The Sizewell C Project

5.6 Sizewell Link Road Flood Risk Assessment Addendum Appendices

Revision: 2.0

Applicable Regulation: Regulation 5(2)(q)

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Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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APPENDICES

APPENDIX A: Extract of the Environment Agency Relevant Representation related to flood risk
(Not revised. Refer to REP2-026)

APPENDIX B: Collated comments from the Environment Agency received on 5th February 2020, 4th August 2020, 14th September 2020 and 30th April 2021

APPENDIX C: Sizewell link road Modelling Report Addendum (Revision 2)

APPENDIX D: Sizewell link road Flood Risk Emergency Plan
(Not revised. Refer to REP2-031)

APPENDIX B: COLLATED COMMENTS FROM THE ENVIRONMENT AGENCY RECEIVED ON 5TH FEBRUARY 2020, 4TH AUGUST 2020, 14TH SEPTEMBER 2020 AND 30TH APRIL 2021

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Date Raised	SZC Co.'s Response	EA Comments April 2021	Issue Resolved?	SZC Co.'s Response June 2021
1.6	**Sizewell Link Road Flood Risk Assessment**	**General comment**	Very little justification has been provided for the proposed crossing designs for the SLR which include culverts. Information on required flow and capacity has not been made clear.	Watercourse crossings should span the width of the floodplain and accommodate the design 1% (1 in 100) annual probability flood event with appropriate allowances for climate change. Where designs deviate from this requirement (such as culverts), it must be shown that the crossing is necessary and the proposed design is the only reasonable and practicable alternative.	Provide justification in reporting for the design of the crossings, incorporating detail regarding the flow capacity.	2	**01/07/2020**	Portal culverts have been sized to accommodate the 1% annual probability (1 in 100 year) event plus climate change allowance flows and have been tested in the fluvial model. Further details on the design and justification has been provided in the FRA Addendum.	Agreed that the proposed portal culverts mostly accommodate the 1% (1 in 100) with climate change flows, and that leaving the natural bed and banks allows them to act more like a bridge than a culvert.	Yes	N/A
1.7	**Sizewell Link Road Flood Risk Assessment**	**1.1.3 & section 8**	Residual risk of blockage of proposed river crossings is not assessed in FRA.	Please refer to the definition of residual flood risk detailed in The National Planning Policy Framework Planning Practice Guidance Flood Risk and Coastal Change available here: https://www.gov.uk/guidance/flood-risk-and-coastal-change#residual-risk. An applicable residual risk to the SLR and 2VB FRA is the blockage of the watercourse crossings and flood relief culverts. This has not be assessed or discussed.	Ensure the FRA discusses the blockage of the crossings and flood relief culverts as this is currently not mentioned. Some of the crossings are large so a blockage is unlikely but this must still be assessed and discussed in the FRA.	2	**05/02/2020**	Risk of blockage has been assessed following model updates to include additional survey data and the latest / improved (where required) design information. Details are discussed in the Modelling Report Addendum.	Blockage scenarios have been run with 33% and 67% blockage. The results of the blockage scenarios for each crossing are shown in tables 4.10 and 4.11. This shows that the maximum increase in the 1% with 35% climate change event is with a 67% blockage of culvert 3, with a 0.23m increase in upstream flood level. However this would not impact on properties, as it also would not for all the other crossings too. This is therefore considered acceptable, especially considering that it is a residual risk event.	Yes	N/A
1.9	**Sizewell Link Road Flood Risk Assessment**	**General Comment**	A lot remains to be addressed at detailed design. Possibly biggest questions surround SW7, much of the current layout and arrangement is unknown. Also, information regarding the proposed 11 infiltration basins, and the watercourse relief basins is insufficient to demonstrate that flood risk will be adequately addressed..	We require certainty in the designs in order to agree the impact upon flood risk and accept the FRA and modelling.	Provide clear designs of layout and location, together with calculations to evidence how features have been adequately sized so as to not increase, and to reduce flood risk where possible. Maximum peak water levels have been modelled for a variety of r.p. events at crossings SW1, 2, 3, 5, 6. No info on 4 or 7!	1	**01/07/2020**	Further design details (where available) have been discussed in the FRA Addendum. Hydraulic models for all (modelled) crossings have been revised following additional topographic survey, including crossing SW7. Details of the revised modelling and results are provided in the Modelling Report Addendum.	All addressed, see separate comments for each crossing. For SW6 which does not have a separate comment, comments are as follows: The modelling shows minimal increase in flood levels in the river, with only 0.01m increase in the 1% with 35% climate change event. However upstream of the proposed culvert, in the floodplain on the left bank of the river, there is a small area of up to 0.4m increase in flood depths as shown on Figure C6.1. A comparison of figures A6.1 and B6.1 show that some of this land was not at risk of flooding before but is now at risk of flooding by up to 0.4m depth. However the area of increased flood risk is very localised, within agricultural land and the site boundary, and is nowhere near any property. Section 4.5.10 of the FRA Addendum states that the area of increase is very small, up to 0.3m wide, however our estimation of the dimensions of the area at risk are approximately 40m by 40m. Landowner agreement to this localised increase in flood risk should be obtained, or the culvert size should be increased to prevent this increase in flood risk. The level of the road is above the maximum extreme 0.1% cc flood levels so is safe as required.	No. Landowner agreement should be obtained for the area of increased flood depths, unless it is determined not to be necessary as within site boundary. Or if agreement is not obtained then the planning inspectorate should decide if this is acceptable.	For most crossings the area of change in flood depth is located solely within the red line boundary and therefore it is considered acceptable for the Project. For SW6 most of the area with increased flood depth is within the red line boundary. There is a small area just upstream of the red line boundary with a small increase in flood depth. However, there are no properties, access roads or tracks affected and as such the change in flood risk is considered to be not significant. Added clarification within the FRA Addendum and Modelling Report Addendum (where appropriate) to confirm that most changes are within the site boundary (order limits). SZC Co. is currently in talks with and will continue to engage with the landowner for the affected area, with the view to reaching an agreement for the increased flood depth.
2.2	**Sizewell Link Road Flood Risk Assessment**	**3.6.2**	Proposed road levels not provided for SW4.Although proposed not to change culvert, flood risk is still unknown.	The SW4 crossing was not modelled as the existing culvert will remain in place. The existing baseline flood risk is unknown as the watercourse is not currently modelled. The FRA also states that road levels will remain close to existing but not the same. Any increase in road level could create a further barrier to flood water which must be assessed.	Confirm road levels. Modelling may be required to evidence baseline and with scheme flood risk. This must be determined in consultation with Suffolk County Council as the river is an ordinary watercourse and the existing baseline flood risk is unknown.	1	**05/02/2020**	Further details on the existing road levels and justification to exclude this crossing from the modelling exercise have been provided in the FRA Addendum.	It has been confirmed that there will be no changes to culvert SW4 or the road in this location. It is now included in the modelling, which shows that the water stays in channel in all flood events in the location of SW4, and both upstream and downstream, so the road would not be at risk of flooding. The modelling also includes SW5 as they are on the same watercourse. The baseline modelling includes an existing 375mm farm crossing culvert, which is then replaced with the new portal culvert in the with scheme modelling. This increase in capacity means that the with-scheme modelling shows significant reduction in flood depths of up to 1.11m upstream of the SLR. Downstream of the SLR the flood depths are 0.01m lower than previously. So overall there is no increase in flood risk as a result of the scheme, and some betterment upstream of the SLR compared to the existing small farm culvert. Currently there is a small area of out-of-bank flooding downstream of the B1122, with depths of 0.3m. This is not altered with the proposed scheme. The road itself is also more than 3m higher than the extreme 0.1% with 65% cc flood level so will not be at risk of flooding in any scenarios.	Yes	N/A
2.3	**Sizewell Link Road Flood Risk Assessment & Model Report**	**3.6.3 of FRA & 2.1.9 of model report**	No flood risk assessment of proposed crossing at SW7. FRA does not show the road will be safe for its lifetime without increasing flood risk elsewhere which is contrary to paragraph 5.7.3 & 5.7.16 of National Policy Statement EN1 and paragraph 160 of the National Planning Policy Framework.	Flood risk at SW7 has not been assessed due to lack of information collected. This is not adequate justification for not assessing flood risk and fails to comply with national planning policy. The flood map for surface water shows a clear flow path is present and the new SLR will create a barrier to this and therefore could increase flood risk elsewhere. It is also possible that the road itself could be at risk of flooding. It has not be proven in principle that the design could work and be sized correctly. It is understood that some hydrology calculations were undertaken for this catchment but this has not be used in the FRA or model report.	Provide further investigation and assessment of flood risk at SW7. Explain why hydrological calculations have not been used to inform design i.e. crossing size. This must be agreed in discussion with Suffolk County Council as this is a surface water flow path/ordinary watercourse.	1	**05/02/2020**	Additional survey data of the watercourse and the existing culvert underneath the B1122 has been obtained and a model for SW7 has been developed for the baseline and with scheme scenarios based on the proposed design. Details on the modelling are discussed in the Modelling Report Addendum.	SW7 has now been surveyed and modelled, both for the baseline and with-scheme scenarios. The baseline modelling showed that the water ponded on the floodplain adjacent to the B1122, and weired over in high flows. The proposal is to extend the existing culvert under the B1122 to incorporate the SLR, and to include a spillway on the left hand bank to allow water to flow onto the floodplain, and so maintain the capacity of the culvert. A new box culvert will be installed under the SLR to maintain the floodplain flows in this location. The modelling shows that there will be an increase in flood depths upstream of the SLR and box culvert with an increased flood depth of 0.1m, however this is within the site boundary. No properties are impacted as the nearest are 300m away and the flood levels are not increased in this location. The SLR itself is 0.72m above the worst case extreme 0.1 (1 in 1000) AEP with 65% climate change so will remain dry in all flood events. The adjacent floodplain storage overspill area floods in all modelled events including the 20% (1 in 5 year) annual probability event, with 0.27m increase in depth of water compared to existing situation. In the design 1% with 35%cc event there is an increase of 0.05m depth on the floodplain compared to existing. The water will weir over the B1122 in the 1 in 20 year event, as is currently the case, however it will happen approximately 1.5 hours sooner in the with scheme scenario than happens currently, although the maximum flood depth on the B1122 road is only 0.01m higher. The highways authority should ensure that they are in agreement with this, and the landowner of the area of floodplain storage should also agree to the 0.27m deeper depths in the 5% event, and 0.05m deeper in the 1% with 35% cc design event. It also appears that Figure C7.1 is incorrect, as minimal flooding is shown on the floodplain in the baseline scenario for the 5% event in Figure A7.1 and there is extensive flooding of the floodplain in the with scheme scenario in Figure B7.1, but the plan showing the difference (Fig C7.1) does not show a large area of increased flood depth as would be expected from the large differences between the two maps.	Not quite. Figure C7.1 needs checking, and Highways and landowner agreement needs to be obtained for increased flood depths. Or planning inspectorate needs to agree to the increased flood depths and timing.	Figure C7.1 has been revised and submitted with the updated report. The change in flood depth is limited to the area within the red line boundary, upstream of the B1122, and therefore it is considered acceptable for the Project.
2.5	**Sizewell Link Road Flood Risk Assessment**	**3.6.6 & 3.6.7**	The final design for the crossings are unclear	The FRA states portal culvert have been used at the crossings. This is misleading as this has not been possible in all locations and contradicts the modelling report and model build (e.g. SW1 is now a T shaped concrete culvert with no portal culvert). Flood relief culverts have been used at some crossings (it is unclear which) and they are not shown on the plans provided or no plans have been provided at all.	Provide final designs for all crossings SW1 to SW7 with arrangement plans and cross sections for each.	1	**05/02/2020**	Further details of the design (where available) have been provided in the FRA Addendum.	All culverts are now portal culverts, except for the extension of an existing culvert at crossing SW7 where a circular pipe, to match the existing, and box culverts will be used. .	Yes	N/A
2.6	**Sizewell Link Road Flood Risk Assessment**	**3.6.6, 3.6.7 & 7.4.6**	Mammal ledges are proposed in the flood relief box culverts. River banks will be used in portal culverts. Full details not provided or information is unclear.	Reporting in FRA and model reports is contradictory. It is not clear when mammal passage will be provided in box culverts or via portal culverts.	Provide final designs for each crossing and show dry mammal passage is available. Drawings showing the height of the ledges should be provided compared to flood levels so we can be satisfied they will remain dry and accessible in a flood.	1	**05/02/2020**	Further details of the design (where available) have been provided in the FRA Addendum.	At crossing SW1, where the portal culvert crossing of the new diverted channel, will cut into the banks, a raised mammal ledge will be provided on the sides of the crossing. The flood levels are not marked on the cross-section of the portal culvert for SW1 so it is not clear whether the mammal ledges are above the flood levels as required. Also not every crossing includes a cross-section showing the water levels in the portal culvert, or the channel nearby, so it is not clear that the banks remain dry enabling safe mammal passage, or whether the flood levels raise up above bank height and therefore preclude safe mammal passage. This is particularly true for SW6 and SW7.	No. Provide cross-section showing mammal ledges above flood levels for SW1 and river banks above flood levels for SW6 and SW7.	For SW1, a simplified representation of the portal culvert was adopted within the model. Mammal ledges are set above the maximum flood levels (including the most extreme event) and therefore would not affect the results or be affected by flooding. Further clarifications and additional plates (for SW1 and SW6) have been added to the FRA Addendum and Modelling Report Addendum. For SW7, the road crossing is required to pass over an existing 450mm pipe. As the crossing is located at the proposed tie-in between the Sizewell link road and the B1122, there is insufficient (vertical) space to fit a portal culvert, as for the other crossings. Therefore, the design assumes an extension of the existing pipe to ensure current flow regimes are maintained. The existing culvert would be extended by approximately 36m with no change to its diameter. The existing pipe does not contain mammal ledges. Figures C7.13 - C7.16 show that the river banks upstream and downstream of the crossing are located above flood levels.
2.9	**Sizewell Link Road Flood Risk Assessment**	**4.2 & 4.3, Table 4.1, 7.6.1 & 9.1.8**	FRA states & concludes that the SLR site is in Flood Zone 1 which has not been proven in the FRA. The watercourses that will be crossed by the SLR have been modelled, although Flood Zone mapping has not been provided. There is a clear indication of flood risk near to crossings as this information has been provided with cross sections. However, a map showing the extents of Flood Zones 3a, 3b and 2, based upon the hydraulic model outputs has not been provided.	The baseline hydraulic model should be incorporated into the known flood risk areas, in order to provide an up to date map showing the extents of flood zones 3a, 3b and 2. The flood levels on the development site should be determined and compared to a topographic site survey to determine the location, flood depths and extent of flooding across the site.	Update FRA and model report text to state correct flood zones. This should be evidenced by modelled flood extents and levels.	1	**05/02/2020**	Initial modelling was carried out with limited information, hence the decision not to produce flood extents at DCO stage. For the majority of the crossings the original modelling results indicated in-channel flow for the 1% annual probability (1 in 100 year) event with climate change and therefore a flood extent map would not aid the assessment (line on a map). The aim of the exercise is to determine the impact of the development on flood risk to the development itself and off-site receptors and not to produce flood risk mapping in the area. This has been reviewed in line with the updated model results and, where flow is out of bank, flood extents were produced. For other crossings (where no out of bank water would be visible on a map) cross-section plots were produced to show flood levels within the channel.	The figures now include mapped flood zones for the present situation, as required. Also included is plans showing the proposed with-scheme flooding outlines and depths and the differences between the two.	Yes	N/A
3	**Sizewell Link Road Flood Risk Assessment**	**4.3.3, Table 4.1, 5.1.2**	FRA states SLR design at Fordley Road will reduce risks of flooding as the road will be moved outside of the currently mapped Flood Zone 3 which is based on JFLOW modelling. Level of road compared with maximum modelled flood extents demonstrates road surface is above flood level. However, the FRA should assess whether the footprint of the SLR is at risk of flooding? This could indication the site would be at risk of flooding during the construction phase.	The Flood Zone maps in this area are formed of national generalised modelling, which was used in 2004 to create fluvial floodplain maps on a national scale, known as JFLOW. This modelling is not a detailed local assessment, it is used to give an indication of areas at risk from flooding. JFLOW outputs are not suitable for detailed decision making. In these circumstances an FRA will need to undertake a modelling exercise in order to derive flood levels and extents (flood zones), both with and without allowances for climate change in order to inform the design of the site. The SLR will still cross the watercourse. The claim that flood risk has been reduced must be evidenced.	Update FRA and model report text and ensure all crossing assessments are based on detailed modelling flood extents not JFLOW extents/flood zones. Remove claim that new SLR route will reduce risk of flooding or qualify with detailed modelling.	1	**05/02/2020**	See comment above. Text has been revised to remove the reference to reduction in flood risk.	Agreed.	Yes	N/A
3.1	**Sizewell Link Road Flood Risk Assessment**	**4.3.4**	No information is provided on the construction phase, methodology or construction compounds required.	We need to understand how the crossings will be constructed and how this will impact on flood risk. Compounds should not be located in areas of flood risk. It is not explained how the safety of people on site will be managed or if safe access and egress is available.	Information provided to date is limited to info related to installing culverts before embankments. Please provide construction phasing, methodology and compound locations and assess the impact on flood risk. Explain how the safety of people on site will be managed.	2	**05/02/2020**	Further information on flood risk during the construction phase has been included (where available) in the FRA Addendum and the Flood Risk Emergency Plan (FREP) in Appendix D of the FRA Addendum.	The Addendum confirms that the construction compounds will be situated in Flood Zone 1, as modelled. It also states that the installation of the portal culverts will not require any construction works within the watercourse. It also confirms that if temporary bailey bridges are required then these would have soffit levels above the 1 in 100 year event as required. The watercourse diversion will be constructed from the downstream end first, and only once complete will it be joined to the existing watercourse. The extension of culvert 7 will involve the temporary blocking of the watercourse and the overpumping of any flows, although this should not be an issue as the channel is normally dry. If there was significant flooding the works would be suspended, but even if the workers were not able to evacuate the site in time, the depths of flooding are low enough that the construction workers would not be at risk. A FREP has been submitted to manage the risk during construction. There are only small sections of floodplain at risk of flooding to 0.4m deep, with a hazard rating of Danger for Some. However the watercourses themselves will be full of water. The FREP proposes evacuating personnel on receipt of Severe Flood Warnings or Red Met Office Warnings. However the watercourses are not covered by the Environment Agency Flood Warning service, and even if they were it may be necessary to stop works before then, as Severe Flood Warnings are often not issued until flooding has started and are only issued for major flood events. Water coming out of rural watercourses onto the floodplain may only be issued with a Flood Alert. Similarly it may be necessary to respond on a yellow or amber Met Office Warning, as small watercourses may respond in such events. However due to the localised nature of the flooding, and the relatively slow expected rate of rise, it would be expected that any construction workers would quickly be able to move to an area of safety before flooding in the watercourse or on the floodplain became hazardous. A FRAP will be applied for any permanent or temporary works in the main rivers or within 8m, and will also address the safety of the construction workers.	Yes. Although we recommend the FREP is amended to recommend works in-channel stop on receipt of a Flood Alert, and not just a Severe Flood Warning. Localised flooding on floodplains may also occur with a yellow or amber Met Office Warning. This can be addressed with the FRAP.	Agreed, the FREP will be reviewed and updated as part of the FRAP process i.e. post-consent.
3.3	**Sizewell Link Road Flood Risk Assessment**	**5.1.3**	FRA concludes the proposed development takes the sequential approach based on existing flood zones which do not map the flood risk from the watercourses in question.	The crossings and therefore site boundary will fall into Flood Zones as the road crosses watercourses. This must inform the sequential test.	Provide modelled flood extents to determine the flood risk posed to the site. Define flood zones using detailed modelling to inform the sequential test. Update sequential approach assessment. Justify why the SLR must cross multiple watercourses and flood zones. Are other alternative sites available?	2	**05/02/2020**	The Sequential Test has been updated. Flood extent maps have been provided, as appropriate, following completion of the updated modelling and provided in the FRA Addendum and Modelling Report Addendum.	The modelling has been used to derive flood extent and depth maps, and consequently the flood zones have been mapped. It is now acknowledged that the crossings will lie within Flood Zones 2 and 3, as necessitated by the nature of crossing watercourses. Details of the consideration of whether the Sequential Test has been passed is also included. The FRA Addendum states that the route was chosen to minimise the number of watercourse crossings, and to particularly avoid crossing wider floodplain areas, so it appears that the Sequential Approach was applied to the location of the road in relation to the flood zones and number of watercourse crossings.	Yes	N/A

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Date Raised	SZC Co.'s Response	EA Comments April 2021	Issue Resolved?	SZC Co.'s Response June 2021
3.4	**Sizewell Link Road Flood Risk Assessment**	**5.2.5**	FRA states that the Exception test has been passed because modelling and an FRA have been produced.	Production of an FRA and or modelling will not in itself result in passing the Exception Test. The FRA must evidence why the Exception test can be passed as stated in paragraph 5.7.16 of National Policy Statement EN1: *'All three elements of the test will have to be passed for development to be consented. For the Exception Test to be passed:* *• it must be demonstrated that the project provides wider sustainability benefits to the community116 that outweigh flood risk;* *• the project should be on developable, previously developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously developed land subject to any exceptions set out in the technology-specific NPSs; and* *• a FRA must demonstrate that the project will be safe, without increasing flood risk elsewhere subject to the exception below and, where possible, will reduce flood risk overall.'*	Update text and evidence in the FRA why the Exception test can be passed. This should draw on the evidence base of the FRA, such as updated flood zones based upon hydraulic modelling, the footprint of the SLR, and design and layout. Adequate consideration to demonstrating the safety, without increasing flood risk elsewhere should be provided.	2	**05/02/2020**	Further discussion and justification on the Exception Test has been provided in the FRA Addendum.	The FRA Addendum now includes discussion on why it is considered to pass the Exception Test, this includes details on the sustainability benefits of the proposed road location, and also explains how the design of the crossings ensures that the road itself is safe from flooding, but also that there is no unacceptable increase in flood risk elsewhere, as the only small increases in flood risk are very localised and do not affect people or property.	Yes	N/A
4.1	**Sizewell Link Road Flood Risk Assessment & model report**	**7.4.3 & 7.4.4 in FRA & 6.1.3 in model report**	At SW1 the main river will be diverted. Flood mapping has not been provided to show the change in flood extent and channel location.	Given it is difficult to compare the in channel flood levels as the alignment of the main river is changing it would be more useful to provide flood outlines to show where the flood zones will now be and demonstrate that flood risk has not been increased elsewhere.	Provide modelled flood extents and show changes in flood risk as a result of the proposals. Demonstrate there is not an unacceptable increase in flood risk elsewhere. Legislative implications of changing main river alignment considered?	1	**05/02/2020**	Flood maps have been derived following the model updates (post topo survey) and included, where appropriate, in the FRA Addendum and Modelling Report Addendum.	The new flood extents with the realigned watercourse have been provided in Plate 4.6, and a map showing the difference in flood extent depths compared to existing is shown in Plate 4.7. The flood depths are also presented in table form in Table 4.1. This shows that the maximum increase in flood depth is 0.01m, and that no properties are at risk. This can be considered to be insignificant and acceptable. The modelling also includes SW2 as the watercourses are joined. This also shows a maximum of 0.01m increase in flood depths in Table 4.2, and Plate 4.7, and can also be considered to be acceptable. The new channel will contain all the modelled flood events including the 0.1% event including climate change.	Yes	N/A
4.2	**Sizewell Link Road Flood Risk Assessment**	**7.4.6**	Flood relief culverts are proposed but exact locations and the level at which they are set has not been provided.	Flood relief culverts are required which suggests out of bank flow is possible. FRA does not show where the flood relief culverts will be located.	Provide plans and cross sections of each crossing. Provide the level & flood event return period when flood relief culverts will be required.	1	**05/02/2020**	Further design details (where available) have been discussed in the FRA Addendum.	A flood relief culvert is only required for SW7, and detailed designs have been provided and included in the modelling. The floodplain floods in all modelled events including the 20% (1 in 5 year) annual probability event, with 0.27m increase in depth of water compared to existing. In the design 1% with 35%cc there is an increase of 0.05m depth on the floodplain compared to existing. The water will weir over the B1122 in the 1 in 20 year event, as is currently the case, however it will happen approximately 1.5 hours sooner in the with scheme scenario than happens currently, although the maximum flood depth on the road is only 0.01m higher. The highways authority should ensure that they are in agreement with this, and the landowner should agree to the increased flood depths in the area of flood storage.	Not yet. Highways and landowner agreement needs to be obtained for area of increased flood depths, and sooner flooding. Or planning inspector agreement that this is acceptable.	The change in flood depth is limited to the area within the red line boundary, upstream of the B1122, and therefore it is considered acceptable for the Project. Added clarification to the FRA Addendum and Modelling Report Addendum (where appropriate) to confirm that most changes are within the site boundary (order limits) and to characterise the earlier flood onset.
4.5	**Sizewell Link Road Flood Risk Assessment**	**Plate 2.7**	The proposed layout at SW3 is provided in plate 2.7, although this is not clear and appears unfinished.	It is not clear from the FRA or model report what the final design for the SW3 crossings are. It is understood an existing culvert will be extended with a portal culvert under Hawthorn Road and a flood relief culvert will also be installed. The description of the SW3 design in 2.2.21 does not appear to be consistent with the drawing in Plate 2.7	Provide clear plans and drawings for SW3 showing the existing and proposed arrangement. The information provided so far is not clear. Update the text to provide clarity and justify the final design in consultation with Suffolk County Council as it is an ordinary watercourse.	2	**05/02/2020**	Further design details (where available) have been discussed in the FRA Addendum.	The flood relief culvert has been removed as it is not considered necessary. The modelling shows that Hawthorn Road is already at risk of flooding to 0.5m deep in the 1% with 35%cc event downstream of Hawthorn Cottages. The cottages are not at risk of flooding as the properties are situated 0.18m above the maximum 0.1% with 65% climate change flood level. With the proposed culvert modelled, this results in increased flood depths, by up to 0.22m increase in the 1% (1 in 100) with 35% climate change. The resulting area of increased flood depths is mostly limited to the strip of land between the existing Hawthorn Road and the connection road to the Sizewell link road, for a distance of 40m upstream, as shown on Plate 4.12. The land owner should be contacted and agreement sought for the increase in flood depths. 4.3.16 states that the increased flood depth area is within the site boundary, so perhaps this won't be necessary. However as it is a small area of increase, then it is hoped that this would be acceptable. This increase does not have any impact on Hawthorn Cottages, as the modelling shows no increases in flood depths in the river adjacent to the properties in all flood events. The FRA Addendum presents the results of the range of climate change flood events for the 1:20, 1:100 and 1:1000 scenarios, ranging from 0.08m increase for the 1:5 year cc event, to 0.29m for the 1:1000 cc event, all just upstream of the proposed culvert. However, it would be good to see the results for the present day scenarios, just to check that they are no worse in terms of increases in flood depths. In the extreme 0.1% (1 in 1000) flood event with 35 or 65% climate change, the maximum increase of flood depths is experienced at 0.29m. However this is considered acceptable as it is an extreme event.	Mostly - it would be good to confirm if landowner agreement needed for area of increased flood depths, or if not necessary as in site boundary. Present day flood event increases should also be provided.	The change in flood depth is limited to the area within the red line boundary and therefore it is considered acceptable for the Project. Although the SLR FRA Addendum only presents the worst-case scenarios (i.e. including climate change), Table 4.3 of the SLR Modelling Report Addendum provides the flood depth values for both present day and future scenarios for comparison. In addition, figures C3.1, C3.4, C3.7 and C3.10 illustrate the change in flood depths for the present day for the 1 in 5 year, 1 in 20 year, 1 in 100 year and 1 in 1,000 year events. Added clarification to the FRA Addendum and Modelling Report Addendum (where appropriate) to confirm that changes are within the site boundary (order limits).
4.7	**Sizewell Link Road Flood Risk Assessment**	**7.6.5 & Table 7.5**	FRA assumes proposed road will not be at risk of flooding from surface water due to the drainage design which has not been provided or agreed with Suffolk County Council or the Environment Agency.	The aim is to infiltrate surface water rather than drain it to watercourses. Infiltration testing has not been undertaken. It is possible alternative drainage will be required. The proposed drainage designs are required in order for the Environment Agency & Suffolk County Council to understand the implications on flood risk and main rivers. A Flood Risk Activity Permit (FRAP) is likely to be required if surface water will be discharged to main rivers via a new outfall structure. Consideration should be given to the location of this feature as it must not exacerbate flood risk downstream.	Ensure the impact on main river is considered when the infiltration testing results are received and the drainage strategy is progressed. The Environment Agency & Suffolk County Council should be consulted accordingly.	2	**05/02/2020**	Further details on surface water drainage design and flood risk are provided, where available, in the FRA Addendum.	The modelling shows that the surface water basins will be located in Flood Zone 1. As infiltration testing has shown that the use of infiltration as a means of drainage is not feasible, they will be attenuation basins, and will discharge into the watercourses at a maximum rate of $0.005m^3/s$, so the water courses have been modelled with an inflow of $0.001m^3/s$ from the two basins, upstream of the culvert, to ensure they are sized to take these flows. Section 5.1.26 states that there is a section of road from the A12 roundabout to the East Suffolk Railway line where there will be attenuation basins provided to receive the highway runoff from the roundabout's underground drains and swales. However it states that there will not be a positive discharge from this basin to a watercourse, instead the water will be gradually removed by natural processes including 'take up by vegetation, evaporation and limited infiltration'. The basin will be sized to contain the 1 in 100 year return period event with 40% climate change, plus additional storage to contain the 1 in 10 year rainfall event, should a second rainfall event be received before the basin has emptied. This is concerning, as there is a real risk that the basin may not drain and will form a pond with standing water all the time, and so will not be able to receive subsequent rainfall events after a while. This is not an option provided in SUDS guidance; there should always be a positive drainage via either infiltration, or to watercourse or sewer. At the request of the LLFA a back-up option is being considered which includes an outfall to a local watercourse, but the FRA Addendum states that this may be impractical, or alternatively the red line boundary has been increased to allow room for a pumping station to be installed to pump the water to discharge to the Middleton watercourse. We would prefer one of these options to be pursued, as long as the discharge rates are restricted so as not to worsen flood risk on the receiving watercourses. The preferred option should be designed in detail at this stage, otherwise there is not a viable drainage scheme. This is in the remit of the LLFA.	No. Concerns over surface water drainage of one of the basins, with no positive outfall proposed in detail. Although in remit of LLFA.	The drainage design team continue to engage with the LLFA (Suffolk County Council) as part of the ongoing design for the drainage in this location. Any changes in the design will be reflected in the next iteration of the Sizewell Link Road drainage design strategy, due to be issued into Examination. This document would take precedence over the text contained within the FRA Addendum.
5	**Sizewell Link Road Flood Risk Assessment**	**Table 7.5**	Surface water drainage features must not be located in areas that are already at risk of fluvial flooding as they could already be flooded with fluvial water and will not function as designed.	This table suggests that the infiltration ponds previously set aside for fluvial water could be used for surface water. Without modelled flood outlines it is not possible to determine if these ponds are at risk of fluvial flooding. Swales also still appear to be located in areas that could be in fluvial flood zone.	FRA states they will not be located within flood zones. Please provide mapped locations in relation to modelled flood extents. Modelled flood outlines for the watercourses should be provide to demonstrate that the surface water infiltration ponds and swales will not be at risk in a fluvial flood and will function as designed.	1	**05/02/2020**	Further details on surface water drainage design (where available) and flood risk have been provided in the FRA Addendum.	The modelling shows that the surface water basins will be located in Flood Zone 1. They will be attenuation basins, and will discharge at a maximum rate of $0.005m^3/s$, so the water courses have been modelled with an inflow of $0.001m^3/s$ from the two basins, upstream of the culvert, to ensure they are sized to take these flows. As there are limited flood zones adjacent to the watercourses, the swales should be able to be located outside the flood zones.	Yes.	N/A
5.3	**Sizewell Link Road Flood Risk Assessment**	**7.10.3**	FRA states that warnings from the Met Office should be considered by site management during construction but does not discuss what people will do in the event of a flood.	Fluvial flood warnings from the Environment Agency's Flood Warning Service are not available for the SLR site. It is possible that fluvial flooding could occur without warning so it must be clear to site users during construction and road users what they should do in a flood. This should be set out in a Flood Warning and Evacuation Plan or Flood Response Plan. There is a flood alert area for the Rivers Minsmere and Yox, from Peasenhall to Middleton.	Update the FRA and provide flood warning and evacuation procedures for the permanent road and during construction. Evidence should be provided to demonstrate that and adequate FREP shall be in place throughout construction and operation phases.	2	**05/02/2020**	Further details have been provided, as appropriate, for the relevant crossings within the FREP (Appendix D of the FRA Addendum).	The FREP proposes evacuating personnel on receipt of Severe Flood Warnings or Red Met Office Warnings. However the watercourses are not covered by the Environment Agency Flood Warning service, and even if they were it may be necessary to stop works before then, as Severe Flood Warnings are often not issued until flooding has started and are only issued for major flood events. Water coming out of rural watercourses onto the floodplain may only be issued with a Flood Alert. Similarly it may be necessary to respond on a yellow or amber Met Office Warning, as small watercourses may respond in such events. However due to the localised nature of the flooding, and the relatively slow expected rate of rise, it would be expected that any construction workers would quickly be able to move to an area of safety before flooding in the watercourse or on the floodplain became hazardous. A FRAP will be applied for any permanent or temporary works in the main rivers or within 8m, and will also address the safety of the construction workers.	Yes. Although we recommend the FREP is amended to recommend works in-channel stop on receipt of a Flood Alert, and not just a Severe Flood Warning. Localised flooding on floodplains may also occur with a yellow or amber Met Office Warning. This can be addressed with the FRAP.	Agreed, the FREP will be reviewed and updated as part of the FRAP process i.e. post-consent.
5.4	**Sizewell Link Road Flood Risk Assessment**	**Plate 9.2 - 9.7**	Plates do not show the latest design for the crossings or sufficient detail.	No design layout drawings have been provided. All just initial sketches with dimensions and no more. No explanation over requirements, design, capacities or location of relief basins yet.	Provide updated final design arrangement plans and cross sectional drawings for SW1 to SW7.	1	**05/02/2020**	Further design details (where available) have been discussed in the Modelling Report Addendum.	Agreed. Design layout drawings are provided for each crossing.	Yes	N/A
5.6	**Sizewell Link Road Fluvial Modelling Report**	**2.1.4, 2.1.10**	The intention is to provide 'watercourse relief basins, if required' upstream of crossings SW1, SW2, SW3, SW5, SW6 and SW7. It is not clear what these will consist of, where they will be located, how they will function, nor how they may be deemed to be 'required'.	2.1.4 states '"No design details were available during this assessment and therefore these have not been included in the hydraulic modelling" 2.1.10 states that "the modelling could not be carried out to a sufficient quality. Further assessment and appropriate modelling would be undertaken at the detailed design stage of the Sizewell C project when further details and survey information would be available.	Information and calculations should be submitted to demonstrate the current watercourse and floodplain flow and capacity, and how the proposed crossings and associated flood relief culverts and watercourse relief basis will act to ensure that the flow and capacity is maintained post-development, and to illustrate that off-site flood risk will not be increased.	1	**01/07/2020**	Further design details (where available) have been discussed in the Modelling Report Addendum.	Watercourse relief basins are no longer required.	Yes.	N/A
5.7	**Sizewell Link Road Fluvial Modelling Report**	**2.1.13 snf Plates 2.8 to 2.12**	Report and proposed crossing layouts imply basic portal culverts have been used at all the crossings which is not correct. There has been little evidence that the knowledge of flood risk has informed and evidenced the design of the culverts and associated flood relief structures and mammal ledges.	2.1.1.3 still refers to portal culverts as though they will be implemented at all 5 modelled crossings, including SW1, which we know to be proposed as a Tshaped culvert. This is confusing. Has the crossing at SW1 been modelled with a Tshaped culvert, as proposed? The plates also present the layout at each crossing as being a basic portal culvert, with no additional flood relief box culverts. We appreciate that omitting the flood relief box culverts from the modelling would yield a more conservative water elevation, although 3.4.2 implies that these were incorporated into the model. However, it would be helpful to provide cross sections to indicate the modelled maximum water levels with the portal culverts, flood relief culverts and mammal ledges etc in place.	Update report and provide final designs for all of the crossings to avoid confusion between design iterations and reports. Clarify what was included in the with scheme model. Provide a section in the report to illustrate the maximum water levels as per the model outputs, in relation to the layout design of each crossing, including portal and flood relief culverts, with mammal ledges etc.	2	**01/07/2020**	Further details of the design and more detailed discussion of the results have been included in the FRA Addendum and the Modelling Report Addendum.	Agreed. Each crossing includes cross-sections to either show that the banks remain dry for mammal passage, or to show the inclusion of mammal ledges if required.	Yes.	N/A
5.9	**Sizewell Link Road Fluvial Modelling Report**	**Plates 2.4 and 2.7**	Plate 2.7 does not show where the flood relief culverts for crossing SW3 will be located. It is not clear how the locations of the proposed flood relief culverts relate to the modelled floodplain/outlines.	Plate 2.4 shows SW1 box culvert runs adjacent to portal culvert. A box culvert is shown on Plate 2.7 for SW3, but this is not clear. There is no mention of a portal culvert. Is this plan incomplete?	Provide updated final design arrangement plans and cross sectional drawings for SW1 to SW7.	2	**05/02/2020**	Further design details (where available) have been discussed in the Modelling Report Addendum.	Flood relief culvert for SW3 has been removed. SW1 no longer has a box culvert, instead the watercourse is realigned, with mammal passage provided in the portal culvert which will need to be cut into the banks.	Yes.	N/A
6	**Sizewell Link Road Fluvial Modelling Report**	**Plate 2.4**	The surface water infiltration basin to the east of Fordley Road at SW1 is located on higher ground. As the surface water drainage design is not available it is difficult to understand how the road will drain to the infiltration ponds.	The field to the east of Fordley road where the infiltration basin is located is higher ground. Surface water is known to run off and drain to the low point at Fordley Road. The FRA should consider how to improve this in the first instance and must not increase flood risk as a result of the development.	Provide information on surface water drainage to Suffolk County Council. Evidence that flood risk will not be increased and where possible it has been reduced overall in line with paragraph 5.7.3 of National Policy Statement EN1 and paragraph 160 of the National Planning Policy Framework.	2	**05/02/2020**	Further details on surface water drainage design (where available) and flood risk have been provided in the FRA Addendum.	This is not specifically mentioned in the FRA Addendum. The height of the land in the location of the proposed basin varies from 12mAOD to 18mAOD, so it is unclear how the road will be able to drain to the attenuation basin here, since the road will be at a high of 13.5mAOD as it goes over the river. We assume that the attenuation basin will be cut into the ground to provide the required storage.	Not specifically addressed in Addendum. Issue for LLFA.	The next iteration of the Sizewell Link Road drainage design strategy is due to be issued into Examination. This document would take precedence over the text contained within the FRA Addendum.
6.1	**Sizewell Link Road Fluvial Modelling Report**	**Plate 2.5**	The proposed cross section of the new diversion channel at SW1 is substantially larger than the current watercourse.	The cross section of the existing watercourse is understood to be approximately $1.5m^2$ this drawing shows the top of the channel to be 9.4m wide which is much larger. The FRA also does not explain how the channel will be constructed. The new channel should be as natural as possible.	Please explain why the cross section shown has been chosen and why it does not replicate the existing channel. Provide cross sectional survey obtained to show existing channel dimensions to provide a comparison to the proposed design.	1	**05/02/2020**	Further details of the design of the re-aligned channel have been provided in the Modelling Report Addendum and the FRA Addendum.	The modelling cross sections show that the existing channel has dimensions of 5.5m top width and 1.5m deep, with very narrow bed, and an approximate cross-sectional area of $4m^2$. The proposed channel has a bed width of 1m, top width of 10m, height of 1.5m and cross-sectional area of approximately $10m^2$, so more than double the existing channel area. It appears that the proposed channel is trapezoidal. From a biodiversity perspective we would rather see a stepped marginal plant ledge on at least one side of the watercourse, on the lengths of watercourse either side of the crossing, in order to ensure that there is a vegetated area in the watercourse. The proposed mammal ledge must be raised above the 1% flood level, but it is not clear whether this is the case, so this should be clarified by showing the flood extents on the portal culvert cross section.	Not yet. Realigned channel should be designed with a marginal stepped ledge, and cross sections of portal culvert should be provided.	A cross-section of the portal culvert at crossing 1 has been provided in Plate 4.2 of the SLR FRA Addendum. Clarification on the levels within the portal culvert in the model have been added to the FRA Addendum and the Modelling Report Addendum. The design has considered current guidance on the required slope for a grassed embankment i.e. 1 in 3. A change to incorporate a stepped ledge can be considered at the detailed design stage, however it would be designed such that it would maintain conveyance capacity of the channel and therefore it would not have an impact on the existing conclusions set out within FRA Addendum or the accompanying Modelling Report Addendum.
6.2	**Sizewell Link Road Fluvial Modelling Report**	**Plate 2.6**	SW1 crossing is now a T shaped concrete culvert. Material will be added to the bed and banks to naturalise the channel.	It is assumed that the cross sectional area shown in plate 2.6 and the model includes any material required to naturalise the culvert. This material could reduce capacity and impact on model results so must be included. It is not explained how or what sort of material will be used to create a natural bed and banks.	Confirm material will not reduce the capacity of the culvert and if it will this must be reflected in the modelling. Provide details on the material to be used to naturalise the bed and banks so we can determine it is suitable.	1	**05/02/2020**	Further details and clarification on the design and capacity of the culvert have been included in the Modelling Report Addendum.	T-Shaped culvert has been replaced with a portal culvert.	Yes	N/A

