A66 Northern Trans-Pennine Project

4.5 Statement of Common Ground Environment Agency (Rev 5)

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4.5 STATEMENT OF COMMON GROUND WITH THE ENVIRONMENT AGENCY

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STATEMENT OF COMMON GROUND

This Statement of Common Ground has been prepared and agreed by (1) National Highways Limited and (2) the Environment Agency

Signed [redacted]

Monica Corso-Griffiths
Head of Design & DCO

On behalf of National Highways

Date: 26/05/23

Signed [redacted]

Philip Carter
Sustainable Places Planning Specialist

On behalf of the Environment Agency

Date: 26/05/23

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1 Introduction

1.1 Purpose of this document

1.1.1 This Statement of Common Ground ("SoCG") has been prepared in respect of the proposed A66 Northern Trans-Pennine ("the Application") made by National Highways Limited ("National Highways") to the Secretary of State for Transport ("Secretary of State") for a Development Consent Order ("the Order") under section 37 of the Planning Act 2008 ("PA 2008").

1.1.2 This SoCG seeks to summarise and explain the respective parties' positions on issues but does not seek to replicate in full information which is available elsewhere within the Application documents. All Application documents are available on the Planning Inspectorate website.

1.1.3 The SoCG has been produced to confirm to the Examining Authority where agreement has been reached between the parties to it, and where agreement has not been reached. SoCGs are an established means in the planning process of allowing all parties to identify and so focus on specific issues that may need to be addressed during the examination.

1.2 Parties to this Statement of Common Ground

1.2.1 This SoCG has been prepared by National Highways as the Applicant. It has been shared with the Environment Agency (EA) for comment prior to the submission of the DCO, at DCO submission, in advance of Deadlines 3, 5, 8 and 9. It has been agreed with the Environment Agency for submission at Deadline 9.

1.2.2 The Applicant has set out the detail of the issues raised by the Environment Agency to date and each of the SoCG parties' respective positions. This is intended to assist the Examining Authority in understanding where discussions have reached.

1.2.3 National Highways (formerly Highways England) became the Government-owned Strategic Highways Company on 1 April 2015. It is the highway authority in England for the strategic road network and has the necessary powers and duties to operate, manage, maintain and enhance the network. Regulatory powers remain with the Secretary of State.

1.2.4 The responsibilities of the EA are outlined on their website at https://www.gov.uk/government/organisations/environment-agency/about and are summarised below: -

- managing the risk of flooding from main rivers, reservoirs and the sea.
- regulating major industry and waste.

- treatment of contaminated land.
- water quality and resources.
- fisheries.
- inland river, estuary and harbour navigation; and
- conservation and ecology of the aquatic environment.

1.3 Terminology

1.3.1 In the table in the Issues section of this SoCG:

- “Agreed” indicates area(s) of agreement between the Applicant and the EA

1.3.2 It can be assumed that any matters not specifically referred to in the Issues section of this SoCG are not of material interest or relevance to the EA, and therefore have not been the subject of any discussions between the parties.

2 Record of Engagement

2.1.1 A summary of the key meetings and correspondence that has taken place between National Highways and the EA in relation to the Application is outlined in Table 2.1.

Table 2.1 – Record of Engagement

Date	Form of correspondence	Key topics discussed and key outcomes
08.02.2021	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on the Evidence Plan, scheme overview and the proposed baselines surveys, modelling and assessment to underpin the HRA.
11.02.2021	Online Meeting	Meeting of the Ecological Impact Assessment TWG with the EA in Attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on the Evidence Plan, scheme overview, and the proposed baselines surveys, modelling, and assessment to underpin the EcIA.
11.02.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on the Evidence Plan, scheme overview and assessment methodology.
25.02.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on the Evidence Plan, environment surveys, approach to mitigation and environmental designated funds.
02.03.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on works to be completed, watercourse crossings and key SW receptors overview.
02.03.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on works to be completed and key GW receptors overview.
16.03.2021	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on Ornithology Strategy, bats and red squirrels.

Date	Form of correspondence	Key topics discussed and key outcomes
18.03.2021	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussion on site and proximity to schemes, biodiversity survey strategy and HRA Baseline, baseline surveys strategy and introduction to SAC fluvial geomorphology.
25.03.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on the Evidence Plan, project updates, Warcop AONB, Trout Beck and approach to statutory consultation and PEI Report.
22.04.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on programme updates, design updates, the Evidence Plan and sifting matrix.
29.04.2021	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on badger bait marking, otter halt monitoring, MoRPH, and air quality and Affected Road Network (ARN).
06.05.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on progress, flood modelling overview, survey updates, DCO process and designated funds.
06.05.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on GW abstraction, assessment area and attenuation ponds.
27.05.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on the Evidence Plan and a scheme-by-scheme design walkthrough.
10.06.2021	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on bat surveys (overview of methods).
15.06.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on progress, works to be completed and design options.
15.06.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application

Date	Form of correspondence	Key topics discussed and key outcomes
		Document Number 3.4)). Meeting included discussions on progress, ongoing work and focus points.
24.06.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on design updates, the approach to mitigation, the environmental designated funds process, the Scoping Report and the Evidence Plan.
08.07.2021	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussion on proposed route alternatives, site Trout Beck geomorphology modelling, HRA programme and documentation and Sleastonhow restoration.
22.07.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussion on environmental designated funds.
10.08.2021	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on ornithology, bats, mammals, terrestrial inverts, river corridor survey and macrophytes, aquatic inverts, fish surveys, white-clawed surveys and key PEI Report findings.
11.08.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on study area, key findings from the PEI Report, potential impacts, design mitigation and enhancement and potential significant effects.
12.08.2021	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on updates on surveys, HRA documentation programme, HRA screening summary and scheme details.
26.08.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on EIA Scoping, PEI Report status and assessment process, statutory consultation, design updates, Appleby to Brough and Rokeby.
02.11.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting includes discussions on PEI Report recap, feedback from statutory consultation and an update on ongoing works.
02.11.2021	Online Meeting	Meeting of the Water TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application

Date	Form of correspondence	Key topics discussed and key outcomes
		Document Number 3.4)). Meeting includes discussions on PEI Report recap, feedback from statutory consultation and update on ongoing works.
03.11.2021	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on survey/assessment updates, response to feedback and requests for specific design elements.
11.11.2021	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on habitats, reptiles, ornithology, bats, mammals, freshwater ecology and feedback following statutory consultation period.
25.11.2021	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on programme updates, design change updates and statutory consultation updates.
02.12.2021	Online Meeting	Meeting to discuss issues around Warcop with the EA. Meeting included discussions on flood modelling and project updates.
13.01.2022	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on design change and supplementary consultation, approach to environmental mitigation and response to statutory consultation design change.
26.01.2022	Online Meeting	Meeting between the EA and the IPT at the regular Ecological Impact Assessment TWG. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on surveys, construction mitigation methods, species specific updates, design mitigation and scheme-by-scheme mitigation.
26.01.2022	Online Meeting	Meeting of the Habitats Regulations Assessment TWG with the EA in attendance. (Matters discussed in the Technical Working Groups are included within ES Appendix 1.1: Evidence Plan (Application Document Number 3.4)). Meeting included discussions on survey updates, assessment updates, construction mitigation and methods, design mitigation and introduction / spread of INNS.
10.02.2022	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on project/programme updates and environmental mitigation approach.
10.03.2022	Online Meeting	Meeting between NE, EA, National Highways and A66 IPT to discuss issues around Warcop. Meeting included discussions on Warcop design.
11.03.2022	Online Meeting	Meeting between CCC, EA, National Highways and the Project Team discussing Water Modelling and joint working.

Date	Form of correspondence	Key topics discussed and key outcomes
		Meeting included discussions on Warcop, culverts, drainage ponds, designated funds and community engagement.
24.03.2022	Online Meeting	Meeting of the Statutory Environmental Bodies Focus Group with the EA in attendance. Meeting included discussions on Trout Beck, Warcop and Moor Beck.
04.04.2022	Online Meeting	Meeting between NE, EA, National Highways, CCC and A66 IPT to discuss issues around Warcop. Meeting included discussions on Warcop design and Trout Beck Crossing design.
26.04.2022	Online Meeting	Meeting between EA and National Highways. Introductory meeting to discuss the content of the SoCG. Agreed to diarise update session after submission of the DCO.
26.04.2022	Email	Email from Environment Agency on UKCP18 – updated rainfall allowances.
20.07.2022	Online Meeting	SoCG discussion to discuss approach to revising the SoCG.
03.08.2022	Online Meeting	Meeting between EA and National Highways to discuss flood mitigation and potential natural flood management (NFM) opportunities at Warcop
17.08.2022	Online Meeting	SoCG update session to review progress, full comments to be issued by 4 September. Issue of standard EA protective provisions also discussed. Area of groundwater survey also highlighted as possible area for further information. EA query on approach to modelling and on timescales for modelling post DCO.
18.08.2022	Online Meeting	Meeting between EA and National Highways to discuss hydraulic modelling and rainfall climate change allowance for the A66 NTP project.
13.09.2022	Online Meeting	Meeting between National Highways and the statutory environmental bodies to discuss the Environmental Management Plan (EMP) process.
28.09.2022	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.
26.10.2022	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.
04.11.2022	Online Meeting	Meeting between EA and National Highways to discuss EA's comments on the Environmental Management Plan (EMP).
23.11.2022	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.
07.12.2022	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.
12.12.2022	Online Meeting	Meeting between EA, the Lead Local Flood Risk Authorities (LLFAs) and National Highways to review outstanding drainage issues along the A66.
04.01.2023	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.
18.01.2023	Online Meeting	Meeting between EA and National Highways to discuss the content of the SoCG.

Date	Form of correspondence	Key topics discussed and key outcomes
20.01.2023	Email	Email from the Environment Agency containing draft of SoCG with Environment Agency's comments on their position on issues considered within the SoCG.
01.02.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the ongoing hydraulic modelling review including estimated timelines for the hydraulic modelling reviews and prioritisation to ensure the most critical schemes are addressed first. Progressive assurance opportunities were discussed with potential for National Highways and the Environment Agency's 3rd party reviewer to liaise direct. Protective Provisions progress update.
09.02.2023	Online Meeting	Meeting between National Highways and the statutory environmental bodies (SEBs) to discuss ExA's Written Questions.
15.02.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the content of the SoCG.
27.02.2023	Online Meeting	Meeting between Environment Agency and National Highways to discuss the ongoing hydraulic modelling review including progress update on the Environment Agency's review of the hydraulic models and response submitted by National Highways. Potential timelines for received comments from the Environment Agency, National Highways responses and next Environment Agency review (if required). Discussion regarding flood compensation details and further comments on this matter from the Environment Agency. Review of outstanding PADSS issues and plan to resolve them.
01.03.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the content of the SoCG.
06.03.2023	Email	Email from the Environment Agency containing draft of SoCG with Environment Agency's comments on their position on issues considered within the SoCG.
10.03.2023	Email	Email from the Environment Agency containing draft of SoCG with Environment Agency's comments on their position on issues considered within the SoCG.
15.03.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the content of the SoCG.
17.03.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the Stage 5 Design Flood Event.
30.03.2023	Online Meeting	Meeting between the Environment Agency, Natural England and National Highways to discuss the content of the SoCG.
17.04.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss hydraulic modelling.
03.05.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the EMP.
09.05.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the EMP.
10.5.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the content of the SoCG.

Date	Form of correspondence	Key topics discussed and key outcomes
12.05.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss flood compensation.
15.05.2023	Email	Letter via email from Environment Agency to confirm that they are satisfied that the baseline hydraulic model for Scheme 6 (Appleby to Brough) is fit for purpose.
22.05.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the ExA's Rule 17 letter.
24.5.2023	Online Meeting	Meeting between the Environment Agency and National Highways to discuss the content of the SoCG.

2.1.2 It is agreed that this is an accurate record of the key meetings and other forms of consultation and engagement undertaken between (1) National Highways and (2) the EA in relation to the issues addressed in this SoCG.

3 Issues

3.1.1 Table 3-1 provides details of the issues raised between the parties and the status. Appendix A provides further detail in relation to historical positions set out by either party in discussing these issues where relevant to provide further context to the Examining Authority on the dialogue.

3.1.2 It should be noted that the numbering of issues has been retained from the Statement of Common Ground with the Environment Agency (Rev 2) submitted at deadline 3 (Document Reference 4.5, REP3-035).

3.1.3 Where possible, related issues have been grouped together with signposting provided, as necessary, to where the full details of the positions for each party can be read.

3.1.4 To focus this SoCG on the pertinent issues, issues which were stated as under discussion at the time of DCO submission but are no longer considered to be relevant (as the issues are either addressed in the DCO documents or outstanding issues are now recorded under relevant representations) are contained in Appendix A of the Statement of Common Ground with the Environment Agency (Rev 3) submitted at deadline 5 (Document Reference 4.5, REP5-007) and are not repeated in this document. In addition, detail in relation to historical positions set out by either party in discussing issues where relevant to provide further context to the Examining Authority on the dialogue at deadline 5 are contained in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007) and are not repeated in this document.

Table 3-1: Record of Issues – Agreed Issues

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-1.1 PEIR: Ecology and Biodiversity	EA Statutory Consultation Response (Appendix 1, page 7)	We welcome the requirement for a competent, qualified and experienced Ecological / Environmental Clerk of Works (ECoW / EcCoW / EnCoW) during construction that is either an Accredited ECoW by CIEEM or a member of The Association of Environmental Clerks of Works (AECoW).	The Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) confirms at Section 2 that an Ecological Clerk of Works will be required to be appointed by the Principal Contractor.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-1.2 Road Drainage and Water Environment	EA Statutory Consultation Response (Appendix 1, page 12)	Warcop is at risk of flooding from both Lowgill Beck and Crooks Beck / Moor Beck (see previous comment regarding consistency of naming) and the EA modelling report and S19 report produced by CCC following Storm Desmond refer to a more extensive flood history than presented in the PIE Report (6 events are referred to since 1968). EA confirmed that they are content that this has been taken into account within the ES.	Comments are noted regarding flood risk related to Lowgill Beck and Crooks Beck / Moor Beck. The impacts of flood risk within these locations have been included within our Flood Model, the result of which are detailed within the Schemes FRA. Further information can be found within Chapter 14 (Road Drainage and Water Environment) of the ES (Document Reference 3.2, APP-057).	Agreed
3-1.6 General	EA Statutory Consultation Response (Appendix 1, page 4)	The report states that “prior to the commencement of the construction works, the EMP will be refined by the contractor, in line with DMRB standard LA 120 (National Highways, 2020)” but it is not clear that the views or concerns of relevant stakeholders / regulators would have any influence over any proposed changes.	Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) will be the subject of further consultation between National Highway’s Delivery Partners and relevant stakeholders/regulators (including the EA) prior to commencement of construction works.	Agreed
3-1.7 PEIR: Ecology and Biodiversity	EA Statutory Consultation Response (Appendix 1, page 5)	While the PEI Report refers to the potential for environmental enhancements associated with the project, there is an apparent absence of any reference to, or approach to the delivery of, environmental net gain. While it is acknowledged that biodiversity net gain is not yet mandatory and will not become mandatory before the submission of the DCO application, it is clear that the provision of a 10% biodiversity net gain is intended to become a requirement for NSIPs as a provision of the Environment Bill when it is passed.	Biodiversity net gain is not currently a requirement within the policy set out in the NPSNN, however, the Project is committed to biodiversity and opportunities have been sought to maximise biodiversity within the footprint of the Project.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-1.8 PEIR: Ecology and Biodiversity	EA Statutory Consultation Response (Appendix 1, page 7)	Where records indicate that otters are in the wider area, the potential impacts of a larger barrier to movement and potential for greater road mortality during the operational phase should be fully assessed and mitigated. Where crossings are in use by mobile species such as otter, in addition to the use of mammal ledges, we also encourage that suitable mammal fencing is considered within the design to ensure species are directed towards crossing points, especially where mammal ledges are not able to be fitted.	Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) confirms that no part of the project can start until a Landscape and Ecological Mitigation Plan (LEMP) has been prepared and approved (in consultation with Local Authorities). The LEMP shall be in accordance with the Outline LEMP essay plan set out in the Appendix B1 to the EMP (Document Reference 2.7, APP-021) which confirms the mitigation for otters. Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	Agreed
3-1.9 Materials Assets and Waste	EA Statutory Consultation Response (Appendix 1, page 8)	Recycled aggregates that are imported from off-site and have not met the end of waste criteria will still be considered to be waste and a suitable waste permit or waste exemption will be required to cover the waste activity. The impacts of the use of materials classed as waste on the environment that are imported from off-site sources will be unknown if they are not considered through the environmental permitting regime.	The Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) and Site Waste Management Plan (SWMP) (Document Reference 2.7, APP-022) acknowledge the need for a registered waste exemption or an environmental permit for reusing / recycling demolition waste. Condition MW-MAW-03 of the EMP provides details regarding the use of re-used or recycled aggregates for the Project.	Agreed
3-1.10 Materials Assets and Waste	EA Statutory Consultation Response (Appendix 1, page 8 – 9)	Evidence of suitability and certainty e.g. testing carried out, contaminants present, remediation strategy, volumes required on site and whether there will be a requirement to re-use soils on site or directly transfer	The Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) and Site Waste Management Plan (SWMP) (Document Reference 2.7, APP-022) acknowledges the need for the appropriate disposal of waste off-site.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		them to site will be required to demonstrate efficient use of waste arisings. Demolition waste may be reused and recycled for use in the development. Please be aware that any treatment of waste will require either a registered waste exemption or an environmental permit. The impacts of the use of demolition waste on the environment will be unknown if they are not considered through the environmental permitting regime. The removal of excess material from the development would be considered waste and this would need to be transferred to a suitably licensed facility by authorised waste carriers, accompanied by waste transfer notes. Prior to this, any waste produced would also need to be assessed and classified in accordance with the WM3 guidelines. The use of demolition waste on the development could be done under the CL: AIRE code of practice so long as the material is produced from ground-based infrastructure. Any material produced from the demolition of above ground structures would not be included under the CL: AIRE code of practice.	Waste generation during the construction phase of the project will be managed through a detailed SWMP meeting relevant legislative, policy and health and safety requirements. The SWMP will acknowledge the requirements of the CL: AIRE code of practice and the need for the appropriate disposal of waste off-site.	
3-1.11 Road Drainage and Water Environment	EA Statutory Consultation Response (Appendix 1, page 10)	The report summarises the content of the proposed FRA to be submitted with the application, but it should also provide the evidence for the Secretary of State to apply	The application of the sequential test is included within Appendix 14.2 (Existing Flood Risk) of Volume 1 of the ES (Document Reference 3.3, APP-127).	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		the Sequential Test and Exception Test, as appropriate.	The principle of applying these tests is agreed.	
3-1.12 Drainage and Water Environment	EA Statutory Consultation Response (Appendix 1, page 11)	Light Water is a tributary of the River Eamont, not the River Eden and it is not in the River Eden & Tributaries SSSI or River Eden SAC, although it is relevant to the SAC if it has features of SAC interest. The significance of any impact of the development on Light Water will depend on site specific surveys to determine presence or absence of features of SAC interest.	The feedback on the scope and content of the PEIR is welcomed and noted. Extensive surveys of Light Water have been undertaken (River Corridor Survey, macrophyte/LEAFPACS surveys, fish habitat assessment, aquatic macroinvertebrate, electric fishing and riverine eDNA) and are detailed within Chapter 6 (Biodiversity) within Volume 1 of the ES (Document Reference 3.2, APP-049).	Agreed
3-1.13 Draft Construction Method Statement	EA Statutory Consultation Response (Appendix 1, page 14)	Based on the proposed location of the SuDS pond to the east of Carleton Hall and to the north of the River Eamont, we would advise that further consideration be given to possible river erosion issues as the use of any revetment to protect the asset in the future would be undesirable in the SAC river. The CMS also indicates that the “proposed boundary treatment” will cross the floodplain down to the river.	This refers to the SuDS pond to the east of the Cumbria Police Headquarters on the M6 junction 40 to Kemplay Bank scheme. We will continue to work with the EA and other stakeholders in the detailed design to minimise impacts on the SAC river. The Environmental Management Plan (EMP) (Document Reference 2.7, APP-019) confirms at MW-BD-17 that no part of the Project can start until a Method Statement for working in and near Special Areas of Conservation, where applicable, is developed in detail in substantial accordance with the essay plan in Annex C1 of the EMP and has been approved in relation to that part. The Method Statement shall include: • Details of the site and key sensitivities associated with it.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
			• Construction methodology for all works proposed in, over, adjacent to or in the floodplain of the SAC (and functionally linked habitats). • Control measures to be implemented to ensure protection of the SAC.	
3-1.14 Draft Construction Method Statement	EA Statutory Consultation Response (Appendix 1, page 15)	The new A66 crosses Crooks Beck (shown as Moor Beck) at an oblique angle, but there does not appear to be any culvert or bridge marked on the map (although there is reference to a “highway structure”). The nature of the crossing is therefore unclear. Trout, bullhead, salmon, and eels are known to use this watercourse and water voles may also be present. There is significant habitat upstream of the A66 and connectivity for fish passage, otters and potentially water voles is required to prevent any harm to the aquatic environment as a result of the proposed development.	The Environmental Management Plan (EMP) (Document Reference 2.7, APP-1019) confirms at D-BD-04 that all crossings of Moor Beck are large open span structures, culverts will not be used here. In addition, all new watercourse crossing will be designed to facilitate the free passage of aquatic and riparian species.	Agreed
3-1.3 - 5 Environment and EMP 3-2.9 Legal 3-2.10 - 31 Environment and EMP	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested various clarifications or updates to the Environmental Management Plan (Document Reference 2.7, APP-019) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification and, where appropriate, updated wording within the draft EMP (Document Reference 2.7 (Rev 2), REP3-004) submitted into the Examination at deadline 3 to address the Environment Agency’s concerns. Further detail on the Applicant’s position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-2.36 EMP	EA Relevant Representation (Annex 2, page Rev 1; dated 13/06/2022) EA Written Representation (Annex 1, Table 1, page 17, REP1-024)	2.7: Environmental Management Plan Annex B15 Invasive Non-Native Species (APP-035): General **Issue** There is a potential risk of importing aquatic plant species (for SUDS ponds, new ditches etc) from sources that could be contaminated by alien crayfish/crayfish plague. If possible and practicable, an additional section within the INNS management plan should be added to address this. **Impact** The importation of plant species from sources that could be contaminated by alien crayfish/crayfish plague has the potential to detrimentally impact upon the aquatic environment. **Suggested solution** Update the INNS management plan to identify and manage this potential risk.	The amendment proposed has been made to the EMP Annex B15 Invasive Non-Native Species Management Plan (Document Reference 2.7, REP3-017), and an updated version was submitted at Deadline 3 of the Examination and published on the A66 project page of the Planning Inspectorate website on 26th January 2023.	Agreed
3-2.37 - 43 EMP	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested various updates to 2.7: Environmental Management Plan Annex C1 Working in and near SAC Method Statement (APP-036) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification to the EA and submitted an updated draft of Annex C1 Working in and near SAC Method Statement of the EMP (Document Reference 2.7 (Rev 2), REP3-019) into the Examination at deadline 3 addressing the Environment Agency's concerns, which was published on the A66 project page of the Planning Inspectorate website on 26th January 2023 Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
			Agency (Rev 3) (Document Reference 4.5, REP5-007).	
3-2.44 - 46 EMP	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested updates to 2.7: Environmental Management Plan Annex C2 Working in Watercourses Method Statement (APP-037) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification to the EA and submitted an updated draft of Annex C2 Working in Watercourses Method Statement (Document Reference 2.7, REP3-021) into the Examination at deadline 3 addressing the Environment Agency's concerns. Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	Agreed
3-2.48 Climate 3-2.49 Material Assets and Waste 3-2.50 - 53 RDWE	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested updates to Table 2 of 2.9 Mitigation Schedule (APP-042) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification and, where appropriate, updated the wording within the Mitigation Schedule (Document Reference 2.9, REP3-025) submitted into the Examination at deadline 3 to address the Environment Agency's concerns. Further detail on the Applicant's is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	Agreed
3-2.55 - 56 Road Drainage and the Water Environment	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested updates to 3.2 Environmental Statement Chapter 14 Road Drainage and the Water Environment (APP-057) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have updated the wording within the draft EMP (Document Reference 2.7, REP3-004) and the updated Project Design Principles (Document Reference 5.11, REP3-040) submitted into the Examination at deadline 3 to address the Environment Agency's concerns.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
			Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	
3-2.73 Book of Reference	EA Relevant Representation (Annex 2, page 26, RR-160) EA Written Representation (Annex 1, Table 1, page 31, REP1-024)	5.7 Book of Reference (APP-290-298): General **Issue** The book of reference identifies the Environment Agency as having an interest in several pieces of land that National Highways intends to acquire to construct the proposed scheme. **Impact** The proposed development may have an impact on land we have an interest in. **Suggested solution** We will continue to review the Book of Reference and DCO documentation to determine how the proposal impact upon our interests and whether we need to provide further comments through the Written Representations stage. At this stage our Relevant Representation should be regarded as an objection to the acquisition of any land in which we have an interest by way of the DCO.	As is stated in the Schedule of Negotiations (Document Reference 5.10, APP-301), the Applicant issued an offer of negotiations letter on the 28 March 2022, inviting Environment Agency to complete and return a form expressing their willingness to discuss the acquisition by National Highways of the interests it requires for the Project by agreement. National Highways will continue to engage with the Environment Agency with a view to securing the necessary land / land interests by voluntary agreement.	Agreed
3-2.74-78 Project Design Principles		The EA requested updates to 5.11 Project Design Principles (APP-302) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification and, where appropriate, updated wording within the Project Design Principles document (Document Reference 5.11, REP3-040) submitted into the Examination	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-2.80 Project Design Principles 3-2.82-87 Project Design Principles Principles 3-2.89 Project Design Principles			at deadline 3 to address the Environment Agency's concerns. Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	
3-2.79 Project Design Principles 3-2.81 Project Design Principles 3-2.88 Project Design Principles 3-2.90 Project Design Principles	EA Relevant Representation (RR-160) EA Written Representation (REP1-024) Additional commentary provided in email dated 06.03.2023 from Environment Agency	The EA requested further updates to 5.11 Project Design Principles (APP-302) at the following points: • LI16 - potential for the use of a native species palette that is not local to appropriate catchment • LI17 – attenuation pond locations • 0405.04 – design of bridge over Trout Beck • 06.07 - management of flood risk associated with the new watercourse crossings. Further detail on the Environment Agency's position is as detailed in Table 3-2 of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification and, where appropriate, updated wording within the Project Design Principles document (Document Reference 5.11, REP6-015) submitted into the Examination at deadline 6 to address the Environment Agency's concerns. Further detail on the Applicant's position is as detailed in Table 3-2 of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	Agreed
3-2.1 General	EA Statutory Consultation Response (Appendix 1, page 3)	Full survey data may not be available at the time of writing the ES and survey data that become available after the DCO is submitted and early in the acceptance	The mitigation measures proposed in the Environmental Statement (ES) (Document Reference 3.2, APP-049) and the Draft Environmental Management Plan (EMP)	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		period will be submitted to verify the findings of the ES.	(Document Reference 2.7, REP3-004) has been based on up-to-date field survey data where available. National Highways are seeking agreement that the survey data that underpins the ES is robust once the EA has had full sight of the environmental information.	
3-2.2 PEIR: Ecology and Biodiversity	EA Statutory Consultation Response (Appendix 1, page 7 – 8)	Based on the proposed location of the SuDS pond to the east of Carleton Hall and to the north of the River Eamont, we would advise that further consideration be given to possible river erosion issues as the use of any revetment to protect the asset in the future would be undesirable in the SAC river. The proposed SUDs Pond may be at risk from erosion, or the SAC may be at risk should mitigation be required to prevent erosion and protect the asset. Further geomorphological and / or geotechnical assessment is required to confirm that the location of the SUDS pond will not pose a risk to the designated SAC.	This specific SUDS pond has been located outside of the flood zone specifically to ensure that there are no interactions between it and the SAC River. The river in this location is currently heavily armoured and no further mitigation is proposed at this stage.	Agreed
3-2.3 Noise and Vibration	EA Statutory Consultation Response (Appendix 1, page 6, 9 – 10)	Fish are not included in the list of species that could be disturbed by noise and vibration during construction. Significant noise and vibration from activities such as piling can be lethal / damaging to fish or fish eggs / fry. It is proposed that the ES will determine construction vibration as a significant effect when it is determined that a major magnitude (above or equal to 10 mm/s Peak Particle Velocity (PPV)) or moderate	Chapter 6 (Biodiversity) of the ES (Document Reference 3.2, APP-049) includes the following embedded mitigation in the design to minimise impacts on fish and fish eggs/fry during construction: • Instream works, or works close to the river banks giving rise to excessive (>13mm/s Particle Peak Velocity) vibration will be undertaken outside of the key fish spawning and incubation period of 1st October to 31st May.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		magnitude (above or equal to Significant Observed Adverse Effect Level (SOAEL) and below 10 mm/s PPV) of impact will occur for a duration exceeding: - Ten or more days or nights in any 15 consecutive days or nights; or - A total number of days exceeding 40in any six consecutive months However, in relation to fish eggs / redds, construction vibration of around 13 mm/s PPV is significant, so any exceedance of this level is significant for any piling works close to rivers with fish. The impact of the development on fish eggs / redds may not be assessed correctly based on the criteria identified at 12.2.14 which will result in the potential for death of fish eggs including protected SAC populations. This is likely to be relevant to salmon, trout, lamprey and potentially bullhead.	• No compaction, piling (or other activities resulting in Peak Particle Velocities (PPV) of greater than 13mm/s) will be permitted with 5m of watercourses with gravel substrate that support gravel spawning species (salmon, trout, lamprey sp., bullhead) without prior consultation with the Environment Agency and Natural England. • If works giving rise to significant vibration are required adjacent to potential spawning gravels, redd surveys (Lemon and Rummel, 2020) to determine whether spawning has occurred within the zone of impact would be undertaken, and the acceptability of in-channel works agreed with the Environment Agency and Natural England (depending on location).	
3-2.5 Draft Construction Method Statement	EA Statutory Consultation Response (Appendix 1, page 15)	Lowgill Beck is shown passing through the middle of a construction work area with no reference to how it will be protected. There is potential for pollution or other impacts of a beck with brook lamprey, trout, bullhead & eels with hydraulic continuity to the River Eden SAC. As Lowgill Beck bisects a construction work area, extra precautions are likely to be necessary to prevent pollution/siltation and to prevent harm to otters. Any temporary culverting/bridging for access around the	The current design involves extension/widening of the existing A66 culvert and minor realignment of Woodend Sike and Yosgill Sike to shift the confluence north of the widened culvert. Bullhead, brown trout, eel, river/brook lamprey (ammocete) and river/brook lamprey (transformer) have all been recorded in Lowgill Beck, as have white-clawed crayfish. The Environmental Management Plan (Document Reference 2.7, REP3-004) includes measures to protect watercourses	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		site would need to be passable to fish and any in-river works for placing temporary structures should be outside the salmonid spawning season.	from pollution during construction including measures relating to temporary watercourse crossings and working seasons.	
3-2.6 Updated Rainfall Allowances	Email from Environment Agency - 26/04/2022	It is advised that the peak rainfall allowances, used as part of drainage design were released by the Environment Agency on 9 May 2022. The DCO application will need to comply with guidance applicable at the time of submission.	Sensitivity testing using the latest rainfall climate change allowances has been undertaken for the schemes in Cumbria and reported in the Flood Risk Assessment (Sections 14.2.4, 14.2.5 and 14.2.7, Appendix 14.2, Document Reference 3.4, APP-221), it did not result in any changes to the outline drainage strategy or flood risk assessment. The Applicant has shared the sensitivity testing results for the schemes in Durham and North Yorkshire with the EA on 02.02.2023 as part of the on-going engagement between the parties.	Agreed
3-2.32-35 EMP	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested updates to 2.7: Environmental Management Plan Annex B7 Ground and Surface Water Management (APP-027) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification and, where appropriate, updated wording within the Annex B7 Ground and Surface Water Management (Document Reference 2.7, REP3-011) submitted into the Examination at deadline 3 to address the Environment Agency's concerns. Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007)..	Agreed
3-2.47 EMP	EA Relevant Representation	2.7: Environmental Management Plan Annex D Emergency Procedures (APP-040): General	National Highways have updated wording within the draft EMP (Document Reference 2.7, REP3-004) submitted into the	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
	(Annex 2, page 16, RR-160) EA Written Representation (Annex 1, Table 1, page 21, REP1-024)	**Issue** We note that in Appendix A – Environmental Incident Action Sheets, the triggers determine a de minimis and selective approach to notifying us of environmental incidents using qualitative rather than quantitative criteria. **Impact** There is a danger that environmental incidents may be reported by third parties, but not by National Highways or their contractors which may lead to erosion of trust and enforcement action. **Suggested solution** Consider the points made around the wording and setting the levels for reporting at a more open and precautionary level and allow satisfactory and open self-reporting to relevant regulatory authorities. Avoid the use of triggers that require a judgment over the scale of the event, e.g. deciding the "likelihood" of a spillage entering controlled waters or deciding what a "large volume" of silty runoff should be.	Examination at deadline 3 to address the Environment Agency's concerns.	
3-2.54 Climate change peak rainfall allowances	EA Relevant Representation (Annex 2, page 19, RR-160) EA Written Representation (Annex 1, Table 1, page 24, REP1-024)	3.2 Environmental Statement Chapter 2 The Project (APP-045) 3.2: 2.5.30 **Issue** We understood that the latest EA guidance in relation to the climate change peak rainfall allowances had not been used, although the latest values have been used in a sensitivity analysis within the Flood Risk Assessment (FRA). **Impact** The impacts on flood risk associated with the latest climate change allowances for peak rainfall levels are uncertain.	The Project's drainage design, presented in Appendix 14.2 of the Flood Risk Assessment and Outline Drainage Strategy (Document Reference 3.4, APP-221) was developed based on rainfall climate changes that have since been superseded. Sensitivity testing has been undertaken using the latest climate change allowances to ensure the proposed attenuation systems can accommodate the increased attenuation requirements within the Project Order Limits. This is included in the Climate change	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		Suggested solution Ensure that detailed design is based on updated modelling that takes account of the latest EA climate change guidance for peak rainfall allowances.	section (one section per scheme) of the Flood Risk Assessment and Outline Drainage Strategy (Document Reference 3.4, APP-221). Item D-RDWE-02 of the Environmental Management Plan (Document Reference 2.7, APP-019) includes the following requirement for the development of the detailed design "Where ponds are designed for highway run-off attenuation (as retention ponds), they must have sufficient capacity to retain run-off from all events with an annual exceedance probability of greater than 1%, plus allowance for climate change in line with DMRB CG 501 and Environment Agency guidance."	
3-2.57 WFD assessment	EA Relevant Representation (Annex 2, page 20, RR-160) EA Written Representation (Annex 1, Table 1, page 25, REP1-024)	3.4 Environmental Statement Appendix 14.1 WFD Compliance Assessment (APP-220): 14.1.10.4 **Issue** No specific mitigation is identified for the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) or Greta from Gill Beck to River Tees (GB103025072130) water bodies which have been identified in the WFD assessment as being impacted by the scheme. **Impact** The proposed scheme may have a detrimental impact on WFD water bodies without specific mitigation. **Suggested solution** Ensure that specific mitigation proposals for the Greta from Sleightholme Beck to Ellder Beck (GB103025072140) and Greta from Gill Beck to River Tees (GB103025072130)	To ensure compliance with WFD objectives and to cause no detriment to the current WFD condition of potentially impacted water bodies, an assessment of the compliances of the detailed design to the WFD will be undertaken prior to the start of that part of the project. Mitigation will be further developed using detailed design and further survey and agreed in accordance with commitment D-RDWE-08 within the Environmental Management Plan (Document Reference 2.7, REP3-004).	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		water bodies are identified and agreed in accordance with EMP D-RDWE-08.		
3-2.67 Hydromorphology Assessment	EA Relevant Representation (Annex 2, page 23, RR-160) EA Written Representation (Annex 1, Table 1, page 28, REP1-024)	3.4 Environmental Statement Appendix 14.4 Hydromorphology Assessment (APP-223): Section 14.4.7 **Issue** Evidence indicates that the Tutta Beck and the Punder Gill have been modified in the past so using these channels as reference conditions to inform the design of a mitigation scheme may not be appropriate. **Impact** The proposed development may have detrimental impacts on the water environment in the absence of a suitable mitigation scheme. **Suggested solution** To comply with D-RDWE-08, National Highways should take the opportunity to restore the watercourses to optimal natural conditions rather than copying existing channel dimensions and conditions. The design of the new channel must include an accessible, and active floodplain. Ground condition and local topography may mean that this needs to be a cut inset floodplain.	This is noted by National Highways. National Highways will seek to restore the watercourses to optimal natural conditions where this is practicable and appropriate. The design of the new channel will be developed following the survey and assessment of the detailed design and agreed in accordance with D-RDWE-08 of the Environmental Management Plan (Document Reference 2.7, REP3-004).	Agreed
3-2.68 - 69 Hydrogeological Impact Assessment	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested clarifications or updates to 3.4 Environmental Statement Appendix 14.6 Hydrogeological Impact Assessment (APP-225) as detailed in Table 3-1 and Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).	National Highways have provided clarification to the Environment Agency on these issues to address their concerns. Further detail on the Applicant's position is included in Appendix B of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007)..	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-2.4 Road Drainage and Water Environment	EA Statutory Consultation Response (Appendix 1, page 12)	Flooding of Kirkby Thore associated with Trout Beck is referenced but based on recent events it is likely that Kirkby Thore can be at risk of flooding from the River Eden and Trout Beck either independently or in combination. We recommend that the hydraulic model being developed to support the FRA and detailed design of the Trout Beck crossing is used to refine the understanding of flood risk in this area.	The PEIR provided preliminary information required for the statutory consultation. Since then, the scheme has been further refined as reported in the ES. The flood model has however considered the impact of flooding assuming the River Eden was full resulting in water backing up within Trout Beck. This is demonstrated within Chapter 14 (Road Drainage and Water Environment) of the ES (Document Reference 3.2, APP-057). The Environment Agency have indicated in their response to ExA's Further Written Questions (REP6-028) submitted at deadline 6 that the hydraulic models used to support this Scheme has yet to be agreed with the EA. However, in so far as it relates to the EA remit, it is accepted that Schemes 4, 5, would not be at an unacceptable risk of fluvial flooding or increase fluvial flood risk elsewhere based on the details submitted to date.	Agreed
3-2.59 Flood Risk Assessment and Outline Drainage Strategy 3-2.60 Flood Risk Assessment and Outline	EA Relevant Representation (RR-160) EA Written Representation (REP1-024)	The EA requested clarifications or updates to 3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221) at the following paragraphs or sections: • 14.2.2.74 - modelling and / or mitigation for the M6 to Kemplay Bank scheme • 14.2.2.81 - historic flood risk at Eamont Bridge • Annex E - Hydraulic modelling reports – Appleby to Brough	National Highways have provided clarification to the Environment Agency on these issues to address their concerns. Further detail on the Applicant's position is as detailed in Table 3-2 of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007), and in the case of issue 3-2.65 in Appendix A of this SoCG.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
Drainage Strategy 3-2.65 Flood Risk Assessment and Outline Drainage Strategy		Further detail on the Environment Agency's position is as detailed in Table 3-2 of the Statement of Common Ground with the Environment Agency (Rev 3) (Document Reference 4.5, REP5-007).		
3-2.8 Legal	EA Relevant Representation (Annex 2, page 1, RR-160) and additional comments in EA Written Representation (REP1-024)	2.1: Understanding the DCO document (APP-007): 2.5.1 **Issue** For National Highways to depart from the approved Design Principles Document (DPD) requires approval from the Secretary of State after they consult with the relevant local authority. No consultation with other relevant consultees is required. **Impact** The significance of any environmental impacts of a detailed design that deviates from the approved DPD may be unknown. **Suggested solution** Further engagement between National Highways and us to identify alternative wording to address this concern. **EA additional commentary:** We note the applicant's response in PDL-013 and accept that the wording within the DCO makes it clear that the Secretary of State (SoS) must be satisfied that the departure would not give rise to any materially new or materially worse adverse environmental effects when compared to those reported in the Environmental	Article 54 of the draft DCO (Document Deference 5.1), which has been updated and submitted into examination at deadline 7 requires that the scheme must be designed in detail and carried out so that it is compatible with, amongst other things, the Project Design Principles (PDP) (Document Reference 5.11, REP3-040). Article 54(2) provides that the detailed design can depart from this requirement where the Secretary of State approves this, following consultation with the local planning authority and the Environment Agency (on matters relating to their statutory function). However, the Secretary of State must be satisfied that the departure would not give rise to any materially new or materially different environmental effects when compared to those reported in the Environmental Statement. As such, it will be for National Highways (or its contractors) to demonstrate this requirement is met, through the submission of robust evidence. Ultimately, a departure where the environmental effects are not known could not properly be approved by the Secretary of State.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		Statement. However, if the SoS is only consulting the relevant planning authorities, are they able to advise the SoS on whether there is a materially new or materially worse adverse environmental effect arising from a proposed change in relation to a matter that they may not have technical expertise on, for example fluvial flood risk? We continue to feel that alternative wording within the DCO to allow the SoS to consult the relevant planning authority and statutory environmental bodies would address our concern.		
3-2.70 Draft Development Consent Order	EA Relevant Representation (Annex 2, page 25, RR-160) and additional comments in EA Written Representation (Annex 1, Table 1, page 29, REP1-024)	5.1 Draft Development Consent Order: Part 5 Miscellaneous and general (APP-285): detailed design 54 (2) **Issue** The draft DCO accompanying the application allows for the Secretary of State to approve a detailed design that departs from the approved design principles, works plans and engineering drawings subject to consultation with the relevant planning authority. No consultation with other relevant consultees (i.e., the Environment Agency) is required. **Impact** The significance of any environmental impacts of a detailed design that deviates from the approved DCO may be unknown. **Suggested solution** Further engagement between National Highways and us to identify alternative wording to address this concern.	Article 54 of the draft DCO (Document Deference 5.1), which has been updated and submitted into examination at deadline 7 requires that the scheme must be designed in detail and carried out so that it is compatible with, amongst other things, the Project Design Principles (PDP) (Document Reference 5.11, REP3-040). Article 54(2) provides that the detailed design can depart from this requirement where the Secretary of State approves this, following consultation with the local planning authority and the Environment Agency (on matters relating to their statutory function). However, the Secretary of State must be satisfied that the departure would not give rise to any materially new or materially different environmental effects when compared to those reported in the Environmental Statement. As such, it will be for National Highways (or its contractors) to demonstrate	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		EA additional commentary: We note the applicant's response in PDL-013 and accept that the wording within the DCO makes it clear that the Secretary of State (SoS) must be satisfied that the departure would not give rise to any materially new or materially worse adverse environmental effects when compared to those reported in the Environmental Statement. However, if the SoS is only consulting the relevant planning authorities, are they able to advise the SoS on whether there is a materially new or materially worse adverse environmental effect arising from a proposed change in relation to a matter that they may not have technical expertise on, for example fluvial flood risk? We continue to feel that alternative wording within the DCO to allow the SoS to consult the relevant planning authority and statutory environmental bodies would address our concern.	this requirement is met, through the submission of robust evidence. Ultimately, a departure where the environmental effects are not known could not properly be approved by the Secretary of State.	
3-2.4 Road Drainage and Water Environment	EA Statutory Consultation Response (Appendix 1, page 12)	Flooding of Kirkby Thore associated with Trout Beck is referenced but based on recent events it is likely that Kirkby Thore can be at risk of flooding from the River Eden and Trout Beck either independently or in combination. We recommend that the hydraulic model being developed to support the FRA and detailed design of the Trout Beck crossing is used to refine the understanding of flood risk in this area.	The PEIR provided preliminary information required for the statutory consultation. Since then, the scheme has been further refined as reported in the ES. The flood model has however considered the impact of flooding assuming the River Eden was full resulting in water backing up within Trout Beck. This is demonstrated within Chapter 14 (Road Drainage and Water Environment) of the ES (Document Reference 3.2, APP-057).	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-2.71 Draft Development Consent Order	EA Relevant Representation (Annex 2, page 25, RR-160) and additional commentary in EA Written Representation (Annex 1, Table 1, page 30, REP1-024)	5.1 Draft Development Consent Order (APP-285): Schedule 9 Protective Provisions Part 4 – Environment Agency **Issue** The Draft DCO has not included protective provisions which are acceptable to the Environment Agency. **Impact** We are unable to agree to disapply Flood Risk Activity Permit (FRAP) requirements if we are not satisfied that the necessary protective provisions are secured through the DCO. **Suggested solution** Further engagement between National Highways and us is required to secure a suite of protective provisions that we would consider acceptable and allow us to disapply FRAPs. **EA additional commentary:** We note the applicant's response in PDL-013 and will continue to work with them to address this issue.	National Highways has been provided with a copy of the current version of the Environment Agency's protective provisions and following discussions with the Environment Agency have agreed on the form of protective provisions which have been included within the Draft DCO submitted to the examination at Deadline 9. Consequently, the Environment Agency has granted consent under section 150 Planning Act 2008 to the disapplications of its consenting requirements contained in article 3 of the draft DCO.	Agreed
3-2.72 Consents and Agreements Position Statement	EA Relevant Representation (Annex 2, page 25, RR-160) and additional commentary in EA Written Representation (Annex 1, Table 1, page 30, REP1-024)	5.4 Consents and Agreements Position Statement (APP-287): 3.1.3 **Issue** Consent to erect structures in, over or under a main river will be subject to National Highways obtaining either a permit under the EPR or, if disapplication and suitable protective provisions are agreed, to consent under the protective provisions but this is not stated. **Impact** Lack of clarity. **Suggested solution** Amend the wording as follows:	National Highways is seeking the standard suite of disapplication of consent requirements from the Environment Agency as is reflected in article 3 of the draft DCO (Document Reference 5.1, APP-285). National Highways' approach is as set out in the Consents and Agreements Position Statement (Document Reference 5.4, APP-287) in that it will seek to agree protective provisions with the Environment Agency to enable the Environment Agency to grant its consent to those disapplication's.	Agreed

