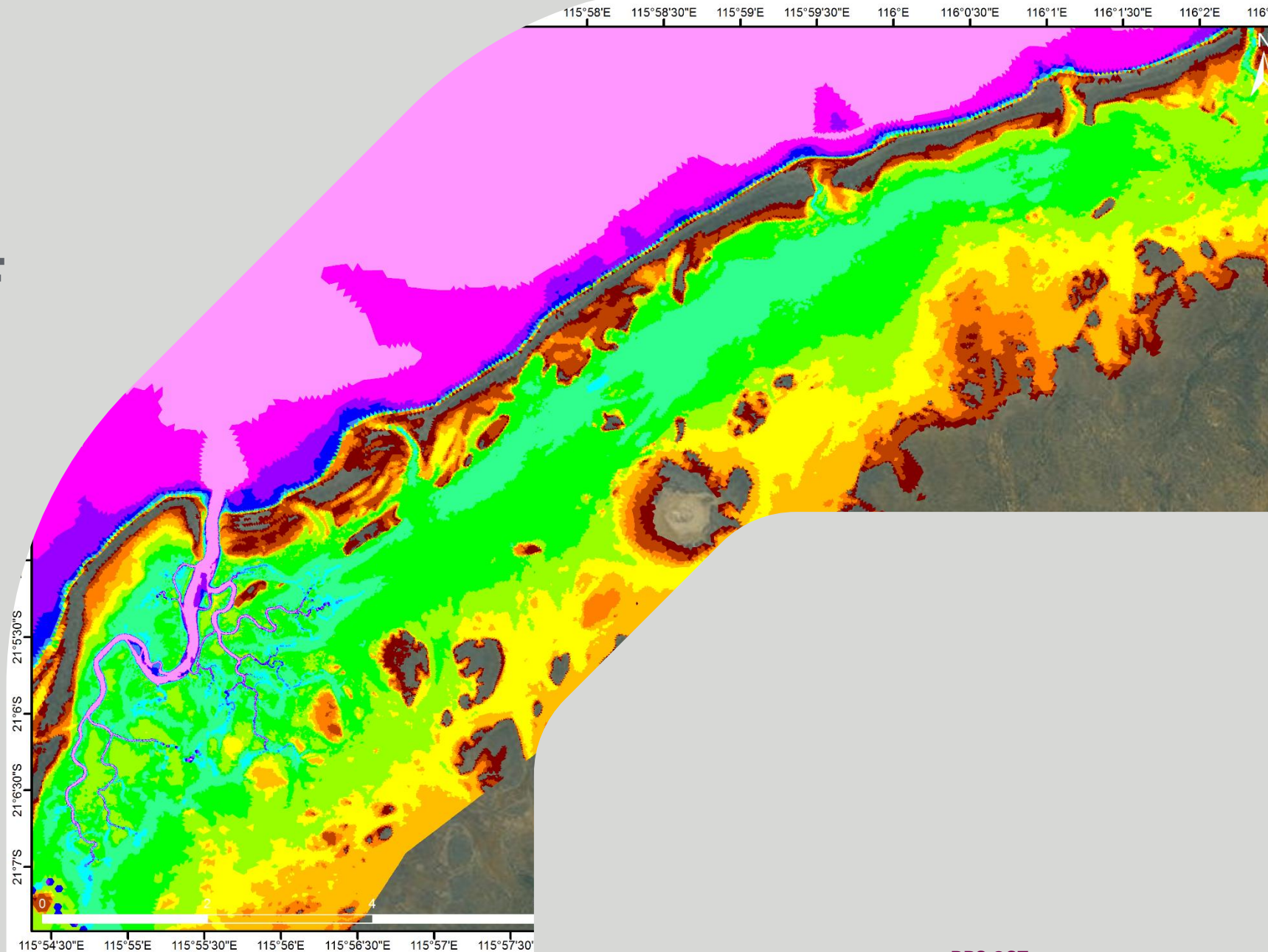
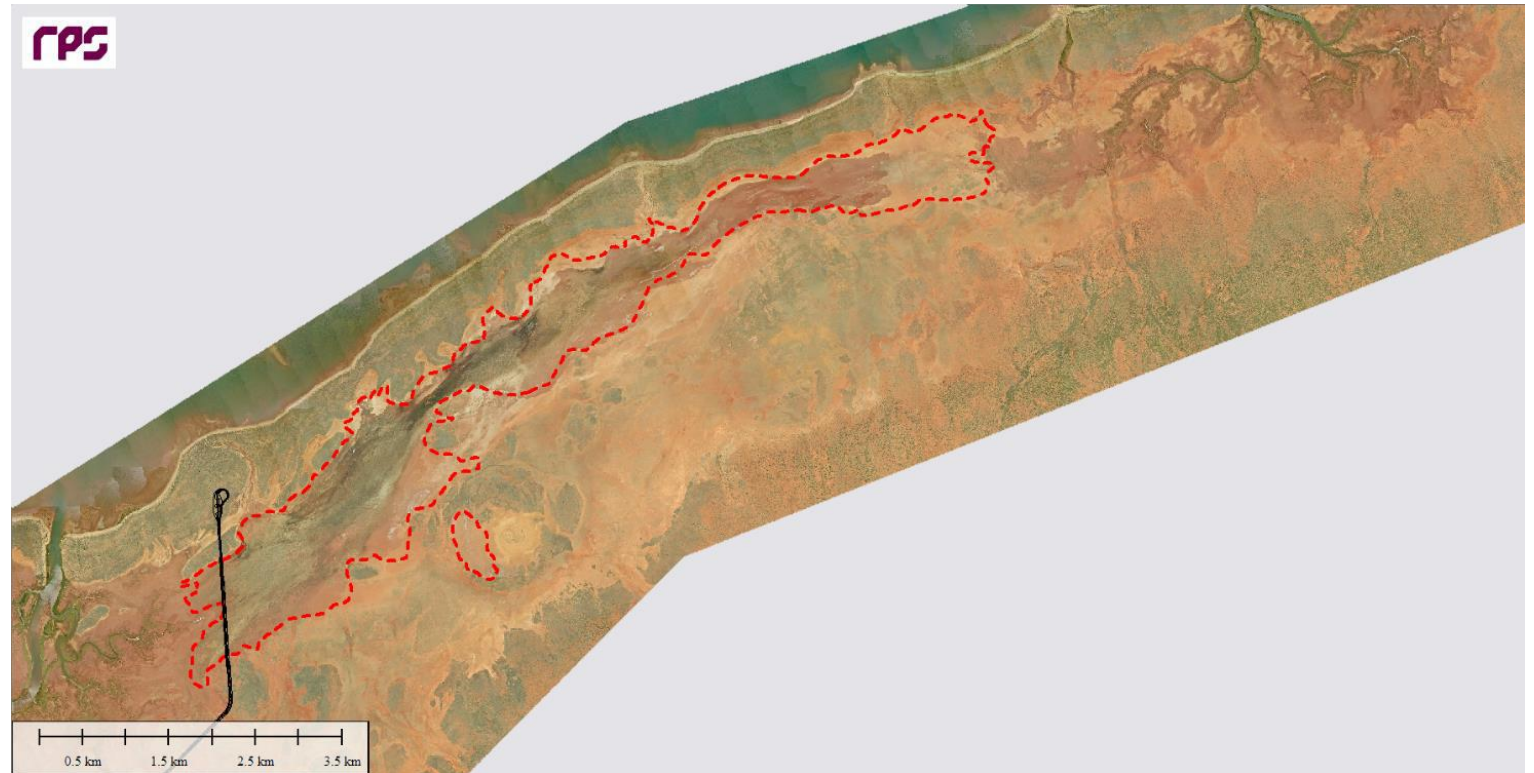