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Date Raised	SZC Co.'s Response	EA Comments April 2021	Issue Resolved?	SZC Co.'s Response June 2021
6.5	**Sizewell Link Road Fluvial Modelling Report**	3.4.2	Section details features included in the with scheme model build but it does not include the embankment of the SLR itself.		Explain why the embankment for the road has not been included in the model.	1	**05/02/2020**	Modelling has been revised for all crossings based on additional survey information. Where applicable, the main road embankment was included (within extended cross-sections or spill units) to appropriately represent constriction within the floodplain. Further details are provided in the Modelling Report Addendum.	Agreed.	Yes	N/A
7	**Sizewell Link Road Fluvial Modelling Report**	**Table 6.1, 6.2.5 and 6.2.6**	The results in table 6.1 differ to those shown in Table 7.2 in the FRA.	It is unclear why the results differ between reports. The FRA and its reporting must also interpret any model results. A few minor differences in the difference between baseline and with scheme. Should be consistent as modelling report should inform FRA.	Please explain the difference in results and which are the final correct results to refer to. Please explain results provided in the tables and what this means for the flooding mechanisms at the crossings. With ref to 6.2.5 and 6.2.6, please confirm whether the Fordley Road will experience increased flooding as a result of the proposed scheme.	2	**01/07/2020**	Results have been revised following updated to the hydraulic models. Updated tables are included in the Modelling Report Addendum.	Agreed. Figures A1.8, B1.8 and C1.8 show that Fordley Road will not experience any increase in flood depths or extents as a result of the scheme in the 1% with 35%cc event. In the 1 in 100 year flood figure C1.7 shows that there would be up to 0.1m increase in flood depths on Fordley Road downstream of the SLR, for a tiny section of no more than 4m long, and up to 0.03m increase for a larger section of approximately 60m length of road, which can probably be considered insignificant. Although the highways authority/local council/landowner should probably agree to this.	Not quite. Slight increase in flood depths on the road should possibly require landowner agreement, or planning inspectorate agreement.	The change in flood depth is limited to the area within the red line boundary and therefore it is considered acceptable for the Project. Added clarification within the FRA Addendum and Modelling Report Addendum (where appropriate) to confirm that changes are within the site boundary (order limits).
1.1	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report/Hydraulic model**	**2.1.8**	Crossing SW7 is not modelled due to lack of data available.	We can't approve this without understanding the effects of this proposed crossing	Once survey is obtained of the existing SW7 opening, baseline and with proposed crossing scenarios should be simulated and reported in order than flood risk impacts can be understood	1	**14/09/2020**	Survey data of the watercourse and the existing culvert underneath the B1122 has been obtained and the model has been developed for the baseline and with scheme based on the proposed design. Further details are provided in the Modelling Report Addendum.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.2	**Hydraulic model**	**Hydraulic Model**	Use of open channel sections to represent portal culverts	Open channel sections have been used to represent crossings (portal culverts). At the time the modelling was undertaken Asymmetrical Conduit units were not available in FMP (introduced in Flood Modeller V4.5), however, a test at SW1 shows that adding culvert inlet and outlet units and asymmetrical conduit units does effect upstream water levels locally	As it looks like some amendments/additions to the model may be required (for example the addition of SW7 and amendments to some widths described below) it would be sensible to consider asymmetrical conduit units or at the very least a test to demonstrate that the losses are adequately represented using open channel sections	2	**14/09/2020**	Noted, losses should be adequately represented in the model. Choice of open channel sections was driven by the fact that portal culverts do not impact existing channel (apart from SW1 where the watercourse would be diverted) and therefore would not introduce any additional losses until water goes out of bank. This has been taken into consideration in the updated models (following additional survey) to ensure that the losses are appropriately accounted for.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.3	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report.pdf**	**Plate 2.10/Hydraulic model**	Discordance between what is shown in Plate 2.10 and what is represented in the hydraulic model at crossing SW3	Proposed revised layout at crossing SW3 long sections do not align with the dimensions shown in the model. Particularly the bank levels. For example Plate 2.1 suggests a bank level through the culvert of 9.4mAOD but inspection of section SW3_C2us reveals this (9.4m) looks more like portal culvert soffit level. Similarly for the Hawthorn Rd Crossing culvert the bank levels shown in Plate 2.10 don't seem to tie in with those shown in cross section SW3_C1us.	Correct the model or plate in the report depending on which is incorrect	1	**14/09/2020**	The model has been revised with additional survey data and the latest / improved (where required) design information. Updated results and further details on the modelling are provided in the Modelling Report Addendum.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.4	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report.pdf**	**Plate 2.11/Hydraulic model**	Discordance between what is shown in Plate 2.11 and what is represented in the hydraulic model at crossing SW5	The proposed layout for SW5 is at odds with what is represented in the model. Plate 2.11 shows a 5400mm wide 1200 high culvert yet cross section SW005B shows a width of 6.4 metres. In addition the bank heights do not align, Plate 2.11 shows 12.2mAOD but the model suggests bank levels are lower than that	Correct the model or plate in the report depending on which is incorrect	1	**14/09/2020**	The model has been revised with additional survey data and the latest / improved (where required) design information. Updated results and further details on the modelling are provided in the Modelling Report Addendum.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.5	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report.pdf**	**Plate 2.12/Hydraulic model**	Width at SW6 seems to be larger than the 5400mm shown on Plate 2.12	The width in the model at SW6 is larger than 5400mm. Cross section SW006B shows a width of 5.7m	Correct the modelled width at SW6	1	**14/09/2020**	The model has been revised with additional survey data and the latest / improved (where required) design information. Updated results and further details on the modelling are provided in the Modelling Report Addendum.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.6	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report.pdf**	**3.2.10**	FEH statistical approach not considered as suggested at the last review	In terms of the hydrological assessment, flows from ReFH1 and ReFH2 have been considered. The addition of ReFH1 as a check since the last review is welcome but it would be also sensible to consider estimates from the statistical approach as identified at the last review	Estimates from the statistical approach should also be presented as a check/comparison as raised previously	2	**14/09/2020**	The FEH statistical method has been undertaken to derive and compare peak flows for each catchment. It has not changed the choice of the adopted approach (ReFH2) for the assessment. Details on the FEH statistical method results and comparison with ReFH2 have been provided in the Modelling Report Addendum.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1.7	**SZC_Bk5_5.6_AppxA_Sizewell_Link_Road_Modelling_Report.pdf**	**Model results general comment**	No mapping of baseline and proposed scenario flood risk hence it is difficult to fully understand any third party impacts, particularly at SW1 and SW3 where afflux is greater	Particularly important to map flood risk, for SW1 for example, as this incorporates a diversion channel and SW3 because of the afflux. It is appreciated that a 1d modelling approach has been adopted, however, it is still possible to generate flood extents using a 1d model	Produce flood extents for the baseline and proposed scenarios so flood risk can be properly evaluated	1	**14/09/2020**	Initial modelling was carried out with limited information, hence the decision not to produce flood extents at DCO stage. For the majority of the crossings the original modelling results indicated in-channel flow for the 1% annual probability (1 in 100 year) event with climate change and therefore a flood extent map would not aid the assessment (line on a map). The aim of the exercise is to determine the impact of the development on flood risk to the development itself and off-site receptors and not to produce flood risk mapping in the area. This has been reviewed in line with the updated model results and, where flow is out of bank, flood extents were produced. For other crossings (where no out of bank water would be visible on a map) cross-section plots were produced to show flood levels within the channel.	N/A	N/A	This comment was not included within the review comments received from the Environment Agency dated 30th April 2021. It is considered that, as the assessment has progressed, this comment is no longer of relevance and has been superseded by the updated comments received in April 2021.
1	**Hydraulic model for Crossing 1 & 2**	**N/A**	Discrepancy between culvert dimensions in the hydraulic model at crossing 1 and the reported dimensions as shown in Plate 2.4 of the Addendum modelling report	There is a discrepancy between the dimensions for Crossing 1 as shown in Plate 2.4, page 8 of the Addendum modelling report and those in the hydraulic model (SW1-CulvUS). The culvert soffit level shown in the Addendum report is higher than the culvert soffit in the hydraulic model	Please check the dimensions in Asymmetrical conduit unit SW1-CulvUS and correct the report and/or hydraulic model depending on which is correct	1	**30/04/2021**	-	-		A simplified representation of the portal culvert was adopted in the model, which resulted in a lower soffit level when compared with the cross-section drawing presented in Plate 2.4. However, the peak flood levels within the culvert for the most extreme scenario, i.e. the 1 in 1,000-year+65%CC event is below the adopted soffit level in the model. Therefore, there is no impact on the modelling results or conclusions presented in the FRA Addendum. Further clarification on the simplified representation of the portal culvert in the model and Plate demonstrating that extreme water levels don't reach the lower soffit have been added to the Modelling Report Addendum and the FRA Addendum in the relevant results sections.
2	**Hydraulic model for Crossing 1 & 2**	**N/A**	Discrepancy between culvert dimensions in the hydraulic model at crossing 2 and the reported dimensions as shown in Plate 2.6 of the Addendum modelling report	There is a discrepancy between the dimensions for crossing 2 in the model (SW2-4ACUS) and those shown in Plate 2.6 of the addendum report	Please check the dimensions in Asymmetrical conduit unit SW2-4ACUS and correct the report and/or hydraulic model depending on which is correct	1	**30/04/2021**	-	-		Plate 2.6 shows an indicative cross-section of the portal culvert. The soffit level of 13.57mAOD has been included within the model which matches the drawing presented in Plate 2.6. The drawing notes that there is a minimum of 500mm between the side wall and slope in profile to the channel for mammal passage. In the model (based on the ground levels obtained from the survey) this was set to approx. 1.05m. The drawing also notes that the ledge on the left side of the channel is determined by existing ground levels but a headroom of between 0.6m and 1.20m should be maintained. The cross-section in the model is therefore consistent with the design principles but takes into consideration existing ground levels (from the survey) and therefore looks slightly different than the indicative cross-section provided on the drawing in Plate 2.6. Clarification has been added to the Modelling Report Addendum and the FRA Addendum in the relevant sections.
3	**Sizewell C Sizewell Link Road Flood Risk Assessment Addendum - Appendix C: Modelling Report Addendum**	**Section 2.2.19, page 8**	The report states that "*The levels presented in Plate 2.4 are indicative levels only and are subject to change within the hydraulic model and the final design as it progresses into detailed design stage, where more detailed information of the existing ground level would be obtained* ."	Are the levels shown in the hydraulic model reflective of the final design for crossing 1? If they are subject to potential further change how can we ensure that this wont adversely affect flood risk if the current modelling is only indicative	Please confirm that the dimensions for crossing 1 (SW1-CulvUS) and 2 (SW2-4ACUS) within the hydraulic model (SLR_Road_SW1_07.dat) are reflective of the final proposed design	1	**30/04/2021**	-	-		The dimensions of the portal culverts within the models reflect the latest (at the time of the assessment) proposed design. It is possible that minor changes may arise at the detailed design stage. However, the design principle and overall capacity of the culverts would not be reduced and therefore would not have an impact on the results of the modelling undertaken and subsequently the conclusions of the FRA. Clarification has been added to the Modelling Report Addendum in the relevant section.
4	**Hydraulic model for Crossing 6**	**N/A**	Discrepancy between culvert dimensions in the hydraulic model at crossing 6 and the reported dimensions as shown in Plate 2.8 of the Addendum modelling report	The dimensions for the proposed portal culvert within the hydraulic model (SW6-CulvUS) do not align with the section shown in plate 2.8 of the modelling report	Please check the dimensions in Asymmetrical conduit unit SW6-CulvUS and correct the report and/or hydraulic model depending on which is correct	1	**30/04/2021**	-	-		The dimensions of the portal culvert in the model match the design drawing i.e. the width and soffit levels are the same. The drawing shows the indicative headroom between the river bank/mammal ledge and the soffit of the culvert to be between 940mm and 1200mm. However, it is noted that the cross section provided is taken from the middle section of the portal culvert. Depending on the existing ground levels at the upstream and downstream end of the culvert, the headroom may be reduced (to approx. 600mm), as is represented within the model. Therefore, the model does represent the design principles correctly. Clarification has been added to the Modelling Report Addendum and the FRA Addendum in the relevant sections.

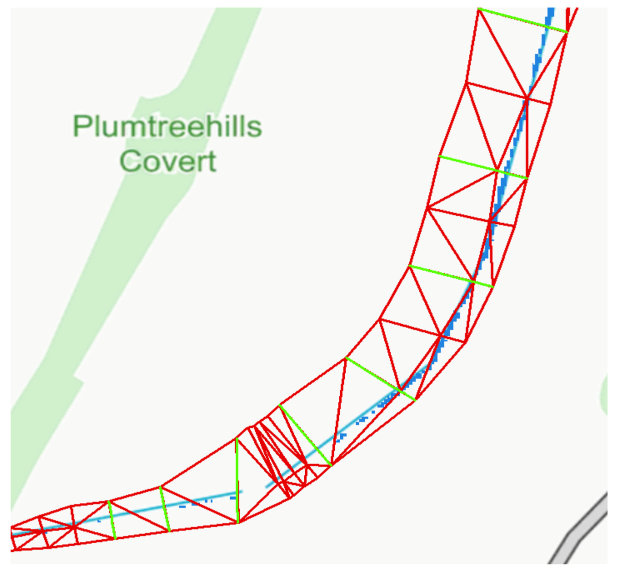
No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Date Raised	SZC Co.'s Response	EA Comments April 2021	Issue Resolved?	SZC Co.'s Response June 2021
5	**Hydraulic model for Crossings 1 & 2 (SW1) and Crossing 7 (SW7)**	**N/A**	Discrepancies between reported inflows and inflows applied to the hydraulic model	Crossing 1 and 2 (SW1): The inflow at SW2_US for the 1% AEP scenario is at odds with what is tabulated in table 3.2, page 4 of the Addendum reporting Crossing 7 (SW7): The inflows applied at SW7_US don't quite align with the peak flows reported in Table 3.2 of the modelling report addendum, particularly for the 1% (1 in 1000) AEP scenario	Correct the model inflows and/or reporting	2	**30/04/2021**	-	-		The inflows within the model have been checked and it is confirmed that the values presented in the FRA Addendum report are correct. For SW2 in the model run for the 1 in 100-year event, an incorrect .ied file has been used, which has slightly higher peak flow value that that presented in Table 3.2. This affects only this one event. The model will be re-run with the correct .ied file, although as the presented results are based on a higher peak inflow it is expected that there will be no change to the overall conclusions of the report. For SW7 for the 1 in 100-year and 1 in 1,000-year events (present day and climate change) an incorrect .ied has also been used. The model will be re-run with the correct .ied files and the results in the report will be updated. Considering that the difference in the modelled peak flow and that presented in Table 3.2 is not significant, the revised results are not anticipated to have an impact on the overall conclusions of either the modelling report or the FRA. The identified scenarios for SW2 and SW7 have been re-run with corrected inflow conditions. Results have been updated in the Modelling Report Addendum and the FRA Addendum, including relevant figures.
6	**All hydraulic models apart from Crossing 6**	**N/A**	Glass Walling within the model cross sections apart from for the models representing the baseline and with road scenarios for Crossing 6	There is glass walling in all the models (apart from SW6), particularly for the rarer AEP event scenarios. This is a limitation of the model and the impacts on the model results and conclusions of the FRA should be investigated	Please evaluate the impact that glass walling is having on the model results and conclusions of the FRA. Document the findings in the reporting	2	**30/04/2021**	-	-		Further investigation of the glass walling was carried out with a focus on the model areas and crossings where potential receptors could be impacted. We have carried out checks which showed that the glass walling is limited to the 1D cross-sections. The tins used to produce the 2D flood extent maps are sufficiently wide not to cause glass walling, see figures in 'Results plots' tab of this spreadsheet. Therefore, the results in the 1D model are likely to be slightly overestimating water levels in those cross sections. However, the maximum flood extent with these water levels are shown on the 2D plots. Therefore, there would be no change to the overall modelling results or conclusions. As such it was considered that the models do not need to be re-run at this stage as they already adopt a conservative approach in terms of flood depths and flood extents in these locations.
7	**Sizewell C Sizewell Link Road Flood Risk Assessment Addendum - Appendix C: Modelling Report Addendum**	**Plate 4.9, Page 53**	Discrepancies between long section bed profile shown in Plate 4.9, page 53 and what is shown in the hydraulic model for Crossing 3 (SW3)	The Long section in Plate 4.9, page 53 of the Addendum report shows an odd 'drop' in bed profile between SW3-4i1 and SW3_C_ds which is not reflected in the hydraulic model (SLR_Road_SW3_NoBox_02.dat).	Please correct the long section in the reporting	2	**30/04/2021**	-	-		The 'drop' in bed profile is a visual / display issue only and is a result of the limitations within the Flood Modeller software which doesn't display exact invert levels within asymmetrical culverts. Long section plots have been updated (outside of Flood Modeller software) and demonstrate that the bed levels are correctly represented in the model. This updated long section plot has been included within the updated FRA Addendum.
8	**Hydraulic model for Crossings 1 & 2 (SW1)**	**N/A**	Baseline model for SW1 did not initialise following Environment Agency Check Run	The baseline model for SW1 (SLR_Base_SW1_07.dat) does not run using FMP Version 4.5.1.6163. There was a missing initial conditions file (SLR_BASE_SW1_07-IC). Inspection of the ZZD files reveals that the supplied results were successfully run through to completion	At the next review milestone please provide the missing initial conditions file (SLR_BASE_SW1_07-IC). No action with regards to the check run on the EA machine. Inspection of ZZD files reveals successful completion of all supplied scenarios	3	**30/04/2021**	-	-		Missing files have been supplied to the Environment Agency on 21/05/2021 following receipt of this comment.
9	**All hydraulic models for the crossings (with road and baseline)**	**N/A**	Spill coefficients for all models are set to the default value of 1.2.	Spill coefficient values have not been changed from default values for all models. Some of the existing bridge decks appear to be quite heavily vegetated. It would have been sensible to assign spill coefficient values based on the material and physical properties of each spill. Adopted values are consistent between the baseline and with road scenarios	Please ensure spill unit values within the model are representative	3	**30/04/2021**	-	-		Sensitivity tests with adjusted spill coefficients have been carried out and the results discussed in the Modelling Report Addendum and the FRA Addendum.
10	**Sizewell C Sizewell Link Road Flood Risk Assessment Addendum - Appendix C: Modelling Report Addendum**	**N/A**	Calibration and verification	There is no section on calibration and verification within the Addendum reporting	It would be sensible to add a paragraph to the addendum report regarding calibration and verification. Whilst it is appreciated that no gauge data or anecdotal evidence is available it is worth confirming this in the report	3	**30/04/2021**	-	-		No model calibration or validation could be undertaken due to the lack of gauge data or anecdotal evidence. Statement has been added at the beginning of the sensitivity testing section in the Modelling Report Addendum and the FRA Addendum.

Priority	Description
1	*Showstopper or potential showstopper* A significant technical issue / deficiency. If this issue is not resolved we would object to the DCO application.
2	*Significantly below the level we would expect of an application or notable technical issues* Incomplete / inaccurate or inadequately substantiated information. We would be likely to request further information prior to the determination of the DCO application or - where appropriate - recommend Requirements be attached to the order to ensure sufficient details are submitted and agreed prior to the commencement of development.
3	*Other* • Information is correct but low quality; or • Minor inaccuracies and lack of clarity Further information / work to resolve these issues will aid our understanding and help us to better inform the DCO determination process.

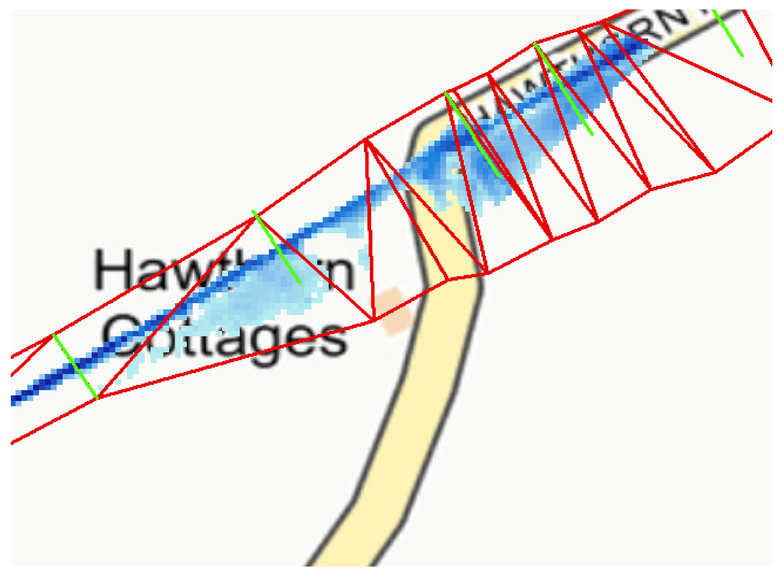
Results Plots

Crossing SW1 - 1,000-year +65%CC

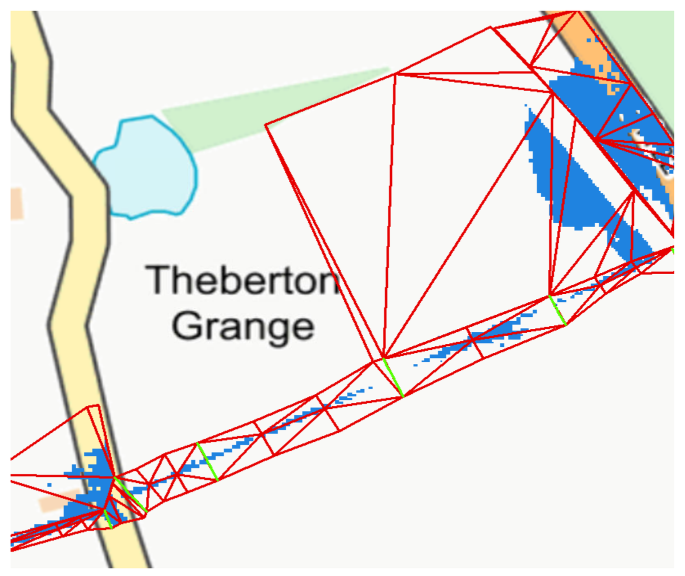
Crossing SW5 - 1,000-year +65%CC



Crossing SW3 - 1,000-year +65%CC



Crossing SW7 - 1,000-year +65%CC



APPENDIX C: SIZEWELL LINK ROAD MODELLING REPORT ADDENDUM REVISION 2

CONTENTS

TABLES

PLATES

APPENDICES

1 INTRODUCTION

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') on 27 May 2020. The Application was accepted for examination by the Planning Inspectorate on 24 June 2020.

1.1.2 As part of the Application, the **Sizewell Link Road Flood Risk Assessment** (Doc Ref. 5.6) [APP-136] was submitted together with a supporting technical report on the hydraulic modelling undertaken to inform the assessment, which was presented in **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137].

1.1.3 Since the submission of the Application, SZC Co. has continued to engage with the local authorities, environmental organisations, local stakeholder groups and the public to gather their responses to the Application. This process has identified potential opportunities for changing the Application to further minimise impacts on the local area and environment, whilst reflecting the further design detail that has come forward in preparation for implementation of the Sizewell C Project.

1.1.4 For that purpose, further engineering design, environmental and flood risk assessments have been undertaken to supplement the Application and to provide additional information in response to the comments received from the stakeholders. This report focuses on the additional hydraulic modelling and forms **Appendix C** of the **Sizewell Link Road (SLR) Flood Risk Assessment (FRA) Addendum** (Doc Ref. 5.6Ad), hereafter referred to as the **SLR FRA Addendum**.

1.1.5 Following their review of the hydraulic model and the report submitted with the Application, the Environment Agency provided comments relating to the previous modelling, including queries on general model schematisation, hydrological assessment, results interpretation and sensitivity testing. These comments are collated in **Appendix B** of the **SLR FRA Addendum** (Doc Ref. 5.6Ad B).

~~1.1.5~~1.1.6 Further comments were received from the Environment Agency on 14th May 2021 following their review of the revised modelling for the Sizewell link road. These comments have informed the amendments within this Revision 2 of the **Sizewell Link Road Modelling Report Addendum**.

~~1.1.6~~1.1.7 Overall, the Environment Agency raised some concerns with regard to the level of detail of the assessment and corresponding hydraulic modelling, lack of modelling for two of the proposed crossings and insufficient representation and discussion of the modelling results and potential flood risk. In order to address these comments and to incorporate the proposed design changes as well as additional information, further hydraulic modelling work has been undertaken and the results of this are presented in this report.

~~1.1.7~~1.1.8 The aim of this addendum is to build upon the previously undertaken hydraulic modelling presented in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137]. The previous modelling was based on very limited information on the topography within the channel and floodplain. This has since been enhanced by carrying out additional topographic survey of the channels and existing structures.

~~1.1.8~~1.1.9 This addendum presents details of the additional modelling undertaken and discusses the results for each of the proposed crossings to improve the understanding of changes in flood risk both to the development itself and to the surrounding areas and off-site receptors.

2 PROPOSED DESIGN

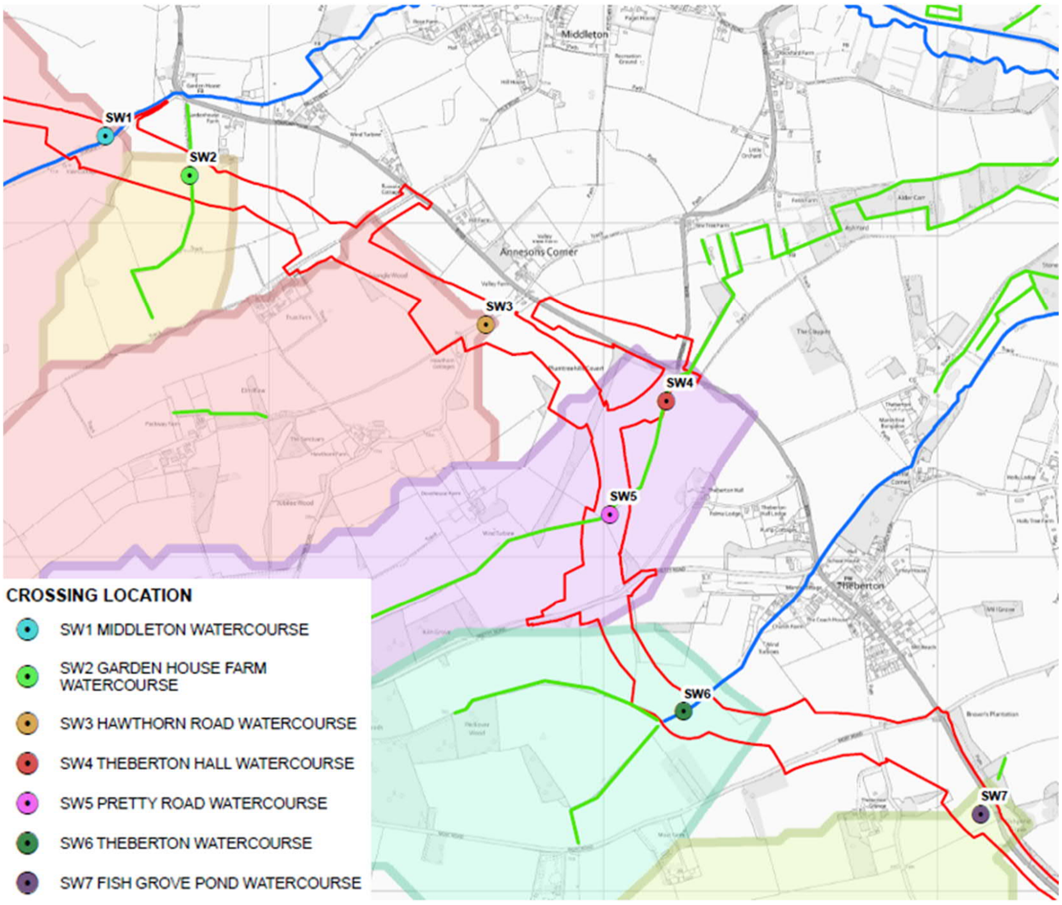
2.1 Location of crossings

2.1.1 The proposed Sizewell link road is mostly located in the Minsmere Old River catchment and would cross six watercourses at seven locations along its route, crossing the same ordinary watercourse at locations four and five. A small section of the proposed route falls within the Fromus River catchment, however it does not cross any watercourses As the route of the Sizewell link road is required to pass over these watercourses there is a need to understand the existing flood risk in these locations as well as the potential future flood risk, following the construction of the proposed development. The locations of the crossings are displayed in **Plate 2.1** and listed below, from west to east:

- Crossing 1: Middleton Watercourse at Fordley Road (main river-);
- Crossing 2: Garden House Farm Watercourse (ordinary watercourse);
- Crossing 3: Hawthorn Road Watercourse (ordinary watercourse);
- Crossing 4: Theberton Hall Watercourse at Pretty Road (ordinary watercourse);
- Crossing 5: Pretty Road Watercourse (ordinary watercourse);
- Crossing 6: Theberton Watercourse at Moat Road (main river); and
- Crossing 7: Fish Grove Pond Watercourse (ordinary watercourse).

2.1.2 There are two Main Rivers, managed by the Environment Agency, which intersect the proposed road layout, both tributaries of the Minsmere Old River. The first, Middleton Watercourse, is at Fordley Road (referred to as crossing 1) and the second, Theberton Watercourse, is adjacent to an unnamed track to the south-west of Theberton (hereafter Moat Road; crossing 6). The remaining four watercourses (crossings 4 and 5 are on the same watercourse) are ordinary watercourses and it is the responsibility of the Lead Local Flood Authority to develop, maintain and apply a strategy for local flood risk management in their areas for these types of watercourses as well as surface water and groundwater.

Plate 2.1~~2.1~~: Location of Sizewell Link Road watercourse crossings and sub-catchment boundaries (extract from Figure 4 of the Sizewell Link Road Flood Risk Assessment (Doc Ref. 5.6) [APP-138])



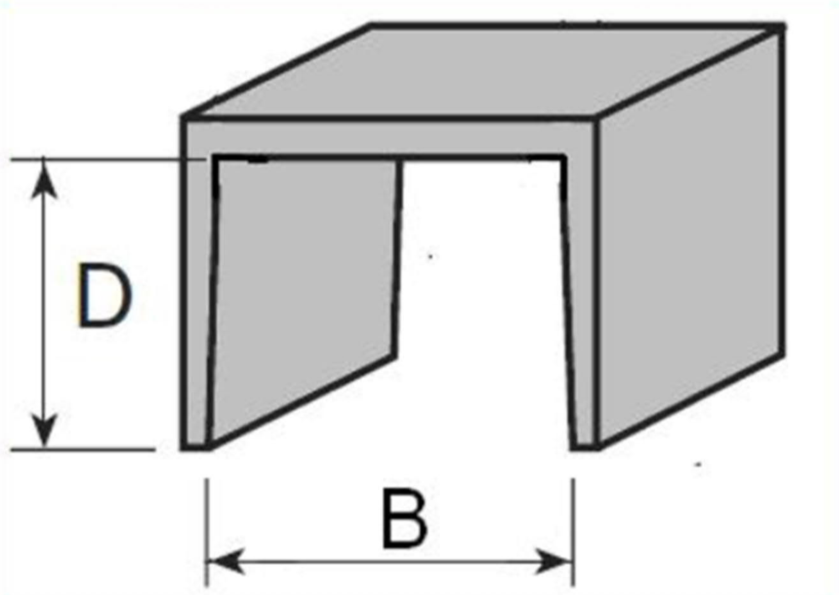
2.2 Proposed design of the crossings

a) Concept of the proposed design

2.2.1 The current proposed concept design for the watercourses crossings has not changed from that presented in the Application, i.e. it assumes a 3-sided portal culvert (as shown on the indicative drawing on **Plate 2.2**), 5.5m wide (B) with up to 1.2m headroom (D). Portal culverts were chosen over more widely used box culverts because as they are placed on top of the existing banks, they allow more height and avoid disturbance of the natural river channel.

2.2.2 The use of portal culverts is coherent with the previous modelling, however the placement of the culverts in some locations has changed slightly since the previous submission. Additionally, further details have been developed for the proposed design at crossing 1 and crossing 7, where the conditions require the proposed design to divert from the standard portal culvert concept.

Plate 2.22.2: Portal culvert design concept



2.2.3 The retained existing river banks are intended to act as ledges to allow mammal passage beneath the Sizewell link road and tie in to the existing river banks. The maximum width of manufactured culvert blocks that could be transported to the site considering current road width and weight restrictions is 5.5m. This was therefore selected above smaller culvert options to optimise conveyance and allow as much natural light through as possible given the required length of the culverts.

2.2.4 The portal culverts will be sited 0.5m outside of the lowest bank at the downstream face of the link road. This allows sufficient space for mammal passage through the culvert.

2.2.5 The soffit of the portal culverts remains flat throughout the culvert. It will be ensured that a minimum of 0.6m headroom will be maintained on the bank upon which the culvert was sited in order to provide for mammal passage. This necessitates some local excavation of the existing bank (within the culvert) at crossings 2, 3, and 5 as the flat soffit would be too close to the ground level without the excavation.

2.2.6 At crossing 7, the layout of the existing road and culvert structure and tie-in of the Sizewell link road to the B1122 do not allow for the use of a portal culvert. Therefore, a circular pipe (to match the existing structure) and standard box culverts are proposed instead.

2.2.7 As part of the modelling exercise, the proposed design of each of the crossings has been considered, both in terms of flood risk and appropriateness of the design. As a result of this iterative process, the dimensions of the proposed culverts are shown in **Table 2.1**. The presented headroom relates to the maximum headroom at the downstream end of the culverts. The headroom at the upstream end of the culvert differs from the maximum due to the flat soffit and the rising ground levels from downstream to upstream. The length of the portal culvert is dictated by the width of the Sizewell link road and its orientation relative to the watercourse at each of the crossings.

Table 2.1: Summary of Sizewell link road and culvert dimensions

Crossing number	Culvert type	Length (m)	Width (m)	Headroom/ Height (m)	Level of link road (m AOD)
1	Portal	37	5.50	1.20	13.50
2	Portal	37	5.50	1.20	16.50
3	Portal	35	5.50	1.20	11.60
5	Portal	34	5.50	1.20	15.16
6	Portal	24	5.50	1.20	14.40
7	Pipe	36	0.45	0.45	7.95
7	Box	30	2.40	1.00	7.95

2.2.8 Further details of the design for each of the crossings are provided in the following sub-sections in order to provide an understanding of how the concept of the design would be implemented at each location and, where applicable, how it would differ due to local constraints.

2.2.9 In addition to the updates to the design of the crossings, SZC Co. propose changes to the Drainage Strategy for the Sizewell link road. Subsequent to the submission of the Application, a ground investigation survey has been undertaken to obtain infiltration rates at various locations along the proposed route. The results show that the proposed strategy set out within the Application for the removal of highway runoff by infiltration to ground is not achievable and therefore, the Drainage Strategy has been revised. It is proposed to replace the infiltration strategy and instead remove the runoff from the highway by discharge to the local watercourses.

