

Rother Valley Railway

Flood Risk Assessment Addendum
March 2021

Quality Management

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Contents

1. Executive Summary	4
2. Introduction	5
2.1 Background	5
2.2 Requirements	6
2.3 Development Proposals	8
2.4 Report Objectives	9
2.5 Limitations	9
3. 2016 Flood Risk Assessment	10
3.1 Site Location and Description	10
3.2 Summary of Flood Risk Assessment (2016)	10
4. Update to Fluvial Flooding Assessment	11
4.1 Introduction	11
4.2 Update to climate change allowances	12
4.3 Hydrology and Modelling Updates	13
4.4 Impact of the Development on Flood Risk	14
4.5 Flood Risk to the Proposed Railway	23
4.6 Mitigation of the schemes impact on Flood Risk	24
4.7 Management of Flood Risk	24
5. Response to Public Inquiry Inspectors Requirements	26
5.1 Appropriate allowance for climate change	26
5.2 Justification relating to the Exception Test	26
6. Conclusions	29
Appendix A1 - Flood extent comparison maps	30
Appendix B1 - Difference in 'With Railway' and Baseline predicted maximum water level maps	31
Appendix C1 - Predicted maximum flood depth maps for the 'With Railway' scenario	32

1. Executive Summary

- 1.1.1 On 19 April 2018, Rother Valley Railway Limited (RVR) applied to the Secretary of State for Transport for the Rother Valley Railway (Bodiam to Robertsbridge Junction) Order under the 1992 Act. A Public Inquiry has been called and the Inspector has requested further environmental information relating to the Environmental Statement. This includes an update to the flood risk analysis.
- 1.1.2 This report forms an addendum to the 2016 Rother Valley Railway Flood Risk Assessment (FRA). The report provides an update to the assessment of fluvial flood risk through the study area and will inform the update to the Environmental Statement.
- 1.1.3 The updated assessment of flood risk has included updates to the flow estimation calculations and the incorporation of the latest climate change guidance. The flood model has been updated to include the revised design flows and allowances for climate change. The spatial resolution of the model downstream of Salehurst has also been increased.
- 1.1.4 The model has been used to assess the impact of the proposed railway on flood risk. The model predicts some small variations in predicted maximum flood levels between the baseline (existing) scenario and the 'with railway' scenario. Across the majority of the floodplain the difference in maximum flood level is between +/- 0.01m in all the design flood events simulated. There are some areas with slightly larger variations (+/- 0.05m) in predicted maximum water level. However, the baseline and 'with railway' flood extents are very similar, and no additional properties are predicted to be at risk of flooding in the 'with railway' scenario. Overall, the model results indicate that there is no significant increase in predicted flood levels in the 'with railway' scenario and small decreases are predicted in some areas.
- 1.1.5 The Exception Test has been updated to include the latest model results and demonstrates that the Proposed Development will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere.
- 1.1.6 The work presented in this Addendum to the 2016 FRA reaches the same overall conclusions as the 2016 FRA; that the proposed railway does not significantly impact on flood levels elsewhere, and that flood risk to the railway can be managed such that the development will be safe for its lifetime.

2. Introduction

2.1 Background

- 2.1.1 This report forms an addendum to the 2016 Rother Valley Railway Flood Risk Assessment (FRA). The report provides an update to the assessment of fluvial flood risk through the study area and will inform the update to the Environmental Statement.
- 2.1.2 The original Flood Risk Assessment for the proposed reinstatement of the Rother Valley Railway between Robertsbridge and Udiam (Bodiam) was completed in 2014. Following discussions with the Environment Agency and updates to the proposed scheme design a new Flood Risk Assessment was completed in June 2016. The 2016 FRA encompassed amendments to the original scheme including changes to the track elevation, sections of viaduct and the proposed culverts through the railway embankment. The June 2016 FRA superseded the earlier 2014 FRA. The route is approximately 3.5 km and will link the existing railway between Bodiam and Robertsbridge (Figure 2-1). Planning permission for the reinstatement of the railway line from Robertsbridge to Udiam was approved in 2017.

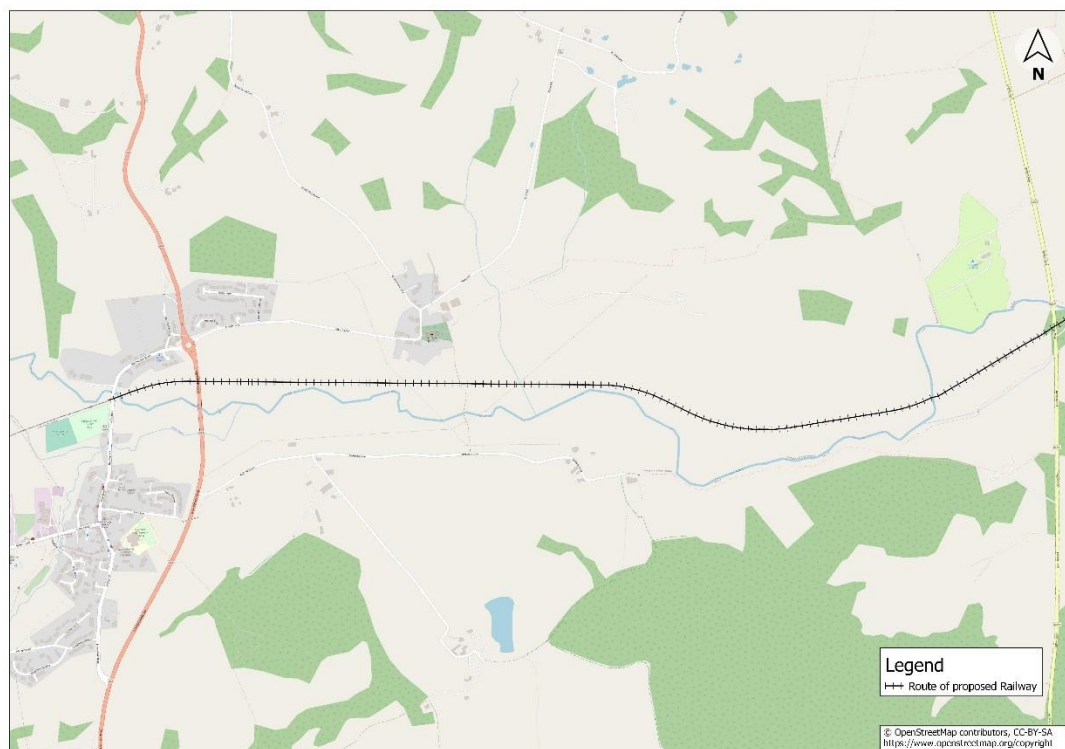


Figure 2-1 Proposed route of reinstated railway

- 2.1.3 On 19 April 2018, Rother Valley Railway Limited (RVR) applied to the Secretary of State for Transport for the Rother Valley Railway (Bodiam to Robertsbridge Junction) Order under the 1992 Act.

- 2.1.4 The purpose of the Order is to confer powers to construct, maintain and operate a re-instated railway along the route of the former Rother Valley Railway between Bodiam and Robertsbridge, thereby completing the “Missing Link” and enabling the Kent and East Sussex Railway (K&ESR) to operate steam trains along the entirety of the historic route between the town of Tenterden and the main line railway at Robertsbridge.
- 2.1.5 A Public Inquiry has been called and the Inspector has requested further environmental information relating to the Environmental Statement. This includes an update to the flood risk analysis. The Inspector has requested:
- 2.1.6 *“An updated flood risk assessment (FRA) making appropriate allowance for climate change in accordance with the Planning Practice Guidance on Flood Risk assessments, which incorporates the revised UKCP18 climate projections and gives specific guidance in relation to Flood Zone 3b-Functional Floodplain. The updated FRA should include detailed justification relating to the Exception Test. Reason: Subsequent to the 2016 Flood Risk Assessment submitted in the ES Addendum, the Met Office has published the higher resolution UKCP18 projections. The updated assessment is required to ensure that the flood model takes into account the most up to date river flow allowances, ensuring that any flood mitigation is of sufficient scope (for example, whether flood plain storage compensation is required and if it is, where it would be provided). An update to the Exception Test is required that demonstrates that the Proposed Development will provide wider sustainability benefits to the community that outweigh flood risk, that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall;”* (Planning Inspectorate letter, 8th June 2020).
- 2.1.7 This report forms an addendum to the 2016 FRA and includes the updates to flood risk information requested by the Inspector.

