

A303 Amesbury to Berwick Down

**Applicant's provision of technical reports supporting the
Environmental Information Review**

Flood Risk Modelling Climate Change Update

Document reference: Redetermination 2.18

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

February 2022



Technical Note

Project:	A303 Amesbury to Berwick Down				
Title:	Flood Risk Modelling Climate Change Update				
Doc ID:	HE551506-AMW-EWE-ZZ-AC-LW-0001				
Date:	17/01/2021	Version:	P03	Status:	A

Revision	Date	Prepared by	Reviewed by	Approved by
P01	10/2021			
P02	02/2022			
P03	02/2022			

1 Introduction

Background

- 1.1 This report has been prepared to support the response to Bullet Point Four of the Statement of Matters for the re-determination of the application for an order granting development consent for the A303 Amesbury to Berwick Down (the Scheme). The response to Bullet Point Four considers the adequacy of the environmental information produced in support of the application for the Scheme (including the 2018 Environmental Statement (ES) and all information submitted in the pre-Examination, Examination and post-Examination periods).
- 1.2 This report details key changes in flood risk policy and guidance identified since submission of the information produced in support of the application. The report then details updates to the technical assessment of flood risk for the Scheme and provides updated results for comparison with results presented in the Flood Risk Assessment (FRA) (May 2019) [REP3-008] which formed Appendix 11.5 to the ES. Finally, the report discusses the validity of previous conclusions in the light of the updated assessment.
- 1.3 Whilst results from the FRA (May 2019) are presented as part of this report for the purposes of direct comparison, it is advised that this document is read in conjunction with the FRA (May 2019) and Technical Annexes, which are referenced throughout the text.
- 1.4 This report has been reviewed by the Environment Agency and Wiltshire Council.

Policy Update

- 1.5 Flood risk policy and guidance has been reviewed in order to identify any updates that have been implemented since completion of the FRA in May 2019.

Technical Note

- 1.6 It was identified that Environment Agency guidance relating to climate change¹ was updated on 20 July 2021, constituting the only flood risk policy update since Development Consent Order (DCO) submission. Climate change guidance applied within the FRA (May 2019) was dated to 2016, the most up-to-date at the time of submission.
- 1.7 Within the updated guidance the River Avon, River Till and Parsonage Down catchments fall within the Avon Hampshire Management Catchment. The development lifetime is expected to be greater than 100 years, therefore the 'total anticipated change to 2080' should be applied.
- 1.8 The superseded climate change allowances for peak river flows applied within the DCO assessment are presented alongside the new updated allowances for peak river flows in Table 1-11.
- 1.9 Table 1-1 shows that the allowances for peak river flows to be applied for the modelled watercourses have increased in the new climate change guidance.

Table 1-1 Comparison of climate change allowances for modelled watercourses

	Higher (previously Higher Central)	Upper (previously Upper End)
Peak river flow allowance- 2016 guidance (2080s)	40%	85%
Peak river flow allowance- 2021 guidance (2080s)	56%	102%

- 1.10 It should be noted that climate change allowances for peak rainfall intensity, applied within the Parsonage Down surface water modelling completed as part of the FRA (May 2019), have not changed as part of the latest update to Environment Agency climate change guidance¹.
- 1.11 To ensure the Scheme is robustly assessed as part of this review, climate change allowances for peak river flows have been applied to the Parsonage Down surface water modelling. Therefore, the 2021 peak river flow allowances included in Table 1-1 have been applied.

Updated Hydraulic Model Simulations

- 1.12 In line with updated climate change guidance a number of hydraulic model simulations have been completed, as detailed within Table 1-2. It should be noted that all simulations are undertaken for the 1% Annual Exceedance Probability (AEP)

¹ Environment Agency Guidance. Flood Risk assessments: climate change allowances. Accessed on 01/10/2021 at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

design event, reflecting that climate change uplifts were applied for this simulation only in the FRA (May 2019).

Table 1-2. Updated Model Simulations

Watercourse/Model	AEP (inc climate change)	Scenario
River Avon	1% AEP + 56% (higher)	Baseline/Proposed
River Avon	1% AEP + 102% (upper)	Baseline/Proposed
River Till	1% AEP + 56% (higher)	Baseline/Proposed
River Till	1% AEP + 102% (upper)	Baseline/Proposed
Surface Water-Parsonage Down	1% AEP + 56% (higher)	Baseline/Proposed (6 hour duration)
Surface Water-Parsonage Down	1% AEP + 56% (higher)	Baseline/Proposed (12 hour duration)
Surface Water-Parsonage Down	1% AEP + 56% (higher)	50% Blockage
Surface Water-Parsonage Down	1% AEP + 102% (upper)	Baseline/Proposed (6 hour duration)

- 1.13 It should be noted that no changes to the wider model setup have been made as part of this review, other than the increases to flows/rainfall reflecting the new climate change allowances. For further details on the technical methodology please refer to the FRA (May 2019) and Technical Annexes.
- 1.14 Models have been simulated in FMP version 4.5, and TUFLOW version 2020-01-AB.

Document Structure

- 1.15 Section 2 provides results from flood risk model simulations undertaken with the updated climate change allowances for each of the watercourses/catchments modelled as part of the FRA (May 2019). It should be noted that to retain clarity the majority of discussion focuses around a comparison of key results from the design event (higher central allowance) which were presented within the FRA (May 2019). Additional supporting results are included where required.
- 1.16 Section 3 provides an overview of the key conclusions of the FRA (May 2019) and comments upon their validity, based upon the updated flood risk modelling.

2 Hydraulic Modelling Results

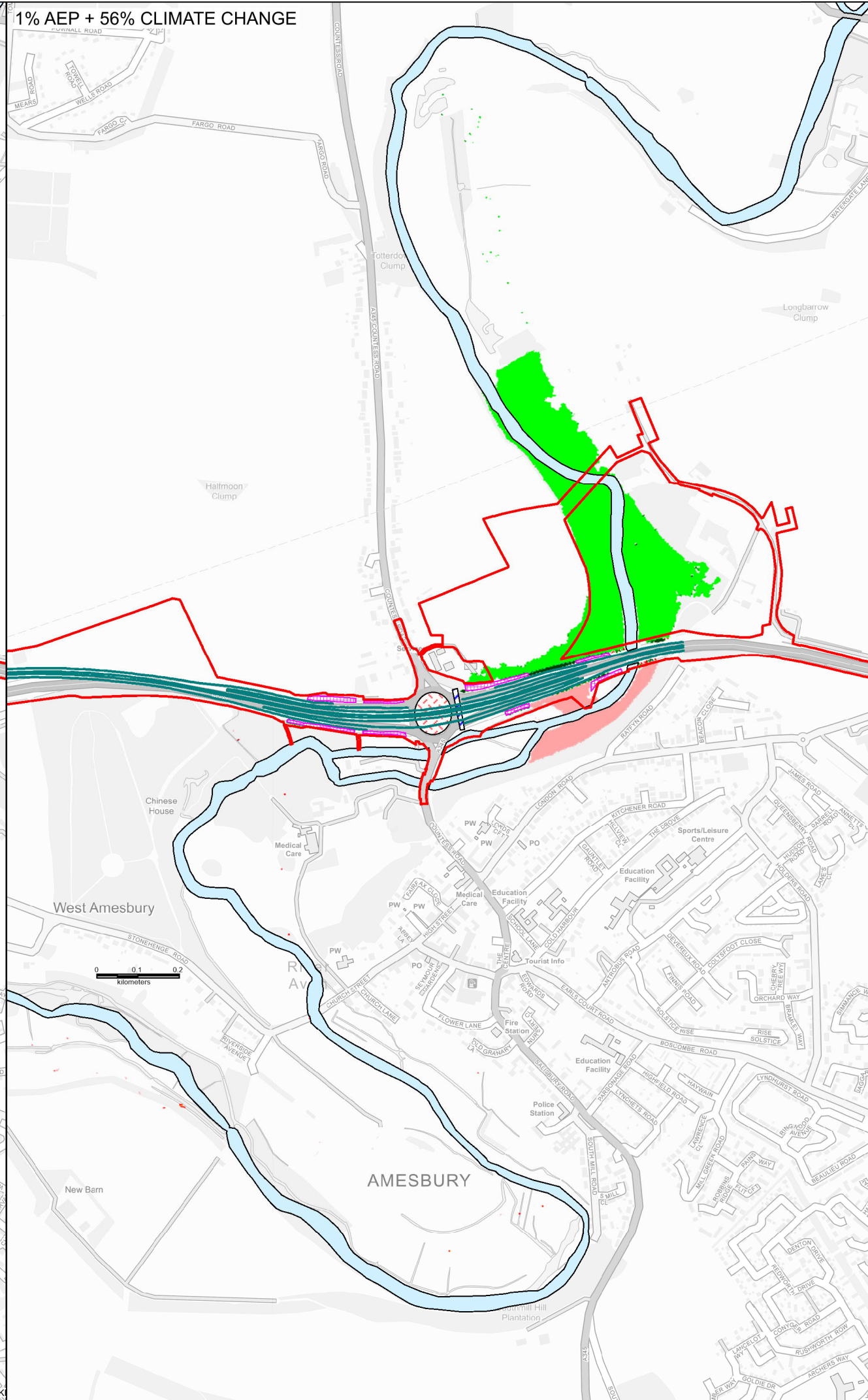
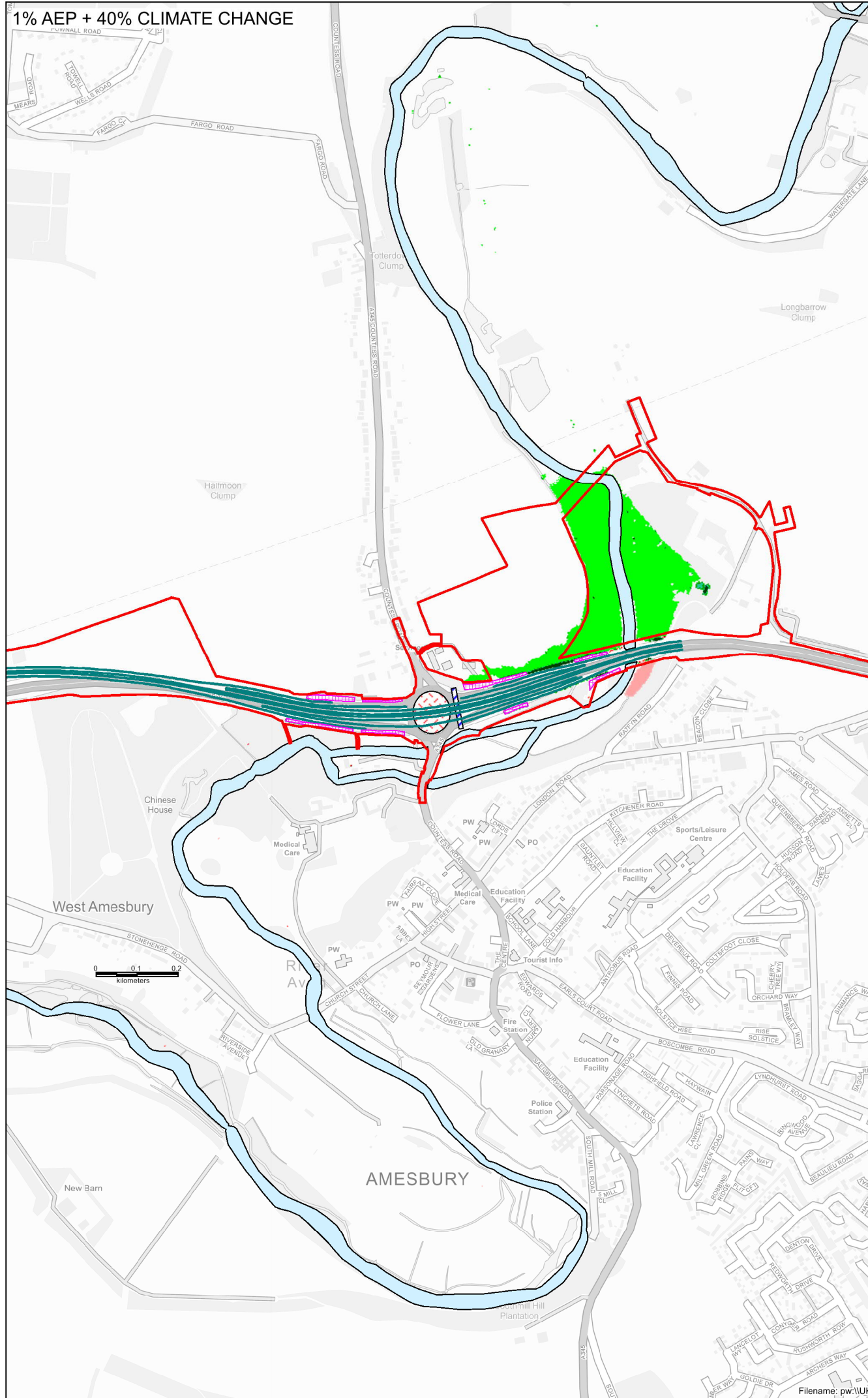
River Avon - FRA Update

- 2.1 Figure 2-1 presents a side by side comparison of the previous River Avon maximum flood depth difference plot for the 1% AEP + 40% climate change event (FRA Figure

- 8.1), and the equivalent plot for the newly simulated 1% AEP + 56% climate change event.
- 2.2 Within Figure 2-1, green colouration indicates a reduction in maximum flood depth within the Scheme scenario compared to the baseline, whilst pink and red colouration indicates an increase in maximum flood depth compared to the baseline.
- 2.3 Figure 2-1 demonstrates that results for the previous and updated climate change allowances are comparable overall. The primary differences are that for the 1% AEP + 56% climate change event the area showing a depth decrease of between 0.01m and 0.025m extends further upstream to the north of the A303 than for the 1% AEP + 40% climate change event.
- 2.4 It should be noted that the area showing an increase in flood depth of 0.01m to 0.025m, observed to the south of the A303 carriageway, is larger within the updated results. This increase is observed over an area of 0.03 km², rather than the 0.003 km² quoted within the FRA (May 2019). It should be noted that this minor increase in flooding is confined to an area of undeveloped green space on the floodplain adjacent to the river channel and does not increase flood risk to receptors such as properties. The remaining commentary relating to the River Avon presented in paragraphs 8.2.1 to 8.2.9 of the FRA (May 2019) remains unchanged.

River Avon - Supporting Commentary

- 2.5 Figure 2-2 presents a side by side comparison of the previous River Avon maximum flood depth difference plot for the 1% AEP + 85% climate change event, and the equivalent plot for the newly simulated 1% AEP + 102% climate change event. The 'upper end' allowance was applied to test the sensitivity of the Scheme to more extreme change, and therefore results were not included within the FRA, but in the supporting Fluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1A).



NOTES / LEGEND

Depth Difference

- > -0.15m
- 0.10m to -0.15m
- 0.025m to -0.10m
- 0.01m to -0.025m
- 0.01m to +0.01m
- +0.01m to +0.025m
- +0.025m to +0.10m
- +0.10m to +0.15m
- >+0.15m

Modelled Proposed Scheme Elements

- Highway Drainage Ponds
- Countess Roundabout Infill
- Pedestrian Subway Removed
- Proposed A303 realignment
- River Avon
- Proposed Scheme Boundary

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Purpose of issue: DRAFT

Client: Highways England



Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-1. RIVER AVON MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO LEFT - CC 2016 (40%) RIGHT - CC 2021 (56%)

Designed RH	Drawn PR	Checked WM	Approved BM	Date SEP 2021
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Internal Project No: 60547200

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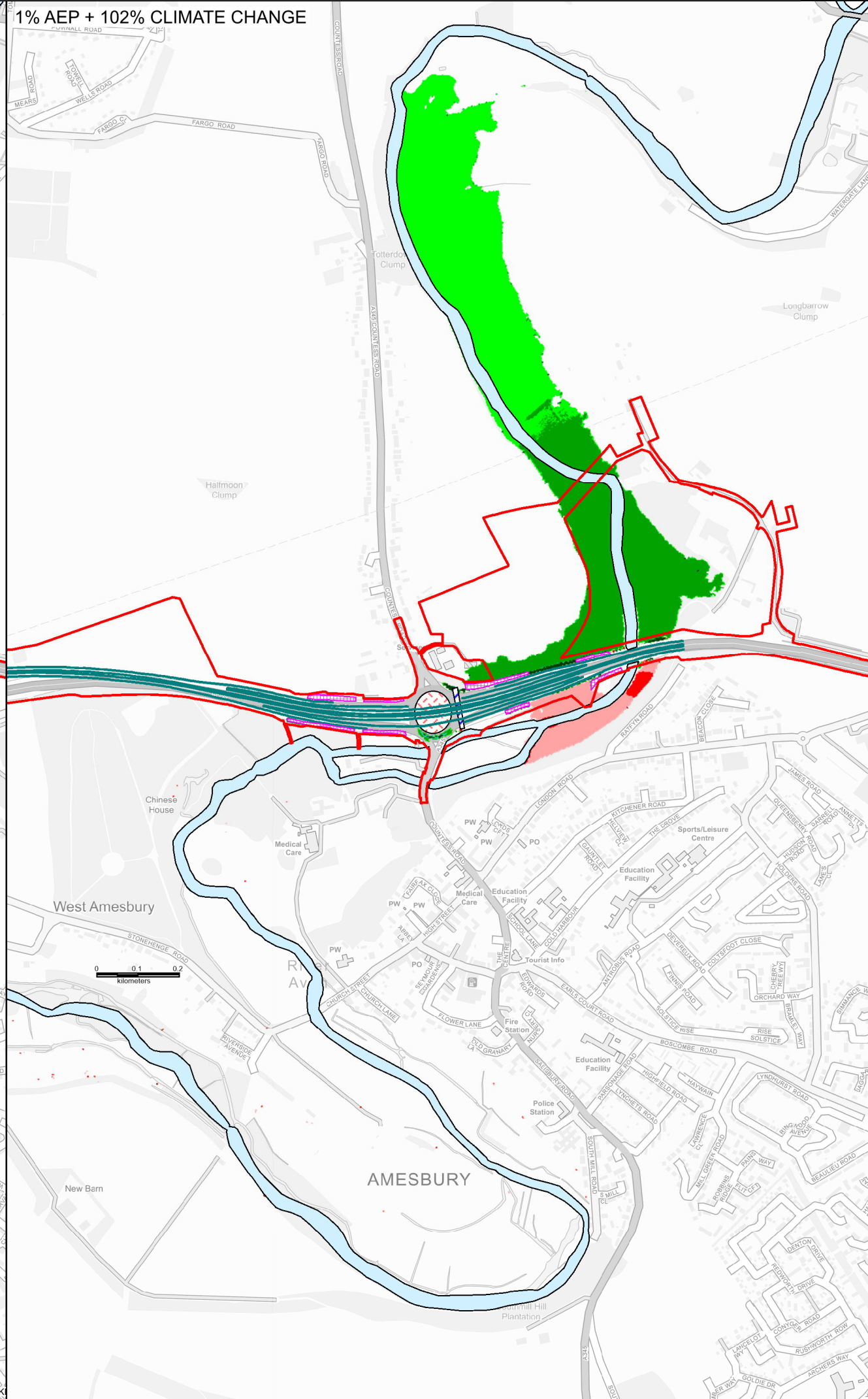
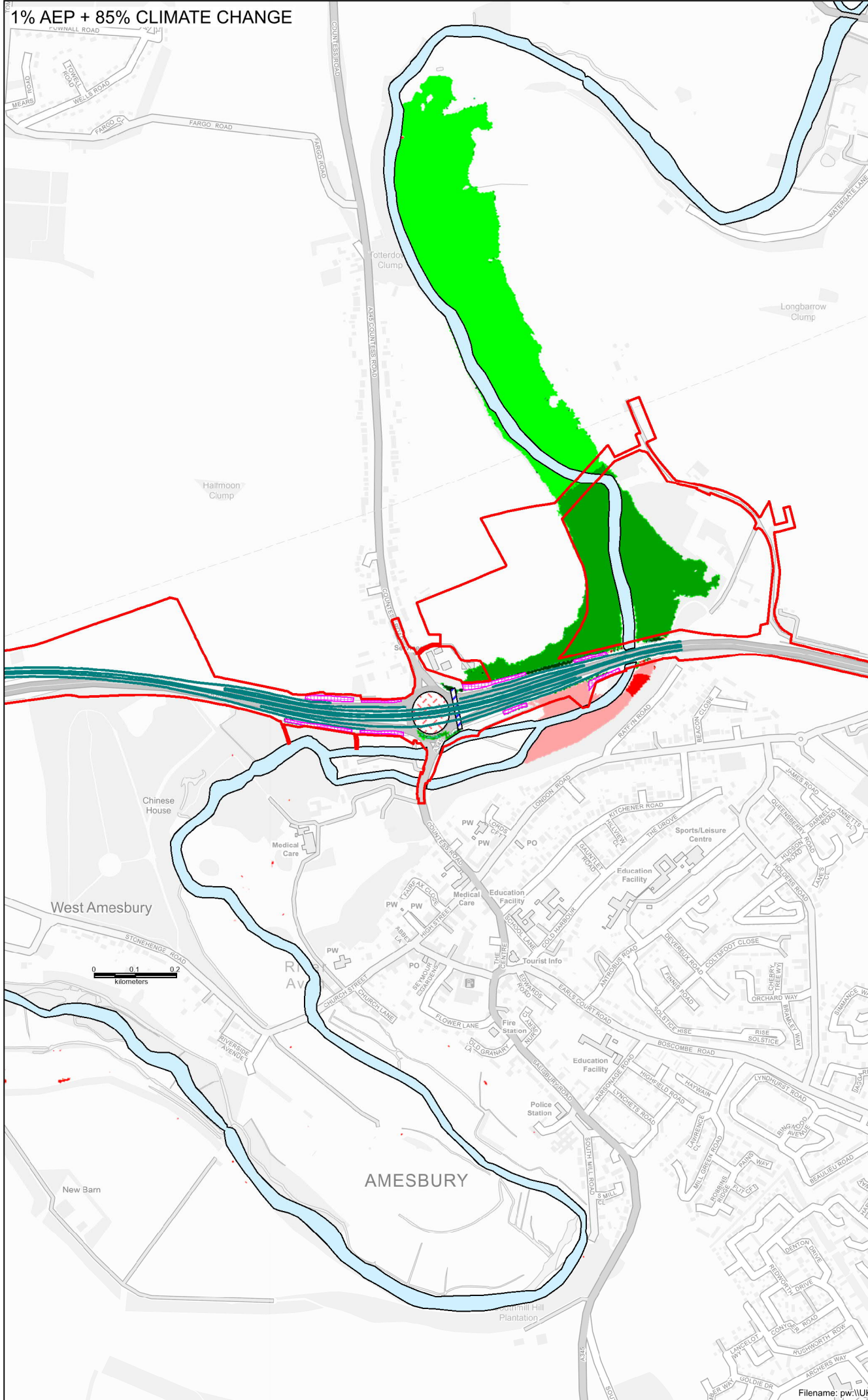
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SCHEME WIDE	DR	HD	0003	
Location	Type	Role	Number	