CALCULATIONS OF FLOOD DRAINAGE FOR NORTH-EAST FLOODPLAIN



BCI Study Brief

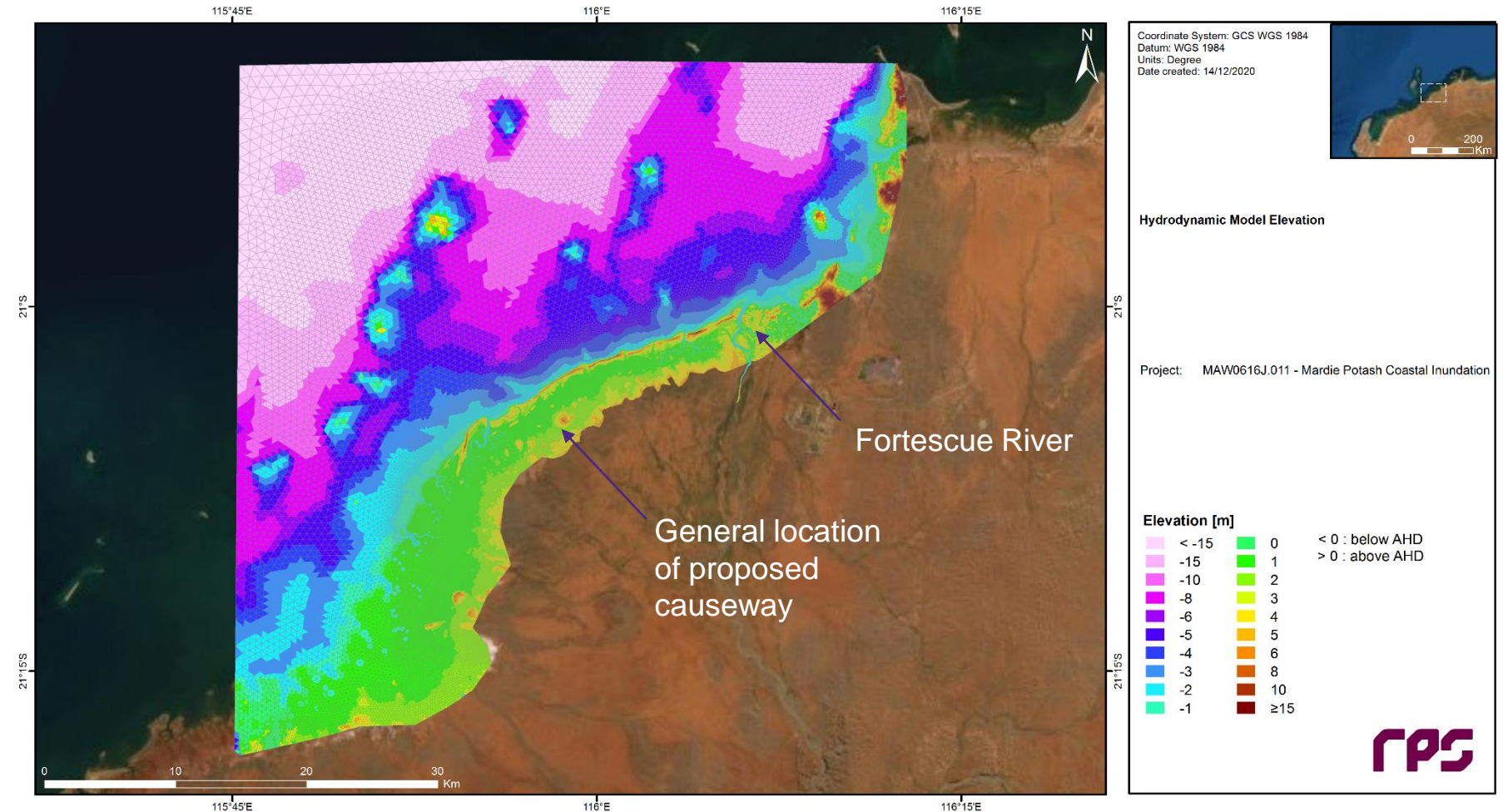
- To determine the extent to which the proposed causeway would increase the residence time of floodwaters from the NE basin, in 1:10 and 1:50 flood events.
- Floodwaters would originate from the Fortescue River mouth and would include tidal influences.
- No modelling of the Fortescue River mouth has ever been undertaken to the extent that 1:10 and 1:50 flood levels can be determined with reliability.
- As an interim measure, a single event with a flood level 4.2mAHD was modelled. At levels above 4.2mAHD, floodwaters overtop the banks of the basin and discharge directly to the ocean.
