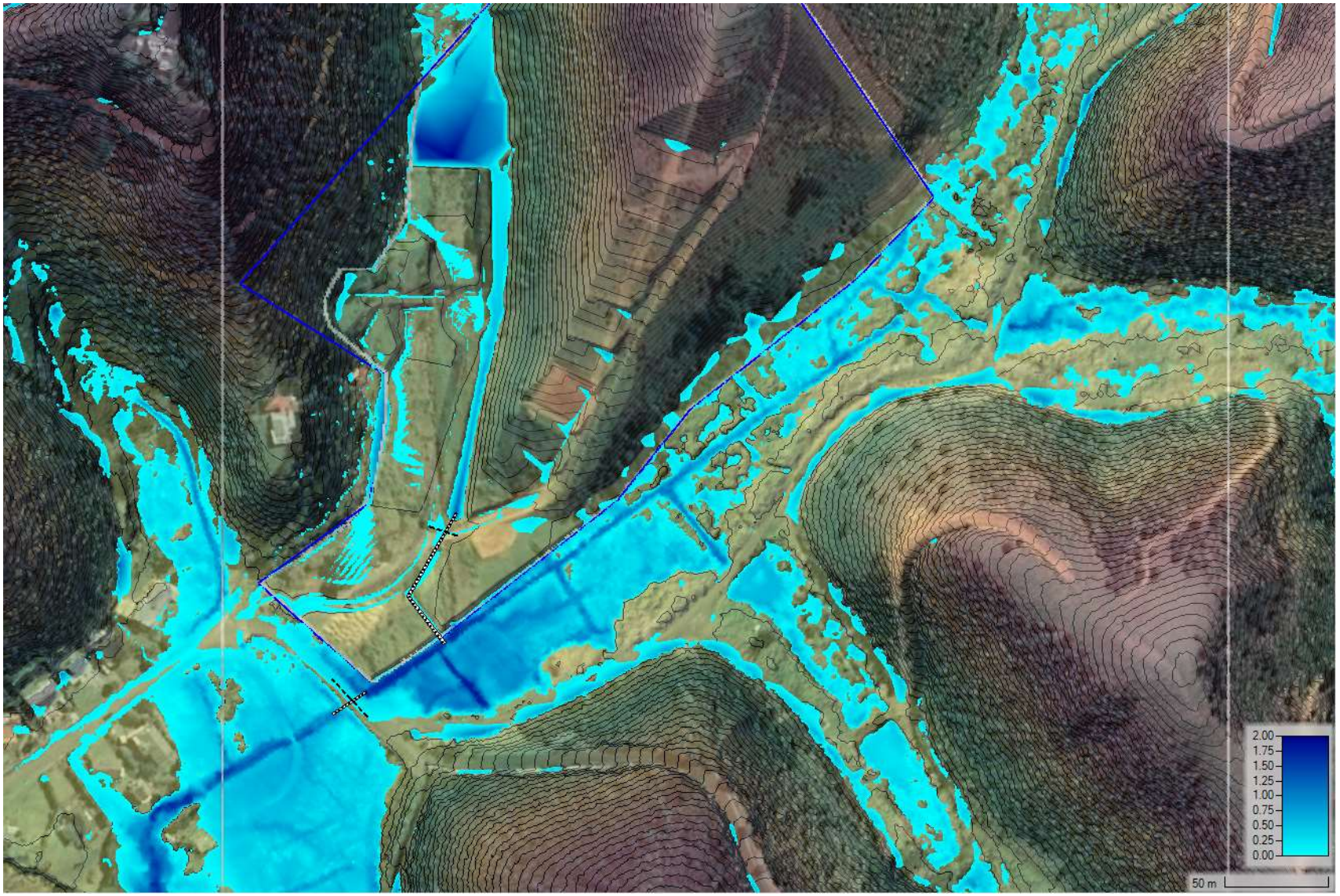

Figure K: Maximum Depth - Post-development - 100yr + MHWS + Storm surge

