Lower Thames Crossing

5.4.1.1 Draft Agreed Statement of Common Ground between (1) National Highways and (2) the Environment Agency (Tracked changes version)

APFP Regulation 5(2)(q)

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

Volume 5

DATE: November 2023 Deleted: October

DEADLINE: 7 Deleted: 5

Planning Inspectorate Scheme Ref: TR010032
Application Document Ref: TR010032/APP/5.4.1.1

VERSION: 4.0 Deleted: 3

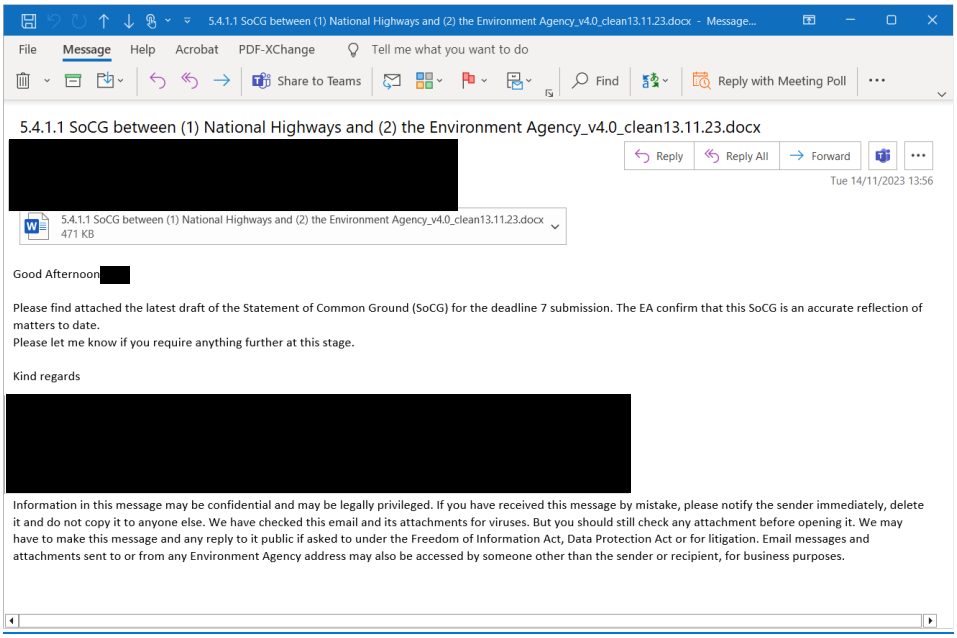
Revision history

Version	Date	Submitted at
1.0	31 October 2022	DCO Application
2.0	18 July 2023	Deadline 1
3.0	3 October 2023	Deadline 5
4.0	17 November 2023	Deadline 7

Status of the Statement of Common Ground

This is an Agreed Draft Statement of Common Ground with matters outstanding.

National Highways and the Environment Agency agree that this draft Statement of Common Ground is an accurate description of the matters raised and the current status of each matter.



A high-level overview of the engagement undertaken since the DCO application was submitted on 31 October 2022 is summarised in Table A.1 in Appendix A.

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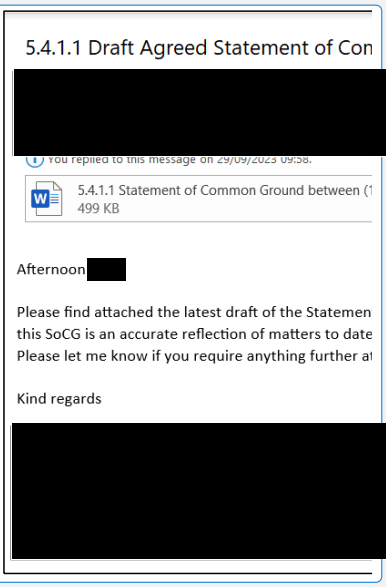

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1 Introduction

1.1 Purpose of the Statement of Common Ground

1.1.1 This Statement of Common Ground (SoCG) has been prepared in respect of the Development Consent Order (DCO) application for the proposed A122 Lower Thames Crossing (the Project) made by National Highways Limited (the Applicant) to the Secretary of State for Transport (Secretary of State) under section 37 of the Planning Act 2008 on 31 October 2022.

1.1.2 The SoCG has been produced to confirm to the Examining Authority where agreement has been reached between the Applicant and the Environment Agency, and where agreement has not been reached. Where matters are yet to be agreed, the parties will continue to work proactively to reach agreement and will update the SoCG to reflect areas of further agreement.

1.1.3 This version of the SoCG has been submitted at Examination Deadline 7.

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1.2 Principal Areas of Disagreement

1.2.1 On the 19 December 2022 the Examining Authority made some early procedural decisions to assist the Applicant, potential Interested Parties and themselves to prepare for the Examination of the DCO application.

1.2.2 One of these procedural decisions was to use a tracker recording Principal Areas of Disagreement in Summary (PADS).

1.2.3 The PADS Tracker would provide a record of those principal matters of disagreement emerging from the SoCG and should be updated alongside the SoCG as appropriate throughout the Examination with the expectation that a revised PADS Tracker should be submitted at every Examination deadline.

1.2.4 The Environment Agency elected not to produce a PADS Tracker at pre-examination stage, indicating to the Applicant that they were content that the number of outstanding matters within the SoCG was insufficient to warrant the exercise.

1.3 Terminology

1.3.1 In the matters table in Section 2 of this SoCG, “Matter not agreed” indicates agreement on the matter could not be reached following significant engagement, and “Matter under discussion” where these points will be the subject of ongoing discussion wherever possible to resolve, or refine, the extent of disagreement between the parties. “Matter agreed” indicates where the issue has now been resolved.

2 Matters

2.1 Movement of outstanding matters

2.1.1 Following submission of the previous version of this Draft SoCG between the Applicant and the Environment Agency, further discussions on the outstanding matters have taken place. These discussions are summarised in Table A.1 in Appendix A and the outcome of these discussions is summarised below.

2.1.2 It is acknowledged there are some matters where further discussion may take place during the detailed design stage of the Project to finalise detail, but the matter is agreed in principle. Matters to which this applies have an asterisk (*) next to them.

2.1.3 In the column 'Item No' in Table 2.1, 'Rule 6' indicates a matter entered in the SoCG as a result of a request in the Rule 6 letter, 'RRN' indicates a matter entered into the SoCG as a result of content in the Relevant Representation, 'RRE' indicates an existing SoCG matter that was also raised in the Relevant Representation, 'WR' indicates a matter entered into the SoCG as a result of content in the 'Written Representation' and 'DLX' indicates a new matter added during examination at/around that deadline.

2.1.4 The following matters have moved from 'matter under discussion', to 'matter agreed':

a. Item 2.1.35 'Road Drainage and Water Environment', 'Compensation and Enhancement'

b. Item 2.1.76 'DCO and Consents', 'Draft DCO Requirement 6'

a. Item 2.1.80 'Road Drainage and Water Environment', 'Flood Risk Assessment'

2.1.5 The following matters have moved from 'matter under discussion', to 'matter not agreed':

b. Item 2.1.74 'DCO and Consents', 'Draft DCO Requirement 6'

c. Item 2.1.75 'DCO and Consents', 'Draft DCO Requirement 6'

d. Item 2.1.78 'DCO and Consents', 'Draft DCO Discharge Provisions'

2.1.6 Further to the matters raised in the Deadline 5 SoCG, further technical engagement has led to two new matters being included in Table 2.1:

a. Item 2.1.81 'Road Drainage and Water Environment', 'Hydrogeology and Ground Conditions',

b. Item 2.1.82 'Road Drainage and Water Environment', 'Hydrogeology and Ground Conditions'

2.1.7 Table 2.1 details and presents the matters which have been agreed, not agreed, or are under discussion between (1) the Applicant and (2) the Environment Agency.

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Item 2.1.75 'DCO and consents, Draft DCO Requirement 6'¶
Item 2.1.76 'DCO and consents, Draft DCO Requirement 6' ¶
Item 2.1.77 'DCO and consents, Draft DCO Requirement 8'¶
Item 2.1.78 'DCO and consents, Discharge Provisions'¶
Item 2.1.79 'DCO and consents, Environmental Permits'¶
Item 2.1.80

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2.1.8 In Table 2.1, relevant issues relating to the dDCO articles and Requirements in Schedule 2 to the dDCO have been identified under the heading 'DCO and Consents'.

2.1.9 At Examination Deadline 5 there were 80 matters in total, of which 69 matters were agreed, 2 matters were not agreed and 9 matters that remained under discussion.

2.1.10 At Examination Deadline 7 there are 82 matters in total, of which 74 matters are agreed, five matters are not agreed and three matters remain under discussion.

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Table 2.1 Matters

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
DCO and consents					
Environmental Permits	2.1.1 RRE	The applicant will need to identify where permissions such as environmental permits and abstraction licences are required.	Environmental permits and abstraction licences will be applied for as required by the Contractor(s). The need for environmental permits and abstraction licences is noted in the Consents and Agreements Position Statement. The Applicant is developing an outline environmental permitting strategy in collaboration with the Environment Agency as detailed in item 2.1.79.	Consents and Agreements Position Statement [REP6-014]	Matter Agreed
Environmental Permits	2.1.2 RRE	Discharges from construction compounds are required to be permitted by the Environment Agency.	Pre-application advice has been sought from the Environment Agency on discharges at the North and South Portals. It is agreed that environmental permits for discharges would be in accordance with REAC Commitment RDWE033 'Discharge from construction of South Portal' and REAC Commitment GS022 'North Portal' (Code of Construction Practice (ES Appendix 2.2)).	ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Agreed
Environmental Permits	2.1.79 (DL5)	The Environment Agency reviewed the outline Environmental Permitting Strategy (oEPS) issued by the Applicant on 11 September 2023, and provided initial	The Applicant has developed an oEPS in collaboration with the Environment Agency. The first draft of the oEPS was shared with the Environment	Consents and Agreements Position Statement [REP6-014]	Matter Under Discussion

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		comments on 29 September 2023. The Applicant issued version two of the oEPS on 30 October 2023, which the Environment Agency is reviewing.	Agency on 11 September 2023, and a subsequent version which responds to the Environment Agency's comments was issued on 30 October 2023.		
Flood Risk Activity Permits (FRAP)	2.1.3 RRE	The Environment Agency initially advised that a FRAP is likely to be required if works are proposed within 8m of the bank of a main river, or 16m of a tidal main river. It would also be required within 8m of any flood defence structure or culvert on a main river, or 16m on a tidal main river. The Environment Agency has subsequently agreed with the Applicant's' request that the Environment Agency agrees to disapply the requirement for FRAPs. Such agreement is conditional on the inclusion of Protective Provisions acceptable to the Environment Agency within the DCO. A form of Protective Provisions has been agreed.	The Applicant considers that flood risk activities could be addressed via protective provisions for the Environment Agency in the draft DCO. A form of protective provisions has been agreed with the Environment Agency.	Draft Development Consent Order [**REP6-010**]	Matter Agreed
Co-ordinating parallel consents and other Appropriate Assessment	2.1.4	The Environment Agency considers that the consultation on the mitigation requirements and the permitting of them has been constructive. The Environment Agency recommends that permits are applied for in appropriate time to facilitate the effective implementation of the mitigation, subject to the Environment Agency's pre-application advice	In accordance with the 2022 update of Planning Inspectorate's Advice Note Ten: Habitats Regulations Assessment relevant to Nationally Significant Infrastructure Projects), Sections 5.3 to 5.6, the Applicant has consulted with the Environment Agency and Natural England with regard to the need for two Environment Agency permits in	HRA [**APP-487 and APP-488**]	Matter Agreed*

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		regarding further assessment being undertaken at detailed design stage. The Environment Agency would undertake their own HRA as a competent authority on permits which it issues.	relation to mitigation measures proposed within the Habitats Regulations Assessment (HRA), namely the discharge permit for the construction discharge from the southern tunnel entrance compound; and the provision of a water control structure in the sea defences at Coalhouse Point to facilitate wetland creation.		
Protective Provisions	2.1.5	The Environment Agency shared their standard Protective Provisions for flood risk activities with the Applicant in 2019. The Applicant shared their draft amendments in December 2020. The Environment Agency has subsequently updated their standard flood risk Protective Provisions. These were shared with the Applicant on 4 July 2022. The Applicant provided comments on the protective provisions, which the Environment Agency has now responded to. The form of protective provisions is agreed excepting paragraph 116(5) which relates to permitting issues. The Applicant has now indicated paragraph 116 (5) will be removed and a new article 'Interface with waste operation permits' has been included in the draft DCO at Deadline 4. The	The Applicant shared their draft amendments to the Environment Agency's standard flood risk Protective Provisions in December 2020. The Environment Agency did not provide comments on this drafting but has subsequently updated their standard Protective Provisions, which relate to flood risk activities, and shared these with the Applicant on 4 July 2022. A form of protective provisions has been agreed with the Environment Agency as detailed in matter 2.1.3. A new article (68) within the draft DCO 'Interface with waste operation permits' was included in the draft DCO at Deadline 4. This was discussed with the Environment Agency on 5 September 2023 and was shared with the Environment Agency via e-mail on	Draft Development Consent Order [REP6-010]	Matter Under Discussion

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		Environment Agency is currently considering the draft article.	12 September 2023. A further discussion was held on 17 October 2023.		
Protective Provisions	2.1.6	The Environment Agency has considered the Applicant's proposal to disapply the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR 2016) with respect to waste operations, through a series of technical and legal discussions, and formal papers, and has also considered the drafting for a new set of Protective Provisions proposed by the Applicant in relation to this disapplication. The Environment Agency does not agree that the disapplication of the EPR 2016 with respect to waste operations is appropriate or necessary and are not willing to give consent under section 150 of the Planning Act 2008 to the disapplication of the relevant provisions.	The Project approach to Environmental Permitting with respect to waste operations has been under discussion with the Environment Agency since 2019. The Applicant had proposed to seek disapplication of the EPR 2016 relevant to waste operations, due to the complexity of the interactions between existing permitted operations at the North Portal construction area with any permits that might be required by the Project for waste operations during construction. Following extensive and considered engagement between the technical and legal teams, the Environment Agency concluded that they did not support this approach. The Applicant has considered the Environment Agency's detailed feedback and has agreed not to seek to disapply the need for an environmental permit for waste operations under the EPR 2016. Accordingly, the Applicant no longer seeks the Environment Agency's	Draft Development Consent Order [REP6-010]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			consent under section 150 of the Planning Act 2008 in respect of such a waste permit.		
Protective Provisions / Article 68	2.1.7 RRE	On 12 September the Environment Agency was provided with the drafting of a proposed Article within the draft DCO with respect to environmental permits issued under the EPR 2016 that are held by third parties and may interact with land that is inside the Project's Order Limits and therefore the Project's construction operations. The Environment Agency is considering the latest drafting.	The Applicant had provided drafting of protective provisions to the Environment Agency for review, with respect to the EPR 2016 (paragraph 116(5)). The Environment Agency did not agree to this drafting and therefore the Applicant has now agreed to remove paragraph 116(5), and has instead included a new article (68) within the draft DCO 'Interface with waste operation permits'. This is in relation to existing environmental permits held by third parties, where the Applicant has no control over the permit or third party operations, but the permit relates to land that is within the Project's Order Limits. The drafting would require the Applicant to provide a written scheme prior to any works being undertaken affected land plots in consultation with the third-party permit holder and the Environment Agency. The drafting is also intended to afford the Applicant and third parties protection against enforcement action	Draft Development Consent Order [REP6-010]	Matter Under Discussion

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			in relation to any such existing environmental permits, in the event that construction operations for the Project do not align with activities authorised by an environmental permit held by a third party, but over which the Applicant has no control. Several meetings have been held with the Environment Agency to discuss permitting, including at meetings on 5 September, 16 October and 7th November 2023 where this drafting was discussed. The Applicant hopes to agree wording relating to the EPR 2016 with the Environment Agency prior to the close of the examination and has arranged another meeting to discuss the drafting with the Environment Agency on 16th November.		
Tunnel Protection Zones.	2.1.8 RRE	The Environment Agency has asked for clarifications regarding works within tunnel protection zones.	The tunnel protection zones are related to works restrictions for protection of the tunnel. In the first protection zone no activities are allowed, and in the second protection zone dredging and maintenance is allowed (works undertaken by the Port of London Authority) and other activities only after consent by the undertaker (National Highways). The tunnel protection zones are detailed in	River Restrictions Plan [**REP1-041**] Draft Development Consent Order [**REP6-010**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			the River Restrictions Plan, which was shared with the Environment Agency. Text from article 48 of the draft Development Consent Order was also shared with the Environment Agency and no comments have been received to date.		
Draft DCO Requirement 6	2.1.74 WR (DL5)	In respect of Requirement 6 (contaminated land and groundwater), the Environment Agency considers that the draft DCO should refer to "land contamination" rather than "contaminated land." The term "contaminated land" is used specifically in the Contaminated Land Regulations (England) (2006) to refer to a piece of land that has been designated as such by an enforcing authority (usually a Local Authority, but in some specific cases, the Environment Agency).	The Applicant has adopted the use of 'contaminated land' given its use in several other DCOs endorsed by the Secretary of State, including A303 Stonehenge Development Consent Order 2023 and M25 Junction 28 Development Consent Order 2022. Contaminated land is consistent with the wording used in the Environmental Protection Act 1990.	Draft Development Consent Order [REP6-010]	Matter Not Agreed
Draft DCO Requirement 6	2.1.75 WR (DL5)	In relation to Requirement 6, sub-paragraph 2, the Environment Agency does not agree that the dDCO should give the undertaker the decision as to whether remediation is necessary or not. The decision should be based on an assessment of risk. A better approach would be to say "Where the risk assessment from (1) indicates that	The Applicant's view is that the remediation decision should lie with the undertaker in the interests of the expeditious delivery of this Nationally Significant Infrastructure Project, and in light of the additional controls relating to contaminated land in the REAC. The Applicant's approach has also been endorsed by the Secretary of	Draft Development Consent Order [REP6-010] ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Not Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		remediation of the contaminated land is necessary…"	State on several DCOs, such as A303 Stonehenge Development Consent Order 2023, and M25 Junction 28 Development Consent Order 2022.		
Draft DCO Requirement 6	2.1.76 WR (DL5)	The Environment Agency would like to add sub-paragraph (4) to require the undertaker to prepare and submit a Validation Report demonstrating the completion of works set out in the approved remediation strategy from (3) and the effectiveness of the remediation shall be submitted to, and approved in writing, by the Secretary of State, the relevant planning authority and the Environment Agency. The report shall include results of sampling and monitoring carried out in accordance with the approved scheme to demonstrate that the site remediation criteria have been met. Validation reports are standard practice in the Land Contamination Risk Management process. We note there is a requirement for 'the EMP2 to include plans for the management of contamination'. If that will involve validation reports then we can agree this matter.	The Applicant notes that there a number of controls in the REAC relating to contaminated land as well as the requirement in paragraph 4(2) which requires EMP2 to include plans for the management of contamination. The Applicant's drafting is in line with several other DCOs endorsed by the Secretary of State, including A303 Stonehenge Development Consent Order 2023 and M25 Junction 10/A3 Wisley Interchange Development Consent Order 2022. REAC commitment GS016 requires a verification report to be prepared by the Contractors after completion of work to remediate contamination at each site where this is undertaken. This would identify the locations of the remediation works undertaken and the final tested ground quality. These reports would be provided to the relevant local authorities and Environment Agency as a record.	Draft Development Consent Order [**REP6-010**] ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Draft DCO Requirement 8	2.1.77 WR (DL5)	The Environment Agency would like to be a consultee on Requirement 8 (surface and foul water drainage) due to its role in regulating the drainage discharges from this Project. Following the draft Development Consent Order Hearing on 11 September 2023, this has now been agreed.	The Applicant has agreed to the Environment Agency's request to be included as a consultee on Requirement 8, due to their role in regulating drainage discharges.	Draft Development Consent Order [REP6-010]	Matter Agreed
Draft DCO Discharge Provisions	2.1.78 WR (DL5)	The Environment Agency considers that in relation to the discharge provisions at 20(2) this provision should be for deemed refusal, not deemed consent.	These provisions do not relate to the Environment Agency and instead apply to the Secretary of State. The Applicant considers that paragraph 20 is appropriate. In circumstances where there is no consultee reporting that there are materially new or materially different effects, it is considered appropriate for the Applicant to proceed. The Applicant maintains that the current drafting is acceptable as it has already been endorsed by the Secretary of State on several other DCOs, for example A303 Stonehenge Development Consent Order 2023, or the A57 Link Roads Development Consent Order 2022.	Draft Development Consent Order [REP6-010]	Matter Not Agreed
Route selection, model alternatives and assessment of reasonable alternatives					

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Route Selection	2.1.9	The Environment Agency agrees that Option C is the preferred route for the Lower Thames Crossing.	Noted.	N/A	Matter Agreed
Sustainability					
Legacy and benefits	2.1.10	Further to initial concerns about the Project's approach to legacy and benefits in 2019, the Environment Agency now agrees with the approach to legacy and benefits working groups. The Environment Agency regularly attends legacy and benefits workshops, including the Marshes and Rivers sub-group of the Environment Legacy Steering Group. The Environment Agency is pleased at the progress being made by this group to organise a structure for allocating funds to environmental improvement projects. They look forward to continuing to support the group into the future.	Noted.	N/A	Matter Agreed
Terrestrial biodiversity					
Methodology & baseline	2.1.11	The Environment Agency agrees with the ecological survey methodologies.	Ecological survey methodologies have been agreed with the Environment Agency.	ES Chapter 8: Terrestrial Biodiversity [APP-146]	Matter Agreed
Methodology & baseline	2.1.12	Essex Field Club data should be included in the ecology baseline data.	Data received from Essex Field Club has been included in the ecology baseline.	ES Chapter 8: Terrestrial	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
				Biodiversity [APP-146]	
Impact	2.1.13	Insufficient information was provided in the Preliminary Environmental Impact Report (PEIR) on potential environmental impacts, however, the level of information subsequently provided to the Environment Agency regarding environmental impacts is appropriate.	The Applicant agrees that the level of information provided to the Environment Agency is appropriate. A series of workshops have been held to discuss the Project's impact, mitigation and enhancement, along with technical meetings, where required. Drafts of the Application Documents were shared with the Environment Agency in December 2020, and the updated Application Documents have subsequently been shared, where relevant to the Environment Agency's function.	ES [APP-138 to APP-486]	Matter Agreed
Impact	2.1.14 RRE	It should be assumed that eels are present in all watercourses along the LTC route. It is agreed that the Applicant's contractors will adopt best practice for eel and fish passage through culverts.	The effects on fish and eels are detailed in ES Chapter 8: Terrestrial Biodiversity which concludes no significant effects to fish and eels. The assessment assumes that eels and minor fish species are present in catchments. Good practice for the design and operation of culverts with respect to elvers is detailed in Part 10 of the Flood Risk Assessment (FRA) (ES Appendix 14.6).	ES Chapter 8: Terrestrial Biodiversity [APP-146] Part 10 of ES Appendix 14.6: FRA [APP-477]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Impact	2.1.15 RRE	The watercourses surrounding the Thames Estuary and Marshes directly feed into this protected area and are likely to be of high ecological value. The Applicant should not impact the flora and fauna of these watercourses during and after construction. The Environment Agency requested that further ecological and water sampling (conductivity) of the drains and ditches in and around the Thames Estuary and Marshes Ramsar was undertaken to understand how this sensitive environment works. The Environment Agency is now satisfied that sampling of water in the drains and ditches in the Ramsar is now complete. It is also agreed that the Project will need to ensure that it meets the requirement of the Environmental Permitting Regulations 2016, and apply to the Environment Agency for an environmental permit for the south portal surface water discharge if required, into the Thames Estuary and Marshes Ramsar western ditch, in line with Register of Environmental Actions and Commitments (REAC) commitment RDWE033 'Discharge from construction of South Portal' (Code of Construction Practice (ES Appendix 2.2, Application Document 6.3)).	Baseline ecological and water quality surveys were undertaken in the watercourses in and adjacent to the Thames Estuary and Marshes between 2021-2022 as requested by the Environment Agency. These are presented in the ES. The impact of the Project on the Thames Estuary and Marshes has been assessed in ES Chapter 8: Terrestrial Biodiversity, which concludes that the impacts on the Site of Special Scientific Interest (SSSI) are not significant. This impact is also assessed in the HRA , which concludes there would be no Likely Significant Effects from changes in water quality. Pre-application advice has been sought from the Environment Agency regarding environmental permitting for the South Portal discharge. It is agreed that any surface water discharge into the Thames Estuary and Marshes Ramsar western ditch would need to be in line with REAC Commitment RDWE033 'Discharge from construction of South Portal' (Code of Construction Practice (ES Appendix 2.2)).	ES Chapter 8: Terrestrial Biodiversity [APP-146] HRA [APP-487 and APP-488] ES Appendix 2.2: Code of Construction Practice [REP6-038] ES Appendix 14.7: Water Framework Directive (WFD) Assessment [APP-478]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Mitigation	2.1.16 RRE	Ecological mitigation and compensation should be included for the construction phase as well as for the final design. Mitigation and compensation should be in situ prior the impact.	The impacts of habitat loss in the construction and operational phases have been fully assessed in ES Chapter 8: Terrestrial Biodiversity. Habitat creation (for mitigation and compensation) will be delivered by the contactor and therefore forms part of the wider construction programme. REAC Commitment LV029 'Landscape Planting' (Code of Construction Practice (ES Appendix 2.2)) states: '*Planting identified on the Environmental Masterplan (Figure 2.4, Application Document 6.2) would be undertaken at the earliest practicable opportunity.* *Where planting is being undertaken to landscape or provide environmental mitigation on land used temporarily for the authorised development, planting for the implementation of environmental mitigation would be undertaken at the earliest practicable planting season after completion of that part of the construction works and in accordance with the LEMP.* *Planting on land taken solely for environmental mitigation purposes would be undertaken at the earliest practicable planting season following*	ES Chapter 8: Terrestrial Biodiversity [APP-146] ES Appendix 2.2: Code of Construction Practice [REP6-038] ES Figure 2.4: Environmental Masterplan [REP4-124, REP3-098, REP2-018, APP-162, REP4-127, REP4-129, REP2-024 to REP2-031]	Matter Agreed