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		• *Consent to erect structures in, over or under a main river (subject to National Highways obtaining either a permit under the EPR or, if disapplication and suitable protective provisions are agreed, to consent under the protective provisions)* **EA additional commentary:** We note the applicant's response in PDL-013 and will continue to work with them to address this issue.	National Highways has been provided with a copy of the current version of the Environment Agency's protective provisions and following discussions with the Environment Agency have agreed on the form of protective provisions which have been included within the Draft DCO submitted to the examination at Deadline 9. Consequently, the Environment Agency has granted consent under section 150 Planning Act 2008 to the disapplications of its consenting requirements contained in article 3 of the draft DCO.	
3-1.15 Control Mechanism	N/A	The Environment Agency agrees with the principle of a control mechanism with regards hydraulic modelling for Scheme 6 and the wording of a control mechanism as outlined in the Joint Position Statement submitted into the examination at Deadline 9, although acknowledging that the Environment Agency does not agree with National Highways on where the control mechanism should be located.	National Highways agrees with the principle of a control mechanism with regards hydraulic modelling for Scheme 6 and the wording of a control mechanism as outlined in the Joint Position Statement submitted into the examination at Deadline 9, although acknowledging that National Highways does not agree the Environment Agency on where the control mechanism should be located.	Agreed (Acknowledging the parties do not agree on the appropriate location for the control mechanism – please see the Joint Position Statement (appended to the Applicant's Response to Rule 17 Request (Document Reference 7.50) submitted by

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
				both parties at Deadline 9).
3-2.7 Hydraulic Modelling	Verbal comment at SoCG meeting 20.07.2022 and additional commentary in a letter from EA via email 15.05.2023.	Modelling to be shared and agreed in advance of Examination. Until the modelling is agreed, we cannot effectively advise the Examining Authority on the flood risk impacts of the proposed development and suitability of mitigation. **Additional commentary 15.05.2023:** The EA have confirmed by letter dated 15 May 2023 that they are satisfied that the baseline models for Scheme 6 are fit for purpose, but continue to work with National Highways on the proposed hydraulic modelling and compensatory storage proposals.	Baseline modelling has been shared with the EA. Comments on baseline modelling were provided by EA late March/early April 2022. In late October/early November 2022 we sent our response to the EA's comments on the baseline model and sensitivity testing reports. National Highways awaits to hear the result of the EA's review of the hydraulic modelling. The EA provided comments on their modelling review for schemes 5 and 6 in March 2023, schemes 1,3 and 4 in April 2023 and scheme 2 in May 2023. The EA have identified in their Deadline 6 Submission - Responses to ExA's Further Written Questions (REP6-028) that *"the hydraulic models used to support each of the different Schemes have yet to be agreed with the EA. However, in so far as it relates to the EA remit, it is accepted that Schemes 1, 2, 3, 4, 5, 7, 8 and 9 would not be at an unacceptable risk of fluvial flooding or increase fluvial flood risk elsewhere based on the details submitted to date."* The baseline and with scheme models for scheme 6 have been updated and have been agreed as fit for purpose with the EA.	Agreed (based on post-DCO controls secured as detailed at 3-1.15)

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
3-2.58 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 20, RR-160) EA Written Representation (Annex 1, Table 1, page 25, REP1-024) and additional commentary in a letter from EA via email 15.05.2023.	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): General **Issue** We have reviewed the baseline hydraulic models used to assess flood risk and inform the conclusions of the FRA for each of the schemes but we have not yet accepted them as fit for purpose so we cannot advise on the accuracy of the flood risk conclusions and any associated mitigation proposals that are relevant to our remit. **Impact** The predicted impacts of the proposed development flood risk and suitability of any mitigation proposals (in so far as they relate to our remit) cannot be verified at this time. **Suggested solution** National Highways should provide a response to our reviews of their baseline hydraulic models and allow us to determine whether they are fit for purpose as soon as possible. **Additional commentary 15.05.2023:** The EA have confirmed by letter dated 15 May 2023 that they are satisfied that the baseline models for Scheme 6 are fit for purpose, but continue to work with National Highways on the proposed hydraulic modelling and compensatory storage proposals.	National Highways considers that this matter was addressed in Issue Specific Hearing 2 and section 3.3 of the Post Hearing Submission document (Document Reference 7.3, REP1-009). Refer to issue 3-2.7 for details on hydraulic modelling review.	Agreed (based on post-DCO controls secured as detailed at 3-1.15)
3-2.61 Flood Risk Assessment	EA Relevant Representation (Annex 2, page 21, RR-160)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): 14.2.5.77	Further details of the flood storage loss, compensation volumes provided, and functionality of the flood compensation for the Project was provided to the EA on 15th	Agreed (based on post-DCO controls

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
and Outline Drainage Strategy	EA Written Representation (Annex 1, Table 1, page 26, REP1-024)	**Issue** Reference is made to 6.4.6 in relation to compensatory storage within Flood Zone 3b, but there is no section 6.4.6 within the FRA. **Impact** The suitability of the compensatory flood storage proposals in FZ3b for the Appleby to Brough scheme are unknown. **Suggested solution** Update the FRA to refer to the necessary details for the scheme for compensatory flood storage in Flood Zone 3b to allow it to be reviewed.	February 2023 for their information and review (see Appendix B). Comments on the Project wide flood compensation report have been received from the EA (8th March 2023) and National Highways provided an update to the reporting in the form of further supporting technical information on the Moor Beck Flood Compensation Area (Scheme 6) which was shared with the EA on 2nd May 2023. Comments have been received from the EA (10th May 2023) and National Highways have updated the report and shared it with the EA on 19th May 2023 (see Appendix C). At Deadline 8, National Highways included a new commitment in the first iteration EMP whereby a detailed flood compensation scheme for Scheme 6 is required to be developed, consulted on with and approved by with the Environment Agency and approved by approved by the Secretary of State as part of a second iteration EMP. Whilst National Highways acknowledges that the Environment Agency's position is that this wording should be contained in the DCO (and both parties acknowledge that this will be a decision for the Secretary of State), the parties agree in principle the form of control mechanism. In parallel to this, National Highways and the Environment Agency have been discussing early issues around the detailed design of flood compensation areas by way of the	secured as detailed at 3-1.15)

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
			sharing of emerging technical information (see above). This has resulted in the parties agreeing the parameters for on-going engagement on this issue, including various actions National Highways will undertake in terms of sharing information with the Environment Agency to demonstrate the effectiveness of the flood compensation areas proposed for the Project. The parties consider the flood compensation reports as submitted demonstrate that there are technically feasible solutions to provide compensatory storage and manage flood risk for each Scheme within the boundary of the DCO. The EA concerns around the provision of compensatory storage are now resolved and the issue is agreed.	
3-2.62 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 21, RR-160) EA Written Representation (Annex 1, Table 1, page 26, REP1-024)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): Table 25 (Page A14.2- 85 of 153) **Issue** Table 25 gives the total volume of storage provided in each location. There is no information provided on how much storage is lost due to the scheme and the flood magnitude at which both the lost storage and the compensatory storage comes online. **Impact** The suitability of the compensatory flood storage proposals to mitigate the increased risk of flooding for the Appleby to Brough scheme are unknown. **Suggested solution** Provide additional information to confirm how much storage is	The reduction in flood storage areas due to the scheme and the compensatory storage areas are contained within the hydraulic models and 3D alignment design models, so have been taken into account in the assessment and mitigation design but have not been tabulated in the reports. Refer to 3-2.61 for details on flood compensation reporting.	Agreed (based on post-DCO controls secured as detailed at 3-1.15)

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		lost due to the scheme and the flood magnitude at which both the lost storage and the compensatory storage comes online.		
3-2.63 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 22, RR-160) EA Written Representation (Annex 1, Table 1, page 27, REP1-024)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): 14.2.5.132 and Plate 4 **Issue** It is hard to see from the details provided (including those in the modelling report) how the compensatory storage areas work and how they are designed. Are they excavated into existing floodplain? How and at what return period / flow magnitude do they fill? How do they drain? **Impact** The suitability of the compensatory flood storage proposals to mitigate the increased risk of flooding for the Appleby to Brough scheme are unknown. **Suggested solution** Provide additional information to confirm how the scheme is designed, whether it is excavated into existing floodplain, how and at what return period / flow magnitude it fills and how it subsequently drains.	The proposed compensatory storage areas are contained within the hydraulic models and 3D alignment design models, and have been taken into account in the assessment and mitigation design, but have not been described in detail in the reports at this stage. Refer to 3-2.61 for details on flood compensation reporting.	Agree (based on post-DCO controls secured as detailed at 3-1.15)
3-2.64 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 22, RR-160) EA Written Representation (Annex 1, Table 1, page 27, REP1-024)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): Annex E: Hydraulic modelling reports – Appleby to Brough **Issue** In relation to the figures showing changes in flood depths because of the scheme, it is not always easy to interpret what is causing the changes in depth	The change in flood depth due to the scheme and the compensatory storage areas is contained within the hydraulic models and 3D alignment design models, so has been taken into account in the assessment and mitigation design, but have not been described in detail in the reports at this stage. National Highways will work with the EA to assist with the EA's review of any	Agreed (based on post-DCO controls secured as detailed at 3-1.15)

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		(changes in peak water level, changes in ground level, changes in flow, cut off flow routes) without also showing the depth grids that have been used to generate these. For example, it is surprising that that the new road embankments at Warcop Junction are not more pronounced within these maps and it is not clear why there are a broad section of increased flood depths passing through the embanked slip road at Warcop Junction (Figure 8-8). **Impact** The suitability of the compensatory flood storage proposals to mitigate the increased risk of flooding for the Appleby to Brough scheme are unknown. **Suggested solution** Provide additional information to address this issue.	changes in flood depth. In response to the example, the increased flood depths at Warcop junction the proposed scheme increases ground levels at the junction and therefore prevents an existing flow path which occurs over the A66 in the baseline 1 in 100 events. Without this flow path water backs up immediately upstream of it, increasing water levels approximately 0.3m over a small area approximately 500m^2. Refer to 3-2.61 for details on flood compensation reporting.	
3-2.66 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 23, RR-160) EA Written Representation - (Annex 1, Table 1, page 28, REP1-024)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): Annex E: Hydraulic modelling reports – Appleby to Brough **Issue** No detailed information is provided on the effects of the scheme on Low Gill Beck between the Lowgill Beck crossing and Warcop. Figure 8-13 in the modelling report shows increased water levels in a few places along this reach and the summary at the end of this section of the report highlights this and concludes that it is *"likely these increases are associated with areas of ground level change in the proposed scheme".* For the most part this looks to be the case in Figure 8-13 in which case there	There are three key areas on Low Gill Beck between the Lowgill Beck crossing and Warcop where moderate increases in flood risk can be seen in the Appleby to Brough Hydraulic Modelling report in Annex E of document 3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (Document Reference 3.1, APP-221). Location 1 – Eden Valley Railway There are no changes to ground levels occurring at this location as a result of the proposed scheme. Increases in flood risk here are solely from the impact of upstream Locations 2 and 3 discussed below. The model has been updated and shared with	Agreed (based on post-DCO controls secured as detailed at 3-1.15)

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
		needs to be an assessment of lost floodplain storage because of this and compensatory storage provided as required. The fact that the most downstream area of increased depth on Lowgill Beck shown in figure 8-13 appears to be downstream of any proposed earthworks suggests the possibility of increased pass on flows which needs to be investigated. **Impact** The suitability of the compensatory flood storage proposals to mitigate the increased risk of flooding for the Appleby to Brough scheme are unknown. **Suggested solution** Provide additional information to address this issue.	the EA. Refer to 3-2.61 for details on flood compensation reporting. <u>Location 2 – Flitholme</u> The scheme designs show a tie in point here to an existing bridge. No changes are proposed to this structure and the differences in flood depths at this location are a combination of the impacts upstream at Location 3 and quality of the LiDAR and design model interface at this location. Alteration to this tie-in location within the model will remove any influence of this effect along with the application of more detailed existing and proposed ground models to be used in the next design stage. Any design changes/refinement that affects the hydraulic models will be subjected additional hydraulic modelling as secured in item D-RDWE-02 the Environmental Management Plan (Document Reference 2.7, REP3-004). The model has been updated and shared with the EA. Refer to 3-2.61 for details on flood compensation reporting. <u>Location 3 - Langrigg</u> A small reduction in the floodplain can be seen at location 3, this is due to the footprint of the proposed balancing pond encroaching on the floodplain. This causes increases in flood depths between 0.01 – 0.1m. The location of this balancing Pond is due to be moved from this location as part of the proposed design changes therefore this impact and its effects downstream may be	

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position	Status
			removed and prevent the need for further mitigation. Ponds will be rationalised and relocated out of the flood plain during the detailed design stage to suit the revised highway alignment submitted to examination at Deadline 7. The post scheme hydraulic models will be amended to reflect this change and presented to the EA for comment in accordance with EMP requirement D-RDWE-02.	

Appendix A: Environment Agency and National Highways historical positions

Table A-1: Appendix A - Environment Agency and National Highways historical positions since SoCG issued at deadline 5.

Issue	Document References (if relevant)	Environment Agency Position	National Highways Position
3-2.65 Flood Risk Assessment and Outline Drainage Strategy	EA Relevant Representation (Annex 2, page 22, RR-160) EA Written Representation (Annex 1, Table 1, page 27, REP1-024)	3.4 Environmental Statement Appendix 14.2 Flood Risk Assessment and Outline Drainage Strategy (APP-221): Annex E: Hydraulic modelling reports – Appleby to Brough **Issue** There is no schematic provided showing locations where before and after level and flow results have been extracted from the model (also confirming that, where applicable, combined 1D 2D flows have been extracted). **Impact** The suitability of the compensatory flood storage proposals to mitigate the increased risk of flooding for the Appleby to Brough scheme are unknown. **Suggested solution** Provide a schematic showing locations where before and after level and flow results have been extracted from the model and confirm that, where applicable, combined 1D 2D flows have been extracted.	National Highways have shared information within the Supplementary Flood Compensation Report with the Environment Agency which demonstrates the locations where before and after level and flow results have been extracted from the model and confirms that, where applicable, combined 1D 2D flows have been extracted.

Appendix B: A66 Flood Compensation Supplementary Information

A66 Northern Trans-Pennine Project
TR010062

Appendix B: A66 Flood Compensation Supplementary Information

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

Deadline 9

26 May 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

Appendix B: A66 Flood Compensation Supplementary Information

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	4.5
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	31st January 2023	For issue to the Environment Agency only
Rev 2	26th May 2023	For inclusion in Statement of Common Ground with the Environment Agency

CONTENTS

1. Floodplain Compensation Assessment

1.1 Introduction

1.1.1 This document was prepared in response to the request for clarificatory information from the Environment Agency in their written representation (REP1-024). It was submitted to the Environment Agency on 15th February 2023. In summary it:

- Provides information on how much flood storage is lost due to the Project and the flood magnitude at which both the lost storage and the compensatory storage comes online.
- Provides details of how the compensatory storage areas would work and how design has been undertaken to date.
- Explain what is causing the changes in flood depths reported in the Hydraulic Modelling reports in Annex E of ES appendix 14.2.
- Provide a schematic showing locations where before and after level and flow results have been extracted from the hydraulic models.

To confirm, this document does not provide any information that would alter the conclusions reported in the Environmental Statement prepared to support the DCO application for the A66 NTP Project – instead, it supports those conclusions.

1.1.2 For details of the Environment Agency's written representation and National Highway's response, refer to page 29 of document 7.7 Applicant's Response to Written Representations made by Interested Parties subject to an SoCG (REP2-016). This document provides additional information to our original response and is for the Environment Agency's information only.

1.1.3 The proposed A66NTP Project will involve upgrading the existing road over multiple discrete schemes varying from new offline routes to online upgrades. The proposals will impact numerous watercourse crossings where the existing floodplain will be reduced as a result of the Project.

CIRIA 624 (Development and flood risk – guidance for the construction industry - Section A.3.3.10, 2004) states that:

"Compensatory flood storage must become effective at the same point in a flood event as the lost storage would have done (McPherson 2002). It should therefore provide the same volume, and be at the same level relative to flood level, as the lost storage"

1.1.4 This document outlines the areas where floodplain will be lost to the scheme and how floodplain compensation requirements will be met.

1.1.5 The majority of the compensation areas proposed have been incorporated into the hydraulic models provided to the EA for review. This document seeks to provide the additional information required for the EA to complete their review of these compensation areas. However, some compensation areas have not been previously modelled or reported on as the preliminary design models did not show any notable increase in flood risk. These areas have been included to show that there is sufficient space in the Order Limits to incorporate them if deemed necessary during the detailed design stage.

1.1.6 In accordance with the clause 0405.11 in the secured document 5.11 Project Design Principles (REP3-040), the detailed design of flood compensation will be blended into the landscape and designed to tie into existing topographic pattern where reasonably practicable. Flood compensation will be designed to reduce the footprint and visual impact of the proposals and is to be designed sensitively with regard to existing ground levels/profiles and local landscape characteristics.

1.2 Data

1.2.1 This assessment was based on the following data sources:

- EA 1m LiDAR data to represent the baseline existing ground levels across the schemeProject,
- 3D proposed surface models of the highway alignment and associated infrastructure. These raster grids are the same as used in the hydraulic models, references to the drawings can be found in the hydraulic modelling reports,
- The maximum flood level grids for each of the watercourses produced by the hydraulic models. These are the 1 in 100 with 61% (Scheme 7) or 94% (all others) allowance for climate change and used to determine the footprint of floodplain losses and the height to which they will apply,
- The Order Limits as shown on the General Arrangement drawings submitted with the DCO application.