2.2.10 At the time of this assessment, details of the modified drainage strategy were being developed. It was not concluded whether the flow from the attenuation basins would be discharged to the watercourses upstream or downstream of the proposed crossings.

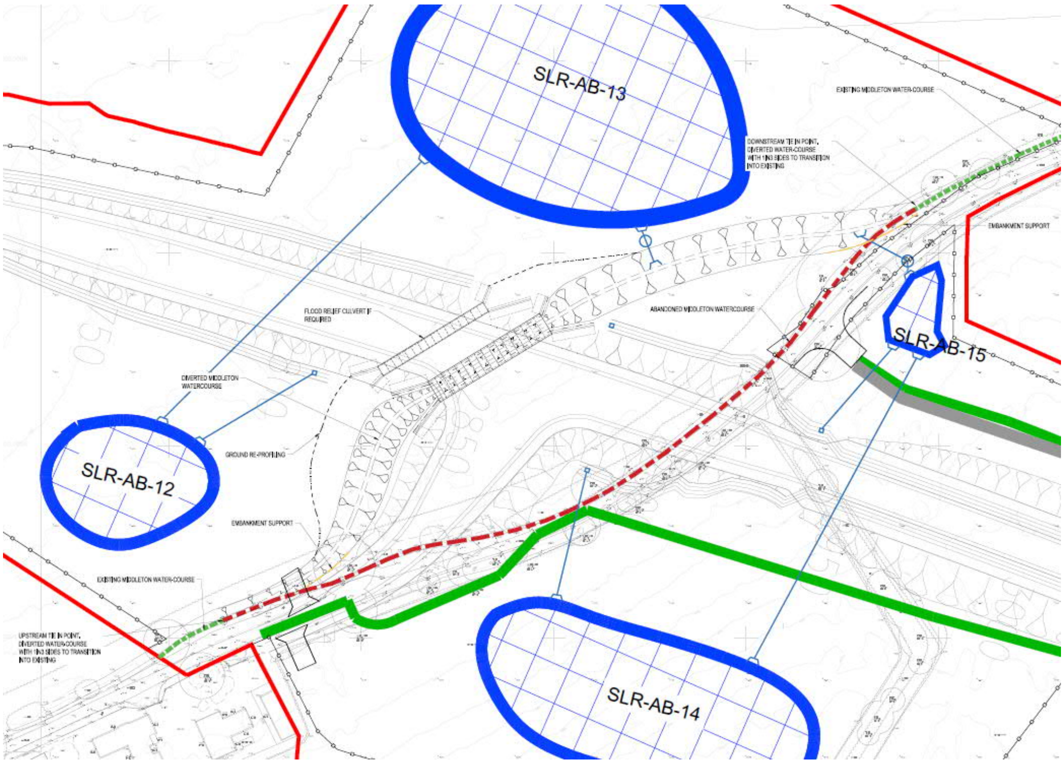
2.2.11 To adopt a more conservative approach for modelling purposes, it was assumed that the flow would be discharged upstream, unless specified otherwise. That would assume all flow would have to be conveyed by the proposed culverts and therefore represent worst-case scenario. Similarly, specific flow rate for each of the crossings was not yet determined and so a maximum potential rate of $0.01m^3/s$ was adopted for all the models.

2.2.12 Further information regarding the proposed discharge to the local watercourses specifically related to the hydraulic modelling is discussed in the following sub-sections for the respective crossings, whereas details of the revised drainage design strategy are provided in the Technical Note '*Sizewell Link Road - DCO Design Validation – Drainage*' (provided in **Volume 3, Appendix 6.2.B** of the **ES Addendum**, (Doc Ref. 6.14 6.2B) [AS-248]) prepared to validate the **Outline Drainage Strategy** proposed in **Volume 2, Appendix 2A** of the **ES** [APP-181].

b) Crossing 1

2.2.13 At crossing 1 (Fordley Road), in order to minimise the required length of the culvert underneath the Sizewell link road and avoid unnecessary crossings under the connection road, SZC Co. propose a diversion of the Main River, as illustrated in **Plate 2.3**.

Plate 2.3~~2.3~~: Extract from drawing SZC-SZ0204-XX-000-DRW-100137 P05 showing Crossing 1 diversion



2.2.14 There are two existing small crossings from the Fordley Road to the field over the existing watercourse. These were not included in the previous modelling for the Application but have now been added to the baseline model schematisation. The diversion of the river channel commences immediately after the uppermost of the field crossings.

2.2.15 The existing upstream field crossing is a 450mm pipe, approximately 6.5m long. As part of the proposed design, this pipe will be removed and replaced by an 8m long box culvert (4.2m wide and 1m high). The downstream field crossing will be fully removed as it becomes redundant due to the diversion of the watercourse and the space is required for the connection road between the Sizewell link road and the Fordley Road.

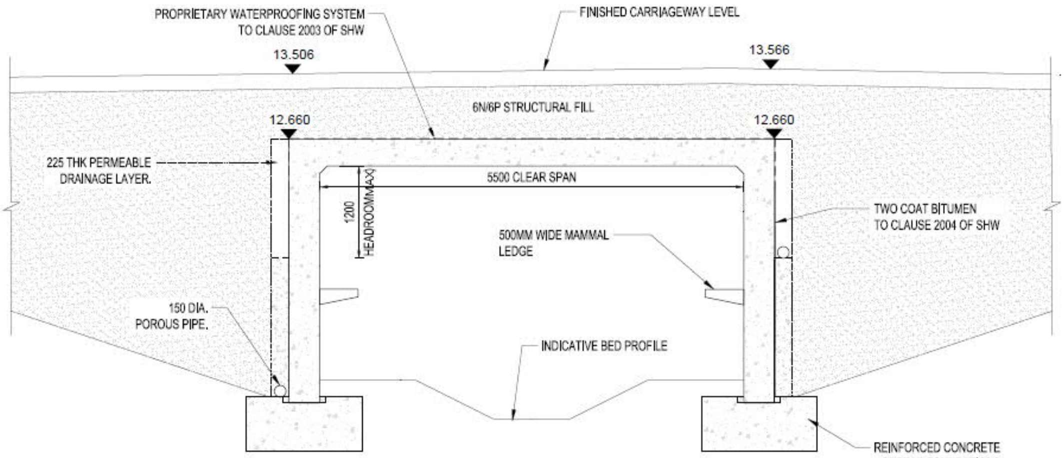
2.2.16 The new channel maintains the overall gradient of the existing riverbed as closely as possible, whilst incorporating the additional length of channel. The channel has a 1 m wide bed and a 1 in 3 slope up to existing ground levels, resulting in a maximum top width of 10m as the diversion moves away from the existing channel and cuts into the existing hillside.

2.2.17 SZC Co. propose a change to the design of the culvert at crossing 1, where in the Application, a T-shaped concrete cross-section through the culvert was proposed. The latest design assumes a portal culvert will be included within the diverted channel keeping the 1 in 3 bank slopes but fitting the culvert by cutting into the banks and incorporating wing walls, as appropriate, to tie into the channel. The channel bed remains 1m wide and the banks will be 0.5m above the bed level and the gradient previously established in the baseline channel will be retained. A cross-section through the proposed portal culvert crossing is shown in **Plate 2.4.**

2.2.18 Due to the fact that the portal culvert cuts into the banks of the diverted channel at the crossing location, and therefore not allowing for a dry mammal passage, a raised mammal ledge would be provided on the sides of the crossing (**Plate 2.4**) at a minimum level of 10.7mAOD within the portal culvert. These would be connected to the ground levels outside of the culvert to provide a continuous path.

~~2.2.18~~2.2.19 Initial modelling results showed that the maximum flood levels ~~-~~are below the mammal ledges and culvert soffit level, considering the most extreme scenario (i.e. 1 in 1,000-year with 65% climate change allowance), and therefore a simplified representation of the portal culvert in the model was adopted (with lower soffit level and no mammal ledges). A review of the modelling has confirmed that this model schematisation does not have an impact on the model results and therefore the flood risk.

Plate 2.4~~2.4~~: Cross-section of portal culvert at crossing 1 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300002)

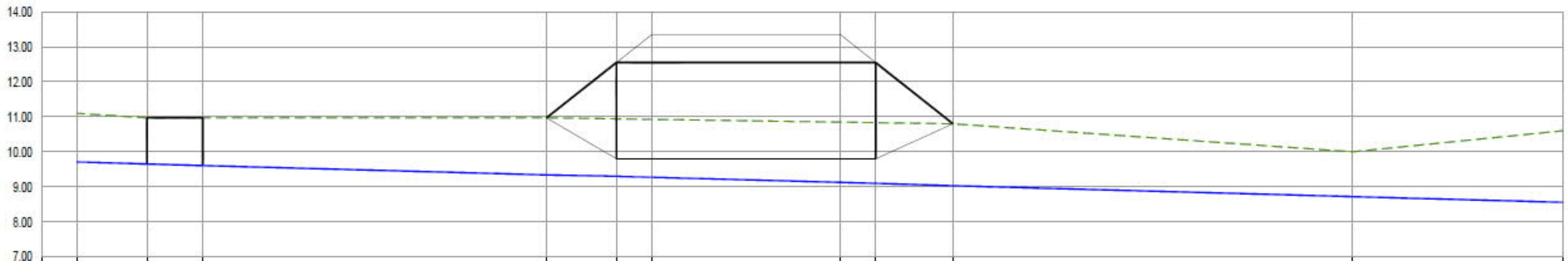


~~2.2.19~~2.2.20 The levels presented in **Plate 2.4** are in mAOD and ~~. T~~they reflect the latest (at the time of the assessment) proposed design. ~~are indicative levels only and are subject to change within the hydraulic model and the final design as it progresses into detailed design stage, where more detailed information of the existing ground levels would be obtained. However, the portal culvert concept and its relative dimensions are unlikely to change.~~It is possible that minor changes may arise at the detailed design stage. However, the design principle and overall capacity of the culverts would not be reduced and therefore would not have an impact on the results of the modelling undertaken and subsequently the conclusions of the FRA.

~~2.2.20~~2.2.21 **Plate 2.5** illustrates a long-section of the diverted channel, including the access track crossing and the portal culvert alignment.

~~2.2.21~~2.2.22 The updated design assumes a combined flow (up to 0.01m^3/s) from the drainage attenuation basins, that would be discharged into the realigned channel downstream of the culvert crossing (**Plate 2.3**) via a controlled outfall connection with flow rate limited to an appropriate value in accordance with the Suffolk County Council stated requirements.

Plate 2.52.5: Long-section of the diverted channel (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300101)



	CROSS SECTION 1-2C	ACCESS TRACK CULVERT INLET	ACCESS TRACK CULVERT OUTLET	SLR INLET HEADWALL	SLR CULVERT INLET	SLR EMBANKMENT LEVEL 13.34	SLR EMBANKMENT LEVEL 13.34	SLR CULVERT OUTLET	SLR OUTLET HEADWALL	END OF DIVERSION	CROSS SECTION 1-5
CHAINAGE	0	11	19	68	78			115	126	183	213
EXISTING GROUND LEVEL	11.10	10.97		11.00					10.60	10.00	10.50
PROPOSED GROUND LEVEL		10.97			9.80			9.80		10.00	
EXISTING BED LEVEL	9.71									8.72	8.56
PROPOSED BED LEVEL		9.65		9.34	9.30			9.10	9.03	8.72	

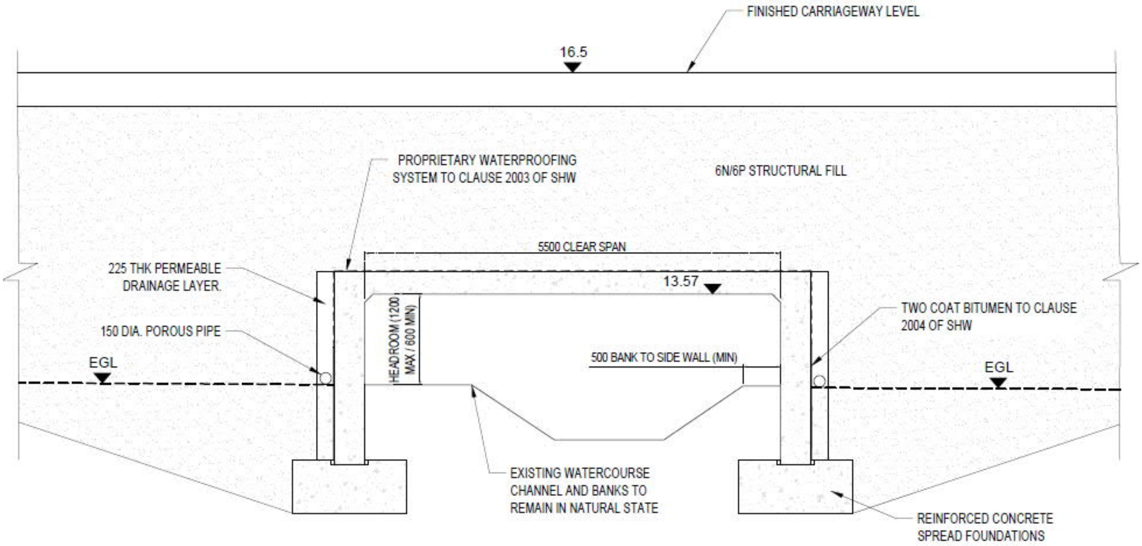
WATERCOURSE DIVERSION LONG SECTION A-A

SCALE X: 1:400, Y: 1:80

c) Crossing 2

2.2.222.2.23 There are no changes to the portal culvert concept with that presented in the Application. The dimensions of the portal culvert would be as discussed in **section 2.2a)**, i.e. the crossing would be a single portal culvert, as presented in **Plate 2.6**.

Plate 2.62.6: Cross-section of portal culvert at crossing 2 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300005)



2.2.3 Further development of the design considered the detail of the placement of the culvert and its tie-into the existing ground. The Ordinary Watercourse on which the crossing is located is relatively steep. The design principle assumes placement of the flat culvert based on the downstream ground levels and as would necessitate some excavation of the banks at the upstream end of the culvert in order to maintain connectivity and the required minimum 600mm headroom for mammal passage on at least one bank.

2.2.4 It should be noted that the geometry of the existing watercourse channel presented in **Plate 2.6** is indicative only and comprises a single cross section location along the portal culvert, whereas the natural channel and banks are not symmetrical. The hydraulic model has been developed using the topographical survey of the existing channel and therefore represents the real geometry whilst maintaining the principles of the portal culvert design, i.e. providing a minimum of 500mm bank width with 600mm headroom below soffit level on one bank or, if possible, on both sides of the channel. As, such, the cross-section of the portal culvert within the model visually might differ when compared with the indicative drawing in **Plate 2.6**.

~~2.2.23~~2.2.5 As noted for crossing 1, it is possible that minor changes may arise at the detailed design stage. However, the design principle and overall capacity of the culverts would not be reduced and therefore would not have an impact on the results of the modelling undertaken and subsequently the conclusions of the FRA.

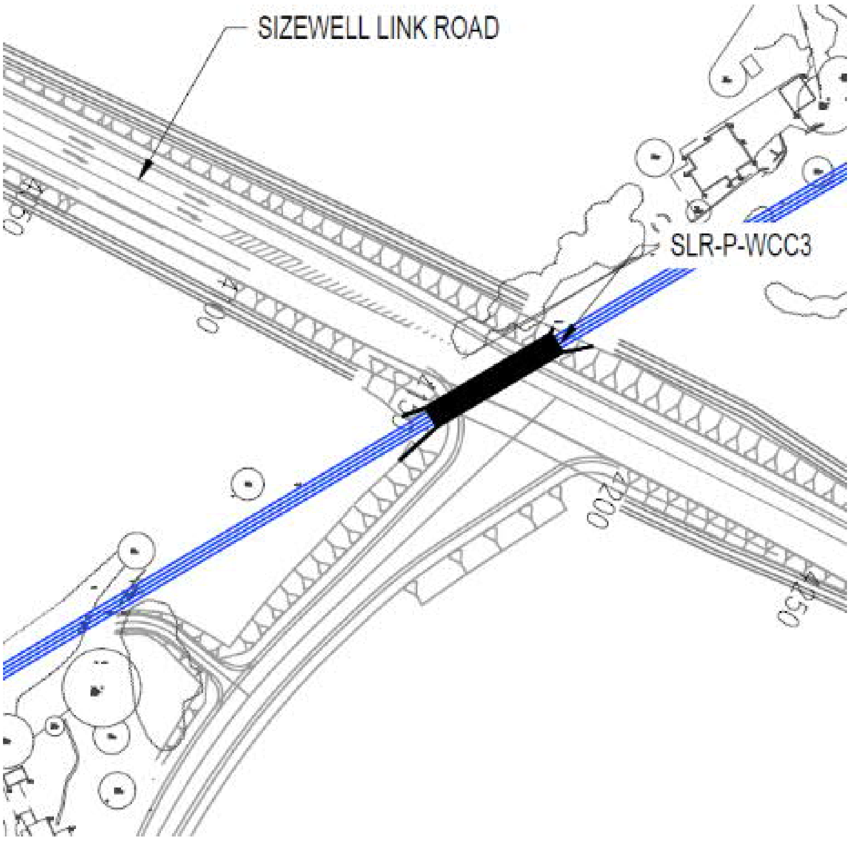
~~2.2.24~~2.2.6 Similarly, to crossing 1, a combined discharge of $0.01m^3/s$ from the highway attenuation basins was included in the design for crossing 2. The outfall connection in the model was set upstream of the proposed culvert crossing. No other changes to the design of crossing 2 have been proposed.

d) Crossing 3

~~2.2.25~~2.2.7 The concept of a portal culvert presented in the Application is still proposed in the updated design, as discussed in **section 2.2a)**.

~~2.2.26~~2.2.8 It is proposed to modify the alignment of Hawthorn Road and its junction with the Sizewell link road, which would eliminate the need to cross the watercourse at the connection road that links the Sizewell link road and Hawthorn Road on the right bank of the watercourse (**Plate 2.7**).

Plate 2.72.7: Plan view of crossing 3 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300006)



2.2.272.2.9 The wing walls of the portal culvert would need to be extended slightly further on the right bank than on the left in order to ensure that the embankment does not reduce the levels within the mammal passage.

2.2.282.2.10 Small grips would be installed on both banks at the upstream face of the proposed portal culvert to allow any ponded water, following a flood event, to flow back into the channel. This is due to the fact that the ground levels on both the floodplain on the right bank and Hawthorn Road on the left bank, are lower than the bank levels of the watercourse.

2.2.292.2.11 No amendments are proposed to the existing ford which carries the water from Wash Lane, over Hawthorn Road, and into the field drain. Also, there would be no amendment to the road levels of Hawthorn Road.

2.2.302.2.12 Following updates to the design and subsequent modelling (results discussed in **section 1.1a)**), it was found that the flood relief culvert proposed in the Application is no longer required and therefore has been removed from the proposed design for crossing 3.

~~2.2.31~~2.2.13 A combined discharge of $0.01m^3/s$ from the highway attenuation basins has been added to the design of crossing 3 and modelled with the outfall connection upstream of the proposed culvert crossing.

e) Crossing 4 and 5

~~2.2.32~~2.2.14 Crossings 4 and 5 are located on the same Ordinary Watercourse i.e. Theberton Watercourse. Crossing 5 is the main crossing of the Sizewell link road and is upstream of crossing 4, which is on the connection road between the B1122 and the Sizewell link road.

~~2.2.33~~2.2.15 Watercourse crossing 4 was considered as part of the **Sizewell Link Road Flood Risk Assessment** (Doc Ref. 5.6) [APP-136], however it was not modelled as there was no intention to undertake highway modification works or change existing road levels at this crossing. The existing 750mm diameter culvert crosses the B1122 approximately 25m to the east of its junction with the B1125.

~~2.2.34~~2.2.16 The current proposed design for the B1122 / B1125 junction with the Sizewell link road has been reviewed and it remains the case that the required road modifications will not extend to the existing culvert and thus the structure and the road levels will remain unchanged. Similarly, there is no intention to undertake any other highway modification works.

~~2.2.35~~2.2.17 As there are no physical modifications proposed to the existing structure at crossing 4, there would be no increase in flood risk to the existing road, providing that the existing hydrological conditions have not been changed by the upstream crossing 5. This was considered in the hydraulic model and is discussed in **Section 4.2c)**.

~~2.2.36~~2.2.18 There are no substantial changes proposed to the design of crossing 5 portal culvert presented in the Application. It will consist of a single standard portal culvert, as discussed in **section 2.2a)**.

~~2.2.37~~2.2.19 Limited topographical information at the time of the assessment undertaken for the Application did not account for an existing field drain crossing (a single 375mm pipe) at the proposed Sizewell link road location. This has now been considered in the baseline model.

~~2.2.38~~2.2.20 The proposed updated design assumes that the pipe will be removed with a natural channel implemented between the upstream and downstream end of the Sizewell link road crossing and that the bed gradient will be interpolated between these two existing points. This provides an increase in the in-channel capacity at this location.

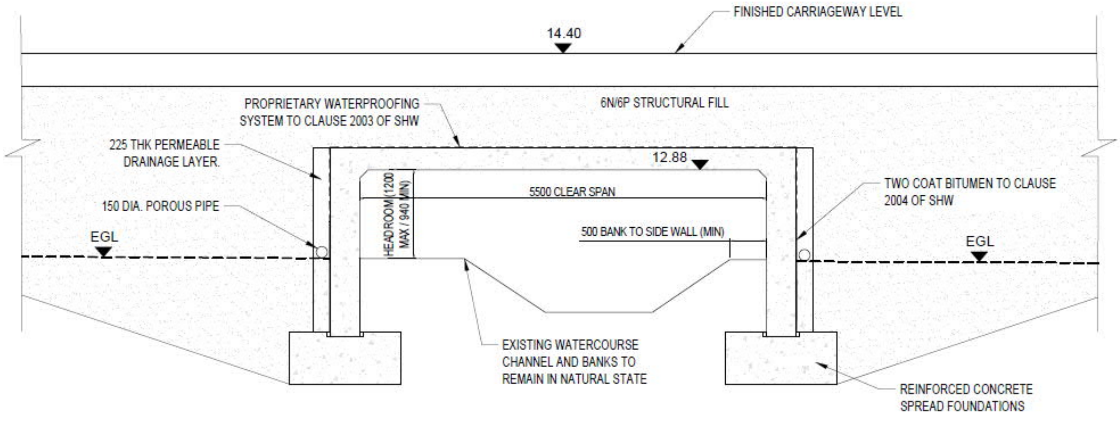
~~2.2.39~~2.2.21 As discussed in **section 2.2a)**, in order to preserve the required headroom for mammal passage at the upstream end of the portal culvert, there is a small amount of excavation required of the right bank due to the flat soffit level set at the downstream end of the culvert.

2.2.402.2.22 Similarly, to the other crossings, a combined discharge of 0.01m^3/s from the highway attenuation basins has been added to the design of crossing 5 and modelled with the outfall connection added upstream of the proposed culvert crossing.

f) Crossing 6

2.2.412.2.23 No changes are proposed to the portal culvert concept for the crossing 6. As in the Application, a standard portal culvert would be implemented at this crossing with dimensions presented in **section 2.2a)** and in **Plate 2.8**.

Plate 2.82.8: Cross-section of portal culvert at crossing 6 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300008)



2.2.24 As mentioned in **section 2.2c)**, the geometry of the existing watercourse channel presented in the design drawings, including that presented in **Plate 2.8** is indicative only and comprises a single cross section location along the portal culvert, whereas the natural channel and banks are not symmetrical. The hydraulic model has been based on the topographical survey of the existing channel and therefore represents real geometry of the channel and banks whilst maintaining the principles of the portal culvert design, i.e. providing a minimum of 500mm bank width with 600mm headroom below soffit level on one bank or, if possible, on both sides of the channel. As, such, the cross-section of the portal culvert within the model visually might differ when compared with the indicative drawing shown in **Plate 2.8**.

2.2.25 As noted for crossings 1 and 2, it is possible that minor changes may arise at the detailed design stage. However, the design principle and overall capacity of the culverts would not be reduced and therefore would not have an impact on the results of the modelling undertaken and subsequently the conclusions of the FRA.

~~2.2.42~~2.2.26 No existing nearby structures were identified to be removed following additional investigation of the proposed crossing location. There are no other changes proposed to the design of the crossing itself.

~~2.2.43~~2.2.27 As for other crossings, a combined discharge of 0.01m^3/s from the highway attenuation basins has been added to the design of crossing 6, with outfall connection upstream of the proposed culvert crossing.

g) Crossing 7

~~2.2.44~~2.2.28 The concept design for crossing 7 was least developed at the time of the Application submission due to very limited topographical information and uncertainty around the connectivity of the watercourse underneath the existing B1122. Hence, this crossing was not modelled in the previous study.

~~2.2.45~~2.2.29 Following additional topographic survey and design development, crossing 7 has now been considered in the hydraulic modelling and the flood risk assessment, including both baseline and post-development scenarios, and these are discussed further in **section 3.3** and **section 4.2e)**.

~~2.2.46~~2.2.30 The survey revealed that this watercourse currently passes under the existing B1122 via a 450mm pipe. As the crossing is located at the proposed tie-in between the Sizewell link road and the B1122, there is not enough (vertical) space to fit a portal culvert, as for the other crossings. Therefore, the design assumes an extension of the existing pipe instead to ensure that current flow regimes are maintained. The existing culvert would be extended by approximately 36m with no change to its diameter.

~~2.2.47~~2.2.31 In order to control water levels at the culvert inlet and avoid surcharging, it is proposed to lower approximately 10m length of the left bank upstream of the culvert by 150mm to allow excess water storage within the floodplain.

~~2.2.48~~2.2.32 In addition, the surface water flood map (**Figure 3** of the **Sizewell Link Road Flood Risk Assessment** (Doc Ref. 5.6) [APP-138]) shows that during an extreme flood event water currently ponds in a topographically low-lying area to the left of the channel before then flowing over the B1122. This was confirmed during a site visit following a heavy rain event.

2.2.492.2.33 In order to ensure that this flow path is maintained, a box culvert (2.4m wide by 1m high) is provided on the floodplain through the Sizewell link road. The general layout and flow routes are shown in **Plate 2.9**.

2.2.502.2.34 The cross-section of the flood relief culvert through the Sizewell link road embankment is presented in **Plate 2.10**.

2.2.512.2.35 The design also assumes a highway attenuation basin that would discharge up to 0.01m^3/s to the watercourse via a controlled connection upstream of the proposed crossing. The attenuation basin would be located outside of the flood extent to ensure that sufficient flood storage volume can continue to be provided and to avoid the mixing of surface water with flood storage.

Plate 2.92.9: Plan view of the proposed dual culvert system and overland flow route at crossing 7 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300003)

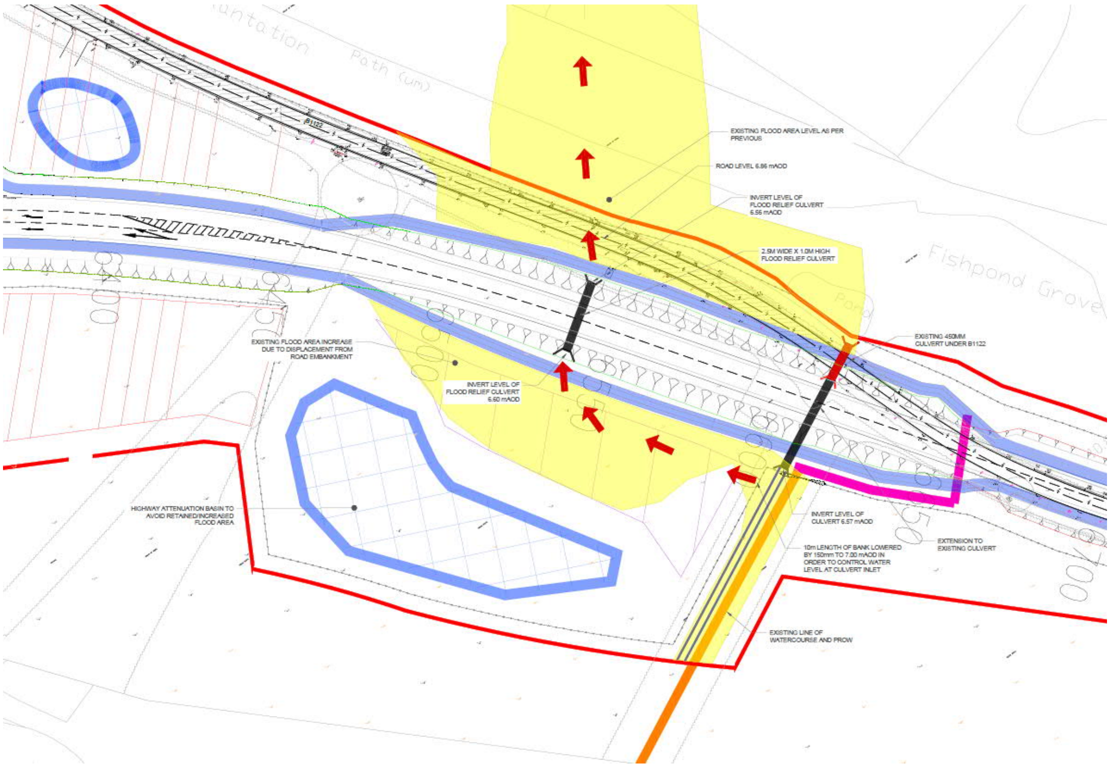
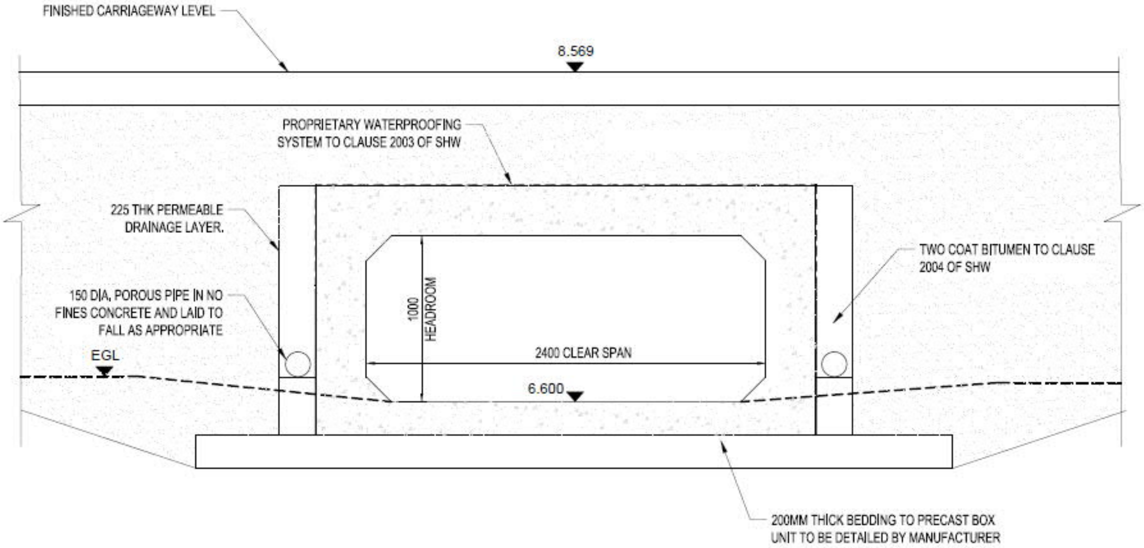


Plate 2.10: Cross-section of the flood relief culvert at crossing 7 (extract from drawing no. SZC-AD0310-WSP-SLRHDG-ZZ0000-DRW-HCD-300004)



3 METHODOLOGY

3.1 Overview

3.1.1 This additional assessment builds on the hydraulic modelling undertaken for the Application and presented in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137] and therefore follows the same approach of using a 1D model with extended sections representing the floodplain.

3.1.2 The updated hydraulic models include additional topographical survey information and some modifications to the model schematisations following comments raised by the Environment Agency. These are further discussed in **section 3.3**.

3.1.3 Each of the watercourses was represented in a separate hydraulic model, with the exception of crossings 1 and 2, which were combined into the same model on the basis the model has been extended further downstream, past their confluence at the B1122.

3.1.4 No changes were made to the approach for deriving the boundary conditions or application of climate change allowances, as discussed in **section 3.4**. Additional hydrological assessment was undertaken with a different peak flow estimation method to compare with the adopted approach. This is presented in **section 3.2**.

3.2 Hydrology

3.2.1 To derive the flow hydrographs, for use within the hydraulic model a hydrological assessment was carried out and the results of this summarised in **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137] submitted as part of the Application.

3.2.2 Within this report the hydrological analysis focused on the comparison of peak flows for each of the proposed crossings using the Revitalised Flood Hydrograph (ReFH) method and the Revitalised Flood Hydrograph 2 (ReFH2) method, which largely replaces the preceding ReFH method.

3.2.3 Subsequently, the Environment Agency noted that additional hydrological assessment should be carried out utilising the FEH Statistical Method to consider and justify the hydrological approach adopted.

3.2.4 Within this **Sizewell Link Road Modelling Report Addendum**, a brief summary has been provided of the ReFH2 method previously undertaken. It then provides an assessment of peak flows obtained using the FEH Statistical Method and a summary of the hydrological approach adopted within the current modelling exercise for the crossings.

a) Revitalised Flood Hydrograph 2 (ReFH2) Method

3.2.5 The **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137] submitted as part of the Application, provided a summary of the main catchment characteristics for the areas draining towards each of the crossings and also set out the method for obtaining catchment descriptors from the FEH web service (Ref. 1) for each of the defined catchments.

3.2.6 The downloaded FEH catchment outlines were compared with the latest available Environment Agency 1m resolution LiDAR elevation data and it was identified that the FEH catchments did not realistically capture the catchment areas in relation to each crossing location. Each catchment outline was therefore manually reviewed and modified based upon the LiDAR data to correctly capture the catchment extents.

3.2.7 **Table 3.1** presents the obtained key catchment descriptors for the six identified sub-catchments. All of these are relatively small in nature and a review of the catchment descriptors was carried out to ensure they were representative of the sub-catchment.

3.2.8 For the catchment at crossing 2, FEH was not able to generate catchment descriptor information due to the small size of the catchment and size of the watercourse itself (this watercourse is a small tributary to the main river at crossing 1). Therefore, descriptors for the catchment at crossing 3 were adopted as the most hydrologically similar with the area adjusted for catchment 2. The area for the crossing 2 catchment was based on an assessment of LiDAR and the boundaries of the adjacent catchments, with the resulting area taken as 0.25km^2.

Table 3.1: Obtained catchment descriptors

Descriptor	Crossing 1	Crossing 3	Crossing 5	Crossing 6	Crossing 7
AREA	2.94	1.13	0.74	0.97	0.54
ALTBAR	28	22	19	22	16
ASPBAR	81	71	58	71	34
ASPVAR	0.48	0.51	0.52	0.49	0.76
BFIHOST	0.327	0.456	0.551	0.483	0.608
DPLBAR	1.59	1.1	1.1	1.11	0.75
DPSBAR	22.4	16.7	17	9.8	14.2
FARL	1	1	1	1	1
FPEXT	0.043	0.118	0.172	0.227	0.107
FPDBAR	0.252	0.47	0.659	0.858	0.361
FPLOC	1.055	0.915	1.054	0.995	0.513
LDP	3.09	2.52	2.56	2.02	1.59
PROPWET	0.26	0.26	0.26	0.26	0.26
SAAR	595	597	598	596	596
SAAR4170	600	600	599	600	599
SPRHOST	43.83	39.03	33.39	36.08	31.29
URBEXT1990	0	0	0	0	0
URBEXT2000	0	0	0.0017	0	0

3.2.9 In the previous hydrological assessment, as set out in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137], review of the catchment characteristics was carried out to understand the similarity between catchments and to ensure that the descriptors are representative. The revised areas for each of the catchments used within the hydrological assessment are presented in **Table 3.2**.

3.2.10 For the hydraulic modelling, four return period events were considered, namely the 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year. For each of the catchments the critical storm duration was calculated based on the 1 in 100-year event. As there are no gauging stations on any of the watercourses along the proposed route of the Sizewell link road, it is not possible to carry out a comparison of peak flows with observed flows. However, the hydrological assessment was undertaken in line with best practice as set out in the Environment Agency guidance (Ref. 2). Derived storm durations and peak flows for the considered return period events are presented in **Table 3.2**.

Table 3.2: Catchment area, critical storm duration and peak flow

Catchment	Area (km^2)	Return Period (years)	Critical Storm Duration (hours)	Peak Flow (m^3/s)
Crossing 1	2.89	5	9.5	1.61
		20		2.29
		100		3.68
		1,000		6.67
Crossing 2	0.25	5	10.5	0.09
		20		0.13
		100		0.21
		1,000		0.39
Crossing 3	1.05	5	11.5	0.38
		20		0.54
		100		0.90
		1,000		1.65
Crossing 5	1.00	5	12.5	0.25
		20		0.35
		100		0.60
		1,000		1.11
Crossing 6	0.98	5	12.5	0.29
		20		0.41
		100		0.68
		1,000		1.26
Crossing 7	0.81	5	10.5	0.18
		20		0.25
		100		0.42
		1,000		0.81

3.2.11 The above results utilising the ReFH2 method have been compared with the peak flow values obtained using the FEH Statistical Method in the following section.

b) FEH Statistical Method

3.2.12 In response to comments raised by the Environment Agency regarding the absence of the FEH Statistical Method analysis in the original hydrological assessment of peak flows, the current modelling exercise included has undertaken a review of peak flows using the FEH Statistical Method.

3.2.13 The hydrological review has been undertaken using the most up to date software and flow datasets available at the time, comprising the use of

WINFAP-FEH v4 software (Ref. 3) and the National River Flow Archive (NRFA) Peak Flows Dataset version 8, dated September 2019 (Ref. 4).

3.2.14 In line with the original hydrological assessment, the current hydrological analysis for the proposed Sizewell link road has focused on the fluvial flood risk associated with the proposed watercourse crossings along its length, as shown on **Plate 2.1**.

3.2.15 As previously noted, the catchment for crossing 2 is extremely small and therefore it was concluded that this would be initially excluded from the analysis using the FEH Statistical Method. It was considered that the size of this catchment was so small it would be difficult to identify a suitable pooling group composition with sufficient hydrological similarity.

3.2.16 The key catchment descriptors, obtained from the FEH web (Ref. 1) in the previous hydrological assessment, for the subject catchments have been reviewed for ongoing applicability as part of the current assessment. It has been noted that the catchment area for crossing 1 is the largest of the subject catchments and it is also the steepest, as indicated by the DPSBAR descriptor.

