Newbuildings Farm Flood Mapping Study

Option H Technical Note

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Revision	Date	Status	Written By	Approved By
	14/12/12	**FINAL**	MZ	SR

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1 Description of the existing flood volumes

During high-order event, land between Marston Brook and Marston Brook tributary will function as floodplain. Bank levels within Marston Brook are generally low and hence most of the water flows out of Marston Brook. Flood water from Marston Brook will follow the ground slope and join flooding from Marston Brook tributary and flow south-easterly towards the A513. Due to limited capacity of the Marston Brook tributary culvert under the A513, land to the east of the culvert gets flooded and eventually the flood water overtops the A513. Flooding from the A513 flows southerly and affects office blocks on eastern and western banks.

2 Proposed Option

The client is interested in developing part of the land falling within Area 2. Combinations of measures are proposed to eliminate risk of flooding up to the 100 year event with climate change within Area 2. These measures not only reduce flooding in Area 2, but will reduce also the flood risk immediately downstream of the site and accordingly further downstream where Sandyford Brook flows through the urbanised area.

2.1 Road embankment

A new road will be constructed north of the Area 2 (Figure 2). The new road will be elevated so it can be used as a flood embankment to stop flood water flowing towards Area 2. This road will be subject to detailed design at later stages to ensure its structural integrity Water stored north of the road will be accommodated within a large storage area. There will be 2 culverts underneath the road to drain the storage area to a bypass channel. One of the culverts is set at 84.50 m AOD, with 0.25 m^2 area. The other is mainly for high flood level and conveys no flow for 100 year with climate change. The dimension of the latter culvert can be decided during design stage.

2.2 Channel conveyance enhancement

Cross sections between the storage area intake and the new proposed road crossing have been amended. The channel was widened and the bed level dropped to enhance the channel storage and conveyance.

In addition, bed levels of the cross sections between Marston Lane crossing to the storage area intake have been dropped to take into account for the de-siltation of the channel caused by lack of maintenance and regular use by livestock for drinking.

Figure 3 and Figure 4 show the cross section and long profile of the existing and proposed Marston Brook.

2.3 Storage area

The storage area to the north of the proposed road will take most of the flows from Marston Brook. The bed level of the storage area is set at 84.50 m AOD. It will cover an area of approximately 35500 m^2. The storage area will be bounded by high ground to the east and north, the road embankment to the south and raised embankment and intake spill to the west. A small channel can be incorporated to take the low flow from the intake directly to the culvert under the road embankment. The details of the low flow channel have not been modelled and can be investigated at the detail design stage.

Inflow into the storage area from the Marston Brook is controlled via a lateral spill. Figure 2 shows the location of the proposed spill. The long profile of the spill can be seen in Figure 5.

2.4 Embankments

To be able to divert the flow effectively towards the storage area behind the proposed road, it would be necessary to raise the existing river bank levels on the east side (left bank) of the Marston Brook. The left bank of Marston Brook must be raised from upstream of the storage area) towards north of the A513. In addition, the right bank of Marston Brook tributary must be raised between the new proposed road and the A513 to prevent flooding of Area 2. Figure 2 shows the possible location of embankments to be raised.

Immediately upstream of the proposed culvert in Marston Brook under the new road, a small stretch of embankments is required on the right bank. See Figure 2.

2.5 Bypass channel

The new bypass channel is proposed to connect Marston Brook to Marston Brook tributary, running south of the proposed road. The bypass channel would divert part of the flow in the Marston Brook to Marston Brook tributary to maintain similar peak flows through both culverts under the A513 as in the existing case.

The proposed bypass channel has a trapezoidal shape cross section. The long profile and cross sections of the channel are represented in Figure 6 and Figure 7.

3 Results

Figure 8 to Figure 12 show the results of the simulation (1 in 100 years with climate change) for the proposed option. As it can be seen in Figure 8 most of the water is derived from Marston Brook and stored behind the new proposed road.

The flow in the channel has considerably decreased downstream of the site (Figure 11).

Water level within the storage area will rise to 85.8 m AOD (Figure 9). During the peak, the storage area will store approximately 42000 m^3.