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Field Code Changed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			commencement of authorised development and in accordance with the LEMP.'		
Mitigation	2.1.17	Green bridges should be a sufficient size and design to function for all mammal species that currently utilise the area, as well as providing the necessary corridors for the movement of other species. The design should use contemporary evidence to establish minimum sizes and locations.	Green bridges have been individually designed to provide the greatest benefit at each crossing location for protected mammal species that currently utilise the area. For example, North Road and Muckingford Road mixed-use green bridges have been designed to accommodate terrestrial mammals and other species such as bats. Green bridge designs have been informed by best practice guidance, recent National Highways green bridge designs (for example the A556) and site-specific conditions (for example the presence of protected species and landscape requirements) to provide enhanced ecological connectivity. Full details can be found in the Design Principles and ES Chapter 8: Terrestrial Biodiversity.	Design Principles [REP6-046] ES Chapter 8: Terrestrial Biodiversity [APP-146]	Matter Agreed
Compensation and enhancement	2.1.18 RRE	The Environment Agency would expect a Project of this scale and importance to achieve net gain in line with the Government's 25 Year Environment Plan.	The Project has an aspiration to achieve Biodiversity Net Gain. Further details are provided in ES Chapter 8: Terrestrial Biodiversity. The Applicant presented its Biodiversity Net Gain results to the	ES Chapter 8: Terrestrial Biodiversity [APP-146]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			Environment Agency on 14 February 2023.		
Marine biodiversity					
Methodology and baseline	2.1.19	The Environment Agency is satisfied with the contents of the PEIR in relation to marine water quality.	Noted.	ES Chapter 9: Marine Biodiversity [APP-147]	Matter Agreed
Impact	2.1.20 RRE	The Project should not impact the water quality of the Thames. The Environment Agency agrees with the assessment within the WFD Assessment.	Any discharges into the River Thames would be required to be permitted by the Environment Agency. Discharges would be compliant with any limits detailed in the conditions of discharge as agreed with the Environment Agency, and as set out in REAC Commitments RDWE023 'Drainage discharge to River Thames', RDWE025 'Operational drainage design', RDWE026 'Tunnel operational drainage design', RDWE028 'Northern tunnel entrance compound drainage discharge design' and GS022 'North Portal' (ES Appendix 2.2: Code of Construction Practice). Required discharges into the River Thames are detailed in ES Appendix 14.7: WFD Assessment, which has been agreed with the Environment Agency.	ES Appendix 14.7: WFD Assessment [APP-478] ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Compensation and enhancement	2.1.21	The Environment Agency's original position was that they would require compensation if the East Tilbury Jetty were re-purposed to be used for the Project, as the timescales involved would make it into a permanent structure. They also advised that changes to the jetty should not impact the surrounding environment, the water quality of the Thames or impact on existing flood defence infrastructure. The Applicant has subsequently removed the East Tilbury Jetty from the Project's Order Limits, which the Environment Agency welcomes.	The Applicant no longer proposes to use the East Tilbury Jetty and has removed it from the Project's Order Limits.	N/A	Matter Agreed
Material assets and waste					
Methodology and baseline	2.1.22	The Environment Agency has requested sight of the Draft Materials Management Plan (MMP). It is agreed that the Draft MMP will be shared with the Environment Agency for review when available.	Draft MMP will not be available prior to submission of the DCO application. The Draft MMP will be written by the contractor and will be shared with the Environment Agency as soon as practicable.	N/A	Matter Agreed
Methodology and baseline	2.1.23	Any site where waste was discarded or disposed of as waste in the past (whether the site now holds a permit or not) remains waste until is it recovered or disposed of. This includes historic landfills and past exempt activities. Excavation of materials from a non-	Matter agreed. The following REAC commitments (ES Appendix 2.2: Code of Construction Practice) relate to waste management activities, and have been agreed with the Environment Agency:	ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		permitted site (historic) is not in itself a waste activity but the subsequent storage, treatment disposal and recovery are.	• REAC Commitment MW007 'Excavated materials and soils' • REAC Commitment MW010 'Construction site waste management'		
Methodology and baseline	2.1.24	All soils should be tested prior to determining appropriate storage provisions.	Appropriate testing will be undertaken as detailed in the REAC Commitment MW010 'Construction site waste management' (ES Appendix 2.2: Code of Construction Practice).	ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed
Impact	2.1.25 RRE	The East Tilbury Landfill is a historic hazardous landfill. The Environment Agency asks that nothing is built on the landfill that could impact its structure, integrity, or increase any pathways for leachate from the landfill. The Environment Agency agrees that REAC Commitment GS020 'East Tilbury access road' is appropriate.	REAC commitment GS020 'East Tilbury access road' (ES Appendix 2.2: Code of Construction Practice) has been agreed with the Environment Agency.	ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed
Mitigation	2.1.26	Further to comments provided on the outline Site Waste Management Plan (oSWMP) provided on 02 March 2021, the Environment Agency would like to see the pre-application draft of the document.	The draft OSWMP (ES Appendix 2.2, Annex A) was shared with the Environment Agency on 02 March 2021, and comments were received on 22 March 2021. The Environment Agency's comments have been addressed in the pre-application draft shared with the Environment Agency on 25 August 2022.	ES Appendix 2.2 Annex A: oSWMP [**REP6-040**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Road drainage and water environment					
WFD					
Methodology and baseline	2.1.27	The Environment Agency agrees with the WFD methodology.	The WFD methodology has been agreed with the Environment Agency.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed
Methodology and baseline	2.1.28 RRE	The Environment Agency advised the Applicant that the quantitative status of the South Essex Thurrock Chalk Waterbody was updated from Poor to Good in September 2022. The Applicant provided the Environment Agency with a technical note setting out any potential implications linked to the WFD status change. The Environment Agency agrees with findings of the Applicant's technical note that the change in status of the South Essex Thurrock Chalk Waterbody does not alter any of the conclusions of the WFD assessment.	Due to the timing of this update to WFD status (September 2022), it was agreed at a meeting held on 22 September 2022 that ES Appendix 14.7: WFD Assessment would not be updated to reflect this status change. The Applicant provided the Environment Agency with a technical note which concludes that the change in status of the South Essex Thurrock Chalk Waterbody does not alter any of the conclusions of the WFD assessment.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed
Impact	2.1.29 RRE	The Environment Agency does not agree with the proposed culverting of watercourses. The Environment Agency has a formal policy against culverting of any watercourse because of the adverse ecological, flood risk, geomorphological, human safety and aesthetic impacts.	Where culverting cannot be avoided, embedded mitigation will be included, the full details of which can be found in the Design Principles and ES Figure 2.4: Environmental Masterplan. Further details of culverting proposals can also be found in ES Figure 14.6: WFD – Groundwater Bodies and	Design Principles [**REP6-046**] ES Figure 2.4: Environmental Masterplan [**REP4-124, REP3-098, REP2-018,**	Matter Not Agreed

Deleted: Design Principles [**APP-516**]¶

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			Current Status. Culvert lengths have been minimised where practicable, for example the Tilbury Main culvert which has been reduced from 83m to 46m.	APP-162, REP4-127, REP4-129, REP2-024, to REP2-031] ES Figure 14.6: WFD – Groundwater Bodies and Current Status [APP-327]	
Impact	2.1.30 RRE	The location of the North Portal means that the Lower Thames Crossing will need to cross the Tilbury Main. The Applicant is proposing a 46m culvert. Although the Environment Agency does not agree with culverting in principle, they do accept this is the least damaging option. The Environment Agency is pleased that this has reduced from the original proposal of an 83m culvert. They are also pleased that three existing culverts on the Tilbury Main, one to the east of the road alignment, and two to the west, will be removed. The Environment Agency still opposes the culverting even though the length has been reduced. It is for the applicant to make a case to the Secretary of State for	A Choosing by Advantage Workshop was undertaken with the Environment Agency to appraise the options for a crossing over the Tilbury Main on 16 December 2019 (HE540039-CJV-GEN-GEN-MIN-DCO-00002). Although the Environment Agency objects to culverting, it was acknowledged that a culvert is the least damaging option in this location owing to the complexity, risks and impacts associated with alternative options. The culvert length has since been reduced from 83m to 46m, with the removal of three further culverts along the Tilbury Main.	ES Appendix 14.7: WFD Assessment [APP-478]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		Transport under Regulation 19 of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 that the culverting should be allowed.			
Impact	2.1.31 RRE	The Environment Agency does not agree with the loss of WFD habitat proposed by the Project. The Environment Agency's view is that the loss of WFD habitat cannot be mitigated for.	The culverting of the Tilbury Main, which results in the loss of WFD habitat, is required for the construction and operation of the tunnel approach. The Applicant agrees that the loss of WFD habitat cannot be mitigated for, but the Project design includes 3km of freshwater compensation in the Mardyke Catchment, which represents an overall increase in the provision of freshwater habitat.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Not Agreed
Impact	2.1.32 RRE	Although the Environment Agency does not agree with the loss of WFD habitat, the Environment Agency agrees that the freshwater enhancements will provide an overall increase in freshwater habitat.	The Applicant agrees that there would be an overall increase in the provision of freshwater habitat.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed
Impact	2.1.33	WFD assessments should be agreed with the Environment Agency. Notwithstanding SoCG items 2.1.28, 2.1.29 and 2.1.31, the WFD assessment has been agreed with the Environment Agency.	The WFD Assessment (ES Appendix 14.7) has been agreed with the Environment Agency.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Compensation and enhancement	2.1.34 RRE	The Environment Agency agrees with the relocation of freshwater habitat creation from Coalhouse Point to the Mardyke catchment due to the condition of the sea wall at Coalhouse Point.	Freshwater habitat creation has been moved to the Mardyke catchment. The Coalhouse Point land will be used as Functionally Linked Land (FLL) mitigation and for invertebrate mitigation.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed
Compensation and enhancement	2.1.35 RRE	The Environment Agency was approached by the Applicant in July 2022 to review the technical note regarding the proposed water supply for FLL mitigation adjacent to Coalhouse Fort and provided comments on 26 July 2022 (HE540039-LTC-EWE-S07-REP-ENV-00001). A meeting was arranged by the Applicant on 23 August 2022 to discuss the comments provided by the Environment Agency as outlined above. A key concluding point from this meeting was of the two options presented by LTC (1. To install a new regulated tidal exchange structure or 2. Utilise the existing drain through agreement from the Coalhouse Fort moat through agreement with Thurrock Council) the Environment Agency position would be to favour option 2 as it doesn't require disturbance of the existing embankments. If option 1 were to be pursued, engagement should be undertaken with relevant landowners and stakeholders,	The Applicant is considering options for ensuring a water supply to the FLL mitigation adjacent to Coalhouse Fort. The current proposal is to allow ingress of water from the River Thames through a water inlet with self-regulating valve as detailed in REAC Commitment RDWE049 'Water supply and water level control at Coalhouse Point wetland' (Code of Construction Practice (ES Appendix 2.2). In parallel, the potential for a formal agreement is under discussion with Thurrock Council regarding the use of existing drainage infrastructure within the Coalhouse Fort Moat. The Applicant provided initial responses to the Environment Agency's comments at a meeting on 22 August 2022, which included a request to undertake a flood risk assessment of the proposed Coalhouse Point wetland mitigation area. A further meeting to discuss	HRA [**APP-487 and APP-488**] ES Chapter 8: Terrestrial Biodiversity [**APP-146**] ES Appendix 2.2: Code of Construction Practice [**REP6-038**] Coalhouse Point Flood Risk Assessment [**REP6-102**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		Statutory Environmental Bodies, local authorities and Statutory Undertakers. Only then would such an option be approved by the Environment Agency in line with 'submission and approval of plans' as required by the Protective Provisions. The Environment Agency has reviewed the Coalhouse Point hydraulic model and technical notes provided by the Applicant and provided comments on 6 and 25 October. The Environment Agency has reviewed and is satisfied with the updated technical note shared with the Environment Agency on 31 October 2023, as detailed in Annex C.15.	flood modelling was held on 08 February 2023, and a site visit took place on 20 April 2023. The Applicant issued the Coalhouse Point hydraulic model and technical note to the Environment Agency on 21 September 2023. These were discussed at a meeting held on 26 September, and the Environment Agency provided their initial comments on 6 October 2023. The Applicant provided an updated technical note on 16 October 2023 which the Environment Agency responded to on 25 October 2023. The Applicant has addressed these comments in an updated technical note shared with the Environment Agency on 31 October 2023, and submitted at Deadline 6 [**REP6-102**]. The interpretation of the hydraulic modelling results demonstrates that the proposed wetland area will not have an adverse impact on flood risk elsewhere. The Environment Agency has now reviewed and accepted this technical note, as detailed in Annex C.15.		
Hydrogeology and ground conditions					

Deleted: Discussion is ongoing with the Environment Agency on this matter, most recently at meetings with the Environment Agency on 20 June and 23 August 2023

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Methodology and baseline	2.1.36 RRE	The Environment Agency agrees with the ground investigation methodology.	Methodology agreed.	ES Chapter 14: Road Drainage and the Water Environment [**APP-152**]	Matter Agreed
Methodology and baseline	2.1.37 RRE	The Environment Agency agrees with the hydrogeology modelling methodology.	Methodology agreed.	ES Chapter 14: Road Drainage and the Water Environment [**APP-152**]	Matter Agreed
Methodology and baseline	2.1.38 RRE	The Environment Agency agrees with the groundwater monitoring regime.	Methodology agreed.	ES Chapter 14: Road Drainage and the Water Environment [**APP-152**]	Matter Agreed
Methodology and baseline	2.1.39	The Environment Agency advised that a suitable desk study and Water Features Survey should be completed and agreed with the Environment Agency. This desk study and Water Features Survey has been completed and agreed with the Environment Agency.	Details of the survey methodology and results are provided in the Water Features Survey Factual Report (ES Appendix 14.2). This has been accepted by the Environment Agency.	ES Appendix 14.2: Water Features Survey Factual Report [**APP-454 and APP-455**]	Matter Agreed
Methodology and baseline	2.1.40 RRE	The Environmental Statement should include an assessment of whether any Unexploded Ordnance (UXO) pose potential land or groundwater contamination issues.	Zetica (UXO specialists) were commissioned to undertake a report detailing likely locations of UXO and risk management protocols. This has informed the assessment included in ES Chapter 10: Geology and Soils.	ES Chapter 10: Geology and Soils [**APP-148**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
Methodology and baseline	2.1.41	Hydrogeological models and risk assessments should be completed and agreed with the Environment Agency. The Environment Agency has reviewed, and is satisfied with, the Hydrogeological Risk Assessment.	A Hydrogeological Risk Assessment (ES Appendix 14.5) has been written and agreed with the Environment Agency, informed by pump test data and groundwater modelling as appropriate.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**]	Matter Agreed
Methodology and baseline	2.1.42 RRE	Modelling should take account of Source Protection Zones (SPZs).	The ES, the Hydrogeological Risk Assessment (ES Appendix 14.5) and the mitigation requirements have been updated to reflect that part of the Project is located within a SPZ 2 and in close proximity to a SPZ 1.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**]	Matter Agreed
Methodology and baseline	2.1.43	The Environment Agency highlighted the risk that the results of the hydrogeology investigations might not be received prior to DCO submission and requested that the ground investigation data and reports are shared with the Environment Agency when available. The Environment Agency is now satisfied that all ground investigation is now complete and that the results have been shared with the Environment Agency.	All hydrogeology investigations were completed in 2022, and the results are presented in the Hydrogeological Risk Assessment (ES Appendix 14.5) which has been shared and agreed with the Environment Agency.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**]	Matter Agreed
Impact	2.1.44	The Project should not affect groundwater quality.	The conclusion of the Hydrogeological Risk Assessment (ES Appendix 14.5), is that the Project will not affect groundwater quality.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
				ES Chapter 10: Geology and Soils [**APP-148**]	
Impact	2.1.45 RRE	Cuttings and embankments from the Project must not impact groundwater, such as impeding flow.	Assessments have been undertaken and reported in a Hydrogeological Risk Assessment (ES Appendix 14.5), informed by pump test data and groundwater modelling as appropriate. This has been agreed with the Environment Agency. The findings have informed ES Chapter 14: Road Drainage and the Water Environment.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**] ES Chapter 14: Road Drainage and the Water Environment [**APP-152**]	Matter Agreed
Impact	2.1.46 RRE	The construction and operation of the Lower Thames Crossing must not impact existing abstractions.	Where practicable, the Project would avoid impacts on existing abstractions. Where avoidance is not practicable, the Applicant will consult with the licence holder and licensing authority to provide mitigation in the form of alternative supplies in line with landowner requirements.	ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed
Impact	2.1.47 RRE	Following the meeting held on 18 August 2022, the Environment Agency is now satisfied that the REAC item RDWE015 'Replacement of existing reservoir at Low Street', RDWE016 'Protection of landowner irrigation supply infrastructure at North Ockendon' and RDWE038 'Avoiding impacts on groundwater resources at the Thames Chase Forest	The Applicant commits to minimising groundwater effects at the A122 Lower Thames Crossing/M25 junction during the construction and operation of the Project through REAC Commitment RDWE038. REAC Commitment RDWE015 commits to reconfigure the water supply system at Low Street, as agreed with the landowner, to maintain	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**] ES Appendix 14.7: WFD Assessment [**APP-478**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		Site of Importance for Nature Conservation (SINC), Hall Farm moat, paddock, and St Mary Magdalene Churchyard SINC' will ensure continuity of irrigation systems and water supply to the affected landowner, located near the M25/LTC junction.	continuity of supply during construction and operation of the Project. Continuity of the irrigation system potentially impacted by the road alignment is secured through REAC Commitment RDWE016, which commits to providing a new supply route across the Project road, unless otherwise agreed with the landowner.		
Impact	2.1.48 RRE	The Environment Agency highlighted that the PEIR identified that lowering of groundwater levels during dewatering could increase the risk of saline intrusion potentially impacting on the designated marshes and surface water features. However, following their review of the detailed groundwater studies presented in the Hydrogeological Risk Assessment (ES Appendix 14.5, Application Document 6.3), the Environment Agency now accepts that there is no groundwater connection to the Ramsar, and saline intrusion has been discounted as a potential effect.	Sampling of water in the drains and ditches in the Thames Estuary and Marshes Ramsar site has been undertaken as part of the programme of ground investigation works undertaken between 2018-2022. This has confirmed that there is no groundwater connection to the Ramsar. The HRA that there would be no significant change to surface water resulting from any groundwater changes. This is supported by the preliminary (Stage 2 assessment) hydrogeological and water balance studies (Hydrogeological Risk Assessment (ES Appendix 14.5).	HRA [**APP-487 and APP-488**] ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**]	Matter Agreed
Impact	2.1.49 RRE	The Environment Agency highlighted that the potential construction effects and mitigation north of the River Thames should consider the potential for impacts	Groundwater numerical modelling of the North Portal has been undertaken to assess any potential impact on the Mucking Flats and Marshes SSSI,	ES Appendix 14.5: Hydrogeological Risk Assessment	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		on Mucking Flats and Marshes SSSI, South Essex Chalk and the Linford public water supply. It should also include the potential for mobilisation of contamination due to dewatering near the historical landfill site. Groundwater numerical modelling of the North Portal is complete, and is reported in the Hydrogeological Risk Assessment, which has been agreed with the Environment Agency.	South Essex Chalk and Linford public water supply. This is reported in the Hydrogeological Risk Assessment (ES Appendix 14.5), and no significant effects have been identified. The Hydrogeological Risk Assessment has been agreed with the Environment Agency.	[**APP-458 and APP-459**]	
Impact	2.1.50	North Road has been lowered by two metres, resulting in a reported potential increase of groundwater seepage into the excavations. Risks to controlled waters should be assessed in terms of quality and quantity. Dewatering requirements and discharge should be quantified and consented/permitted.	Impacts to controlled waters are assessed in Annex L: A122 Lower Thames Crossing/M25 Junction Groundwater Impact Assessment Numerical Model – Technical Note (Hydrogeological Risk Assessment (ES Appendix 14.5), which was issued to and reviewed by the Environment Agency. Further modelling work has been undertaken to quantify the impacts on controlled waters and inform mitigation requirements. Risks to controlled water, either in terms of quantity or quality, as well as mitigation measures and good construction practice, are included in ES Chapter 14: Road Drainage and the Water Environment.	ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**] Consents and Agreements Position Statement [**REP6-014**] ES Chapter 14: Road Drainage and the Water Environment [**APP-152**] ES Chapter 10: Geology and Soils [**APP-148**]	Matter Agreed

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Field Code Changed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			Prior to the excavation in this area, the Contractor(s) would need to apply to the Environment Agency to obtain the necessary dewatering/discharge permits as acknowledged in the Consents and Agreements Position Statement.		
Impact	2.1.81 DL7	The Environment Agency requests that REAC commitment RDWE019 is updated to require engagement with the Environment Agency on the use of any chemical additives proposed for ground treatment, tunnelling or trenchless installation. The Environment Agency has reviewed the updated commitment RDWE019 and can confirm that this matter is agreed.	Following engagement with the Environment Agency, the Applicant has updated REAC commitment RDWE019 at Deadline 7 to state: 'Chemicals and materials, such as cement, grout and lubricants used during construction would be stored, transported and used in a suitable manner to safeguard potable water supply, source protection zones and the water environment. Prior to commencement of ground treatment, tunnelling or trenchless installation the Contractor would be required to agree the use of any chemical additives proposed for the works with the Environment Agency.'	ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed
Mitigation	2.1.51 RRE	The Environment Agency advised that as ground investigations were undertaken and assessment of any discovered contamination was made, the Environment Agency would require	The ground investigation for the DCO application is complete and the results have been shared with the Environment Agency. The results are detailed in ES Chapter 10: Geology and Soils and supporting appendices.	ES Chapter 10: Geology and Soils [**APP-148**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		discussions regarding remediation as part of ongoing DCO assessments. The Environment Agency is now satisfied that the ground investigation works for the DCO are complete.			
Mitigation	2.1.52 RRE	The Environment Agency has requested the monitoring of selected boreholes at the South Portal throughout the construction phase.	The Applicant has committed to monitoring selected boreholes at the South Portal throughout construction in REAC Commitment HR008 'Groundwater Surveillance' (Code of Construction Practice (ES Appendix 2.2)).	ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Agreed
Mitigation	2.1.53 RRE	The design of all drainage systems should be submitted to the Environment Agency for review in relation to pollution prevention. Drainage designs should include sufficient treatment trains prior to discharge to surface water or infiltration to ground. The Environment Agency has reviewed and approved Part 7 of the FRA: surface water drainage strategy for the preliminary design (ES Appendix 14.6, Application Document 6.3). They have also reviewed and approved the Hydrogeological Risk Assessment (ES Appendix 14.5, Application Document 6.3), which assesses the efficiency of these measures.	Part 7 of the FRA (surface water drainage strategy for the preliminary design) sets out the outline drainage design for surface water. As described in Part 7 of the FRA, the drainage design treatment measures and the efficiency of these measures have been assessed in the Hydrogeological Risk Assessment (ES Appendix 14.5), the Operational Surface Water Drainage Pollution Risk Assessment (ES Appendix 14.3) and summarised in ES Chapter 14: Road Drainage and the Water Environment.	ES Appendix 14.6: FRA [**APP-460 to APP-477 and REP1-171**] ES Appendix 14.5: Hydrogeological Risk Assessment [**APP-458 and APP-459**] ES Appendix 14.3: Operational Surface Water Drainage Pollution Risk Assessment [**APP-456**] ES Chapter 14: Road Drainage	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
				and the Water Environment [APP-152]	

Monitoring	2.1.82 (DL7)	The Environment Agency reserves the right to request further groundwater monitoring, if required, throughout the construction phase.	The Applicant has included a number of REAC commitments relating to groundwater quality during the construction phase, including commitments to monitor groundwater at specific locations across the project. Relevant commitments include: GS001, GS002, GS004, GS005, GS006, GS021, GS026, GS027, GS028, HR008, RDWE002, RDWE006, RDWE018a, RDWE038 and RDWE045. In addition to this, the CoCP states that Second iteration of the Environmental Management Plan(s) (EMP2s) will be prepared substantially in accordance with the CoCP and will include the implementation of appropriate industry-standard practice and control measures for environmental impacts during the relevant works. The Contractors will be required to develop the EMP2(s) in consultation and engagement with relevant stakeholders as listed in Table 2.1 of the CoCP, which includes the Environment Agency. Section 2.3 of the CoCP, states that the EMP2s developed by the Contractors will set out their procedures for monitoring compliance with the mitigation measures set out in CoCP relevant to the works.	ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed*