3.2.17 The FARL descriptor indicates that there is no significant surface water attenuation or reservoir influence on the fluvial flows across any of the subject catchments.

3.2.18 All of the established subject catchments are either totally rural or essentially rural (maximum $URBEXT_{2000}$ = 0.0017 at crossing 5). Therefore, there is no requirement for a subsequent adjustment of the QMED value to account for urbanisation for any of the subject catchments.

3.2.19 All of the subject catchments are ungauged and according to NRFA Hydrometric Stations web page (Ref. 4) the nearest gauge to the study area is the Alde at Farnham (Station No. 35003). The Alde at Farnham is also automatically extracted by the WINFAP software from the NRFA Peak Flows Dataset (Ref. 4) as the highest-ranking potential donor gauge for QMED improvement at each of the ungauged subject catchments.

3.2.20 However, a closer review of the gauge details indicate that confidence is low regarding its suitability as a donor gauge for QMED improvement largely due to its much larger catchment size. The gauge is considered unsuitable for QMED donor transfer as the catchment area is over 20 times larger than the largest of the subject catchments (crossing 1).

3.2.21 The NRFA Peak Flows Dataset (Ref. 4) notes that whilst the Alde at Farnham can be considered suitable for QMED donor analysis it should be treated with caution:

"Scatter in check-gaugings within the non-modular range that casts doubt on rating shape and subsequently on QMED estimates. Use with caution."

3.2.22 On the basis of the above, a brief assessment of the availability of other potential donor stations was undertaken using the WINFAP-FEH v4 software to assess the suitability of alternative gauges for QMED donor improvement by data transfer from within the NRFA Peak Flows Dataset (Ref. 4) hydrometric register.

3.2.23 In addition to the Alde at Farnham (Station No. 35003), there were 5 further potential donor stations identified by the WINFAP software. These were:

- 35004 Ore at Beversham;
- 34006 Waveney at Needham Mill;
- 34007 Dove at Oakley Park;
- 35008 Gipping at Stowmarket; and
- 33045 Wittle at Quidenham.

3.2.24 Each of the potential donor stations identified by the WINFAP software had catchment areas that were significantly larger than the subject catchments. Additionally, they were sufficiently distant that their influence on the subject catchment was limited.

3.2.25 As such, no other potential donor stations were identified as being appropriate for use. This is not unexpected due to the very small catchment areas upstream of the subject catchments and the inherent shortage of comparable catchments within the NRFA Peak Flows Dataset.

3.2.26 The FEH Statistical Method is based on utilising observed flow data from a dataset of active gauging stations located throughout the UK river network and therefore it is heavily reliant on the method used for the calculation of QMED.

3.2.27 As no suitable donor stations are available QMED estimates have been derived using catchment descriptors as opposed to utilising observed data transferred across from a suitable donor gauge(s). Additionally, the $QMED_{cds}$ FEH regression equation has been applied in its rural form.

3.2.28 The QMED values, based on the revised catchment areas and catchment descriptors used in the ReFH2 assessment, have been calculated using the current FEH $QMED_{cds}$ equation and summarised in **Table 3.3**.

Table 3.3: Final QMED values derived from catchment descriptors

Descriptor	Crossing 1	Crossing 3	Crossing 5	Crossing 6	Crossing 7
$QMED_{cds}$	0.63	0.20	0.14	0.17	0.10

3.2.29 Once a review of the $QMED_{cds}$ values had been undertaken a pooling group analysis was carried out for each of the subject catchments.

3.2.30 Growth curve development was implemented using the latest WINFAP-FEH v4 software (Ref. 3) and the NRFA Peak Flows Dataset version 8, dated September 2019 (Ref. 4), downloaded from the National River Flow Archive (NRFA) website (Ref. 4).

3.2.31 It is recommended practice that a threshold of at least 500 years of pooled annual maxima data (AMAX) from similar catchments is obtained in the initial pooling group and that this is derived from those stations which are flagged as being ‘suitable for pooling’ in order to derive a confident growth curve. The pooling groups were derived using the revised procedures from the Environment Agency Science Report SC050050 (2008) (Ref. 5).

3.2.32 Pooling group composition is largely based on hydrological similarity and distance from the subject catchments. As the subject catchments for this analysis are relatively small in size this limits the availability of suitable stations, within the NRFA Peak Flows Dataset (Ref. 4), that are sufficiently similar and representative for inclusion within the pooling group.

3.2.33 The catchment for crossing 1 has the largest area compared with the other subject catchments and as a result the composition of the default initial pooling group for this catchment is slightly different to the other catchments, although it is noted that many of the same stations are present within this pooling group when compared with the other subject catchments.

3.2.34 Upon review, it was noted that for all the remaining subject catchment the default initial pooling group comprised the same set of stations, as can be seen by the summary of the default initial pooling group in **Table 3.4**. As previously noted, this similarity is to be expected, due to the relatively similar characteristics and small size of the subject catchments as well as their close geographical proximity.

Table 3.4: Initial Pooling Group Composition

Crossing	Initial Pooling Group
1	76011 (Coal Burn @ Coalburn) 27051 (Crimple @ Burn Bridge) 45816 (Haddeo @ Upton) 28033 (Dove @ Hollinsclough) 25019 (Leven @ Easby) 26802 (Gypsey Race @ Kirby Grindalythe)

	27073 (Brompton Beck @ Snainton Ings) 49005 (Bolingey Stream @ Bolingey Cocks Bridge) 25011 (Langdon Beck @ Langdon) 47022 (Tory Brook @ Newnham Park) 27010 (Hodge Beck @ Bransdale Weir) 71003 (Croasdale Beck @ Croasdale Flume) 44008 (South Winterbourne @ Winterbourne Steepleton) 25003 (Trout Beck @ Moor House) 206006 (Annalong @ Recorder)
3, 5, 6 and 7	76011 (Coal Burn @ Coalburn) 27073 (Brompton Beck @ Snainton Ings) 27051 (Crimple @ Burn Bridge) 45816 (Haddeo @ Upton) 28033 (Dove @ Hollinsclough) 25019 (Leven @ Easby) 26802 (Gypsey Race @ Kirby Grindalythe) 91802 (Allt Leachdach @ Intake) 25011 (Langdon Beck @ Langdon) 47022 (Tory Brook @ Newnham Park) 71003 (Croasdale Beck @ Croasdale Flume) 25003 (Trout Beck @ Moor House) 49005 (Bolingey Stream @ Bolingey Cocks Bridge) 54022 (Severn @ Plynlimon Flume) 206006 (Annalong @ Recorder)

3.2.35 Following a review of the default initial pooling groups derived within the software for each of the subject catchments it should be noted that there has been no significant change in the composition of the pooling group stations for each of the subject catchments.

3.2.36 Minor amendments to the default initial pooling groups were carried out focusing on the removal of stations with highlighted high discordancy, those stations with very high SAAR values (and specifically gauges located in Northern Ireland) as well as those stations with a short length of AMAX data record (i.e. less than 10 years).

3.2.37 During this review it was difficult to identify suitable hydrologically similar stations for use in the pooling analysis and therefore those stations removed for the crossing 1 subject catchment may have been retained for the other subject catchments and vice versa. This does not materially affect the outputs of the hydrological analysis. The stations removed and added to the analysis are summarised in

3.2.38 **Table** 3.5.

Table 3.5: Amendments to Pooling Group Composition

Crossing	Stations Removed	Comment	Stations Added
1	49005 (Bolingey Stream @ Bolingey Cocks Bridge) 206006 (Annalong @ Recorder) 25011 (Langdon Beck @ Langdon) 76011 (Coal Burn @ Coalburn) 25003 (Trout Beck @ Moor House)	8 years of AMAX record Located in Northern Ireland High discordancy Long periods of missing data record and change in gauge on NRFA website High SAAR at 1,905mm	27032 (Hebden Beck @ Hebden) 48009 (St Neot @ Craigshill Wood) 26014 (Water Forlornes @ Driffield) 48004 (Warleggan @ Trengoffe) 73015 (Keer @ High Keer Weir)
3	49005 (Bolingey Stream @ Bolingey Cocks Bridge) 206006 (Annalong @ Recorder) 91802 (Allt Leachdach @ Intake) 25011 (Langdon Beck @ Langdon) 54022 (Severn @ Plynlimon Flume)	8 years of AMAX record Located in Northern Ireland High SAAR at 2,554mm High SAAR at 2,481mm High discordancy	27032 (Hebden Beck @ Hebden) 49003 (de Lank @ de Lank) 27032 (Hebden Beck @ Hebden)
5	49005 (Bolingey Stream @ Bolingey Cocks Bridge) 206006 (Annalong @ Recorder) 91802 (Allt Leachdach @ Intake) 25011 (Langdon Beck @ Langdon) 54022 (Severn @ Plynlimon Flume)	8 years of AMAX record Located in Northern Ireland High SAAR at 2,554mm High SAAR at 2,481mm High discordancy	27010 (Hodge Beck @ Bransdale Weir) 49003 (de Lank @ de Lank) 27032 (Hebden Beck @ Hebden)
6	49005 (Bolingey Stream @ Bolingey Cocks Bridge) 206006 (Annalong @ Recorder) 91802 (Allt Leachdach @ Intake) 25011 (Langdon Beck @ Langdon) 54022 (Severn @ Plynlimon Flume)	8 years of AMAX record Located in Northern Ireland High SAAR at 2,554mm SAAR very high at 2481mm High discordancy	27010 (Hodge Beck @ Bransdale Weir) 49003 (de Lank @ de Lank) 27032 (Hebden Beck @ Hebden)

Crossing	Stations Removed	Comment	Stations Added
7	49005 (Bolingey Stream @ Bolingey Cocks Bridge) 206006 (Annalong @ Recorder) 91802 (Allt Leachdach @ Intake) 25011 (Langdon Beck @ Langdon) 54022 (Severn @ Plynlimon Flume)	8 years of AMAX record Located in Northern Ireland High SAAR at 2,554mm High SAAR at 2,481mm High discordancy	27010 (Hodge Beck @ Bransdale Weir) 49003 (de Lank @ de Lank) 27032 (Hebden Beck @ Hebden)

3.2.39 Following identification of the revised pooling groups, using stations that were as hydrologically similar as possible, all of the pooling groups were found to be acceptably homogenous and a further review of the pooling groups was not required.

3.2.40 A review of the goodness of fit values found that the generalised logistic (GL) distribution, recommended for use in the UK, was appropriate for the derivation of the flood frequency growth curve for each subject catchment. Growth curve factors for the 100-year return period event vary between 3.04 to 3.15 which is within the typical range for the UK (guidance indicates a typical range of 2.1 to 4.0), see **Table 3.6** below.

Table 3.6: Growth curve factors for key return period events

Crossing	Growth curve factors for return period (years)						
	2	20	50	75	100	200	1,000
1	1	2.09	2.64	2.93	3.15	3.75	5.59
3	1	2.02	2.55	2.83	3.04	3.63	5.45
5	1	2.02	2.56	2.83	3.05	3.63	5.46
6	1	2.02	2.56	2.83	3.05	3.63	5.46
7	1	2.02	2.56	2.83	3.04	3.63	5.46

3.2.41 Following derivation of growth curves from the pooling group analysis, the flood frequency curves were produced to provide a peak flow for each subject catchment over a range of flood return periods. These peak flows are presented in **Table 3.7** below.

Table 3.7: FEH Statistical Method Peak Flows (m^3/s)

Crossing	Peak flows (m^3/s) for return period (years)						
	2	20	50	75	100	200	1,000
1	0.63	1.32	1.67	1.85	1.99	2.36	3.53
3	0.20	0.40	0.51	0.56	0.60	0.72	1.08
5	0.14	0.29	0.36	0.40	0.43	0.52	0.78
6	0.17	0.35	0.44	0.49	0.52	0.62	0.94
7	0.10	0.19	0.25	0.27	0.29	0.35	0.52

3.2.42 As noted previously, the peak flows obtained using the FEH Statistical Method are based on indicative catchment descriptors obtained from the FEH web service (Ref. 1) combined with growth curves derived from pooling groups from the NRFA Peak Flows dataset (Ref. 4).

3.2.43 There are no gauging stations within any of the subject catchments or downstream along the subject watercourses. Additionally, each of the subject catchments is relatively small in size (i.e. catchment areas are all below $3km^2$). As such, there are limited gauging stations with comparable catchments within the stations that are suitable for pooling in the NRFA Peak Flows dataset (Ref. 4).

3.2.44 Furthermore, within the hydraulic model there is a need to provide peak flow hydrographs as inflows to the upstream extent of each of the models. The identification of peak flows using the FEH Statistical Method is insufficient for the modelling and the peak flows obtained via this method would need to be incorporated into a hybrid approach alongside another method (i.e. ReFH2) to obtain appropriate flow hydrographs.

c) Conclusions

3.2.45 Comments were provided by the Environment Agency in relation to the application of the ReFH2 method only in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137] and as a result it was recommended that the FEH Statistical Method should also be undertaken.

3.2.46 During the current modelling exercise a review of the FEH Statistical Method has been undertaken for the subject catchments. Therefore, two approaches, comprising the ReFH2 method, undertaken as part of the original modelling exercise, and the FEH Statistical Method as set out within this report, have now been considered.

3.2.47 The size and nature of the subject catchments, combined with the lack of observed data or gauging stations, means there is uncertainty associated with the application of either of the hydrological approaches.

3.2.48 Specifically, in relation to the FEH Statistical Method, the lack of suitable gauges available within the NRFA Peak Flows dataset (Ref. 4) to provide donor data transfer for an improvement in the QMED value and the limitation associated with the pooling group analysis to derive flood growth curves, means that the assessment is based on catchment descriptors alone, similar to the ReFH2 method.

3.2.49 A comparison of the 1 in 100 year peak flow values from the ReFH2 method and the FEH Statistical Method has been carried out, as summarised in **Table 3.8** below.

3.2.50 The results of the FEH Statistical Method indicate a lower peak flow than those produced by the ReFH2 Method for all of the subject catchments. This is reflected across all the return period events considered within the assessment.

Table 3.8: Comparison of 1 in 100-year peak flow estimates

Crossing	ReFH2 peak flow (m^3/s) for the 1 in 100-year event	FEH Statistical Method peak flow (m^3/s) for the 1 in 100-year event
1	3.68	1.99
3	0.90	0.60
5	0.60	0.43
6	0.68	0.52
7	0.42	0.29

3.2.51 Due to the limited data available it was determined that a conservative approach should be adopted in terms of assessing potential flood risk as a result of the proposed Sizewell link road.

3.2.52 Therefore, the ReFH2 method remains the preferred methodology for the derivation of peak flow estimates for all of the subject catchments and the peak flow hydrographs obtained from ReFH2 continue to be applied as the inflows into the current modelling exercise.

3.3 Model build

a) Common elements

3.3.1 Following their review of the hydraulic model, the Environment Agency provided some comments with regard to the model schematisation and representation of the design. These are collated in **Appendix B** of the **SLR FRA Addendum** (Doc Ref. 5.6Ad B).

3.3.2 One of the comments raised relates to the representation of the portal culverts in the model and states:

> *"Open channel sections have been used to represent crossings (portal culverts). At the time the modelling was undertaken Asymmetrical Conduit units were not available in FMP (introduced in Flood Modeller V4.5) […] Some amendments/additions to the model may be required […] it would be sensible to consider asymmetrical conduit units."*

3.3.3 In the updated modelling, the asymmetrical conduit units were used to allow proper representation of both shape and length of the proposed culverts. Additionally, culvert inlet and outlet loss units were also applied in order to fully represent the appropriate losses associated with culverts and pipes. In the instances where the existing structures were relatively small (length was not significant to introduce additional loses) or it was not possible to use 'Conduit' units due to stability issues (due to the size of the structure compared to the channel, its gradient or relatively small amount of flow), 'Orifice' units were applied instead.

3.3.4 'Spill' units were applied to represent the flow path over the tops of the various structures and roads that the watercourses crossed as well as spill over the banks to connect to the floodplain where it was represented with a reservoir unit (e.g. crossing 7).

3.3.5 To construct the updated models for each of the crossings and respective catchments, an additional topographical cross-section survey, conducted in August 2020, was used. This additional survey captured several cross-sections, both upstream and downstream of the proposed Sizewell link road crossing locations, as well as at the location of the crossing itself. For most of the watercourses, the survey covered an area further downstream than the extent of the model build for the Application. This allowed for the models to be extended further downstream to assess whether the proposed scheme would have any impacts on water levels further downstream of the crossings.

3.3.6 The surveyed cross-sections were used in the updated models to replace the cross-sections in the previous model build (for the Application) which were extracted from the Environment Agency Open Source LiDAR Data (Ref. 6). The LiDAR data available had relatively coarse resolution (1m or 2m) considering the size of the watercourses, which in some instances did not fully represent the channels of the smaller watercourses.

3.3.7 Whilst the floodplain immediately adjacent to the channels was captured in the survey where necessary to extend the cross-sections further, this has been supplemented with LiDAR data (Ref. 6). The 1m resolution data was not available for all required areas, primarily it was only available at crossings 1 and 2, therefore for all of the other crossings the 2m resolution data was used.

3.3.8 As discussed in **section 2.2**, a change in the highway drainage design strategy for the Sizewell link road requires the water stored in the attenuation ponds to be discharged into the respective local watercourses. This has been added to all the modelled crossings as a single inflow point with a specified constant flow rate combining flow from multiple attenuation ponds where applicable. Further information on location of the inflow points into the watercourses and the discharge rate is provided in sub-sections of **section 2.2** for each of the respective crossings.

3.3.9 Further details on the design of the attenuation ponds and the modified Drainage Strategy are provided in the Technical Note '*Sizewell Link Road*

- *DCO Design Validation – Drainage*' (provided in **Volume 3, Appendix 6.2.B** of the **ES Addendum**, (Doc Ref. 6.14 6.2B) [AS-248]) prepared to validate the **Outline Drainage Strategy** proposed in **Volume 2, Appendix 2A** of the **ES** [APP-181].

b) Crossing specific elements

3.3.10 In addition to the overall changes to the updated hydraulic models, further changes were made as required to represent the additional information, i.e. surveyed cross-sections and structures, or to reflect the updated design features specific to the relevant crossing.

3.3.11 Crossings 1 and 2 were combined into one model as the models were extended further downstream with the additional survey, beyond the point of their confluence. The baseline model was updated with the additional surveyed cross-sections and five existing structures, i.e. two culverts at field crossings on the main river (crossing 1), one culvert at a field crossing on the Ordinary Watercourse (crossing 2) and two culverts underneath B1122 joining the two watercourses. These were not included in the previous models build for the Application.

3.3.12 For the post-development model, the specific design features, including the diversion channel at Fordley Road and the extended culvert upstream of crossing 1, were represented as per details discussed in **section 2.2b)** and **section 0**, using a model schematisation described in **section 3.3a)**.

3.3.13 As discussed in **section 2.2d)**, the watercourse on crossing 3 has a ford which leads from Wash Lane, over Hawthorn Road, and into the field ditch. The lead up to this structure is represented in the model via a spill unit and an orifice unit to represent the actual structural element which conveys water into the ditch (see **Plate 3.1**). This has been included in both the baseline and post-development models, as there is no change proposed to this structure as part of the design.

3.3.14 In addition, the hydraulic model for crossing 3 was extended further downstream with the additional survey information, beyond the B1122. Therefore, the model was also updated to include the existing culvert underneath the B1122. This change was applied in both the baseline and post-development models.

3.3.15 For the post-development model of crossing 3, the proposed design discussed in **section 2.2d)** was represented with the common approach outlined in **section 3.3a)**.

Plate 3.13.1: Hawthorn Road ford (photograph taken on 24.07.2020)

3.3.16 The updated model for crossing 5 was extended further downstream with the additional cross-sections, beyond B1122, allowing assessment of flood levels in the vicinity of crossing 4. This was not possible with the model developed for the Application, as the extent of that model was too short to cover the area for the proposed crossing 4.

3.3.17 The baseline model was also updated to include three existing structures that were not included in the previous model, i.e. small and bigger field drain crossings upstream of the proposed crossing 5, and a culvert underneath the B1122 downstream of crossing 5 (at the location of the proposed crossing 4).

3.3.18 In the post-development model, the two upstream structures are removed to fit in the proposed crossing 5, as discussed in **section 2.2e)**. The design of crossing 5 was represented with the common approach outlined in **section 3.3a)**.

3.3.19 For crossing 6 both the baseline and post-development models were updated with the additional surveyed cross-sections. There were no existing structures / field crossings found on this watercourse. The design of the portal culvert was represented as per the approach outlined in **section 3.3a)** with details of the design discussed in **section 2.2f)**.

3.3.20 The hydraulic model for crossing 7 was only developed in the updated study as it was not modelled in the Application. The baseline model was built based on the additional survey, including cross-sections of the Ordinary Watercourse and two existing structures i.e. culvert on the existing local road (upstream of the proposed crossing 7) and the pipe culvert underneath the B1122.

3.3.21 Crossing 7 has a low point in the left floodplain just upstream of the B1122, which acts as the primary conveyance route for surface water flooding and to some extent the fluvial flooding (once water exceeds the bank levels). The floodwater flows over the existing B1122 road and is assumed to drain back into the watercourse downstream.

3.3.22 Due to access restrictions, the watercourse downstream of the B1122 could not be surveyed and therefore cross-sections were approximated based on the surveyed cross-sections upstream, general gradient of the watercourse and supplemented with LiDAR data.

3.3.23 In order to represent the floodplain, a 'reservoir' unit was used, in place of extended cross-sections as this was deemed to be more suitable to ensure that appropriate storage capacity is included. This reservoir unit was generated using the 2m LiDAR data, as 1m LiDAR was not available in this area.

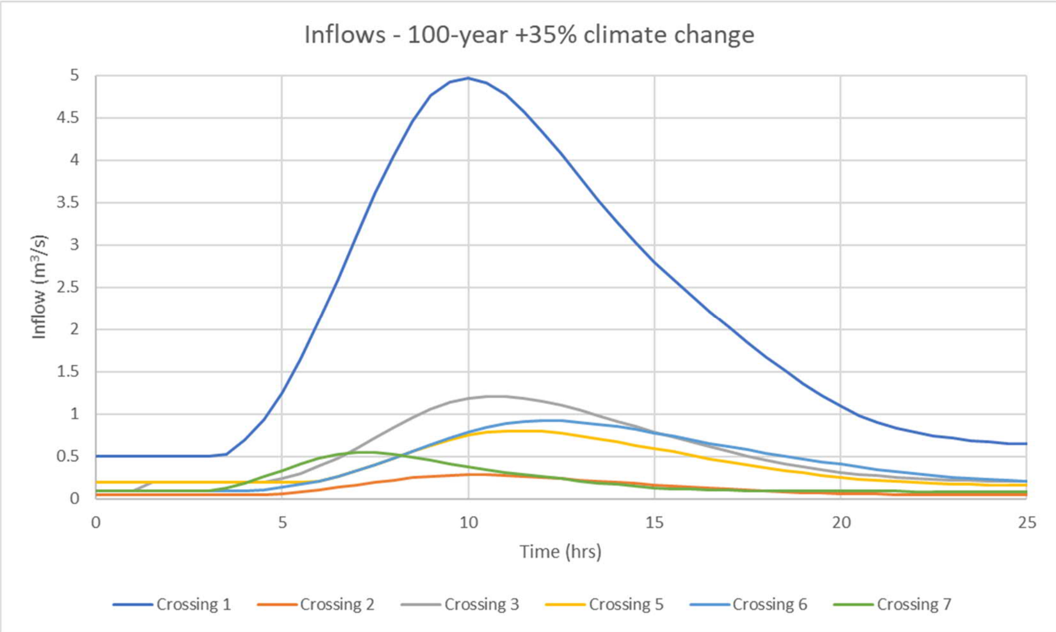
3.3.24 In the post-development scenario, the existing pipe under the B1122 was extended as discussed in **section 2.2g)**. The floodplain was represented as two separate reservoir units, one on the upstream side of the Sizewell link road, and another on the downstream side capturing the land between the Sizewell link road and the B1122 (**Plate 2.9**). The two reservoirs were connected with the box flood relief culvert as per the proposed design (**section 2.2g)**).

3.4 Boundary conditions

3.4.1 There were no changes made to the boundary conditions or applied climate change allowances presented in the Application as set out in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137].

3.4.2 For the upstream inflow boundary conditions, flow hydrographs derived with the ReFH2 method were used as discussed in **section 3.2c)**. Derived flow hydrographs for the 1 in 100-year return period with 35% climate change event are presented in **Plate 3.2**. The downstream boundary of each model was defined as a 'Normal Depth' boundary due to lack of any measured stage or flow data close to the model boundary.

Plate 3.23.2: Inflow hydrographs for each of the crossings (1 in 100-year event +35% climate change)



3.4.3 In addition to the main inflows at the upstream ends of each watercourse, there was an extra 0.01m^3/s of flow added in the post-development models to represent inflow from the highway drainage attenuation ponds, as discussed in **section 2.2** and **section 3.3a)**. This additional flow was set as constant across all considered return period events and climate change scenarios.

3.4.4 All updated models have an increased sweetening flow in order to ensure model stability during the first several hours of each simulation. This is well below peak flow and doesn't impact the final results.

3.4.5 Initial conditions for all the updated models were preferentially generated using a steady state direct method where possible.

3.5 Model parameters

3.5.1 The hydraulic modelling software Flood Modeller was used, using version 4.6. This version was used as it was the latest version available at commencement of modelling. This version of the software includes the 'asymmetrical conduit' that allows representation of the portal culverts in both shape and length. This was not available in the previous version of the software used in the modelling for the Application.

3.5.2 Similarly, to the model for the Application, in the updated models the roughness coefficients of 0.04 and 0.06n were applied within the channels and the floodplains respectively. These were based on relevant literature (Ref. 7) and available photographic evidence collected during the channel cross-sections survey (see **Plate 3.3**). In addition, sensitivity testing was carried out by adjusting the roughness (Mannings' 'n') values used within the model by 20% (both increase and decrease in line with standard Environment Agency best practice). Further information related to this sensitivity testing and results is presented in **Section 4.3.**

Plate 3.33.3: Photograph of a typical channel section

3.5.3 In order to maintain model stability, the automated Preissmann slots were enabled for all the model runs. These are triangular slots that can be added to the base of a river section to aid model stability during periods of low flow. All other model parameters were set to the default values suggested by the software developer.

3.5.4 Further details on the model build, boundary conditions and model parameters adopted from the previous model developed for the Application are available in the **Appendix A: Sizewell Link Road Modelling Report** (Doc Ref. 5.6 A) [APP-137].

4 MODEL RESULTS

4.1 Overview

4.1.1 The updated models for all considered crossings were simulated for a series of return period events (5-year, 20-year, 100-year and 1,000-year) and two climate change scenarios, i.e. 35% (higher central) and 65% (upper end) to assess flood risk throughout the lifetime of the development.

4.1.2 The 1 in 100-year return period with 65% climate change allowance was considered as the basis of design scenarios, whereas the 1 in 100-year return period with 35% climate change allowance was used to assess any potential off-site impact on flood risk as a result of the proposed road scheme.

4.1.3 In their review of the hydraulic modelling and associated reporting, the Environment Agency raised comments (**Appendix B** of the **SLR FRA Addendum** (Doc Ref. 5.6Ad B) that no mapping has been provided to illustrate flood risk in the crossing areas for the baseline and post-development scenarios and understand impacts to off-site receptors.

4.1.4 For the updated hydraulic modelling with additional survey information, flood maps have been derived. Where out of bank flooding was limited, the 2D flood maps were supplemented with 1D cross-sectional plots of flood levels within the channels at key locations within the model. All the figures were used to inform the assessment of flood risk at the proposed crossings locations (baseline scenario) and impacts on flood risk to off-site receptors.

4.1.5 The flood mapping is provided for the baseline (**APPENDIX A:**) and the with scheme i.e. post-development (**APPENDIX B:**) scenarios, as well as illustrating the difference between the two scenarios (**APPENDIX C:**).

4.1.6 In addition to the key model results, a series of sensitivity tests were conducted to determine the sensitivity of the models and to ensure flood risk to and from the proposed development was examined fully. These tests are as follows:

- 20% increase in flows;
- 20% increase in roughness coefficient;
- 20% decrease in roughness coefficient;
- 33% blockage of the Sizewell link road culvert; and
- 67% blockage of the Sizewell link road culvert.

4.1.7 These tests were conducted for both the 100-year event with 35% climate change as well as the 100-year event with 65% climate change in order to examine the impact on on-site and as well as for off-site receptors.

4.1.8 From the above sensitivity tests, the blockage scenario was not previously assessed in the Application, which was raised by the Environment Agency in their review, hence the risk of blockage and potential impacts have been considered in the updated modelling.

4.2 Baseline and With Scheme scenario runs

a) Crossings 1 and 2

4.2.1 Crossings 1 and 2 are part of the same hydraulic model extended beyond their confluence downstream of the B1122. Flood depth maps for crossings 1 and 2 for all modelled events are provided in **APPENDIX A:** (**Figure A1.1** – **Figure A1.12**) for the baseline scenario and in **APPENDIX B**: (**Figure B1.1** – **Figure B1.12**) for the post-development scenario. In **APPENDIX C:** (**Figure C1.1** – **Figure C1.12**) difference figures are provided between the post-development (with scheme) and baseline scenarios. However, since the respective crossings are relatively far apart, the results for each of the crossings are discussed separately.

4.2.2 The flood depth maps in **APPENDIX A:** show that, for the baseline 1 in 100-year present day scenario, there is very limited flooding which is largely confined to Fordley Road itself. In the climate change scenarios for the same event, however, there is some flooding within the site boundary on the left floodplain and also immediately upstream of the B1122 (outside of site boundary). However, the properties located just upstream of the site boundary are not at risk of flooding under those scenarios.

4.2.3 The results in **APPENDIX B** show that water does not flow out of bank within the diverted channel, due to its increased capacity when compared with the existing watercourse channel. This is confirmed in **Plate 4.1** and **Plate 4.2,** which show the peak flood level within the diversion channel upstream and downstream of the crossing respectively for all assessed return period events incorporating an allowance of 65% for climate change.

~~4.2.3~~4.2.4 **Plate 4.3** presents the maximum flood levels within the portal culvert for the 1 in 100-year and 1,000-year event with 35% and 65% climate change allowance. It is demonstrated that the peak flood level for the most extreme event is less than 10.7mAOD (mammal ledge level) and therefore a dry mammal passage would be available at all times.

Plate 4.14.1: Maximum flood levels within the diversion channel upstream of crossing 1 (model node SW1-Div3) – 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year with +65% climate change

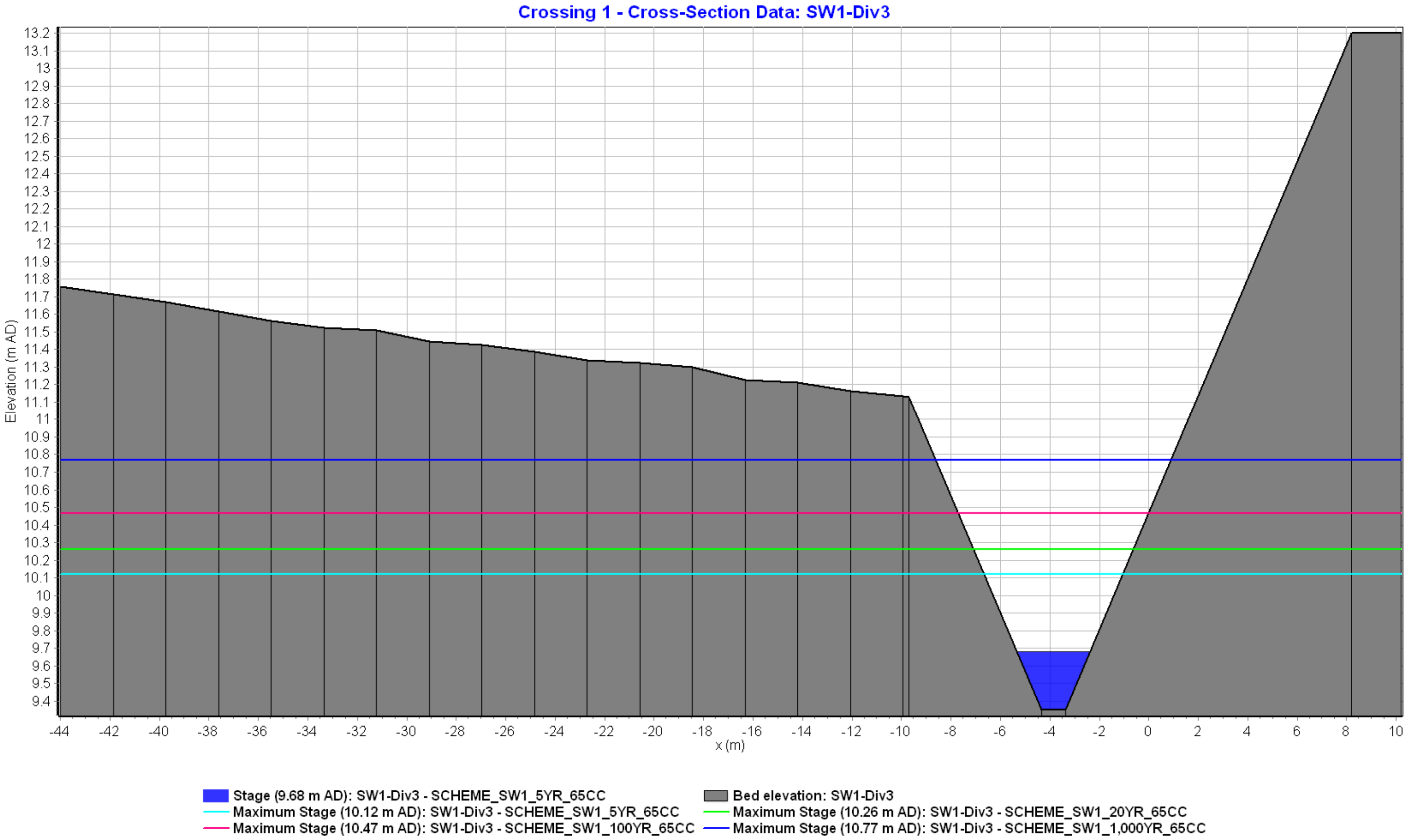


Plate 4.24.2: Maximum flood levels within the diversion channel upstream of crossing 1 (model node SW1-Div6) – 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year with +65% climate change

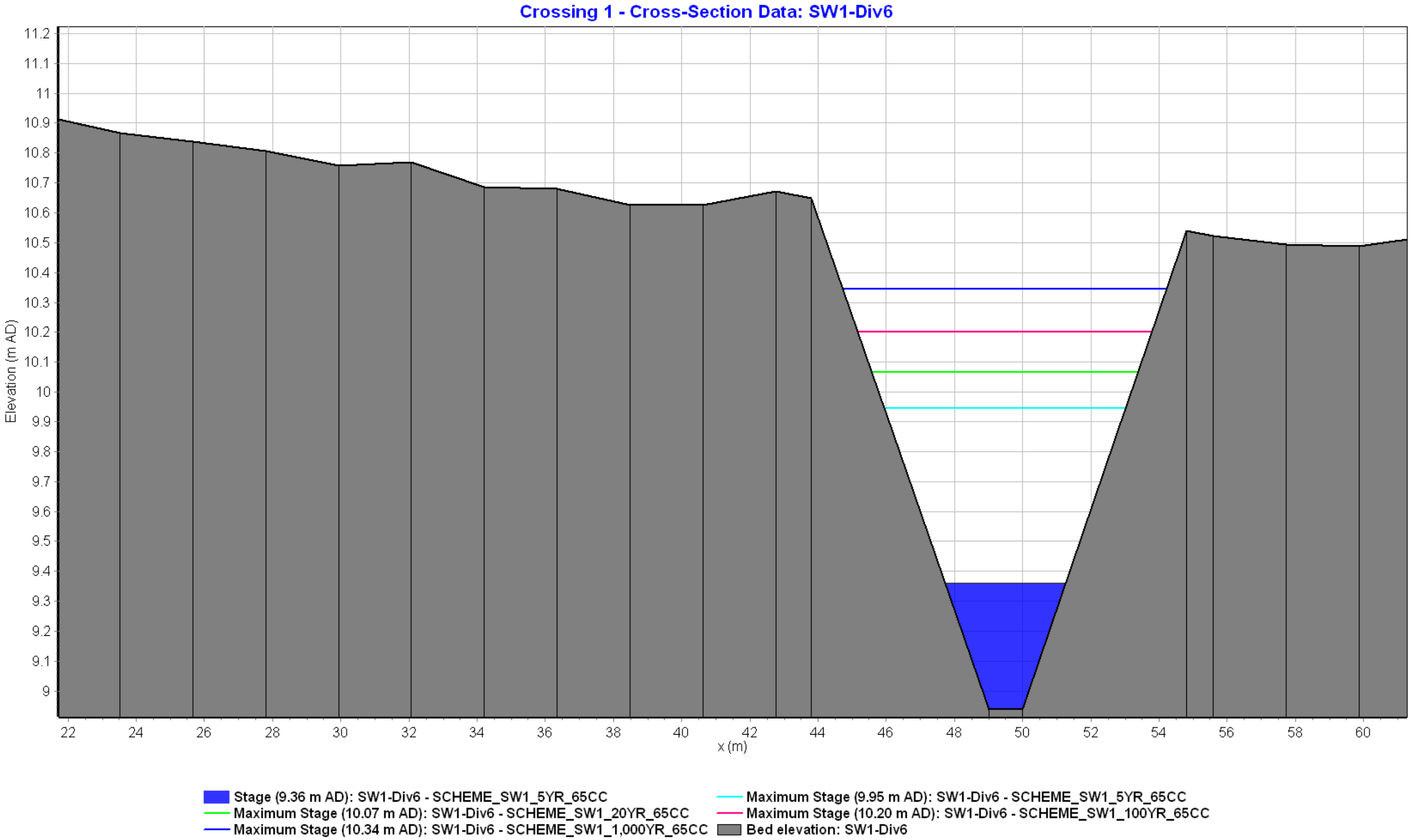
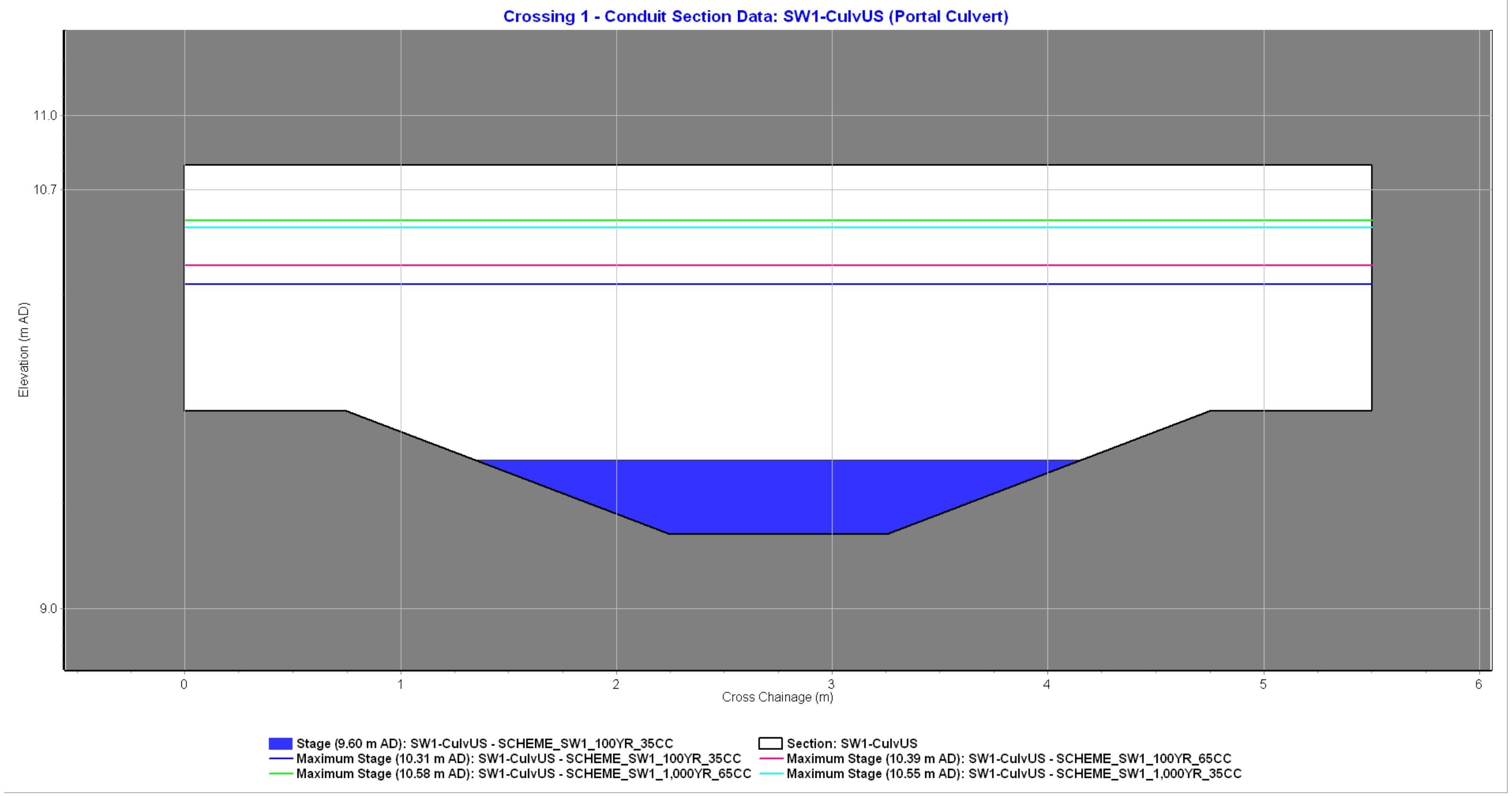


Plate 4.3: Maximum flood levels within the portal culvert at crossing 1 (model node SW1-CulvUS) – 1 in 100-year and 1 in 1,000-year with +35% and +65% climate change



4.2.44.2.5 Results of the peak water levels for the baseline, with scheme and difference scenarios at the key locations (selected model nodes illustrated in **Plate 4.4**Error! Reference source not found.) for all modelled return period events and climate change scenarios for crossing 1 are presented below in **Table 4.1**.