Figure 1: Area 2 with existing flood extent (100 year with climate change)

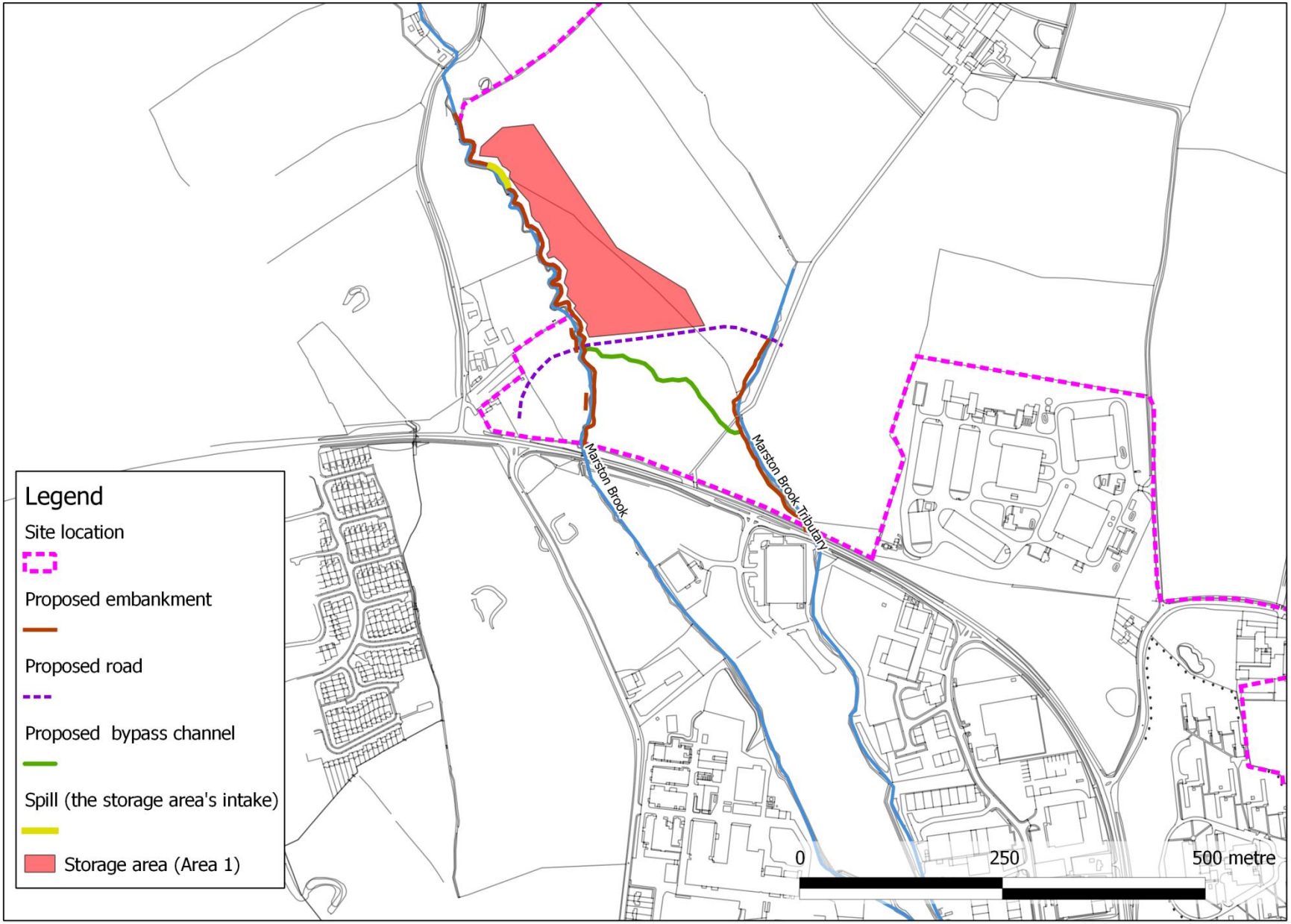