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			The EMP2s will include Contractor roles and responsibilities, together with appropriate control measures, training and briefing procedures, risk assessments, stakeholder engagement and monitoring systems to be employed. The final approach to groundwater monitoring will be developed during detailed design.		
FRA					
Methodology and baseline	2.1.54 RRE	An FRA should be included with the DCO application and the Environment Agency should be consulted on this (including the Tilbury and Mardyke models) and should sign this off. The Environment Agency is satisfied with the Mardyke and Tilbury Main models, and the FRA.	The Environment Agency have confirmed that they are satisfied with all parts of the FRA (ES Appendix 14.6).	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.55	An FRA should be prepared in line with the requirements of the National Policy Statement for National Networks (NPSNN) and the National Planning Policy Framework (NPPF) Flood Risk and Coastal Change Planning Practice Guidance. The Environment Agency agrees with the Applicant's precautionary approach where guidance differs.	The FRA has been developed in line with the requirements of the NPSNN, NPPF and National Highways' Design Manual for Roads and Bridges (DMRB). There are slight inconsistencies across these three documents; where inconsistencies have been observed, the Applicant has adopted the provisions of the most conservative.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			This approach has been agreed with the Environment Agency.		
Methodology and baseline	2.1.56 RRE	The Environment Agency advised that flood modelling was needed to understand the risk of flooding to the Project and the changes that the design will have on flooding. They requested to review the fluvial models and sign these off. The Environment Agency has now reviewed, and is satisfied with, the flood models for the Mardyke and Tilbury Main.	The Applicant has consulted the Environment Agency on the flood models, and they have accepted these.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.57	Bowater's Sluice should be included within the fluvial model.	Bowater's Sluice has been included in the fluvial model.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.58	The residual design life of Bowater's Sluice is less than the design life of the Lower Thames Crossing. If it is required for flood management, its condition should be improved by the Applicant.	The fluvial model assumes that Bowater's Sluice is 100% blocked. The Project would remain operational if Bowater's Sluice failed, therefore upgrading the asset is outside of the scope of the Project. The Project will not increase surface water flood volumes and so will not increase flood risk elsewhere if Bowater's Sluice outfall fails.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.59 RRE	The Environment Agency's initial view was the monitoring of Bowater's Sluice should be undertaken. However, they	The Applicant has undertaken a study which concluded that defence	Bowater Sluice and East Tilbury Tidal Wall	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		now agree with the findings of the Applicant's technical note regarding defence monitoring at Bowater's Sluice (HE540039-LTC-GEN-GEN-TNT-TPI-00001- Annex C.11) and therefore agree that monitoring does not need to be undertaken.	monitoring of Bowater's Sluice is not required.	Monitoring Assessment (HE540039-LTC-GEN-GEN-TNT-TPI-00001)-- Annex C.11	
Methodology and baseline	2.1.60	Star Dam should be included within the fluvial model.	Star Dam has been included in the fluvial model.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.61 RRE	The Environment Agency originally advised that Star Dam was in poor condition and could cause flooding to the North Portal. Their view was that if it failed, it would prevent water from the landward side from draining out into the River Thames, which will back up to the portal entrance. However, the Environment Agency now agrees with, and has signed off, the Applicant's fluvial model which indicates that a blockage of Star Dam would not cause flooding of the tunnel portal.	Fluvial modelling indicates a blockage of Star Dam would not cause flooding of the tunnel portal, since, for fluvial events up to a 1,000 year return period in 2129, post-development (with the specified floodplain compensation mitigation measures) flood extents do not reach the tunnel portal and so the blockage of Star Dam would not affect flood extents or depths.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.62 RRE	The Environment Agency agreed with the approach taken to climate change in the FRA, as detailed in the technical note issued to the Environment Agency on 30 April 2020 (HE540039-CJV- EFR-TNT-ENV-00011). However, models have	Models have been re-run to reflect the latest peak river flow allowances released in 2021 and have been agreed with the Environment Agency.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		subsequently been re-run to reflect the latest peak river flow allowances released in 2021 and have been agreed with the Environment Agency.			
Methodology and baseline	2.1.63	The Environment Agency informed the Applicant on 04 May 2022 that be new peak rainfall allowances would be published on 09 May 2022. The Environment Agency has informed the Applicant that the upper end allowance is unlikely to change significantly from what is published and, in most locations, it will be 40–45%. Where work is within 5% of the updated allowance, the Applicant will not be required to re-run the assessment.	The Environment Agency has confirmed that the updated climate change allowance is within 5% and therefore the fluvial model does not need to be re-run.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.64	The Environment Agency advises that the Lead Local Flood Authority (LLFA) should be consulted on the drainage designs and that comments should be shared with the Environment Agency.	Drainage designs have been shared with the LLFA, and comments have been shared with the Environment Agency.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Methodology and baseline	2.1.80 WR (DL5)	The updated Thames Estuary 2100 Plan (May 2023), with supporting extreme water levels for a range of tidal return periods and climate change scenarios, has been published since the draft DCO was submitted. In addition, the government's Ministerial Statement has delayed the planned completion of the Project by 2 years.	The Applicant has reviewed the Environment Agency's Deadline three submissions in relation to the updated Thames Estuary 2100 Plan, extreme water levels and the Ministerial Statement and has undertaken technical engagement with the Environment Agency on these matters. This includes meetings held on the 23 August 2023 and 26 September 2023.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**] Environment Agency's Deadline 3 submission [**REP3-158**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		The Environment Agency has asked the applicant to review if this information has any implications for the Flood Modelling and Flood Risk Assessment. The Applicant provided a technical note 'Allowing for new information since completing the DCO Application Flood Risk Assessment' (Annex C.13 to this SoCG) to respond to this query on 16 October 2023. The Environment Agency has reviewed the technical note and now considers this matter to be agreed as confirmed in Annex C.14.	The Applicant issued a technical note to the Environment Agency on 16 October 2023 'Allowing for new information since completing the DCO Application Flood Risk Assessment' (Annex C.13 to this SoCG). This considers the updated Extreme Water Levels, the revised Thames 2100 Plan (Defra, 2023) and the impact of the Government's Ministerial Statement. This technical note concludes that there is no significant impact on the conclusions of the Flood Risk Assessment. The Environment Agency confirmed on 24 October 2023 that they now consider this matter to be agreed (Annex C.14 to this SoCG).		
Impacts	2.1.65	There should be no net loss in floodplain storage resulting from the Project. The Lower Thames Crossing must also not impede flood flow and/or reduce storage capacity thereby increasing the risk of flooding elsewhere. Any loss of storage must be compensated, and compensation should be agreed with the Environment Agency.	The FRA (ES Appendix 14.6) demonstrates compliance with these requirements. Fluvial floodplain compensation would be provided on a hydraulically linked level-for-level basis in the Mardyke catchment. Providing level-for-level compensation is not possible in the Tilbury Main catchment due to the low-lying and flat floodplain. Instead, compensation would be largely provided to intercept upstream	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed

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The Applicant and the Environment Agency are actively engaging on this matter.

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			flows, and has been assessed through hydraulic modelling.		
Impacts	2.1.66 RRE	The Environment Agency advised that the design of Project should not impact on the existing flood defence assets. A monitoring program should be agreed with the Environment Agency and should include baseline, construction, and operational surveys to ensure there is no impact to any assets. The Environment Agency has now confirmed that they are satisfied with REAC Commitment RDWE007 'Protection of flood defences from ground movement'.	The Applicant has committed to monitor flood defences to establish a pre-construction baseline and for at least two years after completion of works, in line with REAC Commitment RDWE007 'Protection of flood defences from ground movement' (Code of Construction Practice (ES Appendix 2.2)).	ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed
Impacts	2.1.67	The Environment Agency requires access for maintenance and operation of all flood risk assets, and this should be included in the final design of the Project. Access should be maintained throughout the construction and operational phases. Where changes are made by the Applicant, maintenance should be carried out in the future by agreed parties.	The Applicant's proposals would not compromise the Environment Agency's ability to maintain and operate their assets. For example, where the Project crosses the Mardyke, Orsett Fen Sewer and Golden Bridge Sewer, to protect riverbanks and facilitate Environment Agency access to these watercourses for future maintenance, a bankside access track would be incorporated into the design of the crossings, the width of which would be subject to agreement with the Environment Agency as detailed in	Draft Development Consent Order [**REP6-010**] Design Principles [**REP6-046**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			Design Principle S12.05 'Height of the Mardyke and Orsett Fen Viaducts'.		
Impacts	2.1.68 RRE	In the future, the flood defences along the River Thames may be raised on their current alignment. If this is the case, Environment Agency modelling indicates that the likely the design crest level would be 8m Above Ordnance Datum (AOD) by 2070. The possible raising options include: • Earth embankment • Earth embankment with wall upstand • Earth embankment with sheet pile • Earth embankment with controlled modulus The Applicant should demonstrate that these options could be implemented without impacting on the tunnel. The Environment Agency is now content with the text included in the Contractor's specification.	The following text, as agreed with the Environment Agency, has been included in the contract scope: "*The tunnel lining shall be designed to accommodate the load of a future increase in river flood defences height to 8.0m AOD. Methods of raising may include:* • *Earth embankment* • *Earth embankment with wall upstand* • *Earth embankment with sheet pile* • *Earth embankment with controlled modulus*"	N/A	Matter Agreed
Impacts	2.1.69 RRE	Flood Warning and Evacuation Plans should be produced for compounds located within Flood Zone 3.	The production of an evacuation plan and flood warning system would form part of the safety components of any site compound. The Applicant has also agreed the following REAC commitments with the	ES Appendix 2.2: Code of Construction Practice [REP6-038]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			Environment Agency (ES Appendix 2.2): • REAC Commitment RDWE022 'A226 Gravesend Road, Milton, northern tunnel entrance, Station Road and Mardyke compounds. Construction flood risk'. • REAC Commitment RDWE001 'Construction flood risk'.		
Impacts	2.1.70 RRE	Any utility crossings such as temporary crossings, or walker, cyclist and horse rider (WCH) routes requiring a permit should have modelling to support the application to show no increases in flood risk. The Environment Agency reserves the right to require further modelling or detail about utility crossings once the exact locations are known.	Highway crossings (including WCH crossings) are detailed in Part 10 of the FRA (ES Appendix 14.6). Specific crossings have not been modelled, and this is not currently within the scope of the modelling. Generally, changes in flood levels are within ±10mm, which is classified by the Applicant as 'negligible'. REAC Commitment RDWE008 'Protection of watercourses during utility works' (Code of Construction Practice (ES Appendix 2.2)) commits to the use of trenchless techniques for crossing watercourses.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**] ES Appendix 2.2: Code of Construction Practice [**REP6-038**]	Matter Agreed
Compensation and enhancement	2.1.71	The Environment Agency originally requested that any flood structure should be designed at a height to protect from future water level rise, or to enable retrofitting in the future. The Applicant's	Raising of Environment Agency flood defences is outside of the scope of this Project. However, the proposals should not compromise the Environment Agency's ability to	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed

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Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
		commitment not to compromise the Environment Agency's ability to maintain and raise assets in the future is agreed and has been confirmed by the Environment Agency's acceptance of the FRA and fluvial models.	maintain and raise these defences in the future.		
Compensation and enhancement	2.1.72 RRE	The Environment Agency requested that flood compensation in the Mardyke should be agreed with the Environment Agency. Flood compensation has now been agreed with the Environment Agency.	The Mardyke flood compensation has been agreed with the Environment Agency.	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed
Cumulative effects					
Methodology and baseline	2.1.73 RRE	The proposals and future options in the Thames Estuary 2100 (TE2100) Plan need to be taken account of by the Applicant, including the provision of a future Thames Barrier. The Environment Agency agrees with the approach set out in the Future Thames Barrier breach modelling technical note (HE540039-CJV-EFR-GEN-TNT-ENV-00101).	The TE2100 Plan and its context in relation to the Project is included in Part 2 of the FRA (ES Appendix 14.6). A review of the potential impact that the Project may have on the TE2100 Plan is included in Part 6 the FRA (ES Appendix 14.6). The location options for the new Thames Barrier proposed in the TE2100 Plan are located outside the Order Limits and so have not been considered in the ES. A technical note was issued to the Environment Agency on the Future Thames Barrier breach modelling (HE540039-CJV-EFR-GEN-TNT-ENV-	ES Appendix 14.6: FRA [**APP-460 to APP-477** and **REP1-171**]	Matter Agreed

Topic	Item No.	Environment Agency Comment	The Applicant's Response	Application Document Reference	Status
			00101), and the Environment Agency agreed with the approach set out in it. This technical note is included as an appendix to the FRA (ES Appendix 14.6).		

Appendix A Engagement Activity

Table A.1 Engagement activities between the Applicant and the Environment Agency since the DCO Application was submitted on the 31 October 2022

Date	Overview of Engagement Activities
02 November 2022	Fortnightly catch-up meeting to discuss the DCO application and to highlight that the DCO Application Documents were available for the Environment Agency to access on SharePoint.
16 November 2022	DCO walkthrough presentation to provide stakeholders a summary of where to find relevant DCO Application Documents.
16 November 2022	Fortnightly catch-up meeting to discuss SoCG items and plan upcoming engagement.
22 November 2022	Meeting to discuss the Esso Petrol Station site
25 November 2022	Stakeholder biodiversity and ecology briefing, including impact, mitigation and compensation proposals and the associated biodiversity value
30 November 2022	Fortnightly catch-up meeting to discuss the SoCG and to provide an update on actions.
14 December 2022	Fortnightly catch-up meeting to discuss Relevant Representations, Protective Provisions and the Service Level Agreement.
11 January 2023	Fortnightly catch-up meeting to discuss likely timescales for DCO Examination, the Service Level Agreement, and to provide an update on the Coalhouse Point mitigation land.
17 January 2023	Area Manager Meeting to discuss the likely DCO programme and PADS.
25 January 2023	Fortnightly catch-up meeting to discuss ongoing actions, and to plan the future schedule of engagement.
01 February 2023	Environmental Permitting Strategy Workshop 7
07 February 2023	Area Manager Meeting to discuss Relevant Representations, PADS, and progression of matters under discussion in the SoCG.
07 February 2023	Meeting to discuss Cobham Petrol Station site.
08 February 2023	Meeting to discuss the proposed Coalhouse Point flood modelling simulations.
08 February 2023	Fortnightly catch-up meeting to discuss the SoCG and to provide an update on actions.
14 February 2023	Meeting to discuss Biodiversity Net Gain
22 February 2023	Fortnightly catch-up meeting to discuss SoCG matters and PADS.
07 March 2023	Area Manager Meeting to discuss the Environment Agency's Relevant Representations response, and to provide an update on the permitting workstream

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Date	Overview of Engagement Activities
08 March 2023	Fortnightly catch-up meeting to present the findings of National Highways' assessment of the updated WFD status of the South Essex Thurrock Chalk Groundwater Body.
21 March 2023	Environmental Permitting Strategy Workshop 8
22 March 2023	Fortnightly catch-up meeting to discuss the SoCG review process.
05 April 2023	Fortnightly catch-up meeting to discuss the Service Level Agreement, comments on the proposed modelling of Coalhouse Point and Balfour Beatty's FRAP.
17 April 2023	Stakeholder Landscape and Ecology Working Group (option A)
19 April 2023	Fortnightly catch-up meeting to discuss the SoCG and to provide an update on actions.
20 April 2023	Site visit to Coalhouse Point to discuss the proposed ecological mitigation site.
02 May 2023	Area Manager Meeting to discuss the Rule 6 Letter, ways of working during Examination and to provide an update on the permitting workstream
02 May 2023	Stakeholder Landscape and Ecology Working Group (option B)
03 May 2023	Fortnightly catch-up meeting to discuss the SoCG and to provide an update on actions.
09 May 2023	Briefing on the assessment of groundwater and contamination detailed in the ES.
17 May 2023	Fortnightly catch-up meeting to discuss the Service Level Agreement, the public consultation, protective provisions and Coalhouse Point modelling.
17 May 2023	Stakeholder briefing on the public consultation material.
25 May 2023	Environmental Permitting Strategy Workshop 9
13 June 2023	Area Manager Meeting to discuss the examination timetable, upcoming engagement and the Service Level Agreement.
14 June 2023	Fortnightly catch-up meeting to discuss the agenda for the flood modelling meeting.
20 June 2023	Meeting to provide an update on the flood modelling at Coalhouse Point.
28 June 2023	Fortnightly catch-up meeting to discuss the Rule 8 letter, programme for sharing SoCGs, the permitting strategy and the Linford Water Supply.
12 July 2023	Fortnightly catch-up meeting to discuss the draft environmental permitting strategy, Written Representations and the water supply at Manor Farm.
26 July 2023	Fortnightly catch-up meeting to discuss the upcoming schedule of engagement.
01 August 2023	Area Manager Meeting to discuss Written Representations and to provide an update on the Coalhouse Point flood modelling.

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Date	Overview of Engagement Activities
09 August 2023	Fortnightly catch-up meeting to discuss responses to Written Representations and the schedule for updating the SoCG.
17 August 2023	Meeting with the Environment Agency to discuss Protective Provisions.
23 August 2023	Meeting with the Environment Agency to discuss updated guidance on extreme water levels, Thames Estuary 2100 and flood modelling at Coalhouse Point.
29 August 2023	Environmental Permitting Strategy workshop 10.
05 September 2023	Meeting with the Environment Agency to discuss the proposed new article (68) within the draft DCO 'Interface with waste operation permits'
14 September 2023	Meeting with the Environment Agency to discuss groundwater monitoring
22 September 2023	Fortnightly catch-up with the Environment Agency to discuss the SoCG and the programme of engagement.
26 September 2023	Meeting with the Environment Agency to discuss Coalhouse Point modelling.
28 September 2023	Meeting with the Environment Agency to discuss groundwater quality monitoring and commitments relating to tunnelling polymers/additives
04 October 2023	Fortnightly catch-up meeting to discuss the SoCG and the schedule of future meetings.
11 October 2023	Area Manager Meeting to discuss the Examination and engagement relating to flood risk.
17 October 2023	Meeting to discuss permitting and the draft Order.
18 October 2023	Meeting with the Environment Agency to discuss the SoCG.
20 October 2023	Environmental Permitting Strategy workshop 11.
7 November 2023	Area Manager Meeting to provide an update on the SoCG and to discuss future resourcing.
7 November 2023	Meeting to discuss permitting and the draft Order.
10 November 2023	Environmental Permitting Strategy workshop 12.

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Appendix B Glossary

Term	Abbreviation	Explanation
Above Ordnance Datum	AOD	Vertical datum used by the Ordnance Survey as the basis for deriving altitudes on maps.
Design Manual for Roads and Bridges	DMRB	A comprehensive manual which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is the highway authority. For the A122 Lower Thames Crossing, the Overseeing Organisation is National Highways.
Development Consent Order	DCO	Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP) under the Planning Act 2008.
Environmental Permitting (England and Wales) Regulations 2016 (as amended)	EPR	These Regulations provide a consolidated system of environmental permitting in England and Wales.
Environmental Statement	ES	A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
Flood Risk Activity Permit	FRAP	Flood Risk Activity Permit
Flood Risk Assessment	FRA	An assessment of the risk of flooding from all flooding mechanisms, the identification of flood mitigation measures, and identification of actions to be taken before and during a flood.
Functionally Linked Land	FLL	Functionally linked land is habitat used by the birds outside the European site boundary.
Lead Local Flood Authority	LLFA	LLFAs are county councils and unitary authorities. They lead in managing local flood risks (i.e., risks of flooding from surface water, ground water and ordinary (smaller) watercourses). This includes ensuring co-operation between the Risk Management Authorities in their area. The LLFA for the M25 area is Essex County Council who is acting on behalf of Thurrock.
Materials Management Plan	MMP	Materials Management Plan
National Planning Policy Framework	NPPF	The National Planning Policy Framework was published in March 2012 by the UK's Department of Communities and Local Government, consolidating over two dozen

Term	Abbreviation	Explanation
		previously issued documents called Planning Policy Statements (PPS) and Planning Practice Guidance Notes (PPG) for use in England. The NPPF was updated in February 2019 and again in July 2021 by the Ministry of Housing, Communities and Local Government.
National Policy Statement for National Networks	NPSNN	The NPSNN sets out the need for, and Government's policies to deliver, development of Nationally Significant Infrastructure Projects on the national road and rail networks in England. It provides planning guidance for promoters of Nationally Significant Infrastructure Projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
Outline Site Waste Management Plan	oSWMP	A document which sets out how resources will be managed, and waste controlled during the Project. Plans usually involve recording the amount of waste that will be produced and details the proposed methods of waste disposal.
Preliminary Environmental Impact Report	PEIR	An early output of the EIA process, and part of the DCO application process.
Register of Environmental Actions and Commitments	REAC	The REAC identifies the environmental commitments that would be implemented during the construction and operational phases of the Project if the Development Consent Order is granted, and forms part of the Code of Construction Practice (Application Document 6.3, ES Appendix 2.2).
Site of Importance for Nature Conservation	SINC	Locally designated nature site protected through the planning system
Site of Special Scientific Interest	SSSI	A conservation designation denoting an area of particular ecological or geological importance.
Source Protection Zone	SPZ	EA-defined groundwater sources (2000) such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.
Thames Estuary 2100	TE2100	An Environment Agency project (formed November 2012) to develop a comprehensive action plan to manage flood risk for the Tidal Thames from Teddington in West London, through to Sheerness and Shoeburyness in Kent and Essex.
Unexploded Ordnance	UXO	Explosive ammunition that did not explode when they were deployed and still pose a risk of detonation. Sometimes referred to as UXBs.
Walkers, cyclists and horse riders	WCH	Walkers, cyclists and horse riders

Term	Abbreviation	Explanation
Water Framework Directive	WFD	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. The Directive establishes a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the WFD is through river basin management planning. The UK has been split into several river basin districts. Each river basin district has been characterised into smaller management units known as water bodies. The surface water bodies may be rivers, lakes, estuary or coastal.

Appendix C Documents considered within this Statement of Common Ground

C.1.1 A summary of the documents which have been considered in the development of this SoCG outside of the DCO application documents are provided below, such as emails, meeting notes, etc and are included as annexes to this Appendix:

a. Annex C.1: Environment Agency Statutory Consultation Response

b. Annex C.2: Environment Agency Supplementary Consultation Response

c. Annex C.3: Environment Agency Design Refinement Consultation Response

d. Annex C.4: Environment Agency Community Impact Consultation Response

e. Annex C.5: Environment Agency Local Refinement Consultation Response

f. Annex C.6: Tilbury Main Diversion Options, Choosing By Advantage Light (HE540039-CJV-GEN-GEN-MIN-DCO-00002)

g. Annex C.7: WFD Implications of Culverting Tilbury Main (HE540039-CJV-GEN-GEN-MIN-STK-00801)

h. Annex C.8: Coalhouse Point Mitigation Water Supply Structure (HE540039-LTC-EWE-S07-REP-ENV-00001)

i. Annex C.9: Flood Risk Assessment – Climate Change (HE540039-CJV-EFR-TNT-ENV-00011)

j. Annex C.10: Flood Risk Assessment – Future Thames Barrier Breach Modelling (HE540039-CJV-EFR-GEN-TNT-ENV-00101)

k. Annex C.11: Bowater Sluice and East Tilbury Tidal Wall Monitoring Assessment (HE540039-LTC-GEN-GEN-TNT-TPI-00001)

l. Annex C.12: Agreed Statements

m. Annex C.13: Allowing for new information since completing the DCO Application Flood Risk Assessment

n. Annex C.14: Environment Agency acceptance of LTC's 'Allowing for new information since completing the DCO Application Flood Risk Assessment' technical note

Annex C.15: Environment Agency acceptance of LTC's 'Coalhouse Fort Flood Risk Assessment and Modelling'

Annex C.1 Environment Agency Statutory Consultation Response

creating a better place

Environment Agency

[redacted]

Our ref: KT/2018/124865/01-L01
Your ref: Lower Thames Crossing
Date: 19 December 2018

[redacted]

Section 42 Planning Act 2008 consultation on Lower Thames Crossing – Preliminary Environmental Report (PEIR)

Lower Thames Crossing

Thank you for consulting us on the current Lower Thames Crossing proposals and the Preliminary Environmental Information Report (PEIR).

Based on the information provided the PEIR does not provide all the information that we expected. If an application for development was made using it, we would object to the application due to insufficient information, details of which are below.

We welcome the fact that you have set up regular meetings with us to discuss the requirements of your development in relation to our remit. We also recognise that there have been changes to the scheme designs and locations in response to the environmental information, constraints, and our advice.

Our concerns are as follows:

- **Baseline data and survey information**
  The PEIR does not contain the environmental survey and baseline data for us to fully assess the impacts of the scheme. This information should be used to inform the design of the scheme.

  We would expect that as more information comes available the scheme design will change to ensure that the environment is protected and enhanced, meeting the needs of people and wildlife. Without this information and design changes we would maintain our objection at the submission stage.

- **Environmental protection and enhancement**
  We would expect a scheme of this scale and importance to be providing more environmental improvement and benefit than is shown in the current designs. The 25 Year Environment Plan has a commitment to embed net environmental gain into development, including infrastructure.

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Due to the scale of the scheme and length of time needed for construction we would expect a greater environmental legacy than that proposed. This development has the opportunity to maximize benefits for people, wildlife and the economy. These opportunities should not be missed.

- **Safeguarding for the future**
  We expect the whole life span of the development to be designed in line with the Thames Estuary 2100 plan taking account of the UKCP18 climate change levels. This includes having a robust design that can be retro fitted in line with future information and flood protection changes.

We have provided specific comment on the document in the pages that follow. Please note, we may need to add to or amend the matters set out in this response as further information is provided.

We look forward to continuing to work with you in progressing the points above as the scheme develops including the opportunities to maximise the environmental benefits.

Yours sincerely

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Further comments

These comments relate to flood risk, groundwater and contaminated land, waste and biodiversity specifically and have been split into sections accordingly.

Flood Risk

General comments

The data regarding tidal defences benefitting the project within Essex is not complete and misses the Environment Agency maintained tidal defences at both Star Dam (inland of Coalhouse Fort) and Bowaters Wall / Sluice. Both these locations are 0.1% Annual Exceedance Probability (AEP) defences.

The Bowaters Sluice outfall which provides drainage to the West Tilbury Main Catchment has suffered from significant subsidence and is no longer functioning correctly. The residual life of the structure is significantly less than the design life of the LTC and will require replacement to provide drainage to the scheme.

We are pleased that the South Portal is located within Flood Zone 1. If there are any surface works within the "temporary use of land required" (LTC #13b Map book 2) and within Flood Zone 2 and 3 we would expect these to be detailed within the Flood Risk Assessment and the flood risk and potential impacts appropriately assessed and mitigated. If any works are proposed near to the flood defences we would want to ensure our ability to access the defences to undertake maintenance is not affected.