2.2 Requirements

- 2.2.1 The Public Inquiry Inspector did not require the updates to the Flood Risk Assessment to be agreed with the Environment Agency. However, the Environment Agency has been consulted throughout the process of updating the flood risk information. The Environment Agency has been consulted regarding:
- whether the climate change guidance for fluvial flooding had been updated based on the revised UKCP18 climate projections
 - the proposed methodology for updating the flood risk information
 - the updated hydrological calculations for flow estimation

- 2.2.2 The Inspector has requested that the assessment of flood risk is updated to incorporate the “appropriate allowance for climate change in accordance with the Planning Practice Guidance on Flood Risk assessments, which incorporates the revised UKCP18 climate projections and gives specific guidance in relation to Flood Zone 3b-Functional Floodplain.”
- 2.2.3 The Environment Agency was contacted in June 2020 regarding whether the climate change guidance for fluvial flooding had been updated based on the revised UKCP18 climate projections. We were informed that *“The current allowances are based on UKCP09. Work to translate the rainfall projections into peak river flow uplifts then to covert that data into allowances is underway. We hope to complete this update this year”* (Correspondence with Environment Agency, 30 June 2020).
- 2.2.4 Further correspondence with the Environment Agency in December 2020 confirmed that for peak river flows *“Work is continuing to derive and subsequently apply UKCP18 climate change projections to planning guidance. The latest estimate of the timescale for the change in guidance to take place is mid-2021.”* (Correspondence with Environment Agency, 16 December 2020). The Environment Agency also confirmed that comparison of the UKCP09 allowances against the provisional UKCP18 figures (for the study area) indicates similar figures for the Central and Upper Central scenarios. The provisional UKCP18 figure for the Upper End scenario is lower than the UKCP09 allowance.
- 2.2.5 As of 2nd March 2021, the Guidance on Flood Risk Assessments: climate change allowances published on the GOV.UK website has not been updated to include guidance for fluvial flooding based on the revised UKCP18 climate projections. The 2016 FRA was based on the 20% climate change allowance, which was agreed with the Environment Agency at the time the FRA was produced. However, this is lower than the currently published guidance. Therefore, the assessment of fluvial flood risk documented in this report applies the currently published Climate Change Allowance Guidance based on UKCP09 for the Higher Central and Upper End scenarios. The Environment Agency have confirmed that this is an *“approach we would support given the current uncertainties for UKCP18.”* (Correspondence with Environment Agency, 16 December 2020).
- 2.2.6 The Inspector clarifies that “The updated assessment is required to ensure that the flood model takes into account the most up to date river flow allowances, ensuring that any flood mitigation is of sufficient scope (for example, whether flood plain storage compensation is required and if it is, where it would be provided).”
- 2.2.7 In addition to applying the published guidance on climate change allowances for fluvial flooding, the hydrology (design flows) used in the assessment of flood risk have been updated to reflect the additional years of gauge data and the latest updates to the methods used in flood flow estimation. The flood model has been run with these updated flows and allowances for climate change.

- 2.2.8 The Inspector has requested that the “The updated FRA should include detailed justification relating to the Exception Test.” The reason provided for this update is “An update to the Exception Test is required that demonstrates that the Proposed Development will provide wider sustainability benefits to the community that outweigh flood risk, that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall;”.
- 2.2.9 The Sequential and Exception Test were considered satisfied as part of the planning application, approved in 2017. The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- 2.2.10 Following the updates to the design flows and the allowances for climate change the proposed development has been assessed using the updated flood model to confirm the impact of the proposed scheme on flood risk. Measures were detailed in the 2016 regarding the management of flood risk and these have been reviewed in the context of the updated assessment of flooding.
- 2.2.11 The contents of this Addendum to the 2016 FRA describe the updated assessment of fluvial flood risk and the implications of the proposed development on flood risk. This report has been prepared in light of national policy; National Planning Policy Framework (NPPF) & Planning Practice Guidance (PPG), and guidance for climate change allowances (Flood Risk Assessments: Climate Change Allowances, GOV.UK, last updated 22 July 2020).

2.3 Development Proposals

- 2.3.1 The proposed development is the reinstatement of the Rother Valley Railway between Northbridge Street and Udiam (NGR TQ7380724014 to TQ7718624322). The route is approximately 3.5 km and will link the existing railway between Bodiam and Robertsbridge (Figure 2-1). The proposed scheme includes raised embankment, bridges, culverts, viaducts and setting the track in certain locations close to ground levels.
- 2.3.2 The Environment Agency’s Flood Map for planning shows that the site is within Flood Zone 3, which is described within the Planning Practice Guidance Table 1: Flood Risk as having a ‘High Probability’ of flooding. Flood Zone 3 comprises of land assessed as having a 1 in 100 or greater annual probability of river flooding, or a 1 in 200 or greater annual probability of flooding from the sea. The Flood Map for planning is provided in Figure 2-2.

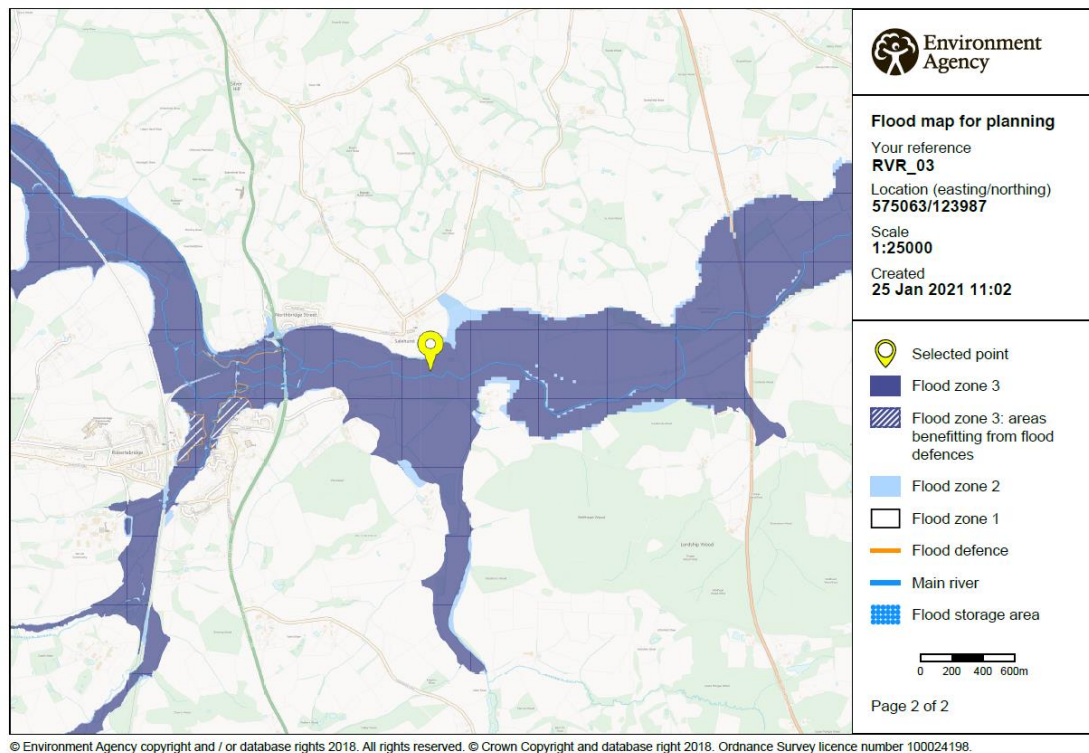


Figure 2-2 Environment Agency Flood Map for Planning

- 2.3.3 The proposed railway is considered to fall under the classification of “Less Vulnerable” land use based on Planning Practice Guidance Table 2: Flood Risk Vulnerability Classification. However in the 2016 FRA it was noted that there is argument for it to be considered as water compatible because during times of flood the railway will not be operated and some sections of the track will be constructed close to existing ground elevations to maintain floodplain connectivity and flow routes during a flood.

2.4 Report Objectives

- 2.4.1 This Addendum FRA report describes the updates made to the hydrology, climate change allowances and flood model. The assessment of the proposed scheme has been updated. The implications of the proposed development on fluvial flood risk are documented in this report.

2.5 Limitations

- 2.5.1 The contents of this Addendum to the 2016 FRA provide an update to the hydrological assessment of the site and the implications of the proposed development on flood risk and levels. This report relies on publicly available information which Capita assumes to be correct. Capita cannot and does not verify accuracy of this data, and it is outside the scope of this commission to do so.

3. 2016 Flood Risk Assessment

3.1 Site Location and Description

- 3.1.1 The site is located between Robertsbridge and Udiam and follows the historic route of the railway. The historic route of the railway is through the Rother floodplain, with some sections of the original railway embankment remaining today.
- 3.1.2 The River Rother flows in an easterly direction to the English Channel at Rye. The Darwell Stream is a tributary of the River Rother that flows through Robertsbridge. A flood defence scheme was put in place for Robertsbridge and Northbridge Street in 2004.