Plate 4.44.3: Location of the key model nodes on crossings 1 and 2

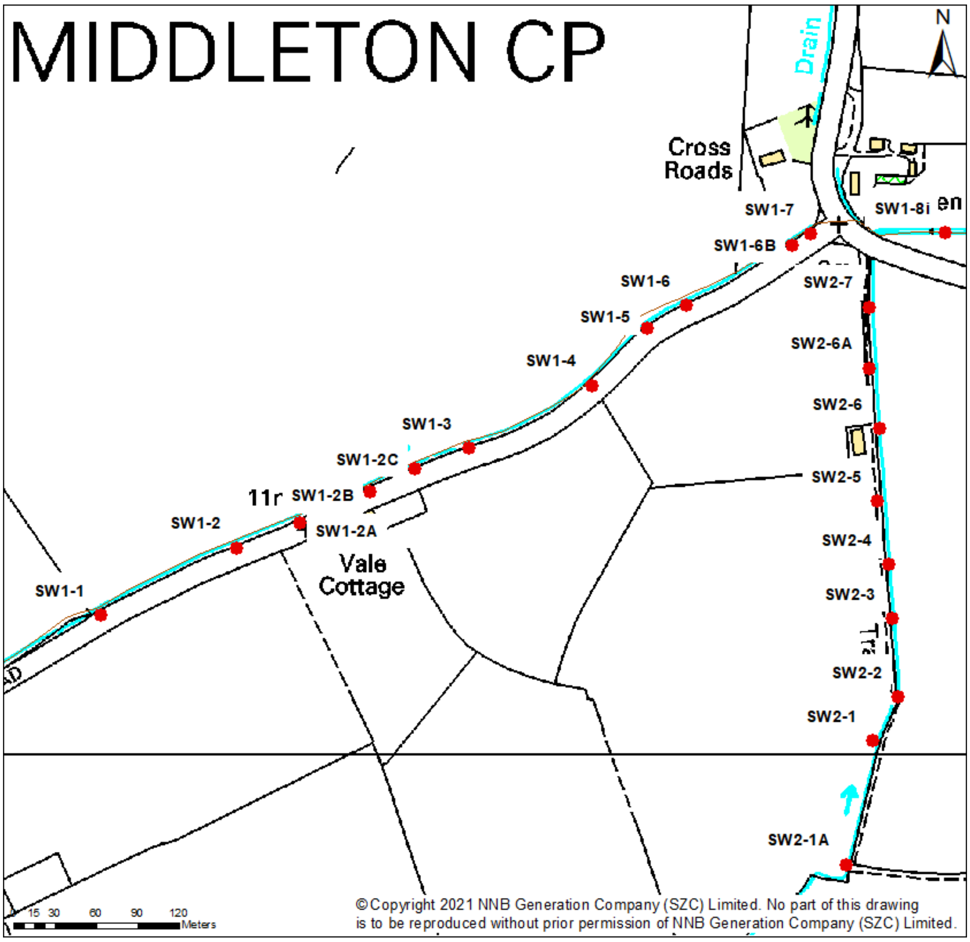


Table 4.1: Modelled peak water levels for crossing 1

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
Next to residential house upstream (SW1-2B)	5	11.14	10.77	-0.37
	5 + 35%CC	11.20	10.86	-0.34
	5 + 65%CC	11.25	10.94	-0.31
	20	11.21	10.88	-0.33
	20 + 35%CC	11.28	10.99	-0.29

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	20 + 65%CC	11.33	11.07	-0.26
	100	11.32	11.06	-0.26
	100 + 35%CC	11.40	11.16	-0.24
	100 + 65%CC	11.45	11.23	-0.22
	1,000	11.48	11.27	-0.21
	1,000 + 35%CC	11.56	11.42	-0.14
	1,000 + 65%CC	11.62	11.51	-0.11
Upstream of the Sizewell link road diversion and culvert (SW1-2C)	5	11.13	10.41	-0.72
	5 + 35%CC	11.19	10.50	-0.69
	5 + 65%CC	11.23	10.57	-0.66
	20	11.20	10.52	-0.68
	20 + 35%CC	11.26	10.63	-0.63
	20 + 65%CC	11.30	10.71	-0.59
	100	11.30	10.70	-0.60
	100 + 35%CC	11.37	10.88	-0.49
	100 + 65%CC	11.41	10.94	-0.47
	1,000	11.43	10.98	-0.45
	1,000 + 35%CC	11.50	11.15	-0.35
	1,000 + 65%CC	11.56	11.30	-0.26
Downstream of the Sizewell link road diversion and culvert (SW1-5)	5	9.40	9.40	0.00
	5 + 35%CC	9.52	9.52	0.00
	5 + 65%CC	9.60	9.61	0.01
	20	9.54	9.54	0.00
	20 + 35%CC	9.67	9.67	0.00
	20 + 65%CC	9.79	9.80	0.01
	100	9.78	9.78	0.00
	100 + 35%CC	9.94	9.94	0.00
	100 + 65%CC	10.01	10.01	0.00
	1,000	10.05	10.05	0.00
	1,000 + 35%CC	10.16	10.16	0.00
	1,000 + 65%CC	10.23	10.23	0.00

4.2.54.2.6 The road level of the Sizewell link road at the location of crossing 1 is situated at 13.50mAOD. As such the development itself would not be at risk of flooding under any of the considered extreme events and climate change scenarios, as the maximum flood level for the 1 in 1,000-year event with 65% climate change allowance is 11.30mAOD for the with scheme scenario and 11.56mAOD for the baseline scenario, providing up to 2m of freeboard.

4.2.64.2.7 In Error! Reference source not found., the peak flood levels upstream of the crossing and the diversion channel are lower as a result of the scheme. This is due to the increased conveyance of the diverted channel. Immediately downstream of the diversion, flood levels are slightly increased, by up to 0.01m, for some of the assessed scenarios, however the difference is very localised and contained within the site boundary (up to 20m downstream) with no change in flood levels further downstream (this is confirmed in the figures presented in **APPENDIX C:**).

4.2.74.2.8 **Plate 4.5** (immediately upstream of the diversion channel) and **Plate 4.6Plate 4.5** (downstream of the diversion channel) show the comparison of peak flood levels between the post-development (with scheme) and baseline scenarios for the 1 in 100-year event with 35% and 65% climate change allowance.

4.2.84.2.9 **Plate 4.5** and **Plate 4.6** confirm the results presented in Error! Reference source not found., showing a reduction in peak flood levels upstream of the diversion channel and no change in flood levels downstream.

Plate 4.54.4: Comparison of maximum flood levels immediately upstream of diversion channel at crossing 1 (model node SW1-2C) – 1 in 100-year event +35% and +65% climate change

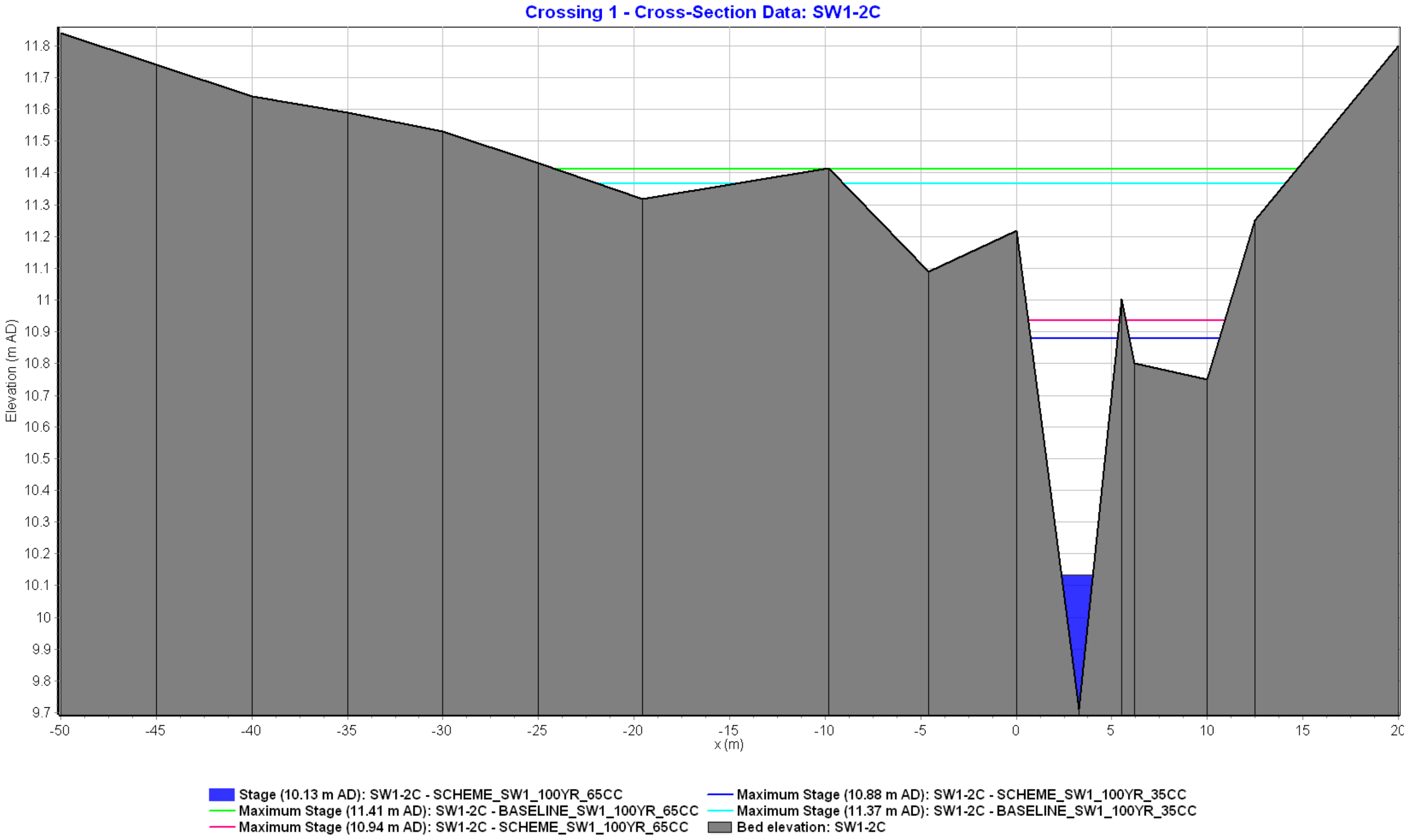
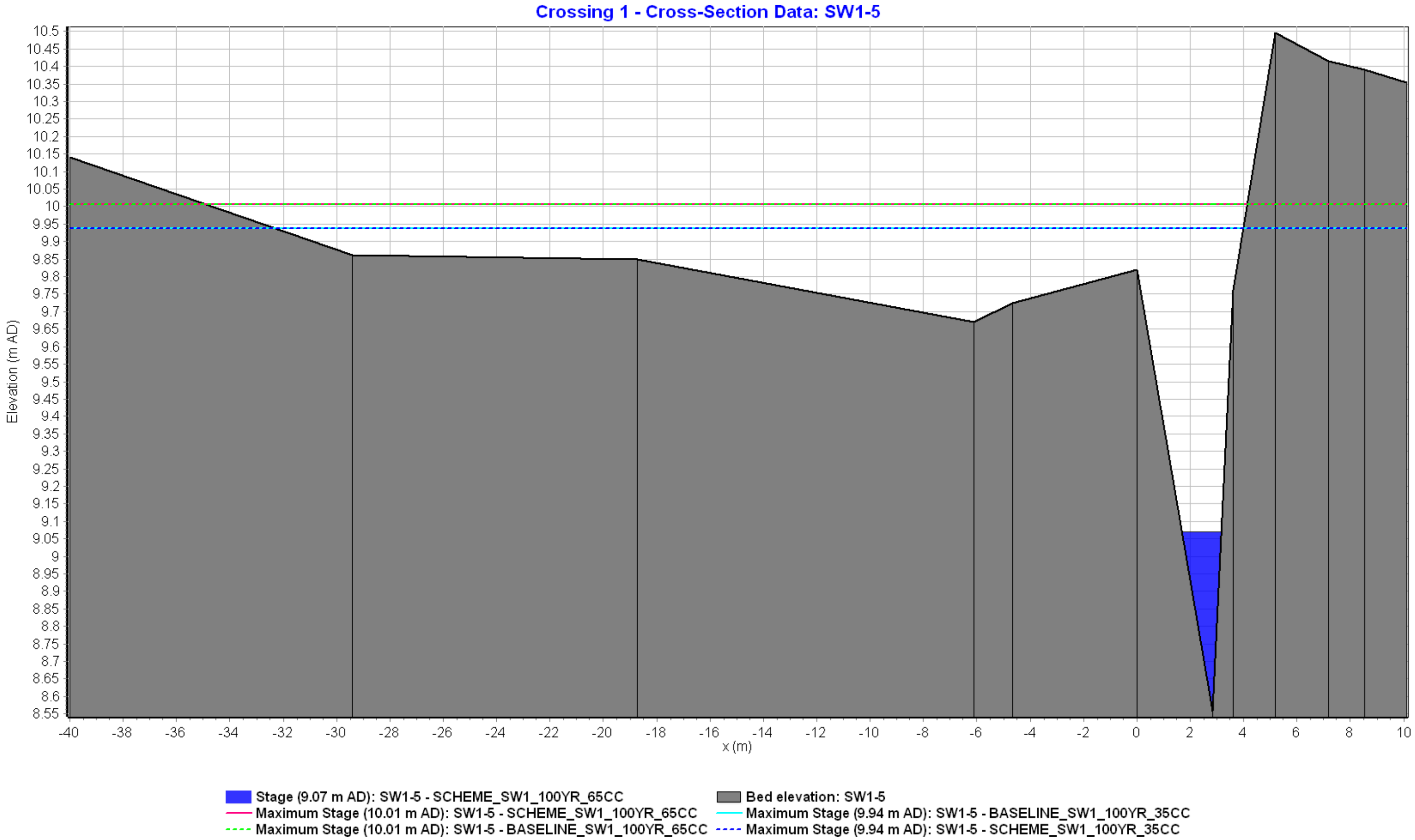


Plate 4.6~~4.5~~: Comparison of maximum flood levels downstream of crossing 1 (model node SW1-5) – 1 in 100-year event +35% and +65% climate change



~~4.2.9~~4.2.10 Flood depth maps in **APPENDIX A:** for the baseline scenario and in **APPENDIX B**: for the post-development scenario show that, in both scenarios flood risk at the proposed crossing 2, along the ordinary watercourse, is low. Furthermore, flooding is mostly contained within the watercourse channel up to the confluence with the Middleton Watercourse at the junction between Fordley Road and the B1122.

~~4.2.10~~4.2.11 Results of the peak water levels for the baseline, with scheme and difference scenarios at the key locations (location of the model nodes as shown in **Plate 4.4**Error! Reference source not found.) for all modelled return period events and climate change scenarios for crossing 2 are presented in **Table 4.2**.

Table 4.2: Modelled peak water levels for crossing 2

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
Upstream of the Sizewell link road (SW2-4)	5	12.50	12.50	0.00
	5 + 35%CC	12.53	12.54	0.01
	5 + 65%CC	12.55	12.55	0.00
	20	12.54	12.54	0.00
	20 + 35%CC	12.57	12.57	0.00
	20 + 65%CC	12.60	12.60	0.00
	100	12.604	12.604	0.00
	100 + 35%CC	12.64	12.64	0.00
	100 + 65%CC	12.67	12.67	0.00
	1,000	12.69	12.69	0.00
	1,000 + 35%CC	12.74	12.74	0.00
	1,000 + 65%CC	12.78	12.78	0.00
Downstream of the Sizewell link road (SW2-5)	5	11.51	11.52	0.01
	5 + 35%CC	11.54	11.54	0.00
	5 + 65%CC	11.56	11.57	0.01
	20	11.54	11.55	0.01
	20 + 35%CC	11.58	11.59	0.01
	20 + 65%CC	11.60	11.61	0.01
	100	11.60~~4~~	11.60~~5~~	0.00~~1~~
	100 + 35%CC	11.64	11.65	0.01
	100 + 65%CC	11.68	11.68	0.00

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	1,000	11.70	11.70	0.00
	1,000 + 35%CC	11.75	11.76	0.01
	1,000 + 65%CC	11.79	11.79	0.00

~~4.2.11~~4.2.12 The road level of the Sizewell link road itself is set at 16.5mAOD at the location of crossing 2. As such the development would not be at risk of fluvial flooding under any of the considered extreme events and climate change scenarios, as the maximum flood level for the 1 in 1,000-year event with 65% climate change allowance is 12.78mAOD.

~~4.2.12~~4.2.13 **Table 4.2** shows that the difference in maximum flood levels between the baseline and post-development for crossing 2 is minimal, comprising a maximum of 0.01m across all assessed scenarios.

4.2.14 This is confirmed in **Plate 4.7** and **Plate 4.8**, which present the comparison of peak flood levels between the post-development (with scheme) and baseline scenarios for the 1 in 100-year event with 35% and 65% climate change allowance at model nodes upstream and downstream of the crossing 2 (location of the model nodes as shown in **Plate 4.4**). These show that there is no change in peak flood levels upstream or downstream of the proposed Sizewell link road at crossing 2.

~~4.2.13~~4.2.15 In addition, **Figure C2.2** and **Figure C2.3** in **APPENDIX C:** show that the peak flood levels are well below the bank levels and therefore dry mammal passage would be available at all times.

Plate 4.7~~4.6~~: Comparison of maximum flood levels upstream of crossing 2 (model node SW2-4) – 1 in 100-year event +35% and +65% climate change

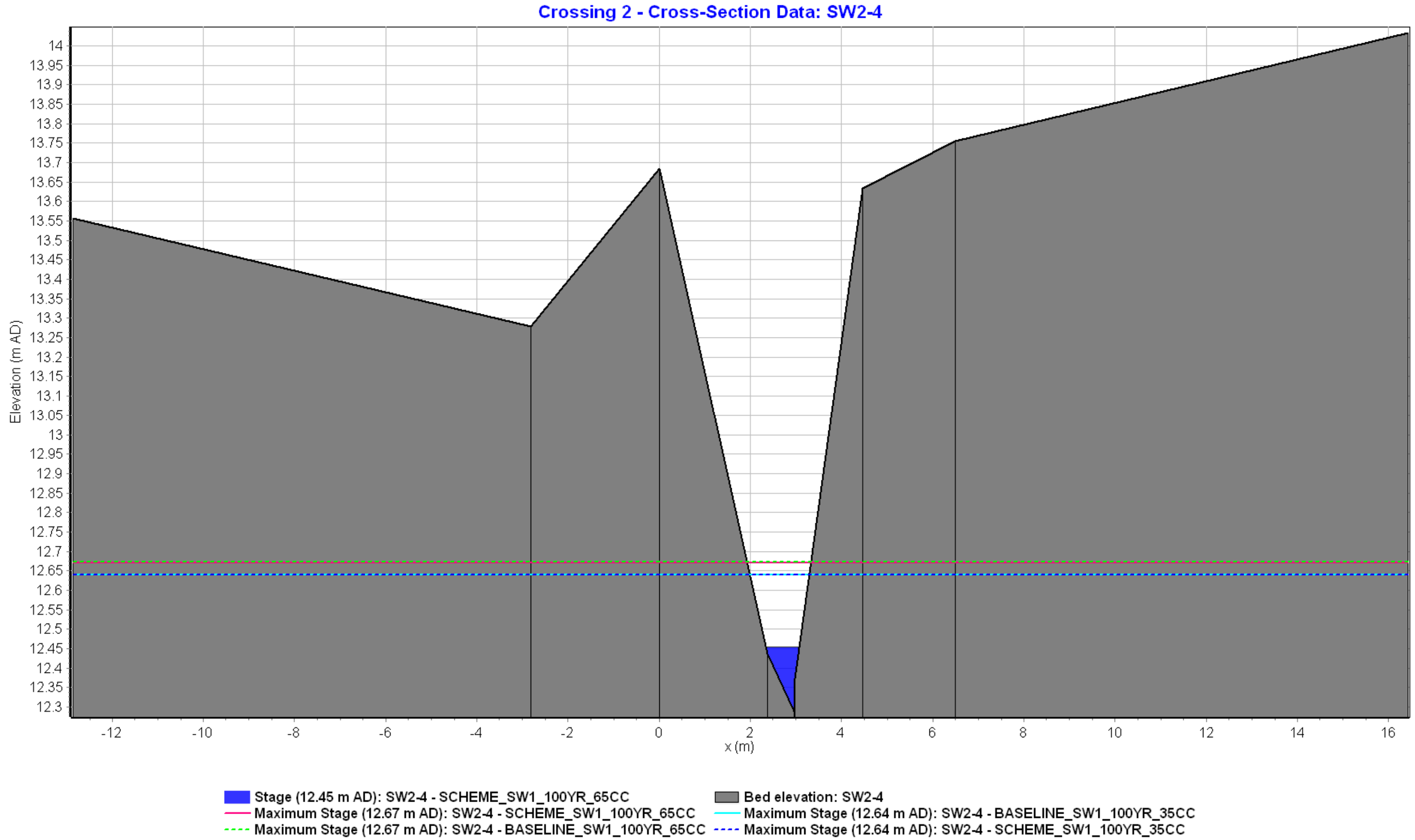
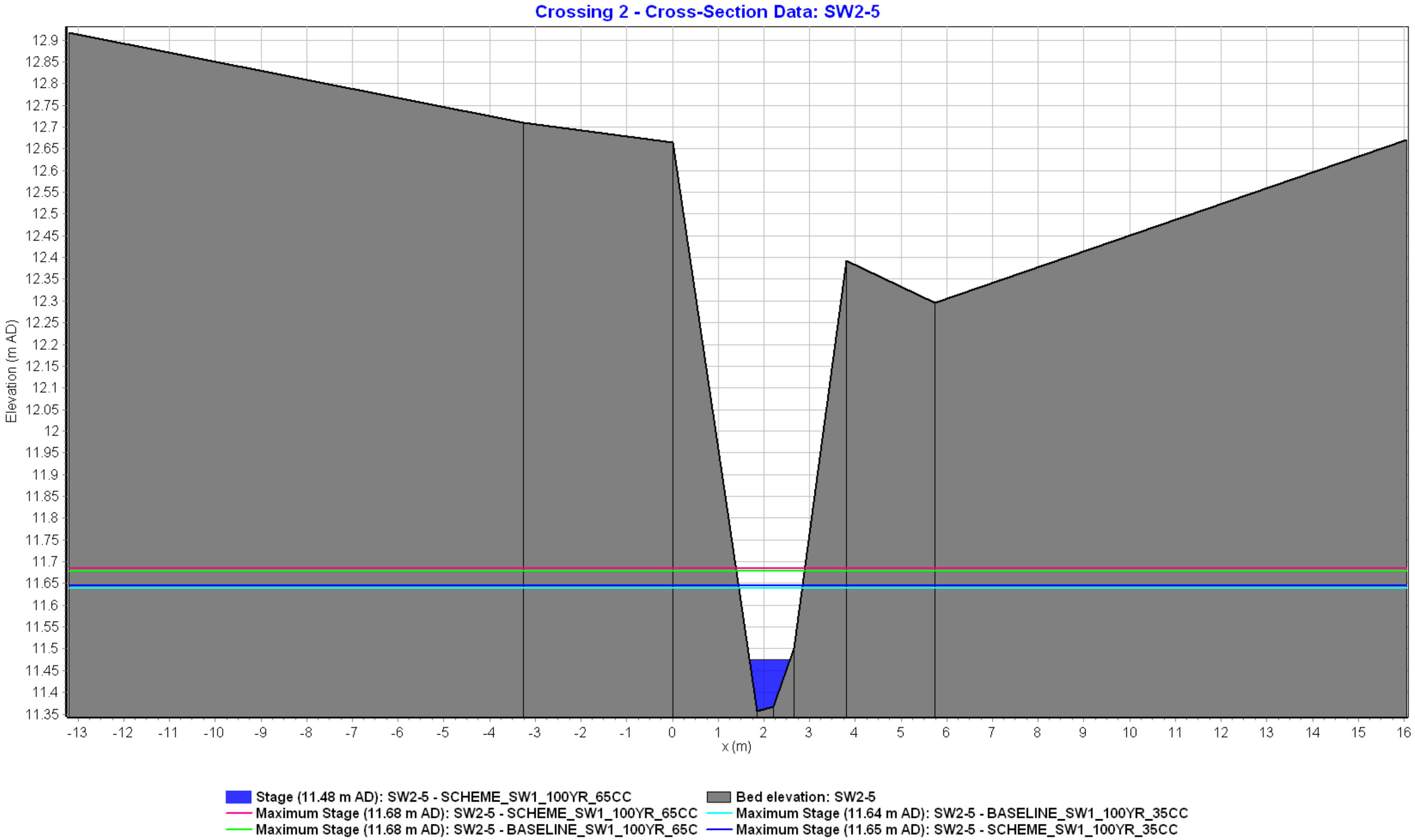


Plate 4.84.7: Comparison of maximum flood levels upstream of crossing 2 (model node SW2-5) – 1 in 100-year event +35% and +65% climate change



b) Crossing 3

4.2.144.2.16 Flood depth maps for crossing 3 (**Figure A3.7** – **Figure A3.9** in **APPENDIX A:**) show that, for the baseline 1 in 100-year present day and climate change scenarios, there is very limited out of bank flooding along this watercourse and the flood extents are relatively small and localised. Flood extent is limited to the area around the corner of Hawthorn Road downstream of Hawthorn Cottages and small areas on the south-eastern (right) floodplain further downstream along the watercourse. There are no properties at risk within these flood extents.

4.2.154.2.3 Results of the peak water levels at the key locations (selected model nodes as illustrated in **Plate 4.9**) for crossing 3 are presented below in **Table 4.3**.

4.2.164.2.4 The proposed road level of the Sizewell link road at the location of crossing 3 is set at 11.60mAOD, whereas the maximum flood level for the 1 in 1,000-year event with 65% climate change allowance presented in **Table 4.3** upstream of the crossing is 8.78mAOD, giving more than 2.5m of freeboard. Therefore, the updated model results show that the development itself would not be at risk of flooding under any of the considered extreme events and climate change scenarios.

Plate 4.94.8: Location of the key model nodes on crossing 3

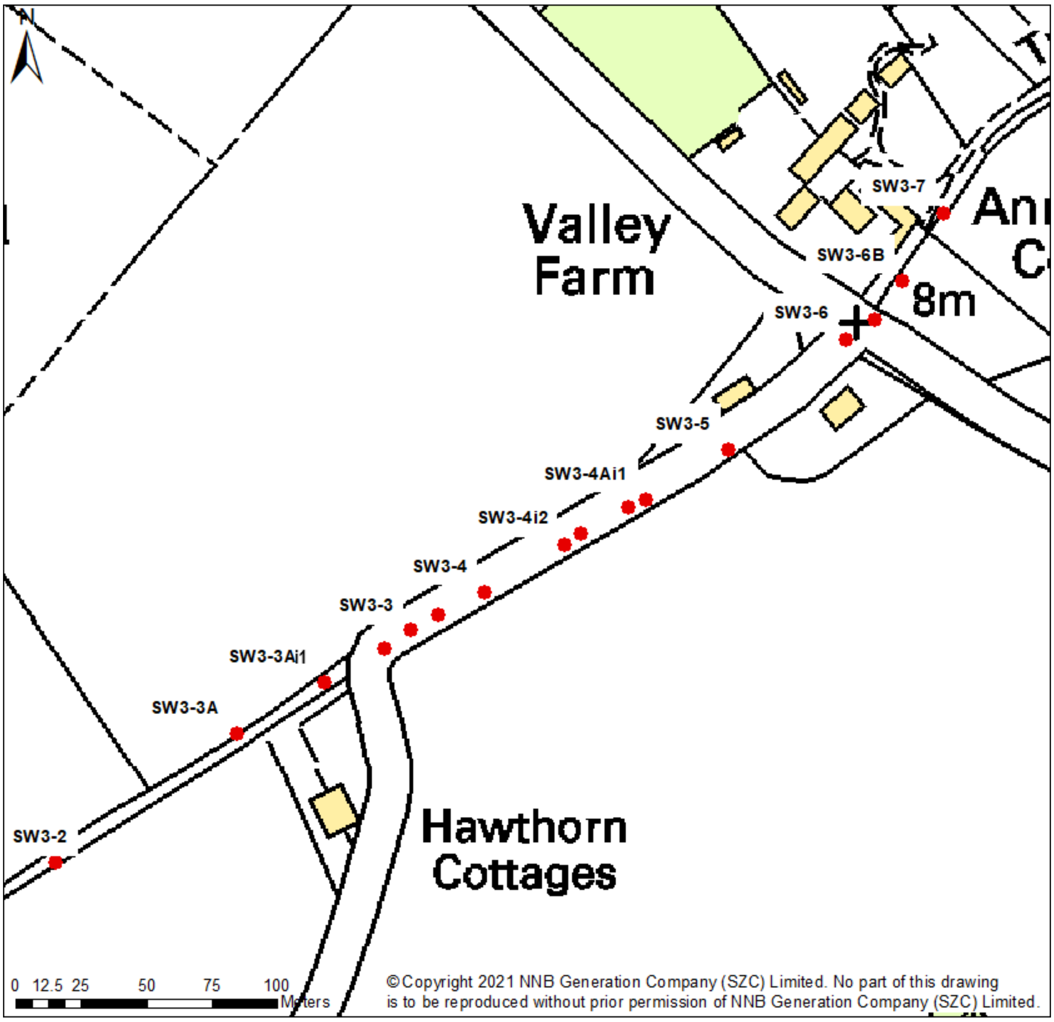


Table 4.3: Modelled peak water levels for crossing 3

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
Next to residential house upstream of the ford (SW3-3Ai1)	5	9.38	9.38	0.00
	5 + 35%CC	9.40	9.40	0.00
	5 + 65%CC	9.42	9.42	0.00
	20	9.41	9.41	0.00
	20 + 35%CC	9.43	9.43	0.00
	20 + 65%CC	9.46	9.46	0.00
	100	9.46	9.46	0.00
	100 + 35%CC	9.49	9.49	0.00

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	100 + 65%CC	9.52	9.52	0.00
	1,000	9.54	9.54	0.00
	1,000 + 35%CC	9.59	9.59	0.00
	1,000 + 65%CC	9.62	9.62	0.00
Upstream of the Sizewell link road culvert (SW3-4i2)	5	8.07	8.15	0.08
	5 + 35%CC	8.14	8.22	0.08
	5 + 65%CC	8.17	8.27	0.10
	20	8.15	8.24	0.09
	20 + 35%CC	8.20	8.32	0.12
	20 + 65%CC	8.24	8.38	0.14
	100	8.24	8.38	0.14
	100 + 35%CC	8.30	8.52	0.22
	100 + 65%CC	8.34	8.57	0.23
	1,000	8.36	8.61	0.25
	1,000 + 35%CC	8.43	8.72	0.29
	1,000 + 65%CC	8.49	8.78	0.29
Downstream of the Sizewell link road culvert (SW3-4Ai1)	5	7.88	7.86	-0.02
	5 + 35%CC	7.95	7.92	-0.03
	5 + 65%CC	7.98	7.96	-0.02
	20	7.96	7.93	-0.03
	20 + 35%CC	8.01	7.99	-0.02
	20 + 65%CC	8.04	8.03	-0.01
	100	8.04	8.03	-0.01
	100 + 35%CC	8.09	8.07	-0.02
	100 + 65%CC	8.12	8.11	-0.01
	1,000	8.14	8.12	-0.02
	1,000 + 35%CC	8.20	8.18	-0.02
	1,000 + 65%CC	8.24	8.22	-0.02

~~4.2.17~~4.2.5 Results in **Table 4.3** show that the water levels immediately upstream of the proposed crossing have increased up to 0.3m when compared to the baseline scenario. However, the main impact of this increased flood level is on the strip of land between the existing Hawthorn Road and the connection road to the Sizewell link road (within the site boundary) and therefore this was deemed acceptable. The extent of the increased flood levels remains well within the red line boundary for the Sizewell link road and overall, the change is very localised.

~~4.2.18~~4.2.6 The increased levels do not propagate upstream far enough to impact the residential property closest to the proposed development. This property is situated at around 9.8mAOD and so remains above flood levels for all modelled scenarios.

~~4.2.19~~4.2.7 As such, it was deemed not necessary to incorporate a flood relief box culvert alongside the portal culvert. Within previous analysis in the Application, it was assumed that inclusion of the box culvert would be necessary to replicate the flow path which appears along Hawthorn Road itself, however the updated design has shown that this is no longer required.

~~4.2.20~~4.2.8 **Plate 4.10** and **Plate 4.11** show that these increased levels dissipate rapidly, with the impact on the flood levels extending only approximately 40m upstream of the entrance to the portal culvert 100-year +35% climate change and approximately 50m for the 100-year +65% climate change scenario.

~~4.2.21~~4.2.9 In these plates the residential property is situated at approximately 190m chainage, the Hawthorn Road ford is at 205m, the entrance to the portal culvert is at 324m, and the exit from the culvert is at 359m.

~~4.2.22~~4.2.10 **Figure C3.1** – **Figure C3.12** in **APPENDIX C:** present the difference in peak flood depth between the baseline and post-development scenarios for the considered events. The figures show that the change in flood depth as a result of the proposed development is limited to the right floodplain along the watercourse. The increase in flood depth is mostly upstream of crossing 3, with an increase in flood depth up to 0.03m, 0.04m and 0.05m for the 100-year +35% climate change, 100-year +65% climate change and 1,000-year +65% climate change scenarios, respectively.

~~4.2.23~~4.2.11 In addition, supplementary cross-sectional plots of comparison of the maximum flood levels between the with scheme and baseline scenarios at key model locations are provided in **Figure C3.13** – **Figure C3.17** in **APPENDIX C:** .