NOTES / LEGEND

Depth Difference

- > -0.15m
- 0.10m to -0.15m
- 0.025m to -0.10m
- 0.01m to -0.025m
- 0.01m to +0.01m
- +0.01m to +0.025m
- +0.025m to +0.10m
- +0.10m to +0.15m
- > +0.15m

Modelled Proposed Scheme Elements

- Highway Drainage Ponds
- Countess Roundabout Infill
- Pedestrian Subway Removed
- Proposed A303 realignment
- River Avon
- Proposed Scheme Boundary

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Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-2. RIVER AVON MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO LEFT - CC 2016 (85%) RIGHT - CC 2021 (102%)

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- 2.6 Figure 2-2 shows that results are essentially equivalent between 1% AEP simulations including the previous (85%) and updated (102%) allowances for climate change.
- 2.7 Updated maximum flood depth mapping for the River Avon is presented in Appendix A, showing that results are consistent with those presented within Appendix B of the Fluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1A).
- 2.8 Overall, the results presented within this section demonstrate that updated modelling for the River Avon, taking into account the most up-to date climate change allowances, are generally consistent with those presented within the FRA (May 2019). Whilst there are some differences within the latest results due to the increased allowances for climate change, the magnitude of the difference is not sufficient to change the conclusions of the River Avon assessment included within the FRA (May 2019).

River Till - FRA Update

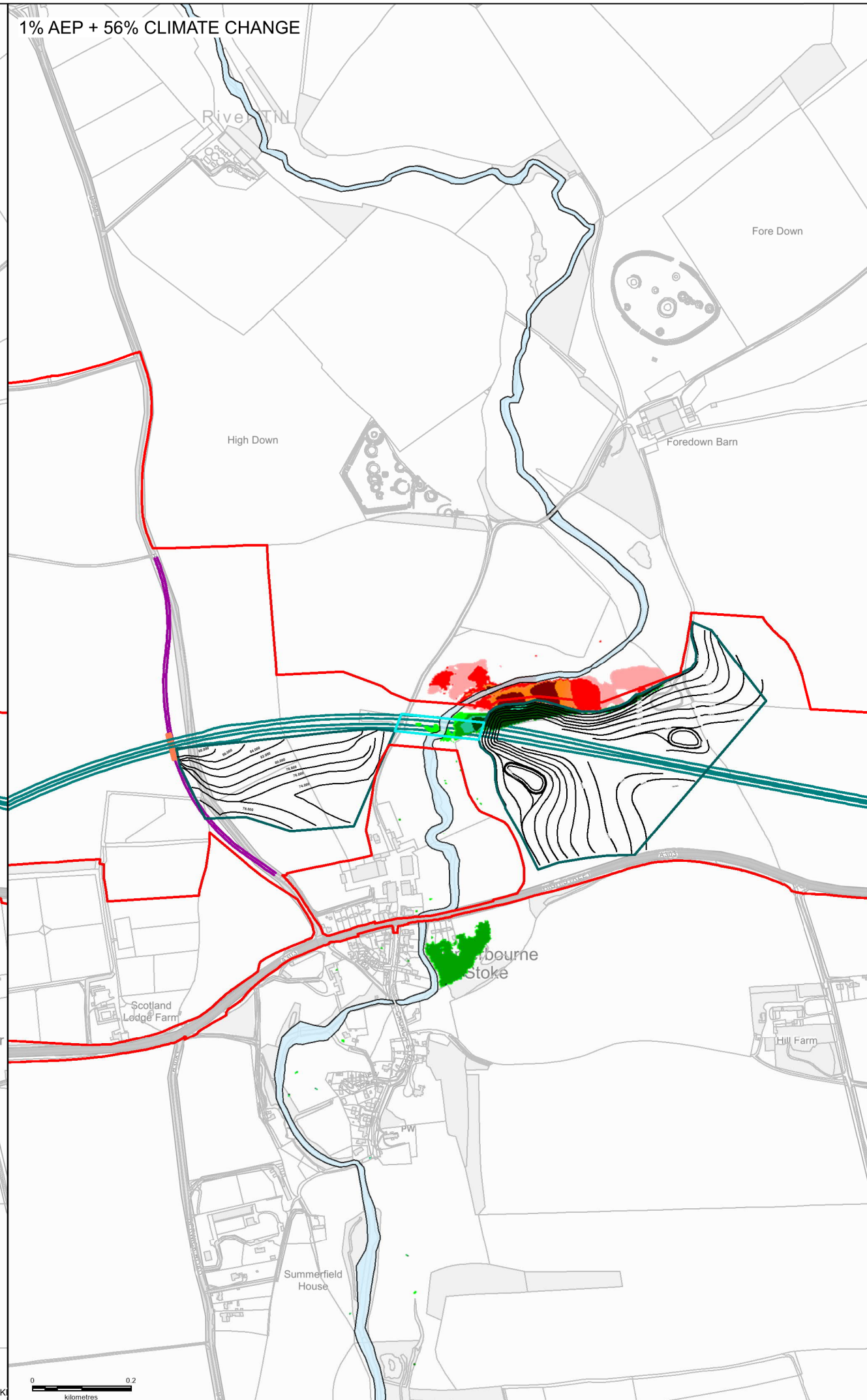
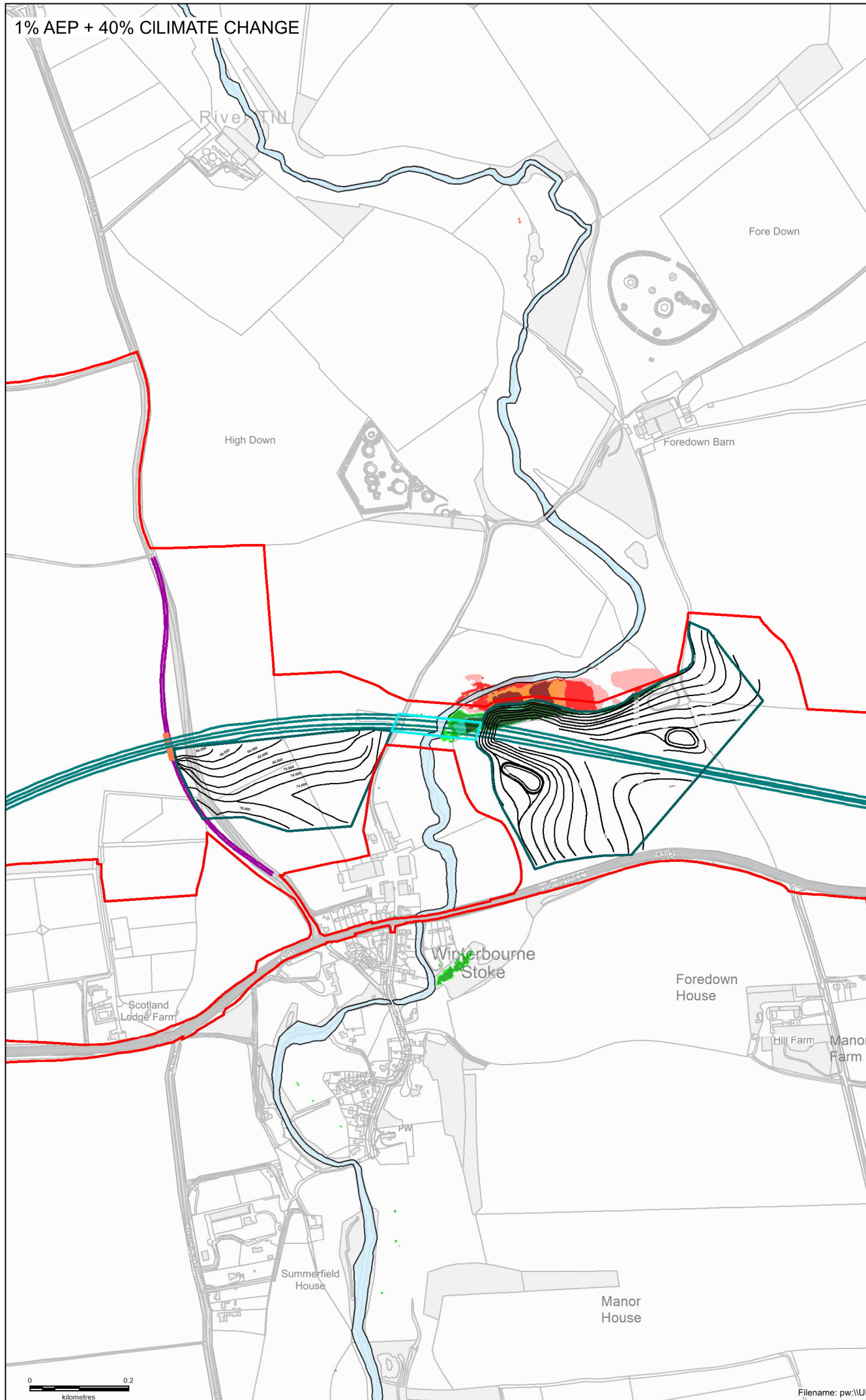
- 2.9 Figure 2-3 presents a side by side comparison of the previous River Till maximum flood depth difference plot for the 1% AEP + 40% climate change event (FRA (May 2019) Figure 8.2), and the equivalent plot for the newly simulated 1% AEP + 56% climate change event.
- 2.10 Within Figure 2-3, green colouration indicates a reduction in maximum flood depth within the Scheme scenario compared to the baseline, whilst pink and red colouration indicates an increase in maximum flood depth compared to the baseline.
- 2.11 Figure 2-3 demonstrates that results for the previous and updated climate change allowances are comparable overall. The primary differences are that for the 1% AEP + 56% climate change event the area showing a depth decrease of between 0.01m and 0.1m, located to the south of the existing A303 carriageway, extends over a larger area than for the 1% AEP + 40% climate change event.
- 2.12 It should be noted that the area showing an increase in flood depth of 0.01m to 0.1m, observed to the north of the new Till viaduct embankments, is more extensive within the updated results. This increase is observed over an area of 0.03 km², rather than the 0.02 km² quoted within the FRA (May 2019). However, the remaining commentary relating to the River Till presented in paragraphs 8.2.1 to 8.2.9 of the FRA remains unchanged.

River Till - Supporting Commentary

- 2.13 Figure 2-4 presents a side by side comparison of the previous River Till maximum flood depth difference plot for the 1% AEP + 85% climate change event, and the equivalent plot for the newly simulated 1% AEP + 102% climate change event. The 'upper end' allowance was applied to test the sensitivity of the Scheme to more extreme change, and therefore results were not included within the FRA, but in the supporting Fluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1A).

1% AEP + 40% CLIMATE CHANGE

1% AEP + 56% CLIMATE CHANGE



NOTES / LEGEND

Depth Difference

- > -0.15m
- 0.10m to -0.15m
- 0.025m to -0.10m
- 0.01m to -0.025m
- 0.01m to +0.01m
- +0.01m to +0.025m
- +0.025m to +0.10m
- +0.10m to +0.15m
- >+0.15m

Modelled Proposed Scheme Elements

- A303 Reprofitting
- Proposed A303 realignment
- Proposed B3083 realignment
- A303 Open Span Bridge
- Proposed B3083 underpass
- River Till
- Proposed Scheme Boundary

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Drawing Title
FIGURE 2-3.
RIVER TILL
MAXIMUM FLOOD DEPTH DIFFERENCE
BASELINE-PROPOSED SCENARIO
LEFT - CC 2016 (40%) RIGHT - CC 2021 (56%)

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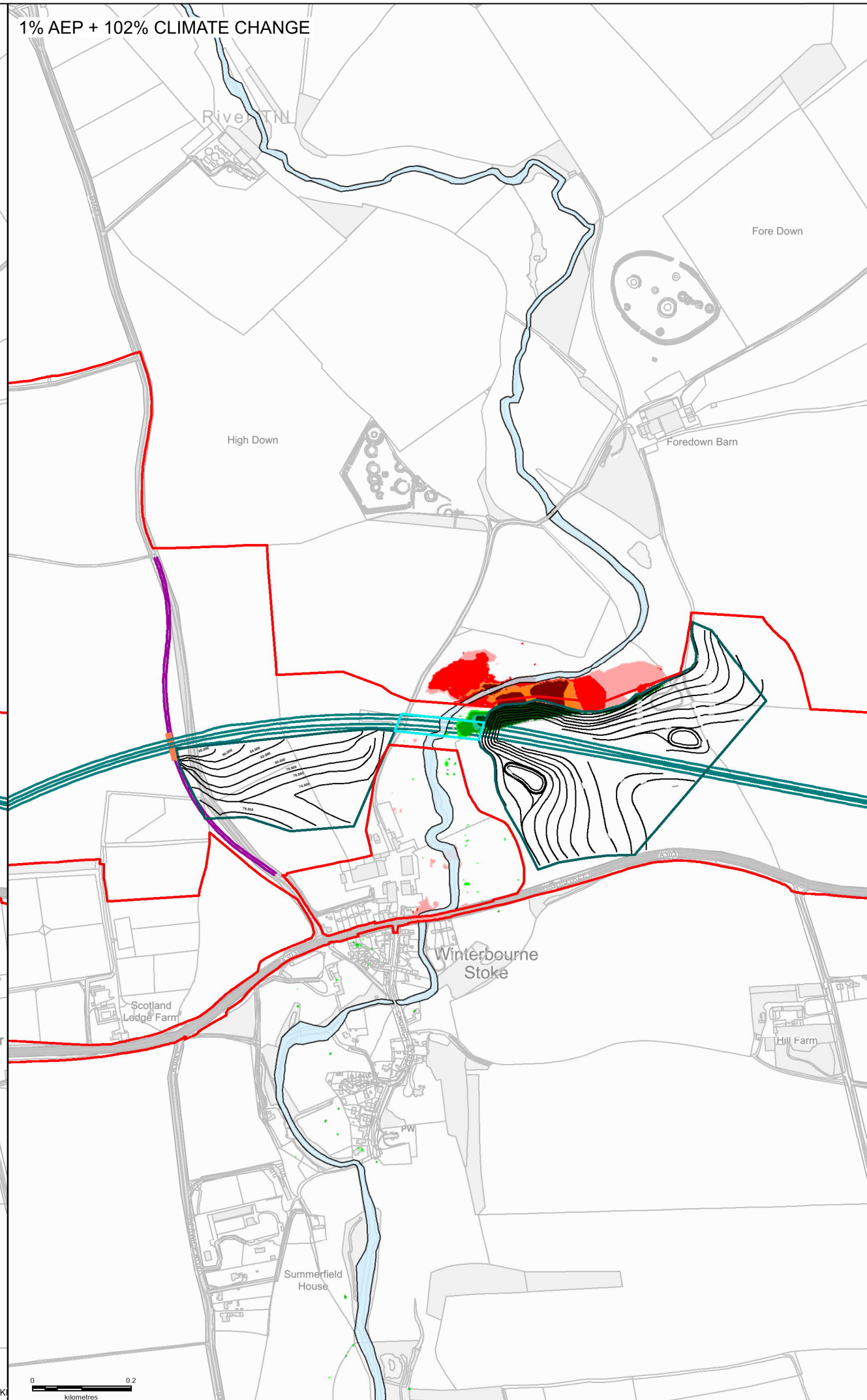
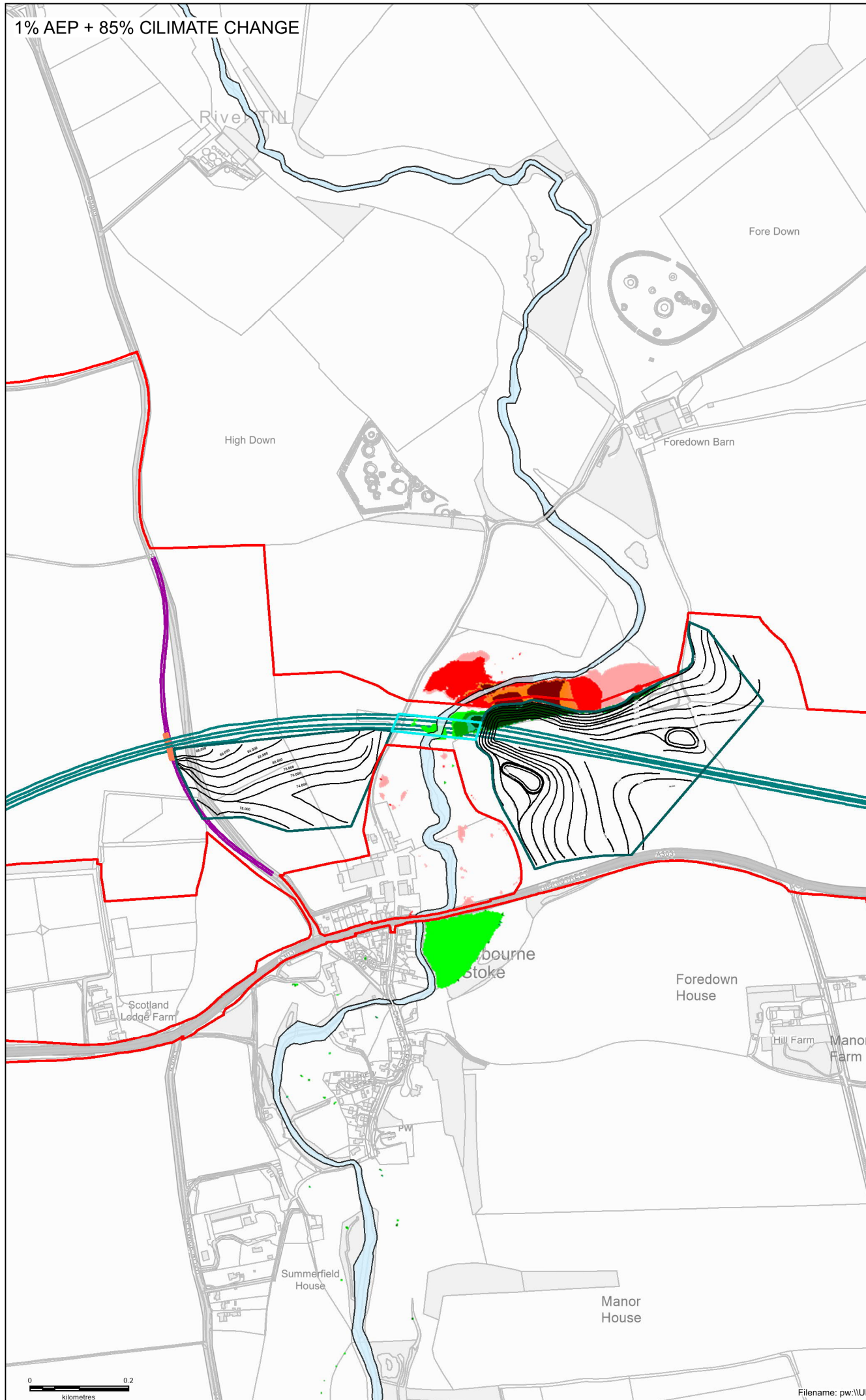
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1% AEP + 85% CLIMATE CHANGE