1.3 Method

1.3.1 A Project wide proposed surface model was created by overlaying the 3D proposed alignment model on to the baseline LiDAR. The change in ground level is then compared where it intersects the floodplain to determine the lost volumes.

1.3.2 Volume losses are generated by comparing the difference in land area at a range of levels. The levels are analysed in 0.1m increments to determine the volumes lost. For the purpose of reporting at the preliminary design stage, these 0.1m increment bands have been condensed to 0.2m bands to keep the tables succinct.

1.3.3 The following assumptions have been made across the schemes for the assessment of the losses:

- Losses have been determined up to the 1 in 100 year event plus climate change allowance, this has been used in preference to the 1 in 1000 event due to its higher levels and conservative nature.
- Balancing ponds within the floodplain have been filled in the proposed ground model as this volume is already earmarked for surface water storage and therefore not usable for fluvial floodplain.
- The proposed ground model does not allow distinction between ground changes and where new culverts will carry water below the road, therefore in-channel losses also present themselves at the lowest levels. These losses will be replicated like for like within culverts or channel realignments. Where these minor volumes have been discounted is highlighted in the tables below.

1.3.4 The assessment has been undertaken on a level-for-level approach, seeking to replicate lost volume at the same elevation. On steep catchments this is not appropriate as the level (in mAOD) of the loss area may be significantly lower than the floodplain compensation area. Where this occurs, a “relative level” approach is used where the level has been adjusted based on the difference in flood level between the loss site and the gain site.

1.3.5 The Warcop area of the Appleby to Brough Scheme 6 has been assessed using a return-period-for-return-period approach. This approach seeks to replicate the lost floodplain volume for each return period. Instead of using fixed intervals for the assessment the maximum flood level for each return period at the loss site is used, this volume is then replicated at the flood level of the same return period at the compensation site. This approach requires a broad range of flood events to be run and therefore is only suitable for the Warcop model where the 1 in 2, 10, 20, 100 and 1000 climate change events have been run.

1.3.6 The floodplain compensation areas have been developed using an automated script that gradually lowers ground levels one increment at a time until the desired volume has been achieved, this produces the most efficient flood storage area possible with the minimal ground work possible. This approach means many of the compensated flood volumes have very good matches to the losses. In most cases it is possible to create more storage if required, however this level of detail will be taken forward at the detailed design phase.

1.3.7 The proposed compensation areas presented here have all assumed a maximum 1 in 3 slope to grade into the surrounding land. Further refinement is to be undertaken at the detailed design phase to blend it into the landscape and designed to tie into existing topographic pattern, where reasonably practicable.

1.4 Scheme 3 – Lightwater

1.4.1 Floodplain losses due to Scheme 3 at the Lightwater crossing are largely due to embankment widening. The proposed crossing to the north for the access track also shows some losses as seen in Figure 1-1, however most of these are in-channel losses caused by the solid nature of the DTM in the channel of the ground model and are therefore considered in-channel losses that will be compensated within culverts.

1.4.2 A floodplain compensation area has been identified within the order limits to the south (upstream) of the floodplain losses. This compensation area is not represented in the current hydraulic models as the impact on flood risk is minimal, however there is sufficient space to make level-for-level compensation for the floodplain losses up to the level of the 1 in 100 event with 94% allowance for climate change. Note, the area is located outside of the oil pipeline exclusion zone.

FIGURE 1-1 LIGHTWATER FLOODPLAIN LOSSES AND GAINS

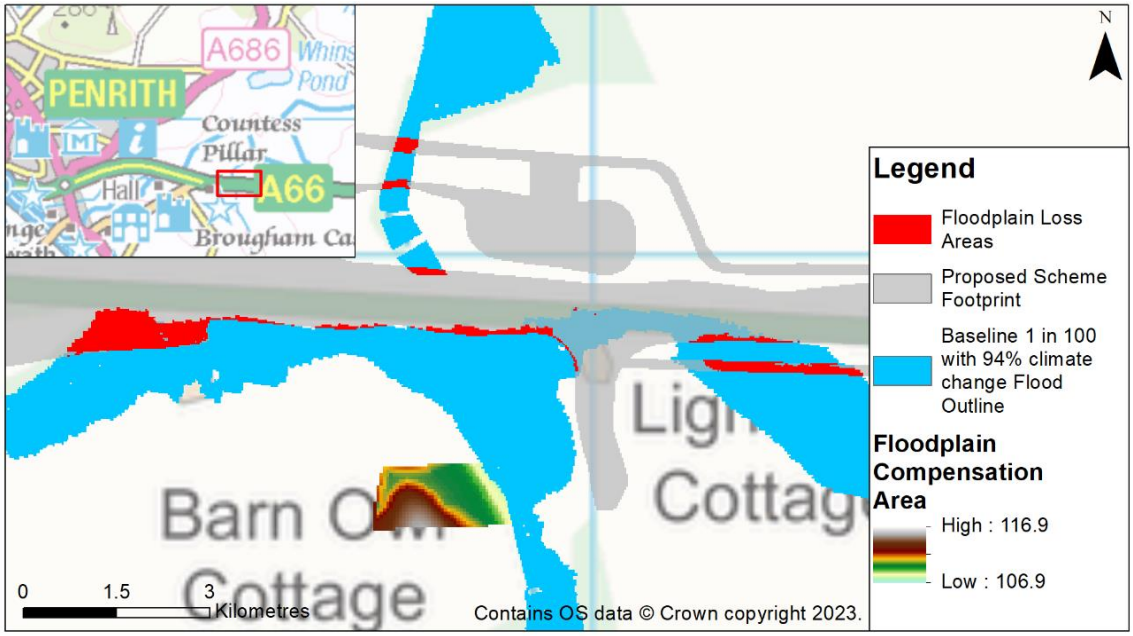


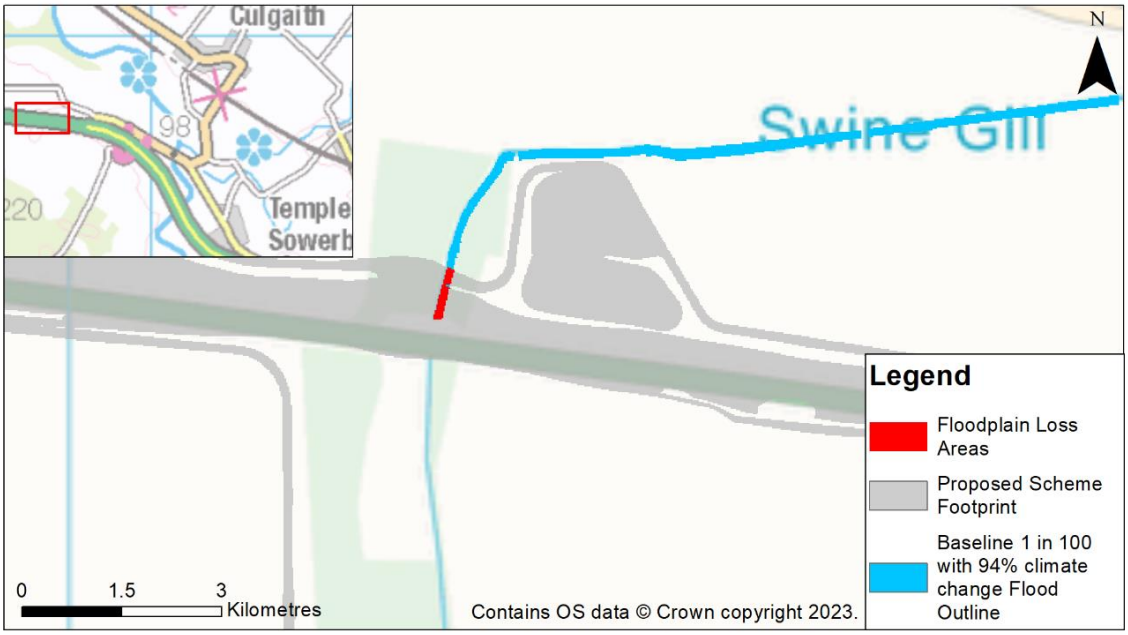
TABLE 1-1 LIGHTWATER TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	**Volume Loss (m3)**	**Level mAOD**	**Volume Gain (m3)**	**Balance**
106	0.3	In Channel Losses (See Assumptions)		
106.2	2.5			
106.4	6.0			
106.6	10.8			
106.8	17.5			
107	24.4	107	13.0	-11.4
107.2	17.2	107.2	28.1	10.9
107.4	13.6	107.4	22.4	8.8
107.6	15.8	107.6	17.2	1.5
107.8	18.7	107.8	19.2	0.5
108	26.1	108	26.0	-0.1
108.2	33.6	108.2	34.4	0.8
108.4	50.1	108.4	50.5	0.4
108.6	44.4	108.6	45.6	1.2
108.8	41.8	108.8	43.6	1.8
109	32.3	109	33.2	0.9
109.2	32.8	109.2	34.0	1.2
109.4	28.1	109.4	32.8	4.7
109.6	23.1	109.6	24.8	1.7
109.8	62.3	109.8	63.3	1.0
110	123.6	110	125.4	1.9
110.2	142.5	110.2	143.6	1.1
110.4	157.2	110.4	157.4	0.2
110.6	159.3	110.6	161.6	2.2
110.8	156.7	110.8	158.7	2.0
111	149.6	111	158.8	9.2
111.2	66.3	111.2	158.3	92.0
111.4	22.2	111.4	153.6	131.5
111.6	15.3	111.6	149.2	134.0

1.5 Scheme 3 – Swine Gill

1.5.1 Swine Gill passes under the proposed Scheme 3 at an area of embankment widening, however this watercourse does not go out of bank at this location during a 1 in 100 year event with 94% allowance for climate change as shown in Figure 1-2. Only in-channel losses are observed at this location, therefore no floodplain compensation area has been designated.

FIGURE 1-2 SWINE GILL FLOODPLAIN LOSSES



1.6 Scheme 3 – UNN302

1.6.1 Unnamed Watercourse 302 flows south to north within Scheme 3. The proposed groundworks will occupy a small portion of the floodplain due to the expanded embankment and pond access as shown in Figure 1-3. Floodplain compensation in the area is challenging due to the steep gradient of the watercourse, meaning direct level-for-level calculations are not appropriate as replacing the exact levels lost upstream of the Scheme would result in an area that filled with water prior to any flood event.

1.6.2 Due to the high gradient, the floodplain compensation area has been shifted 4m higher to provide the same volume of storage relative to the difference in upstream/downstream flood level.

1.6.3 The identified area is not represented in the current hydraulic models as the impact on flood risk is minimal, however compensation requirements can be accommodated with only minor regrading of the land if required.

FIGURE 1-3 UNN302 FLOODPLAIN LOSSES AND GAINS

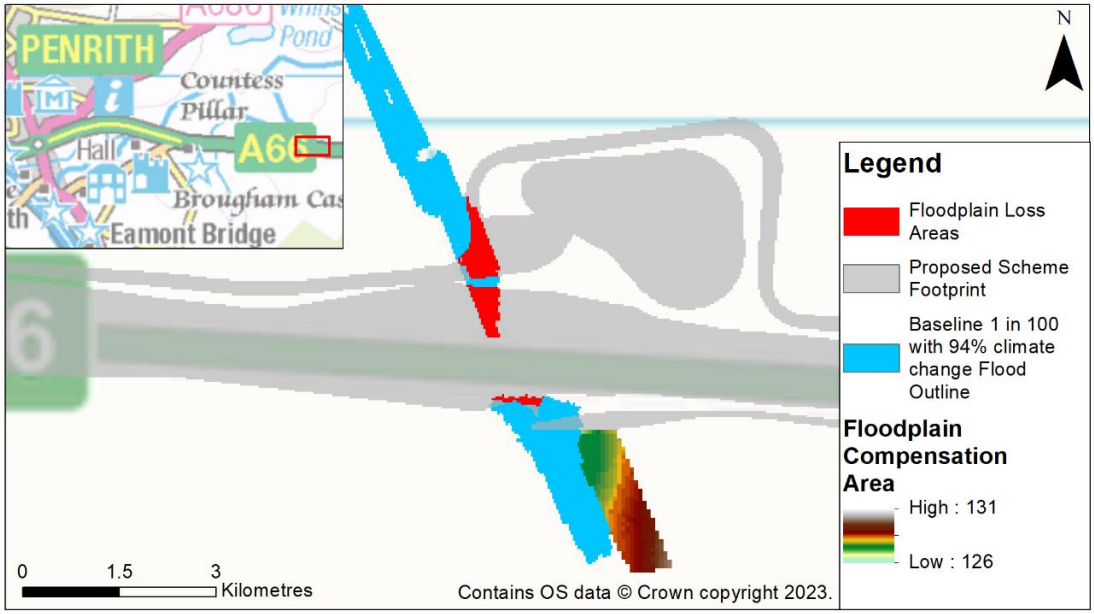


TABLE 1-2 UNN302 TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area			
Level mAOD	Volume Loss (m3)	Relative level adjustment (m)	Level mAOD	Volume Gain (m3)	Balance
123	0.0	In Channel Losses (See Assumptions)			
123.2	0.4				
123.4	5.0				
123.6	13.6	4	127.6	14.0	0.4
123.8	25.6	4	127.8	26.0	0.4
124	30.4	4	128.0	32.0	1.6
124.2	26.9	4	128.2	27.2	0.3
124.4	6.5	4	128.4	13.2	6.7
124.6	20.8	4	128.6	22.4	1.6
124.8	33.1	4	128.8	34.0	0.9
125	39.3	4	129.0	40.4	1.1
125.2	43.1	4	129.2	44.8	1.7

1.7 Scheme 4 - Trout Beck

1.7.1 Floodplain losses at the Trout Beck crossing are split between Trout Beck losses (The bridge piers) and the unnamed Crackenthorpe watercourse UNN05. Floodplain losses due to the piers is shown below in Figure 1-4.

1.7.2 Compensation in the area is challenging due to the wide expanse of the floodplain, the identified compensation area is within the 1 in 100 with climate change flood extent but located on the highest ground possible to maximise its impact. The compensation area is largely oversized in order to provide enough additional volume for the temporary works, the pier footprints themselves remove relatively low amounts of floodplain. The level-for-level breakdown is shown below in Table 1-3.

FIGURE 1-4 TROUT BECK FLOODPLAIN LOSSES AND GAINS

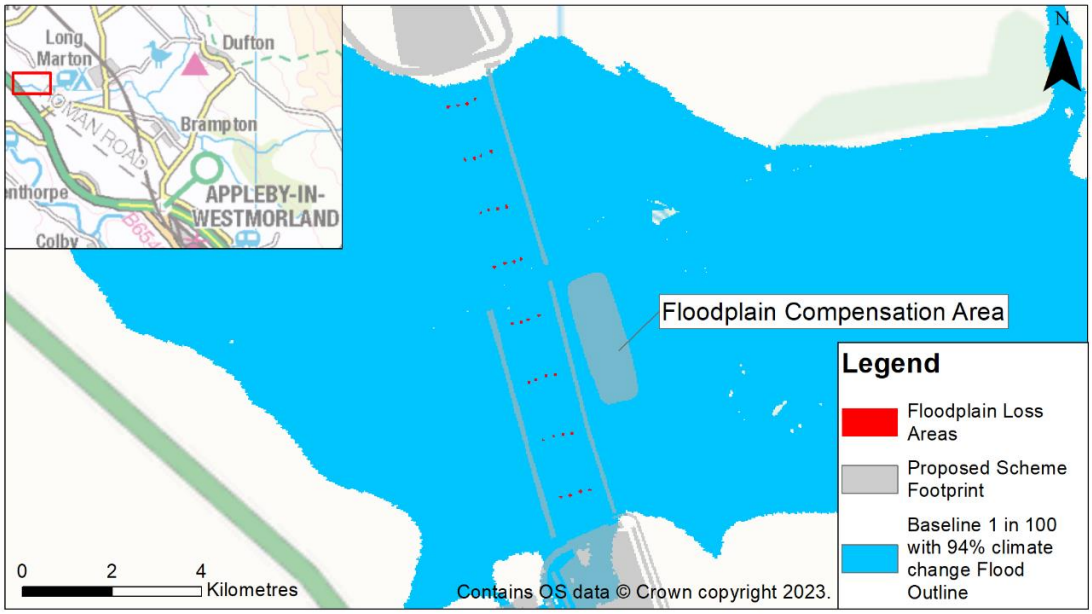


TABLE 1-3 TROUT BECK TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
110	7.3	110	0.0	-7.3
110	7.3	110	0.0	-7.3
110.2	1.9	110.2	0.0	-1.9
110.4	21.6	110.4	191.5	170.0
110.6	20.3	110.6	408.2	387.9
110.8	16.4	110.8	545.1	528.7
111	18.7	111	547.9	529.2
111.2	0	111.2	481.8	481.8
111.4	0	111.4	177.6	177.6
111.6	0	111.6	15.1	15.1

1.8 Scheme 5 UNN005

1.8.1 Floodplain losses at Scheme 5 are split into two discrete locations, one due to the southern bridge abutment of the Trout Beck crossing and the other further south due to the proposed junction.

1.8.2 An original floodplain compensation area was identified at the early stages of the scheme adjacent to the southern bridge abutment on the western side, however due to the watercourse diversion this is no longer suitable and a replacement area of land on the eastern side has been identified.

1.8.3 To the south losses can be compensated at the area to be used as a site compound, ground work in this area would need to take place prior to its use. Whilst these areas are not represented in the current hydraulic model due to the schemes minimal impact on flood risk, they are suitable and can be incorporated if required during detailed design.

FIGURE 1-5 UNN005 FLOODPLAIN LOSSES AND GAINS

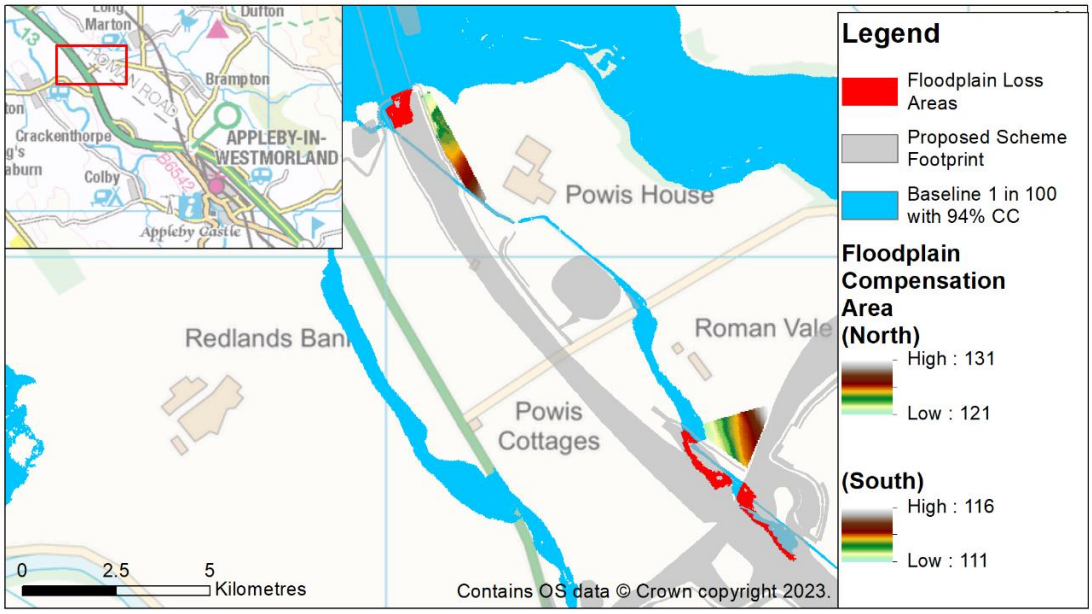


TABLE 1-4 UNN005 TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
111.2	0.0	111.2	0.0	0.0
111.4	2.7	111.4	4.4	1.7
111.6	25.9	111.6	27.7	1.8
111.8	113.5	111.8	115.2	1.6
112	170.1	112	183.2	13.1
112.2	195.0	112.2	196.2	1.2
112.4	142.6	112.4	169.2	26.6
112.6	168.3	112.6	169.2	0.9
112.8	78.4	112.8	93.6	15.2
121.6	1.9	121.6	2.8	0.9
121.8	9.5	121.8	10.8	1.3
122	20.0	122	21.2	1.2

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
122.2	30.7	122.2	31.2	0.5
122.4	42.9	122.4	43.6	0.7
122.6	55.8	122.6	57.6	1.8
122.8	70.9	122.8	73.2	2.3
123	73.1	123	86.0	12.9
123.2	140.4	123.2	142.7	2.3
123.4	132.9	123.4	143.0	10.0
123.6	63.9	123.6	138.8	74.9
123.8	58.5	123.8	116.3	57.8
124	140.4	124	144.5	4.0
124.2	130.3	124.2	144.7	14.5
124.4	110.8	124.4	145.2	34.4
124.6	95.2	124.6	123.6	28.4
124.8	87.1	124.8	113.6	26.5
125	59.0	125	89.6	30.6
125.2	72.3	125.2	76.4	4.1
125.4	81.1	125.4	95.6	14.5

1.9 Scheme 6

1.9.1 Scheme 6 covers the watercourses surrounding Warcop village which is an area sensitive to flood risk. Where possible, assessment in this area has been done on a return-period-for-return-period approach where losses are calculated between return periods and compensated based on the return period flood levels at the compensation site. UNN605 and UNN607 have been assessed on a traditional level-for-level approach.

1.10 Scheme 6 UNN605

FIGURE 1-6 UNN605 FLOODPLAIN LOSSES AND GAINS

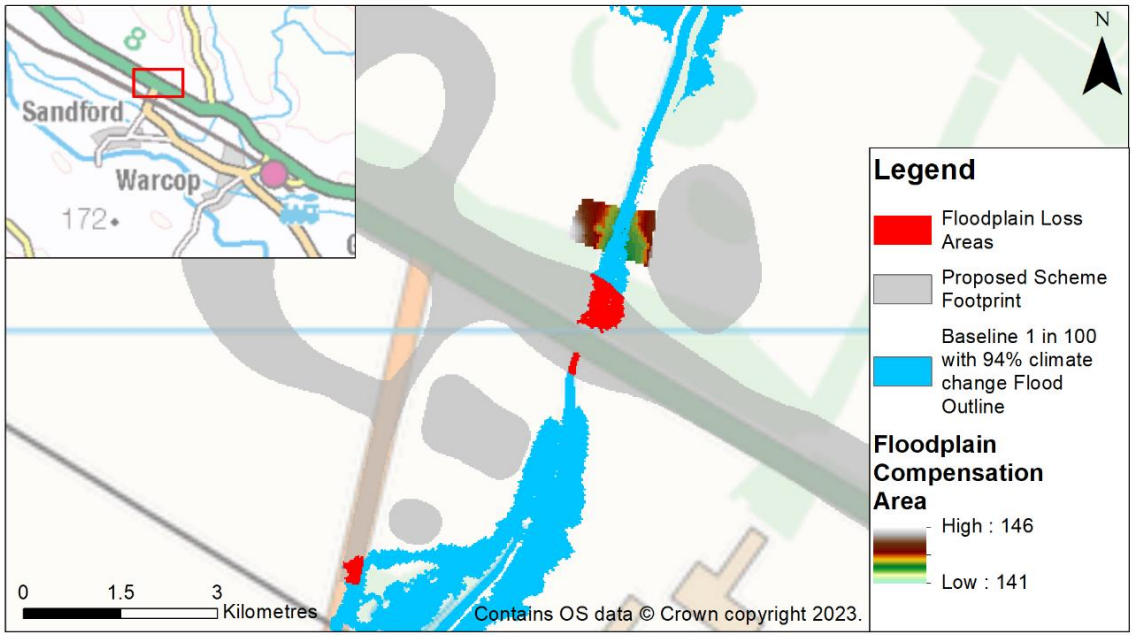


TABLE 1-5 UNN605 TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
141.6	0.0	141.6	1.0	1.0
141.8	5.9	141.8	7.5	1.7
142	13.1	142.0	13.3	0.1
142.2	7.4	142.2	16.4	9.0
142.4	20.2	142.4	22.2	2.0
142.6	52.8	142.6	54.4	1.6
142.8	116.2	142.8	117.4	1.2

1.11 Scheme 6 UNN607

1.11.1 The proposed floodplain compensation area for UNN607 is not represented in the current hydraulic models as the current modelling shows the impact on flood risk is minimal, however sufficient space is available at a suitable location to do this if required.

FIGURE 1-7 UNN607 FLOODPLAIN LOSSES AND GAINS

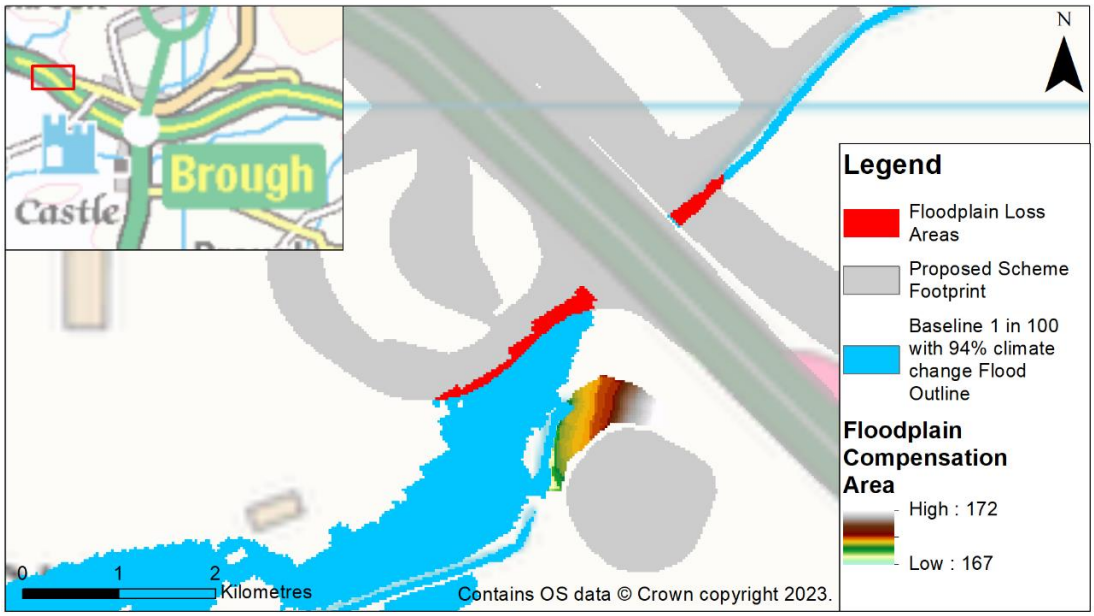


TABLE 1-6 UNN607 TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
167.8	2.0	167.8	3.1	1.0
168.0	4.4	168.0	6.4	2.1
168.2	5.5	168.2	6.9	1.3
168.4	8.0	168.4	9.1	1.1
168.6	7.1	168.6	10.6	3.6
168.8	6.6	168.8	7.0	0.4
169.0	9.9	169.0	11.2	1.3
169.2	14.6	169.2	16.2	1.6
169.4	14.2	169.4	17.9	3.7
169.6	15.1	169.6	16.1	1.0
169.8	19.4	169.8	24.1	4.7

1.12 Scheme 6 Cringle Beck

FIGURE 1-8 CRINGLE BECK FLOODPLAIN LOSSES AND GAINS

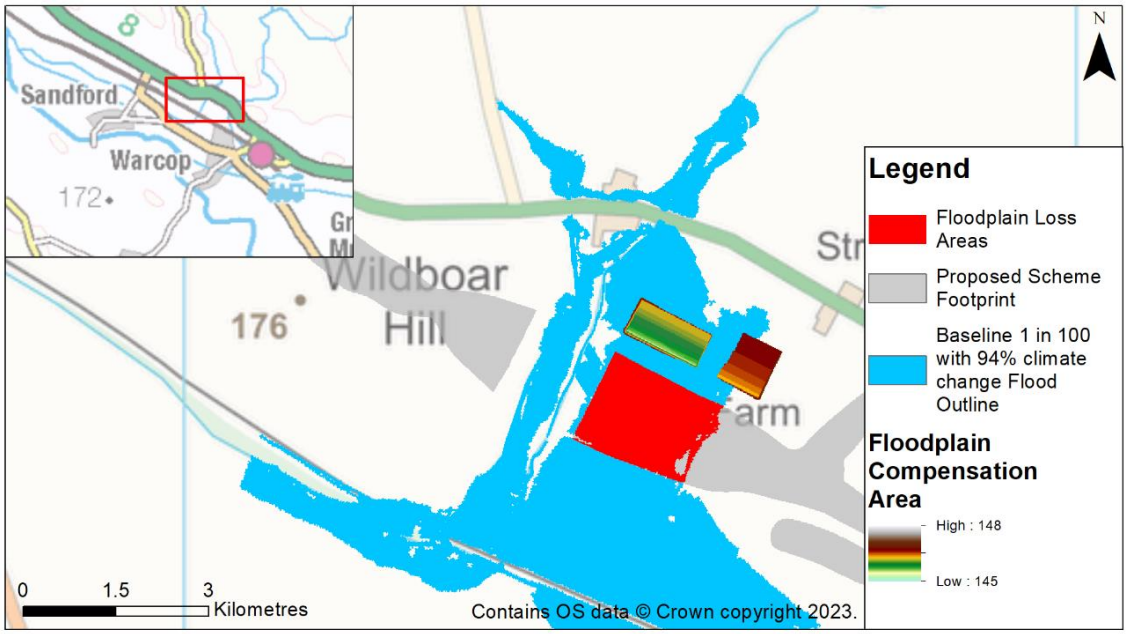


TABLE 1-7 CRINGLE BECK TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area	
Event	**Volume Loss (m3)**	**Volume Gain (m3)**	**Balance**
1 in 2	488.7	3506.6	3017.9
1 in 10	339.6	869.8	530.2
1 in 20	131.5	286.4	154.9
1 in 100	405.6	621.8	216.2
1 in 100 + 94%cc	961.1	1022.6	61.6

1.13 Scheme 6 Eastfield

1.13.1 Eastfield and Moor Beck have interacting floodplains during a 1 in 100 event with 94% allowance for climate change, the losses considered here are those that originate from Eastfield, other losses at this location are discussed in Moor Beck.

1.13.2 The original floodplain compensation area allocated at this location was not sufficient to compensate for all losses, the one shown in Figure 1-9 has been enlarged within the order limits, whilst only the southern part of this is used some regrading would be required to meet a 1 in 3 slope.