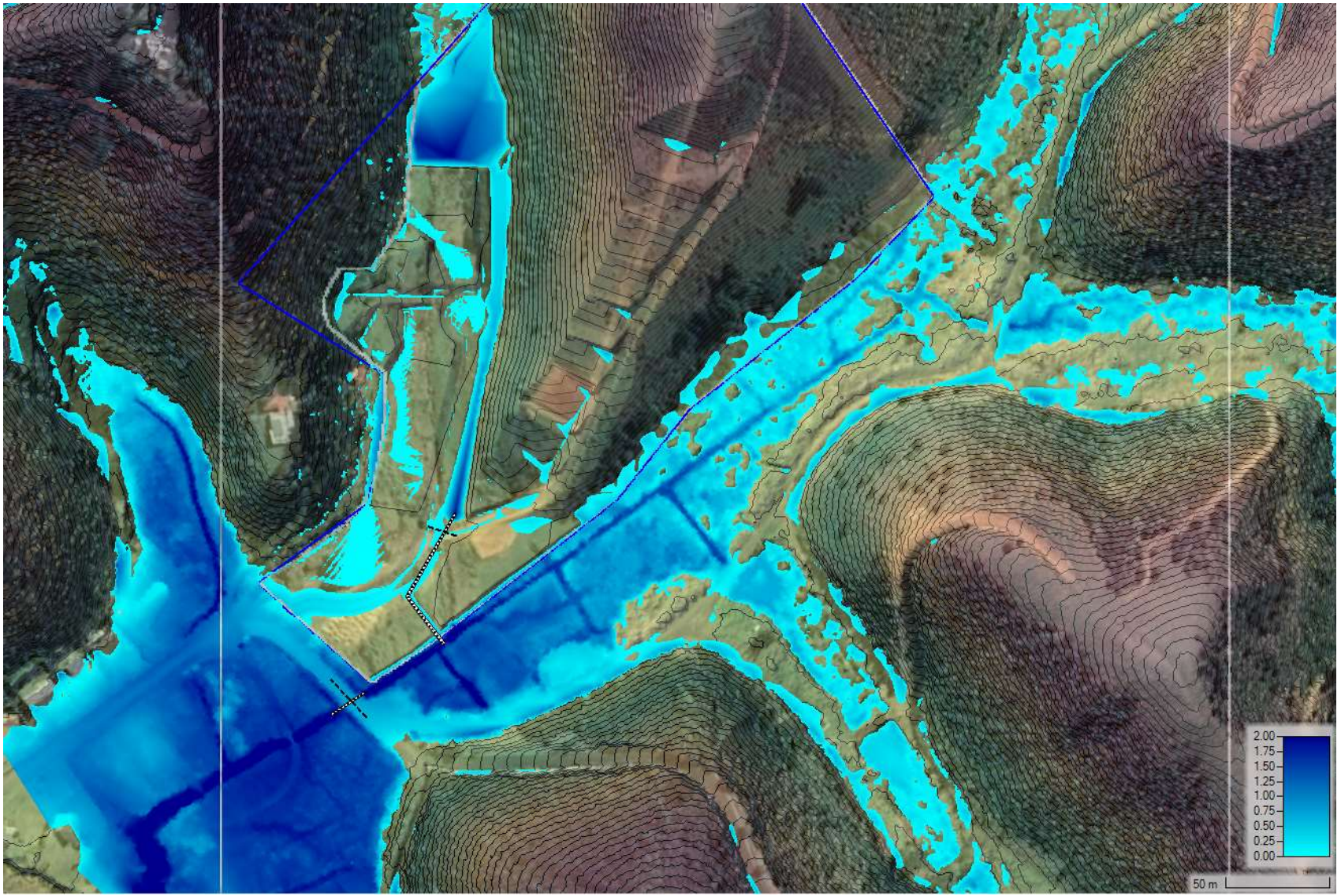

Figure L: Maximum Depth - Post-development - 100yr+20%cc + MHWS + Storm surge + 1.2m SLR