3.2 Summary of Flood Risk Assessment (2016)

- 3.2.1 The Flood Risk Assessment completed in 2016 considered flooding from rivers (fluvial), surface water, groundwater and artificial sources. The FRA concluded that the proposed railway is at low risk of groundwater flooding, low to medium risk of flooding from artificial sources and medium risk of flooding from surface water. Since the completion of the 2016 FRA the Environment Agency has published 'Extent of flooding from surface water' maps which indicate that the majority of the proposed railway is at very low or low risk from surface water flooding.
- 3.2.2 The 2016 FRA also concluded that fluvial flood risk to the proposed scheme was high. The FRA highlighted that flooding of the existing track downstream of Udiam already occurs and is managed by the operators of the railway line. It was proposed that the consequences of flooding between Robertsbridge and Udiam would also be managed by the train operators.
- 3.2.3 The modelling undertaken as part of the 2016 FRA predicted that the construction of the railway would not increase flood risk to properties during a 1% Annual Exceedance Probability (AEP) design flood event with allowance for climate change in Northbridge Street and Robertsbridge. The impact of the proposed railway across the floodplain was predicted to vary with some areas benefiting from reduced flood levels and others experiencing potential increases in flood levels of up to 50mm.
- 3.2.4 Updates have been made to the NPPF since the 2016 FRA was undertaken. The National Planning Policy Framework (NPPF) was first published on 27 March 2012 and updated on 24 July 2018 and 19 February 2019. The Framework states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

4. Update to Fluvial Flooding Assessment

4.1 Introduction

4.1.1 The Inspector has requested an update to the assessment of flood risk in relation to latest climate change guidance. This chapter details the updated assessment of flood risk, which includes updates to the following:

- Climate change allowances,
- Hydrology (flood flow estimation), and
- Model simulations of design flood events.

4.1.2 Flood Risk is a combination of the probability of flooding and the consequences. The Environment Agency Flood Zones describe the extent of flooding that would occur on the assumption that no flood defences are in place for a range of probabilities. The definition of Flood Zones is provided in Table 1 of the PPG and is reproduced below in Table 4-1.

Table 4-1: Flood Zone Terminology

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Flood Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Flood Zone 3a on the Flood Map)

4.1.3 The updated assessment of flood risk has considered the following design flood events:

- 5% Annual Exceedance Probability (AEP) / 1 in 20 annual probability of river flooding. This design flood event has been used to define the Function Floodplain.
- 1% AEP / 1 in 100 annual probability of river flooding.
- 1% AEP with allowance for climate change / 1 in 100 annual probability of river flooding with allowance for climate change.
- 0.1% AEP / 1 in 1000 annual probability of river flooding.

- 4.1.4 There are flood defences in Robertsbridge and Northbridge Street and along sections of the River Rother. The assessment of flood risk presented below has included the defences, which are represented in the model.

4.2 Update to climate change allowances

- 4.2.1 The 'Flood risk assessments: climate change allowances' guidance (published 2016, and last updated July 2020) outlines the allowances that are to be made for climate change when undertaking Flood Risk Assessment. Recent updates include updates to the sea level rise allowances using UKCP18 and guidance on H++ allowances. The climate change allowances for peak river flow have not yet been updated using the UKCP18 projections.
- 4.2.2 As stated in section 2.2 the Environment Agency was consulted regarding guidance for applying UKCP18 projects to peak river flow. The Environment Agency confirmed that work is continuing to derive and subsequently apply UKCP18 climate change projections to planning guidance. The latest estimate of the timescale for the change in guidance to take place is mid-2021.
- 4.2.3 The Environment Agency provided Table 4-3 below which details currently available information on Central, Upper Central and Upper End climate change allowance percentages for the Robertsbridge to Udiam area. Recognising that significant variations in true climate change impacts are likely to be seen not only between different river basin districts (RBDs) but also within river basin districts, 1km² gridded data are being produced by the Environment Agency to provide more localised projections. However, it has not yet been determined how exactly this local data are to be utilised for planning purposes against the River Basin District data.
- 4.2.4 The Environment Agency included notes to be used when interrogating Table 4-3 which have been replicated below.

Table 4-2: Comparison of UKCP09 and provisional UKCP18 allowances for peak river flow

Scenario	UKCP09 RBD (%)	UKCP18 RBD (%)	UKCP18 Local Data (%)*
Central (50 th)	35	35	30
Upper/Higher Central (70 th)	45	55**	40
Upper End (90 th)	105	80	65***

*Based on the highest value of any of the 1km² grids the application area covers.

**Actually based on the 75th percentile, as the 70th percentile is currently being calculated – so the final figure is likely to be lower than 55%.

***The Upper End currently utilises the 90th percentile, but there is some discussion around it being amended to the 95th percentile to align with Coastal uplifts, which in this case means a 75% projection rather than 65%.

- 4.2.5 The Environment Agency's comparison of the UKCP09 figures against the provisional UKCP18 figures (for the study area) indicates similar figures for the Central and Upper Central scenarios, and lower UKCP18 figures for the Upper End scenario.
- 4.2.6 The climate change allowances outlined in Table 1 of the Flood risk assessments: climate change allowances guidance are predictions of anticipated change for peak river flow based on the UKCP09 projections. Table 4-3 summarises the peak river flow allowances for the South East River Basin District.

Table 4-3: Climate Change Allowances for peak river flow in the south east river basin district

Parameter	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Peak River Flow	H ++	30%	60%	120%
	Upper End	25%	50%	105%
	Higher Central	15%	30%	45%
	Central	10%	20%	35%

- 4.2.7 The choice of the allowance category to be applied to a proposed development is dependent on the type of development and the Flood Zone in which it lies. The Flood risk assessments: climate change allowances guidance states that if a development is appropriate even though it will not follow flood zone vulnerability categories, the upper end allowance should be used. For the updated assessment of flood risk the 'Higher Central' allowance (45% increase in peak river flow) and 'Upper End' (105% increase in peak river flow) have been taken into account.
- 4.2.8 The Environment Agency confirmed they supported the use of the Higher Central and Upper end of the UKCP09 allowances for the updated assessment of flood risk requested by the Public Inquiry Inspector given the current uncertainties for UKCP18.

4.3 Hydrology and Modelling Updates

- 4.3.1 The hydrology (flow estimates) for the Rother between Swife Lane and Bodiam have been updated using the latest methods and following the latest Environment Agency Flood Estimate Guidelines (2020).
- 4.3.2 The FEH statistical and ReFH2 methods were used to derive peak flow estimates at the flow estimation locations. The National River Flow Archive (NRFA) peak flows data set, version 9 (September 2020) was used in the assessment. The Statistical Method estimates of peak flow were selected as these have been improved with the use of local data from the study catchment. On the River Rother the ReFH2 method gives lower peak flows than the Statistical Method. Full hydrographs are required for the hydraulic modelling. Testing was undertaken to determine the appropriate storm duration ReFH hydrograph, which was scaled to the Statistical Method peak flow and applied to the hydraulic model.

- 4.3.3 There is always uncertainty surrounding the design flood estimation for hydrological and hydraulic modelling. The selected FEH Statistical Method approach follows the most up to date Flood Estimation guidance and uses available observed local and pooled gauged data.
- 4.3.4 The hydraulic model was updated to incorporate the updated design flow hydrographs. Some further updates were made to the model including an increase in the 2D grid resolution downstream of Salehurst from 20m to 5m and updates to the 1D-2D links based on current best practise. The proposal to change the existing flood embankment downstream of The Clappers to a flood wall has been included in the model.
- 4.3.5 Full details of the technical updates to the flood estimation and hydraulic model have been documented in the Flood Estimation Calculation Record: Rother Valley and the Hydraulic Modelling Report (March 2021).

4.4 Impact of the Development on Flood Risk

- 4.4.1 The hydraulic model was used to simulate a range of design flood events for the baseline (existing) scenario and for the proposed 'with railway' scenario. The model results for the 5% AEP (1 in 20), 1% AEP (1 in 100), 1% AEP (1 in 100) with 45% and 105% allowances for climate change, and the 0.1% AEP (1 in 1000) design flood events are presented below.
- 4.4.2 Figure 4-1 to Figure 4-5 below compare the predicted flood extents for the baseline and 'with railway' scenarios.¹ The model results show that for each design flood event simulated the baseline and 'with railway' predicted flood extents are very similar and that no new receptors are added to the floodplain in the 'with railway' scenario.