- A detailed flood assessment will be undertaken of the final causeway design prior to its construction.



North-East basin, showing proposed causeway alignment and extent of algal mat

Model setup

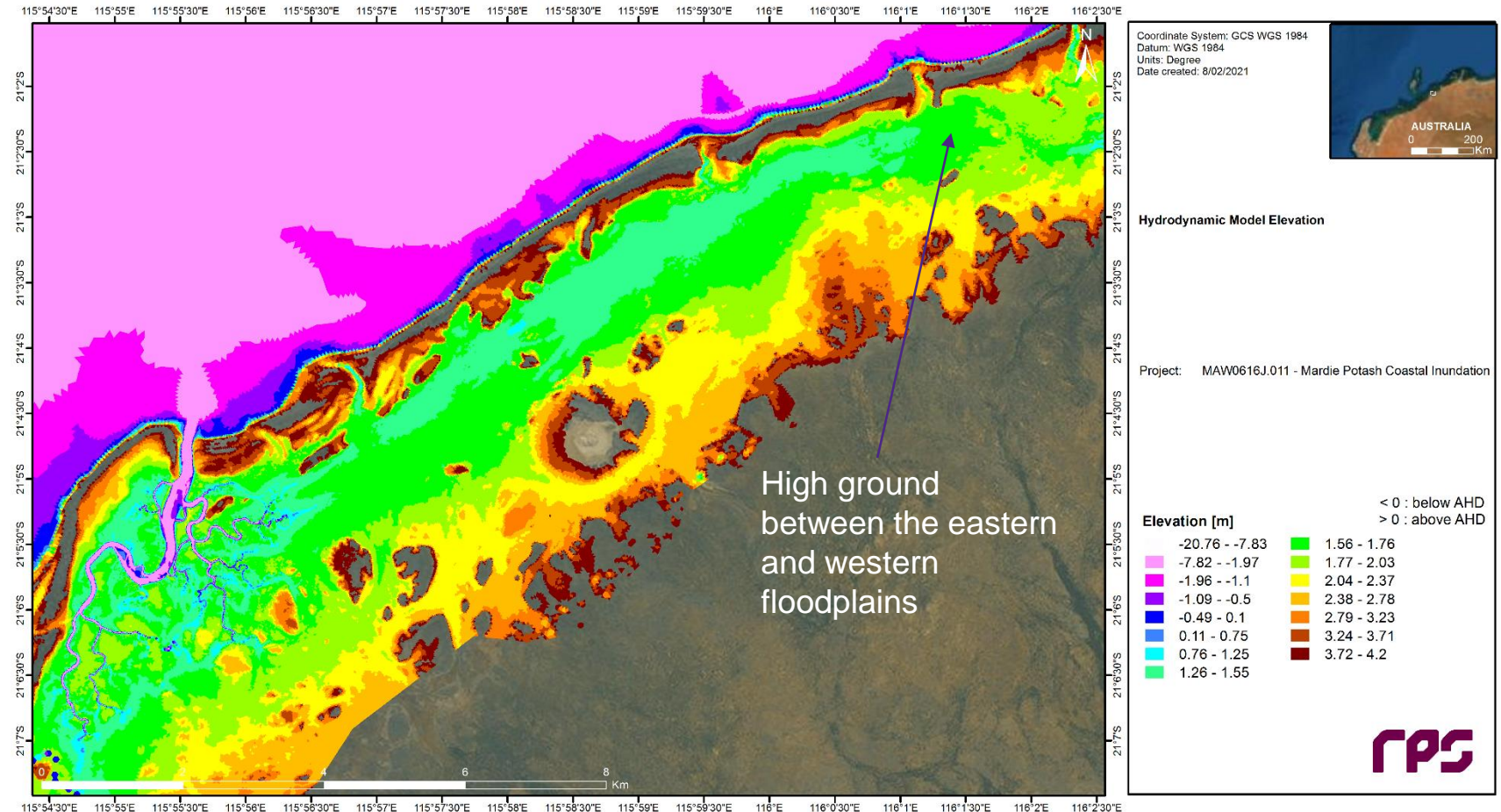
- Simulation of water exchange carried out on a revised model domain covering a larger area at finer spatial resolution
- Covers the wider development area and extends east beyond Fortescue River
- Captures the floodplain further to the east of the north-east floodplain and associated creek system
- Captures the “blind channels” that do not connect to the sea at contemporary, non-storm, water levels
- Accounts for interaction of water over all floodplains and entry/exit points