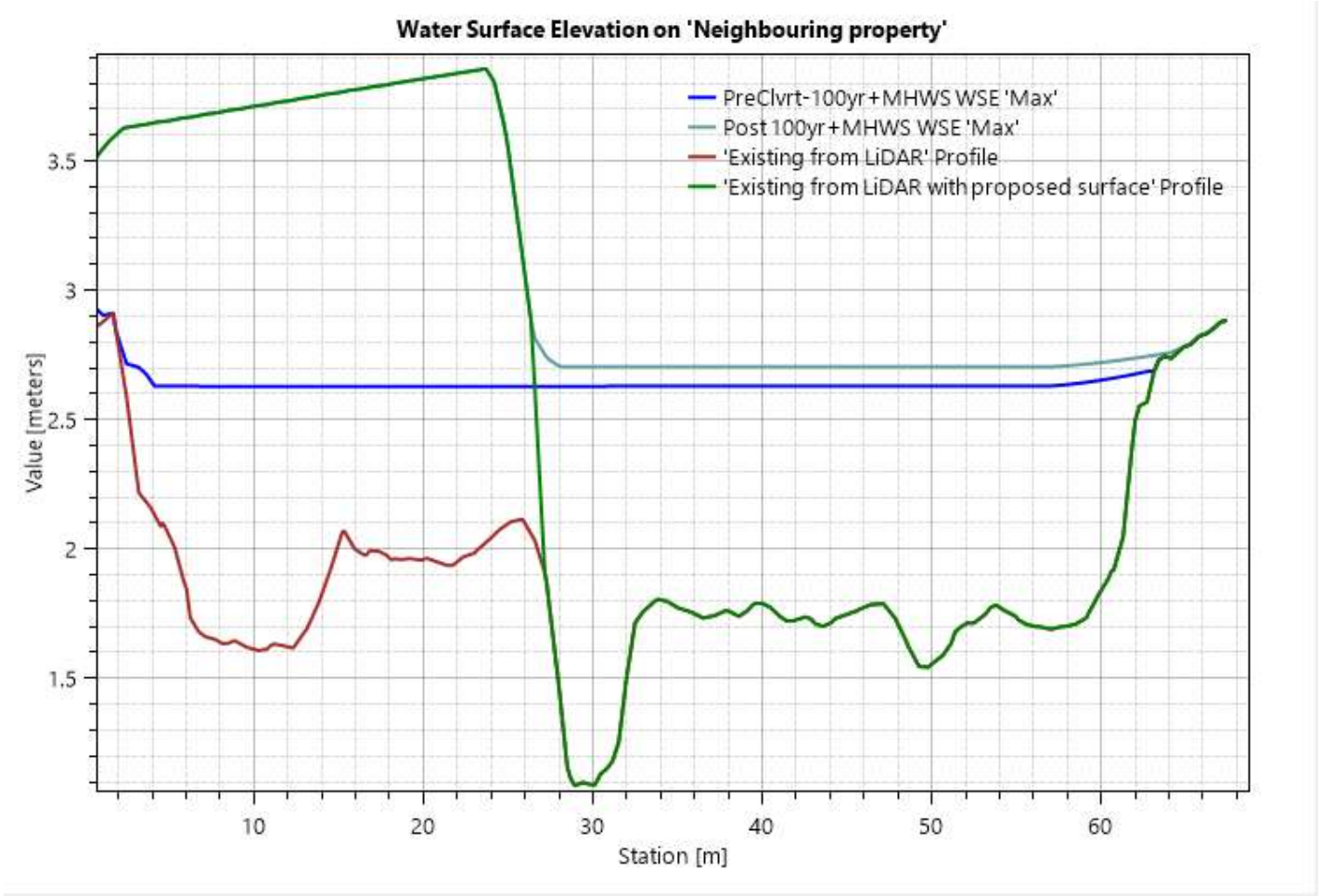

Figure M: Cross section through neighbouring property - Maximum WSE - 100yr +MHWS