¹ Higher resolution versions of the 'Flood Extent Comparison' maps are provided in Appendix A1

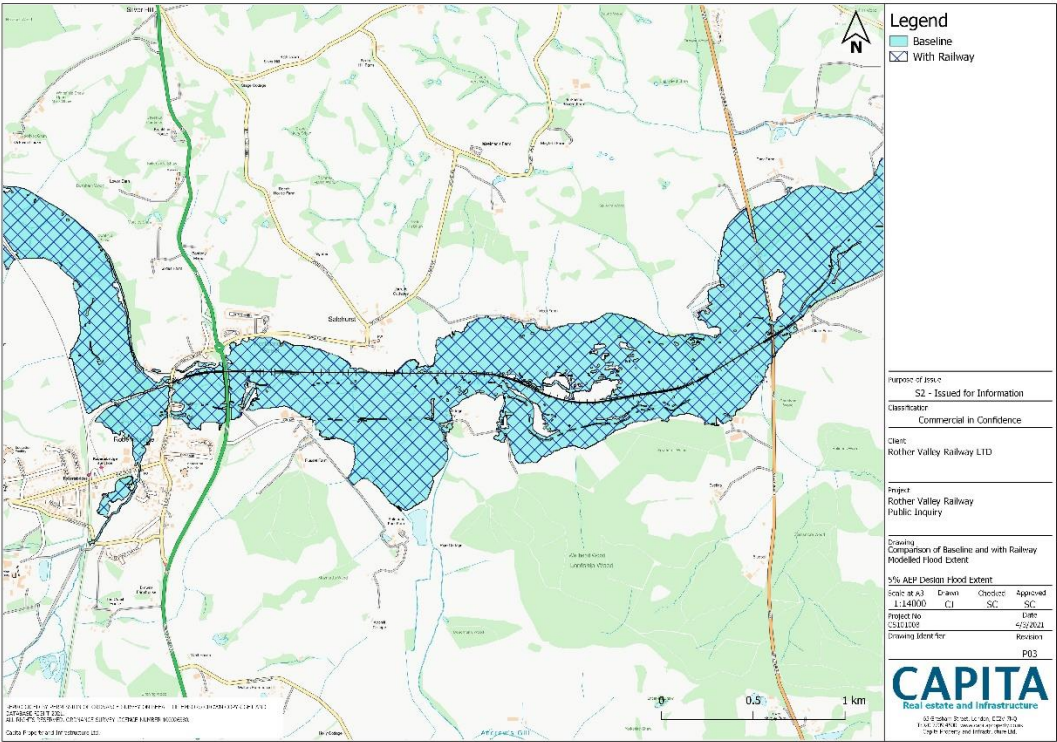


Figure 4-1 5% AEP Flood Extents Comparison

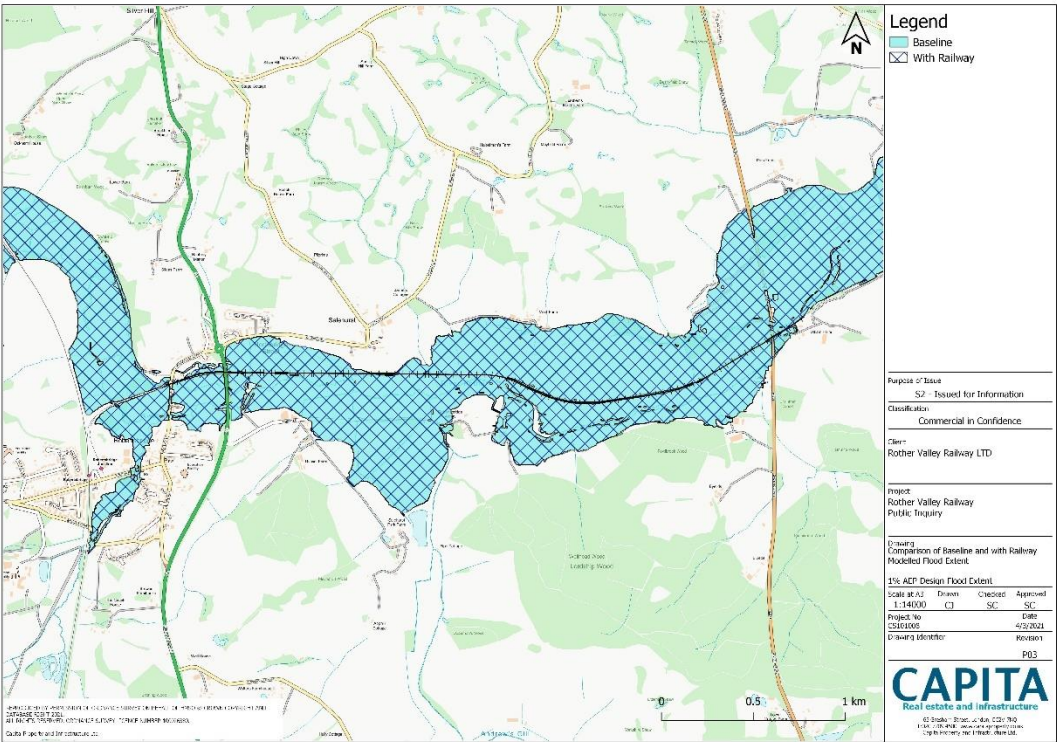


Figure 4-2 1% AEP Flood Extents Comparison

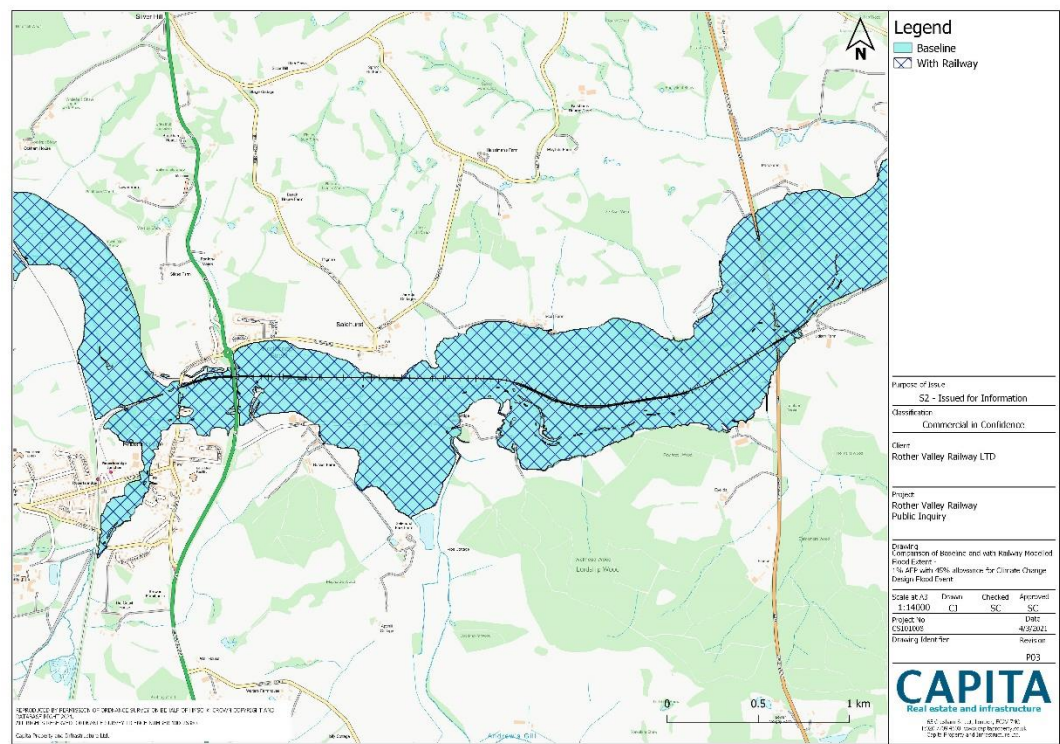


Figure 4-3 1% AEP with 45% allowance for climate change Flood Extents Comparison

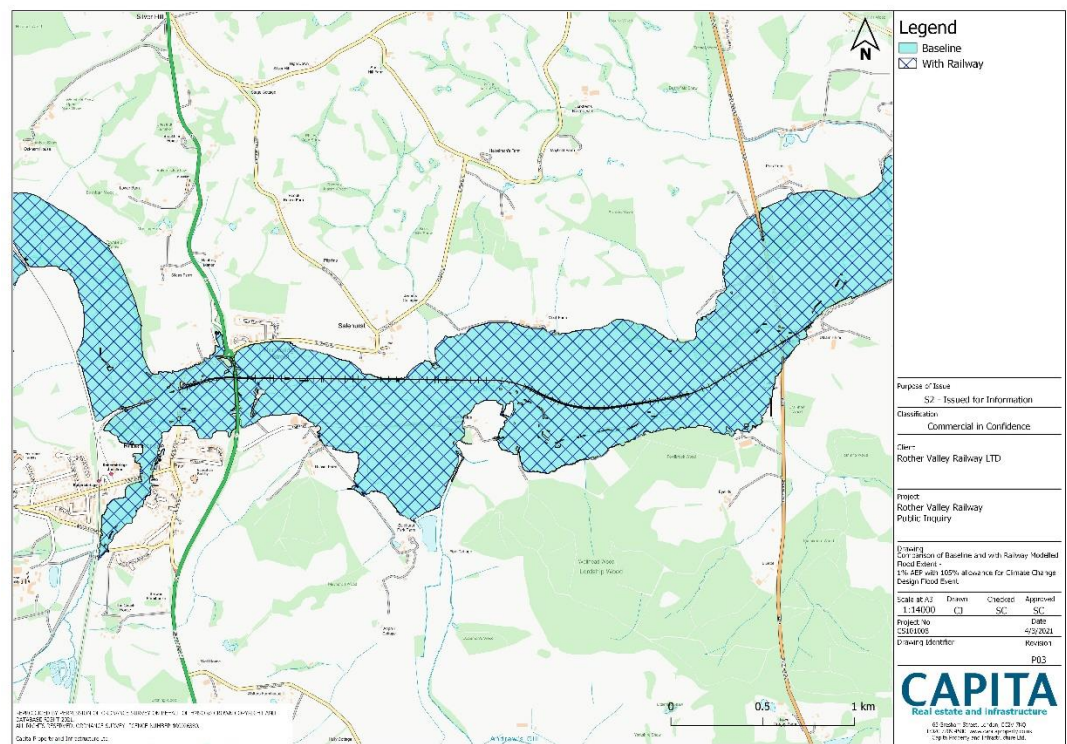


Figure 4-4 1% AEP with 105% allowance for climate change Flood Extents Comparison