Topographic model for the undeveloped area. Depths in m relative to AHD

Model setup

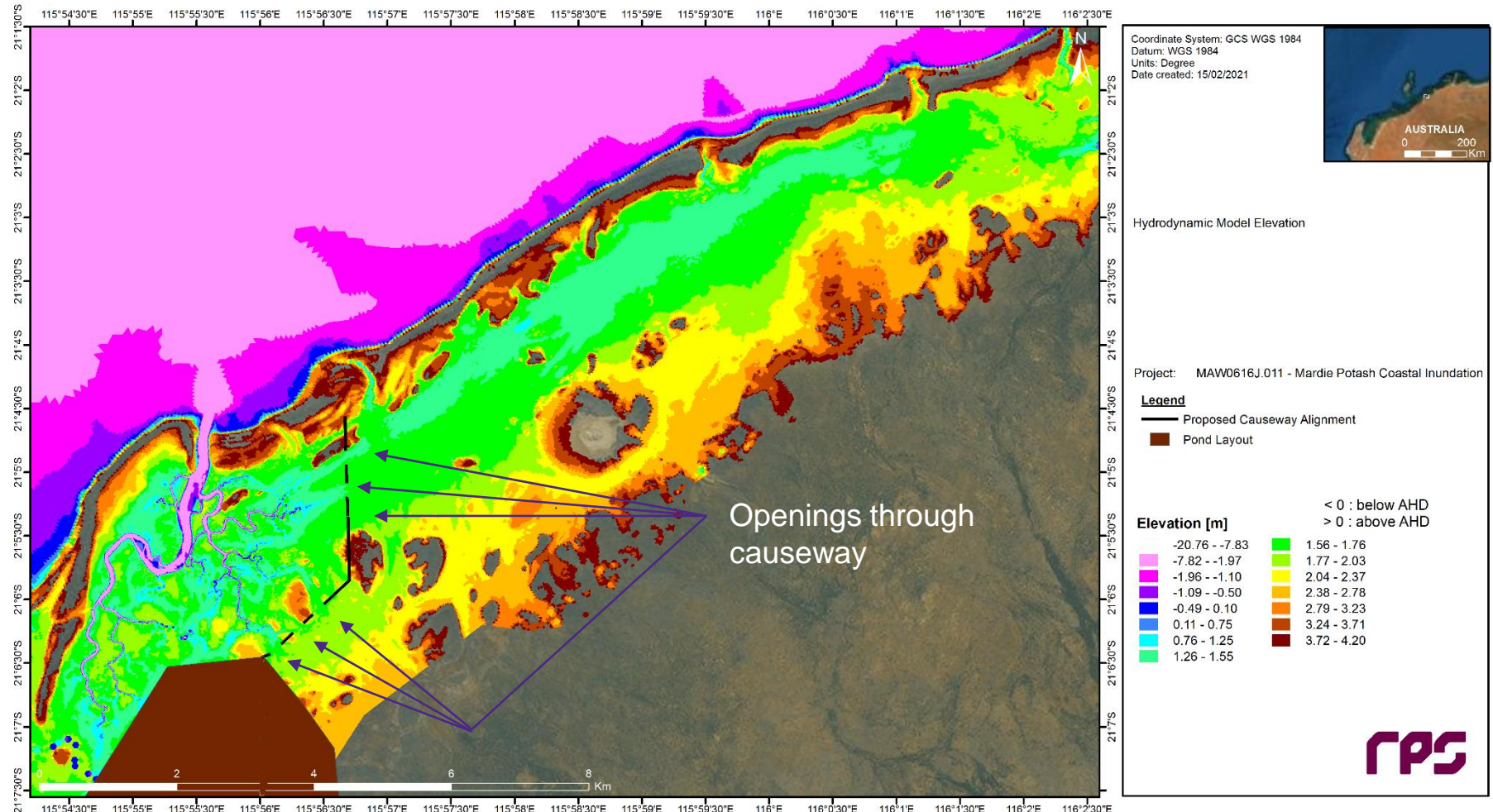
- This image shows the elevations over a sub-section of the model domain covering the NE Floodplain and creek system to the east.
- The colour coding has been set to show all locations ≤ 4.2 m AHD
- These locations would be flooded at 4.2 m AHD for the undeveloped case.