FIGURE 1-9 EASTFIELD FLOODPLAIN LOSSES AND GAINS

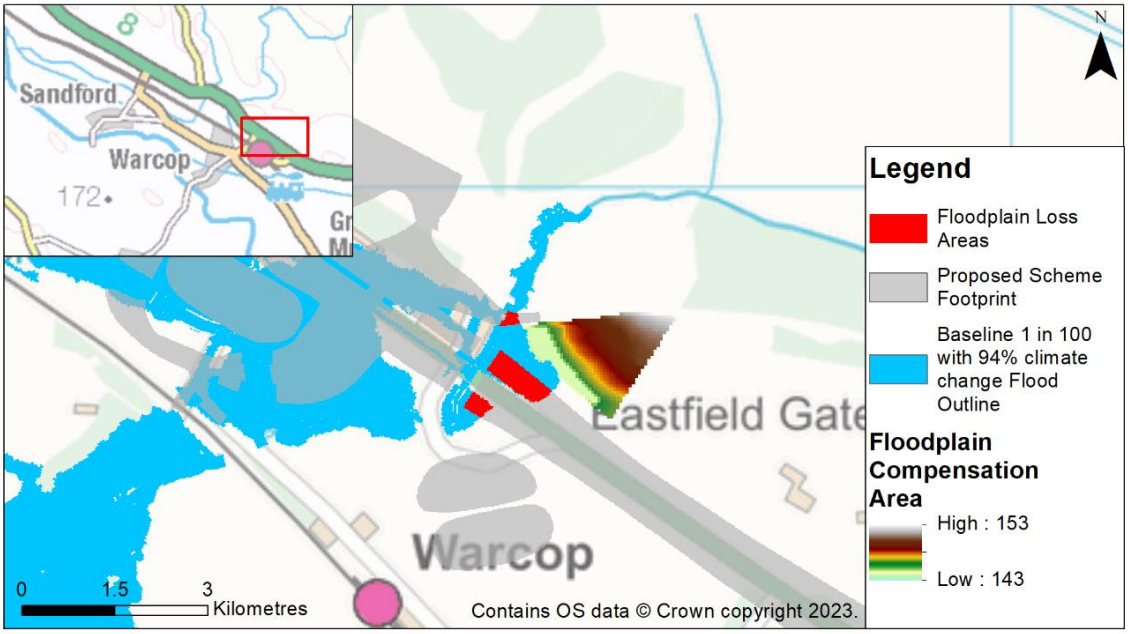


TABLE 1-8 EASTFIELD TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area	
Event	Volume Loss (m3)	Volume Gain (m3)	Balance
1 in 2	0.0	1.2	1.2
1 in 10	0.0	2.1	2.0
1 in 20	0.0	1.2	1.2
1 in 100	58.1	60.0	1.9
1 in 100 + 94%cc	749.1	748.9	-0.3

1.14 Scheme 6 Moor Beck

1.14.1 The floodplain around Moor Beck is extensive and located in a sensitive area upstream of the village of Warcop. Large floodplain losses are present here due to the proposed embankment and balancing pond in the area.

1.14.2 Space in the area is severely limited with the current compensation area located within parts of the floodplain. The area has an embankment located around it to limit the pass forward flow of water and limit conveyance downstream during a large flood event, this will artificially hold back water in the compensation area.

1.14.3 The assessment in this area has been done based on replacing the volume lost on a return-period-for-return-period basis. Whilst the assessment shows that the correct volumes are not present at each event it does not take into account the flow throttling impact of the embankment.

1.14.4 The total volume of compensation provided (whilst not at the ideal levels) is in excess of that lost, combined with the results of extensive hydraulic modelling has shown the combination of the compensation area and flow throttling of the embankment marginally reduces flows passed downstream to Warcop during a severe flood event.

FIGURE 1-10 MOOR BECK FLOODPLAIN LOSSES AND GAINS

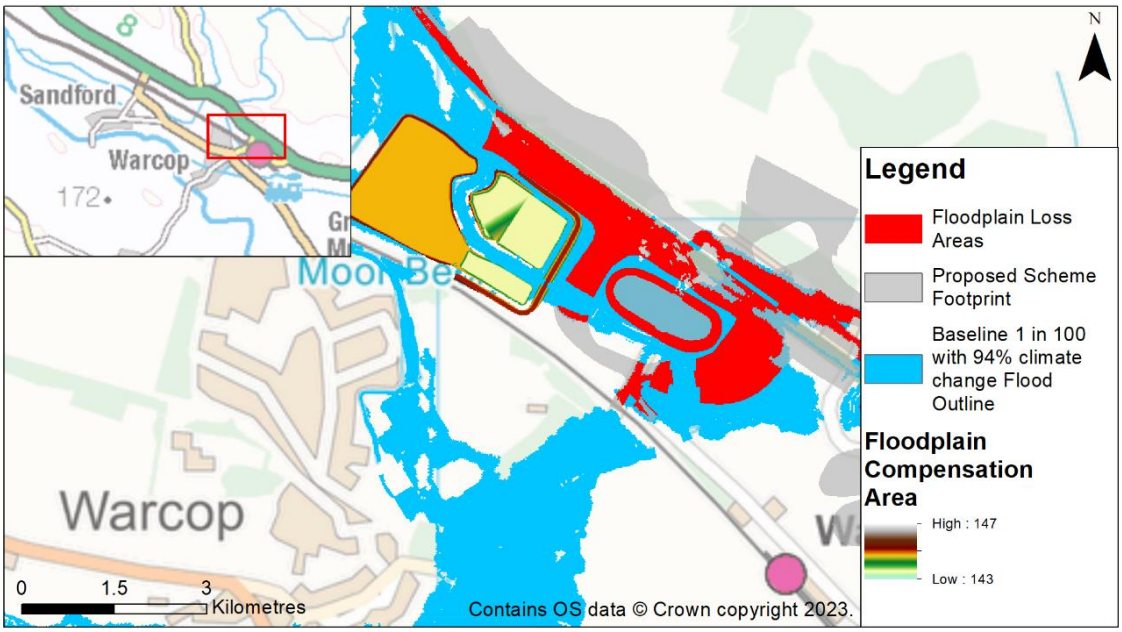


TABLE 1-9 MOOR BECK TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area	
Event	**Volume Loss (m3)**	**Volume Gain (m3)**	**Balance**
1 in 2	0.0	2878.3	2878.3
1 in 10	661.8	466.8	-195.0
1 in 20	317.3	312.6	-4.7
1 in 100	3199.8	1328.6	-1871.1
1 in 100 + 94%cc	8289.3	10487.3	2198.0
Total	12468.2	15473.6	3005.5

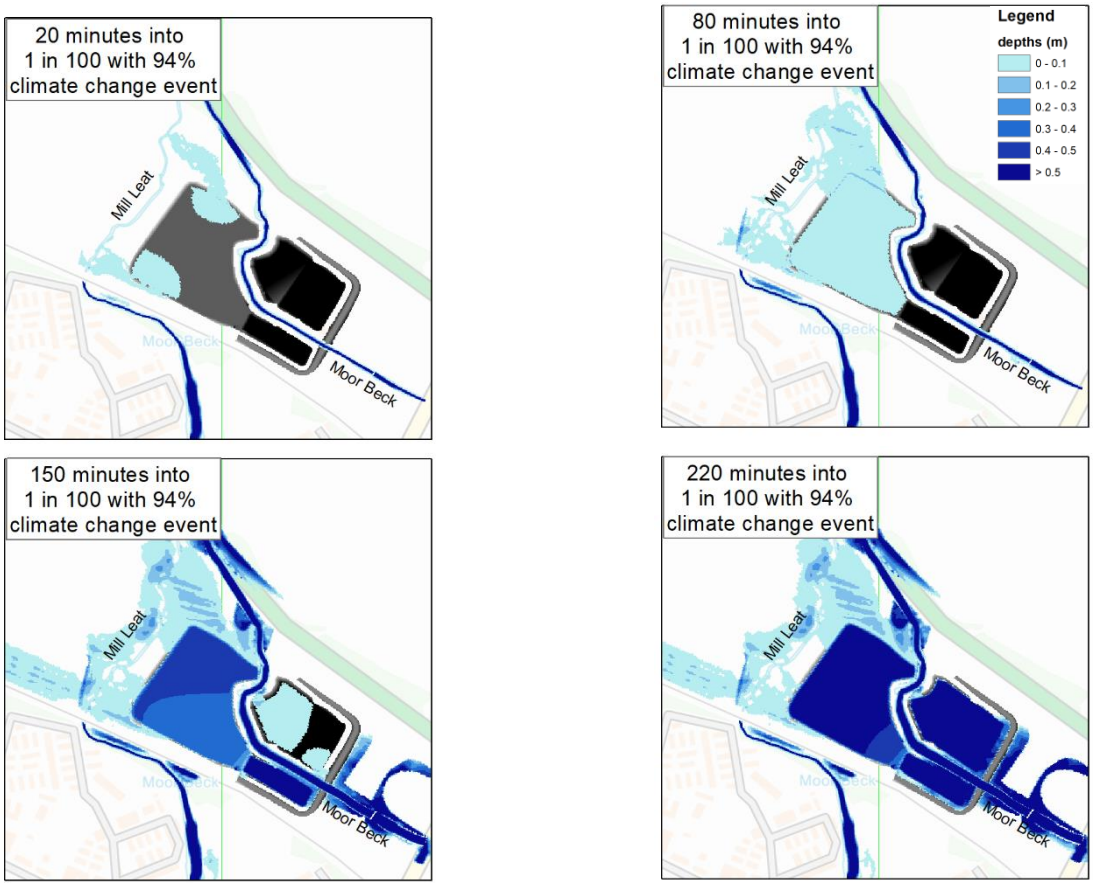
1.14.5 Moor Beck compensation area is largely situated between the disused Mill Leat and the main Moor Beck watercourse. The proposed compensation area has been sized to maximise the volume of water it stores.

1.14.6 The design includes a downstream embankment which throttles flows out of the area during a high flood event, this retains water at a higher level within the compensation area with head differences between the upstream and downstream of the embankment of up to 0.5m.

1.14.7 The figures bellow show the progression of flood water through four snapshots in time during a 1 in 100 event with 94% allowance for climate change.

1.14.8 Flooding into the compensation begins at 20 minutes from two discrete areas on the Mill Leat situated several metres above the Moor Beck. Flood water fills the western portion first at 80 minutes and progresses into the eastern section by 150 minutes. By 220 minutes the FCA is largely filled and throttling further flows downstream to Warcop.

FIGURE 1-11 MOOR BECK FLOODPLAIN FLOW PROGRESSION PLAN



1.14.9 The figures below contain cross sections through the compensation area with several water levels shown to demonstrate the filling through the flood event. The figures show the base of the compensation area to be flat over several levels, this will be further refined to have a more suitable gradient and cross fall to aid drainage during the detailed design.

1.14.10 The base level of the compensation area can be seen to be lower than the bank level of Moor Beck in the cross sections, however as shown, this is higher than the 1 in 2 peak flood level in the area and therefore will drain down with suitable connectivity to be finalised in the detailed design.

FIGURE 1-12 MOOR BECK FLOODPLAIN FLOW PROGRESSION SECTION 1

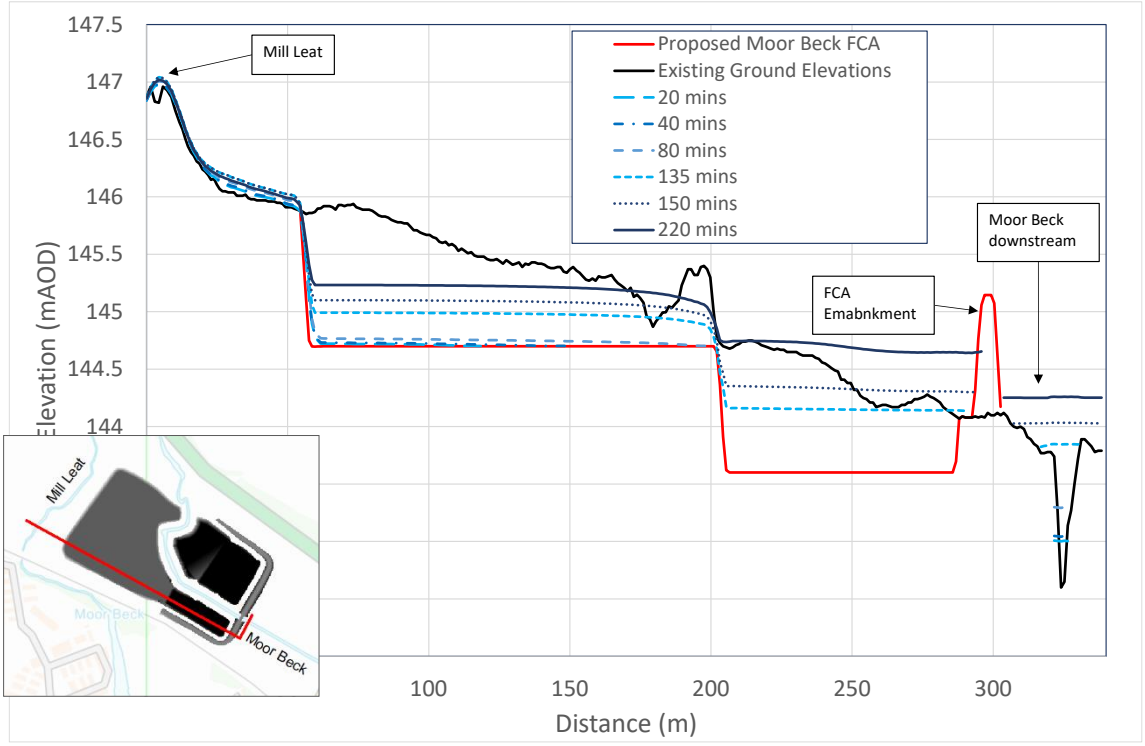
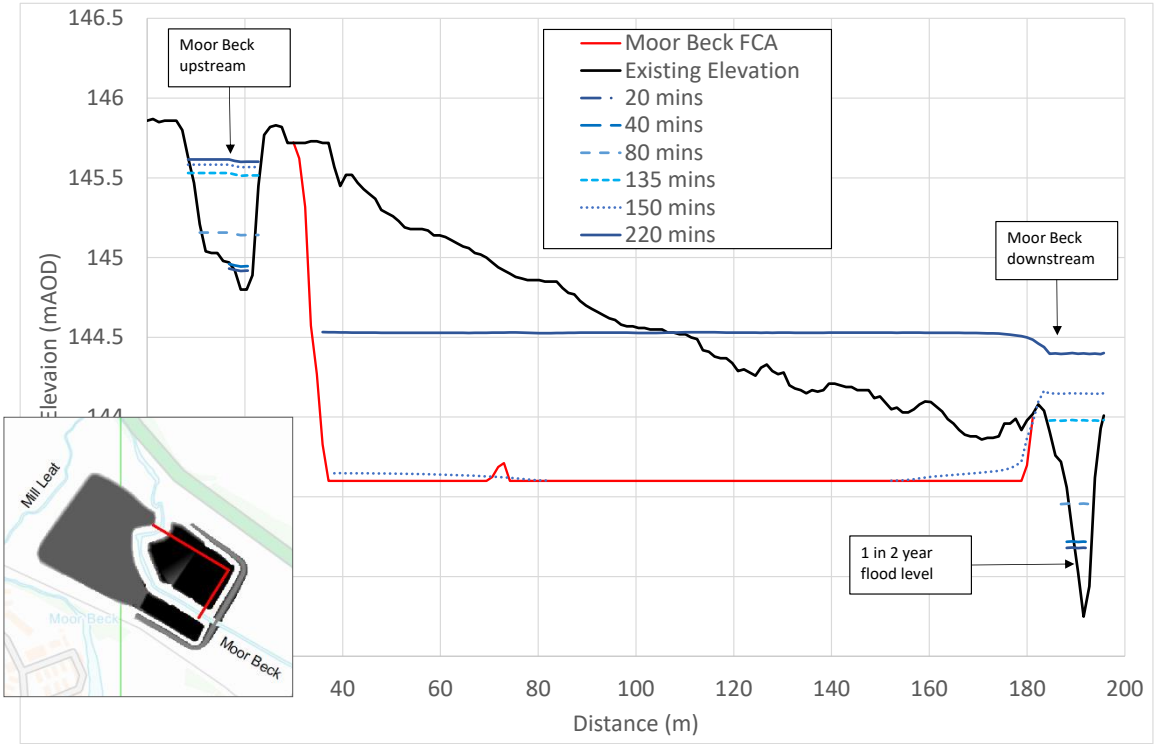


FIGURE 1-13 MOOR BECK FLOODPLAIN FLOW PROGRESSION SECTION 2



1.14.11 As reported within the Appleby to Brough Hydraulic Modelling report (Annex E of ES Appendix 14.2), levels and flows between the existing A66 and the railway show some variation due to the changes in the ground levels as a result of the scheme, however, flows through the railway bridge (along the

existing road into Warcop) show a decrease. Overall, pass-forward flows downstream of the railway at CROO_01473 show a decrease with the proposal.

Location	Node	1 in 2	1 in 20	1 in 100	1 in 100 + 94%
Downstream of railway crossing	CROO_01473	-0.2	-0.0	-0.1	-0.3

1.15 Scheme 6 Lowgill Beck - Upstream

1.15.1 Lowgill Beck flows north to south where it crosses the proposed A66 upgrade and then flows west towards Warcop. The proposed scheme takes a moderate amount of floodplain on the upstream side of the embankment. A compensation area has been designated that has ample capacity to compensate for the losses and provide considerable betterment in the area.

FIGURE 1-14 LOWGILL BECK – UPSTREAM FLOODPLAIN LOSSES AND GAINS

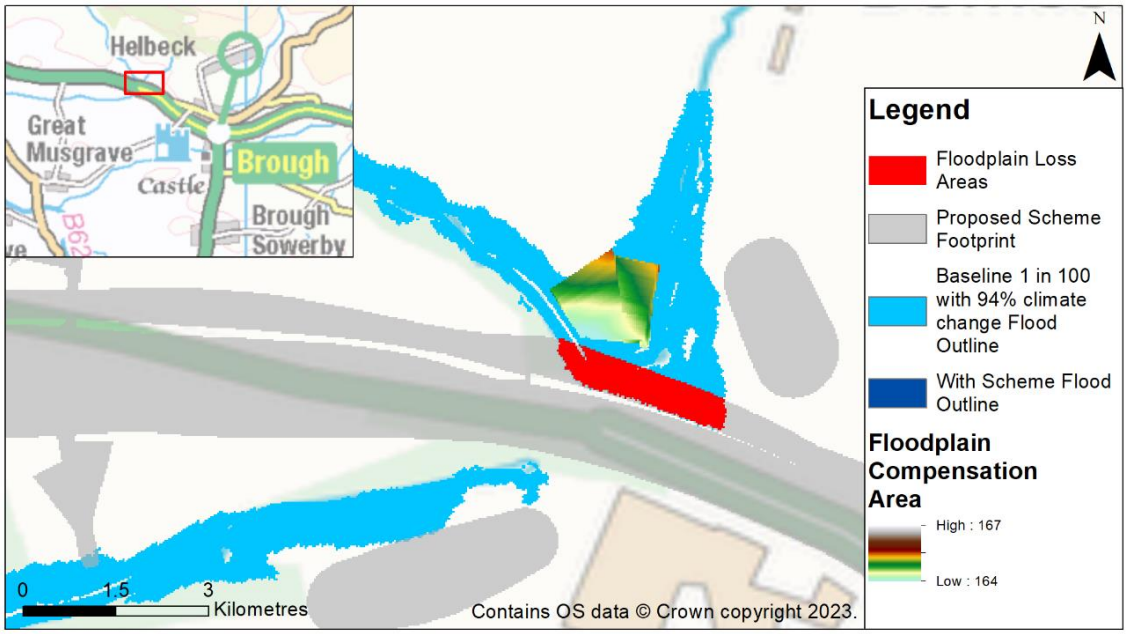


TABLE 1-10 LOWGILL BECK – UPSTREAM TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area	
Event	Volume Loss (m3)	Volume Gain (m3)	Balance
1 in 2	39.4	249.5	210.1
1 in 10	16.7	136.0	119.3
1 in 20	8.4	58.8	50.4
1 in 100	42.0	135.2	93.2
1 in 100 + 94%cc	1024.8	2613.8	1588.9

1.16 Scheme 6 Lowgill Beck - Downstream

1.16.1 Floodplain losses in this location are due to both the proposed A66 road embankment, local road tie in at Flithome and a proposed balancing pond impacting the floodplain of Lowgill Beck. Flood plain compensation has not been provided for the impacts caused by the local road tie in at Flithome and a proposed balancing pond as they will be moved out of the flood plain at detailed design.

1.16.2 Floodplain compensation for the proposed A66 road embankment is not represented in the current hydraulic models as the impact on flood risk is minimal, however there is sufficient space to make level-for-level compensation, for the floodplain losses up to the level of the 1 in 100 event with 94% allowance for climate change has not been incorporated into the flood modelling at the preliminary design stage as shown below.

FIGURE 1-15 LOWGILL BECK – DOWNSTREAM FLOODPLAIN LOSSES AND GAINS

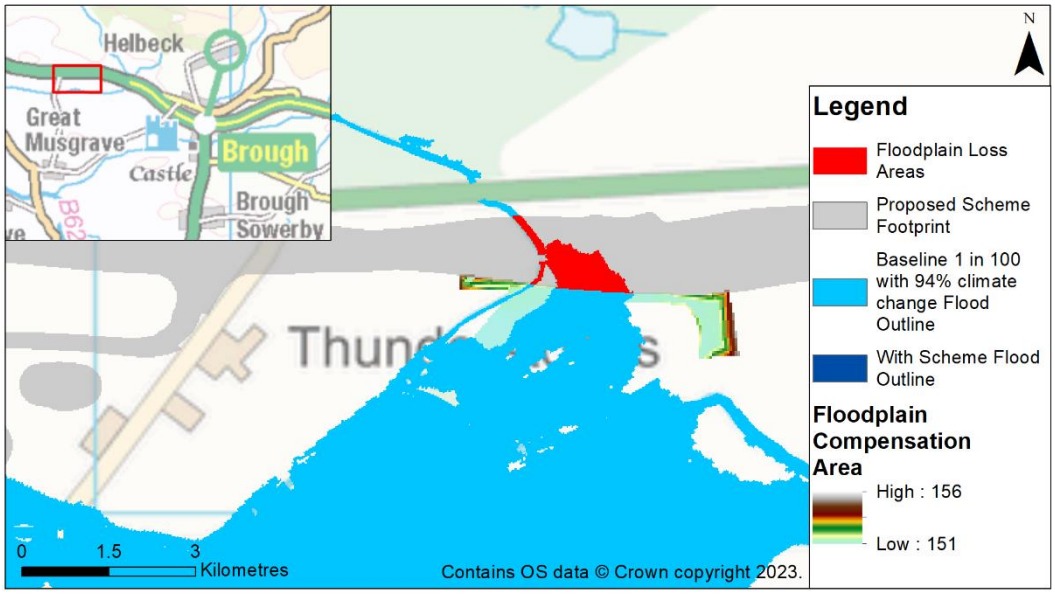


TABLE 1-11 LOWGILL BECK – DOWNSTREAM TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area	
Event	Volume Loss (m3)	Volume Gain (m3)	Balance
1 in 2	0.2	1.0	0.8
1 in 10	19.8	45.1	25.3
1 in 20	8.4	67.1	58.7
1 in 100	28.7	157.2	128.5
1 in 100 + 94%cc	59.2	349.9	290.7

1.17 Scheme 7 UNN701

1.17.1 Floodwaters in the area originate from unnamed drains north of the existing A66, the small catchment is restricted by the current culvert capacity under the road causing water to back up behind the embankment. Whilst the proposed scheme does remove a moderate portion of floodplain, the hydraulics in the area are dominated by water held back against the embankment. The modelled result of this pushes the floodplain back a similar distance.

1.17.2 As this area is dominated by a restricted culvert the preferred approach here is to use the increase to the post development flood outline to designate the additional footprint as new floodplain, however if additional volume is required for a regulatory purpose the below figure and table show this is possible within the land designated, however it is unlikely to bring significant benefits or changes to total footprint of land flooded.

FIGURE 1-16 BOWES FLOODPLAIN LOSSES AND GAINS

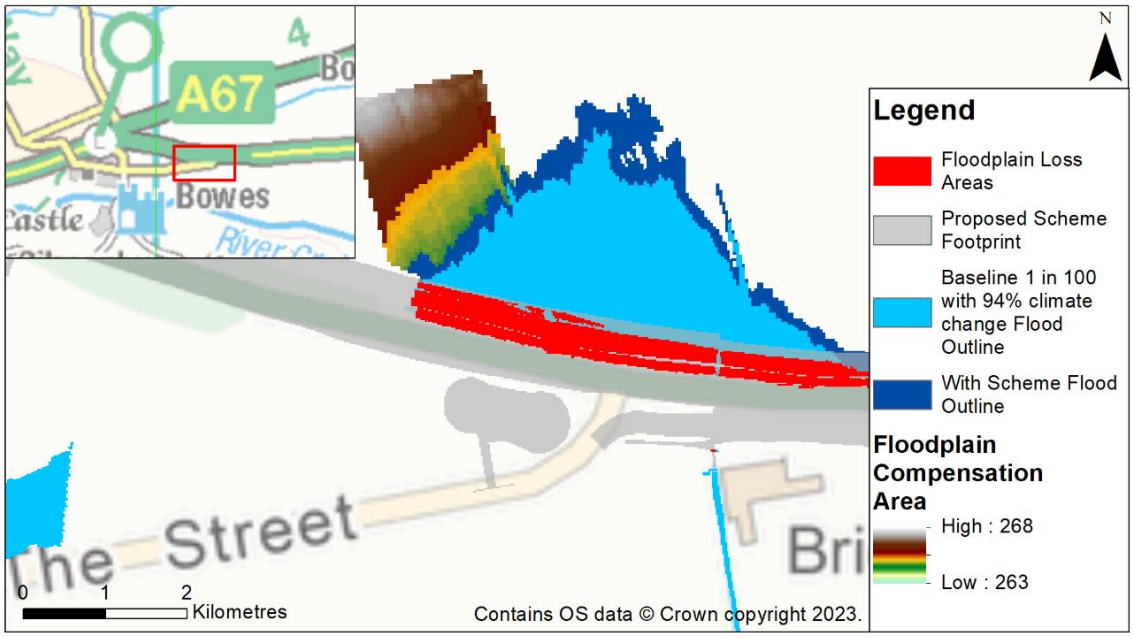


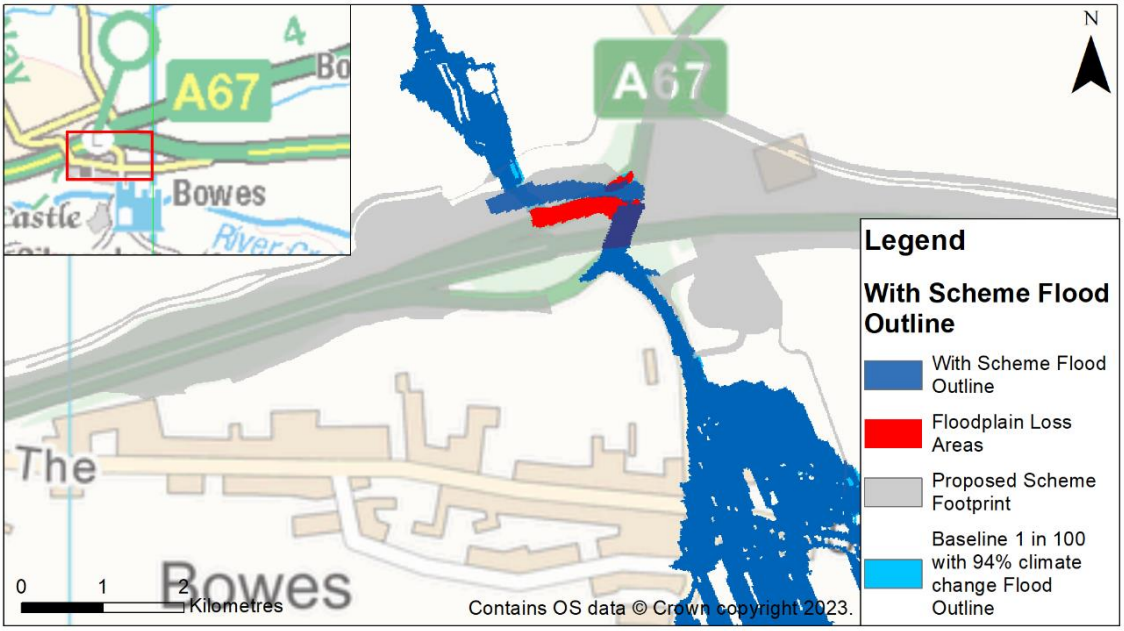
TABLE 1-12 BOWES TABULATED LOSSES AND GAINS

Floodplain Losses		Floodplain Compensation Area		
Level mAOD	Volume Loss (m3)	Level mAOD	Volume Gain (m3)	Balance
263	0.0	In Channel Losses (See Assumptions)		
263.2	0.5			
263.4	0.7			
263.6	0.6			
263.8	2.1	263.8	3.3	1.2
264	70.4	264.0	72.6	2.2
264.2	306.3	264.2	308.1	1.8
264.4	468.8	264.4	470.6	1.8
264.6	606.3	264.6	606.9	0.6
264.8	707.8	264.8	710.1	2.3
265	828.5	265.0	830.7	2.2
265.2	912.8	265.2	914.4	1.6

1.18 Scheme 7 UNN704

1.18.1 The Scheme 7 Armoury flood model shows a flow path route of the existing watercourse that uses the underpass as a flow route south. The proposed scheme expands the footprint of the road and shifts the slip road and start of the underpass slightly to the north. Whilst this situation shows a loss in floodplain where the widened road is proposed it is replicated on the proposed slip road, maintaining the flow route.

FIGURE 1-17 ARMOURY FLOODPLAIN LOSSES



1.19 Conclusions

1.19.1 The Project will reduce available floodplain due to the proposed groundworks. Floodplain compensation can be used to mitigate this reduction in floodplain.

1.19.2 Floodplain compensation areas have been designed and modelled for the main rivers impacted across the Project. These have been shown to be able to mitigate the increased risk through level-for-level or return-period-for-return-period and in the case of Scheme 6 additional infrastructure to throttle flows.

1.19.3 Floodplain compensation areas for some Ordinary Watercourses have not been modelled as the change in flood risk is considered to have minor impact, however where these losses occur this document shows there is suitable land available should the LLFA require this approach.

2. Hydraulic Model Nodes

2.1 Location of Reported Model Nodes

2.1.1 Our response to the Written Representation from the Environment Agency is on page 29 of document 7.7 Applicant's Response to Written Representations made by Interested Parties subject to an SoCG (REP2-016).

2.1.2 Level and flows are taken in-channel only from the 1D model. Whilst they are only reported from the 1D model, this is directly linked to the 2D it will take account for all hydraulic processes occurring across the floodplain by showing their impact on channel flows. The depth difference grid figures show the direct impact on the floodplain and will highlight any areas where floodplain behaviour differs between scenarios.

2.1.3 Schematics showing the location of the reported model nodes are shown on the following maps. These omit model nodes where flows or levels are not reported in order to provide sufficient clarity on the maps.