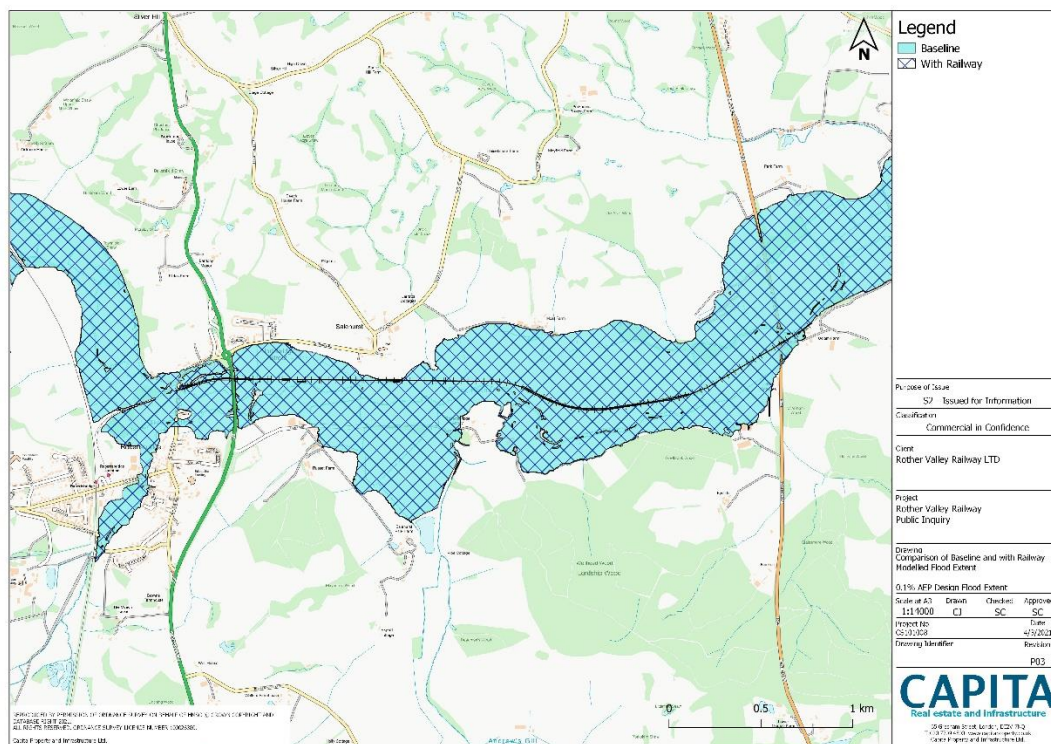


Figure 4-5 0.1% AEP Flood Extents Comparison

- 4.4.3 Figure 4-6 to Figure 4-10 show the difference in predicted maximum flood levels between the 'with railway' and baseline scenario². The modelling predicts a negligible impact on flood levels across the majority of the floodplain with levels varying by +/- 0.01 m. A small reduction in flood levels is predicted in some areas. For example, in all the simulated design flood events a reduction in maximum water level is predicted south of the proposed railway between Salehurst and Junction Road, and in the 1% AEP design event with 45% allowance for climate change a small reduction in maximum flood level is predicted upstream of The Clappers, Robertsbridge. To the south of the proposed railway, to the east of Robertsbridge Abbey reductions of up to 0.09m in maximum flood level are predicted in the 1% AEP design flood event with a 45% allowance for climate change. There are some small areas adjacent to the proposed track where a larger variation in maximum water level is predicted.

² Higher resolution versions of the 'Difference in predicted maximum water level' maps are provided in Appendix B1

- 4.4.4 To the north of the proposed railway, east of Salehurst, a small increase in maximum flood level of approximately 0.02 to 0.04m is predicted in the 1% AEP design flood event. In the 1% AEP design flood event, with allowances for climate change, the increase in predicted maximum flood level is between approximately 0.03 and 0.05m. Maximum flood depths in this area are predicted to reach between 0.5m and 0.8 m in the 1% AEP design flood event with 45% allowance for climate change and the 0.1% AEP design flood event. In some areas of the floodplain depths are predicted to exceed 1 m during 1% AEP design flood event with 105% allowance for climate change.³ There are also some small increases (between 0.01m and 0.03 m) in predicted maximum flood levels between The Clappers and the A21 in the 1% AEP and more extreme design flood events. Floodplain depths of up to approximately 2.3 m are predicted in this area, in the 1% AEP design event with a 105% allowance for climate change Overall, the impact of the change in flood levels is expected to be very small and there is considered to be no material change in flood risk at these locations.

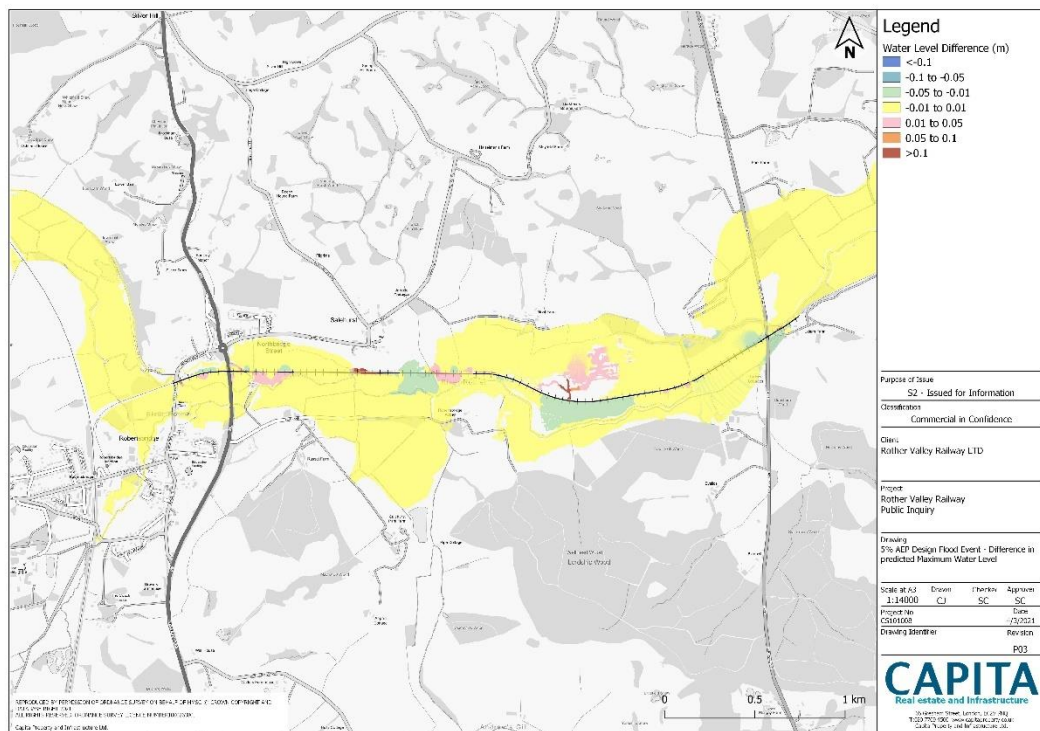


Figure 4-6 5% AEP Design Flood Event - Difference in 'With Railway' and Baseline predicted Maximum Water Level

³ Maps showing the 'Predicted Flood Depths in the with railway scenario' for a range of design flood events are provided in Appendix C1