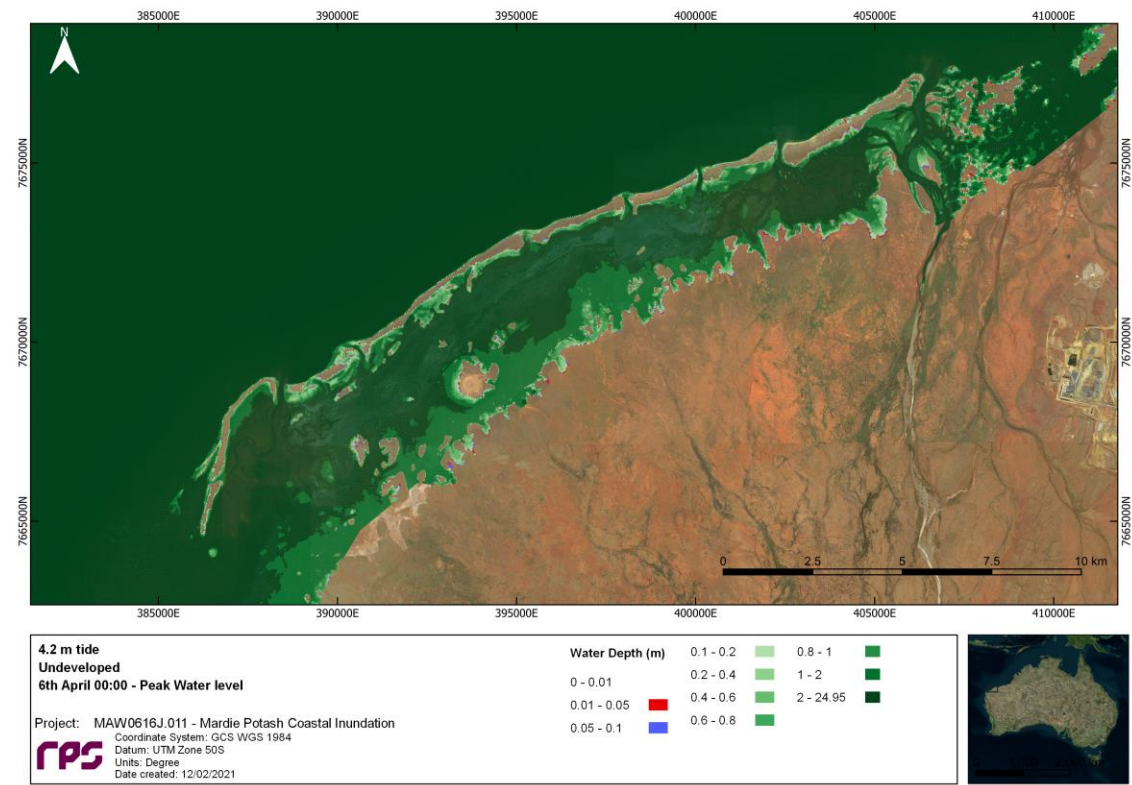
Detail of the topographic model showing the NE floodplain area.
Depths in m relative to AHD for all locations ≤ 4.2 m AHD