Flood Risk Activity Permits

We would advise you that a Flood Risk Activity Permit may be required under the Environmental Permitting (England and Wales) Regulations 2016 if you want to do work

- Within 8m of the bank of a main river, or 16m if it is a tidal main river
- Within 8m of any flood defence structure or culvert on a main river, or 16m on a tidal main river

Further guidance on applying for Flood Risk Activity Permits can be found on the following link https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

In particular the potential drainage outfall mentioned on LTC#13a Map book 1, Sheet 7, General Arrangement Plan and the potential temporary jetty are likely to require a Flood Risk Activity Permit.

Please also be aware that any new jetty, or modification to an existing jetty, will require consideration from us in terms of the impact this may have on existing flood defence infrastructure and the impact upon the Thames Estuary.

Document Specific Comments

LTC #1 - PEIR Volume 1

2.13 Flood Risk Mapping
Make reference to a Flood Zone Map and include this map

2.13.2
refer to the Tilbury Main River not just the Tilbury marshes

2.13.3
separate the areas – Refer to Tilbury Marshes defences and sluices (Star Dam and Bowater Sluice) an then refer to Orsett Fen Sewer and how it is defended.

2.13.4
These comments need to be expanded upon. It must be determined that the project will not result in a net loss in floodplain storage. Furthermore it must show that the proposed development will not impede flood flow and/or reduce flood storage capacity thereby increasing the risk of flooding elsewhere.

Where sections of the Project fall within tidal Flood Zone 3 the picture of flood risk will need to be painted to show the changes to risk. How does the flood hazard (depth, rate of onset, velocity) change as a result of what is being proposed. Areas of compensation will be required if there is significant change in hazard category.

2.13.5
It will need to be shown that any increase in built footprint within the 1% (1 in 100) annual probability flood extent, including allowances for climate change, can be directly compensated for on a volume-for-volume and level-for-level basis to prevent a loss of floodplain storage. If there are no available areas for compensation above the design flood level and compensation will not be possible then a calculation of the offsite flood risk impacts will need to be undertaken.

2.13.8
The following should be added to the points in this section:

h. connectivity of the flood cells and requirements for culverts through the embankments
i. the volume available for breached flows to accumulate behind the sea defences
j. how the project will impact the rate of inundation

2.18 Construction Work
2.18.1
The following should be added to the points in this section:

g. Flood defence and sluice improvement work

Compound Locations (page 34)
2.18.15
The following should be added to the points in this section:

h. Flood Warning and Evacuation Plan for those locations within Flood Zone 3.

2.20 Rest and Service Area
This is in a Flood Zone and will need to be constructed to ensure it is not at risk from flooding or increase the risk of flooding elsewhere

Third party asset protection (page 38)
Need to mention that there will be monitoring of existing flood defences assets during construction phase to ensure there is no detrimental impact to the defences and that monitoring will be continued post construction phase.

11.5.3 Further baseline information and surveys required
We would welcome the results of any geotechnical/pre-condition surveys undertaken that relate to the flood defences.

Chapter 15 - Road Drainage and Water Environment
Table 15.2
Mentions the UKCP09. Needs to be updated to the UKCP18 as they have now been released.

15.4.46
Fluvial and tidal flood risk zones and flood defence assets are illustrated in Figure 15.3 in Volume 3.

15.4.48 and 15.4.60 (Flood risk and flood defences)
Please be aware that the proposed drainage outfall mentioned on LTC#13a Map book 1, Sheet 7, General Arrangement Plan would be within the Policy P4 area - Gravesend unit. Therefore, any works should take account of the need to maintain and raise these defences in the future. We would welcome a conversation to discuss the impact on the tidal defences in more detail.

Policy P4 area - Gravesend unit: Maintain the current standard of protection which will require raising to take account of climate change.

Policy P3 area – North Kent Marshes unit: Maintain the current height of the defences excepting that the standard of protection will reduce with climate change.

Flood risk and Defences (page 509)
15.5.2
We would like the following (*shown in italic*) to be added into the existing text:

An FRA will be prepared in line with the requirements of the NPSNN and the National Planning Policy Framework Flood Risk and Coastal Change Planning Practice Guidance (Ministry of Housing, Communities and Local Government,

2014). The assessment is currently being scoped in consultation with the Environment Agency and will be informed by hydrological and hydraulic modelling of key river systems including the Tilbury Main, the Mardyke and its tributaries (the Orsett Fen Sewer and the Golden Bridge Sewer). In addition, breach of the Thames' defences will be modelled and the subsequent flood risk to the Project assessed. A topographical survey will be undertaken, and the data used to develop models of these watercourses and their floodplains. *The findings of the modelling studies will be reported in an FRA that defines baseline flood risk and informs the design of any flood risk management measures that may be necessary.* These findings will also inform the Road Drainage and Water Environment Chapter of the Environmental Statement.

The highlighted sentence should also say:
The findings of the modelling studies will be reported in an FRA that defines baseline flood risk and also the as built flood risk which *informs the design of any flood risk management measures* and mitigation *that may be necessary.*

Table 15.10
We would expect to understand what monitoring of the tidal defences you will undertake to ensure there is no detrimental impact to the defences (and any associated infrastructure) during and after works have been completed. The applicant would need to agree a programme of monitoring with the Environment Agency and the actions required if any damage to the defences occurs.

It also mentions potential scour protection for the tunnel would require works to the bed of the river. Any works should be agreed with the Environment Agency.

16.2.2
We welcome the project response in table 16.3 that the UKCP18 data will be applied in the ES to cover the estimated lifetime of the project. Please contact the Environment Agency to obtain any potential changes in modelled flood information, approach or impact on flood risk management in the project area as a result of a change in UKCP data.

Table 16.11
Must also include 0.1% (1 in 1000) cc

LTC #3 - Design consultations and operations

4.8.4
This watercourse is called the West Tilbury Main. The main rivers crossed close to the northern portal are known as 'West Tilbury Main', 'West Tilbury West Branch Sewer' and 'West Tilbury North Branch Sewer'. We welcome the comments in paragraph 4.8.5 which confirms that these rivers shall be maintained and comply with the requirements of the Environment Agency and other relevant authorities.

15.5.4
We note the preferred option for crossing the 3 main rivers in this area. These will require a bespoke permit under the Environmental Permitting Regulations.

18.3.4
We note a staged approach is proposed for the provision of flood storage. Details of the staged approach will be supported by detailed flood risk modelling, which will provide sufficient evidence to demonstrate that the works will not result in any increases to flood risk, both upon completion of the project and during the construction phases.

LTC #4a - PEIR Figures (3b)

Figure 11.10- Slope Stability Sheet 2 of 3
Please provide confirmation of where the data has been sourced to inform this map e.g. was it a desktop study or a detailed investigation.

Figure 11.11- Shrink Swell- Running Sands, Sheet 2 of 3
Please provide confirmation of where the data has been sourced to inform this map e.g. was it a desktop study or a detailed investigation.

Groundwater and contaminated land

General comments
The PIER report identifies lowering of groundwater levels during dewatering could increase the risk of saline intrusion potentially impacting on the designated marshes and surface water features.

In order for us to fully assess the likely impacts that may arise from dewatering. Further ecological and water sampling (conductivity) of the drains and ditches in and around the Ramsar need to be undertaken to understand how this sensitive environment works.

Any lowering of groundwater levels must ensure springs and seepages continue to support flow and levels in surface water drains and groundwater-fed ponds.

As of 1 January 2018 previously exempt water abstractors, such as trickle irrigation, dewatering, navigation and others are now a regulated activity to meet the requirements of the Water Framework Directive. Please ensure these new licensed activities, listed under the Water Act 2003, are included in future Water Features Survey.

We look forward to receiving the Hydrogeological Risk Assessment report and further proposal details on dewatering in due course.

The scope of the Environmental Statement and the outline PEIR is accepted as being in line with what is expected for such a significant project for the south bank of the project. In relation to land quality issues; contamination and landfill especially, further ground investigations are crucial to formalising design for the tunnel, roadway and drainage in addition to addressing historic contamination appropriately. Any remediation in the context of the National Planning Policy Framework (NPPF) requirements for sustainable development and environmental betterment and protection must be agreed in detail with relevant regulators prior to any works.

LTC#1 - PEIR Volume 1

Section 2 - Project Description

S.2.7.2
Detailed impact assessments concerning changes to flow and supported surface water body functioning will be required for all cuttings and embankments into the shallow and deep aquifers.

S.2.7.3
Full assessments of the impact of below ground structures on the chalk aquifer with regards to flow and the water quality will be required for construction and operation with particular focus needed on the potential for saline intrusion and contamination mobilisation impacts on dewatering.

S.2.9.1b
Details of the methods for the proposed crossings at Tilbury Main and Mar Dyke are required.

S.2.9.3
The design for all drainage systems will need to be submitted for review and should include sufficient treatment trains prior to discharge to surface water or infiltration to ground; details of operational maintenance programs will also be needed.

S.2.18.11
Any proposals for locating construction or other compounds on East Tilbury (Hazardous) Landfill Site should assess the risks associated with differential settlement of the heterogeneous wastes deposited, potential escapes of polluting leachates as a result of additional loading on the landfill surface reducing the porosity of the wastes and subsequent reduction in leachate storage capacity and possible presence of landfill gas.

S.2.18.15
All soils will need testing prior to determining appropriate storage provisions.

S.2.18.26
Temporary and permanent substations require appropriate design to preclude future pollution risks, especially in sensitive areas with regards to groundwater.

S.2.18.29
We would like to see details regarding the nature of the TBM slurry.

S.2.18.33
We would like to see detailed Hydrogeological Impact Assessments for all dewatering proposals which should include risks to groundwater levels and quality, along with monitoring proposals. This is particularly critical for the Northern portal where dewatering is proposed in the area of an historic hazardous waste landfill.

S.2.20.3
We would like to see any proposals for new fuel stations at the proposed Rest and Services area(s).

Section 11 - Geology and Soils
S.11.4.5
All site investigation data and reports should be provided for review.

S.11.4.30
It is imperative that Tilbury Main and its tributaries are protected from any adverse impacts caused by works around East Tilbury landfill.

S.11.4.39
Assessment of tidal influences on levels in the chalk aquifer should determine whether they are a result of direct hydraulic continuity or tidal loading. It is imperative that the works do not alter the current hydraulic regime between the Thames and the chalk aquifer.

S.11.4.89
Gorham's Farm is currently permitted for restoration rather than impermeable capping.

S.11.4.105
We would like to see the detailed desk study report that has been compiled concerning potential contamination issues.

S.11.4.127
We note that soils information has been compiled from existing sources; we would like to see ground investigation reports for soils within the study area.

S.11.4.145
We would like to see an assessment in the ES of whether any UXO pose potential land or groundwater contamination issues.

Table 11.11
Potential effects and mitigation measures for construction

- we would like the ES to provide ground investigation data and interpretation regarding sink holes and the potential impacts of the works on the quality of

surface and groundwaters and any impacts on abstractions and designated ecological sites.

- we would also like to see the proposals for piling designs.
- full consideration of dewatering impacts on water quality and local abstractions and surface and groundwater is required.
- with respect to East Tilbury Landfill Site, any intrusive investigation should not penetrate confining geological barriers and create pathways for landfill contaminants to enter groundwater. If it is necessary to investigate groundwater or geological strata beneath the landfill site, drilling techniques suitable to maintain the integrity of the geological barriers and prevent the creation pathways to groundwater should be agreed with the Environment Agency.

<u>Section 15 – Road Drainage and the Water Environment</u>

S.15.3.3 and 4

The required water features survey (WFS) area will depend on the exact dewatering proposals; the exact WFS area for the northern portal is still to be finalised with the Environment Agency.

Table 15.7

It cannot necessarily be assumed the alluvium and tidal flats deposits effectively confine the chalk in all areas north of the Thames; this requires detailed assessment.

S.15.4.30

There are relatively few groundwater monitoring locations in the area north of the Thames; site specific monitoring data from nested piezometers will be required to inform the hydrogeological regime at key sites, especially in the area which may be affected by dewatering.

S.15.4.33 and 4

The assessment of aquifer vulnerability needs to consider areas if the chalk north of the Thames that are not covered by low permeability alluvium or London Clay; careful consideration of the degree of protection that is afforded to the chalk by the alluvium is required.

S.15.5.3

We would like to see the Hydrogeological Risk Assessment as soon as it has been completed please.

S.15.5.8 and 9

We agree with the listed aims of ground investigation and groundwater levels and quality works but would also like these to include reference to groundwater quality and in particular, north of the Thames, the potential issues with the historical landfill at East Tilbury Marshes.

Table 15.11

Potential construction effects and mitigation north of the Thames. This table should consider the potential for impacts on Mucking Flats and Marshes SSSI to the east of

the northern portal site; the sections on groundwater resources, the South Essex Chalk and the Linford public water supply abstraction should also include the potential for mobilisation of contamination due to dewatering near the historical landfill site.

LTC#2 - PEIR Volume 2

Water Features Survey. Site visits are required for all sites within the finalised WFS area; a detailed Hydrogeological Risk Assessment for Dewatering (to cover pump testing and construction) will be required before the WFS area can be set.

Figures Volume 3a
Figure 2.2b
Shows an area of landscaped excavated material on the southern half of East Tilbury Landfill Site. Any such proposals must assess the impact of the additional loading on the landfill and potential emissions. If landscaping leads to increased surface water run-off, the Environment Agency should be consulted with regards to the ability of the existing drainage channels and sluices to cope with this extra volume of water.

We do not currently have sufficient detail on the proposals or the site area; this will hopefully be addressed by ground investigations and the Environmental Statement.

Biodiversity

Marine

We have assessed LTCs Preliminary Environmental Information Report (PEIR) consultation documents and are satisfied with their content in terms of marine water quality.

The main impacts on marine water quality from the proposals relate to the potential need for a new jetty or similar infrastructure in the River Thames (or there might be potential to reuse an existing jetty) to transport excavated tunnel material. In the longer term it may be that scour protection is needed in the riverbed (to maintain its stability) which is likely to take the form of either rock dumping or using mattress type solutions to cover the tunnel section. The need for scour protection and impact of other river-based construction activities will be further assessed in consultation with relevant statutory bodies.

We note that potential mitigation for impacts from the jetty includes “Jetty design which limits the number of piles and requirement for dredging where practicable. Where possible, use of soft start and vibro-piling techniques to limit extent and duration of noise emissions. Best practice methods for dredging operations.”

LTC is aware that a full Water Framework Directive (WFD) Assessment of the proposals will be required in due course and we note that (Section 15.5.10) “The

findings from all the above surveys and assessments will be used to inform a stand-alone Water Framework Directive Compliance Assessment, which is being scoped in consultation with the Environment Agency."

Terrestrial ecology
The PEIR states that the drainage strategy in relation to the southern side of the Thames is still be determined. Surveys are being carried out on the Ramsar to establish risks associated with the final proposed drainage plan.

It is noted that the plans retain in them a potential drainage route on the western end of the Ramsar/SSSI and this could therefore have a significant impact on the site. Ecological surveys of the area, as well as a full ecohydrological understanding of how this part of the Ramsar works will be required in order for us to determine the likely impacts of any proposed drainage routes. We therefore cannot determine at this stage whether this is an acceptable choice without the completion of surveys and designs.

It is noted that green bridges are proposed along parts of the Southern road. It must be determined that these are of sufficient size and design to function for all mammal species that currently utilise the area, as well as providing the necessary corridors for the movement of other species. The design should use contemporary evidence to establish minimum sizes and locations.

Volume 1, Chapter 9 Terrestrial Ecology
Page 261
It appears that the Essex Field Club, a major source of wildlife records, has not been consulted. They hold millions of records, many not held by the Essex Wildlife Trust Biological Records Centre.

Page 274
It is highly likely that slender hare's-ear and sea barley are found on the sea wall flood defences.

Page 278
There is a large population of eels in the main Mardyke channel. This needs highlighting.

Page 289
The importance of Tilbury Fort for wildfowl means that measures should be put in place to prevent their disturbance during and after construction.

Page 302
Given the prevalence of water voles in the development area, serious consideration must be given to avoidance, mitigation and compensation measures.

Page 303
There is a reference to two desk-based reports of otters. Given the quality of habitat along the main Mardyke channel, we believe that mammal ledges should be installed along any road culverts.
Page 305
Gap-filling surveys are important and should be undertaken as prescribed. We are particularly interested in the otter and water vole surveys.

Page 307
There is a lack of information on the impacts on fish (particularly eels) during construction and operation of the new road. Also what are the impacts on the Water Framework Directive potential of the Mardyke main channel and tribs.

Chapter 15. Road Drainage and Water Environment
Page 517
The culverting/pollution for Tilbury Main and Orsett Fen need significant offsetting as does the diversion channels. There must be no barriers to eel passage and enhancements where possible. This could include reprofiling to channel banks to benefit riparian wildlife and creation of fish refuges for eels. All bridges or significant culverts should include mammal ledges. Flood compensation and SuDs should be designed to form ecological features.

Clear span crossings are ideal although shading could be offset by channel enhancements downstream and upstream.

All new culverts should be accompanied with the creation of new river/stream habitat at a scale of at least 1:1. Where possible recreated habitats should be of higher quality than those lost to the scheme.

Environmental protection and waste

General comments

The applicant will need to identify where permissions such as environmental permits and abstraction licences are required.

Environmental permit pre-application advice can be found at:
https://www.gov.uk/government/publications/environmental-permit-pre-application-advice-form
and
https://www.gov.uk/guidance/waste-environmental-permits#get-help-with-your-application

Abstraction licence pre-application guidance can be found at:
https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence

LTC#1 - PEIR Volume 1

Page 23 drainage
2.9.4
It is good to see that attenuation basins will be provided which will improve water quality.

2.9.5
We are pleased to see that facilities will be installed to capture and contain pollutants arising from spillages.

2.9.6
Groundwater sensitivity and groundwater source protection zones should also be taken into account when considering drainage options.

Page 28 tunnel design
2.14.6
Suitable disposal routes for contaminated water such as that arising from wash down and fire fighting activities needs to be identified. Will infiltration water be saline? If so, discharge routes need to be considered as freshwater receptors will not be suitable to receive this water.

Page 493 road drainage and water environment
15.2.1
Table 15.2.1 should be updated to include The Environmental Permitting (England and Wales) Regulations 2016. Under Reg. 38 (1) of EPR 2016, it is an offence for a person to operate a regulated facility (for example, a groundwater activity or water discharge activity), or cause/knowingly permit a groundwater/water discharge activity, without an environmental permit.

The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 should be considered.

Page 511 existing drainage
15.4.57 should also refer to Anglian Water Services Limited.

Page 514-524 effects and mitigation
Tilbury Main system (main rivers and ordinary watercourses) have been identified as a receptor for mobilised contaminated land leachates. Chalk and gravel aquifers and Linford public supply have not been identified as potential receptors for mobilised contaminated land leachates.

LTC# 13a-13f

LTC 13a sheet 9b identifies a rest and service access area at Tilbury junction. Foul water disposal arrangements will need to be considered. Suitably sized and designed oil separators will need to be included in the car park design.

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Annex C.2 Environment Agency Supplementary Consultation Response

creating a better place

Environment Agency

[redacted]

[redacted]

Our ref: KT/2018/124865/02-L01
Your ref: Lower Thames Crossing
Date: 02 April 2020

LOWER THAMES CROSSING SUPPLEMENTARY CONSULTATION

The comments provided in relation to this supplementary consultation build on the same comments we provided from the Preliminary Environmental Information Report. Due to limited information available, we are unable to provide detailed reviews of the information submitted to date. We continue to welcome further engagement from the Lower Thames Crossing project to provide early input to key documentation and advice on mitigation, compensation and methodology in preparation for Development Consent Order submission.

Flood risk

We note the changes to the route and associated works and have some further comments to make in addition to those made on the previous consultation. We are currently awaiting further details of the flood modelling, which we know is currently being prepared and look forward to providing detailed comments once this information is available.

Crossing of the River Mardyke and Orsett fen Sewer

The proposed road will cross the River Mardyke and the Orsett Fen Sewer. The document does not detail the proposed height of the viaduct at this location, although we expect to receive the detail once the modelling has been produced.

Compensatory storage

We acknowledge the areas proposed for compensatory storage in map book 2 and look forward to further discussion on these areas as the detailed modelling becomes available.

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Utilities update report
Any utility crossings such as temporary crossing (for construction for example), pedestrian bridge cycle ways, bridle ways requiring a permit should have modelling to support the application to show no increases in flood risk.

Environmental Mitigation Area at Coalhouse Fort
The proposed Environmental Mitigation Area immediately to the west of Coalhouse Fort is not fully protected against tidal inundation, and the defences only protect against tides up to a maximum of 20% AEP events. The defences protecting this site and presently damaged and repair is not guaranteed. We would be open to proposals from the applicant to address these issues.

Mardyke Viaduct
The movement south of the Mardyke Viaduct does not appear to have any significant impact of our activities for maintenance of the Mardyke or its tributaries verus the previous proposals. It is also noted that there is proposed permanent land acquisition for environmental mitigation at this location and along the River Mardyke as well as the Orsett Fenn and Golden Bridge Sewers. We would be open to proposals from the applicant to modify the channel profile of these watercourses to provide additional storage during times of high flows.

Bowaters sluice
The revised proposals do not seem to have any significant impact on this system compared to the previous proposals.

Section 7: Building the Lower Thames Crossing
In the section titled “ground preparation works” it mentions that “this construction activity would take place south of the river. It would start from a shaft located south of Lower Higham Road and travel to a shaft located north of the North Kent Railway Line.” It is unclear whether the Southern Shaft is within Flood Zone 1, however the Northern shaft will be located in Flood Zone 3. These works should be detailed within the Flood Risk Assessment and the flood risk and potential impacts appropriately assessed and mitigated.

The Northern element of these works are close to the main river, Shorne and Higham Marshes. We would want to understand the setback of these works from the river as the detail regarding this has not currently been provided. We would advise you that a Flood Risk Activity Permit may be required under the Environmental Permitting (England and Wales) Regulations 2016 if you want to do work:

- Within 8m of the bank of a main river, or 16m if it is a tidal main river
- Within 8m of any flood defence structure or culvert on a main river, or 16m on a tidal main river

Fisheries, Biodiversity and geomorphology

Terrestrial

The information provided is inadequate for us to comment on, as it fails to include sufficient technical detail on potential environmental impacts. Therefore we cannot provide any feedback on this consultation.

Marine

Section 4 of the report, Lower Thames Crossing Environmental Impacts Update 2020, confirms that changes to the marine works comprise only minor changes. These are to the development boundary to allow flexibility for the location where water will be discharged into the Thames (this would be excess groundwater removed from the construction or operation).

Therefore no significant changes to water quality are expected and effects will be no worse than reported in the PIER for either (i) construction of the temporary jetty or (ii) discharge of operational effluent via the outfall (which will be consented by the EA and controlled to minimise effects on Thames water quality).

Groundwater and contaminated land (inc permits)

Waste and materials

The changes highlighted in the Supplementary Consolation seem to have a negligible effect on the assessment on materials and waste presented in the PEIR. Even with Chalk Park (page 21) where additional landscaping is proposed as replacement open space to the east of Gravesend and surrounding the southern tunnel entrance.

Our previous advice still stands, the applicant will need to identify where permissions such as environmental permits particularly in relation to waste recovery, treatment, transfer, storage and long term stockpiling and abstraction licences are required. As part of that process we would expect a materials management strategy and proposed reuse criteria based on ground investigation of expected material types and classification/suitability for reuse, site-specific chemical criteria for reuse of excavated materials, treatment proposals for remediation of excavated materials and any the waste management and disposal options which will subsequently feed into a materials management Plan.

Also any site where waste was discarded or disposed of as waste in the past (whether the site now holds a permit or not) remains waste until is it recovered or disposed of. This includes historic landfills and past exempt activities (para 9's and 19's). Excavation of materials from a non-permitted site (historic) is not in itself a waste activity but the subsequent storage, treatment disposal and recovery are.

In this situation CL:AIRE DoWCoP cannot be used as that only applies to the direct use of excavated material produced in the course of development and used at a development site. DoWCoP may still be used elsewhere but not for excavated

waste. Waste will need to be treated before it is sent to landfill. This will include any waste excavated from old sites, inert and/ or non-hazardous.

Water environment
From a groundwater protection view on the south side the proposed changes do not alter any of our original assessment of the PIER. As ground investigations continue and assessment of any discovered contamination is made, we will discuss any required remediation as part of on-going DCO assessments/requirements and the EIA reporting.

The proposal for Chalk Park will need early discussion with us on detailed materials management options and any required permitting arrangements or agreements on other frameworks for materials re-use/deposits.

Any fundamental changes to drainage design will also require additional detailed discussions

Previous comments made about concerns around landfill sites have been taken on board.

Environmental Impacts update (P133 - road drainage relating to Marine Works). Any discharge to the estuary may also require a water activity permit. In the document we should also be included as a consultation body.

The route has moved to the east of Chadwell St Mary and may now be closer to the Linford public water supply, possibly within a Source Protection Zone 1 (SPZ1). Section 15.4.43 of the PEIR stated the project did not cross SPZ1. We will need this to be clarified.

Please refer the project team to our approach to groundwater protection and highlight position C4 on page 11:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf

Page 107 of the 'environmental impacts update' document identifies the Linford public water supply and states further assessment will be carried out. We would recommend that Essex and Suffolk Water are involved in this at an early stage.

The realignment route is adjacent to the Ockendon landfill; as such risks to controlled waters needs to be assessed. Intrusive site investigations in this area will need to be carried out according to the PIER prescriptions (such as safe drilling methods) and agreed with the Environment Agency.

The road in section 17 (the height of the LTC and North Road) has been lowered by two metres. As a result, North Road has also been lowered by two metres, resulting reported potential increase of groundwater seepage into the excavations. Risks to controlled waters needs to be assessed in terms of quality and quantity. Dewatering requirements and discharge need to be quantified and consented/permitted.