Figure 2: Propose road, bypass channel and embankment

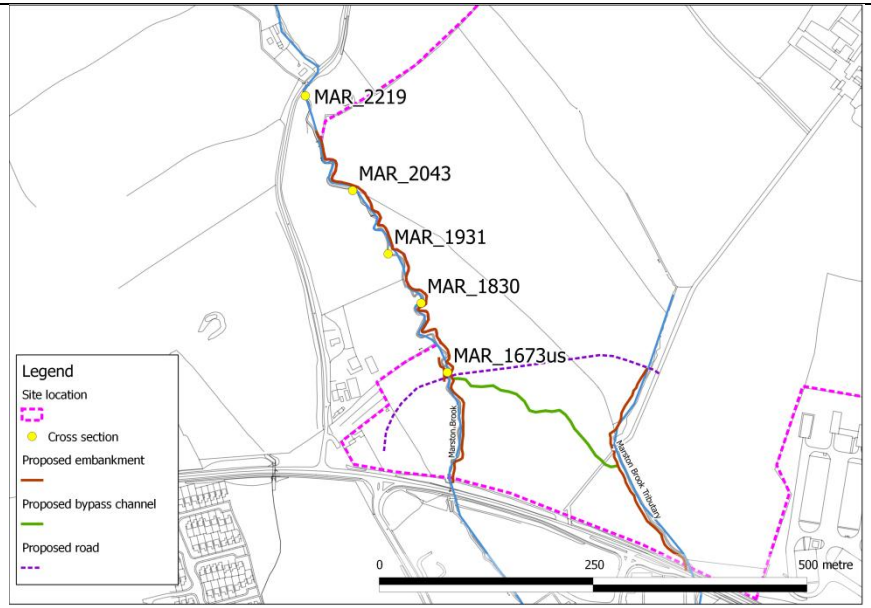
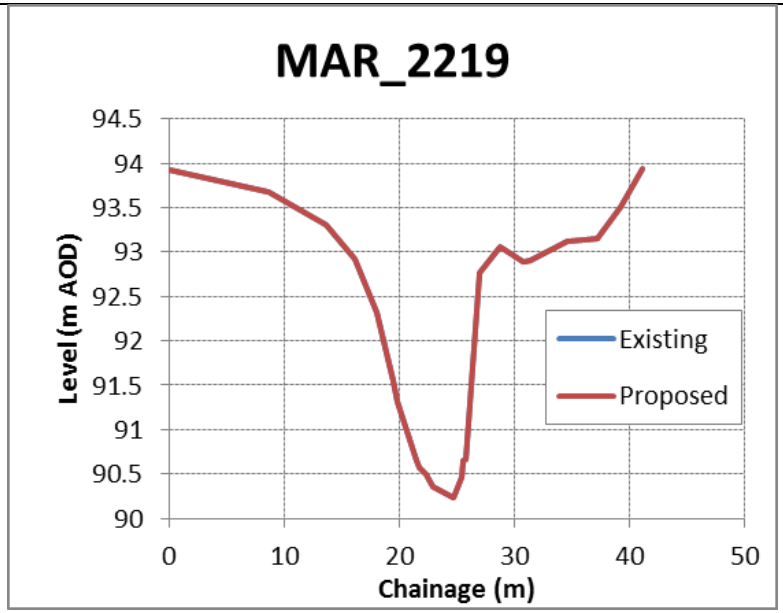