Allowance for development – Developed Model

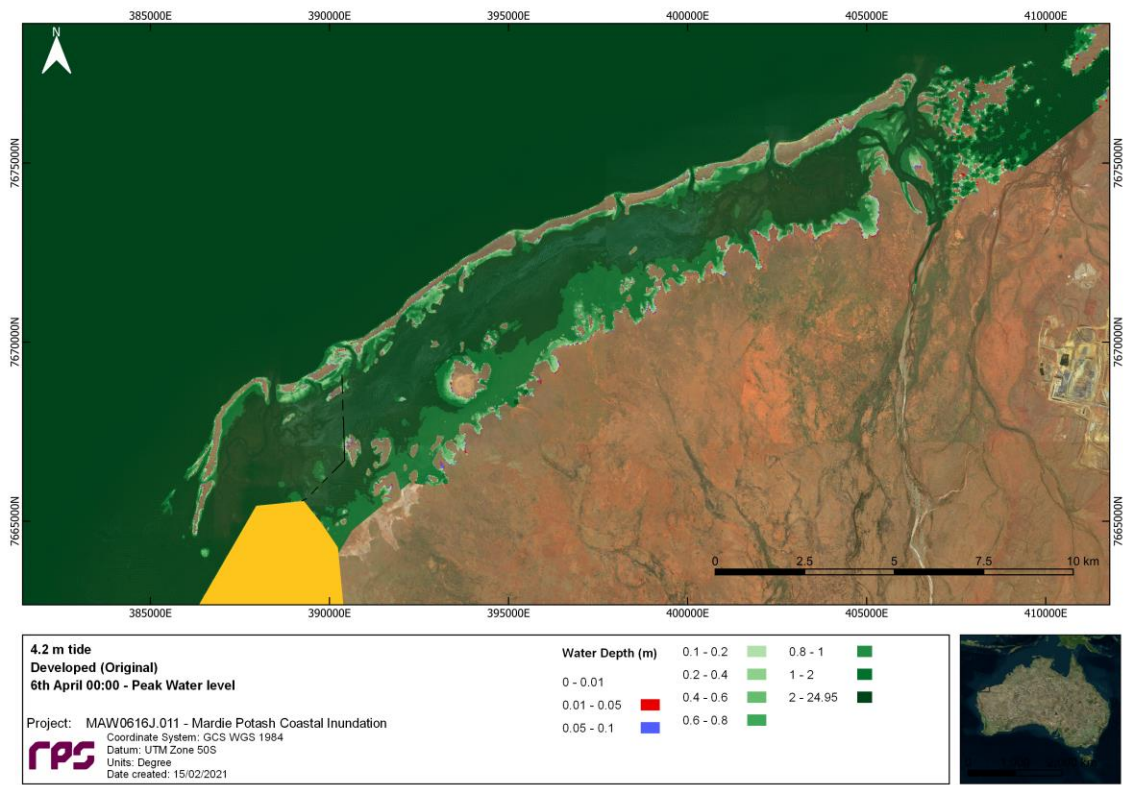
- **Contemporary pond design**
 - **Causeway section 1**
 - 3 x 200 m openings at ground level
 - Positioned at low paths for maximum flow
 - **Causeway section 2**
 - 2 x 200 m openings at ground level
 - Positioned at low paths for maximum flow
 - Plus 9 m opening as culverts towards south end
 - At ground level
- (Setup as for Test 22 from Causeway investigation)