A watching brief needs to be adopted during construction to identify visual/olfactory evidence of gross contamination.

Yours sincerely

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Annex C.3 Environment Agency Design Refinement Consultation Response

creating a better place

Environment Agency

[redacted]

Our ref: KT/2020/127273/01-L01
Your ref: Lower Thames Crossing

Date: 11 August 2020

[redacted]

DESIGN REFINEMENT CONSULTATION
LOWER THAMES CROSSING

Thank you for consulting us on the design refinements of this project before Development Consent Order submission.

Flood risk and assets

There are matters linked to the route of the proposed Highway that are being considered as part of ongoing consultations with the Highways Authority. We have recently provided comments on the further detail required regarding certain elements of the route design. Whilst we do not anticipate that these would lead to insurmountable issues, we await further detail in relation to elements of the design that will require flood risk activity permits (including methodologies for permanent and temporary works), and also relating to the overall tidal and fluvial flood risk modelling for the development area.

As acknowledged in recent discussions it is noted that for the purposes of efficiency the land behind the tidal defences at Coalhouse Fort is included within the proposal despite the present condition of the tidal defences there.

Settlement of proposed access road and landscaping feature at North Portal must be considered in order to ensure design levels can be achieved. Previous advice has indicated that substrata is near maximum loading capacity. Implications for maintenance of the River Mardyke in the area of the proposed environmental mitigation need to be discussed in greater detail.

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We have the following minor comments to make on the submitted design consultation and look forward to receiving the detail in due course.

Map Book 1
Sheet 7a: The South Portal Discharge Options paper proposed to utilise an existing outfall as the preferred option whereas on the General Arrangement Plan (Sheet 7A) a new outfall looks to be proposed. Please confirm which approach is being taken so we can provide you with detailed advice.

Please be aware that a Flood Risk Activity Permit may be required.

Sheet 15. This plan shows the proposed locations on the Mardyke viaduct and the Orsett Fen viaduct. It also shows the embankments required to allow for construction of the road through this location. The embankments are located within the floodplain of the River Mardyke and its tributaries, and must be included within the flood modelling supporting any future application.

Sheet 16c.
It should be noted that the red line boundary for the utility works at this location cross a designated main river, known as 'Tributary to Stringcock Sewer'. A Flood Risk Activity Permit may therefore be required for works within 8 metres of the river.

Sheet 19.
North-west of North Ockendon flows a Main River known as West Branch Mardyke. A flood risk activity permit may therefore be required for works within 8 metres of the river and further information should be submitted regarding the crossing proposed here so that the proposals can be considered further.

Map Book 2
Sheet 6
The main works construction compound starts adjacent to Lower Higham Road, although majority of this construction compound is within Flood Zone 1 a small section adjacent to Lower Higham Road is within Flood Zone 3. From the plan it looks to be that most of these works may be below ground but additional detail needs to be provided to confirm whether this is the case.

For any works proposed in Flood Zone 3 the flood risk and potential impacts relating to the works should be appropriately assessed and mitigated.

Sheet 7
This map shows that there is a main construction compound adjacent to the North Kent Railway and Thames Medway Canal. The Shorne and Higham Marshes main river flows through most of this compound area. A Flood Risk Activity Permit may therefore be required.

Please provide further detail about the works proposed in this location so more detailed advice can be given.

Environment Agency
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www.gov.uk/environment-agency

As this compound area is within Flood Zone 3 the flood risk and potential impacts will need to be appropriately assessed and mitigated. We do not have flood modelling for the Shorne and Higham Marshes main river/ditch network. Therefore, modelling will be required to assess the associated flood risk.

Environmental Impacts Update
We have no specific comments to make on this update report as it does not provide sufficient information for us to make a detailed response. We note that detailed measures will be repowered within the Environmental Statement, which will be submitted in due course.

Groundwater and contaminated land

We have no concerns from a groundwater impact perspective for the majority of the amendments to the Design Consultation. Most have been identified previously and mitigated for. The document appears to be in line with the agreed PIER for matter involving drainage, soils and materials management in the area to the South of the River Thames.

Section 24 New water supply from the Linford borehole and a local water main and Section 25 Potential upgrade of the existing water network.
We were wondering if the supply of water from Linford PWS been officially confirmed with Essex & Suffolk Water? The Water Framework Directive (WFD) status of the South Essex Thurrock Chalk has reduced to 'poor' for Cycle 3, as it has failed the Groundwater Balance Test. Linford PWS, has modelled at its licenced rate, is a contributing factor. We recognise also that in recent years the Linford abstraction has been underutilised. If not already established the water resource availability should be further discussed and confirmed with Essex & Suffolk Water and the Environment Agency.

Environmental pollution

There appears to be fairly minor changes from an environmental pollution point of view.

The document refers a lot to 'Operational effects are the same as those described in the PEIR' and 'Pollution risks during the construction phase are going to be managed through the CoCP and CEMP'. We look forward to receiving further information around these in the submission document.

Fisheries and biodiversity

19. Northern tunnel entrance layout
Loss in continuity of a watercourse, such as putting in a culvert, will affect the ecological aspects along the length of the waterbody and could reduce its Water Framework Directive status. We recognise that the length of this culvert has been

reduced by 20m, however it still will impact the movement of fish and invertebrate populations within this catchment.

As mentioned previously in this letter the land behind the tidal defences at Coalhouse Fort is included within the proposal. The viability of freshwater habitat creation is questionable at this location due to the current condition of the tidal defences. We look forward to working with you more in agreeing a solution for this habitat creation.

Yours sincerely

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Annex C.4 Environment Agency Community Impact Consultation Response

creating a better place

Environment Agency

[redacted]

Our ref: KT/2021/128817/01-L01
Your ref: Lower Thames Crossing

Date: 08 September 2021

[redacted]

COMMUNITY IMPACTS CONSULTATION

LOWER THAMES CROSSING

Thank you for consulting us on the additional and updated information for the Lower Thames Crossing (LTC).

The Environment Agency has an agreement in place to provide pre-application advice and have been working with LTC throughout the project. Comments on specific documents are being made directly to LTC through this service as well as our permit pre-application advice service.

We request that there is a timely flow of information between LTC and the environment agency to ensure we are able to provide the required advice.

We would like to highlight some of the work we have done together to improve the scheme for the environment.

- Moving the southern tunnel entrance 600 metres south, reducing the interaction with groundwater bodies in the area
- Initially moving the location of the proposed Rest and Service area from the closed East Tilbury Landfill to further north
- Removing East Tilbury Landfill from the red line boundary area
- Changing the scheme design from an earth embankment to viaducts through the Mardyke Valley to reduce the impact of the project on flood risk and the river environment
- Increasing the proposed viaduct lengths by 50 metres to reduce impact to the flood risk and reduce environmental impact to the river environments

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- Altering the route of the road around Ockenden Landfill to reduce potential environmental impacts

- Removing of the proposed Rest and Service area, reducing impact on the environment and flood risk

- Finding a suitable, long term site for freshwater habitat creation which will benefit the local area

- Improving the flood protection around the northern tunnel entrance including allowance for increased defence levels in accordance the Environment Agency Thames Estuary 2100 plan

- Reviewing Groundwater Investigations around the proposed location of the southern portal to ensure that ground water flow and dependencies were understood

- Reviewing Ground Investigations around the northern portal location to ensure that groundwater flow and dependences to public water supply are understood as well as the interaction with the local landfill sites

- Reviewing Ground Investigations along the route to assess the impact of the proposed cuttings on the flow of groundwater, local abstractions, and water dependent sites

- Increasing the number of green bridges in the scheme to maintain the connectivity of wildlife between habitats

- Moving of compound locations out of environmentally sensitive areas

Securing Biodiversity Net Gain for the projectWe continue to work with LTC on various aspects of the scheme in preparation for their Development Consent Order submission. We hope this working arrangement will continue after examination, throughout the construction phase of the scheme and into the Legacy work.

Yours sincerely

Environment Agency
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Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Annex C.5 Environment Agency Local Refinement Consultation Response

From: [redacted]
Sent:
To:
Subject: FW: Local Refinement Consultation response from EA
Attachments: 20220617 EA refinement con response.pdf

[redacted]

[redacted]

Subject: Local Refinement Consultation response from EA

Please find attached the response for the Local Refinement Consultation from the Environment Agency.

Kind regards

[redacted]

If you're planning a new development, we want to work with you to make the process as smooth as possible. We offer a bespoke advice service where you will be assigned a project manager who be a single point of contact for you at the EA. This early engagement can significantly reduce uncertainty and delays to your project. More information can be found on our website here.

Please note – Our hourly charge is now £100 per hour plus VAT.

Office 501, 31-35 Kirby Street, London EC1N 8TE

[redacted]

creating a better place

Environment Agency

[redacted]

Our ref: KT/2022/129762/01-L01

Date: 17 June 2022

[redacted]

LOWER THAMES CROSSING: LOCAL REFINEMENT CONSULTATION

Thank you for inviting us to comment on the Local Refinement Consultation for the Lower Thames Crossing.

As you are aware, the Environment Agency has an agreement in place to provide pre-application advice and have been working with LTC throughout the project. Comments on specific documents and themes are being made directly to LTC through this service as well as our permit pre-application advice service.

We have been working with LTC to protect the environment since the preferred option was chosen. We continue to provide advice and guidance on key elements such as flood protection, water quality, groundwater resources and protection, waste management and permitting.

We request that there is a timely flow of information between LTC and the environment agency to ensure we are able to provide the required advice.

We are still working with LTC on various aspects of the scheme in preparation for their DCO submission. We hope this working arrangement will continue after examination and throughout the construction phase of the scheme as well as with the Legacy work.

Yours sincerely

[redacted]

Environment Agency
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Annex C.6 Tilbury Main Diversion Options, Choosing By Advantage Light (HE540039-CJV-GEN-GEN-MIN-DCO-00002)

Stakeholder Meeting Minutes Lower Thames Crossing

Tilbury Main Diversion Options CBA 'Lite'

Date: 16 December 2019

Location: LTC Office, Beaufort House, Aldgate, London

Ref: HE540039-CJV-GEN-GEN-MIN-DCO-00002

Attendees:

Name	Initials	Organisation
[redacted]		

Meeting notes:

Purpose of meeting
For LTC to present the various options for the Tilbury Main River where it crosses the route and to discuss the assessment and decision-making, to see if a preferred solution can be agreed and to mutually acknowledge the assessment outcome.

Actions:

New Action	Owner	Para Ref
1	[redacted]	3.2.3

Discussion points

1. Tilbury Main Diversion Options and Assessment

1.1 **Presentation of options and assessment** were introduced by AK and NP (see presentation for details) comprising:

- 1.1.1 Shorter culvert – 65m shortest combined corridor is the most practical option;
- 1.1.2 Divided river;
- 1.1.3 Longer culvert – 550m;
- 1.1.4 Open channel;
- 1.1.5 Pumping.

1.2 **Simplified Choosing By Advantage (CBA) chart** introduced by AK, representing advantages of each option in green notes, as taken from LTC's 'Options Crossing for Tilbury Main' report (ref. HE540039-CJV-EFR-GEN-TNT-00004 V2.0); pink notes indicate the challenges / key disadvantages of each option over the following topics.

1.3 **Hydromorphology:**

- 1.3.1 Short culvert:
  - 1.3.1.1 MA highlighted the key dimensions of the culvert; there is an existing pipe which is currently a constraint for flow – this larger diameter box culvert offers better flow.
  - 1.3.1.2 The culvert would include a mammal ledge.
  - 1.3.1.3 Hydraulic modelling will be undertaken to allow for climate change / flooding.
  - 1.3.1.4 Proposed box culvert provides betterment compared to existing pipe in terms of hydraulics.
  - 1.3.1.5 Shows the least impact in CBA analysis.
- 1.3.2 Divided river:
  - 1.3.2.1 Disrupts existing hydromorphology.
  - 1.3.2.2 Impacts performance due to the increased length of the channel resulting in slower flow due to lower gradient. This may also increase siltation.
- 1.3.3 Long culvert:
  - 1.3.3.1 Too long to be practical.
  - 1.3.3.2 Length / gradient reduces hydraulic performance.
- 1.3.4 Open channel:
  - 1.3.4.1 1km diversion to the south (Tilbury Main) is significant.
  - 1.3.4.2 Gradient likely to be reduced therefore reducing hydraulic performance of Tilbury Main. This may also increase siltation.
- 1.3.5 Pumped:
  - 1.3.5.1 Fully dependent on mechanical solution.
  - 1.3.5.2 creates complete break in the river.

1.4 **Topography**: Presented by NP with details regarding the landfill, overview of the topography, drainage ditches (ordinary watercourses). Historic landfills throughout the area. Any options that require works in Goshems landfill – require a very wide channel with approx. 20-degree side slopes, therefore an enormous volume of landfill excavation and redeposition. AK pointed out that no advantages have been identified for the longer culvert or an open channel going through Goshems landfill.

- 1.4.1 Short Culvert – some foundations required; groundworks required.

1.4.2 Divided river – neutral as taken outside of landfill to the west.
1.4.3 Long culvert:
1.4.3.1 Foundations required;
1.4.3.2 Complications with tunnel portal structure – heavy engineering required.
1.4.4 Open channel:
1.4.4.1 Natural but geotechnically very challenging;
1.4.4.2 Very shallow side slopes would be required on deep excavations through the landfill.
1.4.5 Pumped – foundation work required.

1.5 **Geotech and contaminated land:**
1.5.1 Leachate issue: the long culvert or open channel would need construction / works would be below the level that leachate would leak out of the landfill – both of these options would require the opening of landfill to get the structures built.
1.5.2 Tunnel engineering complexity – longer culvert linking in with portal; longer culvert piled foundations that could impact on the structure of the portal.
1.5.3 The pumped solution and short culvert are likely to require piled foundations. Foundations would be less significant for the pumped solution.

1.6 **Ecology (NC):**
1.6.1 Short Culvert:
1.6.1.1 Acknowledged that a short culvert is not the preferred choice from an ecological perspective and that there are not many natural ecological advantages.
1.6.1.2 Design replicates exiting channel in terms of hydraulics, depth and flow to facilitate eel passage and invertebrate passage. No impact on eel passage is likely.
1.6.1.3 Base of the culvert to be sufficiently low in order to allow a natural bed to be created.
1.6.1.4 Water Voles (NC): acknowledged that any culvert is detrimental for water voles due to the significant risk of habitat fragmentation. With the proposed design including mammal ledges and appropriate headroom, the short culvert could maintain some connectivity east and west. However, there is no precedent for this so fragmentation seems likely.
1.6.1.5 NP commented that some natural curvature would be added into the culvert so it is not a straight line. It would be built offline and then the river would be diverted into it.
1.6.2 Divided river:
1.6.2.1 No ecological advantages due to fragmentation of habitat.
1.6.2.2 The additional length of the river could be colonised by water voles but the issue of fragmentation outweighs the additional length of open water course that could be achieved.
1.6.2.3 The divided river solution would have a slow discharge rate, which is a key consideration for siltation and the impact on species (MR).
1.6.3 Long culvert:
1.6.3.1 Eels and water voles negatively impacted; vole population will be fragmented because it would be too long for the voles to use. No ecological advantages.
1.6.3.2 As per the short culvert, it would be built offline and watercourse diverted into it.

1.6.4 Open channel:
- 1.6.4.1 Neutral impact for eels;
- 1.6.4.2 Would naturally be a preferred option from an ecological perspective. However, the risk of mobilizing contaminants / leachate from the underlying landfill is a significant risk – this would affect the vole population.
- 1.6.4.3 Owing to underlying landfill would be a significant risk of leachate contaminating water and therefore affecting habitat / animal populations.
- 1.6.4.4 Would require removing large volumes of spoil prior to building the structure – opening the landfill, which is high risk from a contamination perspective.

1.6.5 Pumped:
- 1.6.5.1 Ecologically no advantages.
- 1.6.5.2 Would totally prevent passage of eels and other fish species.

1.7 JH – queried drainage ditch close to the river that will be cut off by the road – what is the interaction between the drainage ditch and the river? NP – doesn't think there is any interaction – the ditch is an artefact of groundwater levels and can dry out; it is not viable from a fish population perspective.

1.8 JH – queried if the channel would be steep sided as it could present issues regarding shading in the channel. AK – unlikely to be an issue; channel cannot be steep sided due to the engineering challenges.

1.9 **Construction**:
- 1.9.1 Temporary diversion of the main river would be required for all options (NP).
- 1.9.2 Query regarding culvert maintenance – would be Highways England's responsibility (AK). The culvert options would be self-cleaning, although this likely to be more effective with the shorter culvert.
- 1.9.3 Pumps would require significant mechanical and electrical maintenance. They are a potentially higher risk option in the instance of them failing in a flood scenario.

2. Discussion of Advantages and Disadvantages

2.1 TB considers an assumption is being made regarding the passability of water voles and other ecological receptors. TB feels that there is an evidence gap in proving that a 65m culvert is passable and suspects the culvert will disconnect the habitats on either side of the road.

2.2 TB also considers that there is an evidence gap regarding the length of culvert that is acceptable for various ecological receptors.

2.3 NC response – LTC has acknowledged that there is the downside of fragmentation through use of a short culvert, but there are the least number of disadvantages and the least negative impacts, compared to the alternatives, from a broader planning perspective. 65m is potentially passable, whereas 500m is not.

2.4 TB queried if it was an assumption to say that a short culvert is any different ecologically compared to a long culvert – discussion followed regarding the

advantages and disadvantages identified for the long vs short culvert (as detailed above in discussion point 1).

2.5 TB stated that on the basis of the discussion he would concur that the short culvert is better in principal.

2.6 AK – queried if the EA had any further recommendations for design of culvert to improve it. MR responded with detail from LTC as within the limitations of a culvert design LTC is trying to provide the best possible solution from an ecological perspective, including the following:

- 2.6.1 It is good practice to sink culverts low enough to introduce natural material in the stream bed.
- 2.6.2 Baffles should be avoided from a debris and maintenance perspective.
- 2.6.3 The design will replicate the existing channel in terms of size and function – there is no change in hydraulics therefore no change in watercourse for eels and fish.
- 2.6.4 LTC acknowledge that culvert is dark for fish passage, but there is no evidence to suggest that darkness is an issue.
- 2.6.5 Within culvert will not get macrophyte growth but within the limitations of the design LTC is trying to find the best possible solution from an ecological perspective.

2.7 MR – for fish species and eels and in-channel short culvert is a suitable solution.

2.8 MR – the planning and construction complications of the open channel means that it is not a viable solution.

2.9 TB – queried whether a behavioural barrier could be presented for e.g. water voles due to lack of vegetation, to hinder species from passing through culvert.

2.10 TB – none of the options avoid fragmenting the water vole habitat. Concerned that under the Water Framework Directive (WFD) the potential for deterioration [due to fragmentation] would require consideration.

2.11 MR – queried which elements of WFD would be most impacted by the short culvert proposal. TB response: eels, macrophytes; fragmentation and disconnection; consideration of impact on the entire downstream ecology or indeed upstream ecology.

2.12 KG asked for clarification regarding perceived issues upstream ecology issues:

- 2.12.1 TB (EA): Eels; coarse fish such as bream and roach may migrate within this catchment (these species migrate upstream to spawn).
- 2.12.2 Response from MR (LTC) – the catchment area is not ‘spectacular’ since the water courses are essentially field drains and there is not much diversity within the field channel. Culvert design is key to minimise any negative impacts on communities. Beyond eels, other species are minor. As previously mentioned, the culvert design will address water depth and water flows to mimic hydraulics upstream and downstream. May need to accept potential impacts and offset elsewhere in the scheme.
- 2.12.3 Noted that LTC has not surveyed the channel for fish species – based on the physical characteristics of the channel, LTC can assume that eels and minor fish species are present.

2.12.4 NC – it should be noted that the CBA light approach doesn't take account of the ability to offset the impacts of each approach.

2.12.5 TB – connectivity of the landscape / habitat is the key issue. Does not think it has been fully represented in CBA diagram – AK countered this point reflecting that the diagram does indicate that the vole habitat is split.

2.12.6 TB – do otters use the catchment and if so how would LTC prevent road fatalities?

2.12.6.1 NC – can address concerns about e.g. crossing roads with fencing. Confirmed that there is no firm evidence to indicate that animals would use a culvert of this length. Best practice guidance says 30-35m max. Beyond that information it is acknowledged that we can't rely on the culvert as a robust mitigation approach.

2.13 TB – made reference to other sites that have presented alternative options to the culverting / the options presented by LTC.

2.13.1 KG requested examples / if there were opportunities that the EA could provide regarding such sites to facilitate learning from experience.

2.13.2 TB cited EDF site that has used an open span bridge.

2.13.3 KG asked the LTC project team to respond on the potential for using / complications of using an open span bridge:

2.13.3.1 Constraints for open span – has the potential for a more naturalised bed but will be the same width or slightly narrower.

2.13.3.2 Open span would be constrained in terms of elevation because of the proximity to the portal. Currently 3% gradient coming out of the portal – if the gradient was increased it would lead to higher CO_2 emissions (therefore decreased air quality and increased carbon footprint), as well as safety risks due to slowing HGVs.

2.13.3.3 In addition, an open span bridge would create the need to take a viaduct over station road and the Tilbury loop line. From a planning perspective, the project is trying to mitigate visual impact of road by keeping the viaduct lower.

2.13.3.4 JH – what percentage incline would we need to increase to, to accommodate an open span bridge?

2.13.3.5 NP – probably 4%. Other factors to consider – open span also requires increased maintenance and inspection whereas the culvert doesn't. This would require operatives to get to the underside of the bridge to inspect it, over a water feature – significant safety risk moving forward.

2.13.3.6 AK – further point to note is that an open span bridge would end up being very similar to a culvert due to the length and depth (very shallow) so would not provide increased ecological value.

2.13.3.7 NP – the bridge option would also be less in keeping with the overall reinstatement of the embankment and engineered fill / green embankment – would instead need to be concrete flood protection walls 3.5m above road level at that point and side road sat up at 7.6m therefore would take up more land.

2.13.3.8 AK queried if an open span structure with these constraints would allow vole passage, given that it would be at least 40m long and need to allow for structural abutments. Vole passage considered as challenged as short culvert.

2.13.4 TB – clear from the discussion that open span is not a viable alternative to the proposed options.

2.14 PF – should it be assumed that a culvert can't have a natural bottom due to contaminated land?

2.14.1 MR response – the culvert would fill with natural material by being set lower.

2.15 PF – could there be light holes along the length of the culvert e.g. in the central reservation?

2.15.1 NP – very difficult to implement light holes e.g. in central reservation of road need to make sure they're not leaking / flood water could rise through the centre and then flood the tunnel (huge safety risk). Would need to surround the light holes by a 3.5m concrete wall to mitigate flood risk so would form a dark shaft.

3. Conclusions

3.1 **LTC Closing comments**:

3.1.1 Short culvert presents the best overall option from a planning perspective.

3.1.2 As discussed, none of the other options presented in the CBA 'lite' present a significant benefit over and above the short culvert option, including open span bridge.

3.1.3 NC – planning balance is required. On assessment of all available options, it is acknowledged that there are detrimental effects with the short culvert but overall it is the most practicable option. Need to agree that this is the best option overall, although not ideal ecologically and reflect that in the statement of common ground.

3.1.4 NC – currently focussed on downsides and not focussed on compensation – require a licence from Natural England but need to demonstrate conservation benefits to species in area. Currently discussing with Natural England and the Wildlife Trust. In addition, further work is being undertaken in parallel to this to make sure we are mitigating impacts across the area e.g. part of the ongoing work is to support wildlife trust with mink control (of benefit to the water vole population).

3.2 **EA Closing Comments**:

3.2.1 JH – question regarding overall impact that short culvert could have on the watercourse in relation to WFD.

3.2.2 Would like evidence that a 65m length culvert is reasonable given best practice guidance is 35m max.

3.2.3 JH – could be an issue to be recorded in the SoCG (LTC agreed).

3.2.4 Would benefit from a discussion with Lisa Driscoll (LTC Water Environment Lead) regarding the WFD aspect.

3.2.5 TB – moving forward with the culvert would be acceptable on the basis that any deterioration is confined within the current watercourse quality classification – therefore can proceed while being mindful that further discussion / confidence is required regarding WFH and potential ability for water vole migration along the length of the culvert. PF and JH in agreement.

3.2.6 JH – assess river system as a whole rather than looking at one specific species.

3.3 Acknowledged Assumptions:

3.3.1 Fish species have been assumed to be present on the basis of the structure of the catchment, experience gained along the Thames, Team 2100 data.

3.3.2 Highways England would maintain the culvert.

4. LTC Position
4.1 It is likely that the project will proceed with the short box culvert option, which is acknowledged to have detrimental impacts ecologically but is the better option from an overall planning perspective. 4.2 LTC will consult with the EA on the WFD to ensure full engagement, consideration and discussion regarding all relevant technical information, prior to formally mutually agreeing our positions for the SOCG. 4.3 LTC will record all relevant matters within the Statement of Common Ground.
5. EA Position
5.1 Understand LTC approach with short culvert. 5.2 Currently hold concerns regarding the WFD requirements. 5.3 Currently hold concerns regarding the length of the short culvert at 65m and viability for water vole passage in comparison to best practice recommended maximum length of 35m. 5.4 TB agreed that the short culvert presented the 'least worst' option.

Annex C.7 WFD Implications of Culverting Tilbury Main (HE540039-CJV-GEN-GEN-MIN-STK-00801)

Stakeholder Meeting Minutes Lower Thames Crossing

WFD Implications of Culverting Tilbury Main

Date: 13/01/20

Location: LTC Office, Beaufort House, Aldgate, London

Ref: HE540039-CJV-GEN-GEN-MIN-STK-00801

Attendees:

Name	Initials	Organisation
[redacted]		

Meeting notes:

Purpose of meeting
To discuss the likely WFD implications of culverting Tilbury Main.