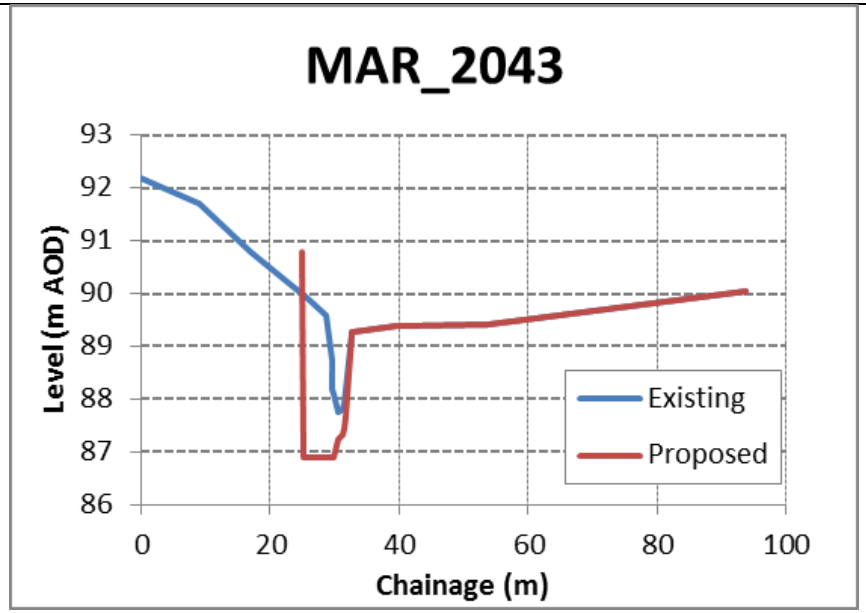
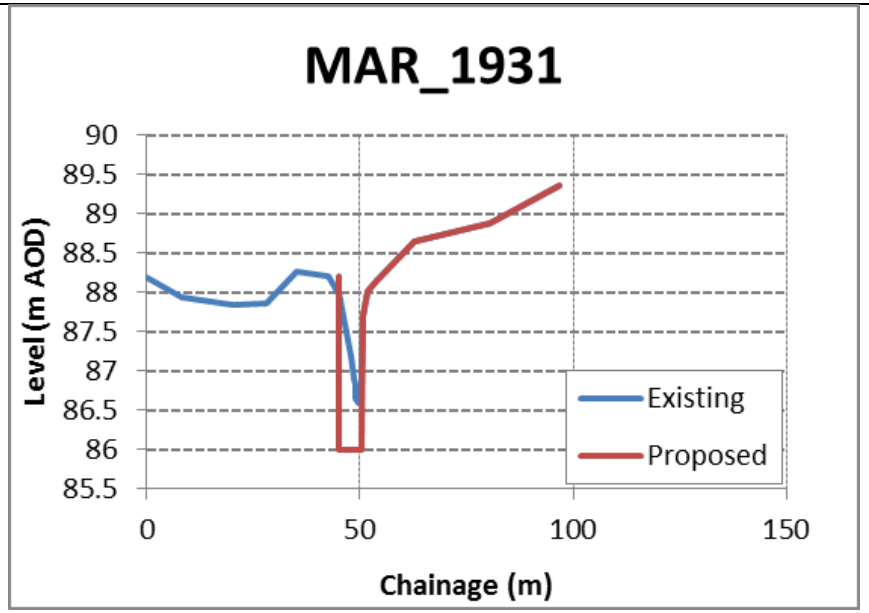
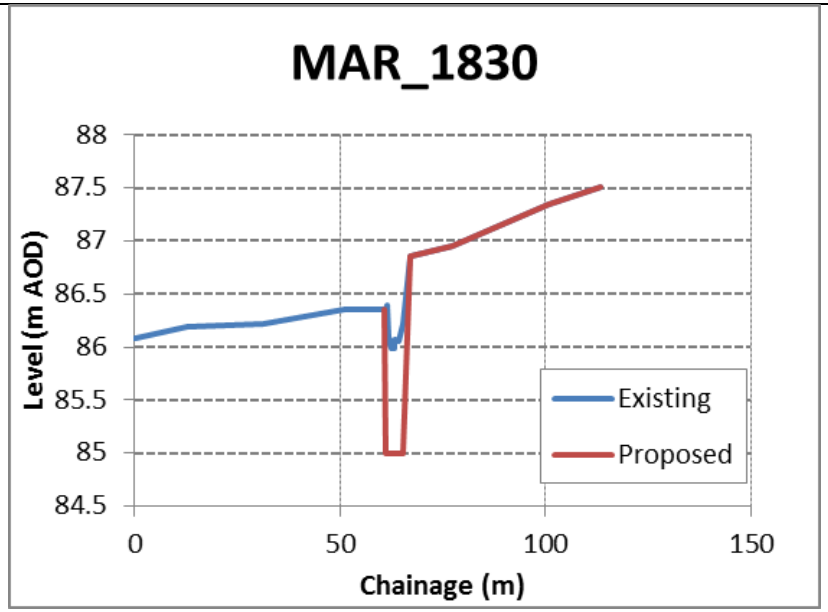