Flooded state – Undeveloped case

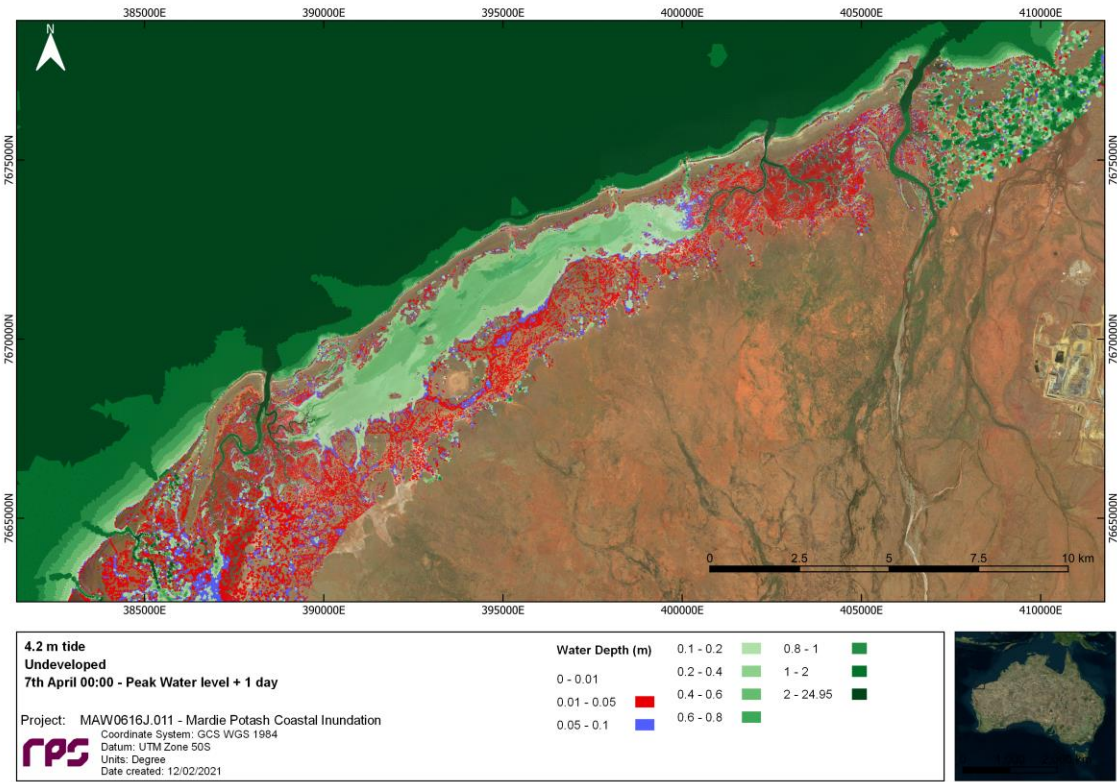


Flooded state – Developed case

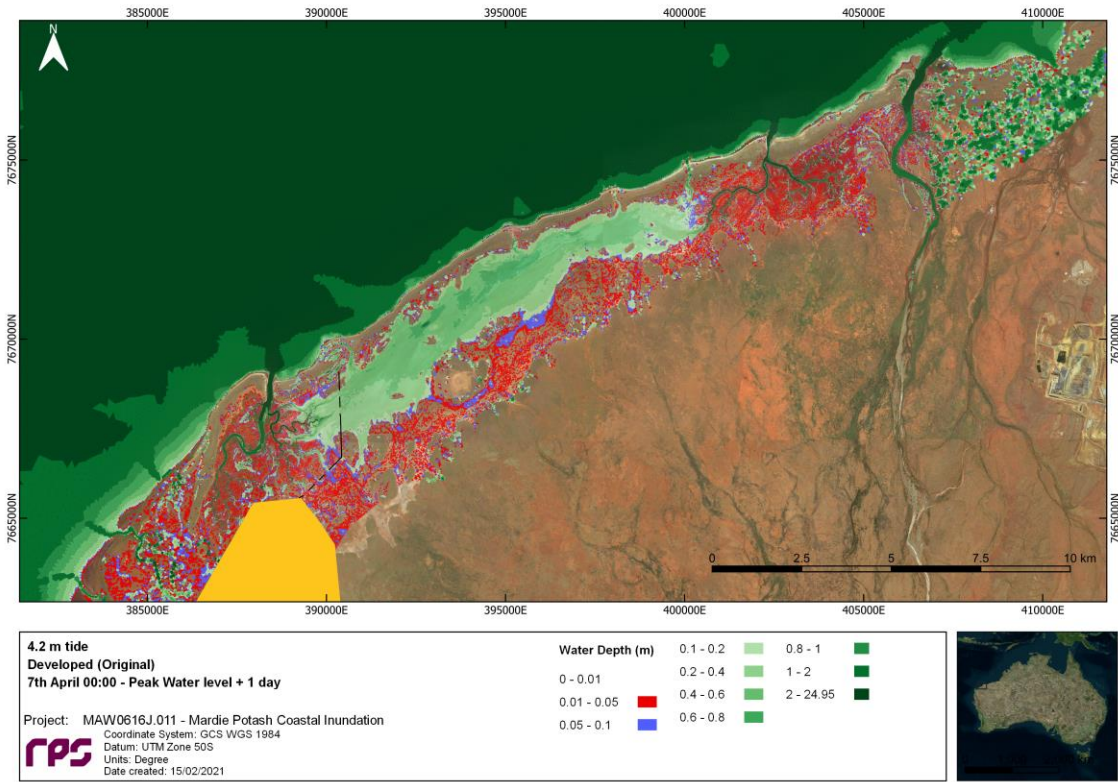




Pond  Causeway sections   

Drained state after 1 day – Undeveloped

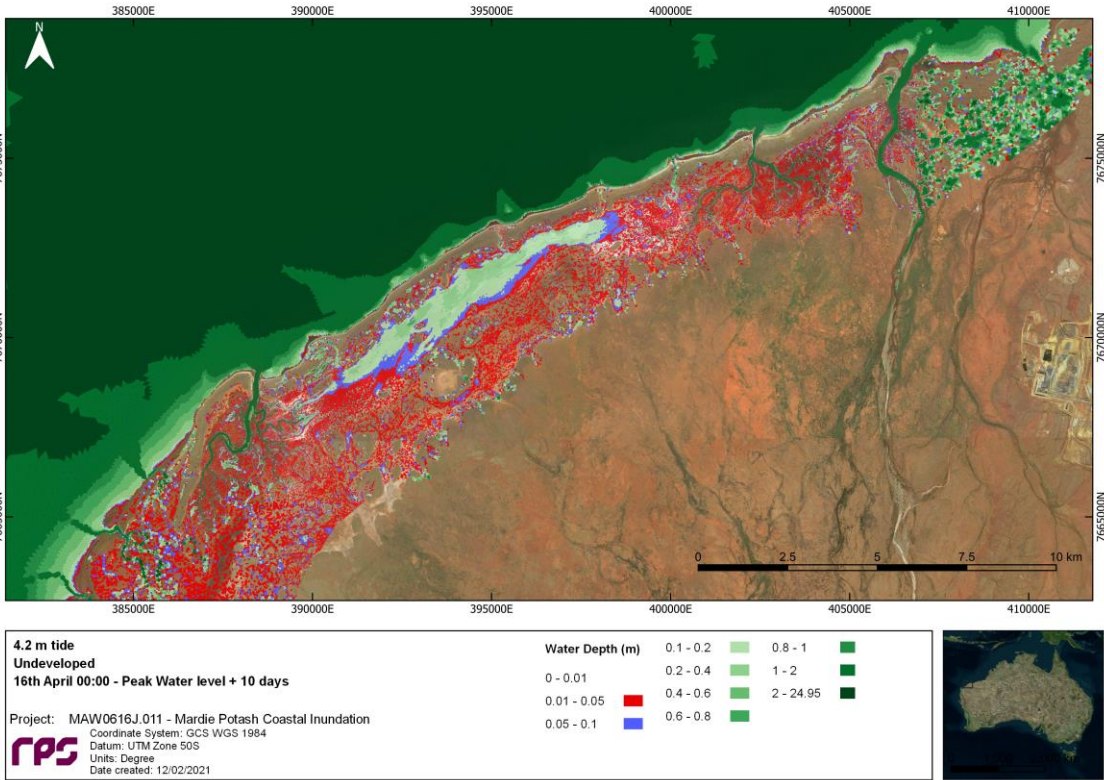


Drained state after 1 day – Developed case

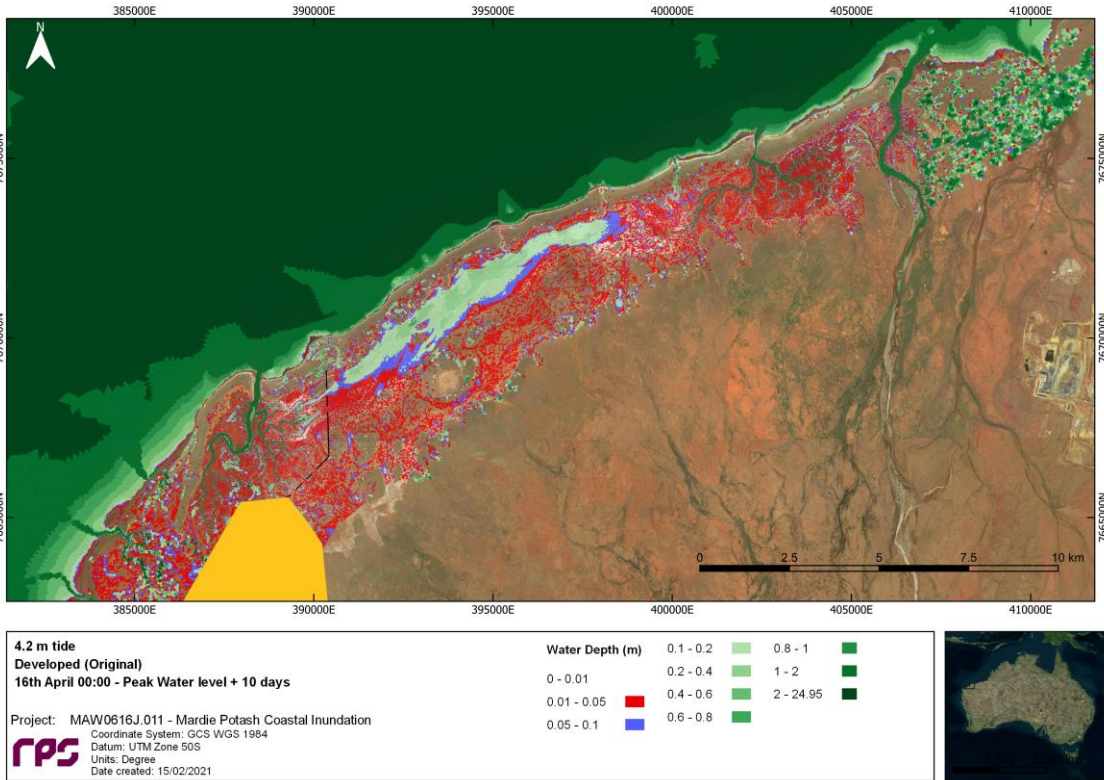


Pond  Causeway sections 

Drained state after 10 days – Undeveloped



Drained state after 10 days – Developed case



Pond Causeway sections

Comparison of water level behind the causeway - Undeveloped case with Developed Case

Blue line = water depth on the eastern side of the causeway for Undeveloped case

Black line = water depth on the eastern side of the causeway for Developed case

Green line = water depth for the tide only

Conclusions:

Following a 4.2 m flood peak, the floodplain would drain rapidly to the natural tidal range, via multiple openings, over 24-36 hours.

Causeway will increase residence time by no more than 3-4 hours.

Over the period of the spring tide refilling events, both cases converge.