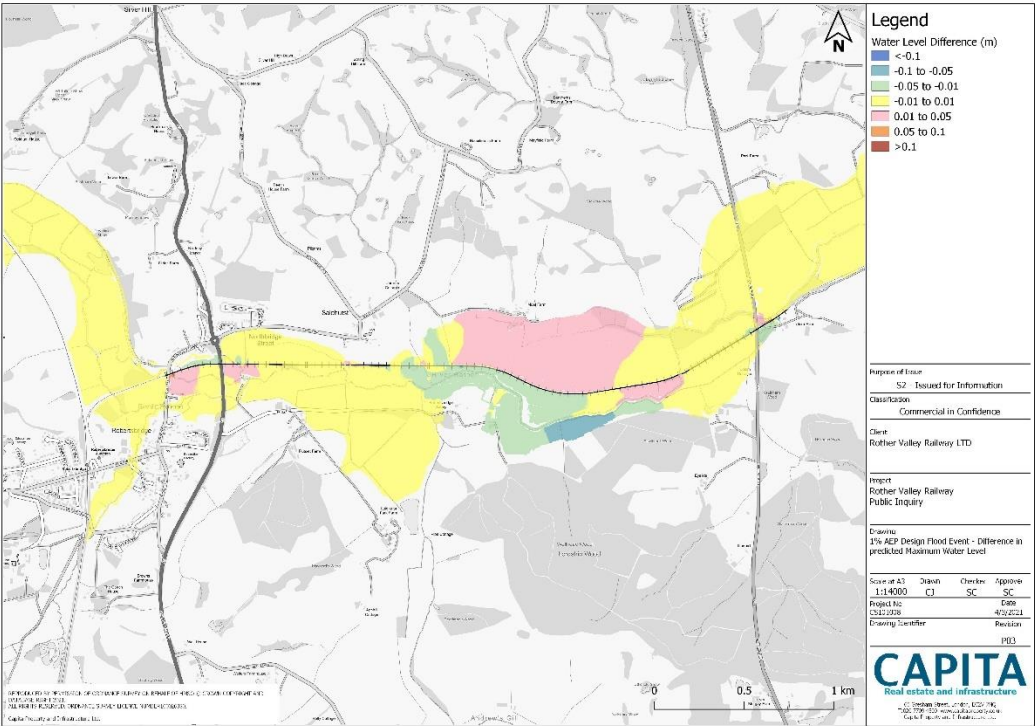


Figure 4-7 1% AEP Design Flood Event - Difference in 'With Railway' and Baseline predicted Maximum Water Level

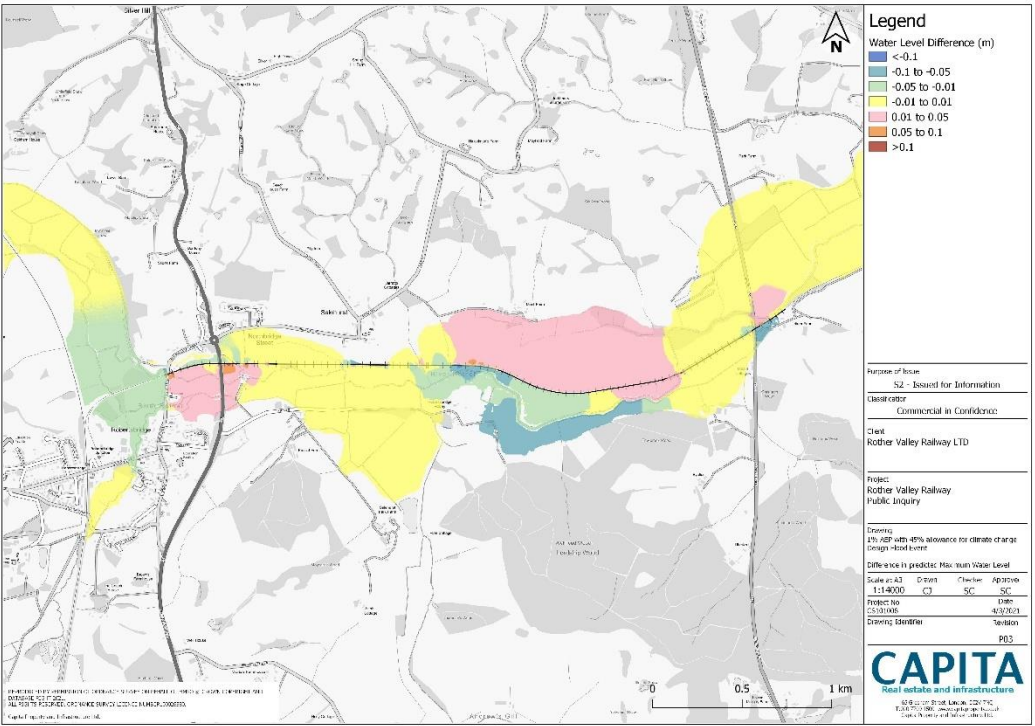


Figure 4-8 1% AEP Design Flood Event with 45% allowance for climate change - Difference in 'With Railway' and Baseline predicted Maximum Water Level

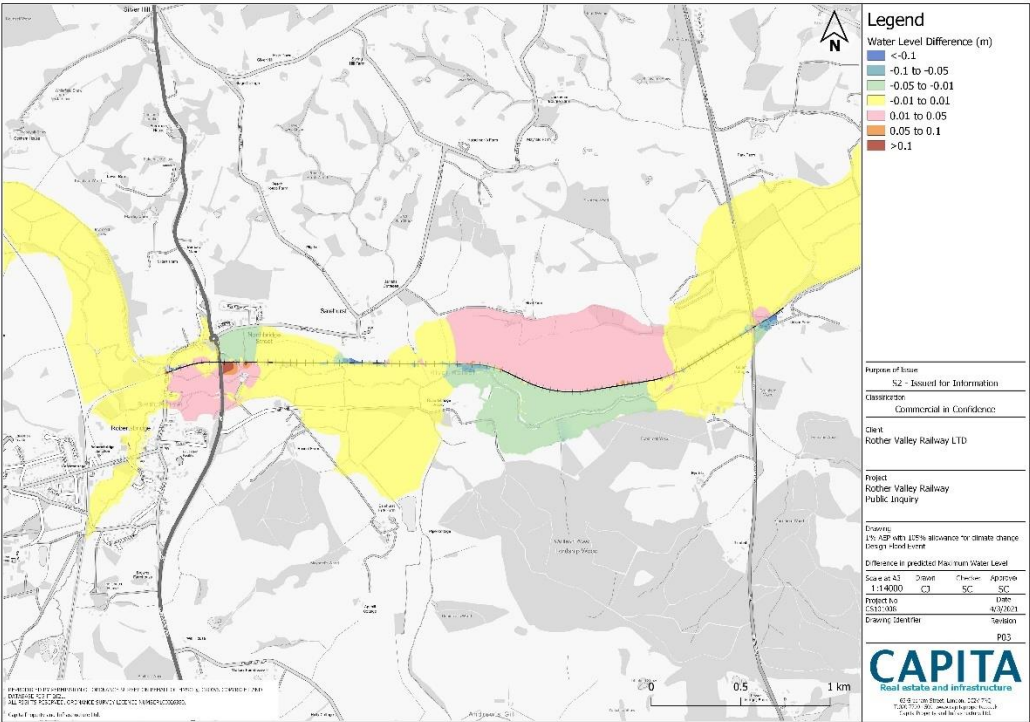


Figure 4-9 1% AEP Design Flood Event with 105% allowance for climate change - Difference in 'With Railway' and Baseline predicted Maximum Water Level

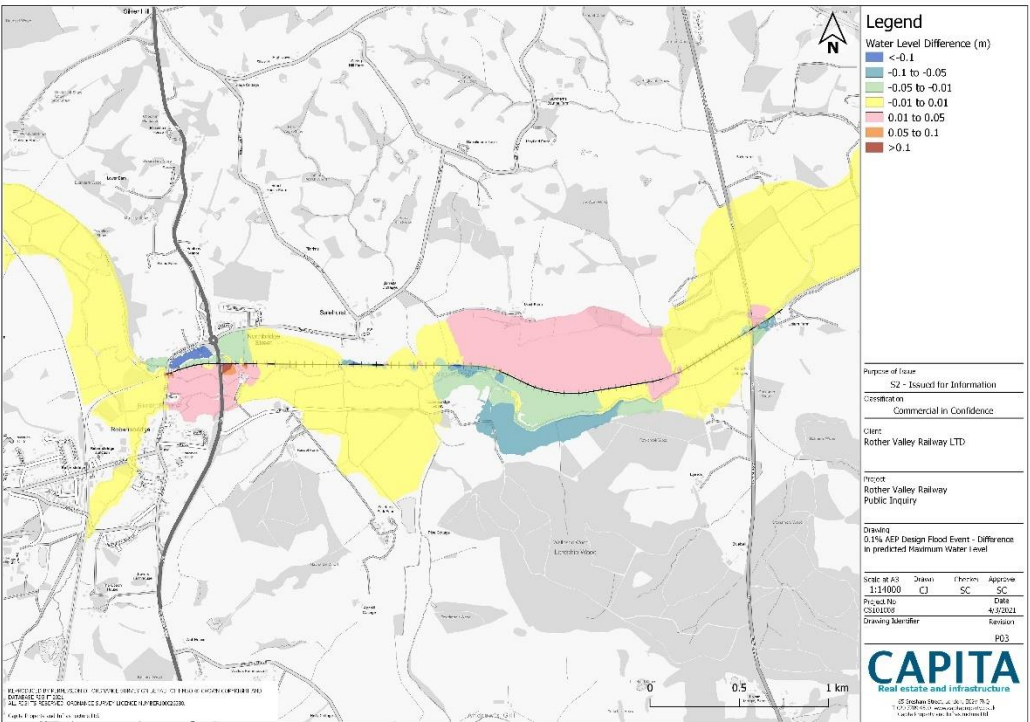


Figure 4-10 0.1% AEP Design Flood Event - Difference in 'With Railway' and Baseline predicted Maximum Water Level

- 4.4.5 The model results for the 5% AEP design event indicate very minor changes in flood levels and extent indicating that the propose railway will not adversely impact on the functional floodplain.
- 4.4.6 The location of receptors in the study area have been identified and are show in Figure 4-11.