1% AEP + 102% CLIMATE CHANGE



NOTES / LEGEND

Depth Difference

> -0.15m
-0.10m to -0.15m
-0.025m to -0.10m
-0.01m to -0.025m
-0.01m to +0.01m
+0.01m to +0.025m
+0.025m to +0.10m
+0.10m to +0.15m
>+0.15m

Modelled Proposed Scheme Elements

A303 Reprofiting
Proposed A303 realignment
Proposed B3083 realignment
A303 Open Span Bridge
Proposed B3083 underpass
River Till
Proposed Scheme Boundary

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Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-4. RIVER TILL MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO LEFT - CC 2016 (85%) RIGHT - CC 2021 (102%)

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0 0.2 kilometres

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- 2.14 It should be noted that an increase in depth in the Scheme scenario of between 0.01m and 0.025m is shown on the existing route of the A303, as well as a small area located to the north of the existing carriageway adjacent to one property in Winterbourne Stoke, for the 102% climate change simulation (Figure 2-4). The aforementioned increases in flood depth were not observed within the 85% climate change event presented within the FRA (May 2019). Given that these areas are shown to flood in the baseline scenario, increases in depth are less than 0.025m, and occur adjacent to rather than within the property, it is not considered that this would result in a change in the conclusions of the FRA (May 2019).
- 2.15 For the property identified above, flood risk as a result of the Scheme would be mitigated through the implementation of Requirement 10 of the DCO (dated 30 November 2021), and commitments MW-WAT12 and MW-WAT13 contained within the Outline Environmental Management Plan (OEMP)².
- 2.16 Updated maximum flood depth mapping for the River Till is presented in Appendix B, showing that results are consistent with those presented within Appendix A of the Fluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1A).
- 2.17 Overall, the results presented within this section demonstrate that updated modelling results for the River Till, taking into account the most up-to date climate change allowances, are generally consistent with those presented within the FRA (May 2019). Whilst there are some differences within the latest results due to the increased allowances for climate change, the magnitude of the difference is not sufficient to change the conclusions of the River Till assessment included within the FRA (May 2019).

Parsonage Down Surface Water - FRA Update

- 2.18 Figure 2-5 presents a side by side comparison of the previous Parsonage Down maximum flood depth difference plot for the 1% AEP + 40% climate change event (FRA (May 2019) Figure 8.3), and the equivalent plot for the newly simulated 1% AEP + 56% climate change event. It should be noted that these outputs have been generated through direct rainfall modelling, and reflect the critical 6 hour duration storm, as applied within the FRA (May 2019).
- 2.19 Within Figure 2-5, green colouration indicates a reduction in maximum flood depth within the Scheme scenario compared to the baseline, whilst pink and red colouration indicates an increase in maximum flood depth compared to the baseline.
- 2.20 Figure 2-5 demonstrates that results for the previous and updated climate change allowances are consistent, indeed it is difficult to visually identify any significant differences between the depth difference plots.
- 2.21 Figure 2-6 shows a direct comparison of hydrographs extracted from the surface water model downstream of the proposed Scheme for the 1% AEP + 40% climate change (previously presented as Figure 4.7 within the Pluvial Hydraulic Modelling Report - FRA (May 2019) Annex 1B) and the 1% AEP + 56% climate change event for the baseline and proposed scenarios at Parsonage Down. The hydrographs show

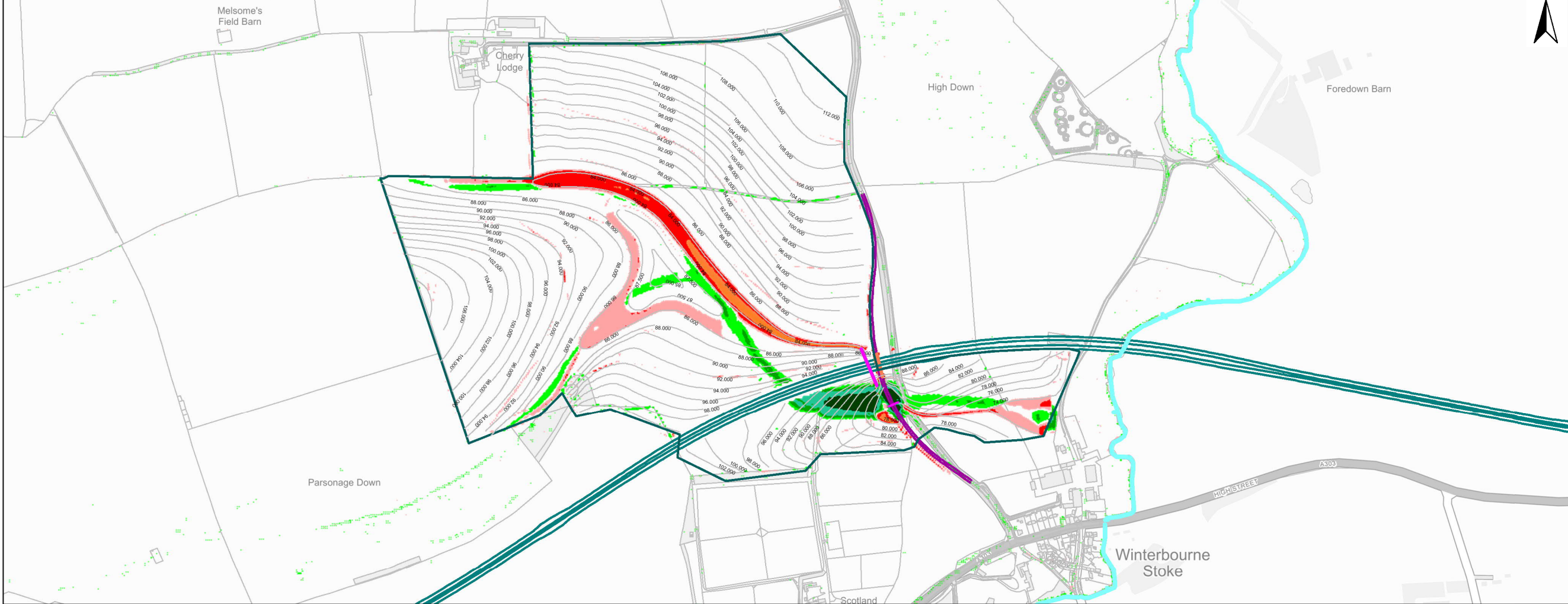
² On the Planning Inspectorate website here: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/TR010025/TR010025-001949-6.3%20Appendix%202.2\(8\)%20%E2%80%93%20Outline%20Environmental%20Management%20Plan%20\(OEMP\)_FINAL_DfT%20Revision.pdf](https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/TR010025/TR010025-001949-6.3%20Appendix%202.2(8)%20%E2%80%93%20Outline%20Environmental%20Management%20Plan%20(OEMP)_FINAL_DfT%20Revision.pdf)

Technical Note

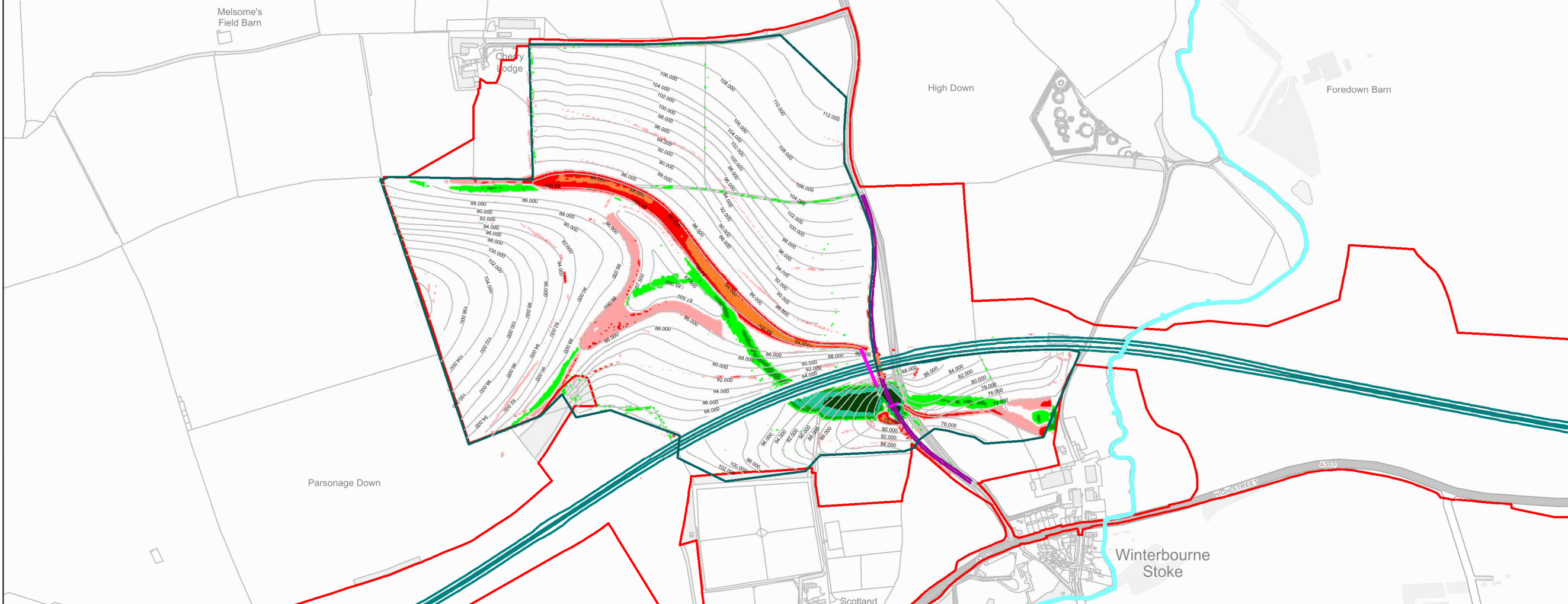
outflow from the Parsonage Down valley onto the River Till floodplain in an extreme rainfall event. The location of the point at which these were extracted is shown in Figure 4.1 of the Pluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1B).

- 2.22 A comparison of the two plots indicates results are consistent for the climate change allowances applied within the FRA (2019), and the updated allowances applied as part of this review. The peak flow has increased in both the baseline and Scheme scenarios within the 1% AEP + 56% climate change design event, as would be expected due to the increase in modelled extreme rainfall.

1% AEP + 40% CLIMATE CHANGE



1% AEP + 56% CLIMATE CHANGE



NOTES / LEGEND

Depth Difference

- > -1.00m
- 0.50m to -1.00m
- 0.20m to -0.50m
- 0.05m to -0.20m
- 0.05m to +0.05m
- +0.05m to +0.20m
- +0.20m to +0.50m
- +0.50m to +1.00m
- >+1.00m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofilling
- Proposed Culvert
- Proposed Scheme Boundary
- River Till

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Revision Details	By	Check	Date	Suffix

Purpose of issue: FINAL

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Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-5 SURFACE WATER 6 HR EVENT MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO TOP - CC 2016 (40%) BOTTOM - CC 2021 (56%)

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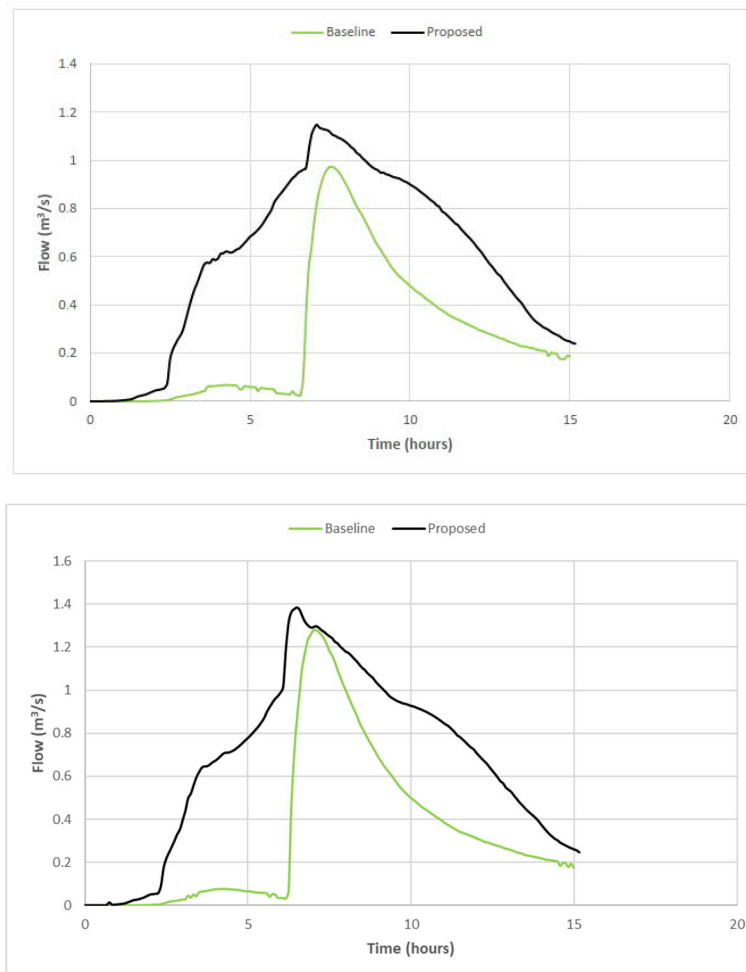


Figure 2.6. Outflow from Parsonage Down- 6 hour duration 1% AEP + 40% climate change (top), 1% AEP + 56% climate change (bottom).

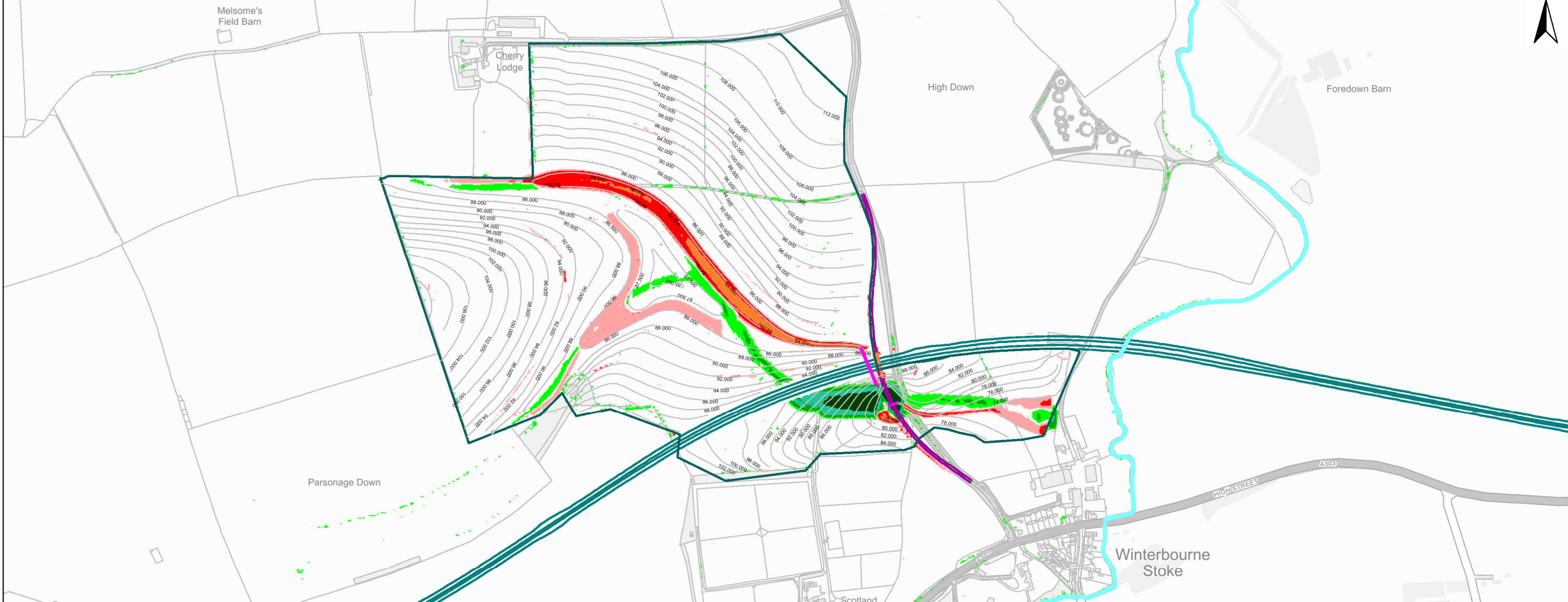
2.23 It can be seen that the small increase in peak flow observed in the proposed scenario is smaller within the 1% AEP + 56% climate change event (+0.10 m³/s), compared to the 1% AEP + 40% climate change event (+0.17 m³/s). This indicates that the small increase in flow onto the River Till floodplain is relatively lower when updated climate change allowances are used, indicating that the implemented drainage solution operates effectively when more conservative climate change allowances are applied.