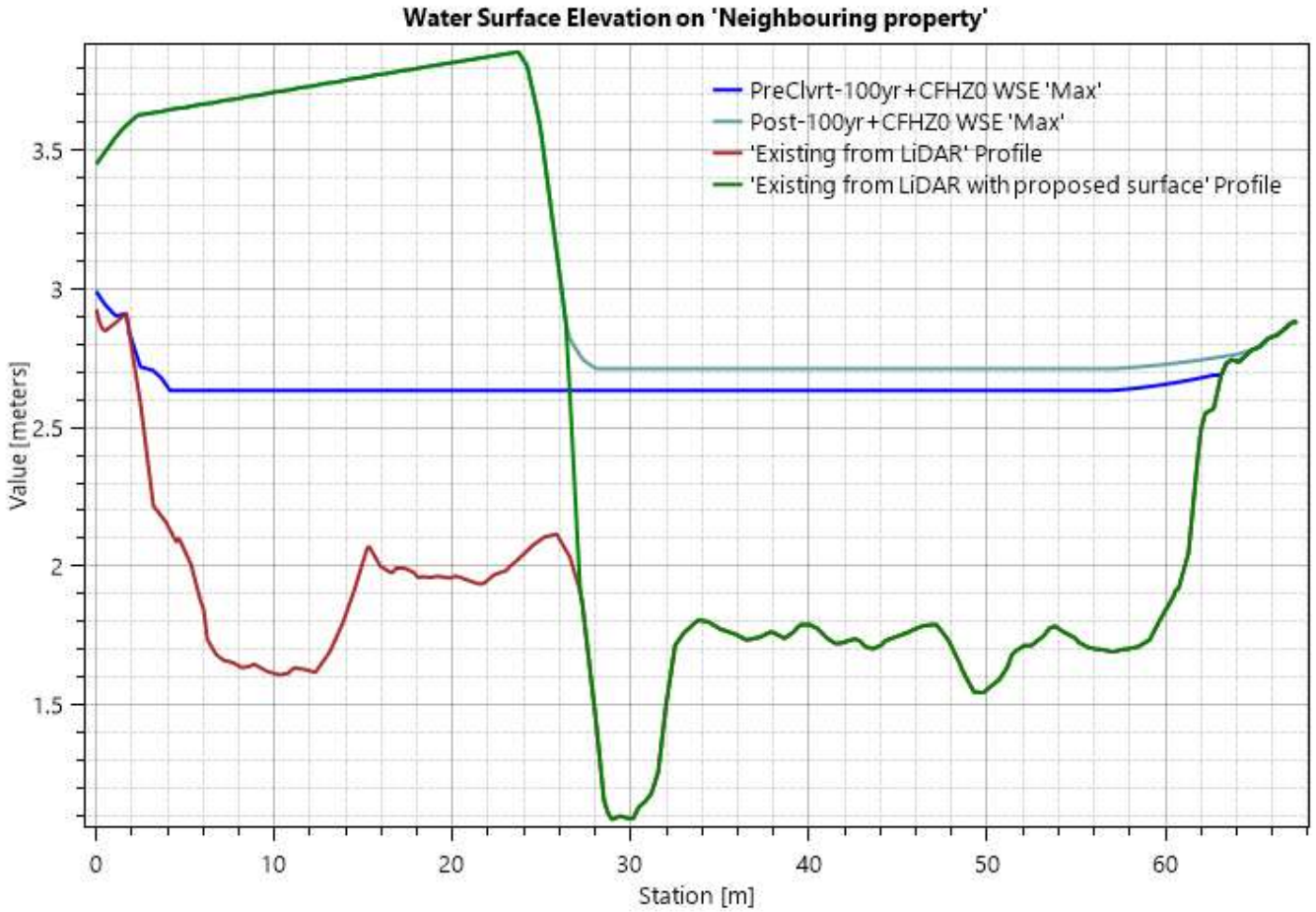

Figure N: Cross section through neighbouring property - Maximum WSE - 100yr + MHWS + Storm surge