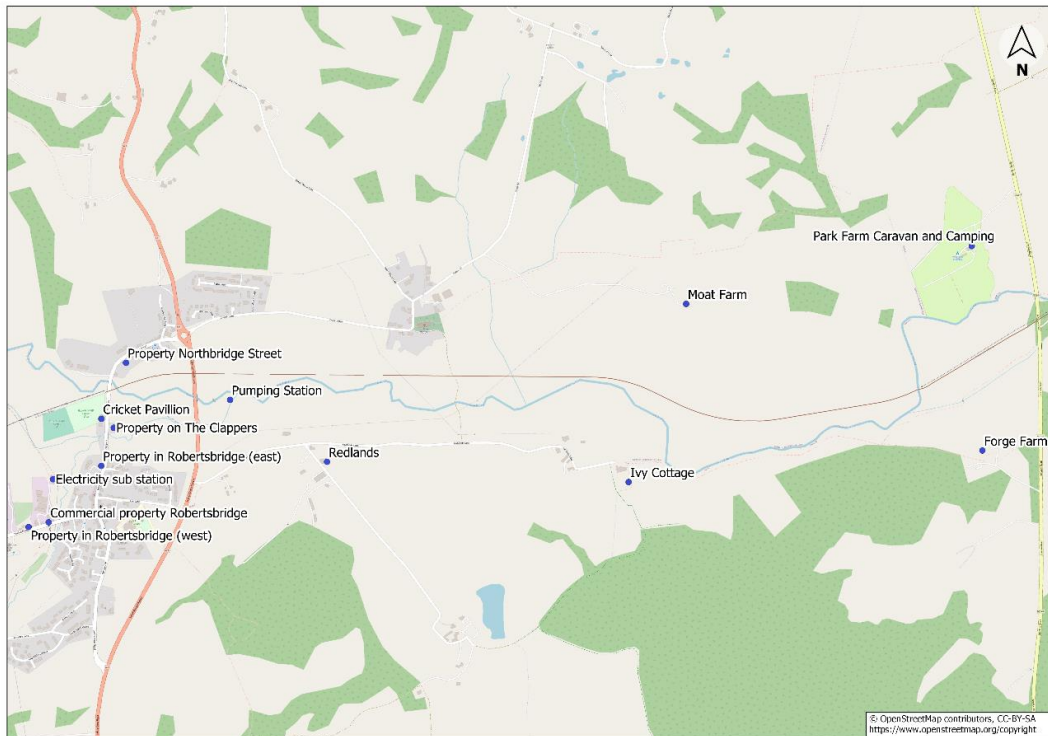


Figure 4-11 Location of receptors

- 4.4.7 A summary of the change in flood levels at these receptors is provided in Table 4-4. The table differentiates between a location 'not flooding' and flooding but with a zero difference in predicted maximum water levels. The model results indicate that there is no increase in flood risk at these receptors, with small decreases in predicted water levels at some locations in the 1% AEP (1 in 100) Design Flood Event with 45% allowance for climate change. These reductions are small, and the receptors are not removed from the predicted flood extent.
- 4.4.8 In the 1% AEP Design Flood Event with 105% allowance for climate change there is a 0.01m increase predicted at Northbridge Street. However, this is not considered significant given the depth of flooding is predicted to be approximately 1.3 m at this location in the 1% AEP Design Flood Event with 105% allowance for climate change.

Table 4-4: Difference in flood levels at receptors

	Difference in predicted maximum water level ('With Railway' and Baseline), m			
Location	5% AEP (1 in 20) Design Flood Event	1% AEP (1 in 100) Design Flood Event	1% AEP Design Flood Event with 45% CC allowance	1% AEP Design Flood Event with 105% CC allowance
Commercial property Robertsbridge	Not predicted to flood	-0.01	-0.03	0.00
Property on The Clappers	Not predicted to flood	Not predicted to flood	Not predicted to flood	0.00
Property Northbridge Street	Not predicted to flood	Not predicted to flood	Not predicted to flood	0.01
Property in Robertsbridge (west)	Not predicted to flood	Not predicted to flood	Not predicted to flood	Not predicted to flood
Property in Robertsbridge (east)	Not predicted to flood	Not predicted to flood	Not predicted to flood	Not predicted to flood
Ivy Cottage	Not predicted to flood	Not predicted to flood	-0.09	-0.05
Forge Farm	Not predicted to flood	Not predicted to flood	Not predicted to flood	-0.01
Cricket Pavilion	0.00	0.00	-0.03	0.00
Pumping Station	Not predicted to flood	Not predicted to flood	Not predicted to flood	Not predicted to flood
Redlands	Not predicted to flood	0.00	0.00	-0.01
Moat Farm	Not predicted to flood	Not predicted to flood	Not predicted to flood	Not predicted to flood
Park Farm Caravan and Camping	0.00	0.00	-0.01	0.00
Electricity sub station	0.00	0.00	-0.04	0.00

4.4.9 The model results have demonstrated that the proposed reinstatement of the railway does not increase the frequency or extent of flooding. It has also demonstrated that the railway does not adversely impact floodplain water levels upstream or downstream of the proposed development. Although both minor increases and decreases in maximum water level were predicted across the floodplain, the difference in predicted maximum flood levels is considered negligible, particularly with reference to the predicted flood depths. Overall, it is concluded there is no increase in flood risk.

4.5 Flood Risk to the Proposed Railway

4.5.1 The proposed railway has been designed to minimise the impact on flood risk and maintain floodplain flow paths. The design includes sections of viaduct, floodplain culverts and sections where the track elevation will be set close to existing ground levels. Where the track is to be set close to existing ground levels that are currently at risk of flooding, it is anticipated that the railway will flood. This will be taken into consideration in the detailed design of the track bed and maintenance regime for the railway.

4.5.2 Figure 4-12 shows the depth of flooding in the 5% AEP design event. Sections of the railway between Salehurst and Robertsbridge Abbey, where the railway elevation will be similar to existing ground levels, are predicted to be at risk of flooding in the 5% AEP design event. Flood depths are predicted to be less than 0.3 m along most of this section, with a small section of railway predicted to flood up to 0.6 m in the 5% AEP design flood event. Approximately 500m of railway is also at risk to the west of Udiam and the B2244, Junction Road, with predicted flood depths less than 0.3m in the 5% AEP design event. Flood Depth maps are provided for all the simulated design flood events in Appendix C1.

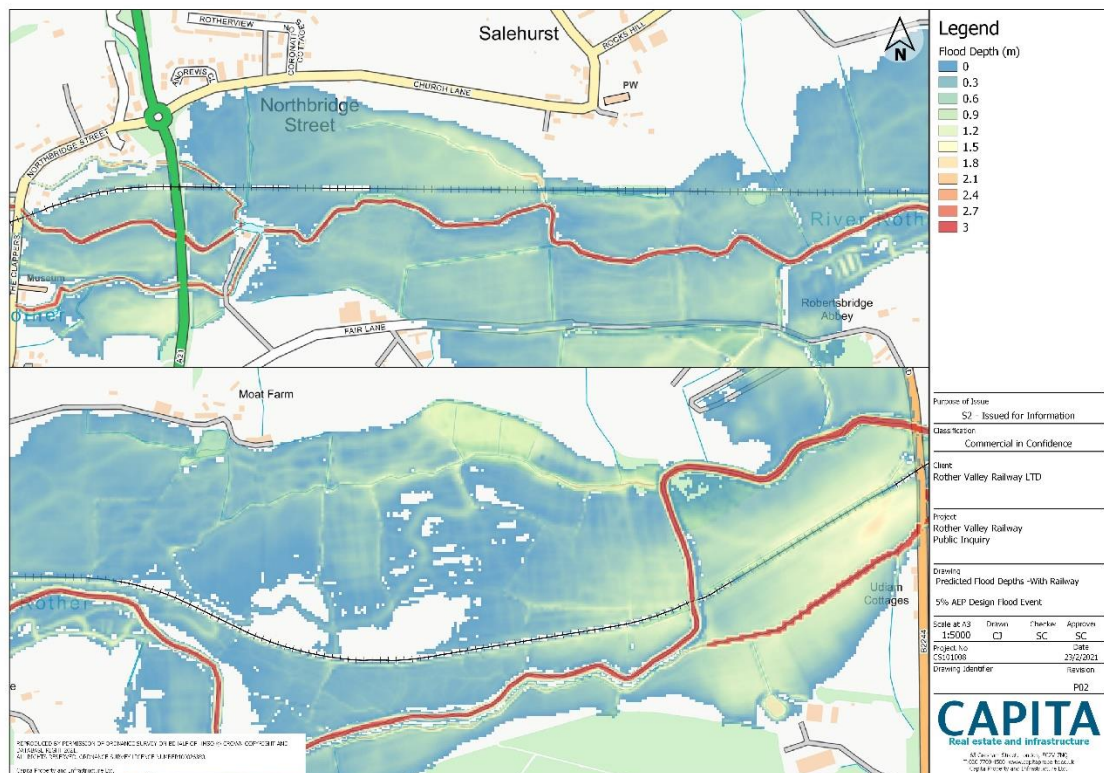


Figure 4-12 5% AEP Design Flood Event, predicted flood depths

- 4.5.3 The existing railway immediately upstream of The Clappers is at risk of flooding in the 1% AEP with a 45% allowance climate change design flood event and in larger flood events. In the extreme 0.1% AEP design flood event the railway between Salehurst and Robertsbridge Abbey, and immediately upstream of Junction Road is predicted to be flooded to depths of approximately 1 m. However, the other sections of the railway raised on the embankment or viaducts are predicted to remain dry and the stations at Bodiam and Robertsbridge are also outside of the predicted flood extents. The railway will be closed, and trains services will cease if flooding is expected. It is recognised that there is a requirement for the development to be safe and this is discussed further in section 4.7.