The results presented within this section demonstrate that the commentary included in Sections 8.3.1 to 8.3.9 of the FRA (May 2019) remain valid.

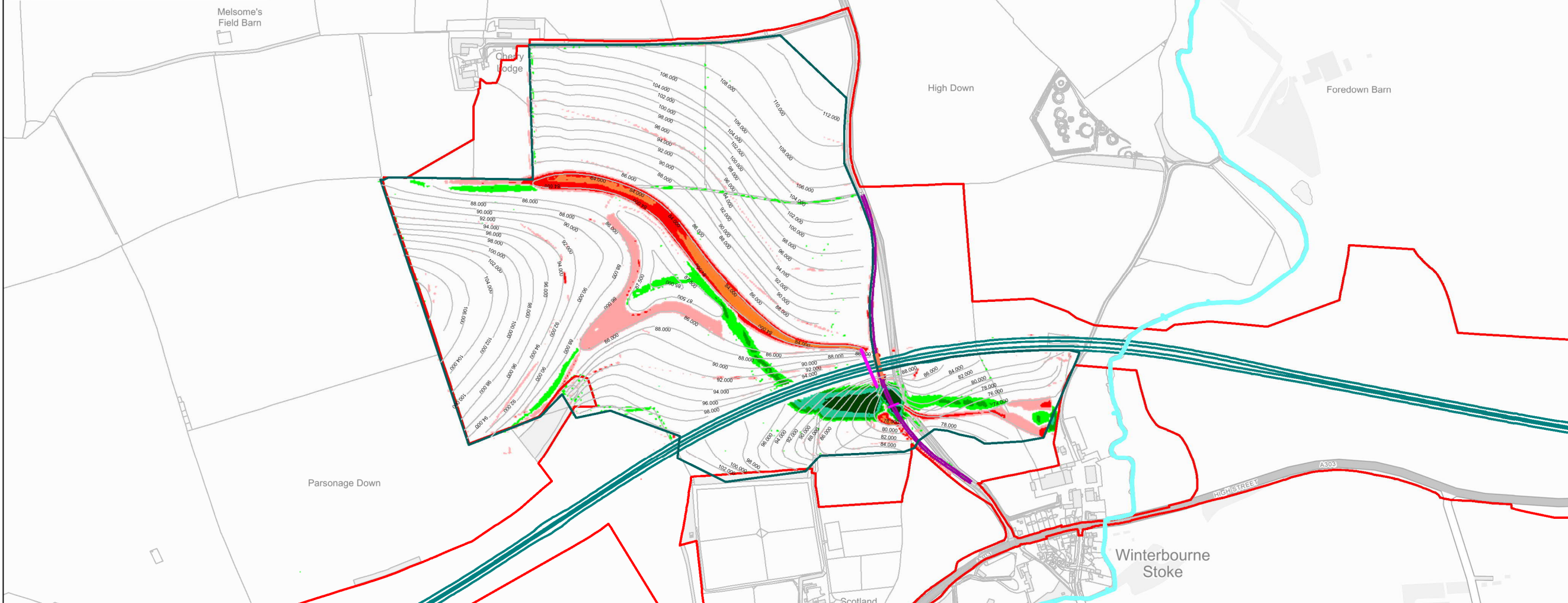
Parsonage Down Surface Water - Supporting Commentary

2.24 Figure 2-7 presents a comparison of the maximum flood depth difference plots for the longer 12 hour duration storm, originally presented as Figure 4.9 in the Pluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1B). Figure 2-8 presents a similar comparison when the 50% blockage is applied to the main Scheme culvert that conveys surface water from Parsonage Down beneath the A303, originally presented as Figure 5.4 in the Pluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1B). Both Figure 2-7 and Figure 2-8 show that simulations using updated climate change allowances (56%) produce results that are consistent with the FRA (May 2019) assessment (40%).

1% AEP + 40% CLIMATE CHANGE



1% AEP + 56% CLIMATE CHANGE



NOTES / LEGEND

Depth Difference

- > -1.00m
- 0.50m to -1.00m
- 0.20m to -0.50m
- 0.05m to -0.20m
- 0.05m to +0.05m
- +0.05m to +0.20m
- +0.20m to +0.50m
- +0.50m to +1.00m
- >+1.00m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofilling
- Proposed Culvert
- Proposed Scheme Boundary
- River Till

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Purpose of issue: FINAL

Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-7 SURFACE WATER 12 HR EVENT MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO TOP - CC 2016 (40%) BOTTOM - CC 2021 (56%)

Designed: RH	Drawn: PR	Checked: WM	Approved: BM	Date: SEP 2021
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Internal Project No. 60547200

Scale @ A3: 1:10,000 | Zone: SW

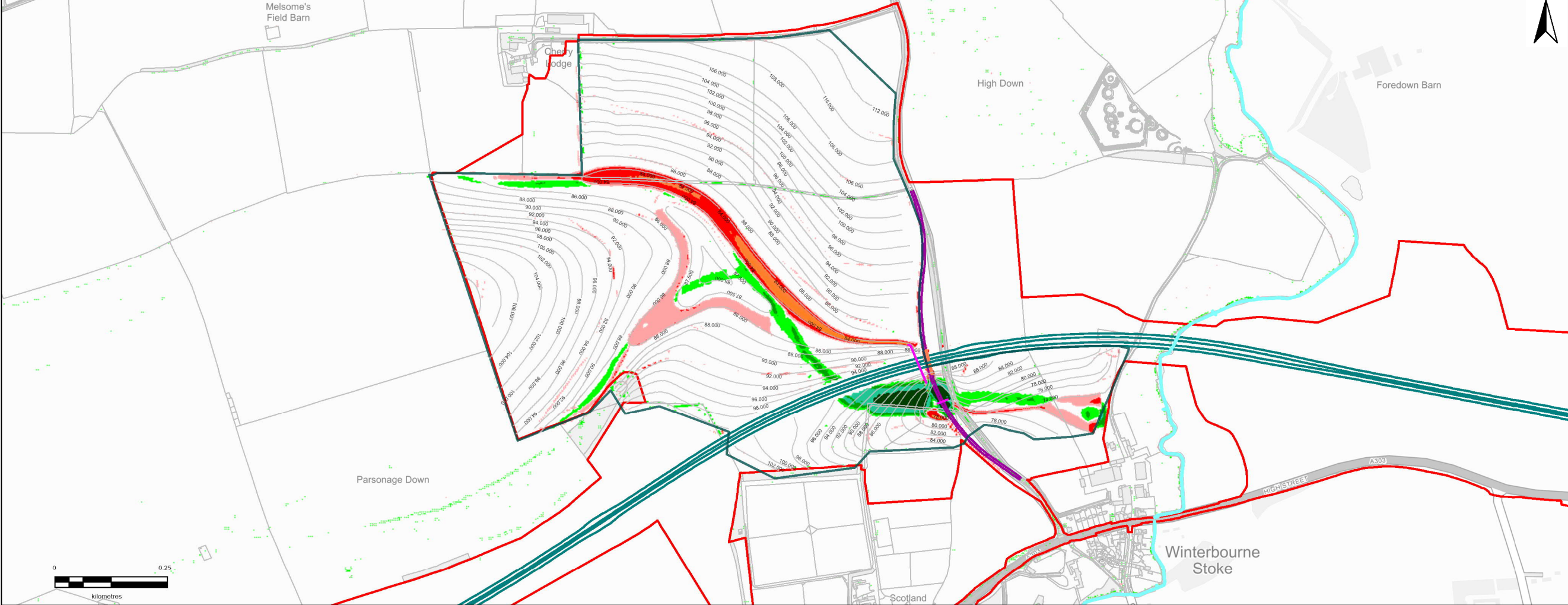
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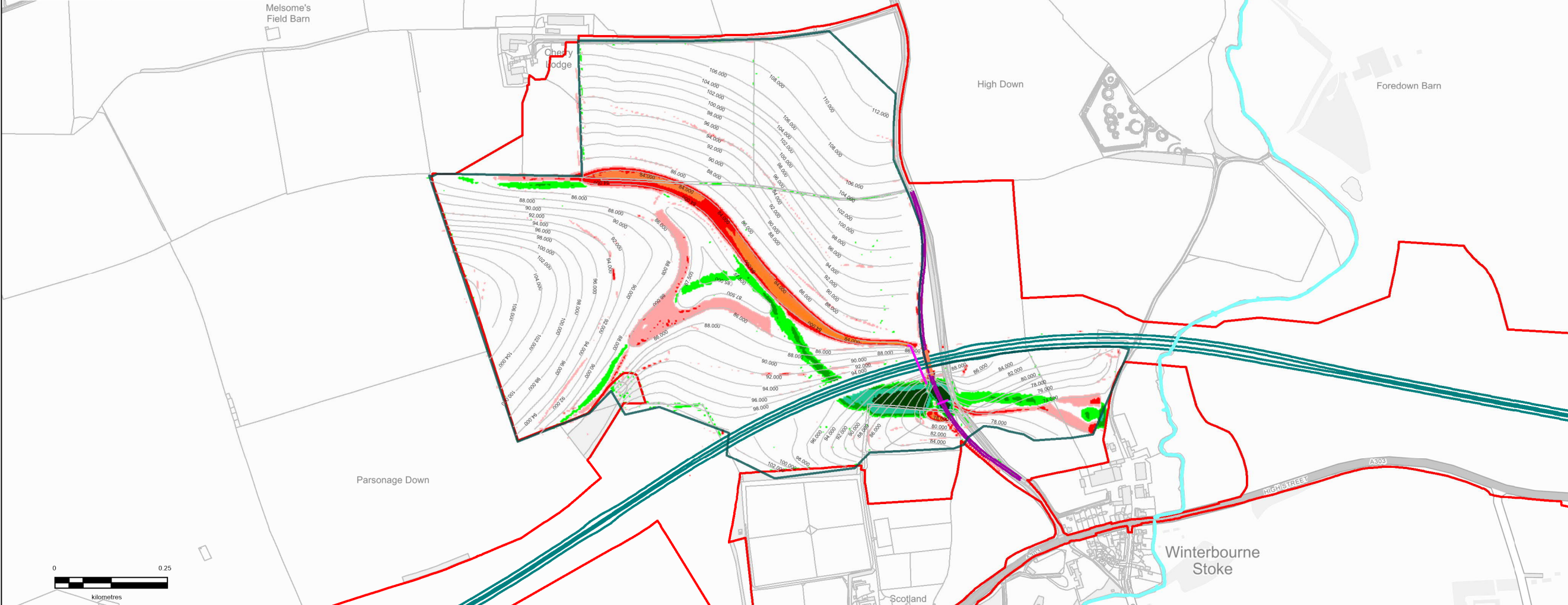
Drawing Number: HE551506	Originator: AMW	Volume: GEN	Rev: 01
SCHEME WIDE	DR	HD	0006
Location	Type	Role	Number

1% AEP + 40% CLIMATE CHANGE



- NOTES / LEGEND**
- Depth Difference**
- > -1.00m
 - 0.50m to -1.00m
 - 0.20m to -0.50m
 - 0.05m to -0.20m
 - 0.05m to +0.05m
 - +0.05m to +0.20m
 - +0.20m to +0.50m
 - +0.50m to +1.00m
 - >+1.00m
- Modelled Proposed Scheme Elements**
- A303 Road Realignment
 - B3083 Road Realignment
 - Proposed B3083 underpass
 - Area of Reprofiting
 - Proposed Culvert
 - Proposed Scheme Boundary
 - River Till

1% AEP + 56% CLIMATE CHANGE



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Revision Details	By	Check	Date	Suffix

Purpose of issue: FINAL

Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-8 SURFACE WATER 6 HR EVENT MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED 50% BLOCKAGE SCENARIO TOP - CC 2016 (40%) BOTTOM - CC 2021 (56%)

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RH	FR	WM	BM	SEP 2021

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SCHEME WIDE	DR	HD	0006
Location	Type	Role	Number

Technical Note

2.25 Figure 2-9 shows a direct comparison of hydrographs extracted from the surface water model (12 hour storm duration) downstream of the proposed Scheme 1% AEP + 40% climate change event (previously presented as Figure 4.10 within the Pluvial Hydraulic Modelling Report – FRA (May 2019) Annex 1B) and the 1% AEP + 56% climate change event for the baseline and proposed scenarios at Parsonage Down. As is expected, the flows for both the baseline and proposed scenario events are higher within the simulations using the latest climate change allowances. However, it can be seen that the small increase in peak flow observed in the proposed scenario is smaller within the 1% AEP + 56% climate change event (+0.03 m³/s) compared to the 1% AEP + 40% climate change event (+0.11 m³/s).

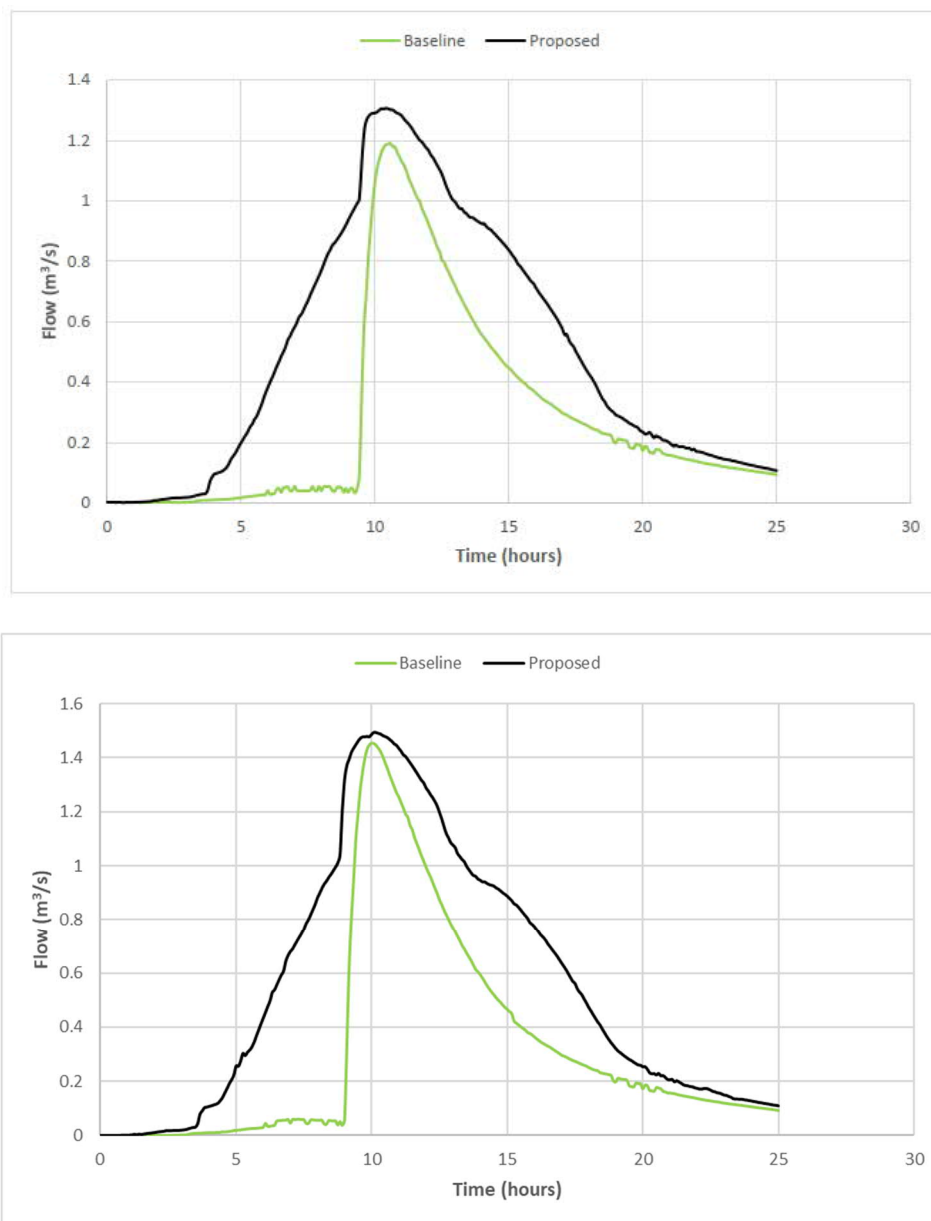


Figure 2-9. Outflow from Parsonage Down- 12 hour duration 1% AEP + 40% climate change (top), 1% AEP + 56% climate change (bottom).

Technical Note

2.26 Figure 2-10 shows a direct comparison of hydrographs extracted from the surface water model downstream of the proposed Scheme 1% AEP + 40% climate change event (previously presented as Figure 5.5 within the Pluvial Hydraulic Modelling Report – FRA (May 2019) Annex 1B) and the 1% AEP + 56% climate change event for the baseline and proposed scenarios at Parsonage Down, including 50% blockage to the Scheme culvert beneath the A303 carriageway. Figure 2-10 demonstrates that new model results, including updated climate change allowances, are consistent with those presented within the FRA (May 2019). This confirms that the A303 culvert and drainage proposals are able to convey surface water flows for the design event, even in the event of blockage.

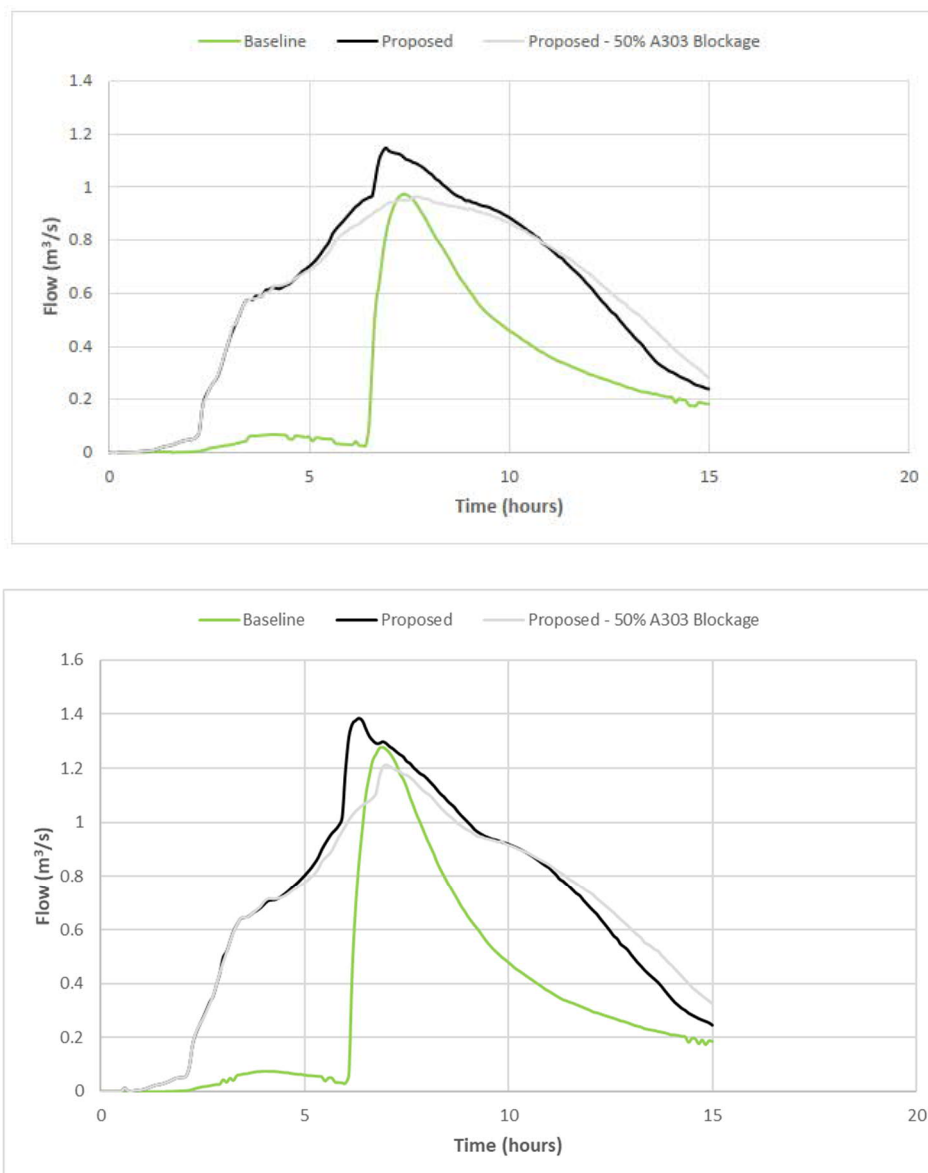


Figure 2-10. Outflow from Parsonage Down- 50% culvert blockage. 1% AEP + 40% climate change (top), 1% AEP + 56% climate change (bottom).