FIGURE 2-1 SCHEME 3 LIGHTWATER AND UNN301

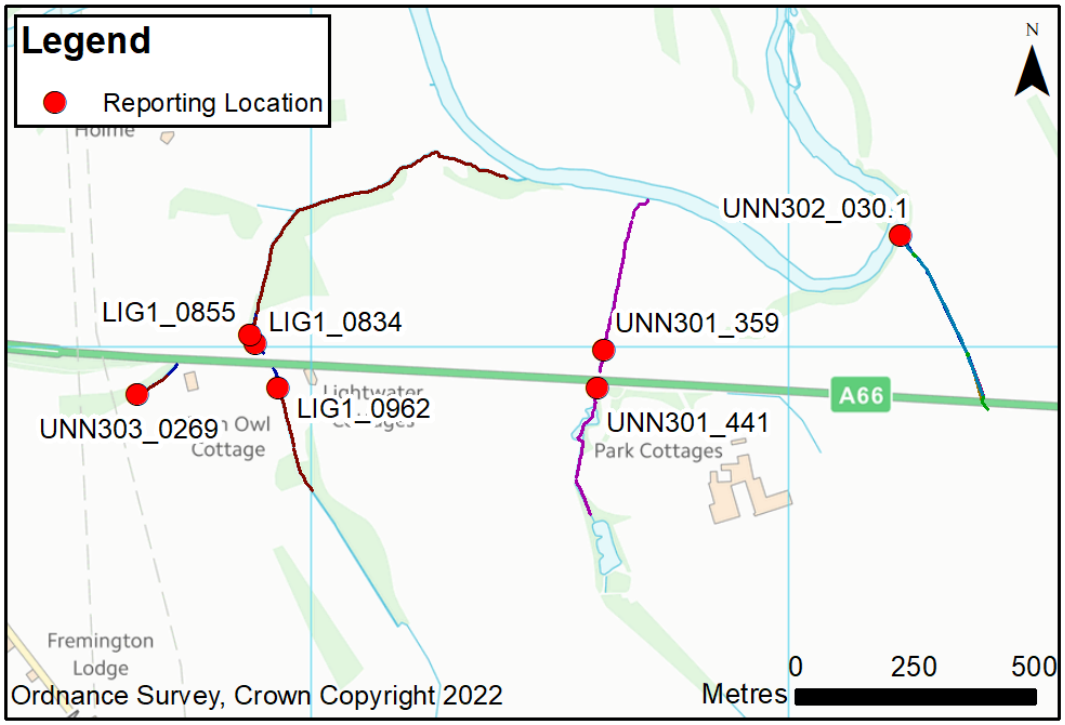


FIGURE 2-2 SCHEME 3 SWINE GILL BECK

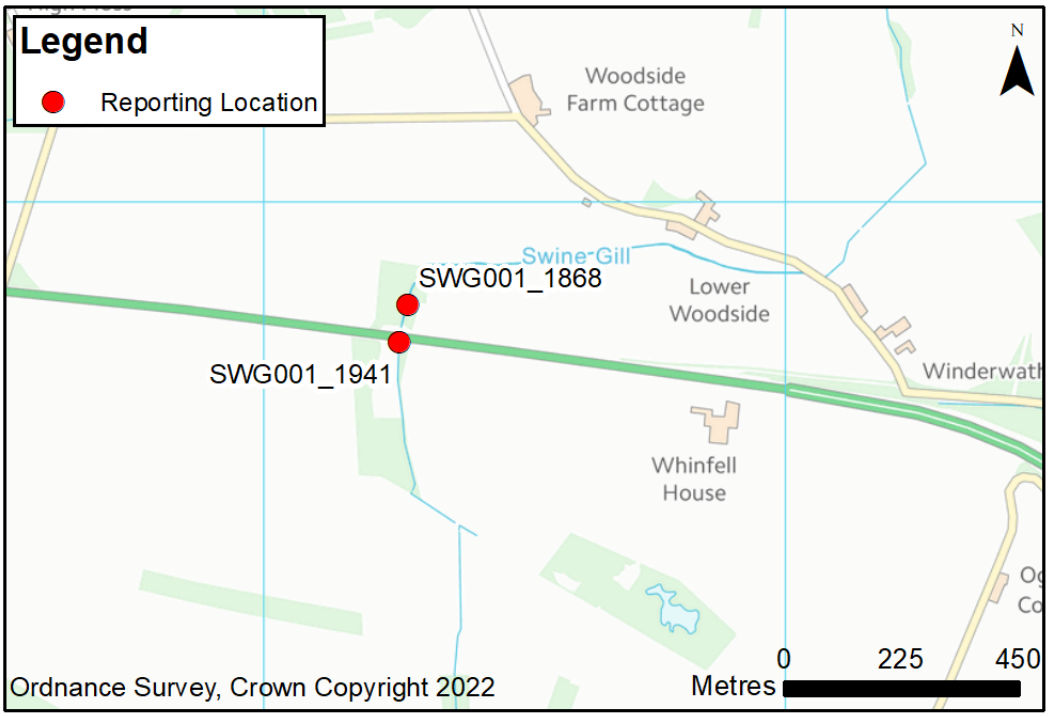


FIGURE 2-3 SCHEME 4 TROUT BECK

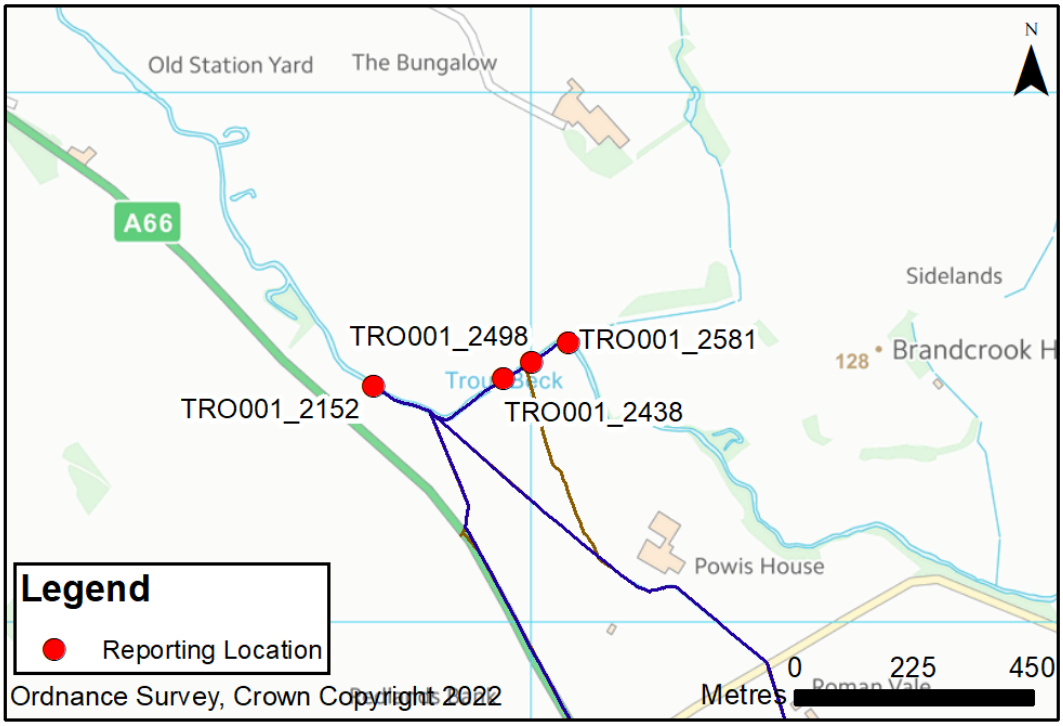


FIGURE 2-4 SCHEME 5 UNNAMED WATERCOURSES

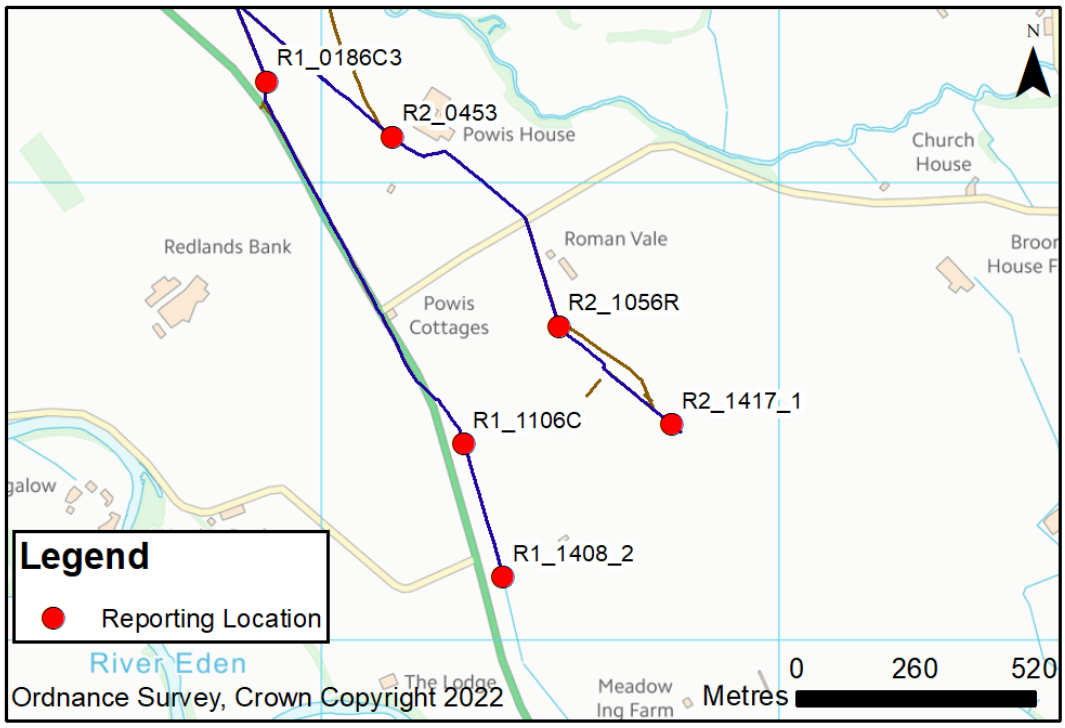


FIGURE 2-5 SCHEME 6 WARCOP MODEL

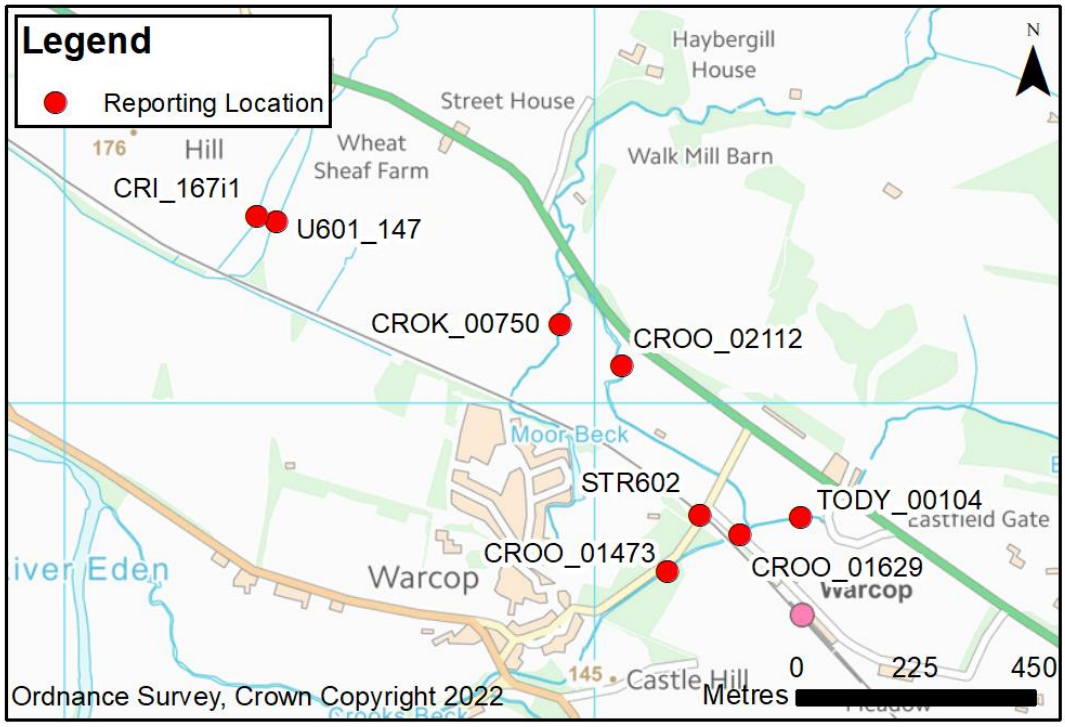


FIGURE 2-6 SCHEME 6 UNN605

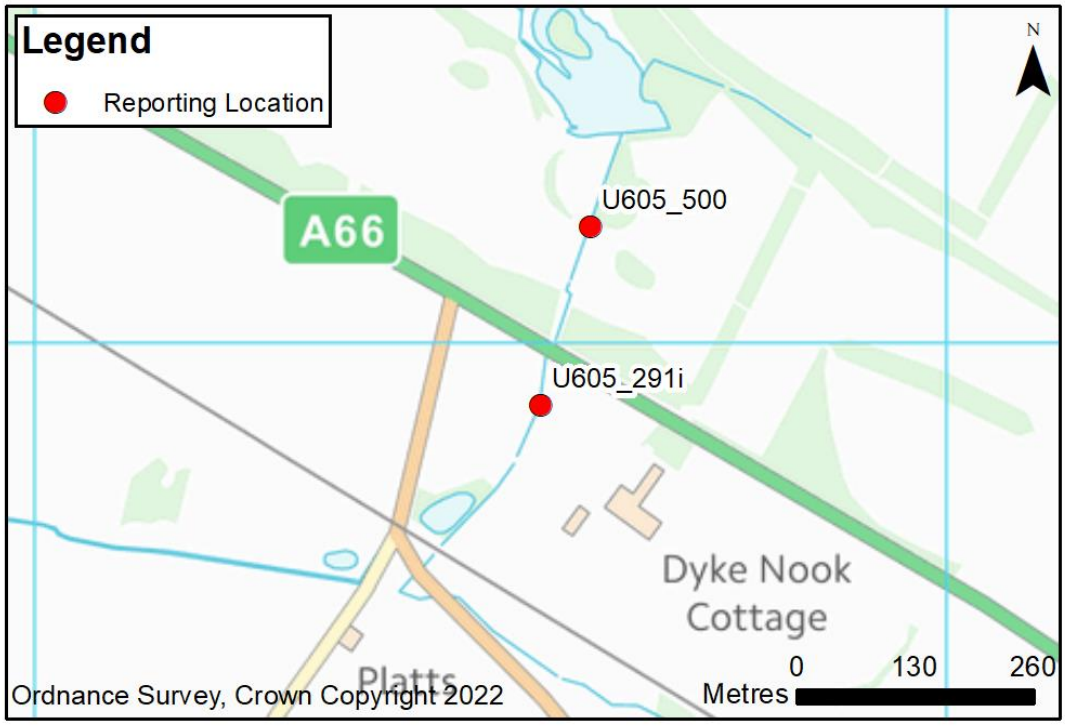


FIGURE 2-7 SCHEME 6 UNN605-607

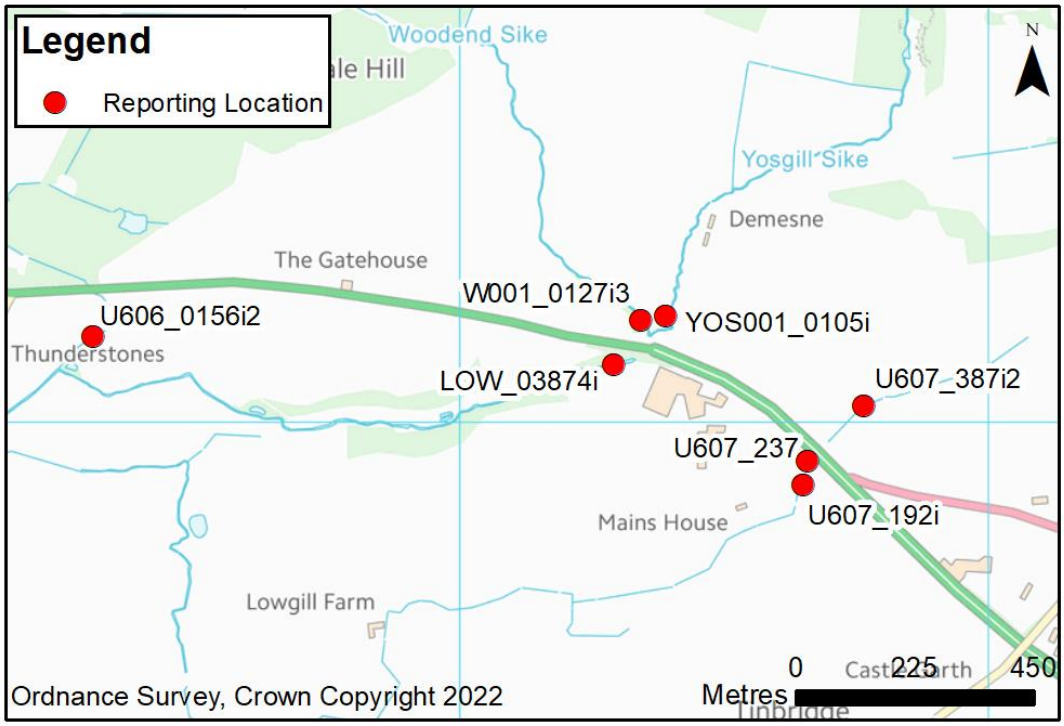
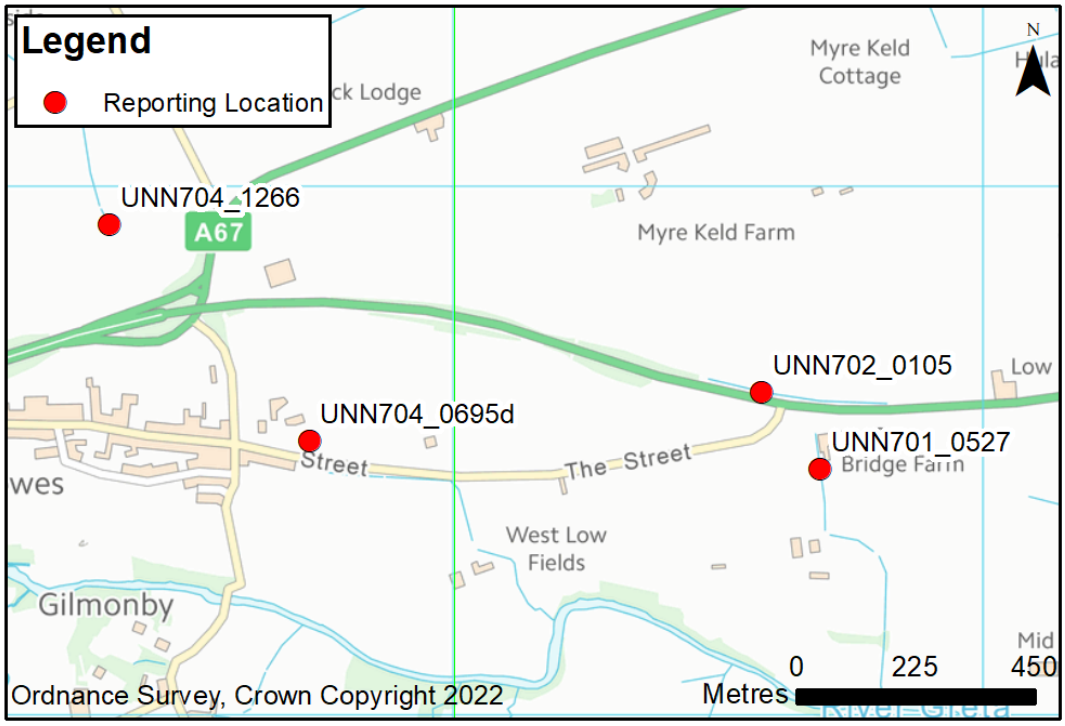


FIGURE 2-8 SCHEME 6 UNN702-704



Appendix C: Scheme 06 Moor Beck Flood Compensation Area

A66 Northern Trans-Pennine Project
TR010062

Appendix C: Scheme 06 Moor Beck Flood Compensation Area

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

Deadline 9

26 May 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A66 Northern Trans-Pennine Project Development Consent Order 202x

APPENDIX C SCHEME 06 MOOR BECK FLOOD COMPENSATION AREA

Planning Inspectorate Scheme Reference	TR010062
Application Document Reference	4.5
Author:	A66 Northern Trans-Pennine Project Team, National Highways

Version	Date	Status of Version
Rev 1	26 May 2023	Deadline 9

CONTENTS

1 Introduction

1.1.1 This note is intended to support the initial stages of the detailed design process for the proposed Moor Beck Floodplain Compensation Area (FCA). It does not provide any information that would alter the conclusions reported in the Environmental Statement prepared to support the DCO application for the A66 NTP Project. Instead, this note aims to demonstrate how the conclusions so reported will be secured. It is intended to provide the Environment Agency with details of the design assumptions and parameters that are proposed to be applied to the FCA. This is particularly in light of the commitment contained in the first iteration EMP for a flood compensation scheme for Scheme 06 to be consulted on with the Environment Agency and submitted to the Secretary of State for approval.

1.1.2 The proposed Moor Beck FCA is largely situated between the disused Mill Leat and the main Moor Beck watercourse. The proposed compensation area has been sized to maximise the volume of water it can store in the space available.

1.1.3 The design of the proposed FCA includes both a reduction in levels across the area to compensate for volume of floodplain lost due to the scheme and a downstream embankment which throttles flows out of the area during a high flood event, this retains water at a higher level within the FCA.

1.1.4 This note provides an initial detailed breakdown of the proposed volumes of floodplain lost and gained at the site as a result of the scheme. Latter sections discuss the flood mechanisms of the floodplain compensation area at a high level with the last sections reporting the extensive sensitivity testing undertaken to ensure the design was not sensitive to key, uncertain parameters used in the modelling. Where sensitivities are identified appropriate mitigation or management actions will be investigated and incorporated into Scheme 06 at the detailed design stage.

1.1.5 This document builds upon and extends the previous work submitted detailing the operation of the Moor beck FCA and as such reuses most of the content in the early sections to provide reference, context and continuity.

2 Floodplain loss and gain calculations

2.1.1 The floodplain around Moor Beck is extensive and located in a sensitive area upstream of the village of Warcop. Large floodplain losses are present here due to the proposed embankment and balancing pond in the area.

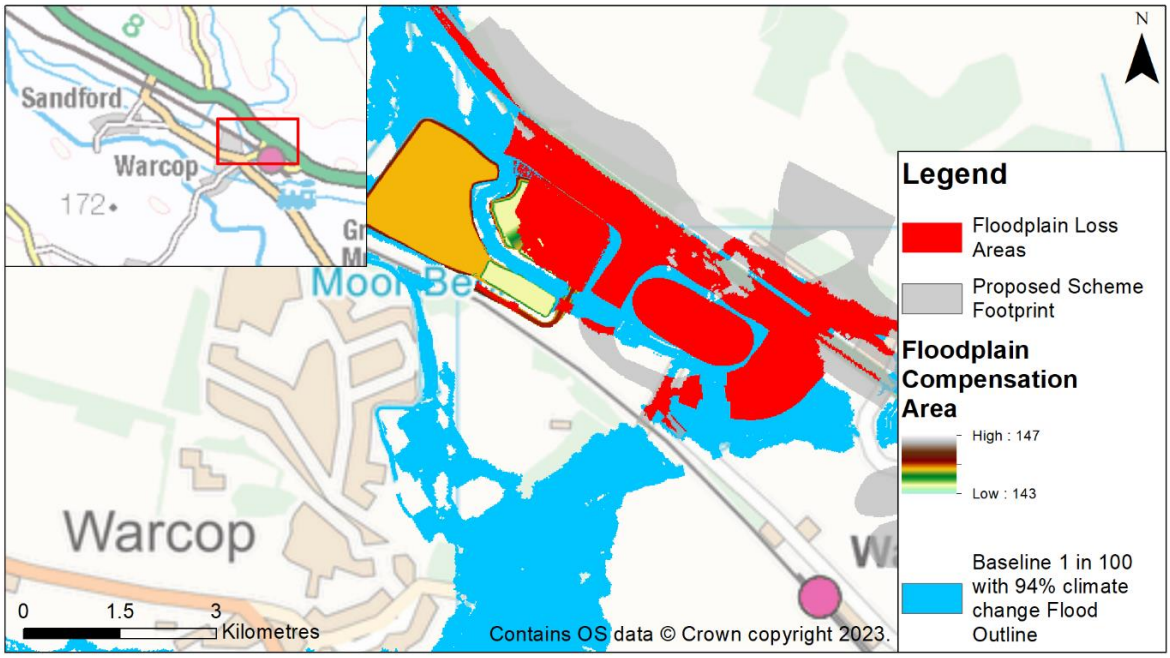
2.1.2 Space in the area is severely limited with the current design of the proposed compensation area located within parts of the floodplain. The area has an embankment located around it to limit the pass forward flow of water and limit conveyance downstream during a large flood event, this will artificially hold back water in the compensation area.

2.1.3 Calculations were undertaken to show the floodplain losses and gains at Moor Beck, these were presented in Feb 2023 to the Environment Agency. Following the review of that document several minor amendments were requested:

2.2 Add disconnected floodplain to the loss calculations.

2.2.1 Where the proposed scheme disconnects a floodplain flow route, the losses from the proposed scheme should be accounted for along with the loss of the any floodplain that solely relies on that flow path.

2.2.2 The compensation calculations have been re-run with the additional disconnected flow route removed from the potential available floodplain in the post development scenario,



		Floodplain Compensation Area Static water level approach		Floodplain Compensation Area Modelled Depth Grid Approach	
Event	**Volume Lost at increment (m^3)**	**Volume Gained at increment (m^3)**	**Balance (m^3)**	**Volume Gained at increment (m^3)**	**Balance**
1 in 2	0	2878	2878	2383	2383
1 in 10	856	467	-390	302	-555
1 in 20	371	313	-58	252	-119
1 in 100	3251	1329	-1922	1171	-2080
1 in 100 + 94%cc	8664	10487	1823	10209	1545
Total	13142	15474	2332	14316	1174

Table 2-1, below shows the updated flood plain losses in the second column.

Figure 2-1 Floodplain losses at Moor Beck

		Floodplain Compensation Area Static water level approach		Floodplain Compensation Area Modelled Depth Grid Approach	
Event	**Volume Lost at increment (m^3)**	**Volume Gained at increment (m^3)**	**Balance (m^3)**	**Volume Gained at increment (m^3)**	**Balance**
1 in 2	0	2878	2878	2383	2383
1 in 10	856	467	-390	302	-555
1 in 20	371	313	-58	252	-119
1 in 100	3251	1329	-1922	1171	-2080
1 in 100 + 94%cc	8664	10487	1823	10209	1545
Total	13142	15474	2332	14316	1174

Table 2-1 Floodplain loss and gain volumes at Moor Beck

2.3 An explanation of how gained floodplain volumes are assigned to each of the return periods

2.3.1 The method used to determine floodplain volume gains at the FCA is based on the difference in ground level between the baseline DTM and the post development DTM up to the modelled flood level for the given event at the FCA location. This method is generally appropriate when levels are largely flat across a floodplain compensation area, however it was noted that this could slightly over estimate volumes at this location due to the large gradient in levels across the compensation site. This is the method used in the original analysis and is shown in the column

labelled "Static water level approach" in

		Floodplain Compensation Area Static water level approach		Floodplain Compensation Area Modelled Depth Grid Approach	
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1 in 100 + 94%cc	8664	10487	1823	10209	1545
Total	13142	15474	2332	14316	1174

Table 2-1.

2.4 Modelled depth grid comparison of volumes gained

2.4.1 Due to the above issue, a secondary method has been used to determine floodplain gains at the compensation site by comparing the baseline and post development depth grids at the FCA to determine how much additional floodplain has been gained.

2.4.2 For each modelled event the volume of the maximum depth grids was calculated over the floodplain compensation area footprint shown in Figure 4-1 for both the baseline and with-scheme scenarios. The difference in volume between the baseline and with-scheme was assumed to be the total volume change for that event. The volume in the lower modelled events were removed from the total volume change to provide a volume gained between each modelled event. Both water in the 1D and 2D domains was considered in the analysis.

2.4.3 This approach has been used for both the individual FCA and the wider Warcop junction floodplain to understand the changes in volume across the area. Due to the flood mechanism operating at the FCA resulting in varied water levels across its extent the latter method using the modelled flood grids is considered more appropriate for calculating floodplain gains at the FCA.

2.4.4 The results of this approach are shown in the last two columns of

		Floodplain Compensation Area Static water level approach		Floodplain Compensation Area Modelled Depth Grid Approach	
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1 in 2	0	2878	2878	2383	2383
1 in 10	856	467	-390	302	-555
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1 in 100 + 94%cc	8664	10487	1823	10209	1545
Total	13142	15474	2332	14316	1174

Table 2-1, above, for the FCA. The table shows there is a slight over-estimation using the static water level approach compared to the modelled water levels. Despite this slightly reduced benefit from the FCA the overall trends remains the same with large overprovision at the lowest and highest levels with an under provision at the 1% event being the most pronounced. The under provision is likely to be reduced during detailed design where better utilisation of the north-eastern portion of the FCA could be investigated.

Wider floodplain storage at Warcop Junction

2.4.5 A broader scale check has been undertaken on the whole Warcop junction floodplain upstream of the railway embankment, this has used the same comparison of modelled depth grids to determine the volumes active on the floodplain across the modelled events for flood cell between the A66 and the railway embankment. Table 2-2 shows how much additional floodplain is present for each event above that in the baseline. Positive numbers show more active floodplain than in the baseline, negative indicates less.

2.4.6 In every event analysed there is a greater volume of modelled active floodplain upstream of Warcop compared to the baseline scenario. This method also takes into consideration changes to floodplain levels outside of the FCA, so includes increases across the area south of the A66 and north of the railway embankment. The overall conclusion of this assessment is that greater floodplain storage upstream of Warcop is present in the post development scenario and provides a minor betterment to the village.

Table 2-2 Floodplain volume balance

Event	Balance (m^3)
1 in 2	2348
1 in 10	2058
1 in 20	1927
1 in 100	717
1 in 100 + 94%cc	4449

3 Operation of the compensation area

3.1.1 The figures below show the progression of flood water through four snapshots in time during a 1 in 100 event with 94% allowance for climate change.

3.1.2 Flooding into the FCA begins at 20 minutes from two discrete areas on the Mill Leat situated several metres above the Moor Beck. Flood water fills the western portion of the FCA first at 80 minutes and progresses into the eastern section by 150 minutes. By 220 minutes the FCA is largely filled and throttling further flows downstream to Warcop.

3.1.3 Figure 3-1, Figure 3-2 and Figure 3-3 below, contain cross sections through the FCA with several water levels shown to demonstrate the filling of the FCA through the flood event. The figures show the base of the FCA to be flat over several levels, this will be further refined to have a more suitable gradient and cross fall to aid drainage during the detailed design.

3.1.4 The base level of the FCA can be seen to be lower than the bank level of Moor Beck in the cross sections, however as shown, this is higher than the 1 in 2 peak flood level in the area and therefore will drain down with suitable connectivity to be finalised in the detailed design.