4.6 Mitigation of the schemes impact on Flood Risk

- 4.6.1 The proposed development includes a combination of viaducts, floodplain culverts, bridges, and sections of railway track at an elevation close to existing ground levels to mitigate the impact of the proposed railway on flood risk and maintain floodplain flow paths.
- 4.6.2 The operator of the railway undertakes Permanent Way patrols and route proving trains to inspect the railway line and structures. Procedures are in place to report concerns and take necessary action.
- 4.6.3 Discussions with the Environment Agency regarding compensatory flood storage will be required to address planning condition 11. The reason given for this condition is to prevent flooding elsewhere. The modelling indicates that baseline and 'with railway' flood extents are very similar and therefore that the proposed railway will not cause new flooding elsewhere.
- 4.6.4 The replacement of the flood embankment with a flood wall downstream of The Clappers will provide a small volume of additional floodplain storage and a section of the existing embankment near Salehurst will be slightly lowered, providing some compensatory floodplain storage. The use of viaducts downstream of the A21 also minimises the impact of the scheme on floodplain storage.

4.7 Management of Flood Risk

- 4.7.1 As noted in section 4.5 the proposed railway line is predicted to be at risk of flooding as are sections of the railway that are currently operated to the east by Kent and East Sussex Railway (KESR). There is a requirement for the development to be safe. The operator of the railway (KESR) receives adverse weather and flood warnings from the Met Office and Environment Agency. The Environment Agency's River Rother at Robertsbridge Flood Warning Area covers Robertsbridge to Bodiam, including areas along the River Rother.

- 4.7.2 Kent and East Sussex Railway (KESR) have procedures for reporting floods and running trains during flood conditions. The procedures include actions in response to Flood Alerts, Flood Warnings and Severe Flood Warnings. The procedures include provision of watchmen and patrolmen to observe parts of the railway likely to be affected by flooding and provision for the closure of the railway line/cancellation of train services. The procedures include inspection of the railway line and structures prior to recommencing services.
- 4.7.3 The proposed measures to manage flood risk including procedures prior, during and following a flood event demonstrate that the development will be safe as required by the Exception Test.

5. Response to Public Inquiry Inspectors Requirements

5.1 Appropriate allowance for climate change

- 5.1.1 The updated assessment of flood risk has taken into consideration the currently published guidance on applying climate change allowances to peak river flows. The current guidance is based on UKCP09, however the provisional allowances based on the UKCP18 projections were provided by the Environment Agency. The Higher Central estimate based on UKCP09 (45% increase in peak flow) is similar to the provisional allowance (40 to 55%) based on UKCP18 projections. The guidance states that if a development is appropriate even though it will not follow flood zone vulnerability categories, the upper end allowance should be used. The Upper End allowance based on UKCP09 is 105% on peak river flows. This is much higher than the provisional allowance of between 60 to 80% based on UKCP18 projections.
- 5.1.2 The hydrological calculations have been updated based on the latest guidance and the additional years of gauge data that are now available. The updated river flows and allowances for climate change, Higher Central (45% allowance) and Upper End (105% allowance), have been included in the flood model.

5.2 Justification relating to the Exception Test

- 5.2.1 The NPPF sets out guidance on the application of the Sequential Test, the aim of which is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. Where areas of lower risk are not available, the Exception Test, can be applied, to ensure that flood risk to people and property will be managed satisfactorily.
- 5.2.2 The Inspector required this report to include details regarding the Exception Test. There are two elements to the Exception Test to satisfy for a proposed development.
- (a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- (b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

- 5.2.3 With respect to the first element of the Exception Test, the wider sustainability benefits of the reinstated railway have been identified. The Rother District Core Strategy (2014) identifies the importance of tourism to the local area and includes a strategic objective ‘to secure sustainable economic growth for existing and future residents and provide greater prosperity and job opportunities for all’. Section 16:33 of the Core Strategy identifies the extension of the Kent and Sussex Steam Railway (KESR) as an opportunity related to tourism.
- 5.2.4 Rother Valley Railway commissioned Steer Group to undertake an investigation into the benefits of the reinstated railway. The study highlighted benefits of the scheme, such as linking the existing Kent and East Sussex (KESR) heritage railway and other tourist attractions along the route with the main line rail services at Robertsbridge. The economic benefits of the reinstating the ‘missing link’ of the railway between Robertsbridge and Bodiam are summarised in the Steer Group report:
- 5.2.5 *The delivery of the Rother Valley Railway is forecast to generate local economic benefits of up to £35.0 million over the two-year construction period (2019 - 2020) and the first ten years of operation, and up to £4.6 million of local economic benefits per year from 2030. It will generate approximately 34 jobs in the construction phase (temporary FTE over two years) and up to 85 in the operational phase (FTE permanent jobs). Additional rail revenues of approximately £355,000 per annum would accrue to the mainline rail operator.” (Steer Report, 2018, included in annex RVR 09 of the Statement of Case).*
- 5.2.6 With respect to the second part of the Exception Test the measures discussed in section 4.7 demonstrate how the railway will remain safe for its lifetime. It should be noted that some sections of the railway have been designed at elevations close to the existing floodplain elevation and will be at risk of flooding. This approach has been adopted to maintain floodplain connectivity and minimise the impact of the scheme on existing flood risk. Flooding of the existing railway track downstream of Udiam already occurs and is managed by the operators of the railway line. The stations at Robertsbridge and Bodiam are within Flood Zone 1, which describes areas outside the 0.1% AEP flood extent and therefore have a low probability of flooding.
- 5.2.7 To manage the consequences of flooding and maintain the safety of those using the service between Robertsbridge and Udiam the train operators will be signed up to the Environment Agency’s Flood Warnings Direct service and cease services when there is a risk of flooding to the railway. KESR already operate the railway to the east which is at risk of flooding and have operating procedures in place for adverse weather including flooding.
- 5.2.8 Rother Valley Railway Ltd are aware of and have accepted the potential additional maintenance cost to repair the line should it be necessary following a flood.

- 5.2.9 The flood modelling discussed in section 4.4 has demonstrated that flood risk is not increased by the scheme. There are no additional properties at risk of flooding and the extent of flooding predicted with the reinstated railway is very similar to the current extent. Across the majority of the floodplain the difference in maximum flood level is between +/- 0.01m. There are some areas with slightly greater differences (-0.1 m to 0.05 m) in maximum predicted flood levels between the 'with railway' and baseline scenario. These areas do not include any properties and the impact is considered very small given the depth of flooding. There are also areas where the predicted maximum flood levels in the 'with railway' scenario are slightly lower than the baseline. Based on the tolerances of modelling and the consequences of variations in maximum flood levels between the baseline and 'with railway' scenarios, it is concluded that flood risk is not increased by the proposed railway.
- 5.2.10 It has been demonstrated that the reinstated Rother Valley Railway will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere. Although it has not been possible to identify opportunities to reduce flood risk overall, the modelling for the scheme does show some areas benefit from a minor reduction in flood levels.

6. Conclusions

- 6.1.1 This Addendum to the 2016 Flood Risk Assessment has been undertaken to address the request for additional and updated information made by the Public Inquiry Inspector. The updated assessment of flood risk has included:
- Updated climate change allowances,
 - Updates to the hydrology (flood flow estimation), and
 - Model simulations of design flood events.
- 6.1.2 The development proposal for the reinstated railway has considered flood risk at all stages throughout the development of the final layout and reflects the flood risk constraints and the need to manage, and where possible reduce, flood risk in compliance with the guidance in NPPF. The proposal will not increase the risk of flooding to others.
- 6.1.3 The Exception Test has been updated and demonstrates that that the reinstated railway will provide wider sustainability benefits to the community that outweigh flood risk, that it will be safe for its lifetime, without increasing flood risk elsewhere.

Appendix A1 - Flood extent comparison maps

Appendix B1 - Difference in 'With Railway' and Baseline predicted maximum water level maps

Appendix C1 - Predicted maximum flood depth maps for the 'With Railway' scenario

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