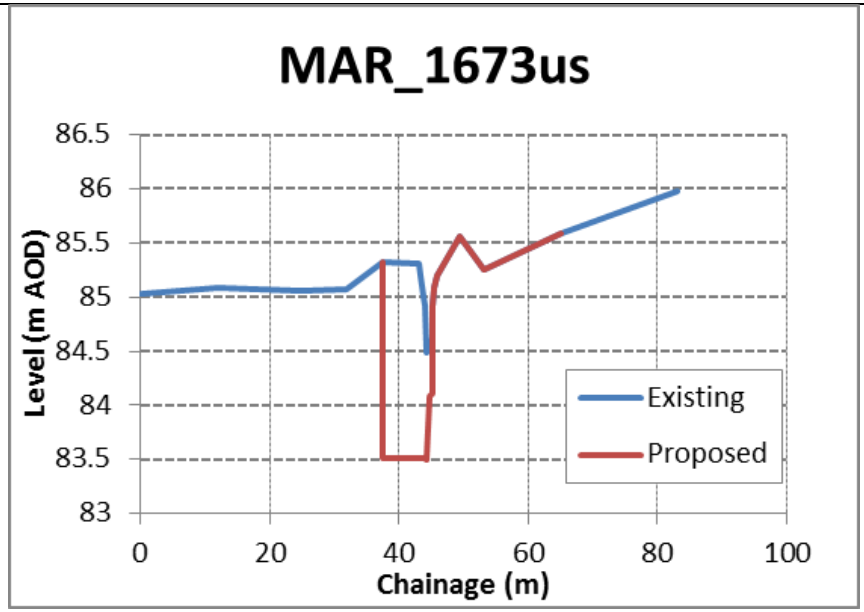
Figure 3: Key cross sections








MAR_1830
88
87.5
87
86.5
86
85.5
85
84.5
Level (m AOD)
0
50
100
150
Chainage (m)
Existing
Proposed


MAR_1673us
86.5
86
85.5
85
84.5
84
83.5
83
Level (m AOD)
0
20
40
60
80
100
Chainage (m)
Existing
Proposed