Plate 4.104.9: Long section comparison for crossing 3 – 1 in 100-year + 35% climate change

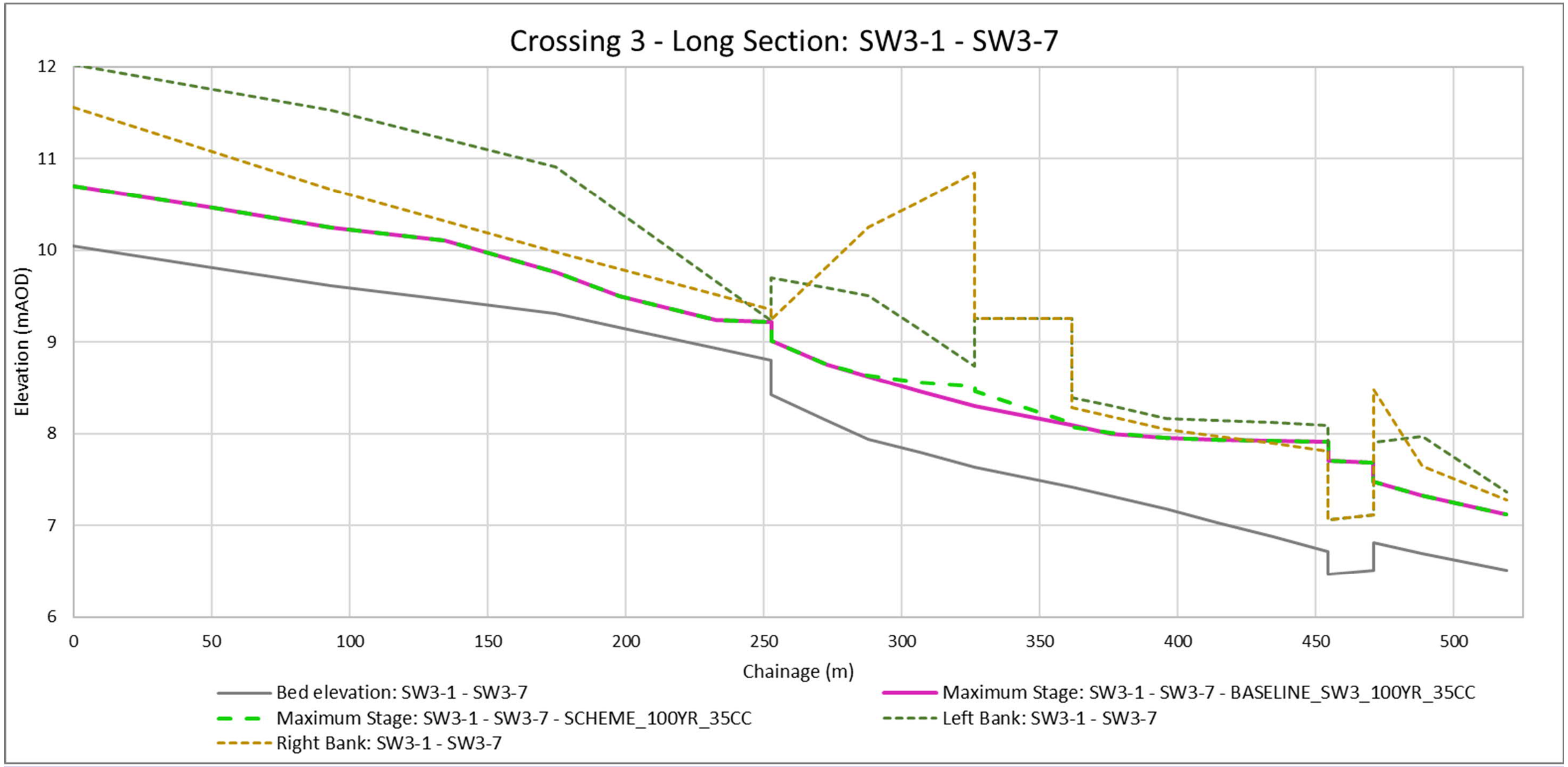
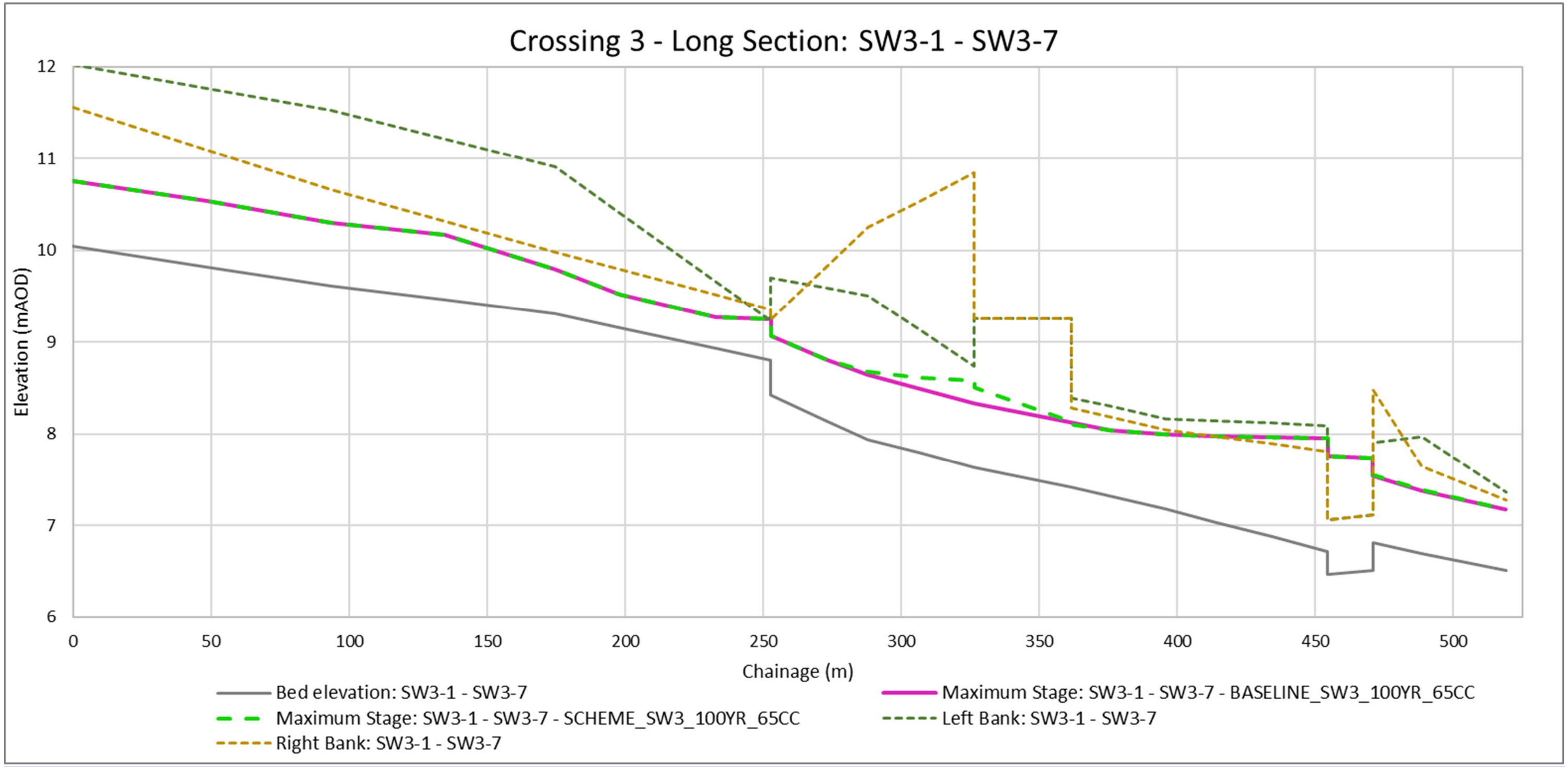


Plate 4.114.10: Long section comparison for crossing 3 – 1 in 100-year + 65% climate change



c) Crossings 4 and 5

~~4.2.24~~4.2.12 As discussed in **section 2.2e)** and **section 3.3b)**, crossing 4 was not specifically modelled as the proposed design does not include any changes to the existing culvert or road levels at this location. However, the model for crossing 5 has been extended downstream and now allows for the flood levels to be assessed at the location of crossing 4 as well.

~~4.2.25~~4.2.3 Flood depth maps for crossings 4 and 5 for the baseline scenario (**Figure A5.1** and **Figure A5.2** in **APPENDIX A:**) for the 100-year event with 35% and 65% climate change, show that the flood extent is very localised and limited to two areas, i.e. around the of the constriction at the existing culverts (crossing 5) and a small area downstream of B1122 with the flood depth up to 0.5m.

~~4.2.26~~4.2.4 Modelled peak flood levels at key locations for both crossings (selected model nodes as illustrated in **Plate 4.12**) are presented in **Table 4.4**.

Plate 4.124.11: Location of the key model nodes on crossings 4 and 5

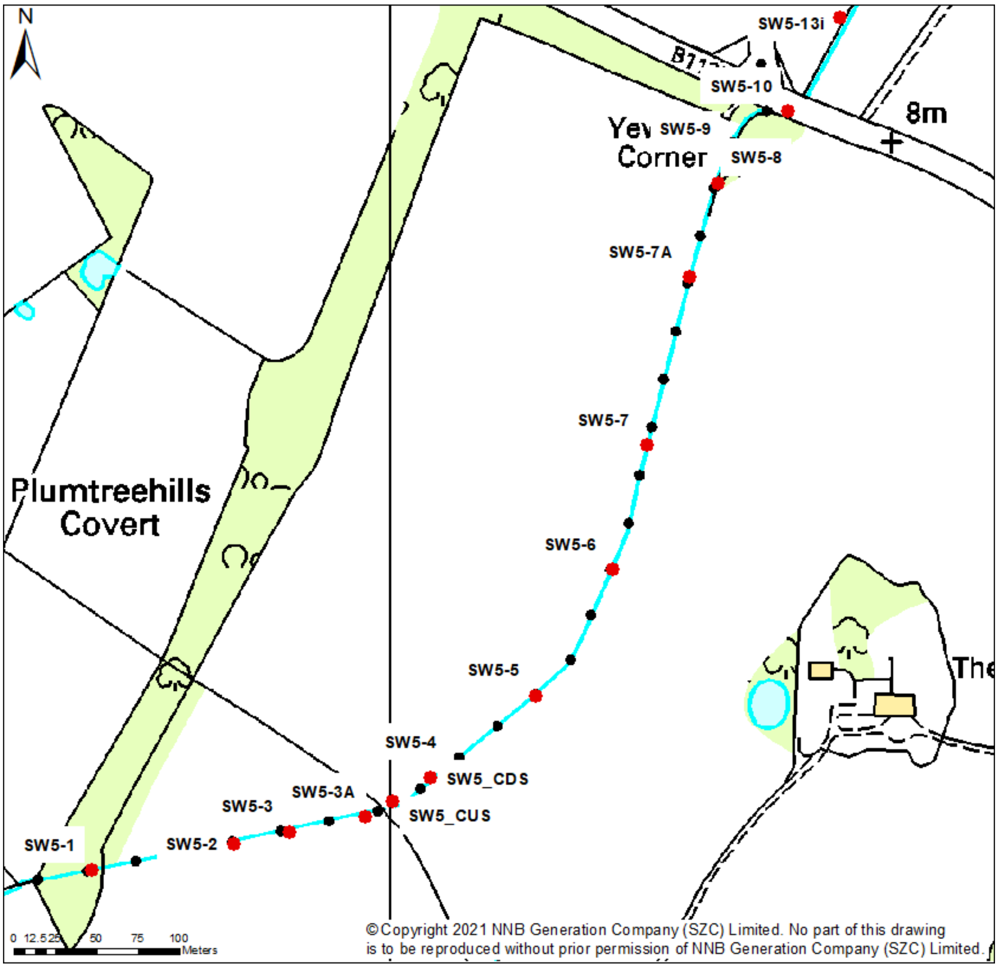


Table 4.4: Modelled peak water levels for crossing 4 and 5

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m))
Upstream of the Sizewell link road (SW5-3A)	5	12.17	11.05	-1.12
	5 + 35%CC	12.28	11.09	-1.19
	5 + 65%CC	12.30	11.11	-1.19
	20	12.28	11.10	-1.18
	20 + 35%CC	12.31	11.14	-1.17
	20 + 65%CC	12.33	11.17	-1.16
	100	12.33	11.17	-1.16
	100 + 35%CC	12.35	11.24	-1.11

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m))
	100 + 65%CC	12.37	11.28	-1.09
	1000	12.38	11.31	-1.07
	1000 + 35%CC	12.40	11.40	-1.00
	1000 + 65%CC	12.42	11.48	-0.94
Downstream of the Sizewell link road (SW5-4)	5	10.30	10.29	-0.01
	5 + 35%CC	10.35	10.34	-0.01
	5 + 65%CC	10.39	10.38	-0.01
	20	10.36	10.35	-0.01
	20 + 35%CC	10.43	10.41	-0.02
	20 + 65%CC	10.47	10.46	-0.01
	100	10.48	10.47	0.00
	100 + 35%CC	10.55	10.54	-0.01
	100 + 65%CC	10.61	10.60	-0.01
	1000	10.65	10.64	-0.01
	1000 + 35%CC	10.75	10.74	0.00
	1000 + 65%CC	10.82	10.81	-0.01
Upstream of Crossing 4 (SW5-10)	5	6.04	6.05	0.01
	5 + 35%CC	6.10	6.09	-0.01
	5 + 65%CC	6.12	6.12	0.00
	20	6.10	6.10	0.00
	20 + 35%CC	6.14	6.14	0.00
	20 + 65%CC	6.18	6.18	0.00
	100	6.19	6.19	0.01
	100 + 35%CC	6.26	6.26	0.00
	100 + 65%CC	6.31	6.31	0.00
	1000	6.34	6.34	0.00
	1000 + 35%CC	6.46	6.46	0.00
	1000 + 65%CC	6.56	6.56	0.00

~~4.2.27~~4.2.5 Results in **Table 4.4** at the model node upstream of crossing 4 confirm that there is no change in flood levels when compared to the baseline scenario at this location and therefore no impact on off-site receptors in the area. Furthermore, the peak flood levels for all scenarios are within the channel (no out of bank flooding), as illustrated in **Plate 4.13** (location of the model shown in **Plate 4.12)**. Therefore, the connection road itself at crossing 4 would not be at risk of flooding under any of the considered scenarios.

~~4.2.28~~4.2.6 The Sizewell link road level at crossing 5 is set at 15.16mAOD. As such the proposed development would not be at fluvial flood risk under any of the considered scenarios, as the maximum flood level (1,000-year +65% climate change) is 11.48mAOD (**Table 4.4)**, giving more than 3.5m of freeboard.

~~4.2.29~~4.2.7 The decrease in peak flood levels presented in **Table 4.4**, primarily upstream of the proposed crossing 5, is a result of the removal of the existing, relatively small, culverts and replacing them with a larger portal culvert, and thereby easing the existing constriction.

~~4.2.30~~4.2.8 Downstream of the proposed crossing, the decrease in peak water level is less but consistent for all considered scenarios. This suggests that the portal culvert does introduce some afflux, however the flood levels are slightly lower than in the baseline scenario and therefore there is no adverse impact of flood risk to off-site receptors. This is confirmed with cross-sectional plots showing a comparison of the maximum flood levels between the with scheme and baseline scenarios at key model locations that are provided in **Figure C5.1** – **Figure C5.4** in **APPENDIX C: .**

~~4.2.31~~4.2.9 **Plate 4.14** illustrates that the peak flood levels for all considered scenarios are within the channel, and therefore dry mammal passage would be provided during extreme flood events. There are no residential or commercial properties located near to the watercourse or the proposed Sizewell link road at crossings 4 and 5.

Plate 4.134.12: Peak flood levels upstream of crossing 4 (model node SW5-10) - 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year with +65% climate change

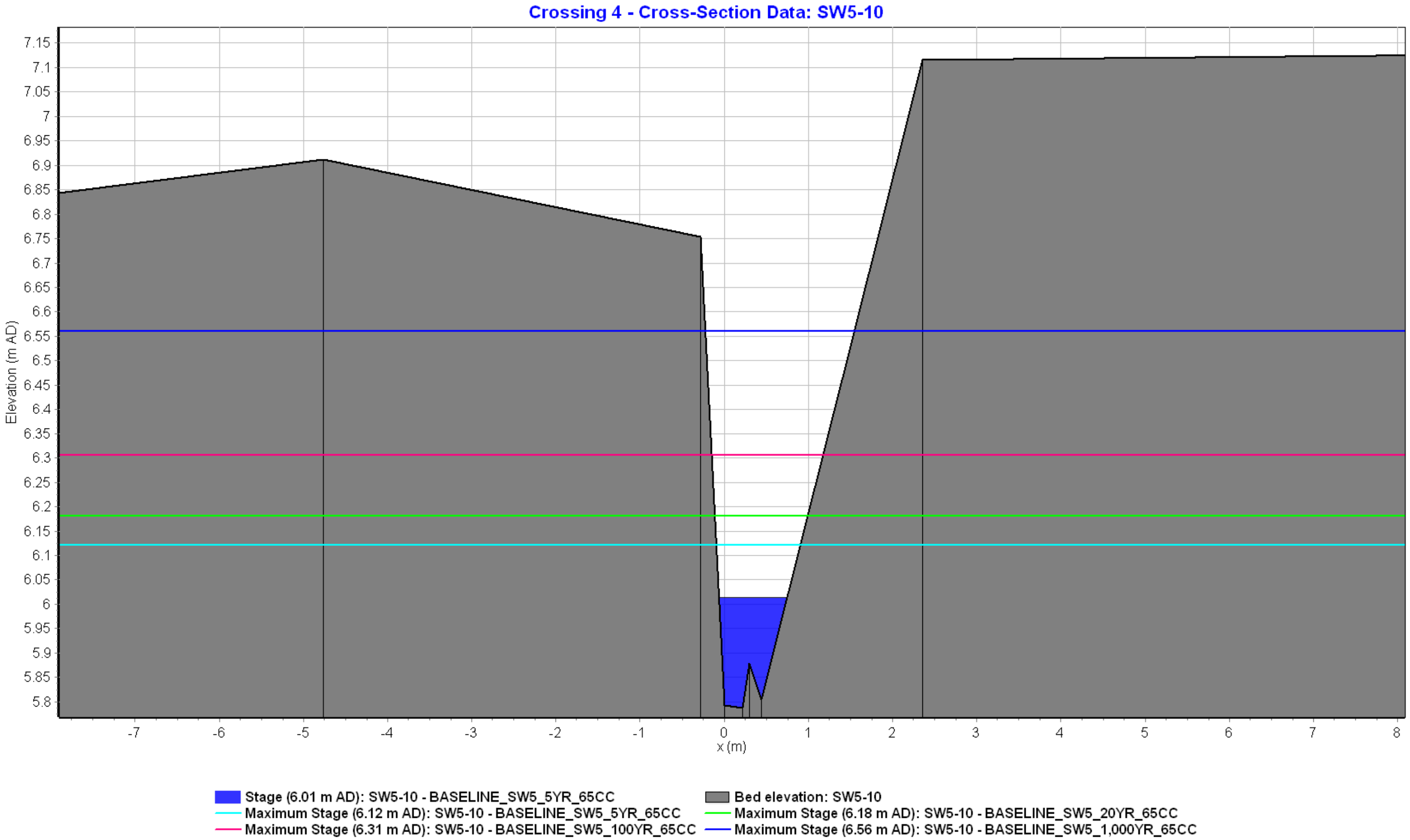
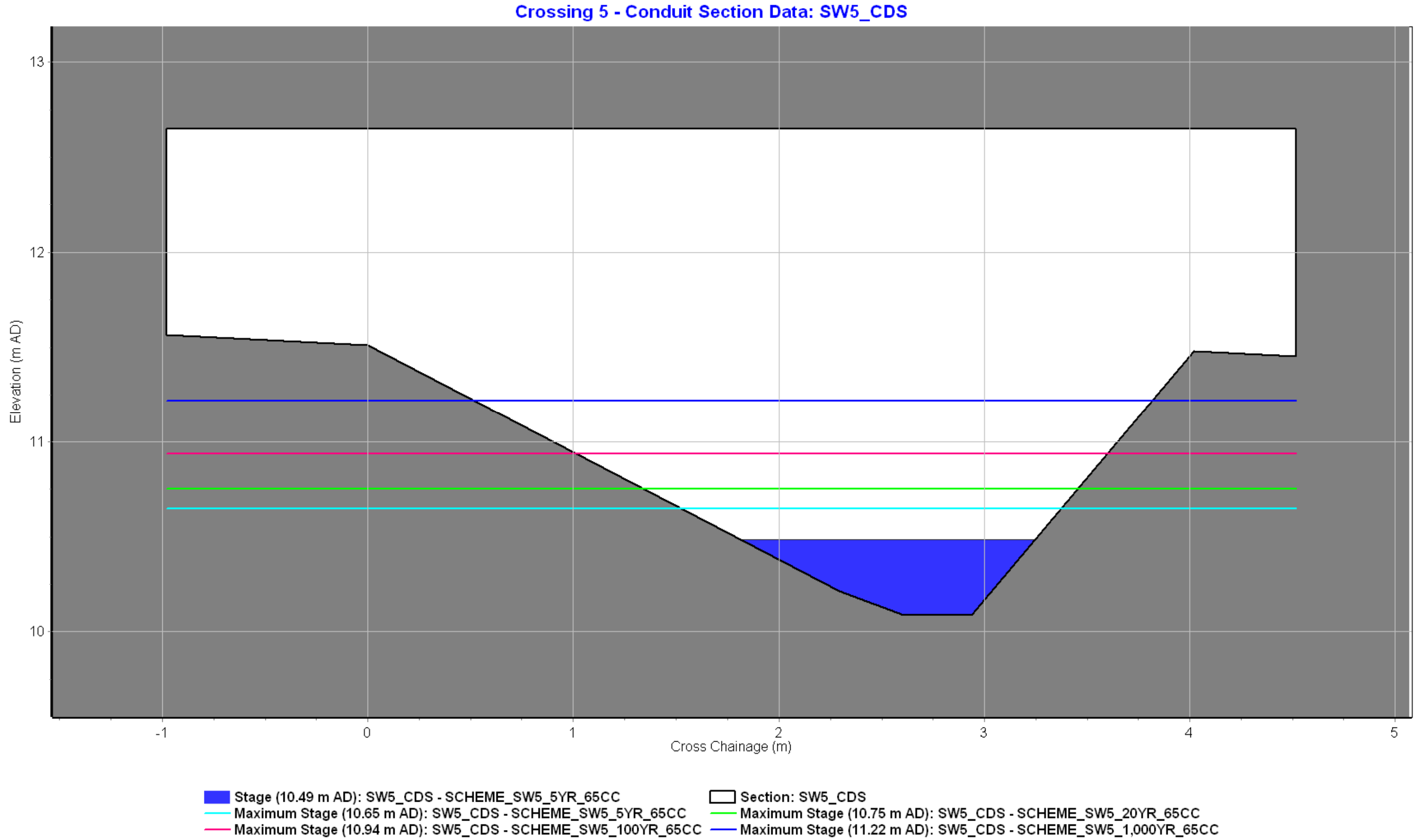


Plate 4.144.13: Peak flood levels within the portal culvert at crossing 5 (model node SW5-CDS) - 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year with +65% climate change



d) Crossing 6

4.2.324.2.10 Flood depth maps for crossing 6 (**Figure A6.1 - Figure A6.5** in **APPENDIX A:)** show that, for the 100-year and 1,000-year event with climate change, the flood extents are relatively small and localised with flood depth up to 0.5m. For other scenarios, results showed there is no out of bank flooding and therefore no further flood extent figures have been prepared.

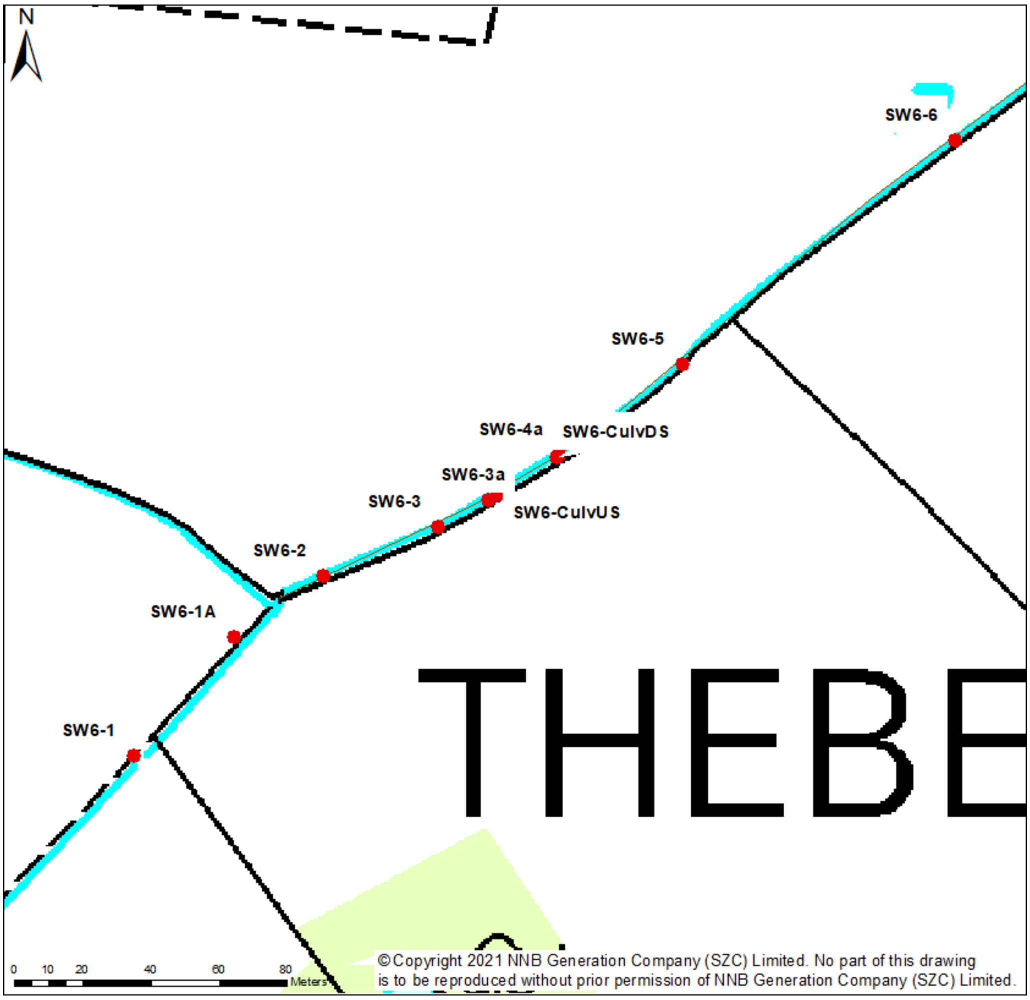
4.2.334.2.3 Modelled peak flood levels at key locations for crossing 6 (selected model nodes as illustrated in **Plate 4.15**) are presented in **Table 4.5**.

Table 4.5: Modelled peak water levels for Crossing 6

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
Upstream of the Sizewell link road (SW6-3)	5	11.73	11.73	0.00
	5 + 35%CC	11.77	11.78	0.01
	5 + 65%CC	11.80	11.81	0.01
	20	11.78	11.79	0.01
	20 + 35%CC	11.84	11.84	0.00
	20 + 65%CC	11.87	11.88	0.01
	100	11.88	11.88	0.00
	100 + 35%CC	11.95	11.96	0.01
	100 + 65%CC	11.99	12.01	0.02
	1000	12.01	12.03	0.02
	1000 + 35%CC	12.06	12.09	0.03
	1000 + 65%CC	12.10	12.15	0.05
Downstream of the Sizewell link road (SW6-5)	5	10.82	10.82	0.00
	5 + 35%CC	10.86	10.86	0.00
	5 + 65%CC	10.89	10.90	0.01
	20	10.87	10.87	0.00
	20 + 35%CC	10.92	10.92	0.00
	20 + 65%CC	10.96	10.96	0.00
	100	10.97	10.97	0.00
	100 + 35%CC	11.03	11.04	0.01
	100 + 65%CC	11.09	11.09	0.00
	1000	11.12	11.12	0.00

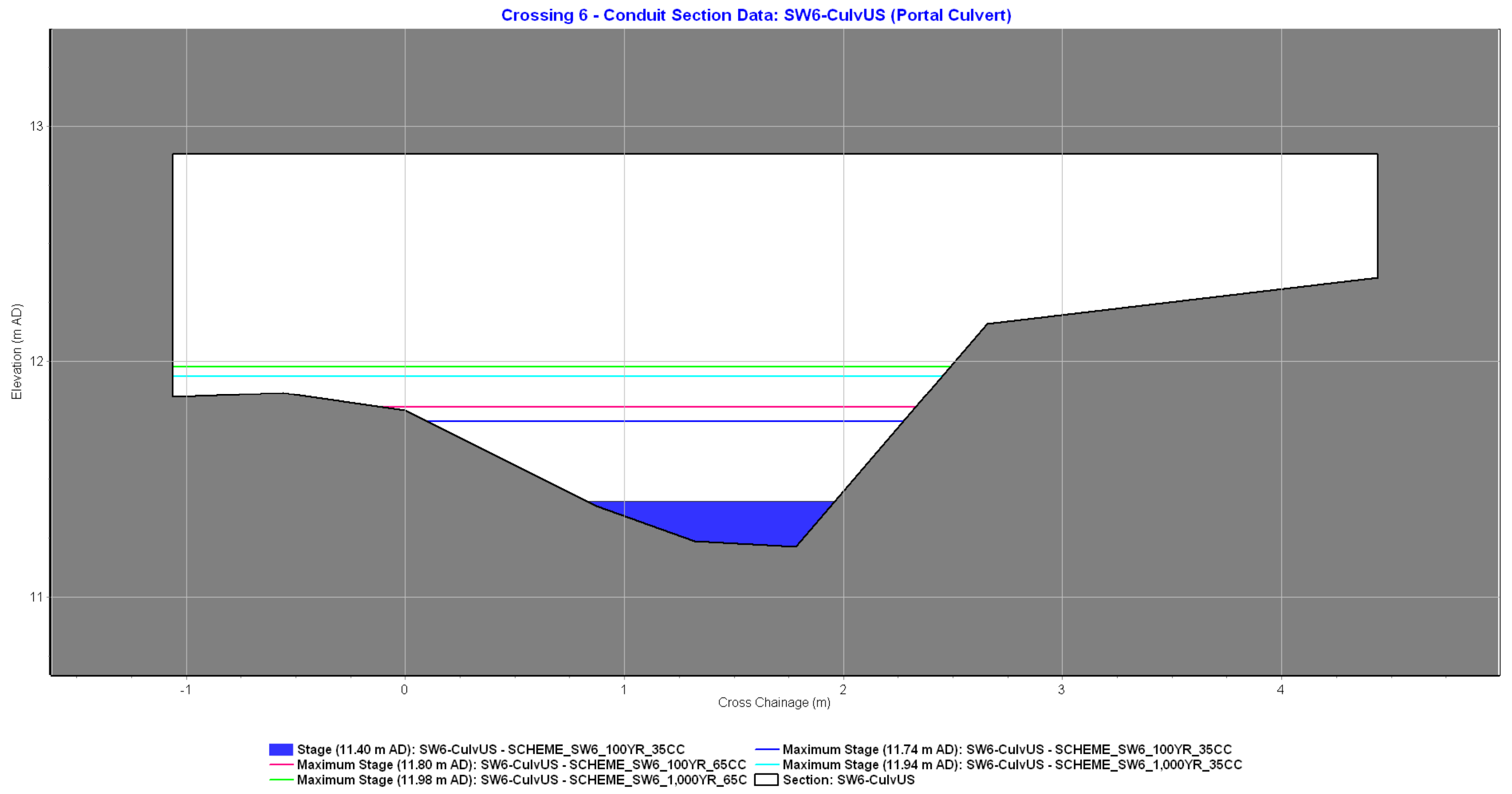
Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	1000 + 35%CC	11.22	11.22	0.00
	1000 + 65%CC	11.28	11.28	0.00

Plate 4.154.14: Location of the key model nodes on crossing 6



4.2.4 **Plate 4.16** presents the maximum flood levels within the portal culvert for the 1 in 100-year and 1 in 1,000-year event with 35% and 65% climate change allowance. It is demonstrated that the peak flood levels for the 1 in 100-year events with climate change are below the bank levels and therefore a dry mammal passage would be available on both sides. For the more extreme 1 in 1,000-year events with climate change, dry passage would be available on one side of the channel as a minimum.

Plate 4.16: Maximum flood levels within the portal culvert at crossing 6 (model node SW6-CulvUS) – 1 in 100-year and 1 in 1,000-year with +35% and +65% climate change



4.2.344.2.5 The road level of the Sizewell link road at crossing 6 is approximately 14.40mAOD at this crossing. **Table 4.5** shows that the maximum flood level for the 1,000-year event with 65% climate change allowance is 12.15mAOD and therefore, the proposed development is well above the fluvial flood levels, with greater than 2m freeboard.

4.2.354.2.6 There is a slight increase in the flood levels upstream of crossing 6 as a result of the proposed development (**Table 4.5**), however only agricultural land would be impacted as there are no properties located within the flood extent. This is also illustrated in **Figure C6.1** – **Figure C6.5** in **APPENDIX C:** , showing that the extent of the change in flood depth is very limited.

4.2.364.2.7 Downstream of the crossing there is also some increase in flood depth, mostly for the 1 in 100-year +35% climate change scenario, however it is very limited and the distance downstream to the nearest property is more than 350m). This is also illustrated in **Figure C6.6** – **Figure C6.9** in **APPENDIX C:** .

e) Crossing 7

4.2.374.2.8 Flood depth maps for crossing 7 (**Figure A7.7** – **Figure A7.9** in **APPENDIX A:**) show that, for the baseline 1 in 100-year present day and climate change scenarios, there is very localised out of bank flooding, limited to the low spot within the left floodplain just upstream of B1122 and a small area at the existing culvert upstream.

4.2.384.2.9 Results of peak water levels for crossing 7 at the key locations (selected model nodes as illustrated in **Plate 4.17**) are presented below in **Table 4.6**.

Plate 4.174.15: Location of the key model nodes on crossing 7

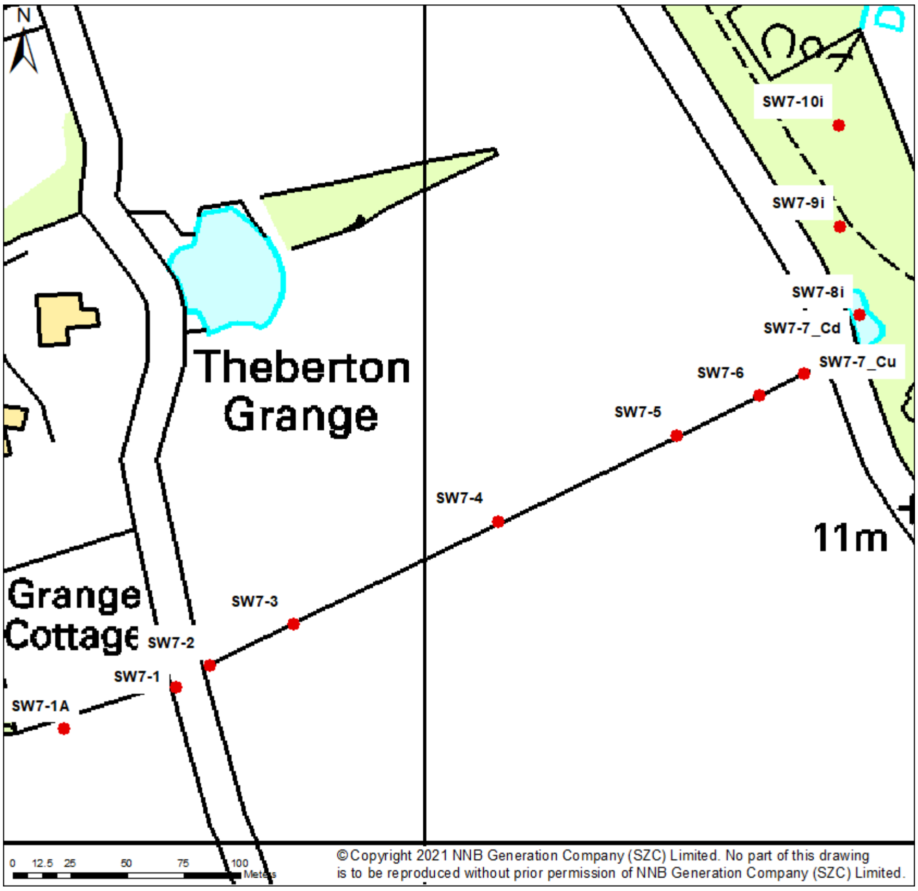


Table 4.6: Modelled peak water levels for crossing 7

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
Next to residential house upstream of the ford (SW7-1)	5	9.58	9.58	0.00
	5 + 35%CC	9.65	9.65	0.00
	5 + 65%CC	9.71	9.71	0.00
	20	9.67	9.67	0.00
	20 + 35%CC	9.76	9.76	0.00
	20 + 65%CC	9.84	9.84	0.00
	100	9.842	9.842	0.00
	100 + 35%CC	10.287	10.287	0.00
	100 + 65%CC	10.320	10.30	-0.002
	1000	10.31	10.31	0.00
	1000 + 35%CC	10.34	10.34	0.00

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	1000 + 65%CC	10.36	10.36	0.00
Within the floodplain upstream of the Sizewell link road (SW7-6_ResOut)	5	6.50	6.77	0.27
	5 + 35%CC	6.76	6.78	0.02
	5 + 65%CC	6.77	6.79	0.02
	20	6.76	6.80	0.04
	20 + 35%CC	6.77	6.81	0.04
	20 + 65%CC	6.78	6.78	0.00
	100	6.78	6.81	0.03
	100 + 35%CC	6.79	6.84	0.05
	100 + 65%CC	6.80~~79~~	6.87~~6~~	0.07
	1000	6.80	6.89~~8~~	0.09~~8~~
	1000 + 35%CC	6.81	6.96~~5~~	0.15~~4~~
	1000 + 65%CC	6.82	7.01~~0~~	0.19~~8~~
Upstream of the Sizewell link road culvert (SW7-6)	5	7.00	7.02	0.02
	5 + 35%CC	7.12	7.04	-0.08
	5 + 65%CC	7.15	7.05	-0.10
	20	7.13	7.06	-0.07
	20 + 35%CC	7.16	7.08	-0.08
	20 + 65%CC	7.18	7.04	-0.14
	100	7.18	7.08~~7~~	-0.10~~1~~
	100 + 35%CC	7.21~~0~~	7.11~~0~~	-0.10
	100 + 65%CC	7.24~~2~~	7.13	-0.11~~09~~
	1000	7.24	7.15	-0.08
	1000 + 35%CC	7.26	7.20~~19~~	-0.06~~7~~
	1000 + 65%CC	7.28	7.24~~3~~	-0.04~~5~~
Downstream of the Sizewell link road culvert (SW7-9i)	5	6.28	6.29	0.01
	5 + 35%CC	6.33	6.35	0.02
	5 + 65%CC	6.38	6.39	0.01
	20	6.35	6.36	0.01
	20 + 35%CC	6.42	6.43	0.01
	20 + 65%CC	6.48	6.49	0.01

Node	Return period (years)	Baseline level (mAOD)	With scheme level (mAOD)	Difference in peak flood level (m)
	100	6.48~~7~~	6.49~~8~~	0.01
	100 + 35%CC	6.58~~6~~	6.59~~7~~	0.01
	100 + 65%CC	6.71~~63~~	6.65~~4~~	-0.0~~1~~6
	1000	6.70~~69~~	6.71~~0~~	0.01
	1000 + 35%CC	6.82~~1~~	6.82~~1~~	0.00
	1000 + 65%CC	6.90~~89~~	6.91~~0~~	0.01

~~4.2.39~~4.2.10 The level of the Sizewell link road at crossing 7 itself is situated at 7.95mAOD (tie-in to the B1122). **Table 4.6** shows that the maximum flood level for the 1,000-year event with 65% climate change is 7.2~~3~~4mAOD. As such the development would not be at fluvial flood risk, having more than 0.5m freeboard above the maximum flood levels.