Actions:

New Action	Owner	Para Ref
JH to send through comments from colleagues on Stage 3 WFD Assessment	JH	2.11

Discussion points
1. Introduction & Update
1.1 SI- A Choosing by Advantage (CBA) light session was held before Christmas to identify the likely advantages and disadvantages of each option including: - Shorter culvert – 65m narrowest combined corridor is the most practical option - Longer culvert – 550m - Divided river; - Open channel;

- Pumping.

1.2 SI- LTC's best option based on engineering, environmental impact and considering an overall planning perspective is the shorter culvert.

1.3 SI- LTC understand the EA's policy is against culverting, but in our meeting before Christmas the EA acknowledged that the shorter culvert option is the least-worst (acknowledging that WFD impacts were not discussed).

1.4 SI- the Second part of the meeting will cover the WFD stage 3 assessment.

2. WFD implications of culverting Tilbury Main

2.1 LD- Stages 1, 2 & 3 of the WFD assessment have been submitted to EA. Stage 4 is being drafted now and being informed by groundwater modelling assessments.

2.2 LD- We understand that some of the EA's the key concerns are around the effects on the biological quality element of the Tilbury Main.

2.3 LD- The physical, chemical and specific pollutant assessments are in accordance with DMRB guidance for the drainage catchment discharging into the Tilbury Main. The assessment has shown that we are compliant. This gives comfort that we won't be impacting those elements of the WFD status of the watercourse.

TB- this is acceptable. Our concerns primarily relate to the connectivity of the landscape – flora and fauna impacts are of more concern.

2.4 LD- What is the EA's position on the principal of improving and enhancing other reaches of the Tilbury Main or nearby watercourses to offset the impacts of culverting; for example, creating water vole habitat?

TB- water vole aren't technically a WFD target species as they are not one of the quality elements. Fish and eels are more important to WFD assessment than water voles.

LD- consideration of water vole would be higher level-impacts on general habitats.

TB- agree. Welcome that this is included. One of the components of the assessment will be the baseline condition. EA don't have any baseline data. What we need to understand is what is there, and what the impacts of the proposed impact may be i.e. will this cause a deterioration of the organisms there? Fish and eel are more important to the WFD assessment than water voles would be. Is 65m passable for fish and eel? This should be covered in the WFD assessment.

LD- is the principal of enhancing other reaches acceptable?

TB- The principal with the WFD assessment is one out, all out. Generally, don't talk about mitigation and compensation in relation to WFD. It is possible but it depends on the species present and if this effects their connectivity.

LD- focus is fish and eels. No strong baseline. Difficult to determine deterioration.

2.5 MR- We went out to site to verify if the desk-based information is right. Most of the channel would be overgrown during the summer with very little open water. During site visit there was lots of silt and the water was shallow. There were some crabs in the lower section which suggests that there may be connectivity through the flood defence. It's possible that eels may be

using the catchment (assuming that it doesn't dry out completely). It was very limited in terms of other species due to overgrown nature of the channel. 65m culvert has the potential to effect connectivity. In terms of connectivity of eels, this could be addressed by the design of the culvert. Limited in terms of fish species based on data collected to date and on site.
TB- will the proposal cause a deterioration? We need to understand what the culvert will impact upon.
MR- the purpose is to retain the connectivity wherever possible, but the length of the culvert is clearly an issue. If the hydraulics are right, it shouldn't prevent fish from moving through the culvert if the flows permit. The watercourse seems to be subject to fluctuating flows. Ephemeral nature identified during the summer period. There is little evidence to support that shading provided by the culvert will affect migration, particularly as most species migrate at night.

2.6 MR- The invertebrate community here is not diverse. Not sure if the culvert would lead to a deterioration of the communities. Due to the low flows, it has a ditch type community
TB- wouldn't expect to see assemblages assocatied with fluvial fresh water condition. What is the impact based on this baseline? Species may be resilient to change.
MR- the intention is to provide the assessment giving a view as to whether there would be a significant impact in status deterioration. There is no baseline.
TB- Even if there isn't a deterioration i.e. high→good, if there is a measurable and visible deterioration it still counts as a deterioration. WFD legislation does allow temporary impacts. In other projects this is anything less than 1 year.

2.7 JH- NE are license holders for water vole, have they been consulted?
NC- We are in discussion with Sean and Jonathan along with Amy Radford (protected species licensing officer). We are also working with Essex wildlife trust to look at a catchment wide approach. This includes a broader scale mitigation approach. This may include mink control, with the objective of releasing water voles into a catchment clear of mink.

2.8 LD- we need to make sure that the assessment provides a robust baseline and sets out the design philosophy of the culvert and how we are reducing impact where possible.

2.9 TB- although there is no obligation it would be good to see discussions around how to improve the status of the waterbody for WFD

2.10 KG- from an engineering and mitigation point of view and from an overall planning perspective the short culvert is the least impactful. We need to clearly demonstrate why this is the case. Hopefully EA can see why we are taking this position.
JH- concern from EA that the culvert will cause a deterioration to the watercourse.
KG- this is what the assessment will address the concerns on. We are working to address them.
TB- recognise that these aren't the highest quality watercourse. If the assessment determines that there is a deterioration, article 4.7 of the WFD may apply which states that even if deterioration will occur in some

locations, the project can still go ahead if it warrants the deterioration. This will need secretary of state sign off.

2.11 Key points from WFD discussion:

LD – ensure all assessments have a robust baseline.

LD – set out design philosophy.

TB – include any measurable impact (regardless of the quality of the starting point).

TB – potential to improve the status of the water body would be an excellent aspiration to have and consider as an outcome.

ACTION: JH to send through comments from colleagues on Stage 3 WFD Assessment.

3. Stage 3 WFD Assessment

3.1 LD- We are breaking down the development into different components of work, which waterbodies may be affected, and which elements may be affected. The stage 3 assessment will screen in and screen out elements for stage 4.

3.2 UP- Some minor comments based on the review to date. In table 1 in section 2.2.1 there is a demolition of an existing of existing petrol station. This could affect WFD water qualities and needs to be included in the assessment. Tables 3, 4 & 5 need to be linked back to tables 1 and 2 to make it more logical.

LD- the petrol station hasn't been included because the remediation works (to ensure there is no pollution risk) is being progressed ahead of the rest of the development.

JH- Jonathan Atkinson also asked for southern portal compound fuelling information to be included

3.3 TB- temporary works issue to be included. Assessment is well laid out and has gone through the appropriate stages. Everything included.

3.4 JH- need to include all watercourses including all non-WFD bodies.

TB- this is mainly applicable to the Tilbury Main. All waterbodies do need consideration, not just those on the catchment data explorer. Anything classified as main river needs consideration. LAs should be leading on WFD elements of the ordinary watercourses.

LD- Tilbury Main and first order tributaries of the Mardyke are included, along with the catchment in between.

TB- sounds proportionate.

3.5 JH- In terms of screened out components- ideally temporary impacts of 1 year rather than 3 years should be considered.

TB- The nature of the activity should be assessed ecologically to determine what is 'temporary'. What happens if temporary impacts coincide with a period of drought for example?

3.6 TC- The long-term impacts of the jetty has been screened out. Does the jetty require planning permission for long term use? It currently has temporary permission for a period of 5 years.

MR- the current jetty that IVL use has permission on it. Plan is to seek a temporary extension. If this isn't possible, we would look to install another

one in the same location. This wouldn't be a permanent jetty. It will be assessed as a temporary structure. TB- The jetty was screened out as it was considered a like for like replacement. If it's a variation it needs to be included in the assessment TC- it may not be possible to get a like for like. MR- the intention is to replicate it in terms of piling and the desk structure. In terms of the location we are constrained with what we can construct. Not looking to construct a jetty to the deep-water channel for example. 3.7 TB- the assessment may need to be altered in the future. Can it be an active document if things do change in the project? LD- yes agree that it would be an active document as the project progresses. KG- please send any comments back to Kirstie on the minutes from the previous meeting by 24th January.
4. LTC Position
4.1 It is likely that the project will proceed with the short box culvert option, which is acknowledged to have detrimental impacts ecologically but is the better option from an overall planning perspective. 4.2 LTC will formally mutually agree positions with EA for the Statements of Common Ground.
5. EA Position
5.1 The EA understands LTC's approach with short culvert and agree that the short culvert is the 'least-worst' option. 5.2 They have concerns regarding the connectivity of the landscape in relation to flora and fauna impacts and the potential to cause a deterioration in WFD status (noting that the assessment should consider any measurable impact (regardless of the quality of the starting point)). 5.3 Improving the status of the water body would be an excellent aspiration to have and consider as an outcome.

Annex C.8 Coalhouse Point Mitigation Water Supply Structure (HE540039-LTC-EWE-S07-REP-ENV-00001)

Lower Thames Crossing

Coalhouse Point Mitigation Water Supply Structure

Document Number: HE540039-LTC-EWE-S07-REP-ENV-00001

Aims of the paper

- To confirm the assumed construction method for the installation of a self regulating tidal gate or equivalent structure at west of Coalhouse Point to secure a water supply for the HRA and ecology mitigation. Including:
    - Construction footprint
    - Operational footprint
    - Method of works
    - Timing of works
    - Design requirements
- Confirm Order Limit changes required for the additional structure

Introduction

LTC's proposed Habitats Regulations Assessment (HRA) and invertebrate mitigation at Coalhouse Point requires a secure water supply. Hydrology studies indicate there is insufficient water in the natural catchment to sustain the water demand. Plate 1 presents the location and indicative design of the proposed mitigation area in the context of the LTC alignment.

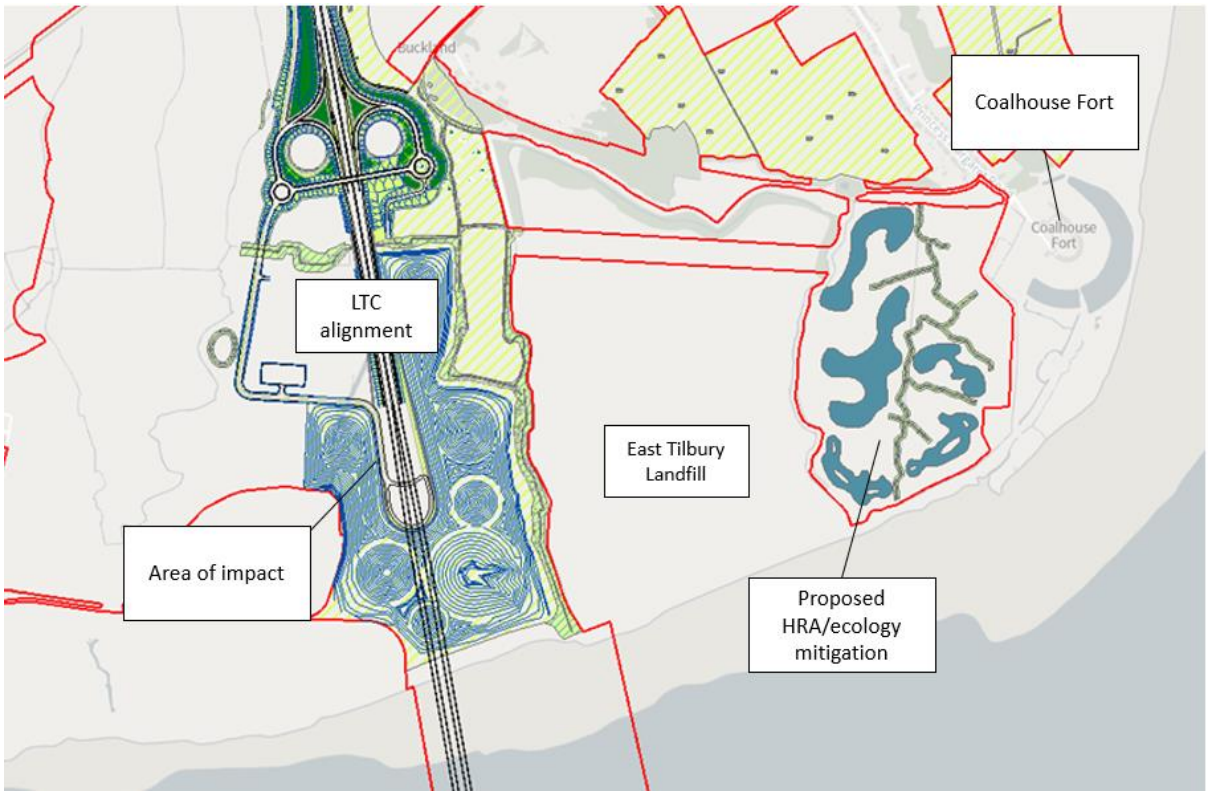

Plate 1: Proposed location of HRA and ecology mitigation

- The HRA and EIA require evidence that proposed mitigation is feasible. Natural England have advised that feasibility of the mitigation will need to be presented before they would be able to agree the sufficiency of the mitigation in the SoCG, which is a DCO acceptance risk and DCO consenting risk.

- A water supply solution is required by the HRA to demonstrate the feasibility of the measures in the DCO application, but also to inform engagement with Natural England in June/July 2022 so that the SoCG submitted at the application will have Natural England agreement on the conclusions of the HRA.
- Uncertainty on long-term condition and ownership of Coalhouse Point flood defences is an ongoing issue, however, does not influence the requirement of demonstrating the feasibility of a self regulating tidal gate or equivalent structure.

A choose by advantage workshop was carried out by the LTC Project team to achieve the following:

- Selection of preferred option/solution using Choosing by Advantage
- Identify next steps and risks
- Present update on a preferred option to DDG

The preferred option selected was to include provision for a structure to provide a direct supply from the River Thames within the DCO Order Limits and works plans. In parallel, the Project would seek to gain a legal agreement with Thurrock to supply water from the existing infrastructure within the Coalhouse Fort moat, however, this cannot be relied upon within the timescales required for the HRA consultation or DCO submission.

A review of alternative sites for the HRA and ecology mitigation has been carried out. No alternatives were identified.

The commitments in the HRA to include this structure reads:

HR010 – The habitat creation at the land adjacent to Coalhouse Point, indicated on the Environmental Masterplan (Figure 2.4, Application Document 6.2) and described in Clause S9.13 of the Design Principles (Application Document 7.5) will be carried out prior to the commencement of works at the Northern tunnel entrance compound. The water required to maintain a range of depths within the habitat consistent with the guidance in “Manage lowland wet grassland for birds” (DEFRA 2021) will be secured prior to completion of the habitat creation works and will, unless otherwise agreed with the Secretary of State, be sourced from the River Thames via a self-regulating tide gate or equivalent structure, passable by eels, constructed (in accordance with HR011) in the sea wall, at approximately TQ686761, to allow regulated tidal exchange (Work No. [TBC]).
HR011 –Works to construct a self-regulating tide gate or equivalent structure (HR010 Option 2) would be undertaken with the following constraints:

- In line with best practice, the works to construct the self regulating tidal gate or equivalent structure should be programmed for April – August (to avoid disturbance to passage and overwintering birds associated with European designated sites) where this would not delay the completion of the habitat creation works at the earliest date.
- All works requiring access to the inter-tidal zone would be completed to suit tidal cycle and at periods of low water.
- All piling works would be completed during periods of low water to avoid transmission of underwater noise.
- All piling works would utilise soft start piling and other best practice techniques, as per the JNCC 2010 guidance (Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise), to help avoid noise and vibration impacts.
- Excavated arisings would be retained within the coffer dam or stored on a support barge.
- No tracking on the upper foreshore area would be carried out.

Change to the Order Limits

To include provision of a new structure within the existing flood defence at Coalhouse Point, an amendment to the Order Limits would be required.

The location of the proposed structure, noted on Plate 2, has been determined by the following constraints:

- 50m offset from the western buried high pressure gas pipeline that crosses beneath the River Thames and the flood defence before taking an easterly alignment towards the National Grid AGI.
- An area which minimises the temporary disturbance of intertidal / mudflat habitat between the flood defence and mean high water level.
- Maintaining a distance of 100m from the boundary of East Tilbury Landfill.

To allow for the construction of the new structure, a temporary working area of 50m (longitudinally to the flood defence) by 20m to 35m (extending into the Thames) would be required. This would allow sufficient space during construction. This is presented as the orange area in Plate 2. The construction works would result in the temporary loss of inter-tidal habitat, however, given the scale of the proposed works and the dynamic nature of the tidal regime, any loss would naturally re-establish within a short-term timescale.

Once operational, it is assumed that the footprint of the proposed structure would not extend beyond the existing footprint of the flood bund and therefore the Project would not result in any permanent loss of inter-tidal habitat.

It was proposed to amend the Order Limits to incorporate the existing flood defence that is currently owned by the landowner, Mr Mott. This change was proposed irrespective of the requirement of a structure and is show as the red area in Plate 2. Given the new structure would be limited to the footprint of the flood defence, this change would also incorporate the new structure.

Plate 2: Proposed amendments to the DCO Order Limits to provide the 50mx20-35m working space for the construction of the sluice structure. Approximate amendments to Order Limits to incorporate flood defence also highlighted.

Key commitments/constraints to works

The works to construct the structure would be required in the early part of the construction programme. The HRA mitigation will need to be established prior to the northern tunnel entrance construction compound.

Works will be delivered in line with the constrains set out below.

- In line with best practice, the works to construct the self-regulating tidal gate or equivalent structure should be programmed for April – August (to minimise disturbance to birds) where this would not delay the completion of the habitat creation works at the earliest date (HR011).
- All works requiring access to the inter-tidal zone would be completed to suit tidal cycle and at periods of low water (HR011).
- All piling works would be completed during periods of low water to avoid transmission of underwater noise (HR011).
- All piling works would utilise soft start piling and other best practice techniques, as per the JNCC guidance, to help avoid noise and vibration impacts (HR011).
- Excavated arisings would be retained within the coffer dam or stored on a support barge (HR011).
- No tracking on the upper foreshore area would be carried out (HR011).
- The proposed final structure arrangement would be passable by eel, potentially opening up the proposed mitigation as new eel habitat, in line with HR010.
- The new structure would include a self-regulating arrangement to ensure water levels entering the mitigation can be controlled and water ingress can be stopped when the desired level within the created ditches and scrapes is achieved.
- Water level control would be established at the exit of the HRA mitigation to control flows leaving the site.

Structure design assumptions

The existing ground levels and tidal regime has informed the potential location and size of the structure, relative to the existing flood bund. The crest of the flood bund sits at approximately 4.0m AoD, whilst its base on the river side is around 1.0m AoD. The existing ditch directly to the north of the flood defence is at 0.0m AoD. Plate 3 provides a cross section of the existing flood defence.

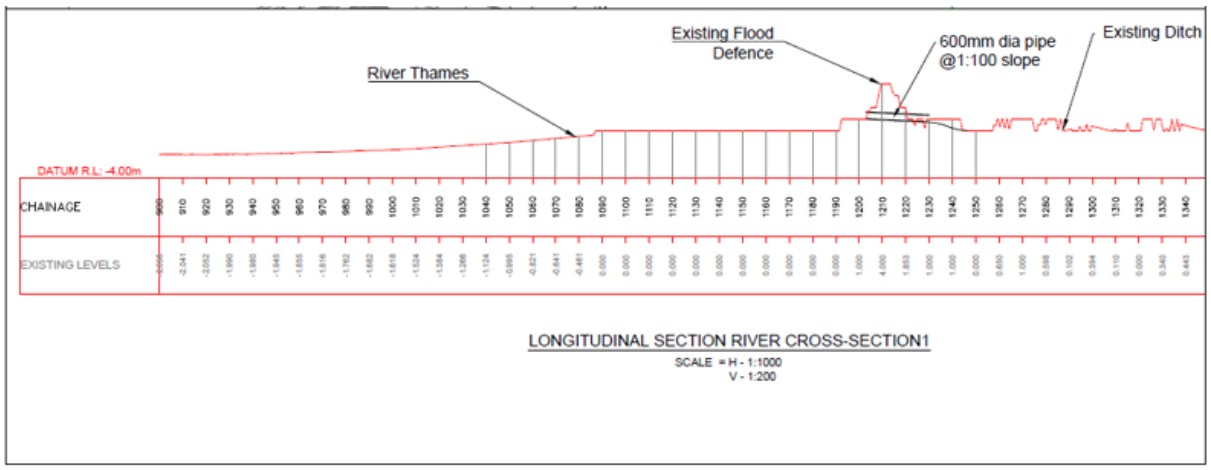

Plate 3: Cross section of the existing Coalhouse Point flood defence

An estimate of the Mean High Water Spring tidal cycle over a three-day period was developed using TE2100 model node at East Tilbury Marshes (Plate 4). It was determined

that the Thames' water level would be greater than 2.0m AoD for 24.75 hours over the three-day period. Assuming that a 600mm diameter pipe is installed, this would be sufficient to convey water through the flood defence to meet the required water demand of the proposed mitigation area and would avoid any permanent works within the inter-tidal area. Due to the elevated position of the structure within the flood defence and its relative position in terms of overall tidal frame, it has been assumed that the risk of the structure becoming silted up is low.

The final siting and form of the structure would be subject to detailed design.

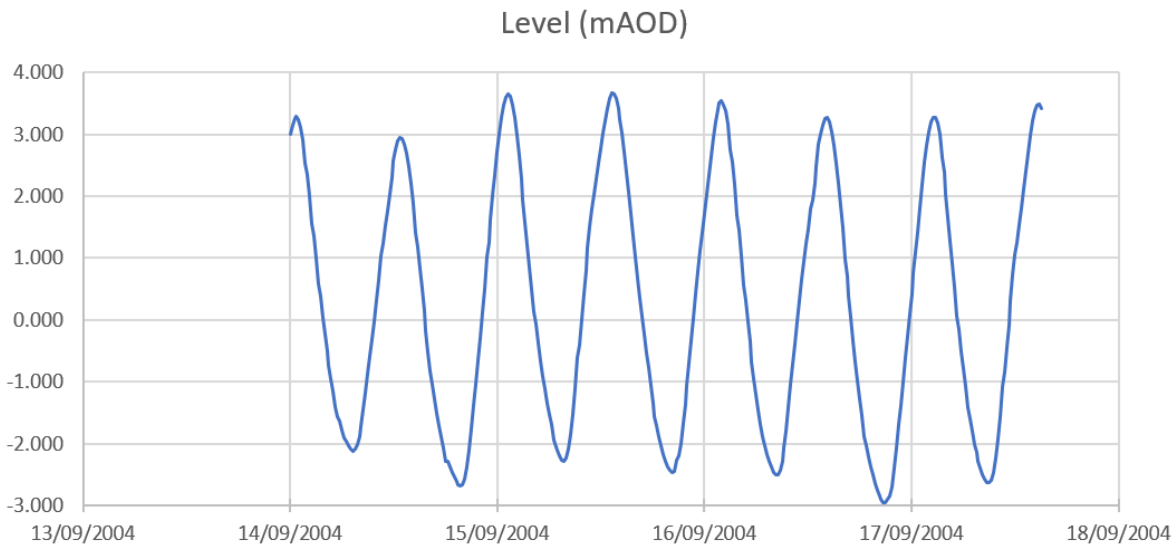

Plate 4: Mean high water spring tidal cycle at Coalhouse Point

To prevent unacceptable inundation of the land behind the flood defence, a mechanism would be required to control and/or stop water inflow once the mitigation features are filled to the required water level (HR010). Plate 5 illustrates a self-regulating tidal gate structure that has been used in similar situations and would likely be used on this proposal.

Plate 5 Self regulating tide gate at Seaton in Devon (Figure 3.6 in https://assets.publishing.service.gov.uk/media/6033a8f5e90e076607c1bf0e/Self-regulating_tide-gate_a_new_design_for_habitat_creation_technical_report.pdf)

Construction Method

The following sections describe the envisaged construction method required for the installation of the structure within the footprint of the existing flood defence. It is envisaged that in total construction would be up to 12 weeks in duration.

It is assumed that all works within the intertidal area would be restricted to periods of low water.

Construction and excavation of coffer dam

A sheet-piled coffer dam would be constructed to isolate the section of the flood defence in which the structure is to be installed. Isolation via the coffer dam allows the flood defence to be "breached" for the installation of the structure.

Piling works for the coffer dam would be undertaken from a dumb barge with spud legs or anchors on winches, with a 30 to 50 tonne 360 excavator and a multi cat that has a 5 tonne lifting capacity to set anchors as required.

The main piling barge may be serviced by a second dumb feeder barge carrying sheet piles. Alternatively, depending on the final siting of the sluice structure, servicing could be achieved via crane access from the landward side of the defence.

The short sheet piles would be vibro-piled into place (circa 6m "driven" in 4m below trench base) with small vibrating hammer (https://www.omsvibro.com/products/vibratory-hammers/excavator-mounted/). Sheet piling would be installed along either side of the proposed working area forming the coffer dam. Indicatively, the coffer dam would be approximately 10m x 15m, and would not extend beyond the maximum working area defined for the construction works. Excavation of the section of flood defence would take place within the coffer dam to the required depth.

Excavated arisings would be retained within the coffer dam or stored on a support barge or on land. Arisings would not be side cast within the inter-tidal area.

Assumed plant required for construction:

- Dumb barge/Jack up barge/pontoon
- Vibrating Hammer attachment on an excavator, or similar
- Crane – if servicing from land
- Excavator
- Multi Cat with lifting capacity
- Supply barge (for sheetpiles)

Installation of structure

The proposed structure selected to convey the water flow would be installed in the location of the flood defence "breach". Due to uncertainty over ground conditions, this may require additional foundation works and therefore piling has been assumed.

Assumed plant required for construction:

- Dumb barge/Jack up barge/pontoon
- Mini piling rig – on the barge
- Supply barge for precast piles and other materials
- Crane
- Excavator
- Compressor and small tools

Reinstatement

Following the installation of the structure the flood defence would be reinstated / back filled to maintain continuity of the defence around the new structure and maintain the existing public right of way. The sheet piled coffer dam would be removed and any areas excavated back filled as required.