2.27 Figure 2-11 presents a maximum flood depth difference plot for the 1% AEP + 102% (upper) climate change event. This simulation, for the critical 6 hour storm duration,

has been undertaken as a sensitivity test to assess the impact of the proposed Scheme with more extreme future climate change.

- 2.28 Within Figure 2-11, green colouration indicates a reduction in maximum flood depth within the Scheme scenario compared to the baseline, whilst pink and red colouration indicates an increase in maximum flood depth compared to the baseline.
- 2.29 Figure 2-11 shows that when the upper allowance for climate change is applied, changes in maximum flood depths through Parsonage Down attributable to the Scheme are consistent with those shown for the higher allowance in Figure 2.5. Flood water is attenuated in the Parsonage Down valley, upstream of the A303 Scheme culvert, to greater depths, whilst the changes in key flow pathways are similar to those observed for the other simulated scenarios. Importantly, there are no increases in flood depth outside the red line boundary or to any vulnerable receptors.
- 2.30 Figure 2-12 shows a comparison of hydrographs for the baseline and proposed scenarios extracted for the 1% AEP + 102% (upper) climate change event at the outflow of the Parsonage Down valley to the River Till floodplain, downstream of the Scheme. It should be noted that as for Figure 2-11 the results are presented as a sensitivity test to assess the impact of the proposed Scheme within a more extreme future change scenario.

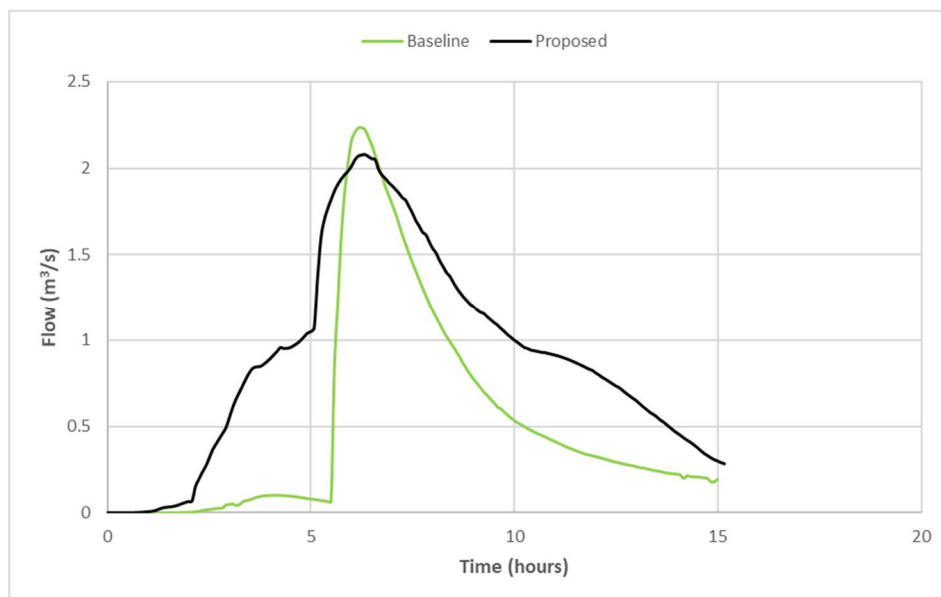
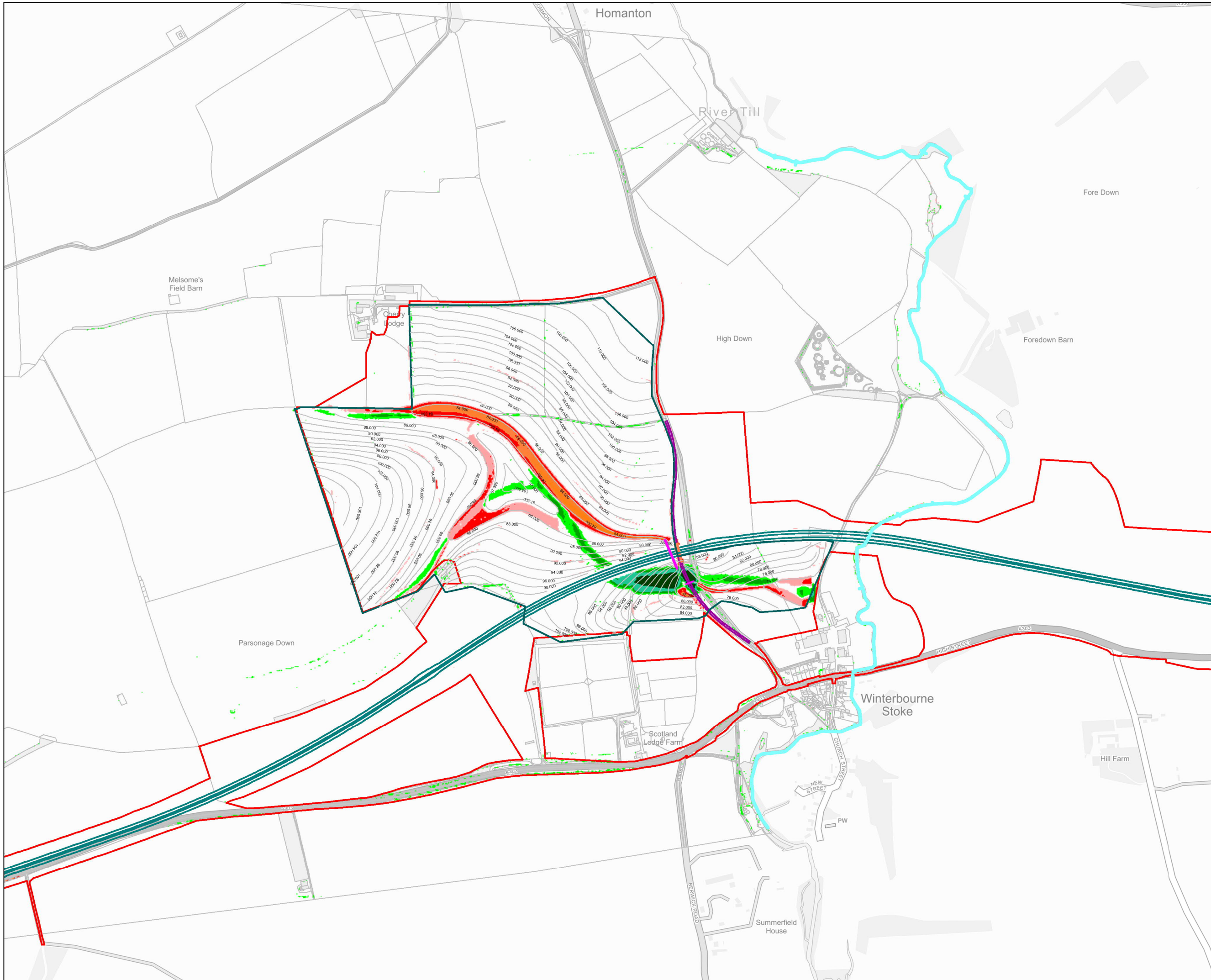


Figure 2-12. Outflow from Parsonage Down- 1% AEP + CC (102%)

- 2.31 Figure 2-12 shows a small reduction in peak flows downstream of the Scheme in the proposed Scheme scenario ($2.08\text{m}^3/\text{s}$) compared to the baseline scenario ($2.23\text{m}^3/\text{s}$). This shows that in the more extreme 'upper' climate change scenario, the Scheme drainage solution attenuates flow effectively in a similar manner to the results presented within Figures 2-5 to 2-10 for the 'higher' scenario.

Additional updated maximum flood depth mapping for Parsonage Down is presented in Appendix C for the 1% AEP + 56% and 1% AEP + 102% climate change events. This shows that updated results are generally consistent with those presented within Pluvial Hydraulic Modelling Report (FRA (May 2019) Annex 1B).



NOTES / LEGEND

Depth Difference

- > -1.00m
- 0.50m to -1.00m
- 0.20m to -0.50m
- 0.05m to -0.20m
- 0.05m to +0.05m
- +0.05m to +0.20m
- +0.20m to +0.50m
- +0.50m to +1.00m
- >+1.00m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofiting
- Proposed Culvert
- Proposed Scheme Boundary
- River Till

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Purpose of issue: FINAL

Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE 2-11 SURFACE WATER 6 HR EVENT CC102% MAXIMUM FLOOD DEPTH DIFFERENCE BASELINE-PROPOSED SCENARIO

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Location	Type	Role	Number

- 2.32 Overall, the results and commentary presented, taking into account updated climate change guidance, are consistent with those presented within the FRA (May 2019). Whilst there are some differences within the latest results due to the increased allowances for climate change, the magnitude of the difference is not sufficient to change the conclusions of the Parsonage Down assessment included within the FRA (May 2019).

3 Conclusions

- 3.1 Following additional simulations of the River Avon and River Till fluvial models and Parsonage Down surface water model to reflect the latest Environment Agency climate change guidance released in July 2021, conclusions documented within the original A303 Amesbury to Berwick Down DCO FRA (May 2019) remain unchanged.
- 3.2 This report has been reviewed by the Environment Agency and Wiltshire Council and comments received did not raise any concerns with the statement above that the conclusions of the original FRA (May 2019) remain unchanged.

River Avon

- 3.3 Section 2 of this document provides a direct comparison of results presented within the FRA (May 2019) and new results that take into account the most up to date climate change allowances for the Avon catchment.
- 3.4 Results presented in Section 2.1 demonstrate that key commentary and conclusions relating to flood risk for the River Avon presented within the FRA (May 2019) remain valid and unchanged.

River Till

- 3.5 Section 2 of this document provides a direct comparison of results presented within the FRA (May 2019) and new results that take into account the most up to date climate change allowances for the Till catchment.
- 3.6 Results presented in Section 2.2 demonstrate that key commentary and conclusions relating to flood risk for the River Till presented within the FRA (May 2019) remain valid and unchanged.

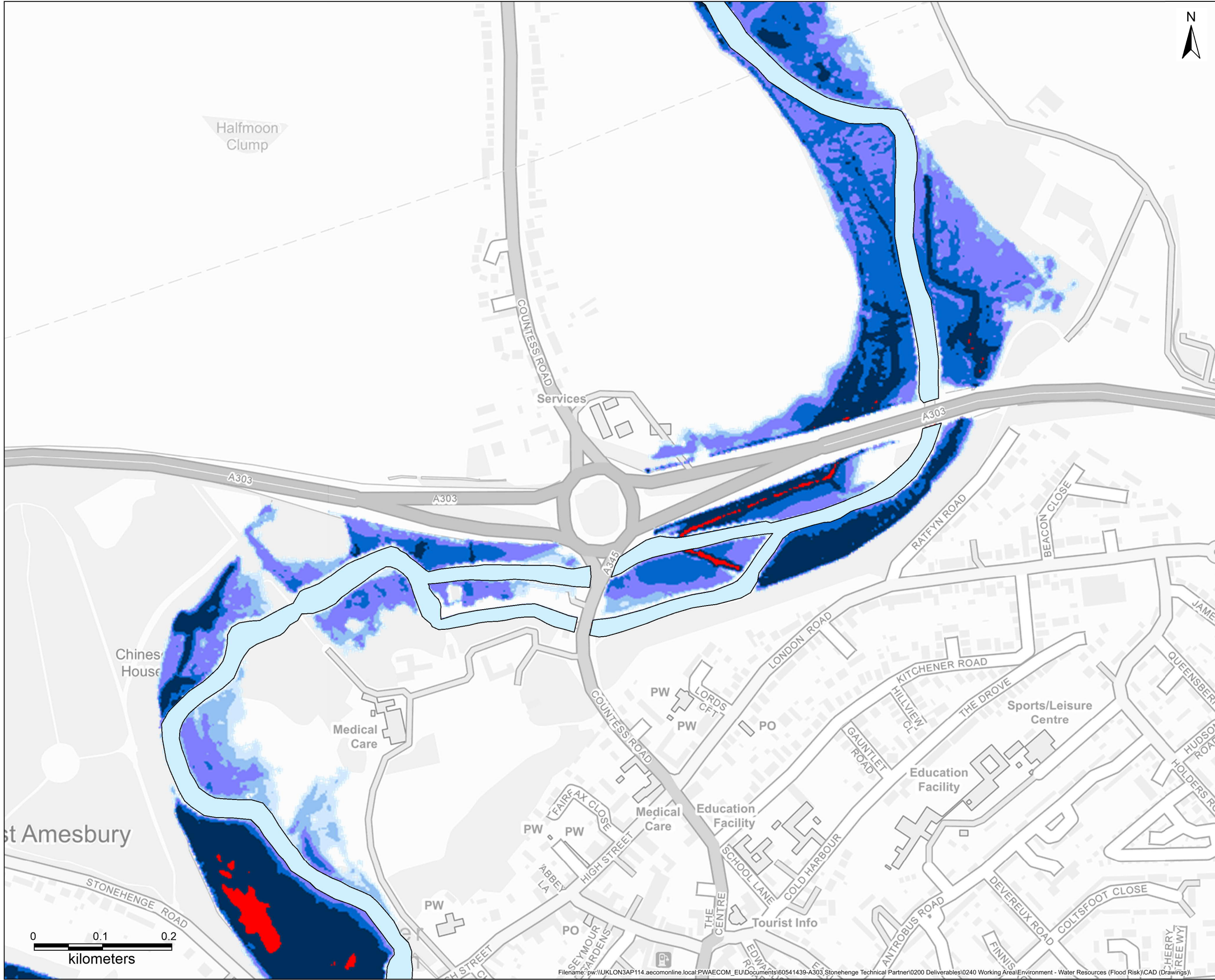
Parsonage Down

- 3.7 Section 2 of this document provides a direct comparison of results presented within the FRA (May 2019) and new results that take into account the most up to date climate change allowances, for the Till catchment.
- 3.8 Results presented in Section 2 demonstrate that key commentary and conclusions relating to flood risk associated with Parsonage Down presented within the FRA (May 2019) remain valid and unchanged.
- 3.9 Results are also presented for the 'upper' peak river flow allowance as a sensitivity test, to assess the Scheme impact at Parsonage Down within a more extreme change scenario. Results show that the Scheme drainage solution operates effectively when the 'upper' allowances are applied.

Technical Note



Appendix A River Avon Flood Mapping



NOTES / LEGEND

Flood Depth

0.00m to 0.01m
0.01m to 0.15m
0.15m to 0.30m
0.30m to 0.60m
0.60m to 0.90m
0.90m to 1.50m
1.50m to 2.00m
>2.00m

Modelled Baseline Scheme Elements

River Avon



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Purpose of issue: DRAFT

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Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE A-1 RIVER AVON MODELLED 1% AEP + 56% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO

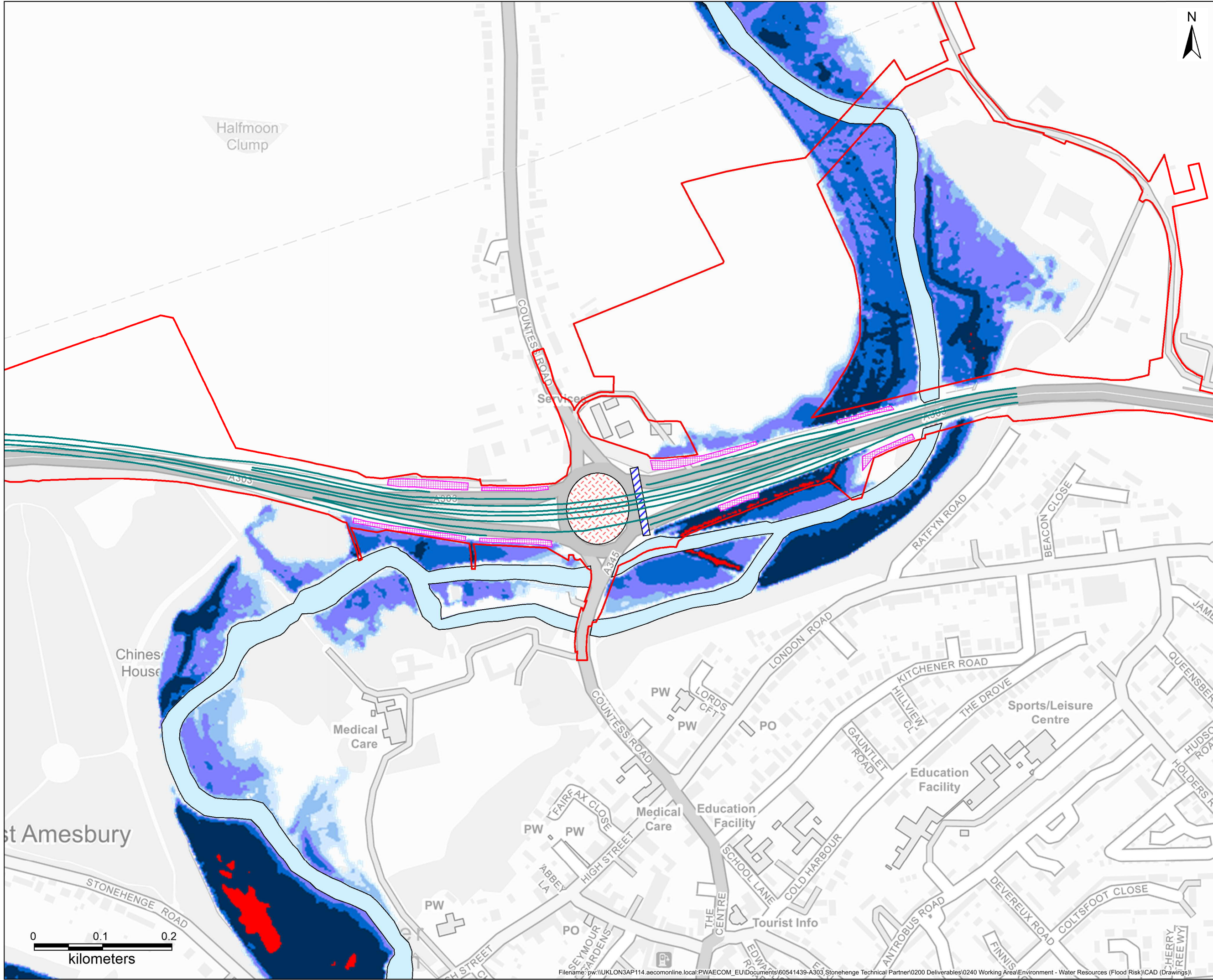
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SCHEME WIDE DR HD 0003		Location Type Role Number	



NOTES / LEGEND

Flood Depth

0.00m to 0.01m
0.01m to 0.15m
0.15m to 0.30m
0.30m to 0.60m
0.60m to 0.90m
0.90m to 1.50m
1.50m to 2.00m
>2.00m