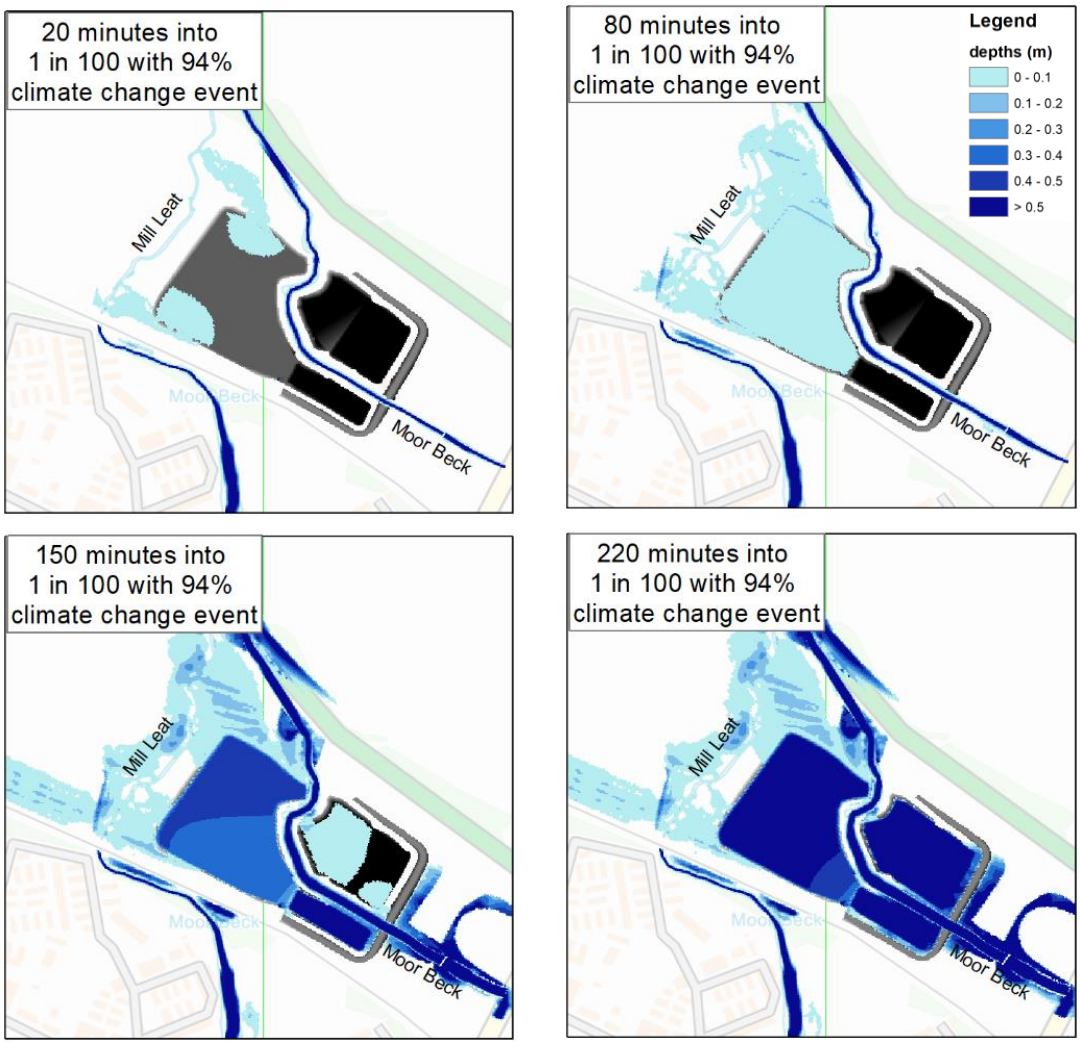


Figure 3-1 Flood progression through FCA

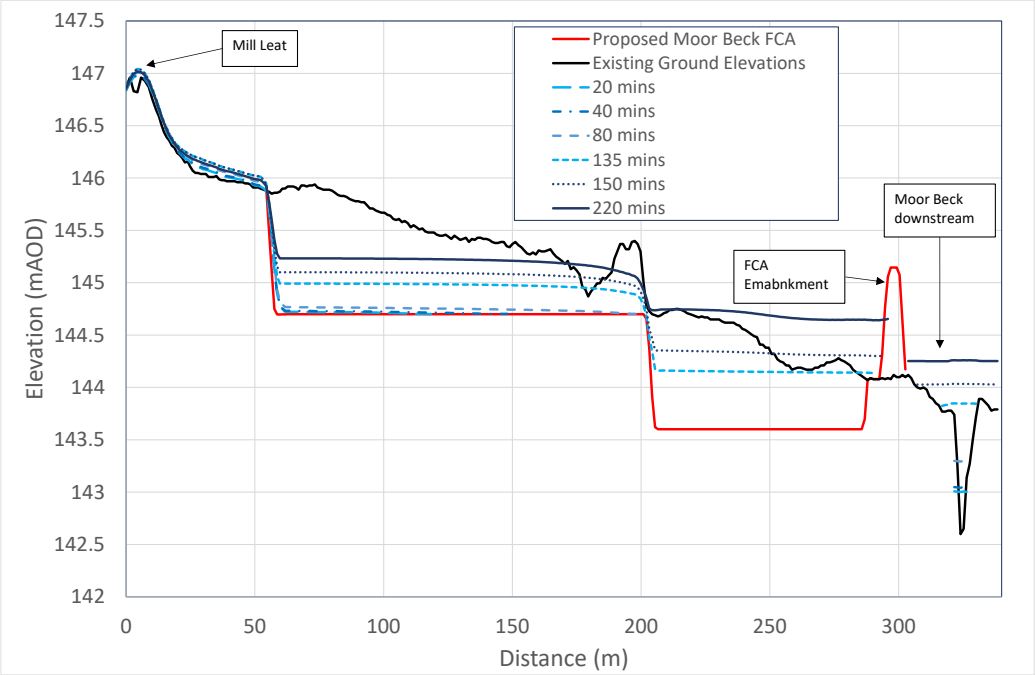


Figure 3-2 Flood progression through FCA - Cross Section 1

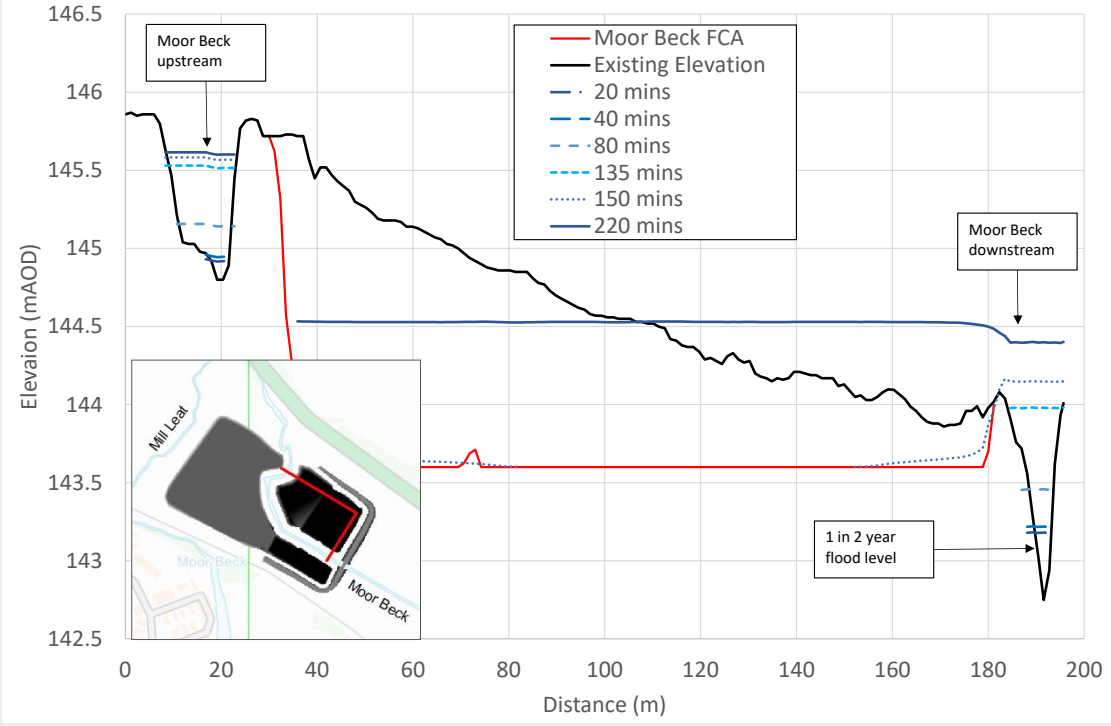


Figure 3-3 Flood progression through FCA - Cross Section 2

3.1.5 As reported within the Scheme 06 hydraulic modelling report, levels and flows between the existing A66 and the railway show some variation due to the changes in the ground levels as a result of the scheme, however, flows through the railway bridge (along the existing road into Warcop) show a decrease. Overall, pass-forward flows downstream of the railway at CROO_01473 show a decrease with the proposal.

Location	Node	1 in 2	1 in 20	1 in 100	1 in 100 + 94%
Flow Downstream of railway crossing (m^3)	CROO_01473	-0.2	-0.0	-0.1	-0.3

4 Sensitivity tests

4.1.1 The following sensitivity tests were undertaken at the request of the Environment Agency. The reminder of this section discusses the model setup and results of the tests. The models were run for the 5%, 1% and 1% with 94% climate change events to provide a broad spread of flow conditions for the sensitivities listed in Table 4-1 below. Figure 4-1 shows the key locations referred to throughout the sensitivity analysis section.

Table 4-1 Sensitivity analysis

Sensitivity	Description	
S1	Vegetation	Mannings + 40% in FCA channel and FCA floodplain. Represent light-moderate scrub.
S2	Deposition	Increase base level of FCA by 0.3m to represent material deposition over time
S3	Erosion	Reduction of level of FCA bank heights to represent erosion following high flows
S4	Parameter uncertainty	Spill coefficients increase by 20% in FCA area to represent less efficient spill into FCA
S5	Control structure	Increase impounding embankment opening by 20%
S6	Weir removal	Removal of Mill Leat Weir, all in-channel water to go down main channel
S7	Long storm duration	Doubling of hydrograph volume to understand impact of multiple storms
S8	Bank-full drain down	Reduction of banks to represent better drainage following a flood event

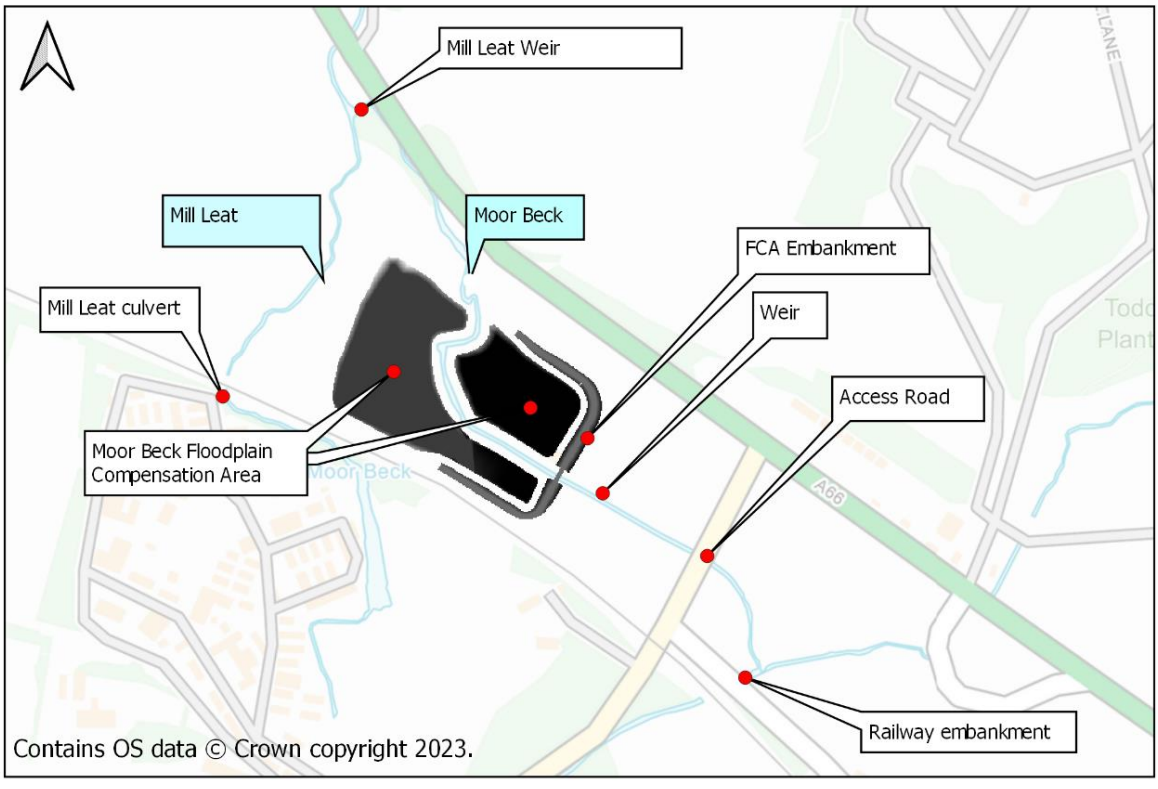


Figure 4-1 Location plan of key structures

4.2 Sensitivity 1 (S1) – Vegetation growth

4.2.1 Increased vegetation within the FCA area would be a typical result of an unmaintained area. Concern has been raised to the efficiency of the floodplain compensation if a suitable maintenance regime was not put in place. This sensitivity test aims to show the flood risk impacts of not maintaining this area.

4.2.2 To represent higher vegetation the manning roughness coefficient was increased in both the channel and the 2D FCA location by 40% to 0.049 and 0.084 respectively. This would represent considerable channel growth and moderate scrub across the FCA area.

4.2.3 Figure 4-2 below shows the results of the sensitivity for the 5% AEP and 0.1% AEP with 94% climate change. The 1% AEP has been omitted for clarity, however the trends are similar.

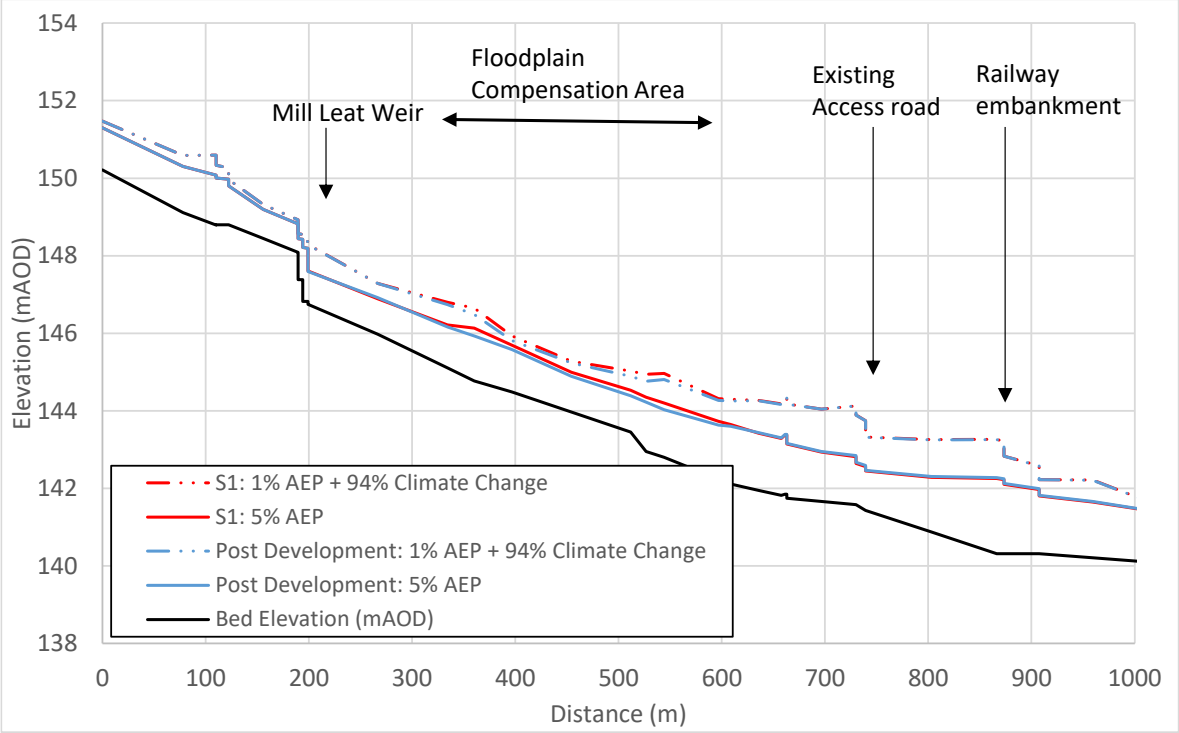


Figure 4-2 Sensitivity 1 long section

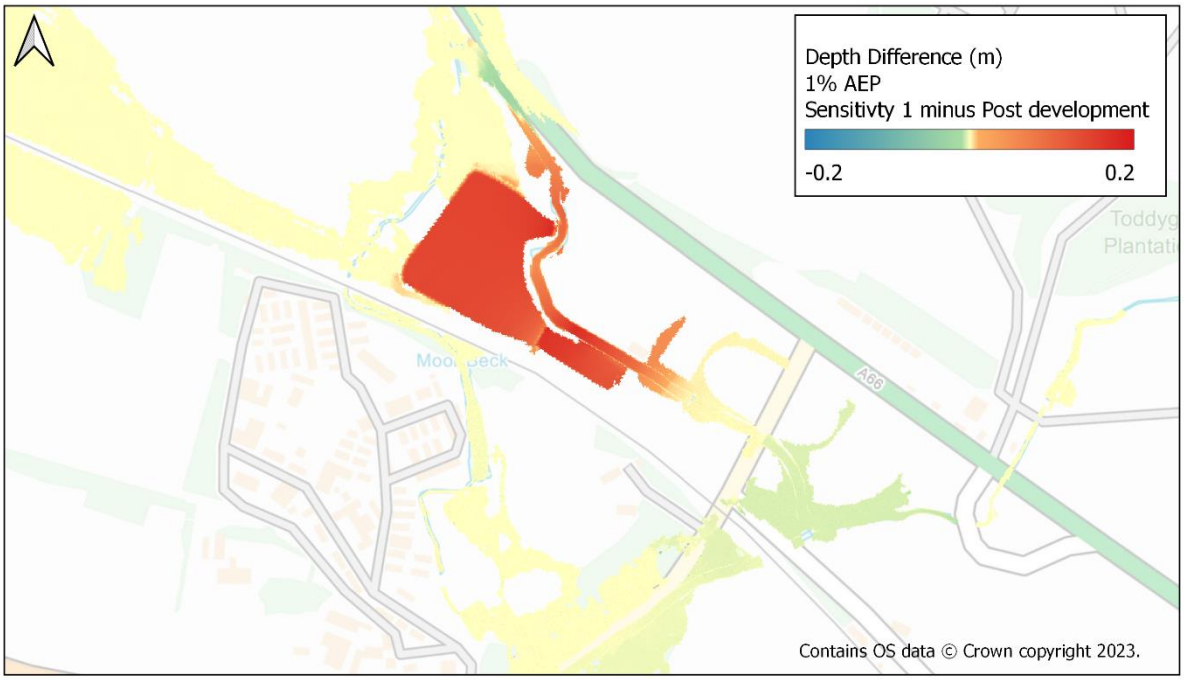


Figure 4-3 Sensitivity 1 depth difference map

4.2.4 The increases in manning roughness has the expected impact on increasing levels within and slightly upstream of the FCA, however it has negligible impact downstream of the FCA. Whilst the increased vegetation slows the movement of water it does not impact the storage volume. As the benefit of the storage area is not reliant on high velocities within it results in the low impacts seen.

4.2.5 Despite the relatively positive outcome showing low sensitivity to vegetation growth it should be not be used as evidence for lower maintenance requirements. Higher vegetation such as the moderate scrub represented here would also encourage greater build-up of sediment over time.

4.3 Sensitivity 2 (S2) - Deposition

4.3.1 Deposition within the FCA area would increase the levels and reduce the potential storage area available for flood water. This sensitivity test has been undertaken to determine what impact light to moderate deposition will have on the ability of the FCA area to perform over a range of events.

4.3.2 To represent sediment deposition, the elevation of the FCA has been increased 0.3 metres to represent potential increases that could occur over a several years if no maintenance was undertaken. The results are shown below in Figure 4-4 and Figure 4-5 for the three events.

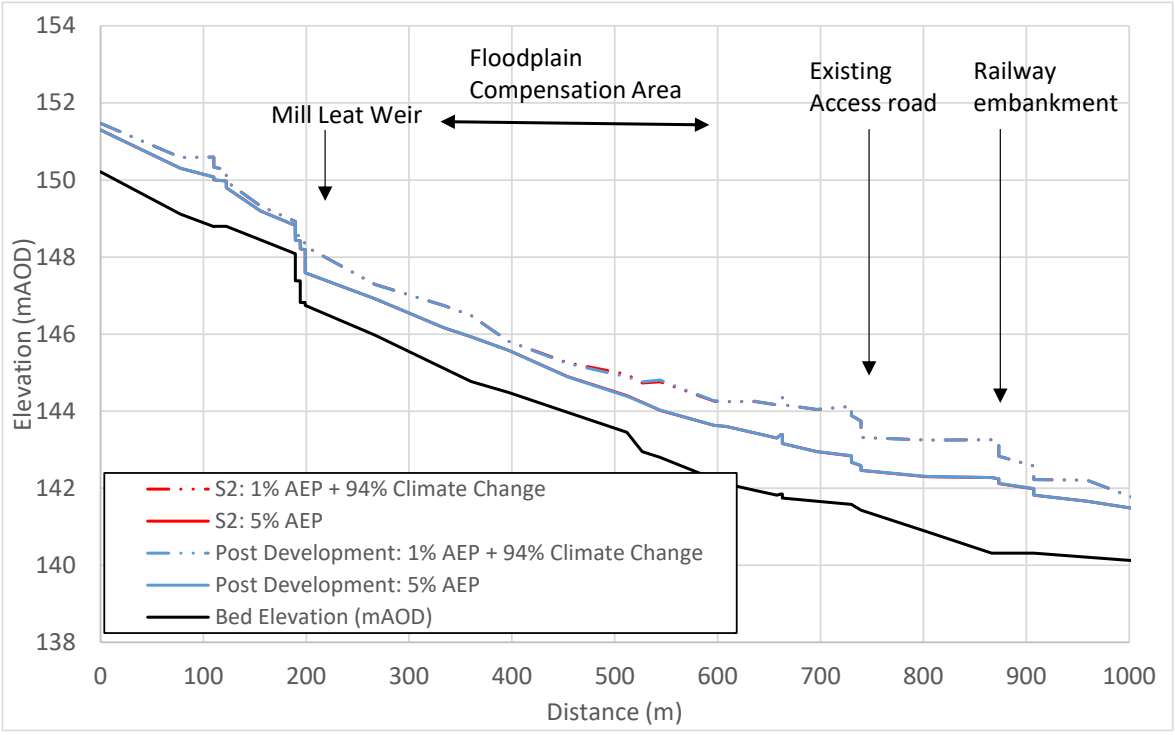


Figure 4-4 Sensitivity 2 long section

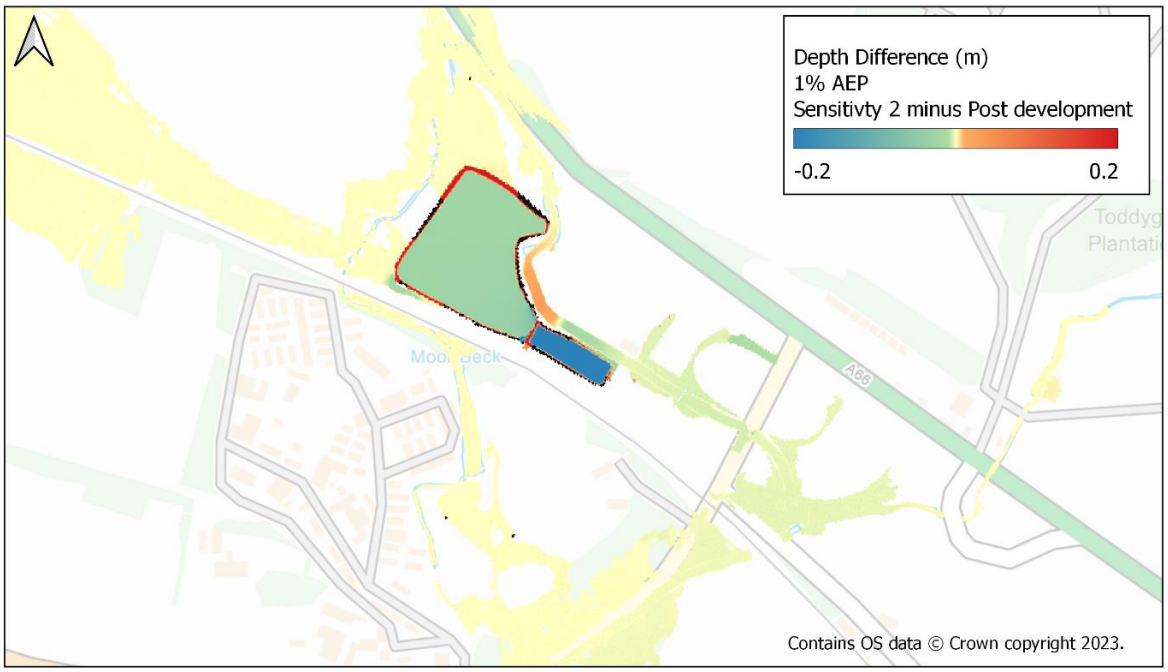


Figure 4-5 Sensitivity 2 depth difference map

4.3.3 The results show negligible change in channel water levels. In-channel there are slightly higher peak flows in the upstream FCA and higher in-channel levels. Downstream peak flows are slightly earlier but not significantly.

4.3.4 On the floodplain both east and west portions of the FCA fill through a mechanism of overbank topping to areas of the FCA that are over 1m below the height of the bank they spill from, shown in Figure 4-6. The western part of the FCA fills from the Mill Leat and the eastern part from

the channel that runs through the FCA (1 in 100 + 94% climate change only). Whilst this does prevent some early spilling and therefore higher levels in the upstream FCA channel the mechanism still functions even with deposition.

4.3.5 The results show the system is relatively insensitive to deposition due to the mechanism of flooding. Greater levels of deposition associated with complete abandonment have not been tested at this point, however these impacts should be investigated following a more developed design.

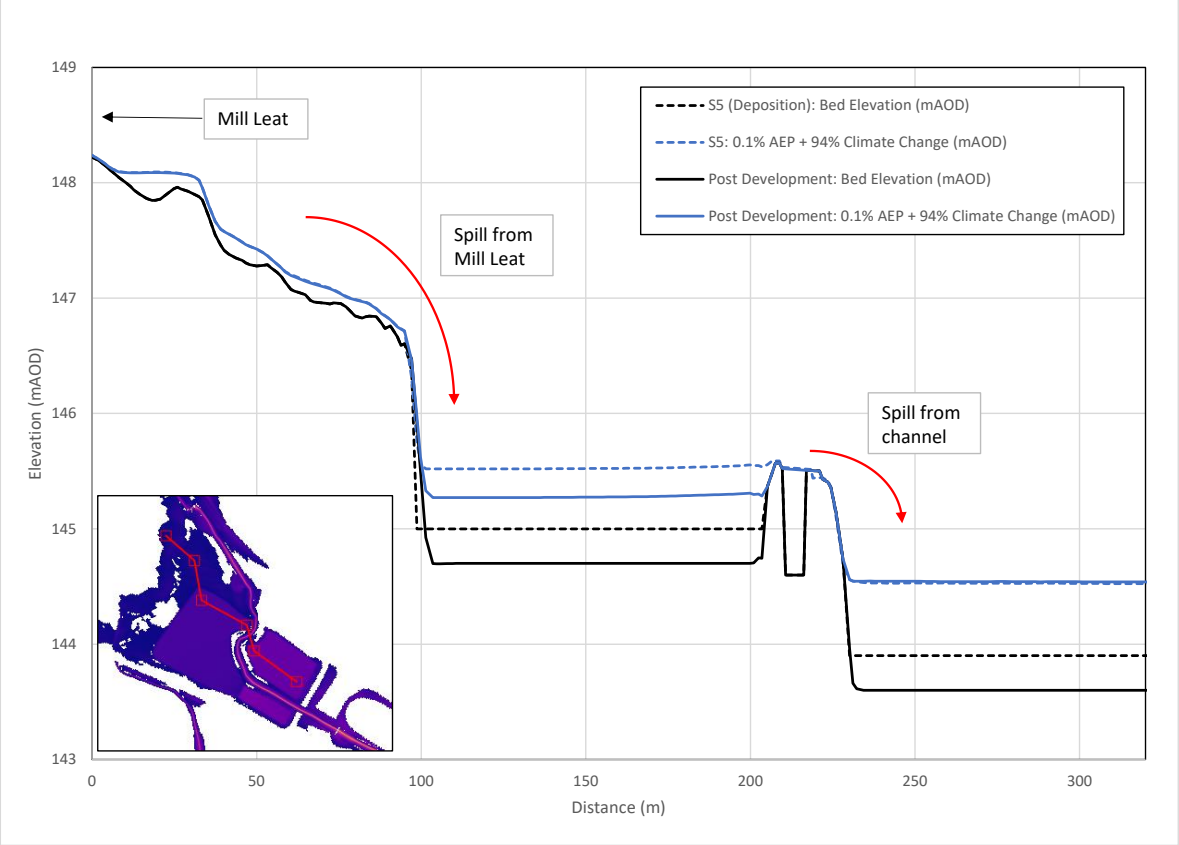


Figure 4-6 Flow paths through FCA

4.4 Sensitivity 3 (S3) - Erosion

4.4.1 Potential erosion of the watercourse banks due to high velocity flood flows could change the flood mechanisms at the site. Lower bank levels could cause the onset of flooding in the FCA to occur sooner in the hydrograph and reduce available storage at the peak.

4.4.2 To represent erosion the banks, the elevation of these were reduced removing some of the effects of a levee allowing out of bank flooding sooner in the event, the results are shown in Figure 4-7 and Figure 4-8.

4.4.3 The faster onset of flooding into the FCA does not appear to significantly impact the efficiency of it, aided by the throttling effect of the embankment. The additional connectivity of the lowered banks has a minor 10-20mm betterment within Warcop.

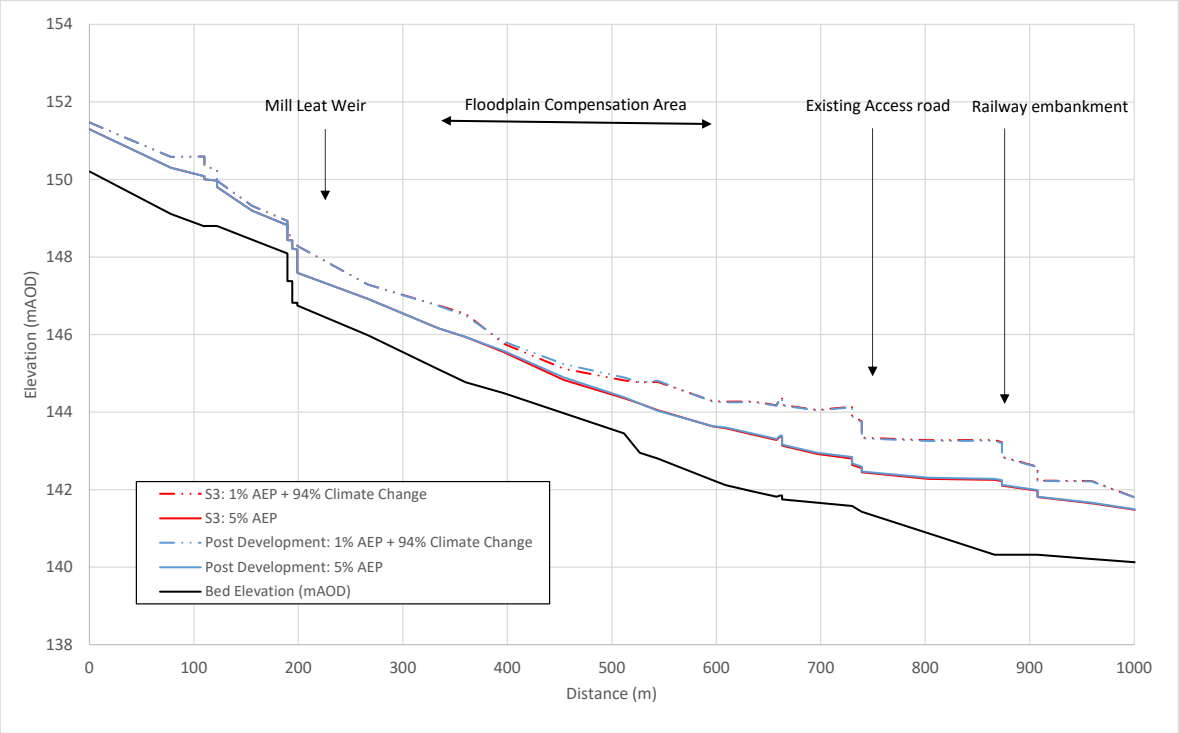


Figure 4-7 Sensitivity 3 long section

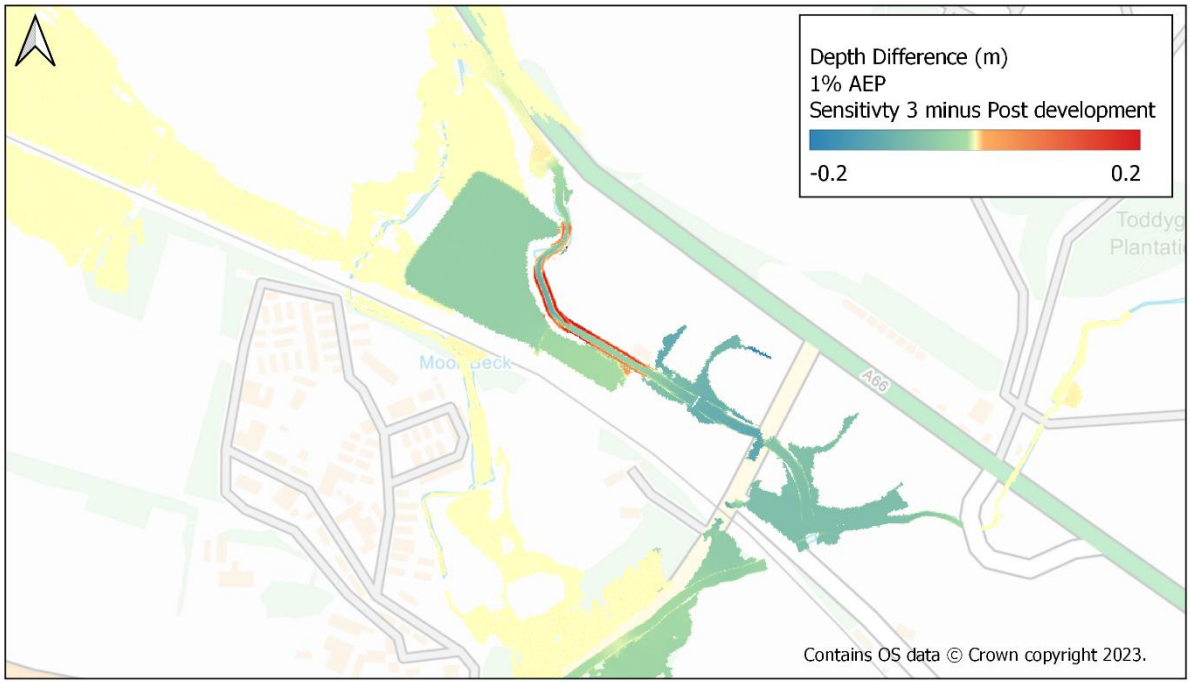


Figure 4-8 Sensitivity 3 depth difference map

4.5 Sensitivity 4 (S4) - Parameter uncertainty

4.5.1 Water spilling out of the 1D model domain and into the 2D domain is largely controlled through application of the weir equations. These are reliant on coefficients to describe how efficiently water flows over the banks as jagged and vegetated structures will be less efficient than smooth well maintained concrete crests.