Assumed plant required for construction:

- Dumb barge/Jack up barge/pontoon
- Supply barge
- Excavator
- Multi Cat with lifting capacity

Decommissioning

It is assumed that the structure would be permanent, due to its role in supporting HRA and ecology mitigation. Therefore, decommissioning of the asset would not be assessed.

Secondary Consents and Stakeholder Engagement

Secondary consents

- Deemed Marine Licence
- Preliminary Navigational risk assessment
- River works licence
- Abstraction licence
- Flood Risk Activity Permit

Stakeholders

- Port of London Authority
- Environment Agency
- Marine Management Organisation
- Thurrock Council (as other flood defence owner)
- Natural England
- National Highways
- Landowner

Annex C.9 Flood Risk Assessment – Climate Change (HE540039-CJV- EFR-TNT-ENV-00011)

Lower Thames Crossing

Flood Risk Assessment

Climate Change

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Lower Thames Crossing

Flood Risk Assessment

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1 Introduction

1.1.1 Climate change has the potential to increase peak rainfall intensity with a corresponding increase in the rate and volume of runoff being discharged to local watercourses and subsequently create an escalation in flood risk. Furthermore, sea levels are also projected to increase as a result of climate change.

1.1.2 This Technical note sets out the approach that Lower Thames Crossing is taking with respect to climate change for the Flood risk Assessment.

2 General

2.1.1 Outputs of the current UK Climate Projections (UKCP18) were published in November 2018 through a web-based user interface, providing climate projections for user-selected locations. The current Environment Agency (EA) guidance on climate change allowances for flood risk assessments[1] was updated in December 2019 to apply UKCP18 sea level rise allowances (and further amended in March 2020 with a minor clarification – i.e. the allowances did not change). Other allowances, including peak rainfall and river flow allowances, were not updated and remain unchanged since before the UKCP18 projections were published.

2.1.2 Lower Thames Crossing will become operational in 2027 and the operational life is up to 2127. The impacts of climate change are therefore assessed up to 2127. The EA's guidance on climate change allowances provides uplifts for rainfall and flow for the period covering 2015 to 2115, and sea level rise for the period covering 2000 to 2125.

2.1.3 In the absence of climate change allowances for 2127, the EA's climate change uplifts to rainfall and flow for 2115 will be adopted for the purposes of this assessment. This approach is consistent with the Environment Agency's climate change guidance for appraisal of flood defence schemes[2]. Sea level rise beyond 2125 will be extrapolated by assuming the same rate of rise (mm/year) as specified for 2125 continues beyond 2125.

2.1.4 The scheme design and assessment will apply the climate change allowances specified in the EA's guidance. In addition, sensitivity testing will be undertaken to consider the potential impacts on the scheme of the H++ climate change scenario. H++ climate change assessment allowances are provided in the Environment Agency's climate change guidance for appraisal of flood defence schemes.

1 Environment Agency, *Flood risk assessments: climate change allowances*, December 2019. (web link)
2 Environment Agency, *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities, 2016*. (web link)

3 Peak Rainfall Intensity Allowance

3.1.1 Table 3-A shows anticipated changes in extreme rainfall intensity in small and urban catchments, as detailed in the EA's guidance on climate change allowances.

Table 3-A: Peak rainfall intensity allowance in small and urban catchments (using 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated		
	2015 to 2039	2040 to 2069	2070 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

3.1.2 For flood risk assessments, the EA guidance states that:

- *For flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact.*
- *Design your drainage system to make sure there is no increase in the rate of runoff discharged from the site for the upper end allowance.*
- *Where on-site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant* flood hazard to people from on-site flooding for the central allowance.

3.1.3 As the highway is considered to be Essential Infrastructure and has a protracted operational life, the upper end and central rainfall intensity allowances of 40% and 20% respectively shall be used for the purposes of the FRA.

3.1.4 There are no rainfall allowances specified for the H++ scenario.

4 Peak River Flow Allowances

4.1.1 Peak river flow allowances for climate change are based on river basin districts. The development falls within the Thames River Basin District[3]. The peak river flow allowances for the Thames River Basin District are presented in Table 4-A.

Table 4-A: Peak river flow allowances for Thames river basin district

Allowance category	Total potential change anticipated		
	2015 to 2039	2040 to 2069	2070 to 2115
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%
Note: Allowances are for 1961 to 1990 baseline flows			

4.1.2 The application of the allowance category is a function of flood risk vulnerability classification for the type of development and the flood zone. A matrix of allowances for peak river flows is presented in Table 4-B.

Table 4-B: Peak river flow allowances by flood risk vulnerability and the flood zone

Flood risk vulnerability classification		Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Flood zone (s)	Zone 2	Upper end	Higher central Upper end	Higher central Upper end	Central Higher Central	Central
	Zone 3a	Upper end	Development should not be permitted	Higher central Upper end	Central Higher Central	Central
	Zone 3b	Upper end	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

4.1.3 As the highway is considered to be Essential Infrastructure and will have a protracted operational life, peak river flow allowances of 70% shall be used for the purposes of the FRA.

4.1.4 The H++ scenario flow uplifts for the Thames River Basin District is 80% for the 2080s (2070-2115). This uplift will be simulated as a sensitive test to consider the potential impact of the H++ climate change scenario on the scheme.

[3] Environment Agency, *River basin district map*, 2015

5 Sea Level Rise Allowances

5.1.1 The EA guidance specifies sea level rise allowances to be applied in flood risk assessments. These allowances are reproduced in Table 5-A.

Table 5-A: Flood risk assessment sea level allowance for each epoch in mm per year, with total sea level rise for each epoch in brackets (use 1981 to 2000 baseline)

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)	Cumulative rise 2000 to 2127 (extrapolated beyond 2125) (metres)
South east, Thames	Higher Central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20	1.23
	Upper end	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.60	1.64

5.1.2 The EA guidance specifies:

- *For flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact.*

5.1.3 Where the LTC assessment has applied higher central allowances, these are taken directly from the EA guidance (Table 5-A).

5.1.4 Where the LTC assessment has applied upper end allowances, these are consistent with the EA guidance upper end allowances, as follows:

- After the UKCP18 projections were published in November 2018, and prior to the updated EA guidance being published in December 2019, the Project applied interim sea level rise allowances as advised by the EA. These interim sea level allowances were those of the UKCP18 RCP 8.5 climate change scenario, extrapolated beyond 2100 to 2127 by applying the 2100 rate of sea level rise for the period beyond 2100. These interim sea level rise allowances are essentially the same as the EA guidance upper end allowances, as shown in **Error! Reference source not found.**Table 5-B, which compares the sea level rise allowances that were applied to the EA's Coastal Flood Boundary 2018 (CFB2018) extreme water level dataset (base year 2017) to those derived applying the EA guidance (relative to the 2017 base year). The allowances are identical for 2027, and the LTC interim allowances applied are 3.4mm higher for 2127 than the EA guidance upper end allowances.

Table 5-B: Comparison of the LTC interim sea level rise allowances with the EA guidance (relative to the 2017 base year of the CFB2018 dataset applied)

Allowance	Sea level rise allowance (mm)	
	2017 to 2027	2017 to 2127
LTC allowances (UKCP18 - RCP 8.5)	69	1523.0

Allowance	Sea level rise allowance (mm)	
	2017 to 2027	2017 to 2127
EA guidance: South east - upper end	69	1519.6
Difference (LTC allowance – EA guidance)	0	3.4

5.1.5 As the LTC allowances applied are consistent with the EA guidance (the 3.4mm higher allowance applied for 2127 in the LTC assessment is considered insignificant), the LTC climate change assessment applying the interim sea level rise allowances was not re-worked to apply the EA guidance values published in December 2019.

5.1.6 The H++ Sea Level Rise allowances are listed in Table 5-C.

5.1.7 The LTC will be designed to the climate change allowances specified for the project (i.e. consistent with EA guidance upper end sea level rise allowances).

5.1.8 Due to the nature of the road design, it will not be adaptable to the higher H++ climate change scenario, and the road could be inundated for the H++ design event. This will be assessed from consideration of the amount of additional sea level rise under the H++ rather than by hydraulic modelling. The LTC project does not propose simulating the H++ scenario by hydraulic modelling as available estuary water level time series are not available from the Environment Agency's TE2100 modelling.

Table 5-C: H++ sea level allowance for each epoch per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115	Cumulative rise 1990 to 2120 (extrapolated beyond 2115)	Cumulative rise 1990 to 2127 (extrapolated beyond 2115)
East, east midlands, London, south east	6 mm/yr (210 mm)	12.5 mm/yr (312.5 mm)	24 mm/yr (720 mm)	33 mm/yr (1155 mm)	2.40 m	2.56 m	2.79 m

Annex C.10 Flood Risk Assessment – Future Thames Barrier Breach Modelling (HE540039-CJV-EFR-GEN-TNT-ENV-00101)

Lower Thames Crossing

Flood Risk Assessment

Breach modelling: Considering TE2100 future barrier options

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Reviewer list

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[redacted]	

Approvals

Name	Signature	Title	Date	Version

Lower Thames Crossing

Flood Risk Assessment

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Page number

1 Introduction

1.1 Background

1.1.1 The Lower Thames Crossing (LTC) breach assessment, undertaken to inform the LTC Flood Risk Assessment (FRA), includes breach simulations for the present day (2027) and future (2127) for return periods 200 years (0.5% AEP) and 1000 years (0.1% AEP). Breaches were simulated at the following TE2100 model nodes:

- 3.15 (Mardyke Sluice breach location)
- 3.26 (TIL005 breach location)
- 3.28 (TIL006 breach location)

1.1.2 Further details of the breach modelling undertaken are in Part 5 of the LTC FRA, Appendix F (Application Document 6.3).

1.1.3 The LTC FRA breach simulations did not consider the future Thames barrier options, as set out in the TE2100 plan (TE2100 Phase 3 Topic 1.5 Set 2 Estuary Wide Options - Hydraulic Modelling, Environment Agency (December 2008) and TE2100: Design Water Levels and Future Defence Crest Levels, Environment Agency, (May 2015)). Following consultation with the Environment Agency, this technical note extends the LTC FRA breach assessment to also consider breaches assuming the following TE2100 future Thames barrier (and flood defences) options:

- Option 1.4 (barrier at Woolwich)
- Option 3.2 (barrier at Long Reach)
- Option 3.1 (barrier at Gravesend Reach)

1.1.4 The breach modelling undertaken to date for the LTC FRA assumes that during a simulated breach of the River Thames tidal defences, flood water is conveyed into the tidal floodplain only through the breach opening (i.e. no overflow of tidal flood defences), as the simulated Extreme Water Levels (EWLs) for all breaches simulated are below flood defence levels. This assumption remains valid when considering the TE2100 future Thames barrier Options 1.4, 3.2 and 3.1, as these options specify that the flood defence heights would be upgraded when required for each option to provide the required standard of service specified by the TE2100 plan (which is greater than or equal to 1000 years at the LTC breach locations, and so above the 1000 year return period EWL applied in the breach simulations).

1.2 Potential for TE2100 future barrier options to influence the LTC FRA breach assessment

1.2.1 Results of a simulated breach assuming the future barrier Options 1.4, 3.2 and 3.1 in 2127 may differ to results of the LTC FRA breach simulations already undertaken, since:

- Future barrier options may result in different River Thames design EWLs compared to those applied in the LTC FRA breach modelling.
- Future barrier options may specify different future tidal flood defence levels (in 2127) compared to those applied in the LTC FRA breach modelling. The LTC FRA breach simulations undertaken and the future barrier options both assume that the 1000 year return period River Thames EWLs in 2127 would be below the River Thames tidal flood defence levels in 2127 at the LTC FRA breach locations. However, the specification of simulated breach start and end times is influenced by flood defence heights (Breach of Defences Guidance, Environment Agency, 2018), and so a change in flood defence levels (in the barrier options) results in a change in specified breach start and end times.

2 Assessment of TE2100 future barrier options

2.1 Comparison of EWLs for TE2100 future barrier options with those applied in LTC FRA breach modelling

2.1.1 The LTC FRA breach modelling applied EWLs derived from TE2100 EWLs, adjusted to account for the more recent Environment Agency Coastal Flood Boundary dataset 2018 (CFB2018) and UKCP18 projected sea level rise allowances.

2.1.2 The TE2100 simulated EWLs for Option 1.4 (TE2100: Design Water Levels and Future Defence Crest Levels, Environment Agency (May 2015)) are the same as the TE2100 EWLs from which the LTC FRA breach modelling EWLs were derived, as this option assumes no change to the tidal barrier location in the future.

2.1.3 The TE2100 simulated EWLs for TE2100 Options 3.2 and 3.1 differ from those of Option 1.4 as Options 3.2 and 3.1 represent a change in tidal flood barrier location (with future barriers at Long Reach and Gravesend Reach respectively).

2.1.4 Table 1 compares EWLs applied in the LTC FRA breach modelling (including the TE2100 EWLs provided by the Environment Agency and adjusted values accounting for CFB2018 and UKCP18) with those simulated for the TE2100 Options 1.4, 3,2 and 3.1, at LTC breach locations Mardyke Sluice, TIL005 and TIL006.

2.1.5 A comparison of EWLs applied in the LTC FRA with those simulated for the TE2100 Options 1.4, 3,2 and 3.1 should be based on the TE2100 EWLs provided for use in the LTC FRA rather than the adjusted EWLs. This provides a “like-for-like” comparison, as all values compared are then based on the TE2100 modelling and boundary conditions.

Table 1: Mardyke Sluice: EWLs applied in the LTC FRA breach modelling and EWLs simulated for the TE2100 Options 1.4, 3,2 and 3.1

	1000 year (0.1% AEP) Extreme Water level values (mAOD)				
Year	**TE2100 EWLs provided for LTC FRA**	***Applied in LTC breach modelling**	**[1]TE2100 Option 1.4**	**[2]TE2100 Option 3.2**	**[3]TE2100 Option 3.1**
TE2100 model node 3.15 (Mardyke Sluice breach location)					
2120	6.85		6.85		
2127	6.92**	7.06			
2140	7.04**			5.40	5.40
2170	7.33		7.33	5.40	5.40
TE2100 model node 3.26 (TIL005 breach location)					
2120	6.65		6.65		
2127	6.73**	6.87			
2140	6.87**			6.88	5.18
2170	7.19		7.19	7.24	5.18
TE2100 model node 3.28 (TIL006 breach location)					
2120	6.56		6.56		
2127	6.65**	6.82			
2140	6.80**			6.83	6.61
2170	7.17		7.17	7.21	7.06

** The LTC EWLs adjust TE2100 values according to the latest Environment Agency Coastal Flood Boundary dataset 2018 and UKCP18 sea level rise values. Full details of this adjustment are in the LTC FRA breach modelling appendix (FRA Part 5).*

*** Interpolated values to aid comparison with values applied in the LTC breach modelling and other TE2100 options*

1 – Source: Table A.5 in TE2100: Design Water Levels and Future Defence Crest Levels, Environment Agency (May 2015)

2 – Source: TE2100 Phase 3 Topic 1.5 Set 2 Estuary Wide Options - Hydraulic Modelling, Environment Agency (December 2008). 2140 EWLs taken from Table 4.8, 2170 EWLs taken from Table 4.10

3 – Source: TE2100 Phase 3 Topic 1.5 Set 2 Estuary Wide Options - Hydraulic Modelling, Environment Agency (December 2008). 2140 EWLs taken from Table 4.7, 2170 EWLs taken from Table 4.9

2.1.6 Table 1 indicates:

- Option 1.4 EWLs are the same as the TE2100 EWLs provided for use in the LTC FRA breach modelling at all LTC FRA breach locations.
- Option 3.2 EWLs are;
  - lower than the TE2100 EWLs provided for use in the LTC FRA breach modelling at the Mardyke Sluice breach location.
  - slightly higher than the TE2100 EWLs provided for use in the LTC FRA breach modelling at TIL005 and TIL006 breach locations by approximately 0.01m and 0.03m respectively (based on values for 2140, highlighted orange in Table 1).
- Option 3.1 EWLs are lower than the TE2100 EWLs provided for use in the LTC FRA breach modelling at all LTC FRA breach locations.

2.1.7 In summary, the EWLs presented in Table 1 indicate the TE2100 future barrier Options 1.4, 3.2 and 3.1 would not result in a significant increase in EWLs at the LTC FRA breach locations in 2127, with increases only for Option 3.2 by up to 0.03m (based on values for 2140).

2.1.8 An increase in EWLs by up to 0.03m is considered insignificant compared to other assumptions and uncertainties in assessing breach impacts in 2127. Other assumptions and uncertainties include:

- The CFB2018 stated 2.5% and 97.5% confidence intervals in the 1000 year return period EWL at Southend in the CFB2018 base year (2017) are -0.49m and +0.60m respectively (and these confidence intervals only account for statistical uncertainty).
- There is significant uncertainty in estimating future sea level rise due to climate change.
- There is uncertainty in the TE2100 hydraulic modelling.
- The breach modelling guidance applies assumptions (e.g. breach width, start time and duration) which may or may not be representative of an actual breach, should one occur in the future.
- There is uncertainty in the hydraulic modelling of breach propagation inland.

2.1.9 The increase in EWLs by up to 0.03m is therefore considered insignificant in the context of the wider assumptions and uncertainties in assessing breach impacts in 2127, and, with respect to the EWLs applied, the LTC FRA breach simulations results are considered an appropriate assessment of future breach flood risk i.e. the LTC FRA assessment of the impact of the LTC Project on breach flood risk elsewhere, and the impact of a breach on the LTC Project, is considered robust in this regard.

2.2 Comparison of flood defence levels for TE2100 future barrier options with those applied in LTC FRA breach modelling

2.2.1 The EA breach simulation guidance specifies a simulated breach start time to be when flood levels reach ¾ of the flood defence height. For a given EWL, a change in flood defence levels at a simulated breach location therefore has potential to impact on the simulated breach impacts. The TE2100 future Options 1.4, 3.2 and 3.1 require changes in flood defence levels at the LTC FRA breach locations, as detailed in Table 2 which lists:

- Existing flood defence levels at the LTC FRA breach locations as applied in the LTC breach modelling and as reported in TE2100 reports (report references are in Table 2).
- Required future flood defence levels for the TE2100 Options 1.4, 3.2 and 3.1 at the LTC FRA breach locations, as reported in TE2100 reports (report references are in Table 2).

Table 2: Existing and future flood defence levels at LTC FRA simulated breach locations

				Required future defence level in 2127 (mAOD)		
LTC FRA breach location	**TE2100 model node**	**LTC FRA breach modelling assumed defence level (mAOD)**	**Existing defence level (according to TE2100 reporting) (mAOD)**	**Option 1.4**	**Option 3.2**	**Option 3.1**
Mardyke Sluice	3.15	7.16[1]	7.05[4]	8.10[4]	6.10[4]	6.90[5]
TIL005	3.26	6.48[2]	6.65[4]	7.90[4]	8.00[4]	6.63[5]
TIL006	3.28	4.99[3]	7.00[4]	7.00[4]	7.00[4]	6.63[5]

1 – Source: Lower Thames Crossing channel topographic survey, undertaken for this study – Storm Geomatics (November/December 2018)

2 – Source: Information received from Environment Agency for Asset Number 152988 (Datasheet reference EAN/2018/76391, 2018)

3 – Source: Environment Agency Bowaters Sluice "as built" drawing

4 – Source: Table 7.1 in TE2100: Design Water Levels and Future Defence Crest Levels, Environment Agency (May 2015)

5 – Source: Table 4.9 in TE2100 Phase 3 Topic 1.5 Set 2 Estuary Wide Options - Hydraulic Modelling, Environment Agency (December 2008)

2.2.2 Where Table 2 indicates a required future flood defence level is lower than the existing flood defence level:

- It is assumed the level of the existing flood defence would not actually be lowered in the future.
- The requirement for a lower flood defence level arises from a lower design EWL (for that future barrier option and location) than the equivalent TE2100 EWL provided for use in the LTC FRA. The simulated impacts of a breach for these options would therefore be lower than the LTC FRA simulations.

2.2.3 Therefore only the future barrier options with increased EWLs compared to the TE2100 EWLs provided for use in the LTC FRA, and/or increased flood defence levels if required, have potential to result in increased simulated breach impacts. As discussed earlier, the impact of increased EWLs by up to 0.03m is considered insignificant, and so the following considers the influence on simulated breach events of increasing flood defence levels.

2.2.4 Figures 1 to 3 show the influence of increasing flood defence levels on breach start and end times for the LTC FRA breach simulations. The change in breach start and end times is shown for the highest required future defence levels (i.e. the future defence levels that are most different to those assumed in the LTC FRA breach simulations, highlighted in orange in Table 2).

Figure 1: Impact of increased defence levels on breach start and end times at Mardyke Sluice breach (based on future level for Option 1.4 in 2127)

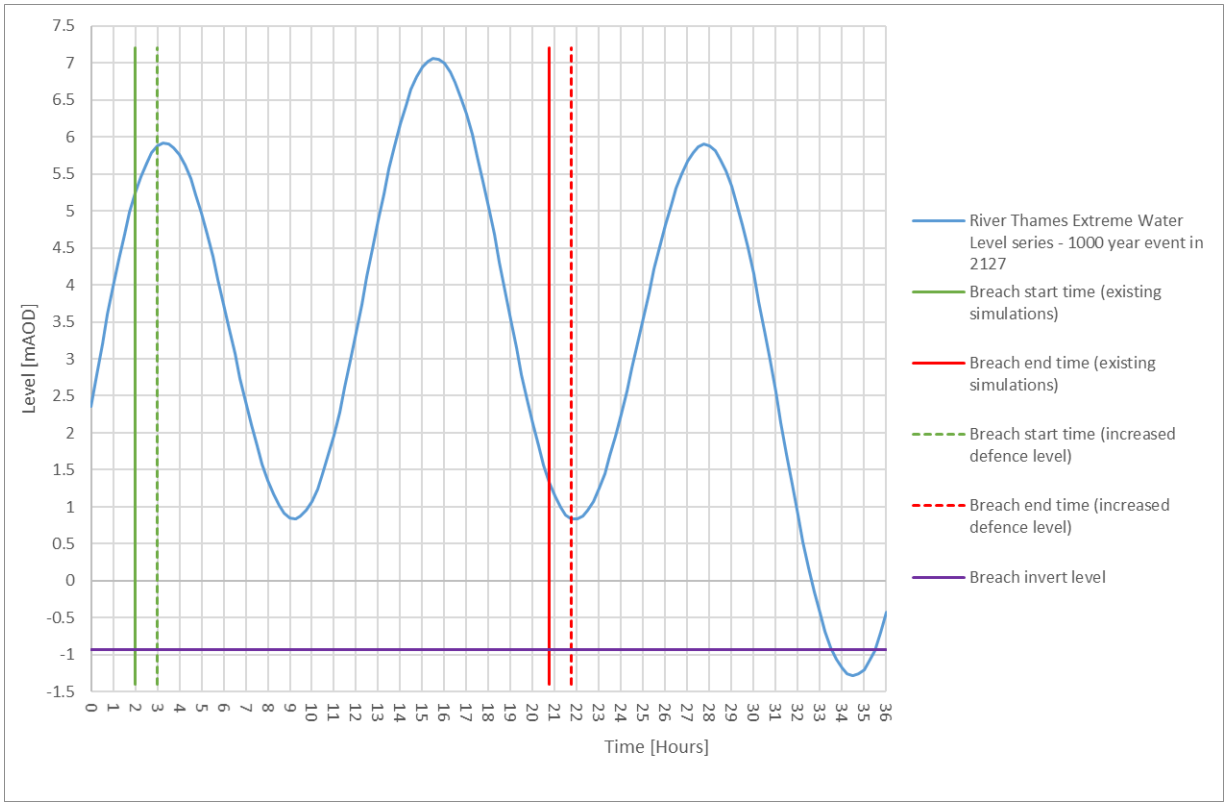


Figure 2: Impact of increased defence levels on breach start and end times at TIL005 breach (based on future level for Option 3.2 in 2127)