Modelled Proposed Scheme Elements

Highway Drainage Ponds
Countess Roundabout Infill
Pedestrian Subway Removed
Proposed A303 realignment
River Avon
Proposed Scheme Boundary

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Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE A-2 RIVER AVON MODELLED 1% AEP + 56% CLIMATE CHANGE MAXIMUM FLOOD DEPTH PROPOSED SCENARIO

Designed RH	Drawn PR	Checked WM	Approved BM	Date SEP 2021
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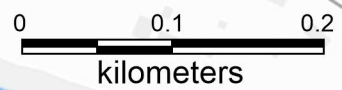
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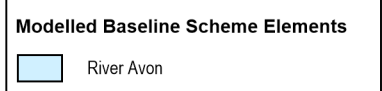
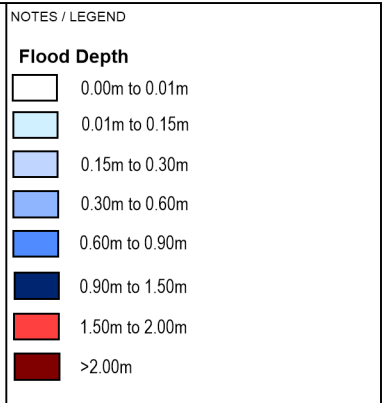
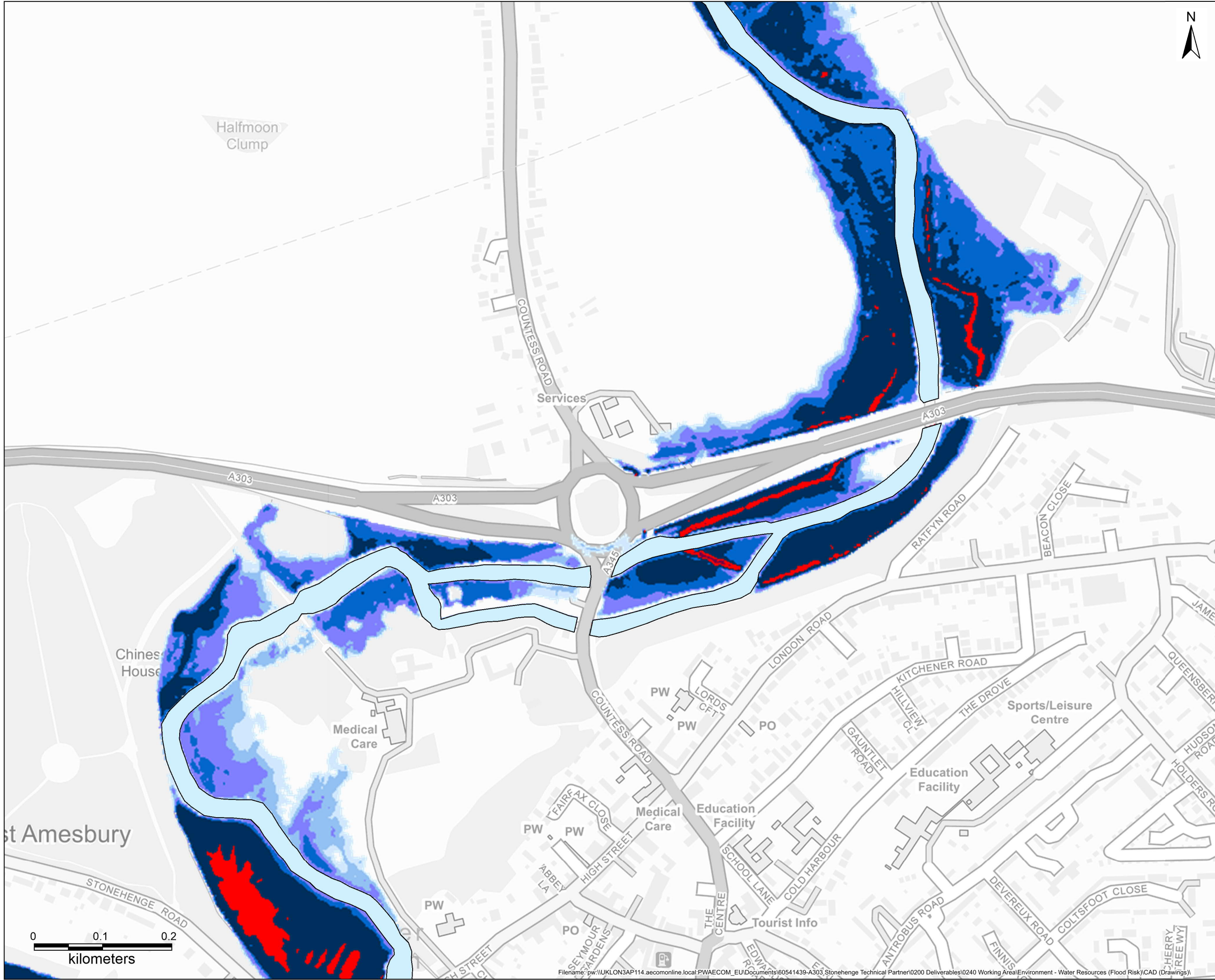
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SCHEME WIDE DR HD 0003		Location Type Role Number	





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Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE A-3 RIVER AVON MODELLED 1% AEP + 102% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO

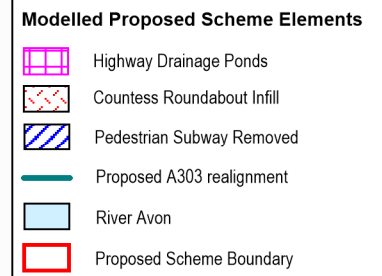
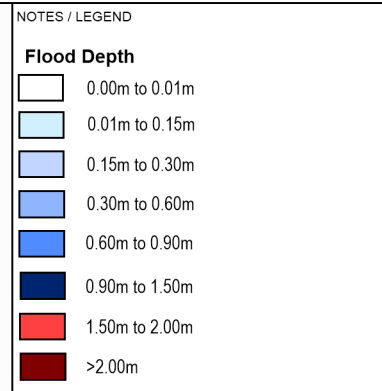
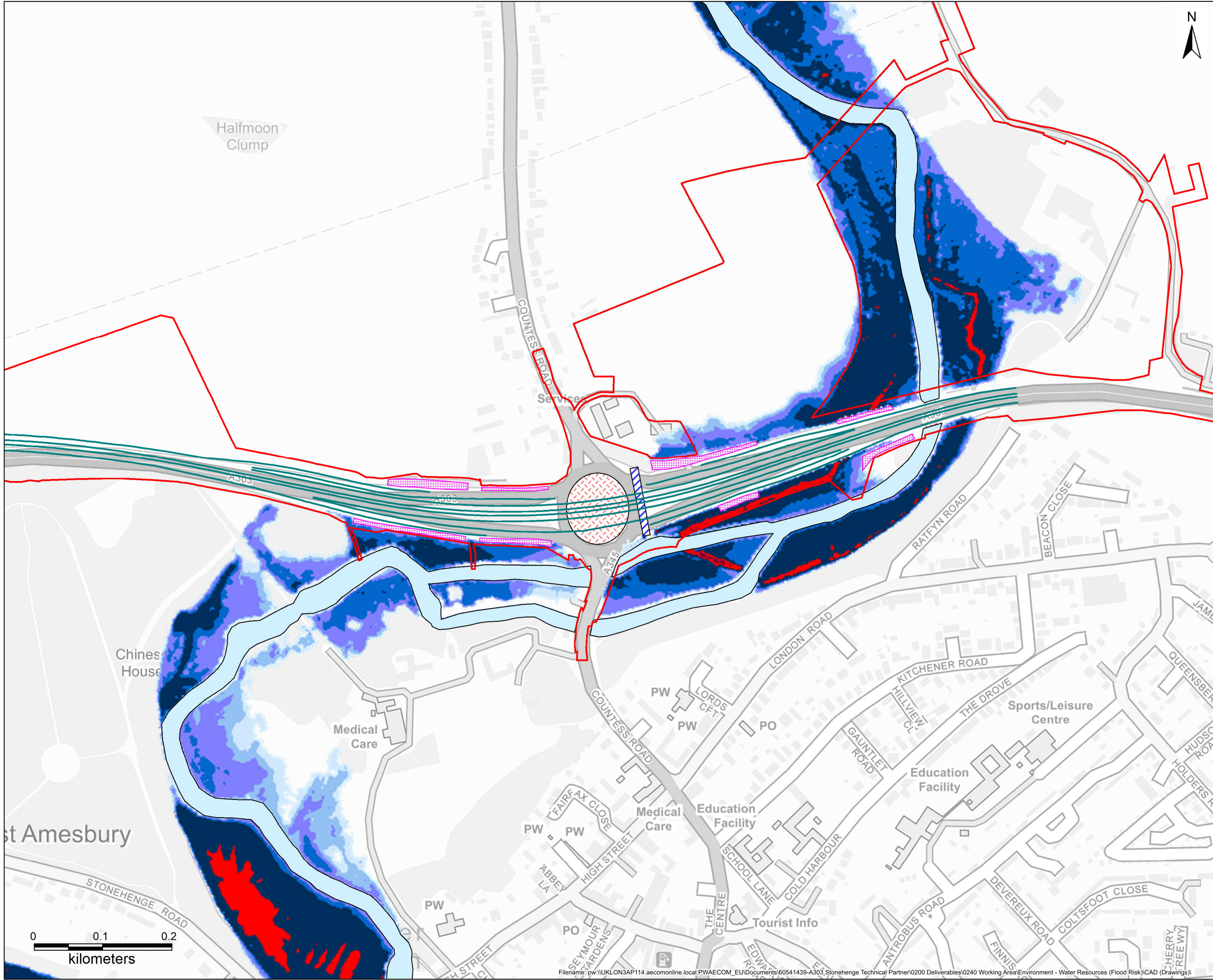
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Scheme Wide: DR	Volume: GEN
Location: Type Role Number	Rev: 01



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Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE A-4 RIVER AVON MODELLED 1% AEP + 102% CLIMATE CHANGE MAXIMUM FLOOD DEPTH PROPOSED SCENARIO

Designed	Drawn	Checked	Approved	Date
RH	PR	WM	BM	SEP 2021

Internal Project No: 60547200

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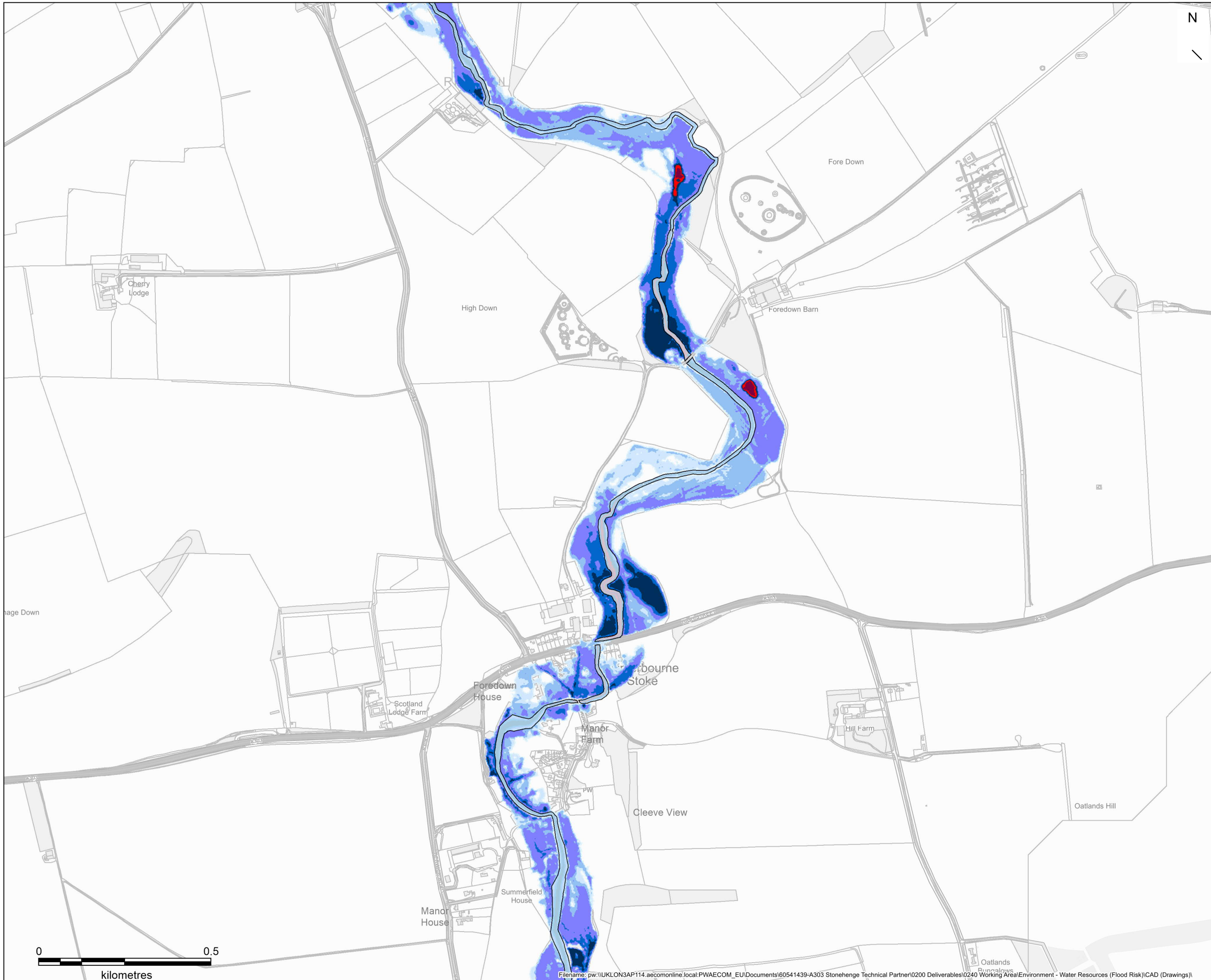
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Scheme Wide: DR	Volume: GEN
Location: Type Role Number	Rev: 01

Technical Note



Appendix B River Till Flood Mapping



NOTES / LEGEND

Flood Depth

0.00m to 0.01m
0.01m to 0.15m
0.15m to 0.30m
0.30m to 0.60m
0.60m to 0.90m
0.90m to 1.50m
1.50m to 2.00m
>2.00m

Modelled Baseline Scheme Elements

River Till

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Purpose of issue
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Client
Highways England



Project Title
A303 AMESBURY TO BERWICK DOWN

Drawing Title
**FIGURE B-1
RIVER TILL
MODELLED 1% AEP + 56% CLIMATE CHANGE
MAXIMUM FLOOD DEPTH
BASELINE SCENARIO**

Designed	Drawn	Checked	Approved	Date
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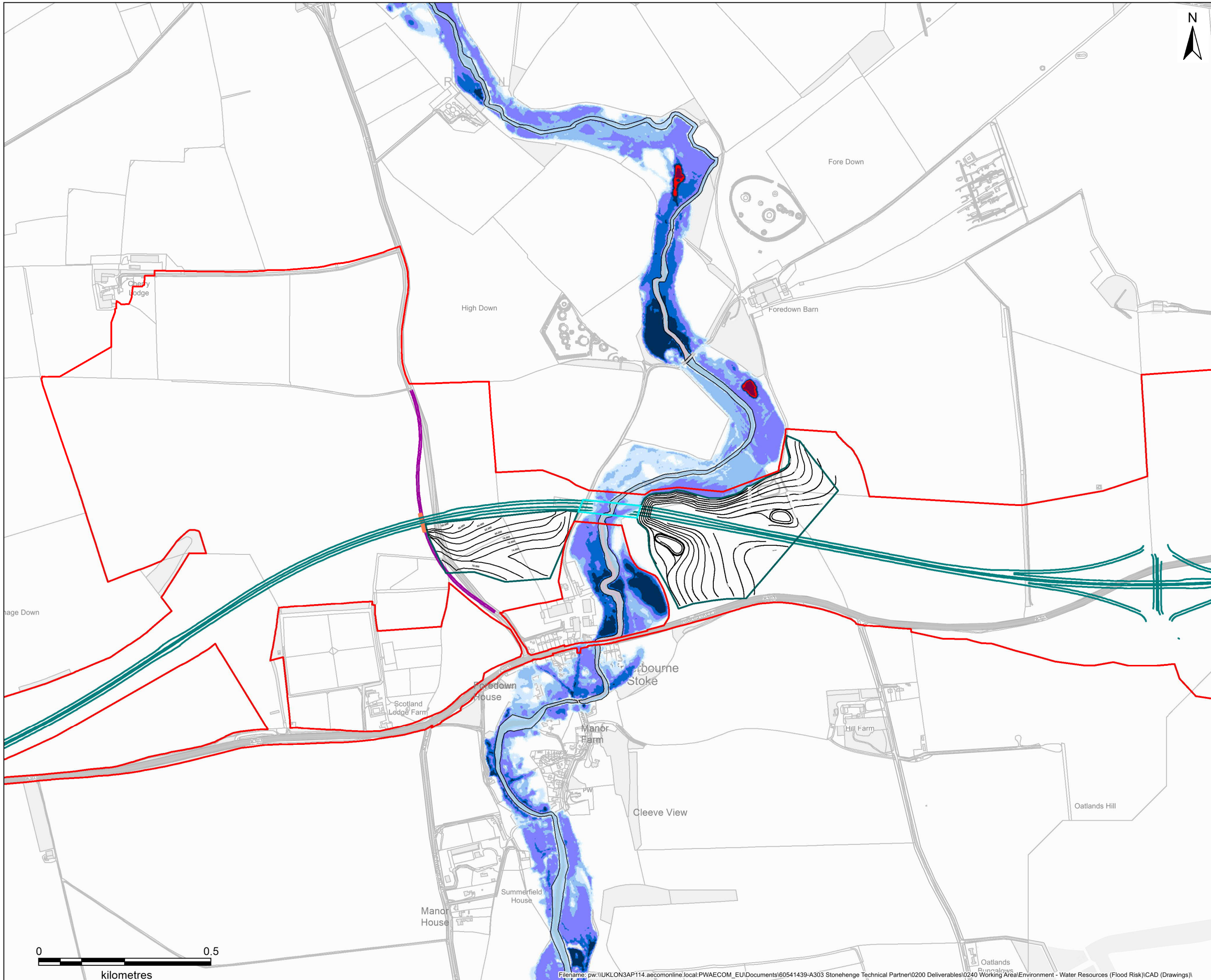
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Location	Type	Role	Number



NOTES / LEGEND

Flood Depth

0.00m to 0.01m
0.01m to 0.15m
0.15m to 0.30m
0.30m to 0.60m
0.60m to 0.90m
0.90m to 1.50m
1.50m to 2.00m
>2.00m

Modelled Proposed Scheme Elements

A303 Reprofitting
Proposed A303 realignment
Proposed B3083 realignment
A303 Open Span Bridge
Proposed B3083 underpass
River Till
Proposed Scheme Boundary

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Revision Details	By	Check	Date	Suffix

Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE B-2 RIVER TILL MODELLED 1% AEP + 56% CLIMATE CHANGE MAXIMUM FLOOD DEPTH PROPOSED SCENARIO