4.5.2 This sensitivity will test the impact on the FCA operation should the assumptions on weir coefficients be too generous. By increasing the weir

factor (WrF) by 20%, the spills will be less efficient, reducing flow over them. (Tuflow HX, b value set to 1.2).

4.5.3 The figures below show a negligible (~1mm) reduction in levels in the FCA when the spills are operating less efficiently. This is as expected as much of the water enters from overland flow from the north, reduced overbank flows in the FCA slow down the filling but not significantly to prevent its function.

4.5.4 Figure 4-9 and Figure 4-10 shows there is no significant impact downstream in Warcop or the wider floodplain.

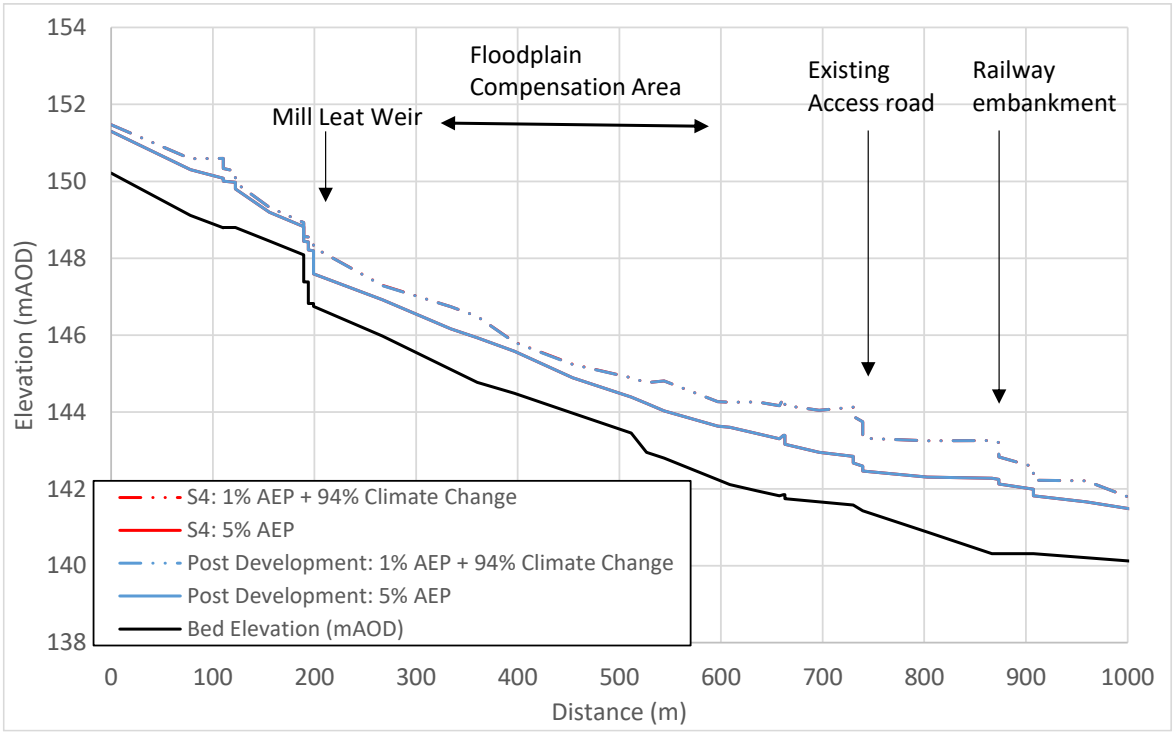


Figure 4-9 Sensitivity 4 long section

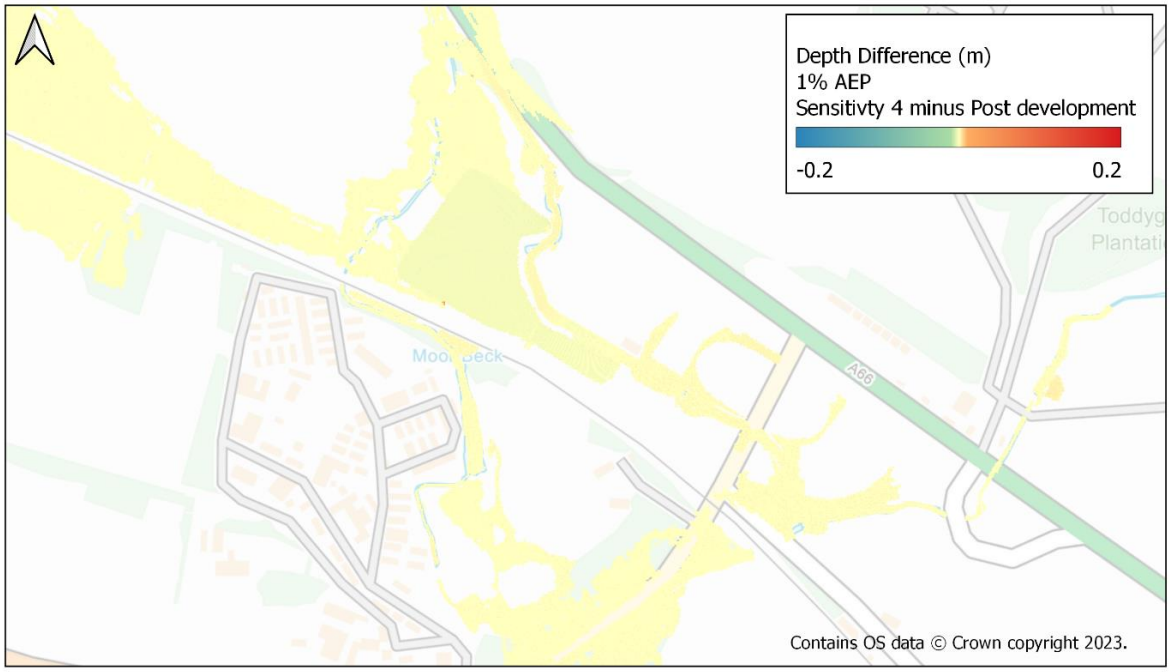


Figure 4-10 Sensitivity 4 depth difference map

4.6 Sensitivity 5 (S5) - Control structure

4.6.1 The nature of this floodplain compensation area combines two mechanisms for holding back water from Warcop village.

- The first is additional floodplain volume to compensate that lost due to the scheme,
- The second is an 1.1m high embankment across the watercourse (Figure 4 11) that impounds floodwater. This is a passive structure that currently has an 11m wide opening.

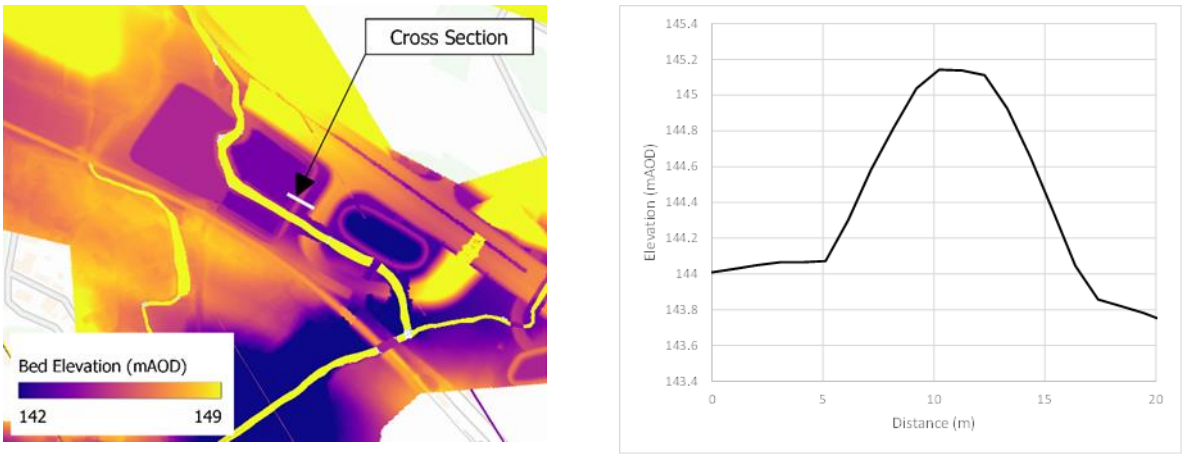


Figure 4-11 Cross section of Embankment

4.6.2 Under normal flow conditions conveyance is unaffected. Once out of bank flows begin to occur, the opening constricts the flows and impounds water in the FCA. High velocities of water through this constriction would be likely to erode the embankment on both sides, widening it and compromising its function.

4.6.3 The model has been amended to test the sensitivity of the FCA operation to this structures integrity. The 1D channel has been widened by 1m on both left and right bank representing just under a 20% increase to the opening as if is some moderate erosion had taken place.

4.6.4 The results of this sensitivity (Figure 4-12 and Figure 4-13) show there are reduced levels in the FCA due to higher flows exiting the area. Increased levels of up to 56mm occur both in-channel and on the floodplain immediately downstream of the embankment.

4.6.5 These impacts are largely moderated by the presence of the new road embankments, weir and access bridge downstream of the FCA which provide a similar throttling effect, to the point there is negligible impact downstream of the railway embankment and into Warcop village.

4.6.6 Whilst the new road embankment and other structures do prevent floodwater propagating downstream it should be noted that these are not flood defence structures and will not be designed to function as such.

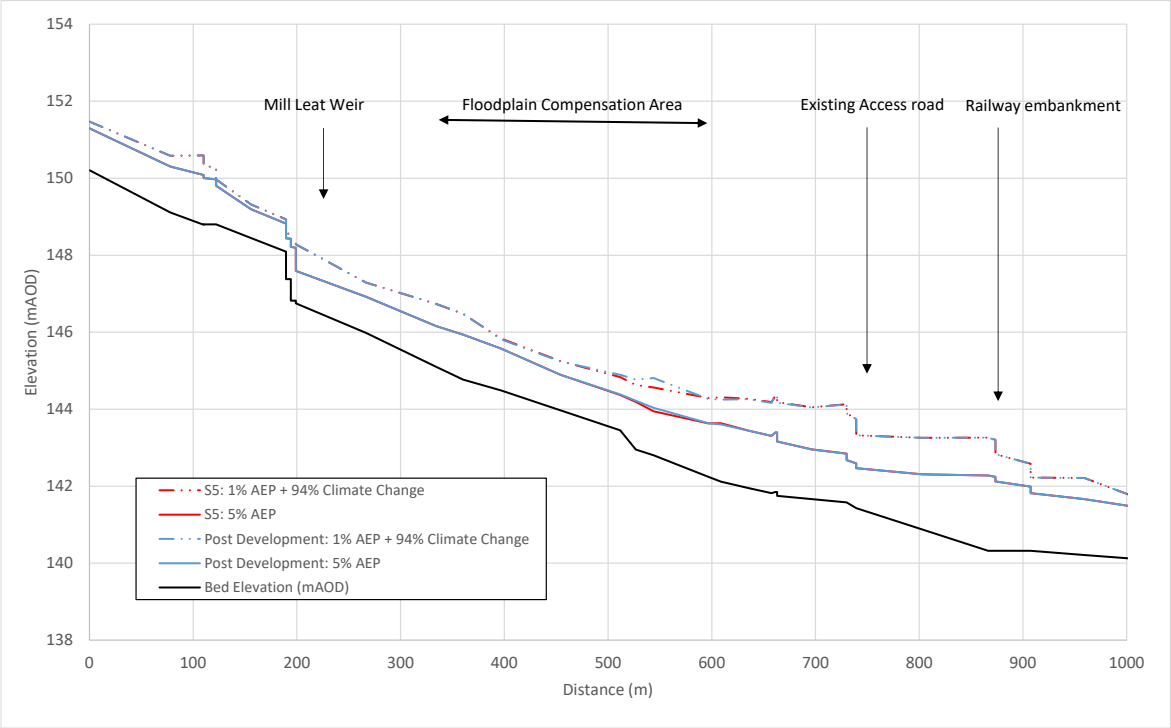


Figure 4-12 Sensitivity 5 long section

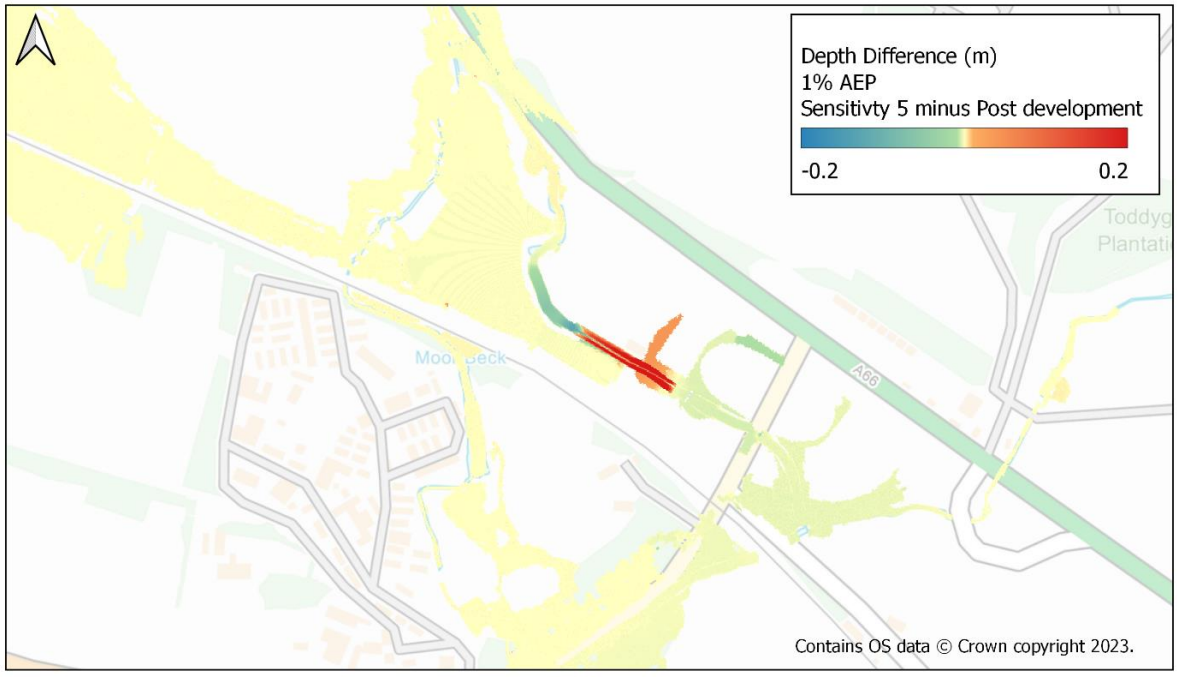


Figure 4-13 Sensitivity 5 depth difference map

4.7 Sensitivity 6 (S6) - Weir removal

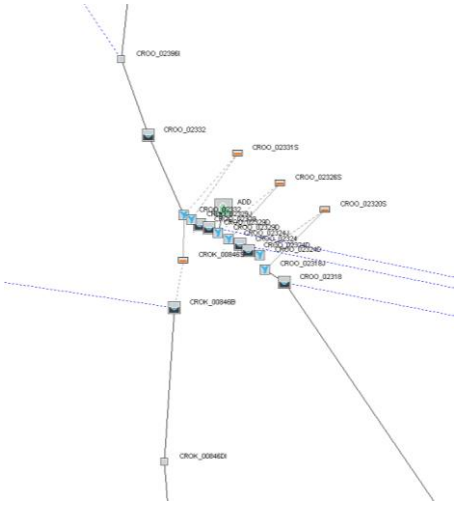
4.7.1 The flood mechanisms at this location involve water backing up behind the weir to allow flow into the Mill Leat, this also causes out of bank flow during flood events where water comes out of bank upstream of the weir and flows overland into the Mill Leat.

4.7.2 This was an important mechanism to consider as the flow regime and flood mechanisms at the FCA area could be impacted by the integrity of these structures, changing the flows that enter the FCA.

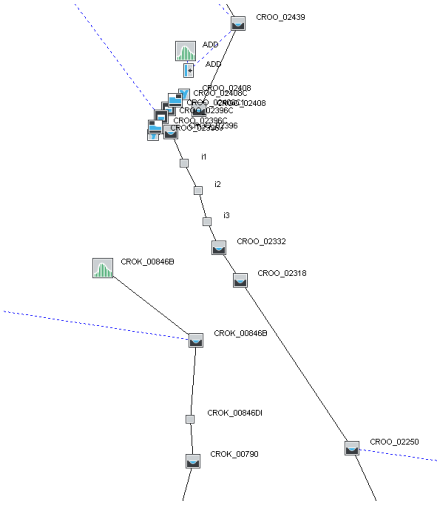
4.7.3 This sensitivity involved the removal of a weir that controls the flow into the Mill Leat. The 1D model was re-schematised in the area to allow all flow down the main channel. The re-schematisation involved both structure removal and re-grading of the bed to represent long terms erosion to a naturalised gradient along the reach and a worst case scenario in terms of flows not filling the FCA from the Mill Leat spill mechanism.

4.7.4 The Mill Leat was separated from the main channel in 1D and a sweetener flow added to allow computations. Water from the main channel can still access the Mill Leat through overland flow in the 2D domain and lateral flows still enter the channel in the 1D domain. This is shown in the figure below.

4.7.5 Figure 4-14, Figure 4-15 and Figure 4-16, below, shows a long section of the main channel and Mill Leat for two events, both baseline and weir removal (s6). The results show there is potential for moderate detriment downstream following removal of the weir with flood depths increasing in Warcop up to 10mm in the 1% AEP event, likely due to the reduced flow from the Mill Leat into the FCA. This sensitivity test suggests the presence of the weir is important to managing flood risk downstream in Warcop.



Post development schematisation, Structures in place and spill into Mill Leat.



Sensitivity 6 schematisation, Structures removed and Mill Leat separated from channel.

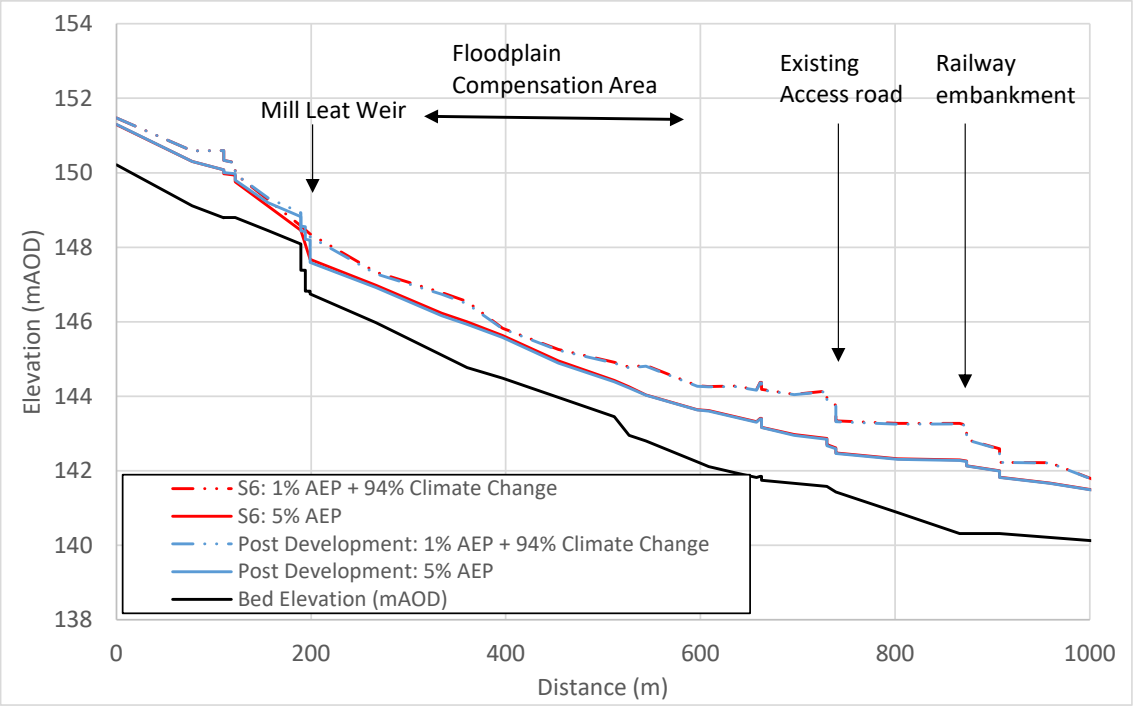


Figure 4-14 Sensitivity 6 long section

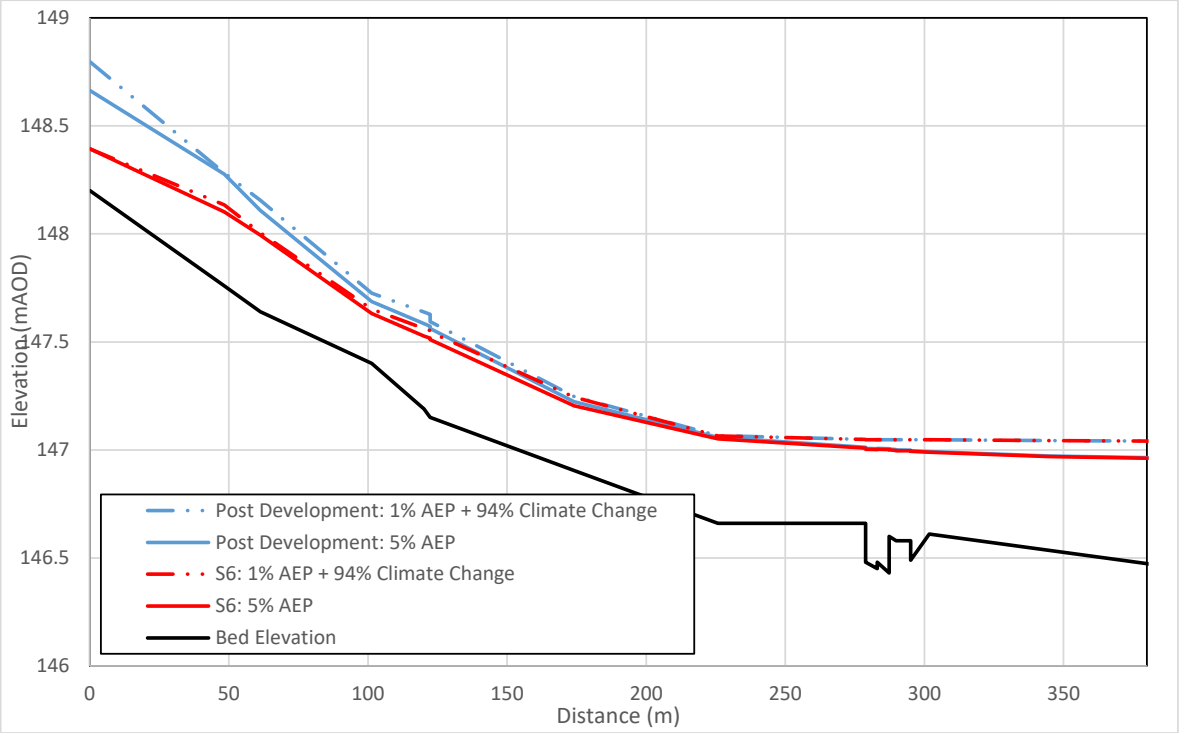


Figure 4-15 Sensitivity 6 Mill Leat long section

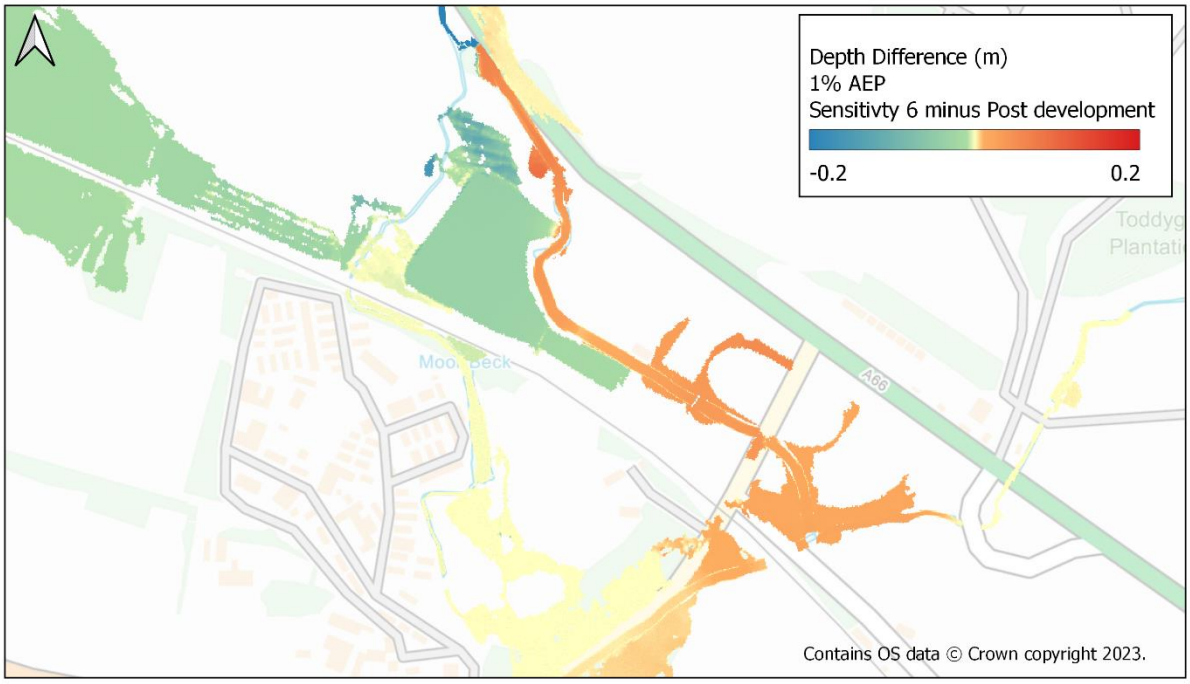


Figure 4-16 Sensitivity 6 depth difference map

4.8 Sensitivity 7 (S7) - Long storm duration

4.8.1 The hydraulic model for Scheme 06 has been used to test the response to flooding for several design events, these each involve flows resulting from a single simulated rainfall event. Whilst this is necessary to test the proposed scheme against a set comparable standards it does provide some limitations to understanding how a catchment will respond when multiple events occur in quick succession, where the tail end of one event has not fully passed when another begins.

4.8.2 This sensitivity was undertaken to understand the impact to the system of increased flood volumes over an extended period, reflecting multiple events in quick succession.

4.8.3 In order to test this the inflow hydrographs were stretched to double their length whilst retaining the same peak to produce a model run with considerably more volume over a longer time frame. The model run time was increased in line with this to ensure the peak was captured. This sensitivity run was undertaken for the 5% and 1% only. The larger volumes of the 1% with 94% climate change were deemed excessive to double in this fashion as it would produce an unrealistically large long event.

4.8.4 The results are shown in Figure 4-17 and Figure 4-18. At the FCA area in channel and floodplain levels increase by up to 130mm in both 5% and 1% events, however this impact does not full reflect downstream of the railway embankment in Warcop where floodplain levels downstream increase by 25-44mm, although averaging up to 30mm.

4.8.5 The results of the test are as expected given the increase in volume representing multiple events, when compared to the same hydrograph run through the baseline model there is negligible difference in levels of the 5% long hydrograph event with and without scheme. The 1%

baseline event with a long hydrograph shows levels lower than the with scheme at the compensation area and upstream of the railway embankment which is as expected, however downstream at Warcop there is negligible change in levels.

4.8.6 Note: The 'benefit' shown in the figures below on Cringle Beck is erroneous as hydrograph was not altered for this watercourse with the original unlengthened hydrograph now peaking before the rest.