4.2.11 As presented in **Table 4.6**, there is some decrease in flood levels within the channel in the post-development, with scheme, scenario. This is a result of the added berm on the left bank (lowered bank levels) which is allowing water to spill out earlier than in the baseline scenario. This in return, causes a small increase in flood level within the floodplain upstream of the Sizewell link road, however flooding remains within the red line boundary and does not impact the road drainage attenuation basin.

~~4.2.40~~4.2.12 Since the design at this crossing comprises an extension to the existing pipe culvert, there are no specific mammal ledges included. However, **Figure B7.1 – Figure B7.12** in **APPENDIX B:** shows that there is no out of bank flooding immediately adjacent to the watercourse, specifically on the right bank, and therefore ~~a~~ passage would be available thereby mimicking the existing situation.

~~4.2.41~~4.2.13 The increase in flood depth between the baseline and post-development scenarios for the considered events is illustrated in **Figure C7.1** – **Figure C7.12** in **APPENDIX C:** , showing that the maximum increase immediately upstream of Sizewell link road embankment within the floodplain is up to 0.05m and 0.07m for the 100-year event with 35% climate change and 65% climate change respectively.

~~4.2.42~~4.2.14 The figures also show that there is a slight increase in flood depth in the area between the Sizewell link road and the B1122. However, this increase is only up to 0.01m, with no properties at risk, and the existing flow path over the top of the B1122 road is maintained. The flow path over the B1122 is activated in a 1 in 20-year return period event for both baseline and with scheme scenarios, when the flood levels within the floodplain exceed 6.6mAOD. In the with scheme scenario that occurs approximately 1.5 hours sooner than in the baseline scenario due to lowered section of the left bank resulting in sooner floodplain inundation but the difference in flood levels is no higher than 0.01m.

~~4.2.43~~4.2.15 Additional supplementary cross-sectional plots of comparison of the maximum flood levels between the with scheme and baseline scenarios at key model locations are provided in **Figure C7.13** – **Figure C7.16** in **APPENDIX C: .**

~~4.2.44~~4.2.16 There is no impact at the residential property upstream of the proposed development.

~~4.2.45~~4.2.17 The property is situated around 300m upstream of the proposed development at around 10.3mAOD, as observed from LiDAR. Based on the baseline modelling results (**Figure A7.1** – **Figure A7.12** in **APPENDIX A:**), it is likely that the property might be flooded in the 100-year + 65% climate change event and higher events (assuming a 100mm threshold). However, there is no increase in flood risk at this property due to the proposed development.

~~4.2.46~~4.2.18 Downstream of the B1122 the modelling results show some increase in flood depth. As discussed in **section 3.3b)**, the access to this area during the topographical survey was restricted and therefore information used in the hydraulic model was approximated. Therefore, there is some uncertainty in the obtained results for this area. However, the nearest property downstream is located more than 550m away and set on higher ground than the watercourse. Figures in **APPENDIX C:** show that any impact on flood levels from the proposed Sizewell link road would likely be very localised and have dissipated before reaching any properties.

4.3 Sensitivity tests

4.3.1 The scale and nature of the watercourses that are proposed to be crossed by the Sizewell link road are such that they are relatively small and as such there is limited information available for them. As such, there are no river level or flow gauges located along any of these watercourses within the study area. Furthermore, their relatively small size means there is limited anecdotal information related to historic out of bank events. As a result, n~~N~~o model calibration or validation could be undertaken as part of the modelling exercise due to the lack of gauge data or anecdotal evidence.

~~4.3.1~~4.3.2 Therefore, ~~A~~as discussed in **section 4.1**, a series of sensitivity tests was undertaken to determine the model response to a change in some of the key parameters, including inflow, roughness, ~~or~~ blockage of key structures or spill coefficient. The sensitivity tests were simulated for the key return periods, i.e. the 100-year +35% climate change and the 100-year +65% climate change scenarios. These return periods relate to examining both on-site and off-site risks.

4.3.24.3.3 All the sensitivity testing was carried out only for the with scheme model schematisation to determine potential change in flood risk to the proposed Sizewell link road itself and to assess how these changes would affect flood risk off-site with the development in place.

4.3.34.3.4 Results for each of the sensitivity test were analysed with a focus on comparison of the peak flood levels at the nearest comparison point upstream of the relevant Sizewell link road crossing location. These are presented in the following sub-sections.

4.3.44.3.5 Supplementary 1D cross-sectional plots of comparison of maximum flood levels between the with scheme and sensitivity test scenarios at key model locations are provided in **APPENDIX C:** for all of the crossings. The location of the selected model nodes is indicated in respective sub-sections of **section 4.2** for each of the crossings.

a) Increase in flow

4.3.54.3.6 The results of the sensitivity test with 20% increase in fluvial flow are presented in **Table 4.7** below for the model nodes just upstream of the Sizewell link road at each relevant crossing (model nodes presented in respective sub-section of **section 4.2**). The sensitivity test was run for the with scheme model schematisation only, hence the difference is comparing the sensitivity test to the with scheme (no increase in flow) results. A positive difference indicates that the sensitivity test has a higher flood level.

Table 4.7: Peak flood levels immediately upstream of the crossings for sensitivity test with 20% increase in flow

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +35% climate change	1	11.37	10.88	10.93	0.05
	2	12.64	12.64	12.67	0.03
	3	8.30	8.52	8.57	0.05
	5	12.35	11.24	11.28	0.04
	6	11.95	11.96	12.01	0.05
	7	7.210	7.110	7.132	0.02
	1	11.41	10.94	11.02	0.08

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +65% climate change	2	12.67	12.67	12.70	0.03
	3	8.34	8.57	8.64	0.07
	5	12.37	11.28	11.33	0.05
	6	11.99	12.01	12.05	0.04
	7	7.24~~2~~	7.13	7.16~~5~~	0.03~~2~~

~~4.3.6~~4.3.7 As expected, **Table 4.7** shows that the increase in flow results in increase in flood levels, with the greatest difference up to 0.08m at crossing 1.

~~4.3.7~~4.3.8 The increased levels however, do not affect the properties upstream of crossing 1, crossing 3 or crossing 7, as also indicated with the results for higher return period events discussed in **section 4.2a)**, **section 1.1a)** and **section 4.2e)** respectively.

b) Change in roughness

~~4.3.8~~4.3.9 To assess sensitivity of the developed models to changes in roughness, e.g. due to seasonal vegetation growth, the models were simulated with an increase of 20% and a decrease of 20% in roughness values.

~~4.3.9~~4.3.10 The results are presented in **Table 4.8** and **Table 4.9** for increases and decreases in roughness, respectively, with the differences comparing the sensitivity test to the normal (no change in roughness) with scheme model. The results are presented for the model nodes just upstream of the Sizewell link road at each relevant crossing (model nodes presented in the respective sub-section of **section 4.2**).

Table 4.8: Peak flood levels immediately upstream of the crossings for sensitivity test with 20% increase in roughness

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +35% climate change	1	11.37	10.88	10.89	0.01
	2	12.64	12.64	12.67	0.03
	3	8.30	8.52	8.57	0.05
	5	12.35	11.24	11.28	0.04

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
	6	11.95	11.96	11.99	0.03
	7	7.21~~0~~	7.11~~0~~	7.10	-0.0~~0~~1
100-year +65% climate change	1	11.41	10.94	10.98	0.04
	2	12.67	12.67	12.71	0.04
	3	8.34	8.57	8.63	0.06
	5	12.37	11.28	11.33	0.05
	6	11.99	12.01	12.03	0.02
	7	7.24~~2~~	7.13	7.13~~2~~	~~-~~0.000~~1~~

~~4.3.10~~4.3.11 As expected, **Table 4.8** shows that the increase in roughness results in increased peak flood levels. However, the increase is not significant enough to pose risk to the proposed development at any of the crossing locations. As discussed in **section 4.2**, the proposed Sizewell link road levels are well above any of the maximum flood levels.

~~4.3.11~~4.3.12 Similarly, the impact of the development to off-site receptors is very limited and does not affect any properties, and therefore the slight increase in flood levels as a result of change in roughness would not significantly impact flood risk in the area.

Table 4.9: Peak flood levels immediately upstream of the crossings for sensitivity test with 20% decrease in roughness

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +35% climate change	1	11.37	10.88	10.81	-0.06
	2	12.64	12.64	12.61	-0.03
	3	8.30	8.52	8.45	-0.07
	5	12.35	11.24	11.19	-0.05
	6	11.95	11.96	11.94	-0.02
	7	7.21~~0~~	7.11~~0~~	7.11	0.000~~1~~
100-year +65% climate change	1	11.41	10.94	10.93	-0.01
	2	12.67	12.67	12.64	-0.03
	3	8.34	8.57	8.52	-0.05

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
	5	12.37	11.28	11.24	-0.04
	6	11.99	12.01	11.99	-0.02
	7	7.242	7.13	7.143	0.010

4.3.124.3.13 The results presented in **Table 4.9** show that the peak flood levels are slightly lower in the sensitivity test with decrease in roughness for most of the crossings, except crossing 7 where there is minimal increase. Therefore, the proposed development would not have a significant impact on flood risk in the area.

c) Risk of blockage

4.3.134.3.14 To assess the flood risk to the development itself and potential impacts to off-site receptors in the event of blockage of the proposed portal culvert, additional hydraulic model runs were undertaken.

4.3.144.3.15 Considering the dimensions of the proposed portal culverts, it is highly unlikely that a 100% blockage would occur. Therefore, two other blockage ratios were assessed i.e. 33% and 67%, in line with the available guidance from the Environment Agency (Ref. 8).

4.3.154.3.16 The results of the two sensitivity tests for all crossings are presented in **Table 4.10** and **Table 4.11** below with the differences comparing the sensitivity test to the with scheme model without blockage. These results are presented for the selected model nodes just upstream of the Sizewell link road at each relevant crossing (model nodes presented in respective sub-section of **section 4.2**).

Table 4.10: Peak flood levels immediately upstream of the crossings for sensitivity test with 33% blockage

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +35% climate change	1	11.37	10.88	10.89	0.01
	2	12.64	12.64	12.65	0.01
	3	8.30	8.52	8.61	0.09
	5	12.35	11.24	11.27	0.03

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
	6	11.95	11.96	12.00	0.04
	7	7.21~~0~~	7.11~~0~~	7.12~~1~~	0.01
100-year +65% climate change	1	11.41	10.94	10.95	0.01
	2	12.67	12.67	12.69	0.02
	3	8.34	8.57	8.67	0.10
	5	12.37	11.28	11.32	0.04
	6	11.99	12.01	12.05	0.04
	7	7.24~~2~~	7.13	7.14	0.01

Table 4.11: Peak flood levels immediately upstream of the crossings for sensitivity test with 67% blockage

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD)	Difference in peak level (m)
100-year +35% climate change	1	11.37	10.88	11.00	0.12
	2	12.64	12.64	12.72	0.08
	3	8.30	8.52	8.75	0.23
	5	12.35	11.24	11.27	0.03
	6	11.95	11.96	12.11	0.15
	7	7.21~~0~~	7.11~~0~~	7.14~~2~~	0.03~~2~~
100-year +65% climate change	1	11.41	10.94	11.35	0.41
	2	12.67	12.67	12.78	0.11
	3	8.34	8.57	8.82	0.25
	5	12.37	11.28	11.32	0.04
	6	11.99	12.01	12.20	0.19
	7	7.24~~2~~	7.13	7.20~~18~~	0.07~~5~~

~~4.3.16~~4.3.17 As to be anticipated, results in **Table 4.10** and **Table 4.11** show that the blockage of the portal culverts would increase flood levels upstream of the crossings, with greater increase for the higher blockage ratio.

~~4.3.17~~4.3.18 However, as discussed in **section 4.2**, the proposed Sizewell link road levels are well above any of the maximum flood levels. That remains the case in the blockage scenarios, showing that the proposed Sizewell link road itself would not be at flood risk under such scenario.

4.3.19 Similarly, the impact of the development to off-site receptors, as illustrated in **section 4.2** and figures in **APPENDIX C:** , is very limited and does not affect any properties (**Figure C1.23**, **Figure C3.23**, **Figure C5.10**, **Figure C6.15** and **Figure C7.22**). Therefore, the increase in flood levels in an event of blockage would not significantly impact flood risk in the area.

d) Spill coefficient

4.3.20 The hydraulic modelling was undertaken with default spill coefficient values adopted from the software developer. It is acknowledged that some of the existing bridge decks appear to be quite heavily vegetated and therefore the spill coefficient might be over or underestimating flow over some of the spills. Therefore, a sensitivity test has been undertaken where the spill coefficient values have been reviewed and assigned a value based on the material and physical properties of each spill.

4.3.21 For the purpose of this sensitivity test, all maintained grass embankments and heavily vegetated access track bridge decks have been given a spill coefficient value of 0.8, whereas 'smoother' surfaces such as roads have been updated to adopt a spill coefficient value of 1.4. Coefficient values for grassy embankments were retained at the default value of 1.2. These values were determined based on advice within the Flood Modeller software. Where the spill was not used in any of the modelled scenarios (i.e. did not convey any flow) the default value of 1.2 was not changed.

4.3.22 As for the other sensitivity tests, the spill coefficient testing was carried out for the 1 in 100-year return period event with 35% and 65% climate change allowance. The spill coefficient values were adjusted in both, baseline and with scheme model schematisations.

4.3.23 The results of the sensitivity testing with the adjusted spill coefficient values are presented in **Table 4.12** for the model nodes immediately upstream of the Sizewell link road at each relevant crossing (model nodes are presented in the respective sub-sections of **section 4.2**).

4.3.24 Crossing 6 was not included in this sensitivity test as there are no existing structures that would require a spill unit in the model and, based on the previous results, the spill over the proposed Sizewell link road does not convey any flow (i.e. water levels are well below the soffit of the portal culvert). Therefore, adopting an adjusted spill coefficient would not have any impact on model results.

Table 4.12: Peak flood levels immediately upstream of the crossings for sensitivity test with adjusted spill coefficient values

Return period	Crossing number	Baseline level (mAOD)	With scheme level (mAOD)	Sensitivity test level (mAOD) - Baseline	Sensitivity test level (mAOD) – With Scheme
100-year +35% climate change	1	11.37	10.88	11.45	10.88
	2	12.64	12.64	12.64	12.64
	3	8.30	8.52	8.30	8.50
	5	12.35	11.24	12.34	11.24
	7	7.21	7.11	7.21	7.11
100-year +65% climate change	1	11.41	10.94	11.50	10.94
	2	12.67	12.67	12.67	12.67
	3	8.34	8.57	8.34	8.56
	5	12.37	11.28	12.36	11.28
	7	7.24	7.13	7.22	7.13

4.3.25 **Table 4.12** shows that the adjusted spill coefficients do not have significant impact on model results, i.e. for most crossings the difference is up to 0.01m for both baseline and with scheme scenarios and therefore the relative impact of the proposed scheme is not different to that discussed in **section 4.2**.

~~4.3.18~~4.3.26 The greatest impact on model results is shown for the crossing 1 baseline scenario, where the peak flood levels increased by 0.0~~8~~9m. However, the results have not changed for the with scheme scenario and, therefore in line with the results presented in **section 4.2a)**, the scheme results in a slight reduction in peak flood levels upstream of the proposed crossing, and as such the scheme does not have an adverse impact on flood risk to receptors in the area.

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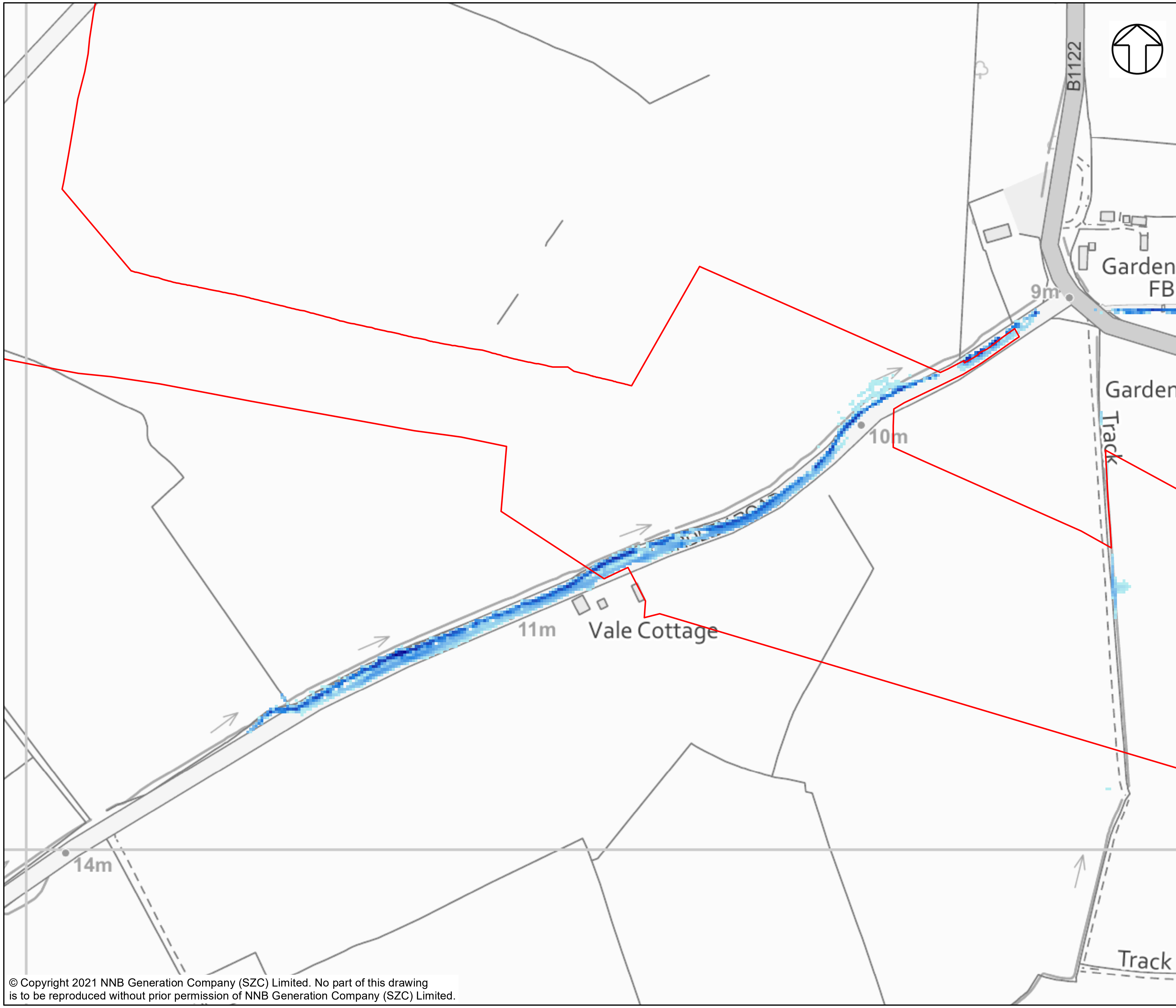
APPENDIX A: SIZEWELL LINK ROAD FLUVIAL MODEL RESULTS – BASELINE SCENARIO



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 1.543

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
Doing the power of good for Britain
EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSINGS 1 AND 2
BASELINE
1 IN 100-YEAR

DRAWING NO:
FIGURE A1.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	F.C.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)
High : 0.396
Low : 0.002

NOT PROTECTIVELY MARKED

SizewellC
Doing the power of good for Britain
EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
BASELINE
1 IN 100-YEAR

DRAWING NO:
FIGURE A7.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.773

Low : 0.002

NOT PROTECTIVELY MARKED

SizewellC

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EDF CGN

DOCUMENT:

SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:

CROSSING 7
BASELINE
1 IN 100-YEAR + 35% CLIMATE CHANGE

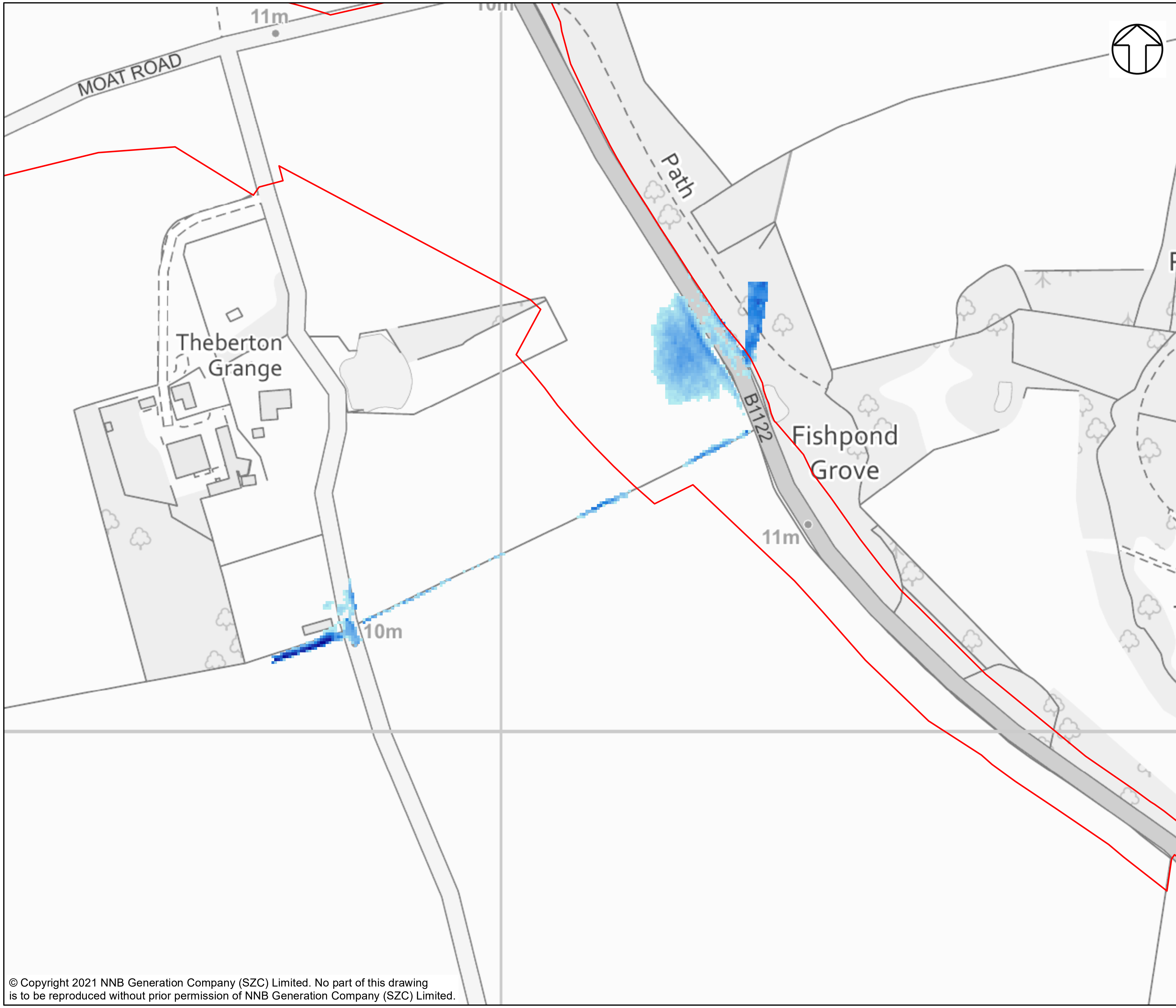
DRAWING NO:

FIGURE A7.8

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR

0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.797

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
Doing the power of good for Britain
EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
BASELINE
1 IN 100-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE A7.9

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.809

Low : 0.003

NOT PROTECTIVELY MARKED

SizewellC
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eDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
BASELINE
1 IN 1000-YEAR

DRAWING NO:
FIGURE A7.10

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.83

Low : 0.001

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
BASELINE
1 IN 1000-YEAR + 35% CLIMATE CHANGE

DRAWING NO:
FIGURE A7.11

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.844

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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eDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

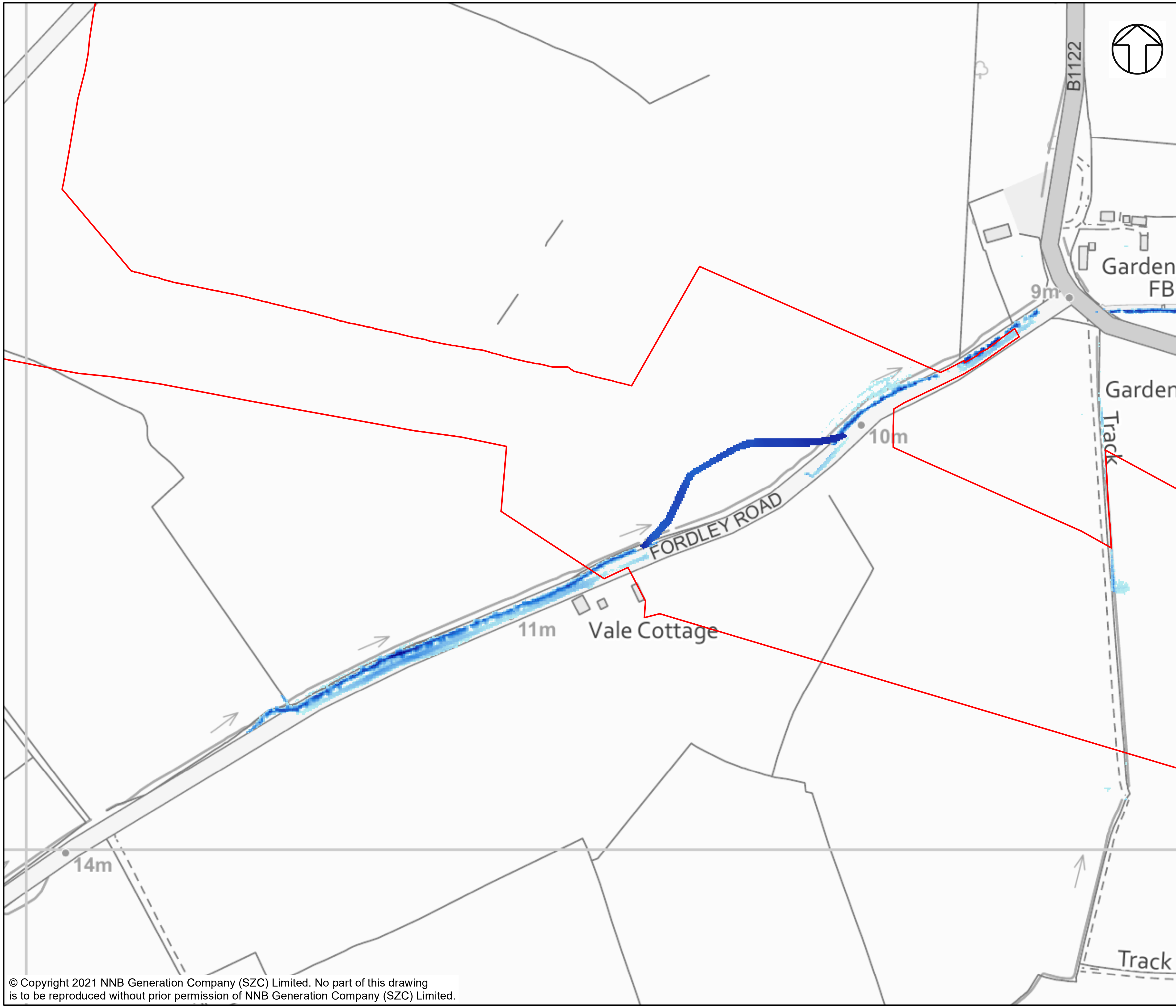
DRAWING TITLE:
CROSSING 7
BASELINE
1 IN 1000-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE A7.12

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

APPENDIX B: SIZEWELL LINK ROAD FLUVIAL MODEL RESULTS – WITH SCHEME SCENARIO



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 1.569

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

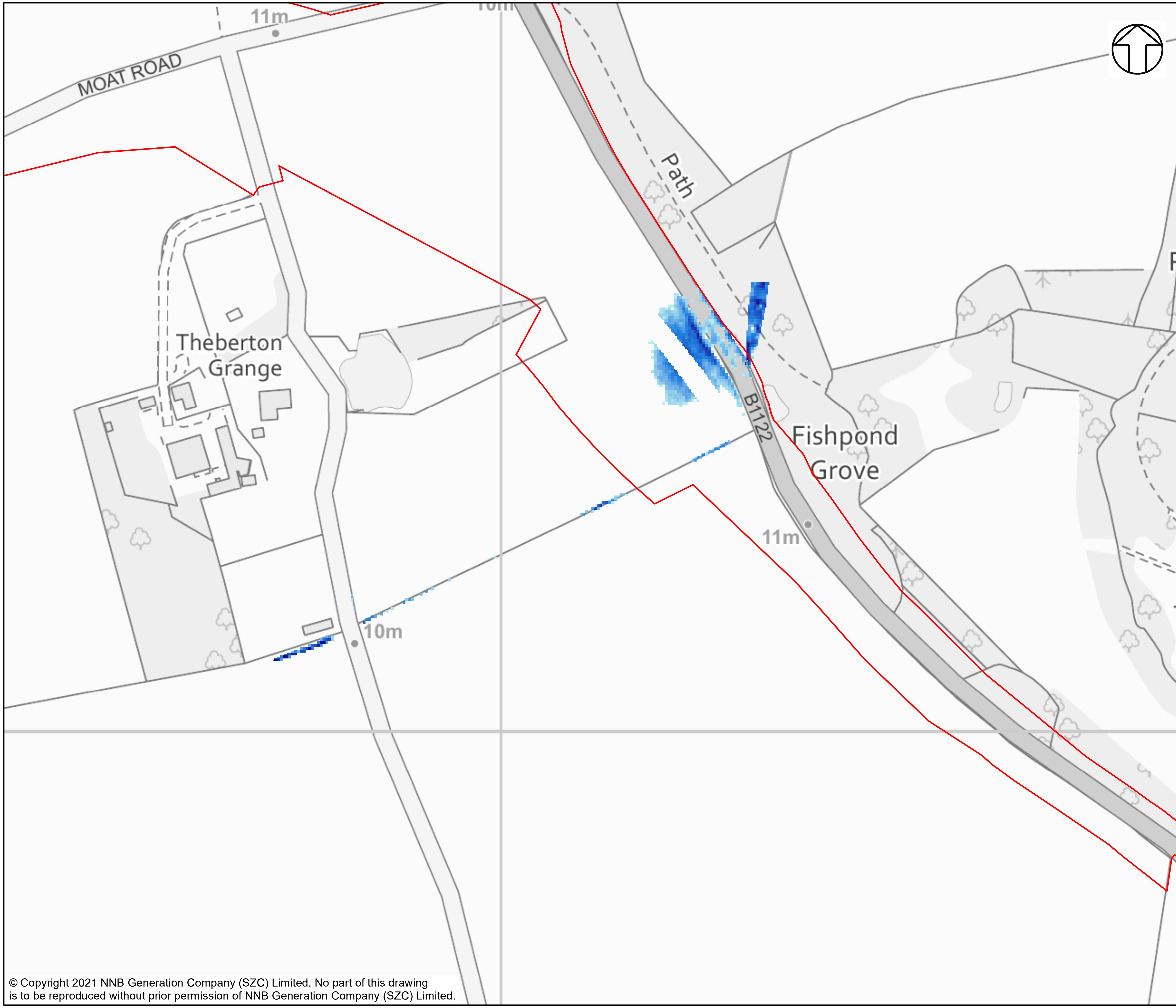
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSINGS 1 AND 2
WITH SCHEME
1 IN 100-YEAR

DRAWING NO:
FIGURE B1.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	F.C.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.494

Low : 0

NOT PROTECTIVELY MARKED

SizewellC

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edf CGN

DOCUMENT:

SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:

CROSSING 7
WITH SCHEME
1 IN 100-YEAR

DRAWING NO:

FIGURE B7.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR

0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.847

Low : 0

NOT PROTECTIVELY MARKED

SizewellC

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DOCUMENT:

SIZEWELL C

SIZEWELL LINK ROAD

FLOOD RISK ASSESSMENT ADDENDUM

FLUVIAL MODELLING RESULTS

DRAWING TITLE:

CROSSING 7

WITH SCHEME

1 IN 100-YEAR + 35% CLIMATE CHANGE

DRAWING NO:

FIGURE B7.8

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR

0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)
High : 0.871
Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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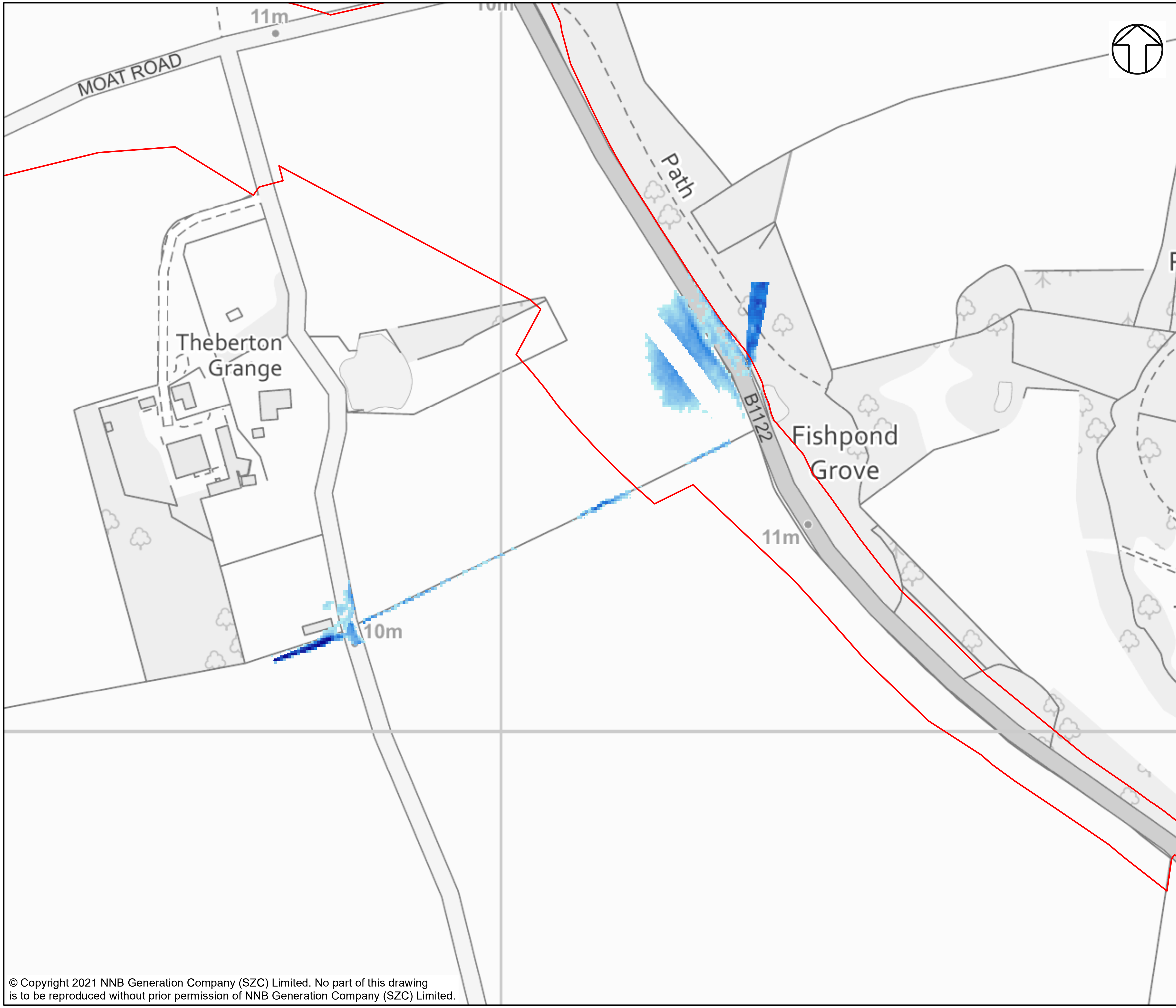
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
WITH SCHEME
1 IN 100-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE B7.9

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.883

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
WITH SCHEME
1 IN 1000-YEAR

DRAWING NO:
FIGURE B7.10

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.904

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
WITH SCHEME
1 IN 1000-YEAR + 35% CLIMATE CHANGE