Designed: RH	Drawn: PR	Checked: WM	Approved: BM	Date: SEP 2021
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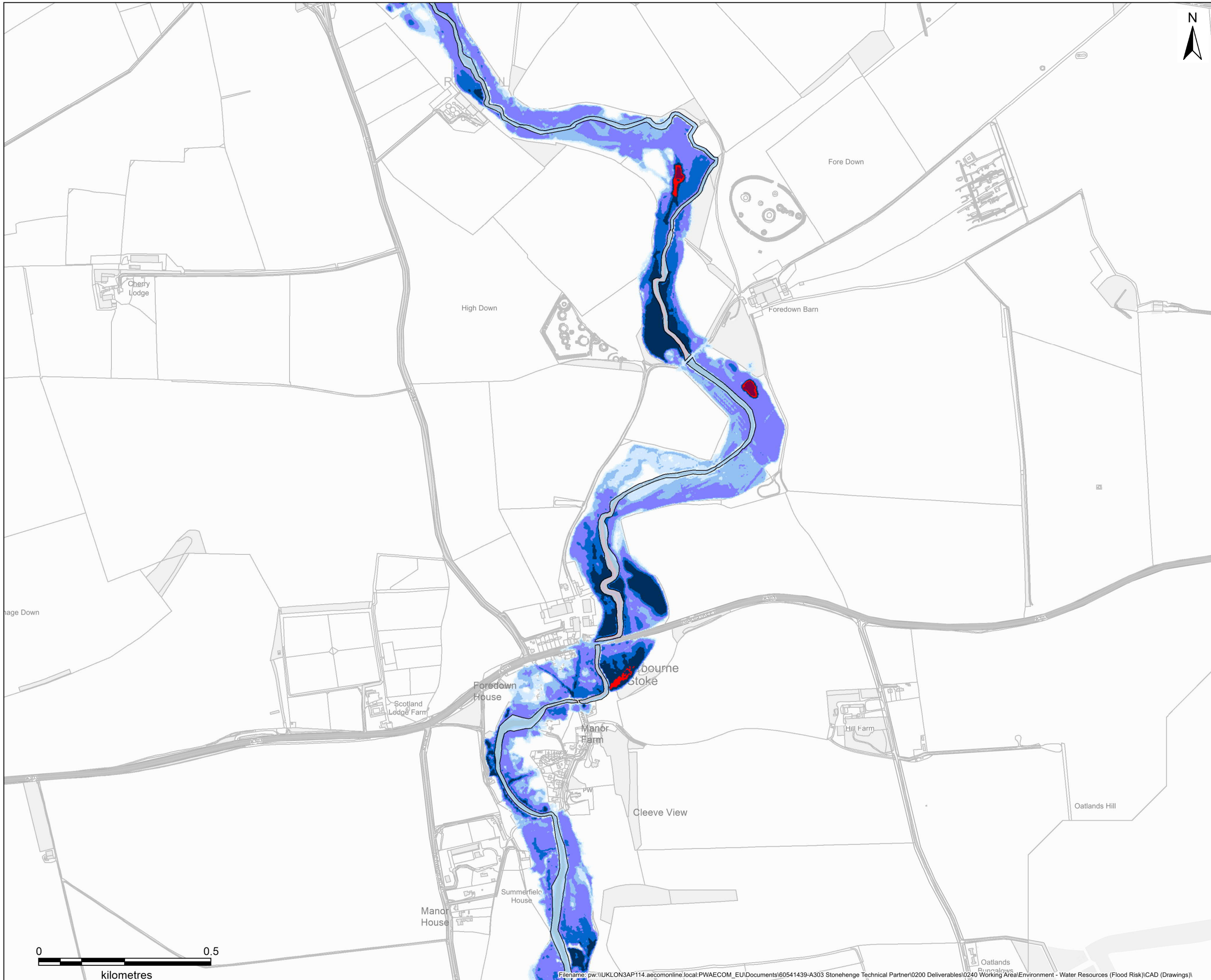
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Drawing Number: HE551506	Originator: AMW	Volume: GEN	Rev: 01
SCHEME WIDE	DR	HD	0000
Location	Type	Role	Number





NOTES / LEGEND

Flood Depth

- 0.00m to 0.01m
- 0.01m to 0.15m
- 0.15m to 0.30m
- 0.30m to 0.60m
- 0.60m to 0.90m
- 0.90m to 1.50m
- 1.50m to 2.00m
- >2.00m

Modelled Baseline Scheme Elements

- River Till

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Revision Details		By	Check	Date	Suffix

Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE B-3 RIVER TILL MODELLED 1% AEP + 102% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO

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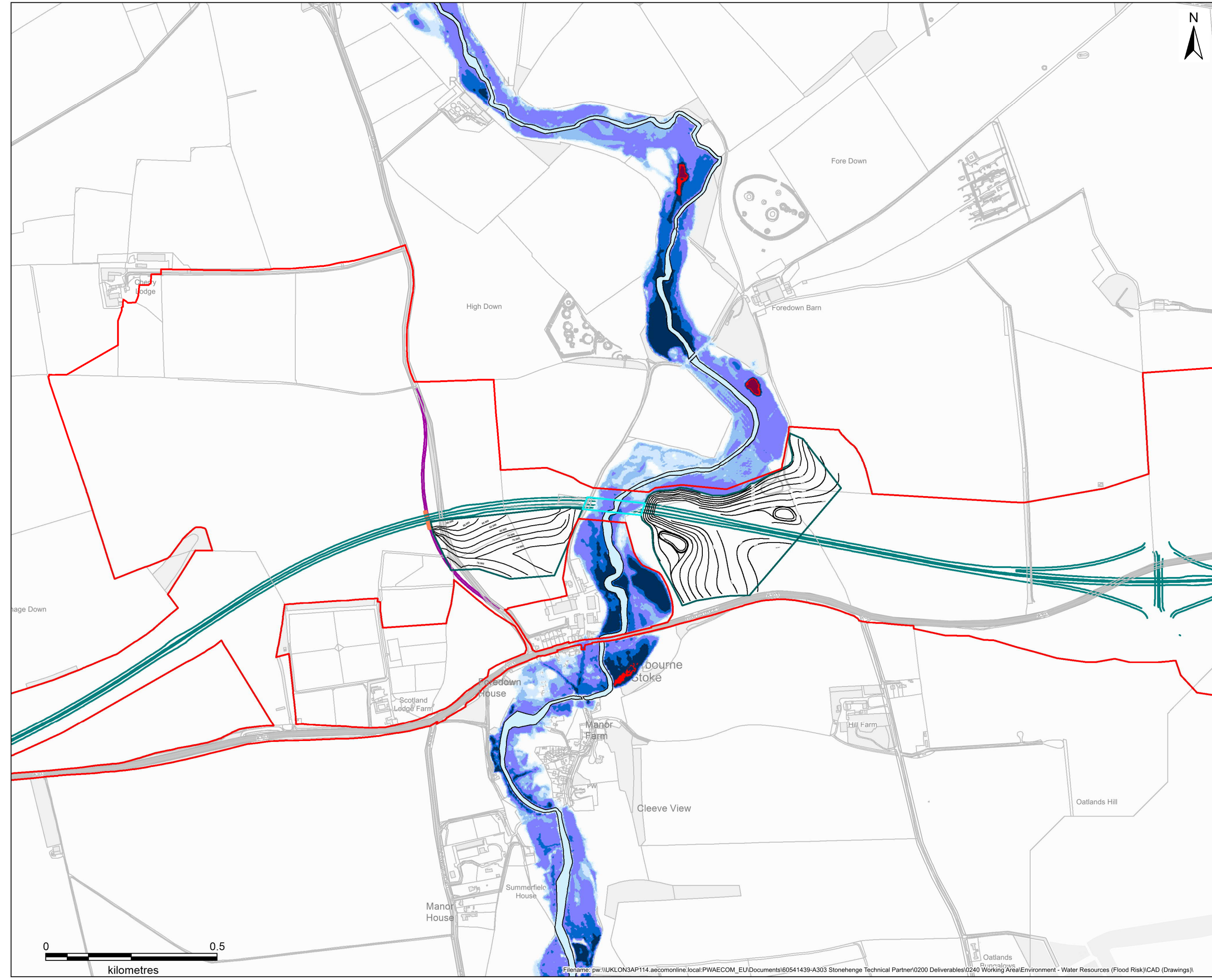
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Drawing Number	Highways England PIN	Originator	Volume	Rev
HE551506	AMW	GEN	01	01

SCHEME WIDE	DR	HD	0000

Location | Type | Role | Number

Filename: p:\UKLON3AP114.aecomonline.local\PWAECOM_EU\Documents\60541439-A303 Stonehenge Technical Partner\0200 Deliverables\0240 Working Area\Environment - Water Resources (Flood Risk)\CAD (Drawings)



NOTES / LEGEND

Flood Depth

0.00m to 0.01m
0.01m to 0.15m
0.15m to 0.30m
0.30m to 0.60m
0.60m to 0.90m
0.90m to 1.50m
1.50m to 2.00m
>2.00m

Modelled Proposed Scheme Elements

A303 Reprofitting
Proposed A303 realignment
Proposed B3083 realignment
A303 Open Span Bridge
Proposed B3083 underpass
River Till
Proposed Scheme Boundary

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Purpose of issue: DRAFT

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE B-4 RIVER TILL MODELLED 1% AEP + 102% CLIMATE CHANGE MAXIMUM FLOOD DEPTH PROPOSED SCENARIO

Designed RH	Drawn PR	Checked WM	Approved BM	Date SEP 2021
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Drawing Number HE551506	Originator AMW	Volume GEN	Rev 01
SCHEME WIDE	DR	HD	0000
Location	Type	Role	Number

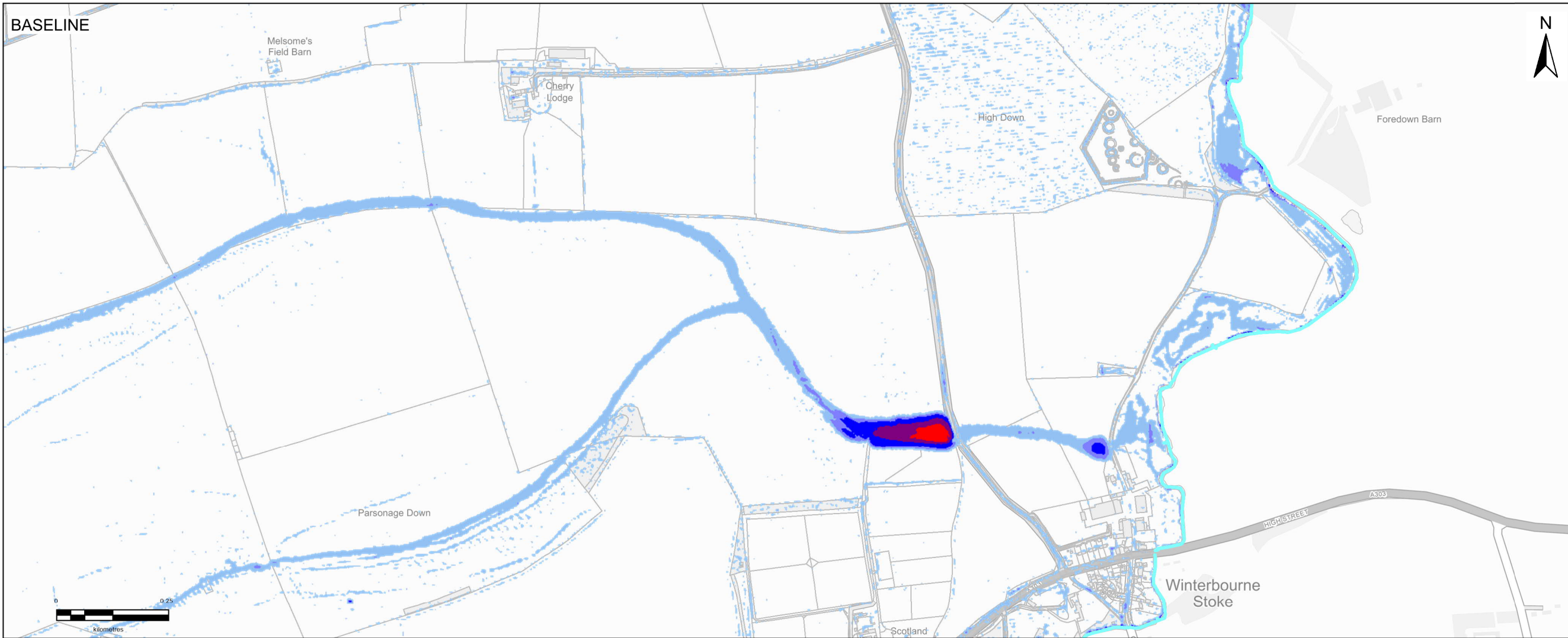


Technical Note



Appendix C Parsonage Down Surface Water Flood Mapping

BASELINE



NOTES / LEGEND

Flood Depth

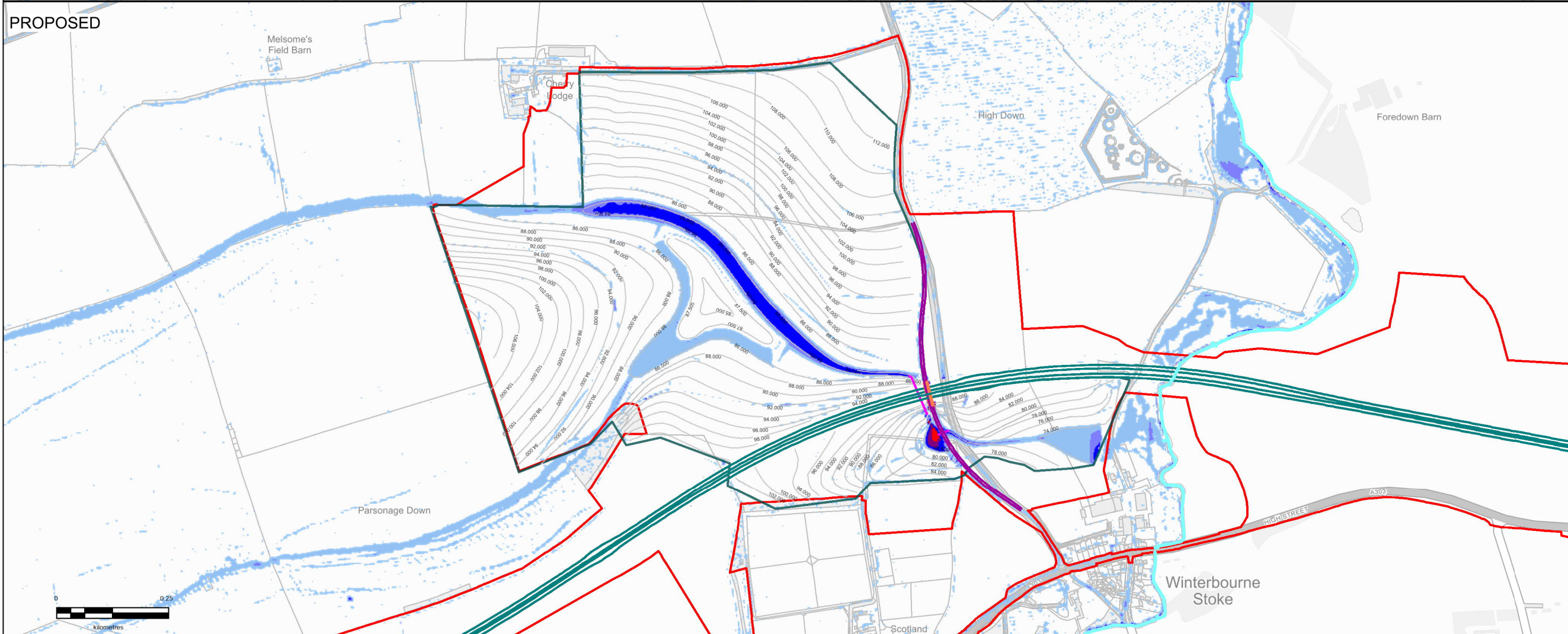
- 0.00m to 0.05m
- 0.05m to 0.25m
- 0.25m to 0.50m
- 0.50m to 1.00m
- 1.00m to 1.50m
- >1.50m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofiling
- Drainage Culvert
- River Till



PROPOSED



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Revision Details		By	Check	Date	Suffix

Purpose of issue
FINAL

Client
Highways England



Project Title
A303 AMESBURY TO BERWICK DOWN

Drawing Title
**FIGURE C-1
SURFACE WATER 6HR EVENT
MODELLED 1% AEP + 58% CLIMATE CHANGE
MAXIMUM FLOOD DEPTH
BASELINE SCENARIO/PROPOSED SCENARIO**

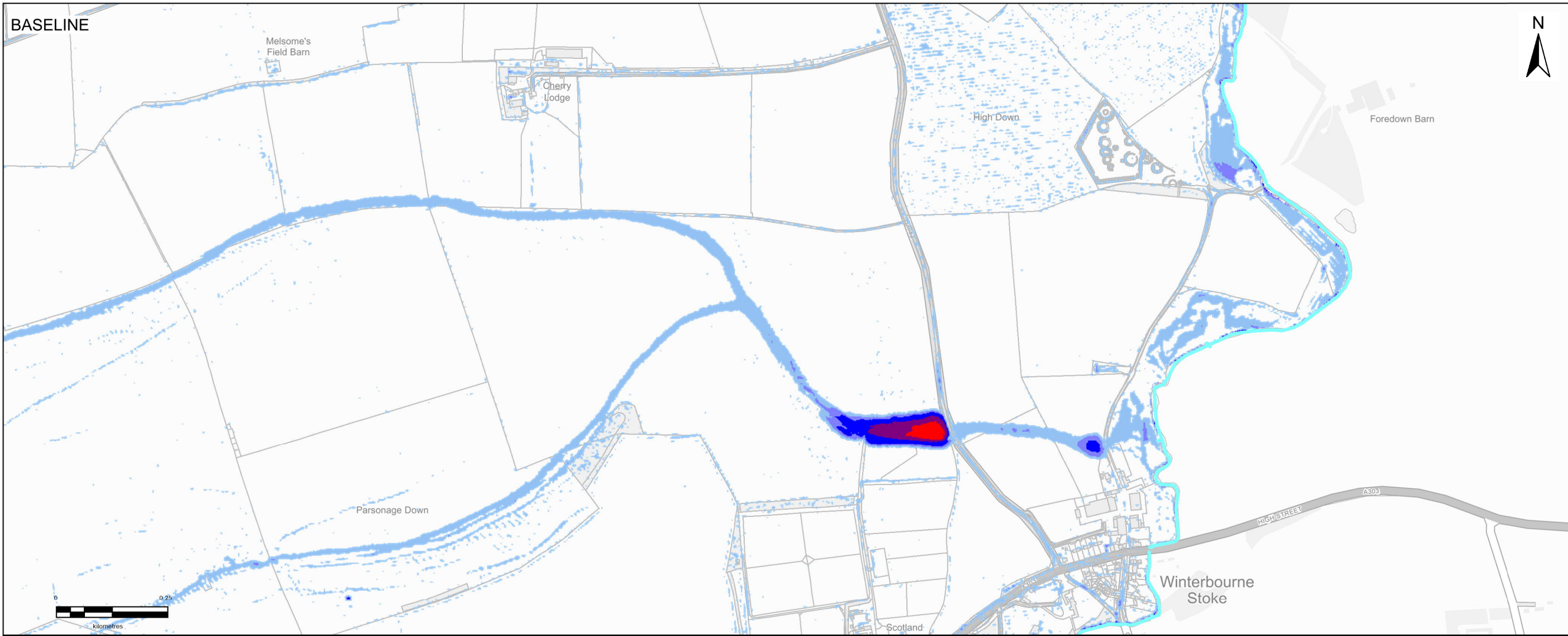
Designed	Drawn	Checked	Approved	Date
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SCHEME WIDE	DR	HD	0028
Location	Type	Role	Number