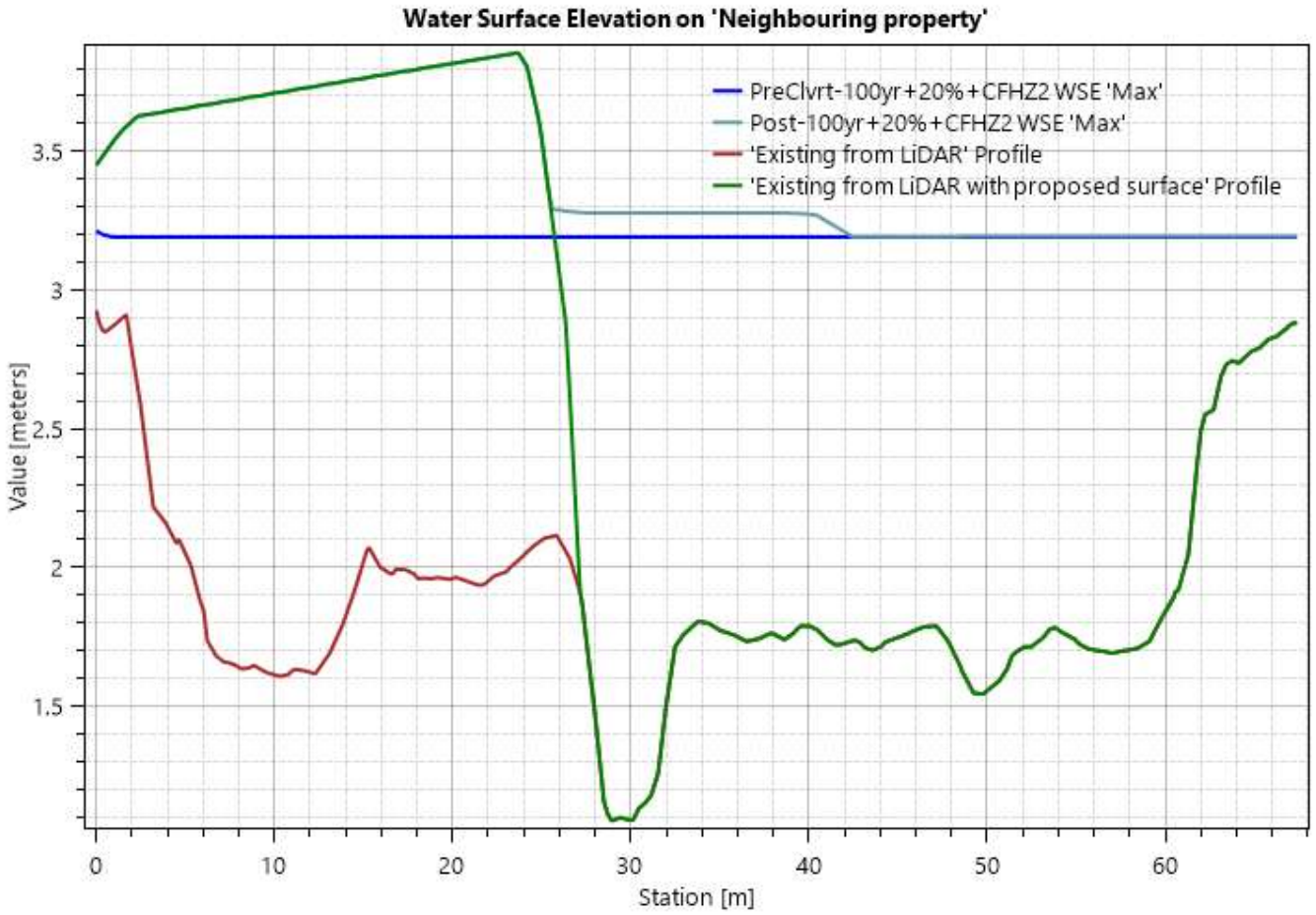

Figure O: Cross section through neighbouring property - Maximum WSE - 100yr+20%cc + MHWS + Storm surge + 1.2m SLR