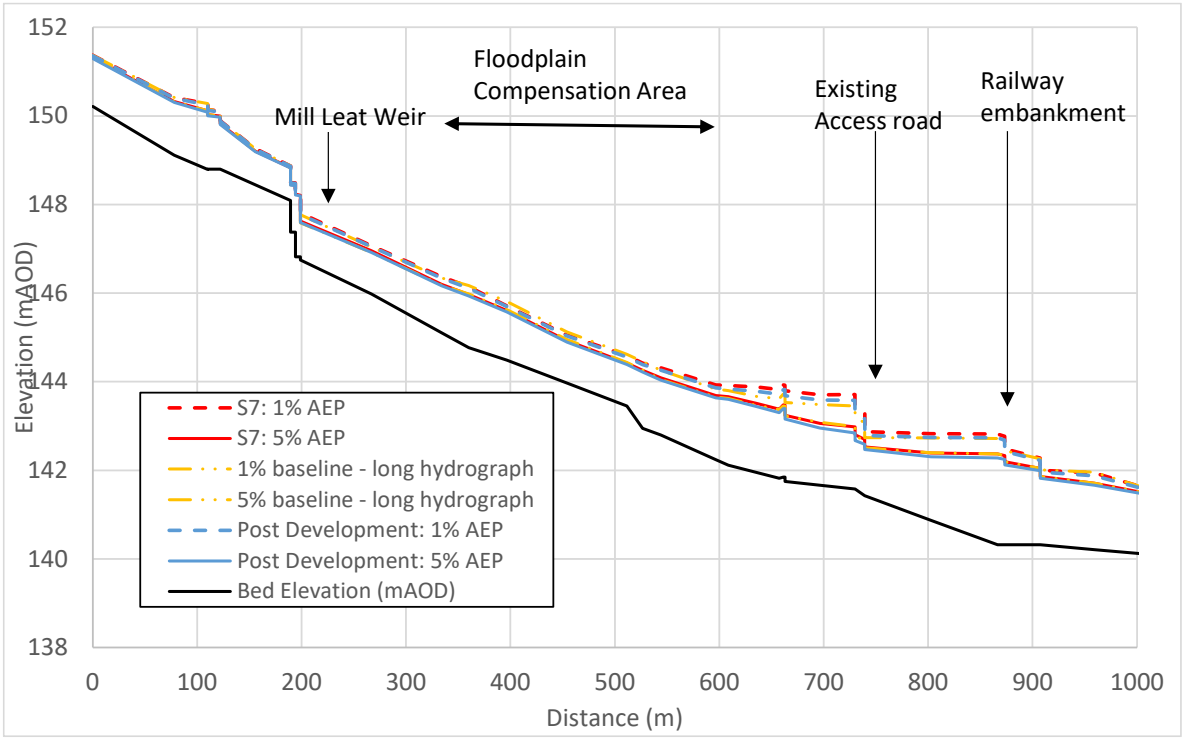


Figure 4-17 Sensitivity 7 long section

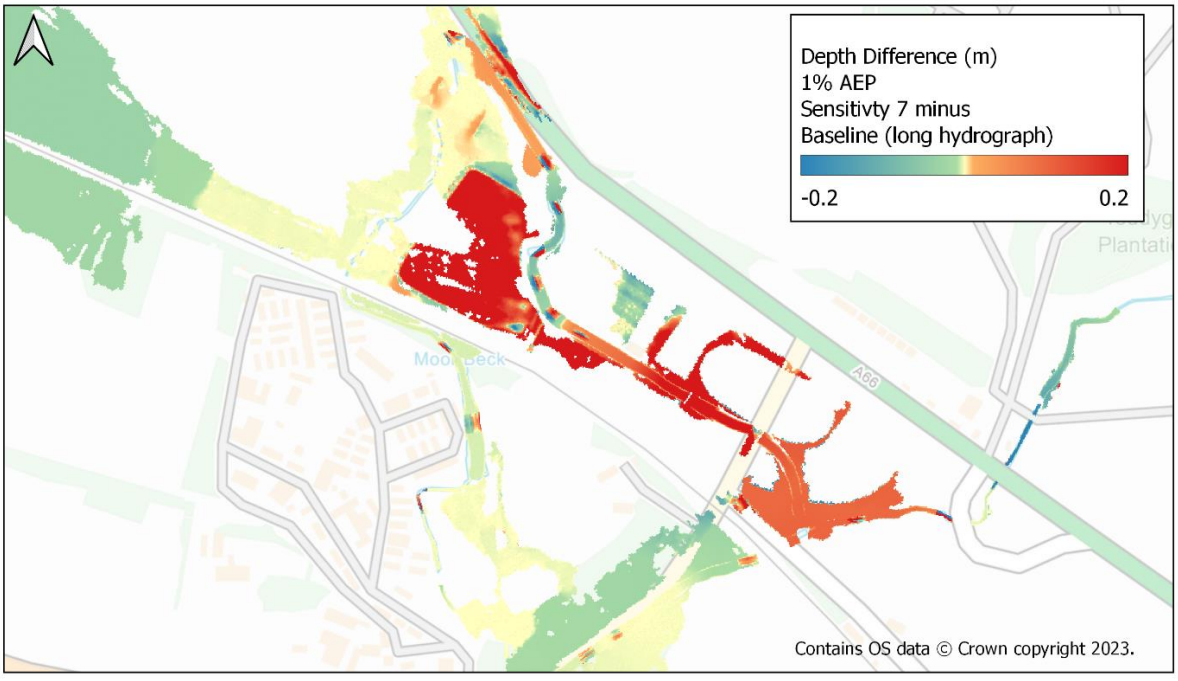


Figure 4-18 Sensitivity 7 depth difference map

4.9 Sensitivity 8 (S8) - Bankfull draindown

4.9.1 Some concern has been raised as to the efficiency of the floodplain compensation area to drain following a flood event as no explicit drawdown mechanism is present beyond natural drainage in the outline design. The exact details to this will be investigated and finalised during the detailed design phase, however it was considered important to demonstrate that effective drainage could occur in a timely fashion following a flood to leave the volume available for the next event.

4.9.2 This additional test involved lowering the bank levels at the downstream portion of the FCA to allow water to flow back into the channel as a representation of the simplest method of drainage.

4.9.3 25m of bank was lowered on both sides of the channel, upstream of the proposed throttling embankment. This allowed an increase in both drainage at the end of the event and inundation at the start of the event.

4.9.4 Figure 4-19, below, shows the original long tail of drainage from the current representation of the FCA in blue, with the potential additional drainage of this sensitivity shown in red for a sample location at the south of the FCA.

4.9.5 The additional drainage allows the FCA to largely empty in a couple of hours whilst the original FCA setup does not drain down within the 9 hours of model run time, indicating several days may be required.

4.9.6 The additional connectivity has a similar impact to the erosion sensitivity in that it has minor benefits downstream due to the better connectivity (Figure 4-20 and Figure 4-21).

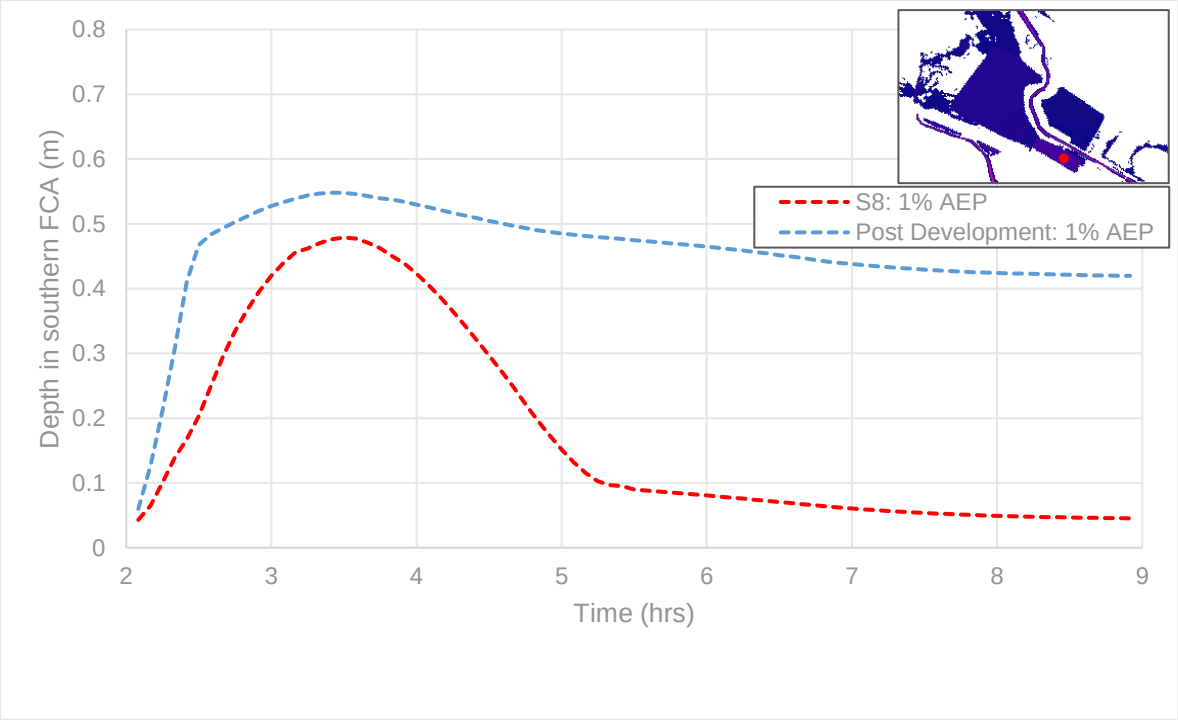


Figure 4-19 Sensitivity 8 stage hydrographs in south of FCA

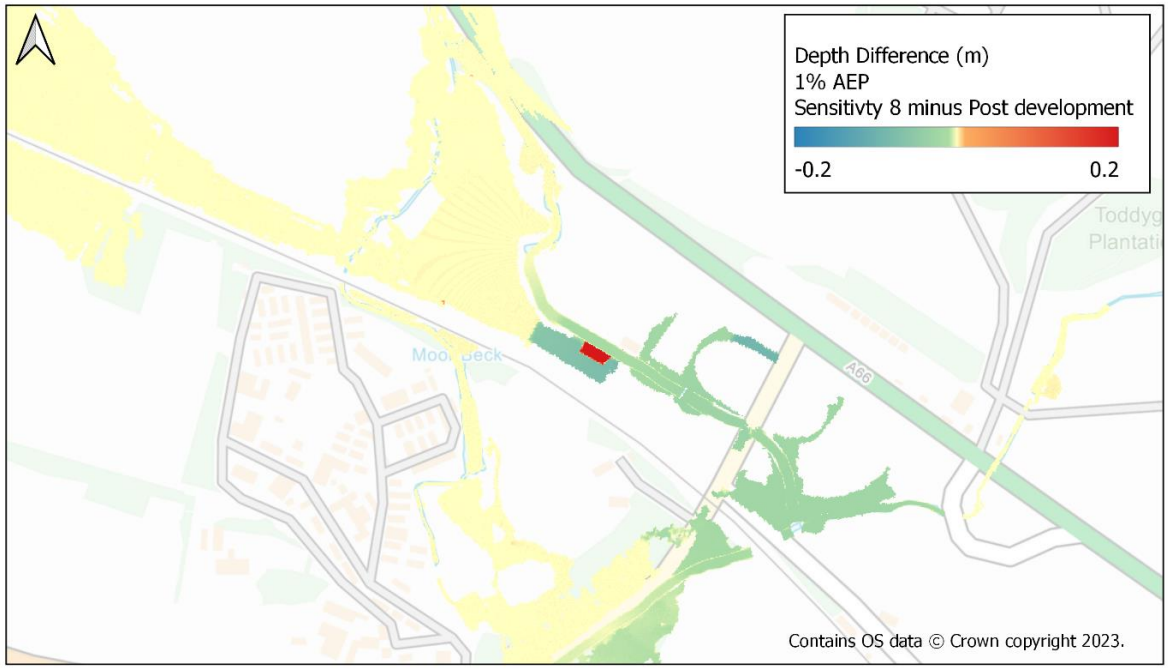


Figure 4-20 Sensitivity 8 depth difference map

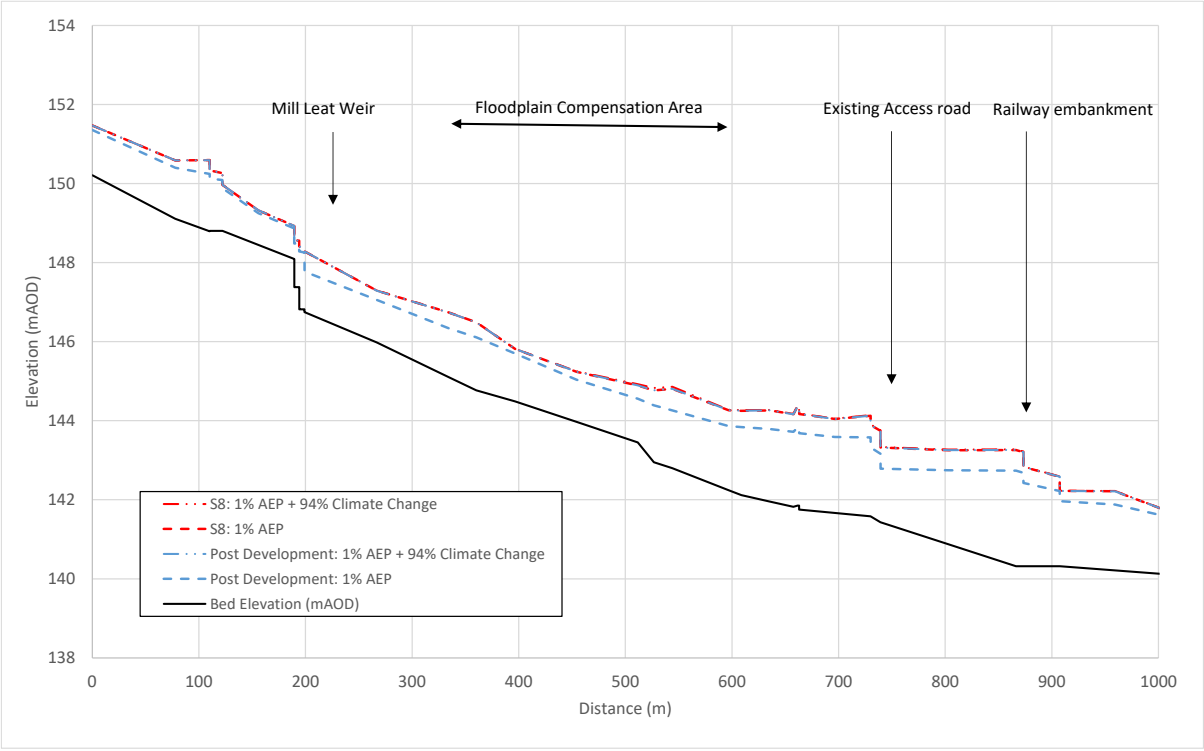
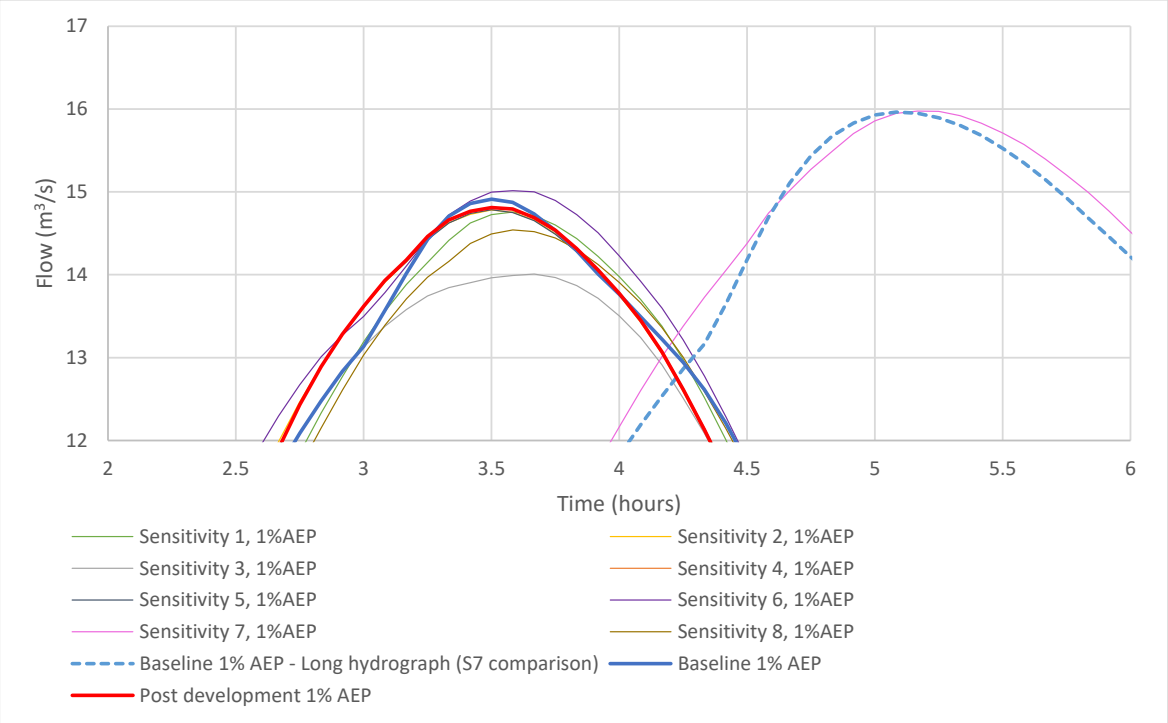


Figure 4-21 Sensitivity 8 long section

4.10 Downstream pass forward flow

4.10.1 The graph below (Figure 4-22) shows the flow hydrographs downstream of the railway embankment for the baseline, with scheme and the sensitivities for the 1% AEP (model Node CROO_01473). The baseline “long hydrograph” run is also included for comparison to Sensitivity 7. The extent of the graph has been truncated to focus on the peak flows and show differentiation between them.

4.10.2 As reported in the Scheme 06 modelling report, peak flows in the post development scenario are slightly less than the baseline. The



sensitivities are all similar or below this baseline peak flow with the exception of Sensitivity 6 where the Mill Leat diversion weir has been removed and Sensitivity 7 with significantly higher volume.

Figure 4-22 Flow hydrographs downstream of railway embankment

5 Conclusions

5.1.1 The results have shown areas of optimisation that can be investigated at detailed design stage, largely involving lowering bank levels to increase connectivity and making better use of the north-east part of the FCA on the left bank of Moor Beck that currently remains unused until the extreme events. However the FCA as shown here serves it function and show it to be a robust solution even during adverse conditions that could occur over its lifespan.

Sensitivity		Conclusions
S1	Vegetation	No significant impact, however as noted, vegetation will have a close relationship with deposition, therefore at least yearly maintenance is recommended to prevent any scrub from gaining a foothold.
S2	Deposition	Minimal impact due to the flow mechanisms at work in the FCA, however if left unmaintained this could compromise the throttling effect of the embankment once levels cause overtopping. Further deposition could have greater impact and should be investigated further at detailed design.
S3	Erosion	Negligible benefit, seen mostly due to better connectivity. opportunity to investigate lowered banks as design improvement during detailed design.
S4	Parameter uncertainty	No significant impact. The condition of the banks will have negligible impact to the operation of the FCA, however for the reasons mentioned above a yearly maintenance regime would be prudent.
S5	Control structure	Moderate impact. Whilst other watercourse features moderate this impact from being felt in Warcop village the features that aid this are not designed as flood defence structures and their performance as such would not be guaranteed and could compromise their intended function. This structure should be designed with erosion protection.
S6	Weir removal	Moderate impacts. The removal of the weir causes increases to flood levels in Warcop of approximately 2cm over the PD scenario. Whilst the scenario used is likely a worst case, reconditioning this weir and maintaining as part of the FCA design would eliminate this risk.
S7	Long storm duration	Negligible impact. Whilst a 2-3cm increase in flood levels in Warcop can be seen in this scenario this must be viewed in context of a doubling of the flood volume, in light of this the impact is negligible and the system as a whole is shown to be robust when exposed to prolonged or multiple events.
S8	Bank-full drain down	Significant positive impact, test showed a much better after-event response allowing the compensation area to empty at a faster rate, this should be investigated during detailed design.

6 Follow on work for detailed design

6.1.1 Following a meeting held with the Environment Agency on the 12th May 2023, the following actions were agreed to be taken forward and addressed at detailed design stage:

- To run the sensitivity tests for a full set of return periods (1 in 2 through to 1 in 100 + 94%cc) at detailed design stage.
- To run an additional sensitivity test at detailed design stage, which will involve increasing roughness of the floodplain surrounding the Mill Leat channel to capture detriment to flow paths.
- To maintain the floodplain compensation area at its designed parameters including the channel and structures between the A66 and railway embankment.
- To undertake further sensitivity testing at detailed design stage to optimise the compensation areas connectivity with the channel.
- To undertake a detailed design of the impounding embankment including suitable erosion protection insofar as reasonably practicable.
- Incorporate the reconditioning and maintaining the Mill Leat weir as part of the detailed design insofar as reasonably practicable.
- To revisit the longer-storm-duration sensitivity test at detailed design stage to optimise storage with adverse antecedent conditions.
- To optimise the FCA at detailed design stage to minimise drain down time following an event.

Appendix D: Environment Agency Protective Provisions

PART 5

FOR THE PROTECTION OF THE ENVIRONMENT AGENCY

51.—(1) The following provisions will apply for the protection of the Agency unless otherwise agreed in writing between the undertaker and the Agency.

(2) In this Part of this Schedule—

"the Agency" means the Environment Agency;

"construction" includes execution, placing, altering, replacing, relaying and removal and excavation and "construct" and "constructed" is construed accordingly;

"drainage work" means any main river and includes any land which provides or is expected to provide flood storage capacity for any main river and any bank, wall, embankment or other structure, or any appliance, constructed or used for land drainage or flood defence;

"fishery" means any waters containing fish and fish in, or migrating to or from, such waters and the spawn, spawning ground, habitat or food of such fish;

"main river" has the same meaning given in section 113(1) of the Water Resources Act 1991(**a**);

"plans" includes sections, drawings, specifications, calculations and method statements;

"remote defence" means any berm, wall or embankment that is constructed for the purposes of preventing or alleviating flooding from, or in connection with, any main river;

"specified work" means so much of any work or operation authorised by this Order as is in, on, under, over or within—

(a) 8 metres of the base of a remote defence which is likely to—

(i) endanger the stability of, cause damage or reduce the effectiveness of that remote defence; or

(ii) interfere with the Agency's access to or along that remote defence;

(b) 8 metres of a drainage work or is otherwise likely to—

(i) affect any drainage work or the volumetric rate of flow of water in or flowing to or from any drainage work;

(ii) affect the flow, purity or quality of water in any watercourse or other surface waters;

(iii) cause obstruction to the free passage of fish or damage to any fishery;

(iv) affect the conservation, distribution or use of water resources; or

(v) affect the conservation value of the main river and habitats in its immediate vicinity;

or which involves—

(c) an activity that includes dredging, raising or taking of any sand, silt ballast, clay gravel or other materials from or off the bed or banks of a drainage work (or causing such materials to be dredged, raised or taken), including hydrodynamic dredging or desilting; and

(d) any quarrying or excavation within 16 metres of a drainage work which is likely to cause damage to or endanger the stability of the banks or structure of that drainage work;

"watercourse" includes all rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, basins, sewers and passages through which water flows except a public sewer.

Submission and approval of plans

52.—(1) Before beginning to construct any specified work, the undertaker must submit to the Agency plans of the specified work and such further particulars available to it as the Agency may within 28 days of the receipt of the plans reasonably request.

(**a**) 1991 c. 57. Th definition of "main river was amended by section 59(3) of the Water Act 2014 (c. 21).

(2) Any such specified work must not be constructed except in accordance with such plans as may be approved in writing by the Agency, or determined under paragraph 62.

(3) Any approval of the Agency required under this paragraph—

(a) must not be unreasonably withheld or delayed;

(b) is deemed to have been refused if it is neither given nor refused within 2 months of the submission of the plans or receipt of further particulars if such particulars have been requested by the Agency for approval; and

(c) may be given subject to such reasonable requirements as the Agency may have for the protection of any drainage work or the fishery or for the protection of water resources, or for the prevention of flooding or pollution or for nature conservation or in the discharge of its environmental duties.

(4) The Agency must use its reasonable endeavours to respond to the submission of any plans before the expiration of the period mentioned in sub-paragraph (3)(b).

(5) In the case of a refusal, if requested to do so the Agency must provide reasons for the grounds of that refusal.

Construction of protective works

53. Without limiting paragraph 52 the requirements which the Agency may have under that paragraph may include conditions requiring the undertaker, at its own expense, to construct such protective works, whether temporary or permanent, before or during the construction of the specified works (including the provision of flood banks, walls or embankments or other new works and the strengthening, repair or renewal of existing banks, walls or embankments) as are reasonably necessary—

(a) to safeguard any drainage work against damage; or

(b) to secure that its efficiency for flood defence purposes is not impaired and that the risk of flooding is not otherwise increased,

by reason of any specified work.

Timing of works and service of notices

54.—(1) Subject to sub-paragraph (2), any specified work, and all protective works required by the Agency under paragraph 53, must be constructed—

(a) without unreasonable delay in accordance with the plans approved under this Part of this Schedule; and

(b) to the reasonable satisfaction of the Agency,

and the Agency is entitled by its officer to watch and inspect the construction of such works.

(2) The undertaker must give to the Agency not less than 14 days' notice in writing of its intention to commence construction of any specified work and notice in writing of its completion not later than 7 days after the date on which it is completed.

(3) If the Agency reasonably requires, the undertaker must construct all or part of the protective works so that they are in place prior to the construction of any specified work to which the protective works relate.

Works not in accordance with this Schedule

55.—(1) If any part of a specified work or any protective work required by the Agency is constructed otherwise than in accordance with the requirements of this Part of this Schedule, the Agency may by notice in writing require the undertaker at the undertaker's own expense to comply with the requirements of this Part of this Schedule or (if the undertaker so elects and the Agency in writing consents, such consent not to be unreasonably withheld or delayed) to remove,

alter or pull down the work and, where removal is required, to restore the site to its former condition to such extent and within such limits as the Agency reasonably requires.

(2) Subject to sub-paragraph (3) and paragraph 60, if, within a reasonable period, being not less than 28 days beginning with the date when a notice under sub-paragraph (1) is served upon the undertaker, the undertaker has failed to begin taking steps to comply with the requirements of the notice and has not subsequently made reasonably expeditious progress towards their implementation, the Agency may execute the works specified in the notice and any reasonable expenditure incurred by the Agency in so doing is recoverable from the undertaker.

(3) In the event of any dispute as to whether sub-paragraph (1) is properly applicable to any work in respect of which notice has been served under that sub-paragraph, or as to the reasonableness of any requirement of such a notice, the Agency must not, except in the case of an emergency, exercise the powers conferred by sub-paragraph (2) until the dispute has been finally determined in accordance with paragraph 62.

Maintenance of works

56.—(1) Subject to sub-paragraph (6) the undertaker must from the commencement of the construction of the specified works maintain in good repair and condition and free from obstruction any drainage work which is situated within the limits of deviation and on land held by the undertaker for the purposes of or in connection with the specified works, whether or not the drainage work is constructed under the powers conferred by this Order or is already in existence.

(2) If any such drainage work which the undertaker is liable to maintain is not maintained to the reasonable satisfaction of the Agency, the Agency may by notice in writing require the undertaker to repair and restore the work, or any part of such work, or (if the undertaker so elects and the Agency in writing consents, such consent not to be unreasonably withheld or delayed), to remove the work and restore the site to its former condition, to such extent and within such limits as the Agency reasonably requires.

(3) Subject to sub-paragraph (5) and paragraph 60, if, within a reasonable period, being not less than 28 days beginning with the date on which a notice in respect of any drainage work is served under sub-paragraph (2) on the undertaker, the undertaker has failed to begin taking steps to comply with the requirements of the notice and has not subsequently made reasonably expeditious progress towards their implementation, the Agency may do what is necessary for such compliance and any reasonable expenditure incurred by the Agency in so doing is recoverable from the undertaker.

(4) If there is any failure by the undertaker to obtain consent or comply with conditions imposed by the Agency in accordance with the provisions of this Part of this Schedule the Agency may serve written notice requiring the undertaker to cease all or part of the specified works and on receipt of such notice the undertaker must cease the specified works or part thereof until it has obtained the consent or complied with the condition unless the cessation of the specified works or part thereof would cause greater damage than compliance with the written notice.

(5) In the event of any dispute as to the reasonableness of any requirement of a notice served under sub-paragraph (2), the Agency must not, except in the case of an emergency, exercise the powers conferred by sub-paragraph (3) until the dispute has been finally determined in accordance with paragraph 62.

(6) This paragraph does not apply to—

(a) drainage works which are vested in the Agency, or which the Agency or another person is liable to maintain and is not prevented by the exercise by the undertaker of the powers of the Order from doing so; and

(b) any obstruction of a drainage work expressly authorised in the approval of specified works plans and carried out in accordance with the provisions of this Part of this Schedule provided that any obstruction is removed as soon as reasonably practicable.

Remediating impaired drainage work

57. If by reason of the construction of any specified work or of the failure of any such work, the efficiency of any drainage work for flood defence purposes is impaired, or that drainage work is otherwise damaged, such impairment or damage must be made good by the undertaker to the reasonable satisfaction of the Agency and if the undertaker fails to do so, the Agency may make good the impairment or damage and recover any expenditure incurred by the Agency in so doing from the undertaker.

Agency access

58. If by reason of construction of the specified work the Agency's access to flood defences or equipment maintained for flood defence purposes is materially obstructed, the undertaker must provide such alternative means of access that will allow the Agency to maintain the flood defence or use the equipment no less effectively than was possible before the obstruction within 24 hours or as soon as reasonably practicable of the undertaker becoming aware of such obstruction.

Free passage of fish

59.—(1) The undertaker must take all such measures as may be reasonably practicable to prevent any interruption of the free passage of fish in the fishery during the construction of any specified work.

(2) If by reason of—

(a) the construction of any specified work; or

(b) the failure of any such work,

damage to the fishery is caused, or the Agency has reason to expect that such damage may be caused, the Agency may serve notice on the undertaker requiring it to take such steps as may be reasonably practicable to make good the damage, or, as the case may be, to protect the fishery against such damage.

(3) Subject to paragraph 60, if within such time as may be reasonably practicable for that purpose after the receipt of written notice from the Agency of any damage or expected damage to a fishery, the undertaker fails to take such steps as are described in sub-paragraph (2), the Agency may take those steps and any expenditure incurred by the Agency in so doing is recoverable from the undertaker.

(4) Subject to paragraph 60, in any case where immediate action by the Agency is reasonably required in order to secure that the risk of damage to the fishery is avoided or reduced, the Agency may take such steps as are reasonable for the purpose, and may recover from the undertaker any expenditure incurred in so doing provided that notice specifying those steps is served on the undertaker as soon as reasonably practicable after the Agency has taken, or commenced to take, the steps specified in the notice.

Indemnity

60. The undertaker indemnifies the Agency in respect of all costs, charges and expenses which the Agency may incur—

(a) in the examination or approval of plans under this Part of this Schedule;

(b) in the inspection of the construction of the specified works or any protective works required by the Agency under this Part of this Schedule; and

(c) in the carrying out of any surveys or tests by the Agency which are reasonably required in connection with the construction of the specified works.

61.—(1) The undertaker is responsible for and indemnifies the Agency against all costs and losses not otherwise provided for in this Schedule which may be reasonably incurred or suffered by the Agency by reason of—

(a) the construction, operation or maintenance or failure during construction of any specified works comprised within the authorised development;

(b) the operation or maintenance of any specified works comprised within the authorised development or the failure of any such works; or

(c) any act or omission of the undertaker, its employees, contractors or agents or other persons acting under the direction of the undertaker whilst engaged upon—

(i) the construction, operation or maintenance of the specified works; or

(ii) in the case of those specified works that the undertaker is liable to maintain, dealing with any failure of those specified works.

(2) For the avoidance of doubt, in sub-paragraph (1)—

"costs" includes—

(a) expenses and charges;

(b) staff costs and overheads;

(c) legal costs;

"losses" includes physical damage.

(3) The undertaker indemnifies the Agency against all liabilities, claims and demands arising out of or in connection with the authorised development or otherwise out of the matters referred to in sub-paragraph (1).

(4) In sub-paragraph (3)—

"claims" and "demands" include as applicable—

(a) costs (within the meaning of sub-paragraph (2)) incurred in connection with any claim or demand;

(b) any interest element of sums claimed or demanded;

"liabilities" includes—

(a) contractual liabilities;

(b) tortious liabilities (including liabilities for negligence or nuisance);

(c) liabilities to pay statutory compensation or for breach of statutory duty;

(d) liabilities to pay statutory penalties imposed on the basis of strict liability (but does not include liabilities to pay other statutory penalties).

(5) The Agency must give to the undertaker reasonable notice of any such claim or demand and must not settle or compromise a claim without the agreement of the undertaker and that agreement must not be unreasonably withheld or delayed.

(6) The Agency must, at all times take reasonable steps to prevent and mitigate any such claims, demands, proceedings, costs, damages, expenses or loss.

(7) The fact that any work or thing has been executed or done by the undertaker in accordance with a plan approved by the Agency, or to its satisfaction, or in accordance with any directions or award of an arbitrator must not relieve the undertaker from any liability under the provisions of this Part of this Schedule.

(8) Nothing in this paragraph imposes any liability on the undertaker with respect to any costs, charges, expenses, damages, claims, liabilities, demands or losses to the extent that they are attributable to the neglect or default of the Agency, its officers, servants, contractors or agents.

Disputes

62. Any dispute arising between the undertaker and the Agency under this Part of this Schedule must, if the parties agree, be determined by arbitration under article 51 (arbitration), but failing agreement be determined by the Secretary of State for Environment Food and Rural Affairs or its successor and the Secretary of State for Transport or its successor acting jointly on a reference to them by the undertaker or the Agency, after notice in writing by one to the other.