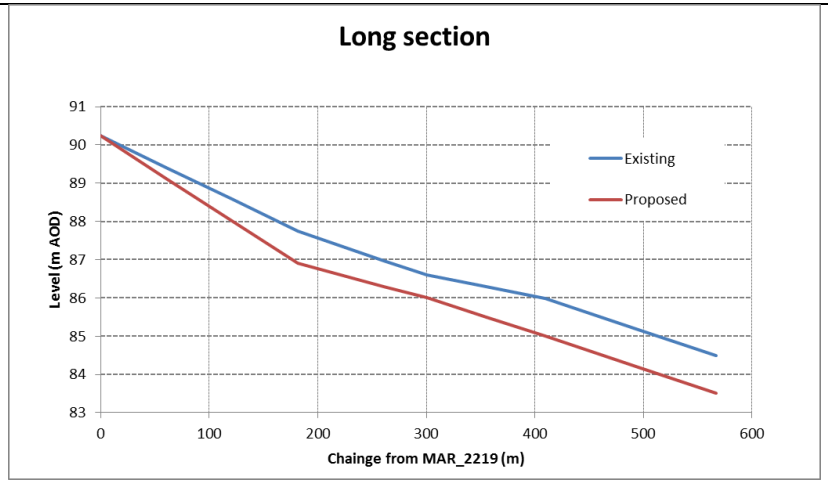


Figure 4: Long profile from Marston Lane to the new proposed road crossing

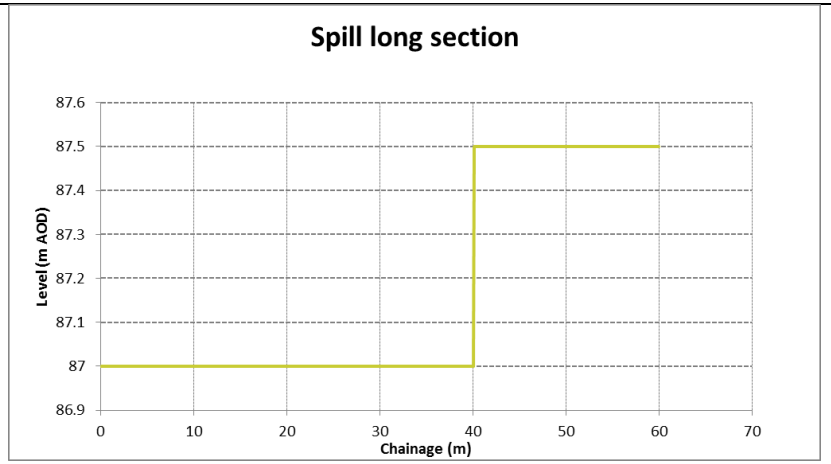


Figure 5: Spill section on the left bank of MAR_2043

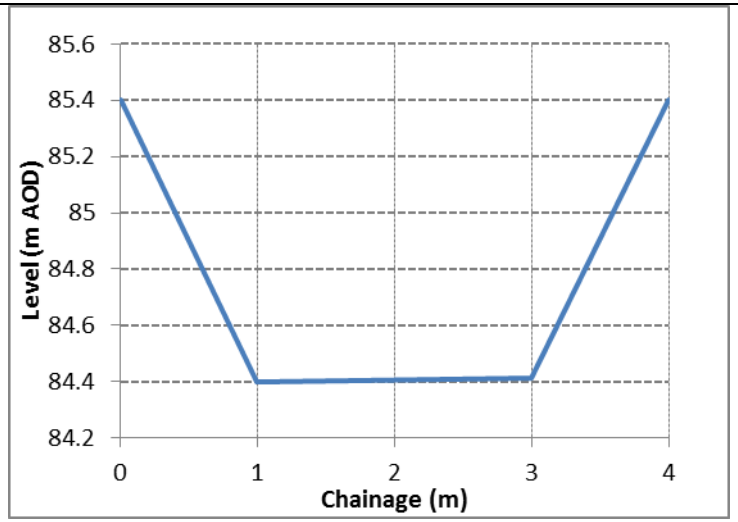


Figure 6: Bypass channel - cross section shape

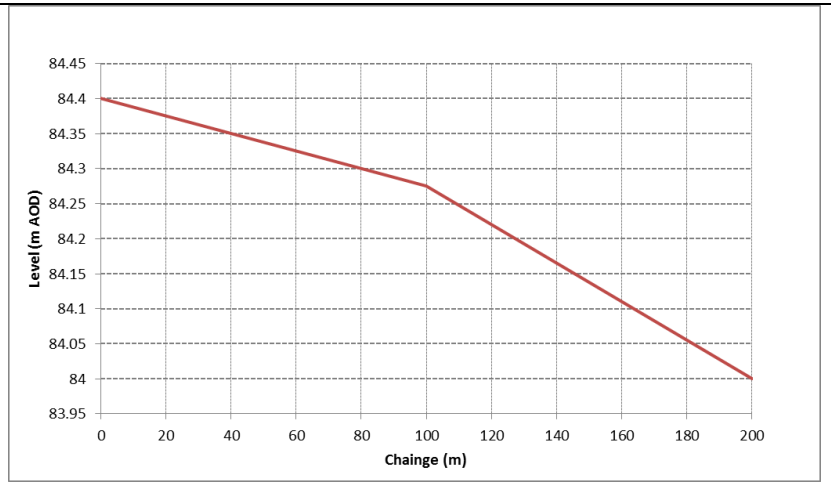


Figure 7: Bypass channel - long profile from Marston Brook to Marston Brook tributary

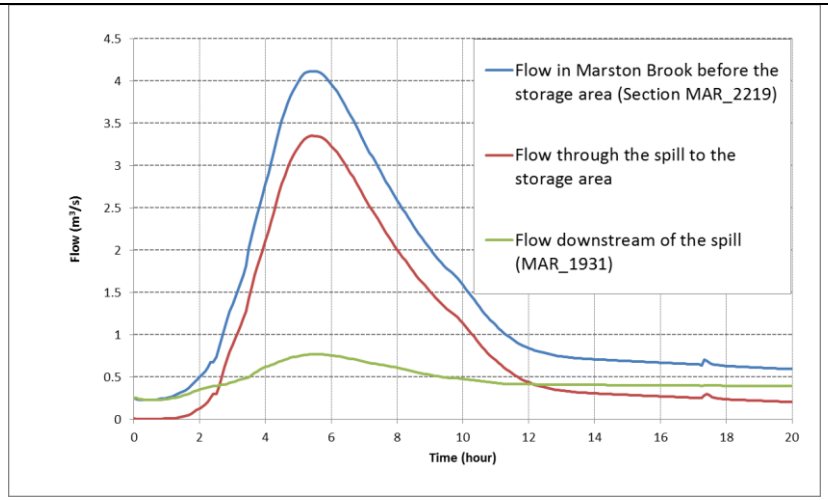


Figure 8: Flow (100 year with climate change) split before and after the storage area