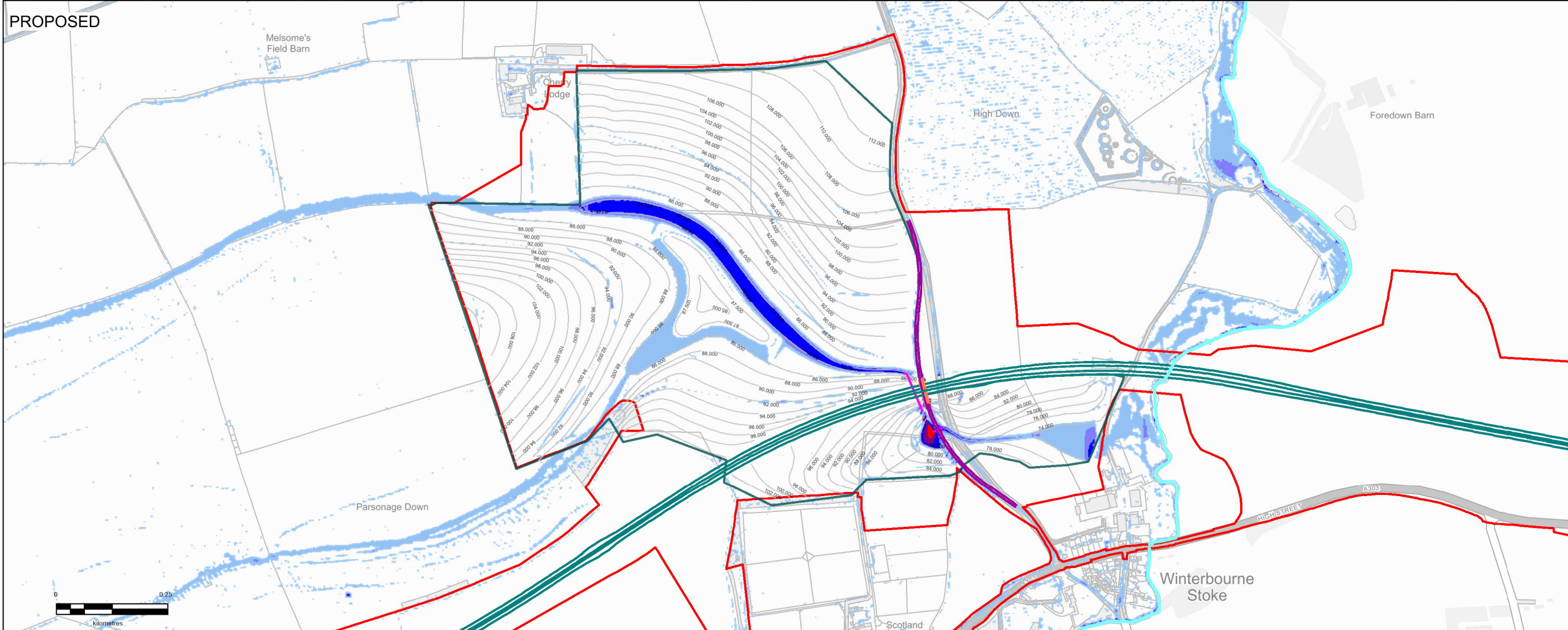
NOTES / LEGEND

Flood Depth

- 0.00m to 0.05m
- 0.05m to 0.25m
- 0.25m to 0.50m
- 0.50m to 1.00m
- 1.00m to 1.50m
- >1.50m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofiling
- Drainage Culvert
- River Till



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Purpose of issue: FINAL

Client: Highways England

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE C-2 SURFACE WATER 12HR EVENT MODELLED 1% AEP + 58% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO/PROPOSED SCENARIO

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RH	FR	WM	BM	SEP 2021

Internal Project No. 60547200

Scale @ A3: 1:10,000 | Zone: SW

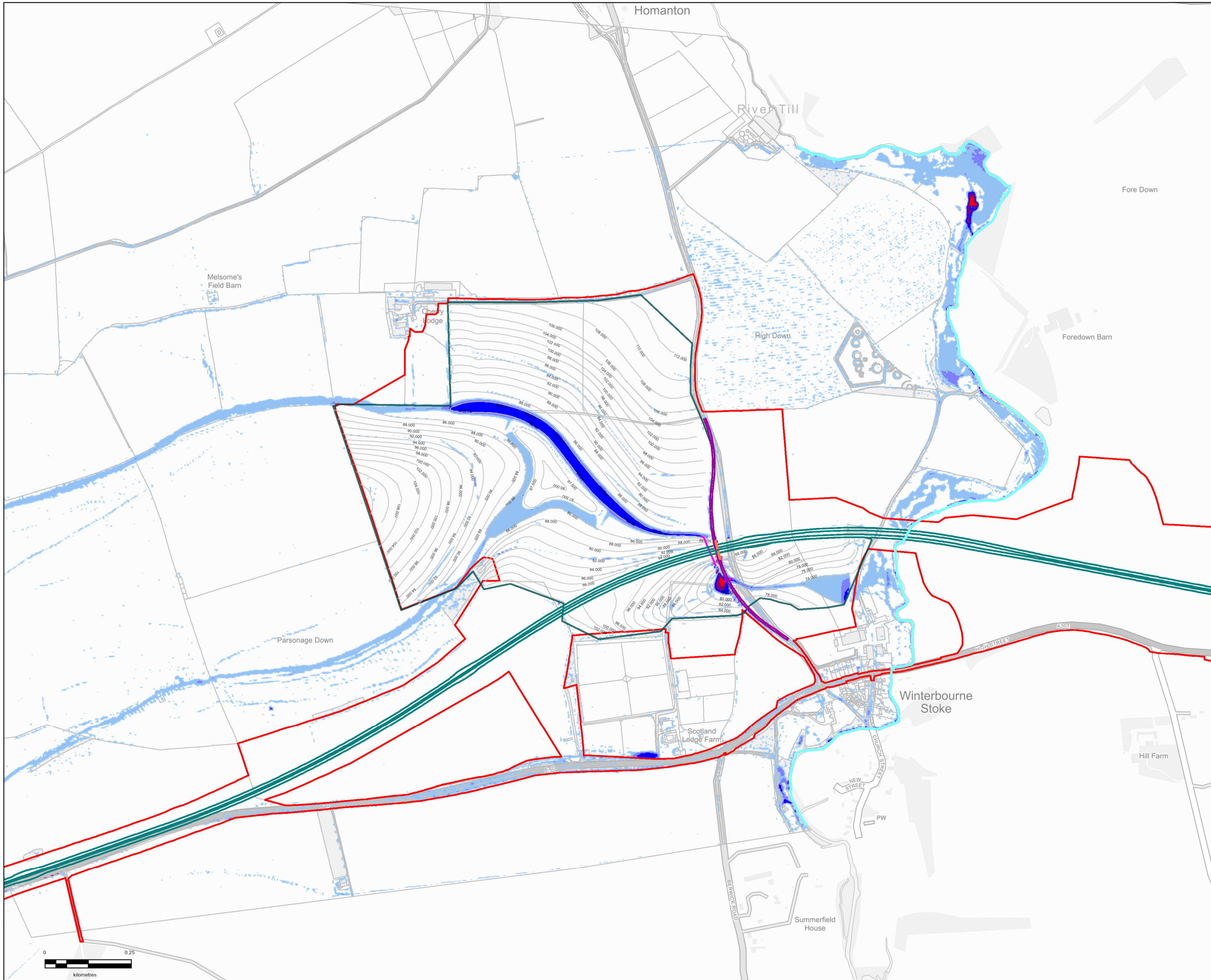
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AECOM + mca + WSP

Drawing Number	Originator	Volume	Rev
HE551506	AMW	GEN	01

SCHEME WIDE	DR	HD	0028
Location	Type	Role	Number



NOTES / LEGEND

Depth Difference

> -1.00m
-0.50m to -1.00m
-0.20m to -0.50m
-0.05m to -0.20m
-0.05m to +0.05m
+0.05m to +0.20m
+0.20m to +0.50m
+0.50m to +1.00m
>+1.00m

Modelled Proposed Scheme Elements

A303 Road Realignment
B3083 Road Realignment
Proposed B3083 underpass
Area of Reprofiting
Proposed Culvert
Proposed Scheme Boundary
River Till

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Purpose of issue: FINAL



Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: FIGURE C-3 SURFACE WATER 6HR EVENT MODELLED 1% AEP + 50% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO/PROPOSED 50% BLOCKAGE SCENARIO

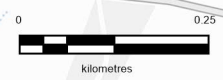
Designed: RH	Drawn: PR	Checked: WM	Approved: BM	Date: SEP 2021
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Scale @ A3: 1:10,000 | Zone: SW

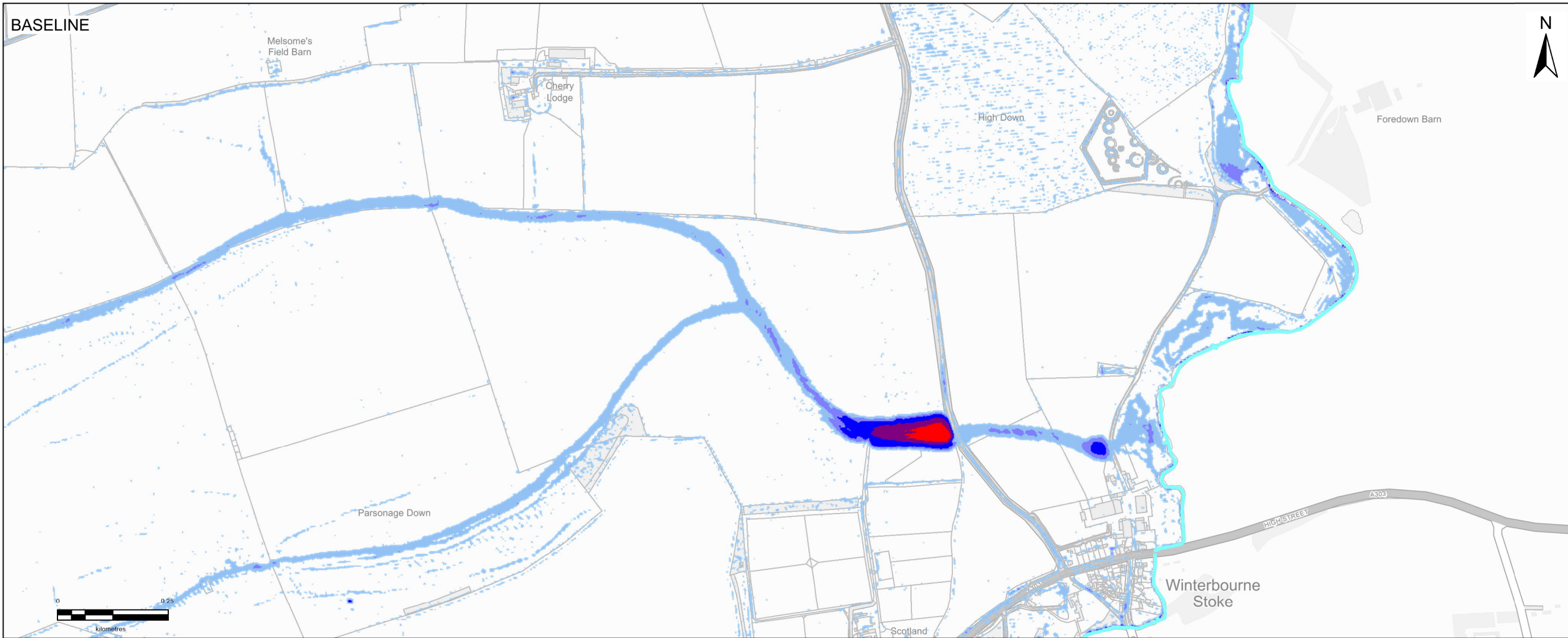
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SCHEME WIDE	DR	HD	0006
Location	Type	Role	Number



BASELINE



NOTES / LEGEND

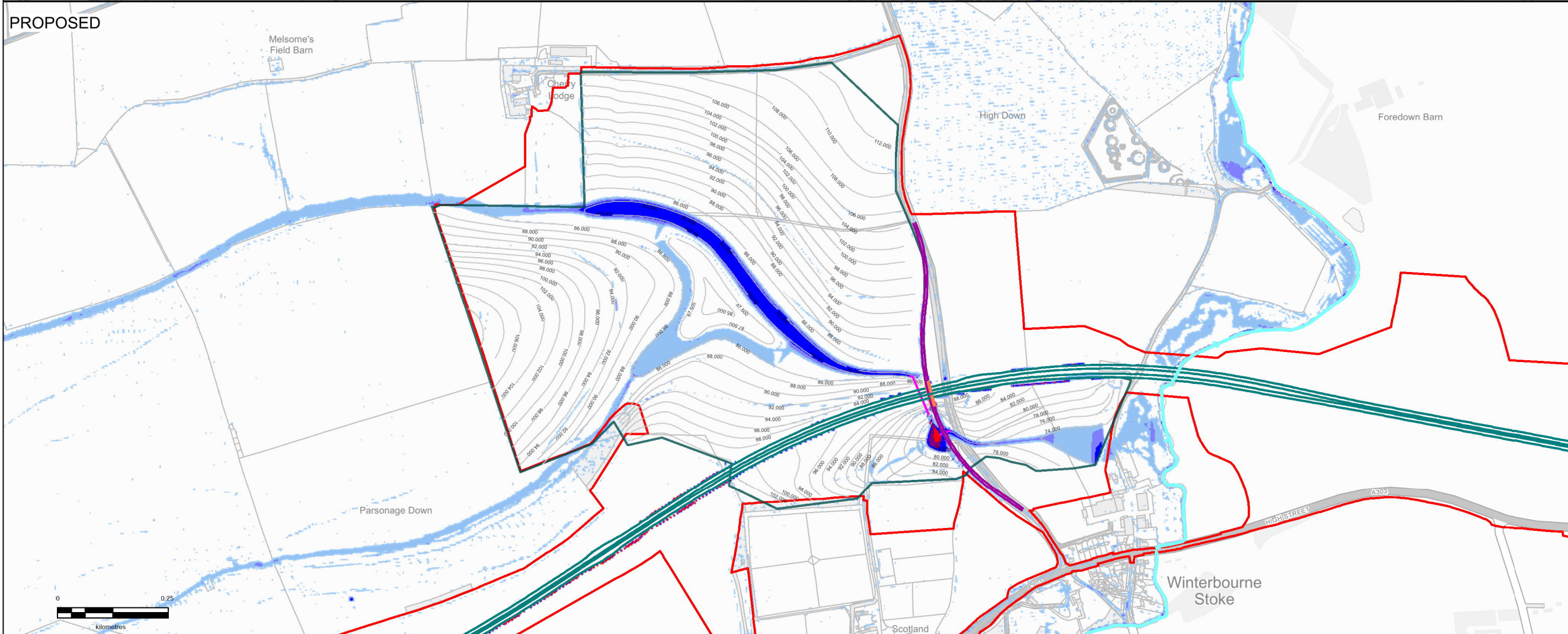
Flood Depth

- 0.00m to 0.05m
- 0.05m to 0.25m
- 0.25m to 0.50m
- 0.50m to 1.00m
- 1.00m to 1.50m
- >1.50m

Modelled Proposed Scheme Elements

- A303 Road Realignment
- B3083 Road Realignment
- Proposed B3083 underpass
- Area of Reprofiling
- Drainage Culvert
- River Till

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Revision Details	By	Check	Date	Suffix

Purpose of issue: **FINAL**

Client: **Highways England**

Project Title: **A303 AMESBURY TO BERWICK DOWN**

Drawing Title: **FIGURE C-4 SURFACE WATER 6HR EVENT MODELLED 1% AEP + 102% CLIMATE CHANGE MAXIMUM FLOOD DEPTH BASELINE SCENARIO/PROPOSED SCENARIO**

Designed	Drawn	Checked	Approved	Date
RH	FR	WM	BM	SEP 2021

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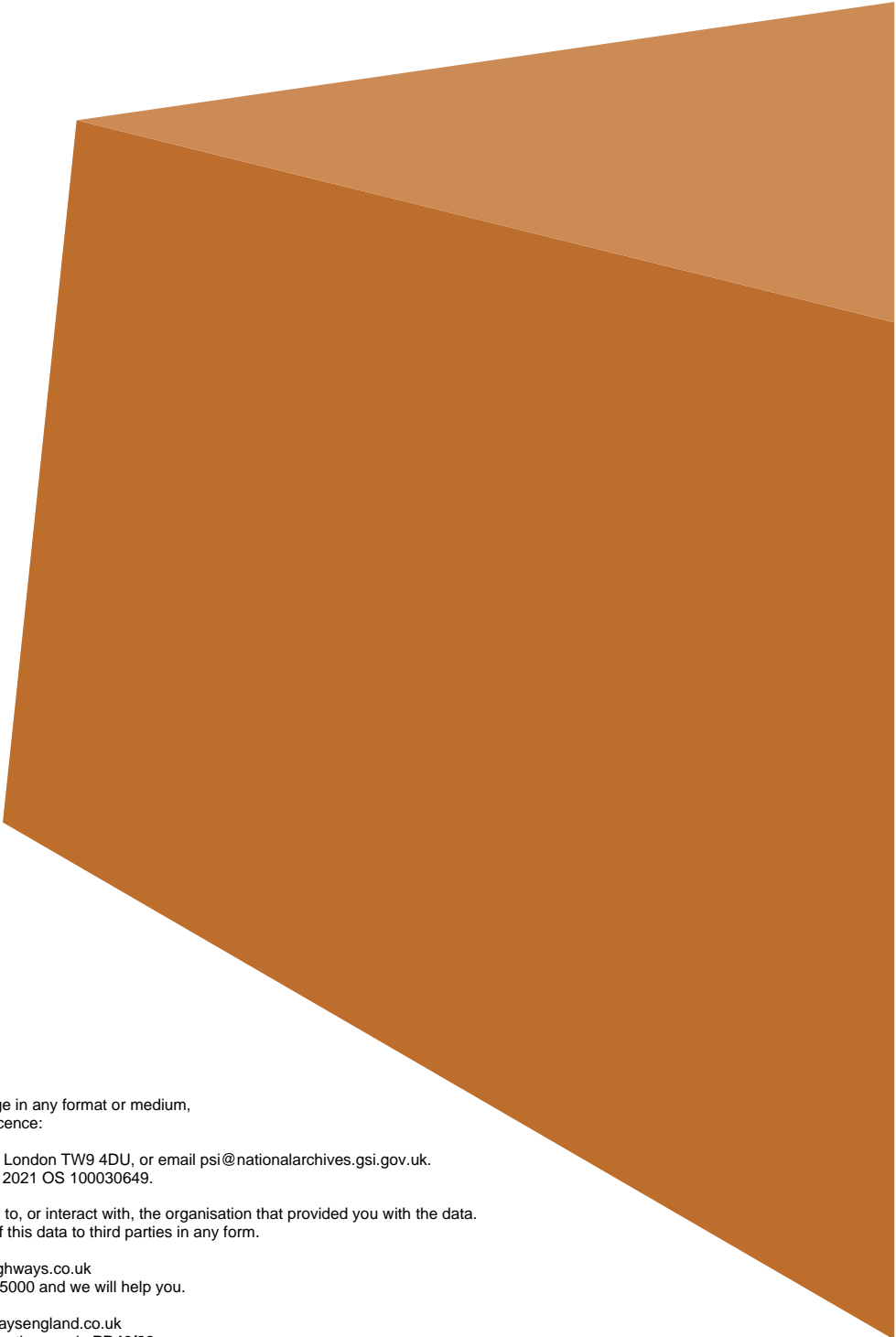
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AmW
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Drawing Number	Originator	Volume	Rev
HE551506	AMW	GEN	01

SCHEME WIDE	DR	HD	0028
Location	Type	Role	Number



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