DRAWING NO:
FIGURE B7.11

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR

0 25 50 75 100 125 Metres

NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.918

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

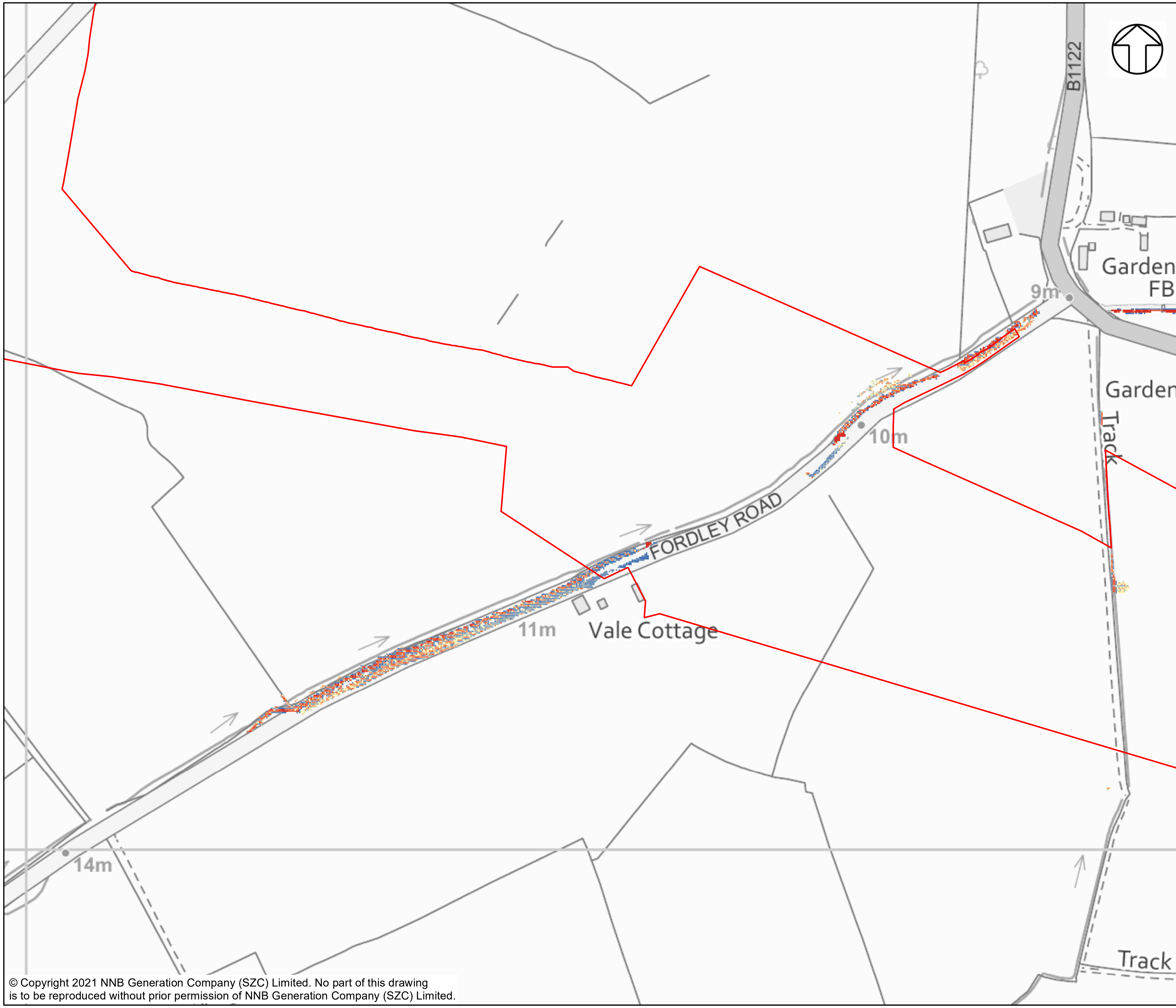
DRAWING TITLE:
CROSSING 7
WITH SCHEME
1 IN 1000-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE B7.12

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

APPENDIX C: SIZEWELL LINK ROAD FLUVIAL MODEL RESULTS – DIFFERENCE IN FLOOD DEPTH



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 1.4 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.4

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

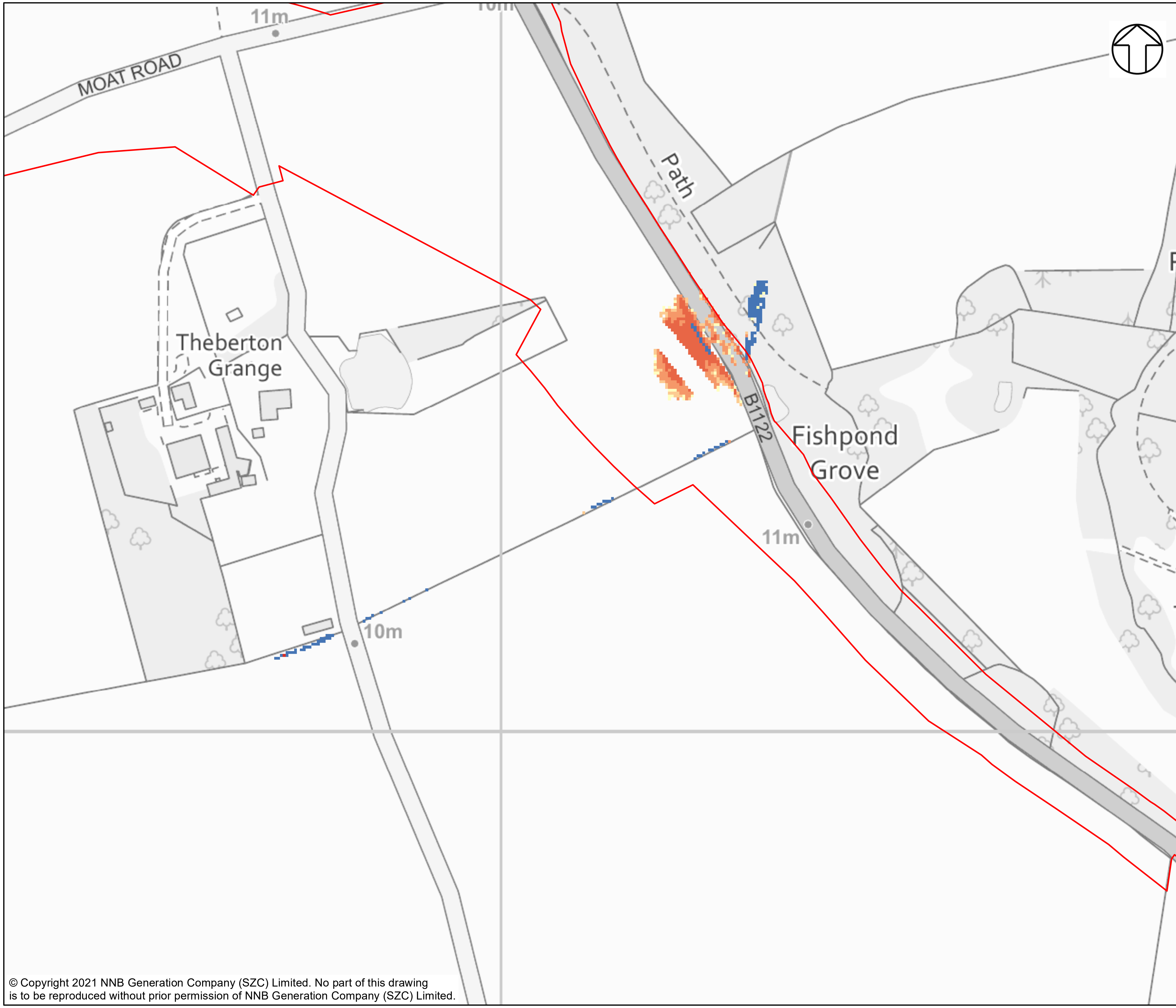
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSINGS 1 AND 2
DIFFERENCE
1 IN 100-YEAR

DRAWING NO:
FIGURE C1.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	F.C.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.6

NOT PROTECTIVELY MARKED

SizewellC
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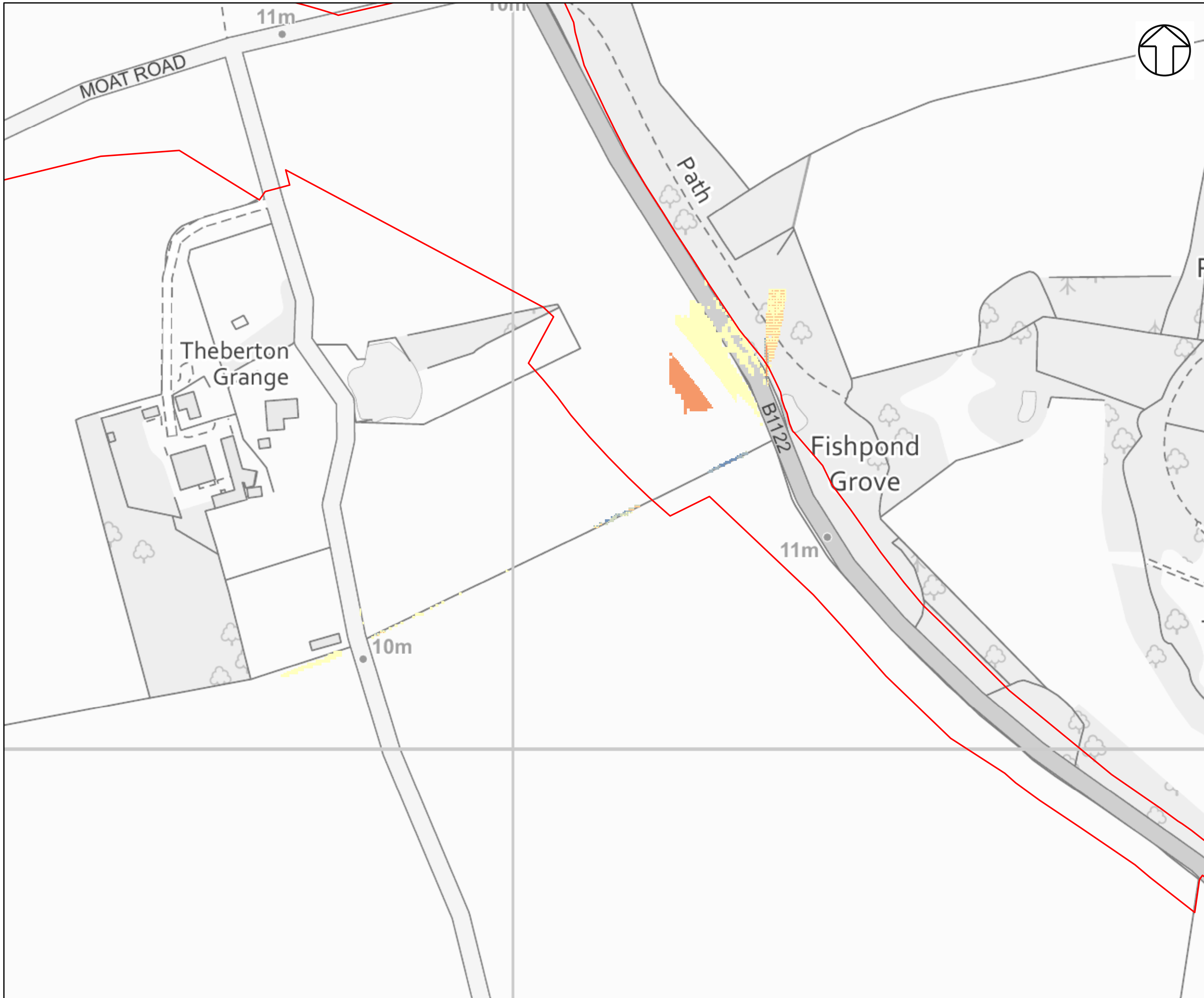
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 5-YEAR

DRAWING NO:
FIGURE C7.1

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.6

NOT PROTECTIVELY MARKED

SizewellC
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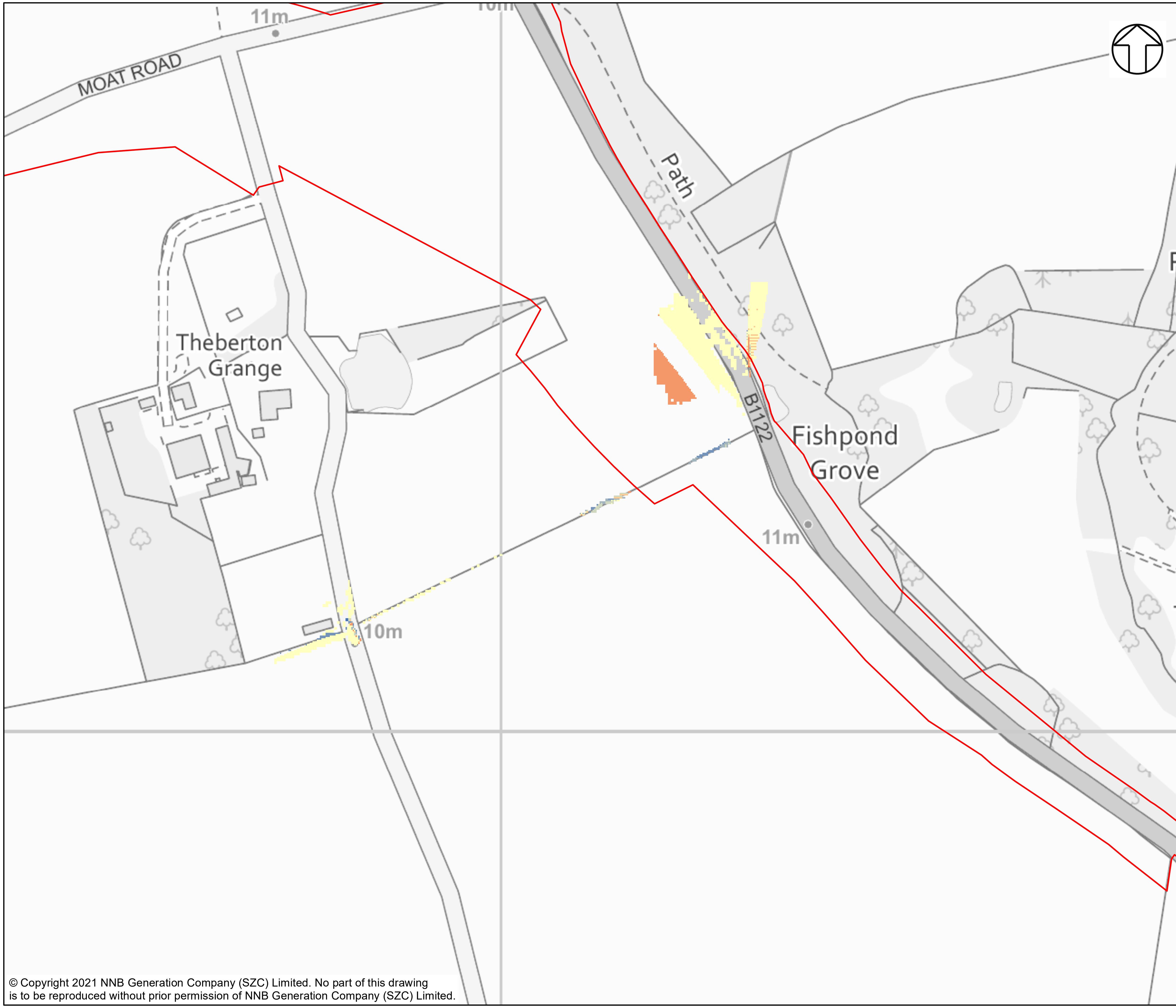
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 100-YEAR

DRAWING NO:
FIGURE C7.7

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.4

NOT PROTECTIVELY MARKED

SizewellC
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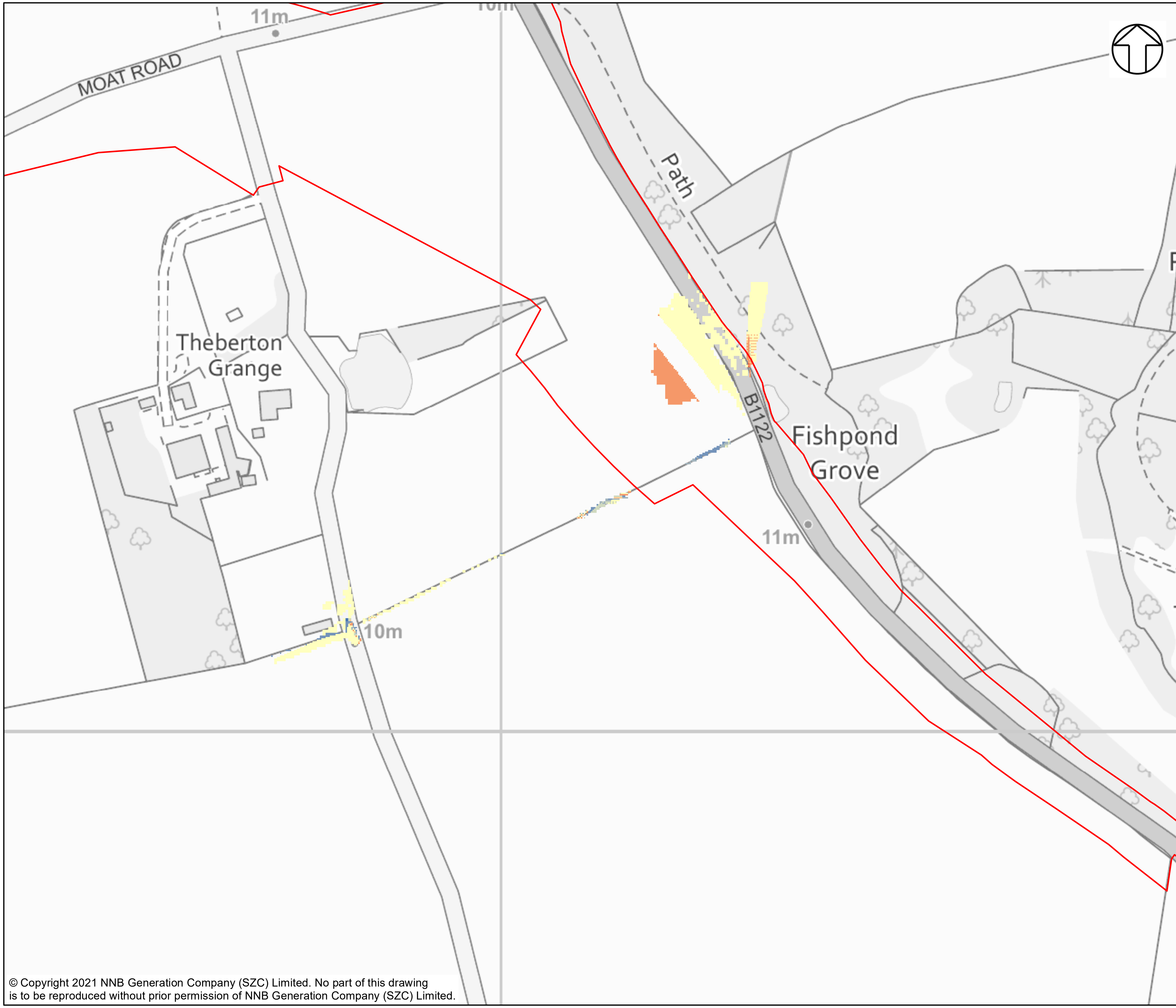
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 100-YEAR + 35% CLIMATE CHANGE

DRAWING NO:
FIGURE C7.8

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.6

NOT PROTECTIVELY MARKED

SizewellC
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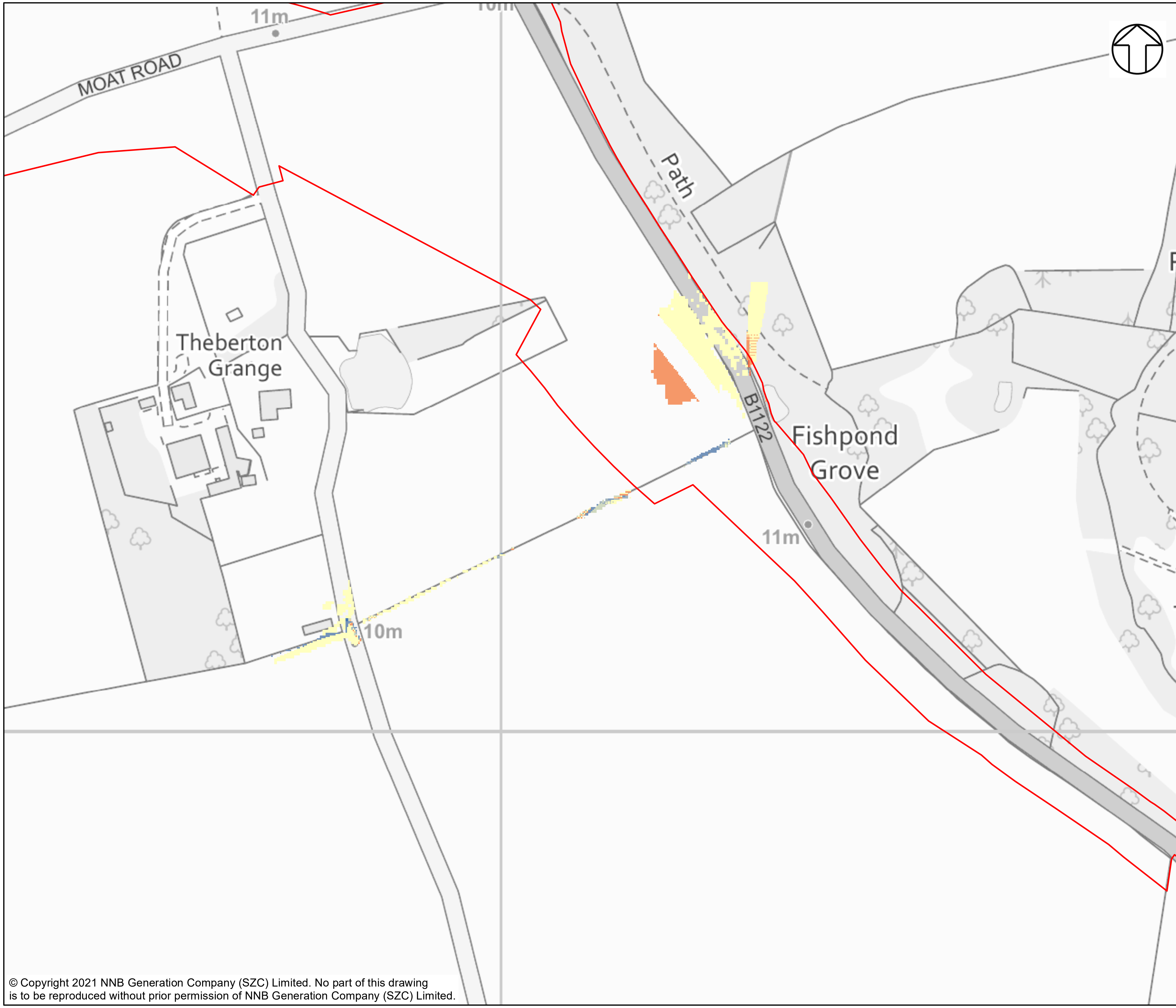
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 100-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE C7.9

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.4

NOT PROTECTIVELY MARKED

SizewellC
Doing the power of good for Britain
EDF CGN

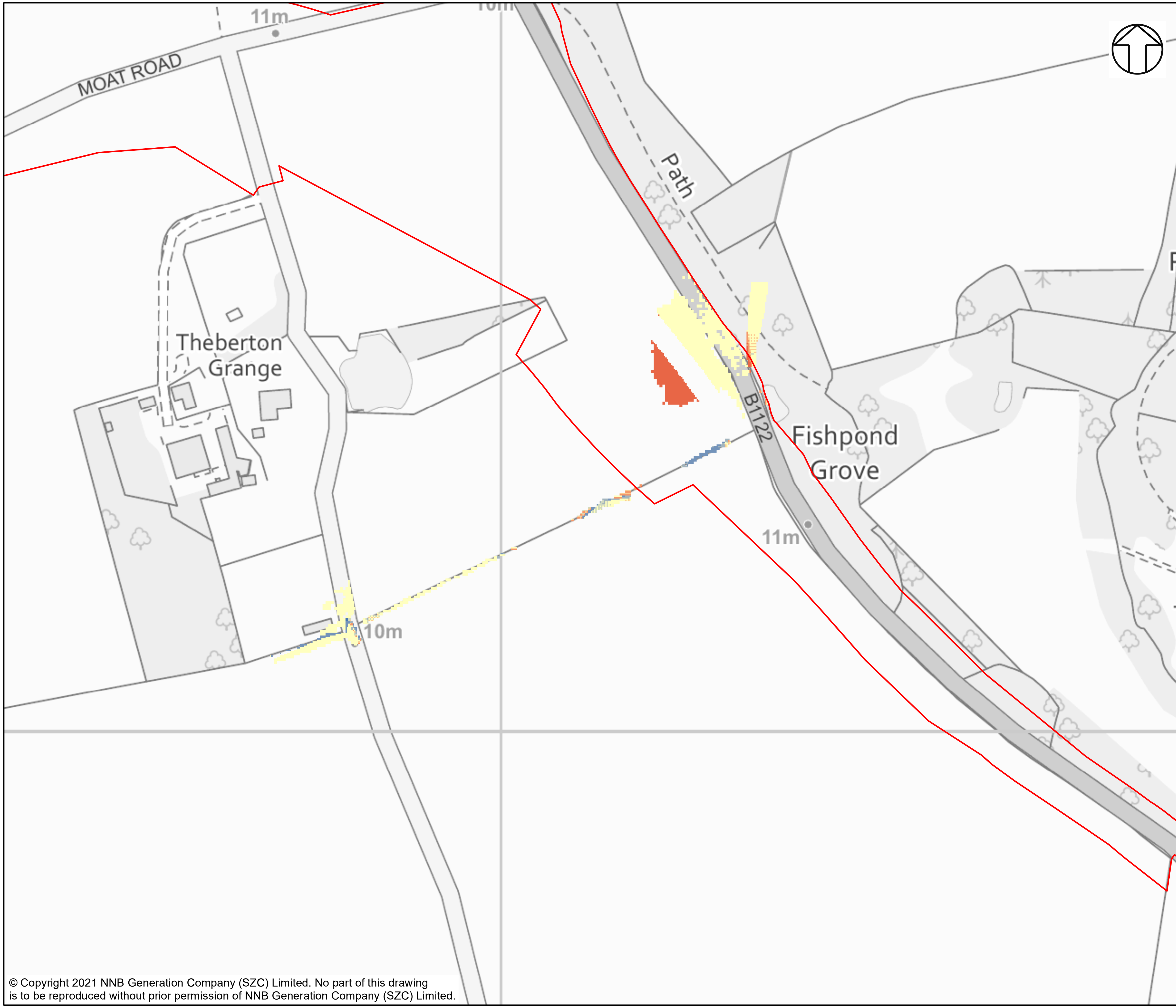
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 1000-YEAR

DRAWING NO:
FIGURE C7.10

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.4

NOT PROTECTIVELY MARKED

SizewellC
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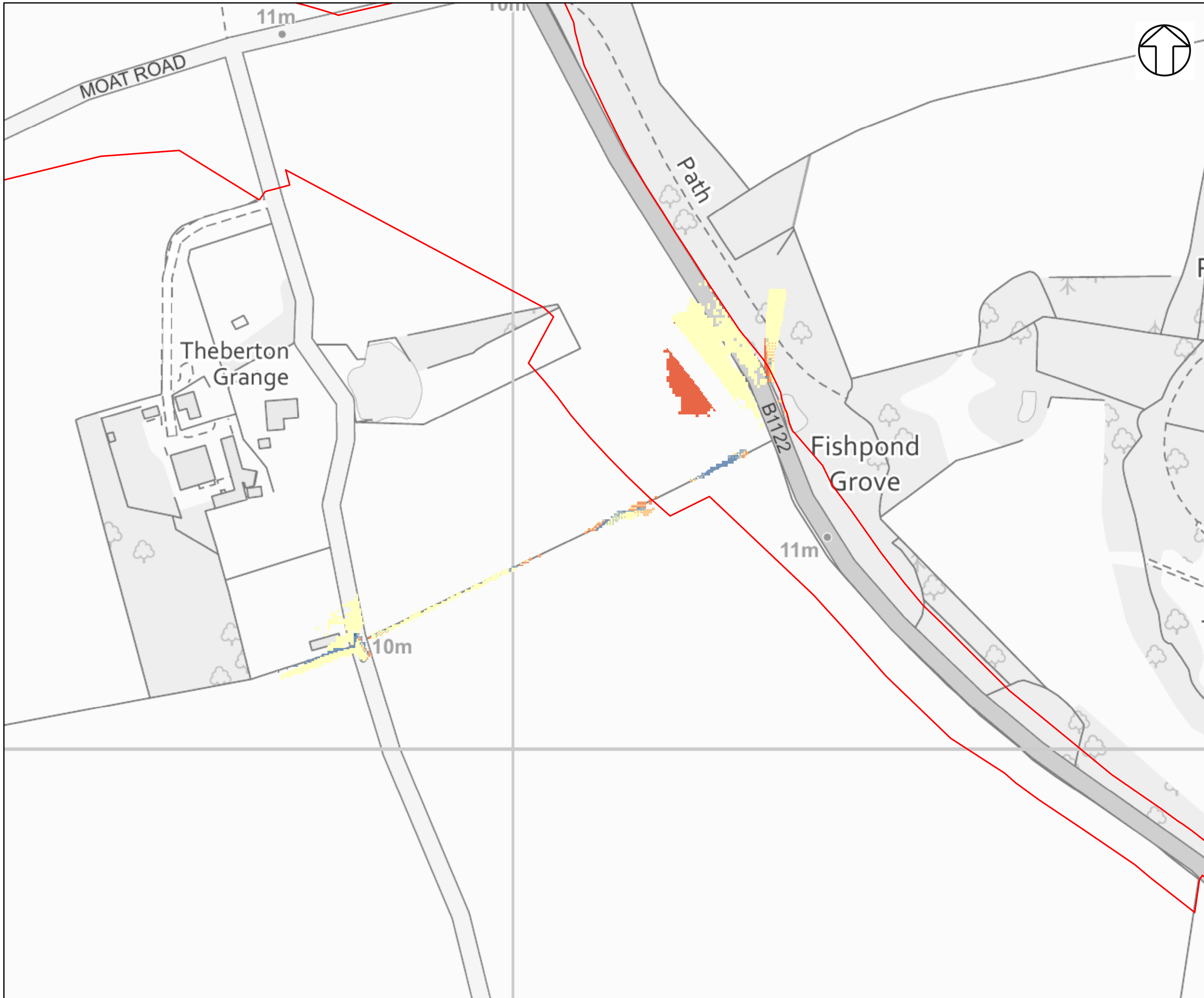
DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 1000-YEAR + 35% CLIMATE CHANGE

DRAWING NO:
FIGURE C7.11

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

FLOOD DEPTH DIFFERENCE (M)

- 0.5 - 0.3
- 0.3 - 0.1
- 0.1 - 0.03
- 0.03 - 0.01
- 0
- -0.01 - -0.03
- -0.03 - -0.1
- -0.1 - -0.3
- -0.3 - -0.4

NOT PROTECTIVELY MARKED

SizewellC
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EDF CGN

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
DIFFERENCE
1 IN 1000-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE C7.12

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	J.T.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres

Crossing 7 - Cross-Section Data: SW7-2
Elevation (m AD)
x (m)
10.05
10
9.95
9.9
9.85
9.8
9.75
9.7
9.65
9.6
9.55
9.5
9.45
9.4
9.35
9.3
9.25
9.2
9.15
9.1
9.05
9
8.95
8.9
8.85
8.8
8.75
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Stage (8.88 m AD): SW7-2 - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (9.094 m AD): SW7-2 - BASELINE_SW7_100YR_65CC_V2
Maximum Stage (9.09 m AD): SW7-2 - SCHMEE_SW7_100YR_65CC_V2
Maximum Stage (9.058 m AD): SW7-2 - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (9.06 m AD): SW7-2 - SCHEME_SW7_100YR_35CC_V2
Bed elevation: SW7-2


Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
6.45
0
1
2
3
4
5
6
7
8
9
x (m)
Stage (6.86 m AD): SW7-6 - \SLR_BASELINE_SW7_100YR_35CC_V2
Maximum Stage (7.21 m AD): SW7-6 - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (7.22 m AD): SW7-6 - BASELINE_SW7_100YR_65CC_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Bed elevation: SW7-6


Crossing 7 - Cross-Section Data: SW7-8i
Elevation (m AD)
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
6.45
6.4
6.35
6.3
0
1
2
3
x (m)
Stage (6.61 m AD): SW7-8i - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (6.82 m AD): SW7-8i - BASELINE_SW7_100YR_65CC_V2
Maximum Stage (6.755 m AD) ; 0 - 12.5 hours: SW7-8i - C:\Users\...\Update\SLR_ROAD_SW7_09-100YR_65CC_V2.zzl
Maximum Stage (6.80 m AD): SW7-8i - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (6.73 m AD): SW7-8i - SCHEME_SW7_100YR_35CC_V2
Bed elevation: SW7-8i


Crossing 7 - Cross-Section Data: SW7-10i
Elevation (m AD)
6.65
6.6
6.55
6.5
6.45
6.4
6.35
6.3
6.25
6.2
6.15
6.1
6.05
6
5.95
5.9
5.85
5.8
5.75
5.7
5.65
5.6
5.55
5.5
0
1
2
3
x (m)
Stage (5.79 m AD): SW7-10i - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (6.21 m AD): SW7-10i - BASELINE_SW7_100YR_65CC_V2
Maximum Stage (6.2148 m AD) ; 0 - 12.5 hours: SW7-10i - C:\Users\...\Update\SLR_ROAD_SW7_09-100YR_65CC_V2.zzl
Maximum Stage (6.15 m AD): SW7-10i - BASELINE_SW7_100YR_35CC_V2
Maximum Stage (6.16 m AD): SW7-10i - SCHEME_SW7_100YR_35CC_V2
Bed elevation: SW7-10i

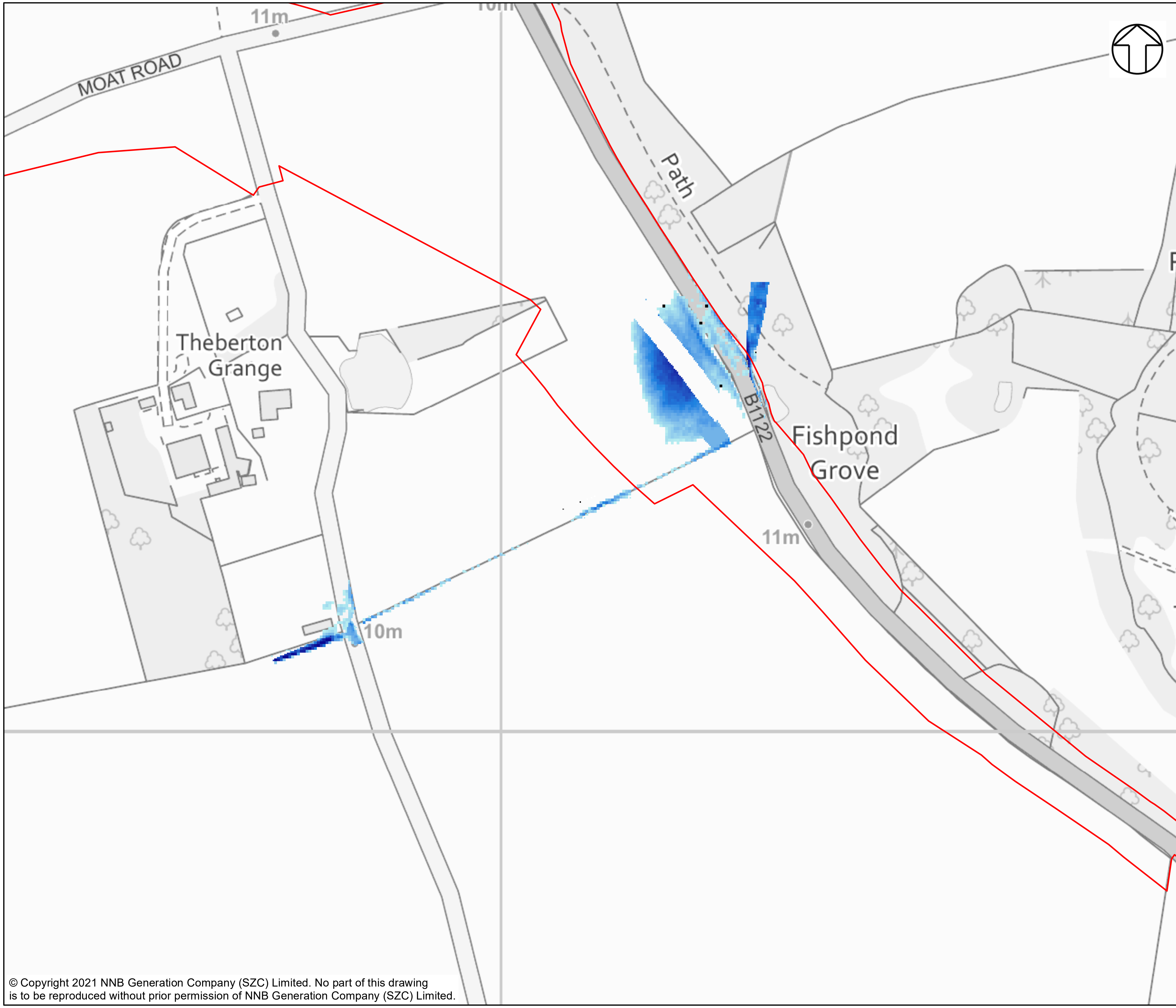
Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
6.45
0
1
2
3
4
5
6
7
8
9
x (m)
Stage (6.94 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.11 m AD) : SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_+20%FLOW_V2
Maximum Stage (7.16 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_+20%FLOW_V2
Bed elevation: SW7-6


Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
0
1
2
3
4
5
6
7
8
9
x (m)
Stage (6.94 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Maximum Stage (7.14 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_-20%ROUGHNESS_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_-20%ROUGHNESS_V2
Bed elevation: SW7-6


Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
6.45
0
1
2
3
4
5
6
7
8
9
x (m)
Stage (6.94 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_+20%ROUGHNESS_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.10 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_+20%ROUGHENSS_V2
Bed elevation: SW7-6


Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
x (m)
Stage (6.94 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Maximum Stage (7.14 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_33%BLOCKAGE_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.12 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_33%BLOCKAGE_V2
Bed elevation: SW7-6

Crossing 7 - Cross-Section Data: SW7-6
Elevation (m AD)
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
6.55
6.5
6.45
0
1
2
3
4
5
6
7
8
9
x (m)
Stage (6.94 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_V2
Maximum Stage (7.20 m AD): SW7-6 - SCHEME_SW7_100YR_65CC_67%BLOCKAGE_V2
Maximum Stage (7.11 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_V2
Maximum Stage (7.13 m AD): SW7-6 - SCHEME_SW7_100YR_35CC_67%BLOCKAGE_V2
Bed elevation: SW7-6



NOTES

KEY

SIZEWELL LINK ROAD DEVELOPMENT SITE BOUNDARY

DEPTH (M)

High : 0.871

Low : 0

NOT PROTECTIVELY MARKED

SizewellC
Doing the power of good for Britain

DOCUMENT:
SIZEWELL C
SIZEWELL LINK ROAD
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
CROSSING 7
67% BLOCKAGE SCENARIO
1 IN 100-YEAR + 65% CLIMATE CHANGE

DRAWING NO:
FIGURE C7.22

DATE:	DRAWN:	SCALE :	REVISION:
JUN 2021	F.C.	1:2,500 @A3	2.0

SCALE BAR
0 25 50 75 100 125 Metres