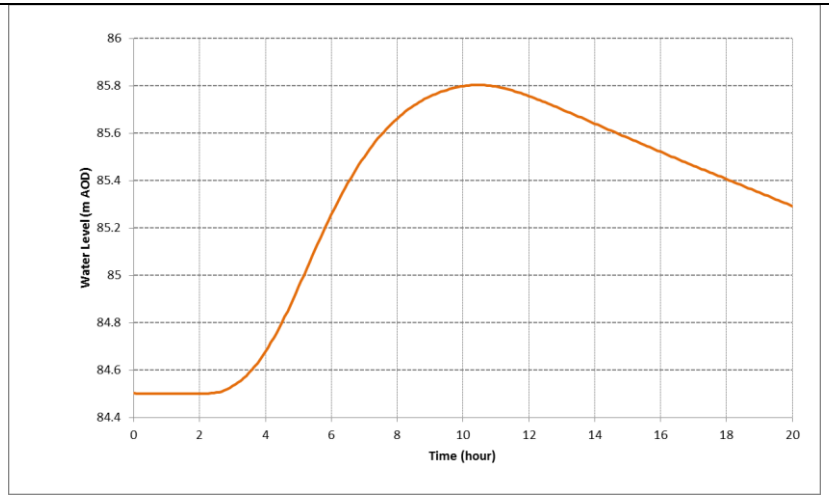


Figure 9: Water level in the storage area (100 year with climate change)

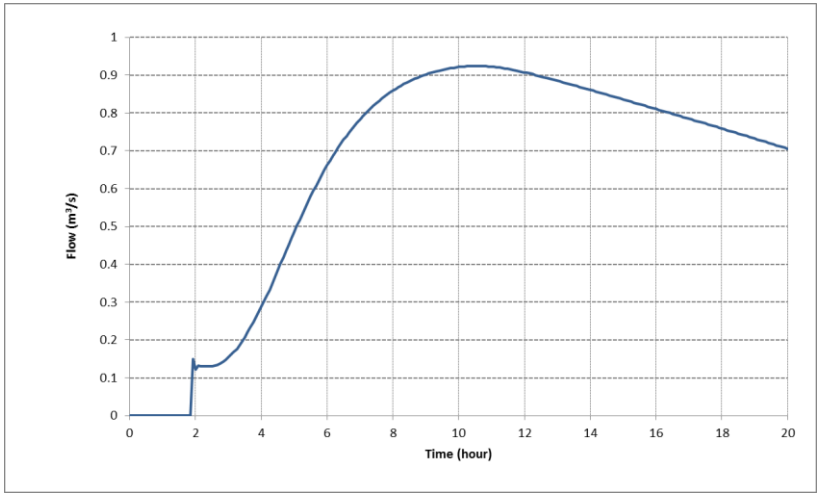


Figure 10: Flow out of storage area (100 year with climate change)

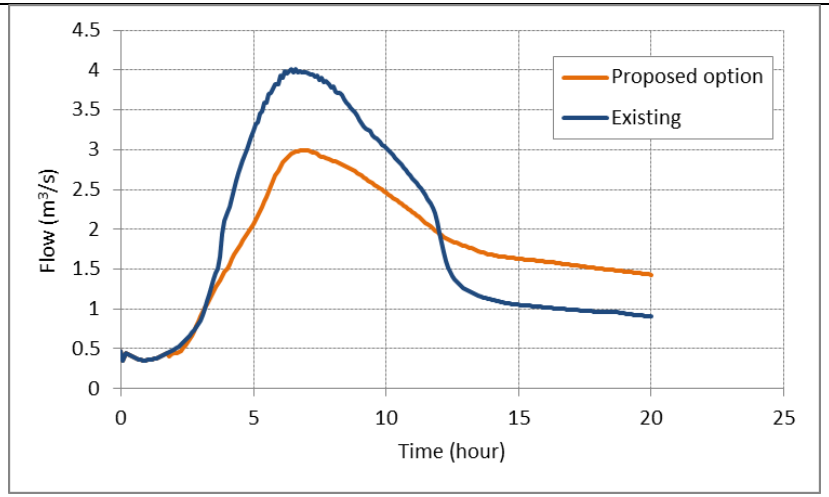


Figure 11: Flow downstream of Marston Brook and Marston Brook tributary confluence - 100 year with climate change

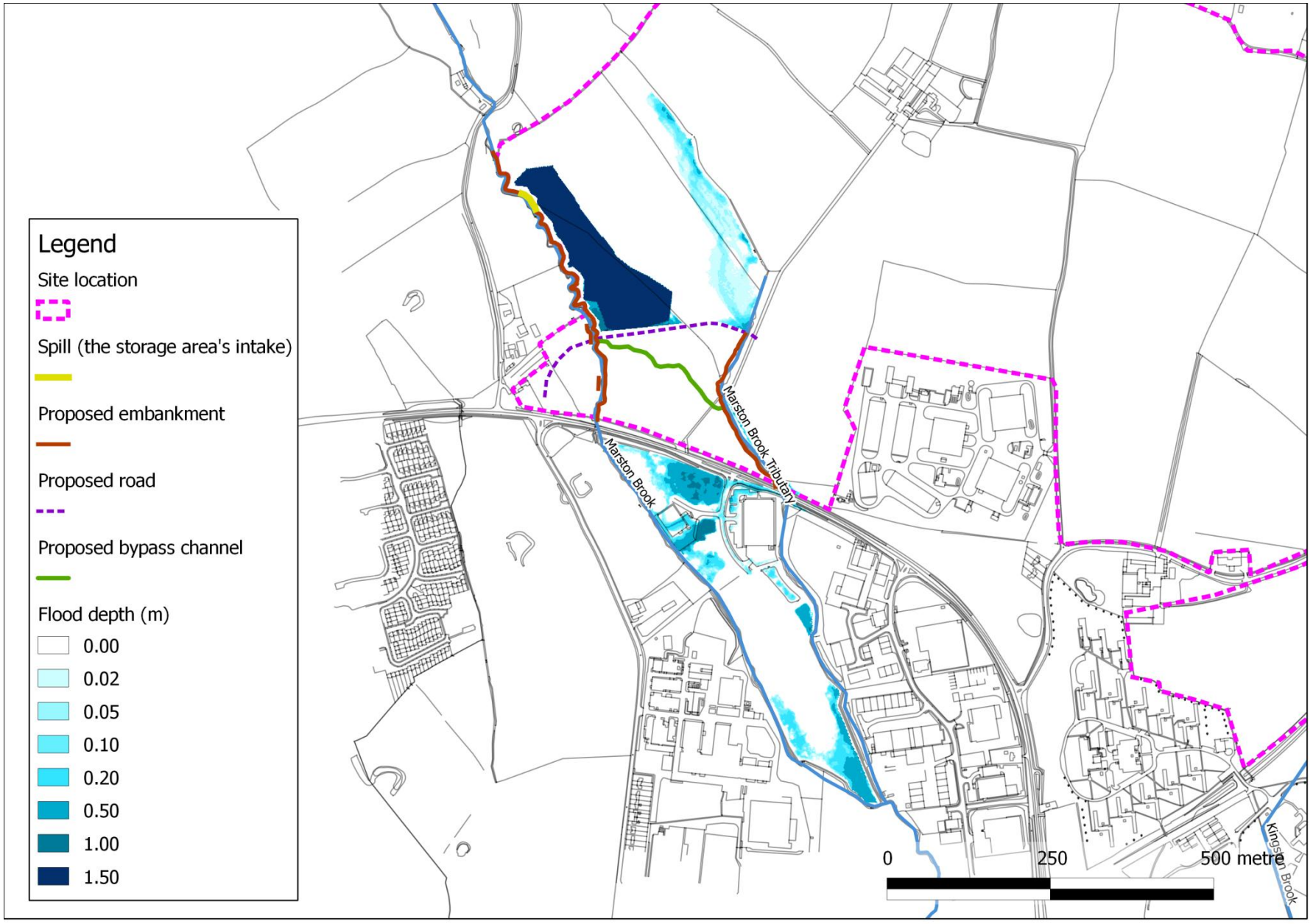


Figure 12: 1 in 100 years with climate change with proposed scheme