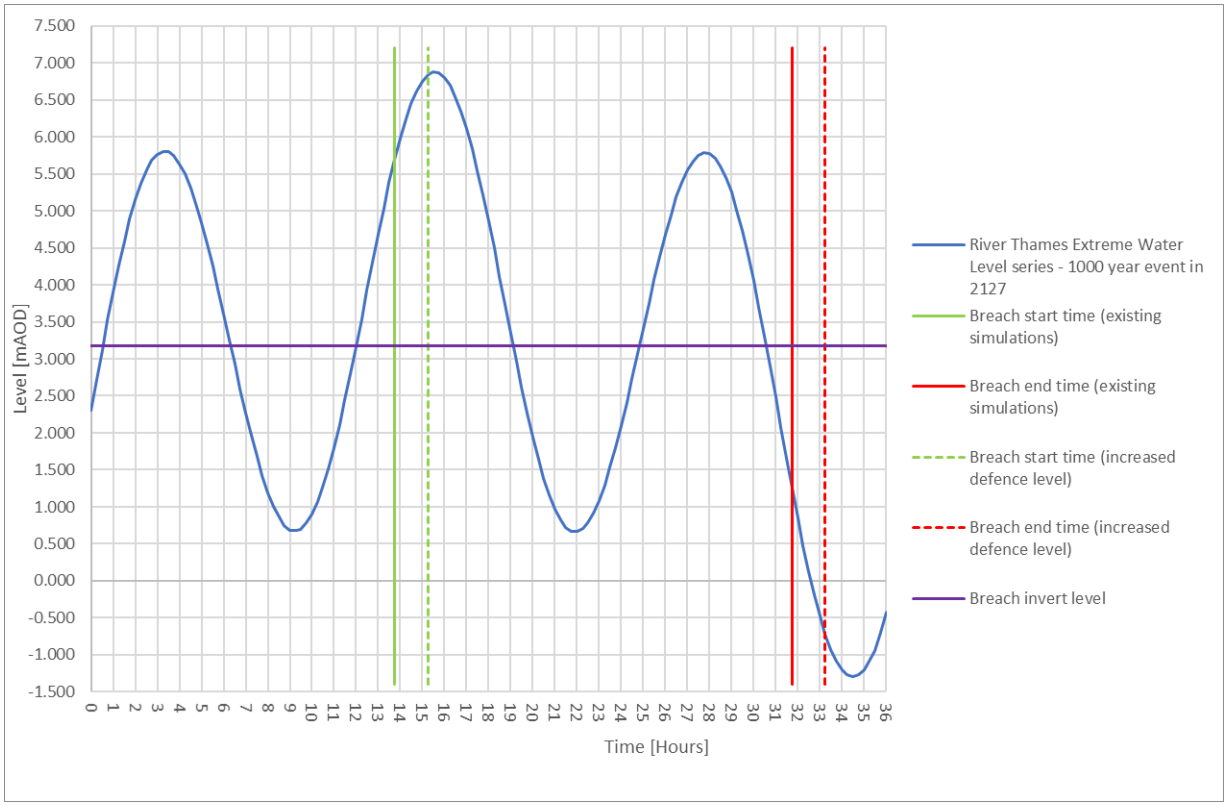
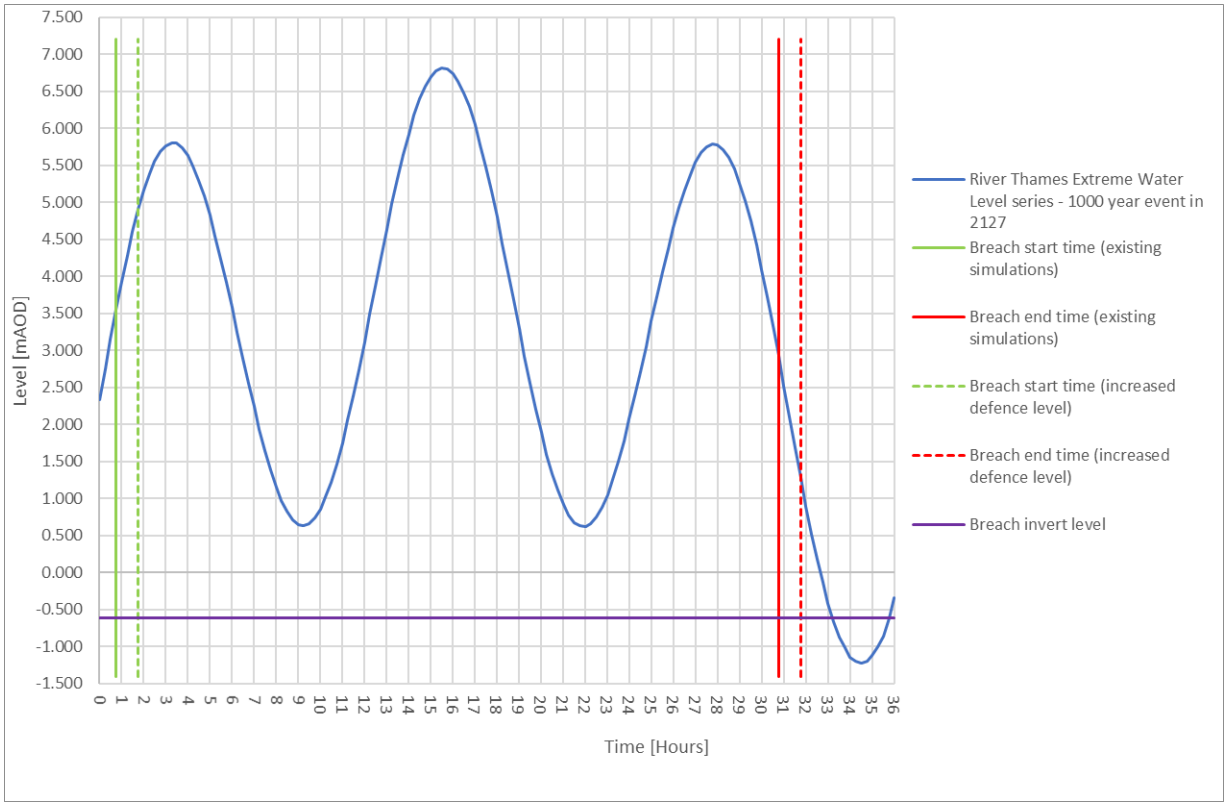


Figure 3: Impact of increased defence levels on breach start and end times at TIL006 breach (based on future level for Option 3.2 in 2127)



2.2.5 Figures 1 to 3 show that for all LTC FRA breach locations, applying higher flood defence levels results in a delay in the start and end times of simulated breaches. An inspection of Figures 1 to 3 indicates that the reduction in initial breach flows resulting from increased defence levels (due to a delayed start) would exceed the gain in breach flows at the end of the simulated breach event, as River Thames flood levels are higher at the start of simulated breach events than at the end of the events (and for TIL005 there would be no gain in breach flows at the end of the simulated breach event, as River Thames levels would be below the TIL005 breach invert level at the end of the simulated beach). There would therefore be an overall reduction in simulated breach flood volume as a result of increasing flood defence levels.

2.2.6 The LTC FRA breach simulation results show the nearest parts of the LTC Project within TIL005 and TIL006 breach event flood extents are approximately 2km and 0.8km respectively from the breach locations, with simulated peak velocities significantly lower than at the breach locations. The influence of an increase in flood defence levels on breach impacts at the LTC Project would therefore be dominated by total breach volume (i.e. breach flood extent and level).

2.2.7 Simulating increased flood defence levels would therefore be expected to reduce breach event peak flood levels and extents slightly in the vicinity of the LTC Project (and a breach of Mardyke Sluice would remain in-channel at the LTC Project location, as is the case for the breach simulations undertaken for the LTC FRA), such that the LTC FRA breach simulations already undertaken portray a slightly more conservative case in the future (2127) than the alternative future barrier options.

2.2.8 The slight reduction in breach flood volumes as a result of increased flood defence levels is considered insignificant in the context of the wider assumptions and uncertainties in assessing breach impacts in 2127 listed in paragraph 2.1.8. The LTC FRA breach simulations results are therefore considered an appropriate assessment of future breach flood risk i.e. the LTC FRA assessment of the impact of the LTC Project on breach flood risk elsewhere, and the impact of a breach on the LTC Project, is considered robust in this regard.

3 Conclusions

3.1.1 This technical note:

- Extends the LTC breach assessment to also consider breaches assuming the following TE2100 future Thames barrier (and flood defences) options:
  - Option 1.4 (barrier at Woolwich)
  - Option 3.2 (barrier at Long Reach)
  - Option 3.1 (barrier at Gravesend Reach)
- Considers the potential for changes in River Thames EWLs and required flood defence levels in the future, as a result of implementing any of the future barrier Options 1.4, 3.2 and 3.1, to influence future breach flood risk.
- Concludes that the LTC FRA breach simulation results provide an appropriate assessment of future breach flood risk i.e. the LTC FRA assessment of the impact of the LTC Project on breach flood risk elsewhere, and the impact of a breach on the LTC Project, is considered robust. Therefore no further breach simulations are required to account for TE2100 future barrier options 1.4, 3.2 and 3.1.

Annex C.11 Bowaters Sluice and East Tilbury Tidal Wall Monitoring Assessment (HE540039-LTC-GEN-GEN-TNT-TPI-00001)

Lower Thames Crossing

Bowater Sluice and East Tilbury Tidal Wall monitoring assessment

Technical Note

Document Number: **HE540039-LTC-GEN-GEN-TNT-TPI-00001**

<Confidential>

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Contents

1. Executive Summary

The purpose of this Technical Note is twofold:

- To provide an overview of the main factors that govern the behaviour of the area around Bowater Sluice and the East Tilbury Tidal Wall.
- To express the constrains for a successful monitoring program of the assets prior to the construction of the Lower Thames Crossing main tunnels (Baseline).

This Technical Note is based on limited information and its result could be reassessed when more information becomes available. The assessment has been carried out based on information provided by the Environment Agency (owner of the asset), and two site visits on 14th March 2019 and 30th September 2021.

2. Location of the assets

Bowater Sluice and East Tilbury tidal wall are located in the North bank of Thames river, Essex, approximately 1600m Southwest of Coalhouse Fort and 2800m East of Tilbury Fort.

In respect to the LTC scheme, the area is approximately 300 metres East of the Main Tunnels, according to DR3.0. See Figure 1 for reference.

Figure 1

3. Description

There are two independent but related assets in the area, Bowater Sluice and the East Tilbury tidal wall, directly above the first.

Bowater Sluice

Bowater Sluice is an asset designed to prevent the entrance of water from the Thames river and the tide to the canal behind it. The structure is thought to be constructed in the decade of 1960. It has a bore of pipe estimated in 18 or 24 inches. It is constructed with engineering brick and concrete capping slab. The asset is thought to have been constructed around 1960.

The brickwork is in poor condition showing signs of displacement and cracking. The reason behind this is not known. The condition of the internal pipework is not known either.

East Tilbury Tidal Wall

The East Tilbury Tidal Wall is an asset constructed after or during 1976 or 1979, as the only documents related to it provided by the EA are from these years (See Appendix 1). The purpose of the asset seems to be related to protect the sluice under it from erosion.

The asset is an L-shaped cantilever retaining wall made of reinforced concrete and divided in nine independent sections. Sealed expansion joints run between the different sections. Some of the joints are in poor condition.

The asset is covered in graffities and its concrete seems to be in good state, with no apparent cracking or spalling in any section. Nevertheless, there are mild signs of displacement between these sections, mainly at both ends of the structure. The middle sections don't seem to be suffering any displacement. There is some cracking present at the edge of one of the sections (Figure 2), probably caused by said displacement.

There is actually an active erosional area West of the asset, which is related to the existing local water circulation. The asset is protected by a slabbed area to protect the structure from erosion, which has been already affected as seen in figures 3 and 4. There's no evidence of erosion in the immediate area East of the wall.

The soil above high tide level surrounding these two assets seems to be made ground.

Figure 2

Figure 3

Figure 4

4. Discussion

The eligibility criteria for Baseline I&M stated in document HE540039-CJV-GEN-GEN-REP-CLO-00008 – Baseline Instrumentation and Monitoring Report – have been followed to assess whether the assets are susceptible to be included in the current Baseline I&M scope.

Both assets lie beyond the zone of influence of the works, as per documents HE540039-CJV-GEW-GEN-REP-TPI-00001 and HE540039-CJV-GEN-GEN-TNT-GEO-00100. They include the 1mm settlement contour, which is considered the zone of influence of the works (ZoI).

Bowater Sluice

As stated before, there are signs of displacement and cracking in the brickwork. Although the reason behind this is not known, it is most likely that movement of the ground underneath has caused the damage over the years.

In earlier stages of the design of the alignment, the water discharge route from the North portal compound was designed to flow through Bowater Sluice. This could negatively impact the structural health of the asset.

To avoid it, Lower Thames Crossing devised a solution so this asset will not be affected by the works. A draft of this proposal is shown in document "North Portal Discharge Assumptions" (HE540039-CJV-EGN-S07-TNT-ENV-00002). Although this document has a BC number assigned, the document has not been published on BC as of December 2021.

Regarding the zone of influence of the works, it is not possible that this structure will be affected by the settlement produced by drilling the main tunnels, as it rests well beyond this boundary (approximately 250m away from the 1mm settlement contour).

East Tilbury Tidal Wall

The EA has expressed concerns about the stability of this asset in relation to the LTC works. As stated before, the asset lies approximately 250m away from the zone of influence of the Main Works.

Although the structure shows some displacement between its different sections, it is not known what is causing this movement. It is not known either whether these displacements are still active.

Mechanisms that can affect the stability of the assets

Hypothetically, the ways these assets can be affected by the LTC works are the following:

- Settlement by tunnelling.
- Accumulating or excavating a sizeable volume of earths near the structure, i.e., an embankment or a cutting.
- Local erosion-sedimentation dynamics in the estuary.

As mentioned above, document HE540039-CJV-GEN-GEN-TNT-GEO-00100 presents the Stage 1 ground movement assessment for the bored tunnels, the portals and the approach to the portals based on Design Release (DR) DR2.11, including the 1mm settlement contour.

The ZoI in the North bank area extends approximately 50 metres at each side of the tunnels. The assets object of discussion here are beyond this line, as they are approximately 300 meters away from the nearest of the tunnels.

Document HE540039-CJV-GEN-GEN-TNT-GEO-00223 analyses settlement on existing assets due to the main tunnels' boring, under Design Release 3.0.

As none of the assets were inside the zone of influence of the works, no settlement analysis was deemed necessary to be carried out.

Nevertheless, the Flood Defence Embankment, on the South bank, was assessed for expected displacements due to tunnelling. The settlement analysis on the South bank can be considered comparable to the expected displacements for the North bank as the method used (Attewell et al., 1986) does not take into account the geology of the area assessed.

According to this assessment, the maximum vertical displacement expected in the Flood Defence Embankment is near 70 mm over the crown of one of the tunnels and 60 mm over the second tunnel.

The induced settlement will modify the channel bed and the shoreline. Still, this amount of expected settlement is not deemed to generate a significant impact on the currents. Also, as the estuary has mobile sediments, on the event of any displacement the river bed and the sediment would just adapt to any small changes. In addition, the displacements are within typical modelling tolerances, especially in a large estuary with sediment load as the Thames's.

Notes on the morphology of the North bank and its shoreline.

A quick analysis of the aerial imagery of the zone reveals several erosional landforms in the shoreline of the North bank. The affected areas are shown in figures 5 and 6. A detail of the area of erosion near the assets was shown in figures 3 and 4. No erosional forms have been found in the opposite shoreline.

Figure 5

The two zones affected by erosion seem to be related to small headlands or raised areas found at the East of the eroded zones. It suggests that the governing currents are in direction East to West in this area and side of the river, which coincides with the general circulation pattern in estuaries given the influence exerted by Coriolis acceleration. The hypothesis is that these raised areas could disturb the currents and generate enough turbulence as to erode the shoreline in the locations indicated in figure 6.

Figure 6

Monitoring options

As shown in figure 3, the asset is covered in graffities, and any part of it can be accessed easily by pedestrians. This ease of access implies that any monitoring instrument installed on the asset has a high chance of being vandalised at any moment, becoming useless after a short period of time, particularly in case of automated monitoring.

The only fully automatic monitoring option that could be of some help is satellite monitoring (InSAR), provided that:

- The asset has natural signal reflectors, as any reflector installed as part of the monitoring program could be vandalised.
- It would be needed a long baseline to understand the behaviour of the asset under different conditions, including tides, as a satellite produces an image of an area each 7 to 12 days, depending on the satellite.
- There is at least another on-site monitoring method supporting InSAR data, as the displacements of the asset could be complex to interpret due to tidal influence.

The most appropriate supporting methods will need on-site stable references, which would be difficult to produce given the influence of the tides in the area. Also, any manual monitoring method will have to match the satellite monitoring frequency for an easier interpretation of the data, which can be difficult to achieve.

5. Conclusions

- Three hypothetical mechanisms of action are deemed capable of de-stabilising the assets: settlement by tunnelling, accumulating or excavating earths and modifying the existing currents.
- The assets are too far from the zone of influence of the works as to be affected.
- No excavation or earth accumulation is planned near the assets.
- The East Tilbury Tidal Wall is thought to be affected by displacements at least on both ends of the asset.
- Further erosion in the West tip of the East Tilbury tidal wall area can be affecting the asset now or could do it in the future.
- It is not known whether this erosive process can explain all the displacements on the West tip of the wall.
- Origin of displacements on the East tip of the asset is not known.
- Bowater Sluice is not going to be affected by the LTC works.
- The effect of the modification of the shoreline and the river bed due to settlement is deemed not enough to generate visible effects on the erosion-sedimentation dynamics in the area.
- The governing local current in this area of the estuary is thought to be East to West, so any effects would become evident West of the main tunnels and not East, where the assets are placed.
- Any monitoring system installed on the asset must consider tidal effects and vandalism as a handicap to overcome, in order to achieve stable, accurate and trustworthy data during the life of the project to match the standards required throughout and beyond its execution.

6. Recommendations

- None of the assets assessed in this technical note are thought to be affected by the LTC Main Works, directly or indirectly, therefore they are not proposed for monitoring.
- Shall more information become available, the assets should be reassessed as indicated in document HE540039-CJV-GEN-GEN-REP-CLO-00008 – Baseline Instrumentation and Monitoring Report.
- In the event of these assets being monitored, any solution must consider the effect of tides on the area and the risk of any instrument being vandalised.

7. References

HE540039-CJV-GEN-GEN-REP-CLO-00008 – Baseline Instrumentation and Monitoring Report.

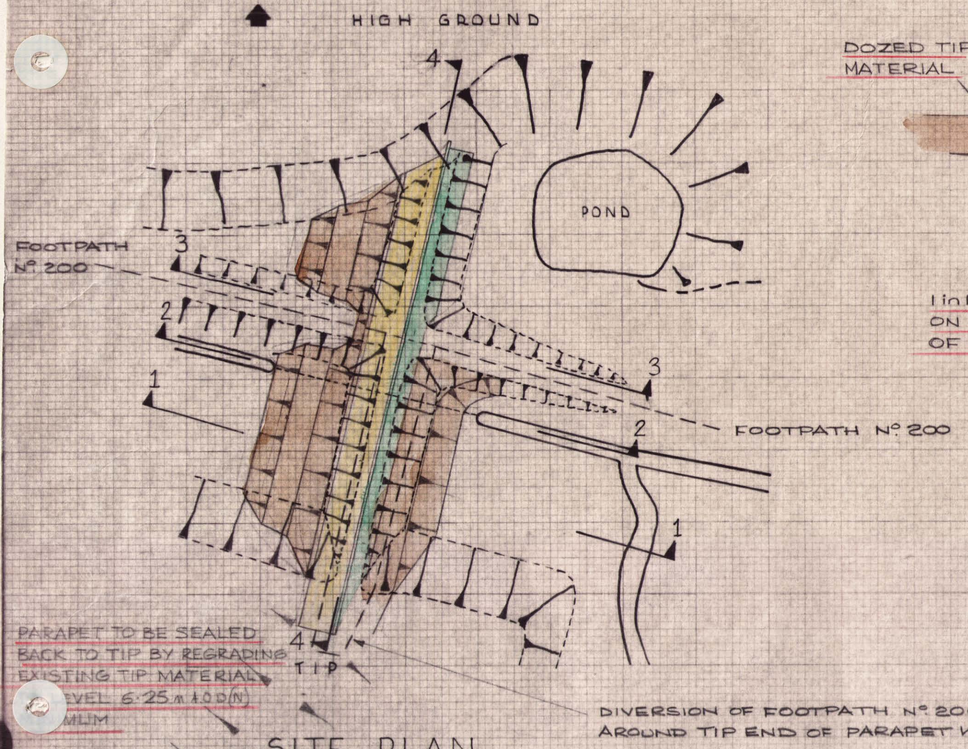
HE540039-CJV-GEN-GEN-TNT-GEO-00223 – Ground Movement Assessment (Stage 2) – Main Crossing.

HE540039-CJV-GEW-GEN-REP-TPI-00001 – Stage 1 Damage Assessment Report – Permanent Works.

HE540039-CJV-GEN-GEN-TNT-GEO-00100 – Ground Movement Assessment (Stage 1) - Main Crossing.

HE540039-CJV-EGN-S07-TNT-ENV-00002 – North Portal Discharge Assumptions.

8. Appendix 1. East Tilbury Tidal Wall and Star Dam plans



SITE PLAN
1:500
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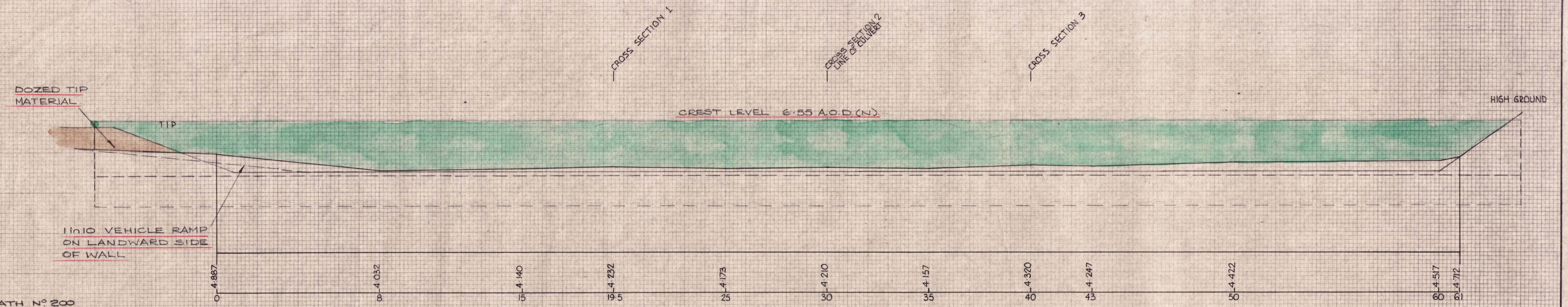

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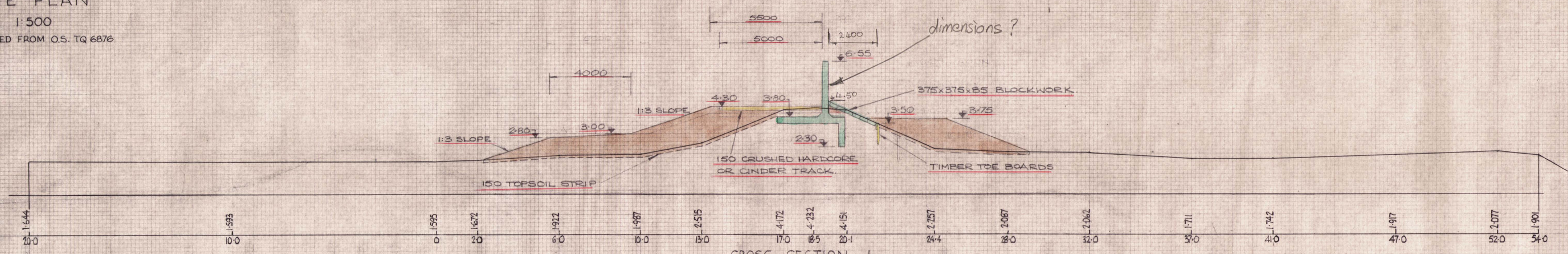

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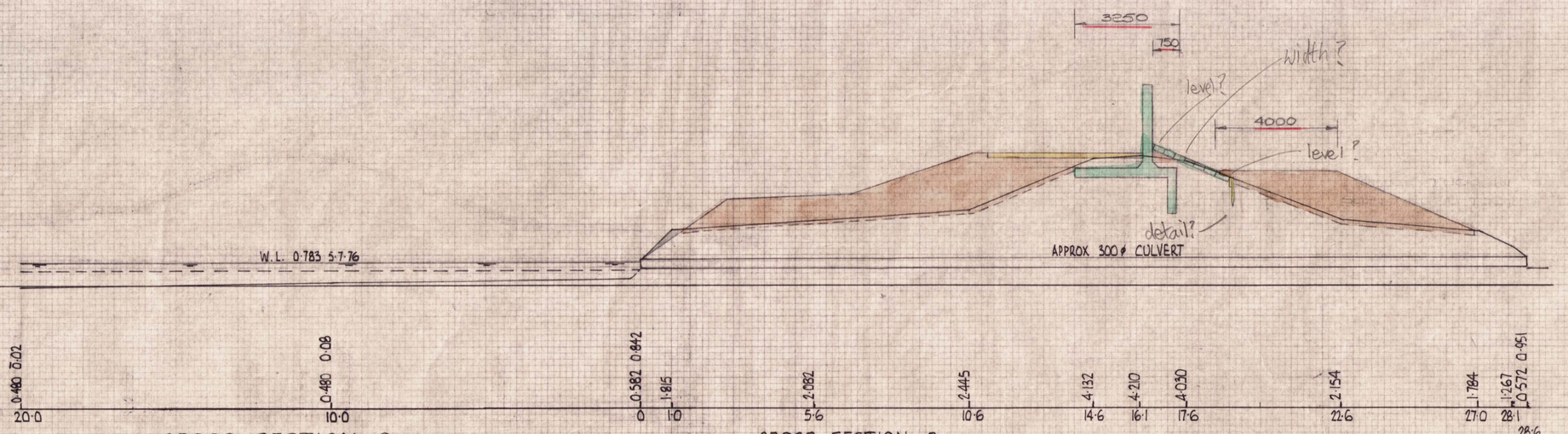
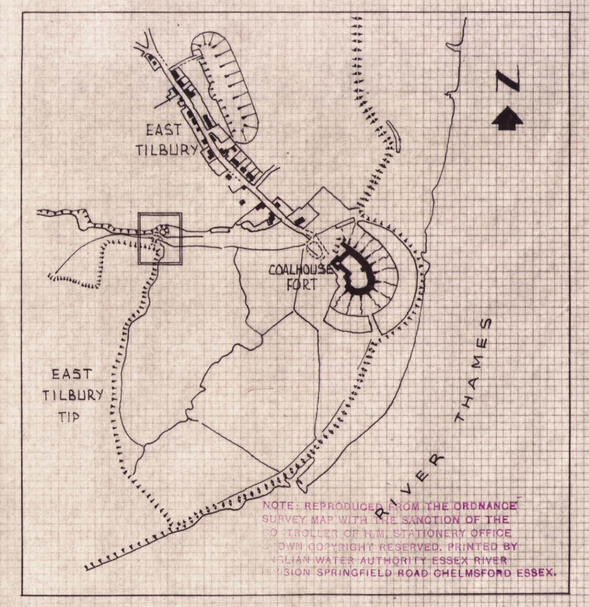
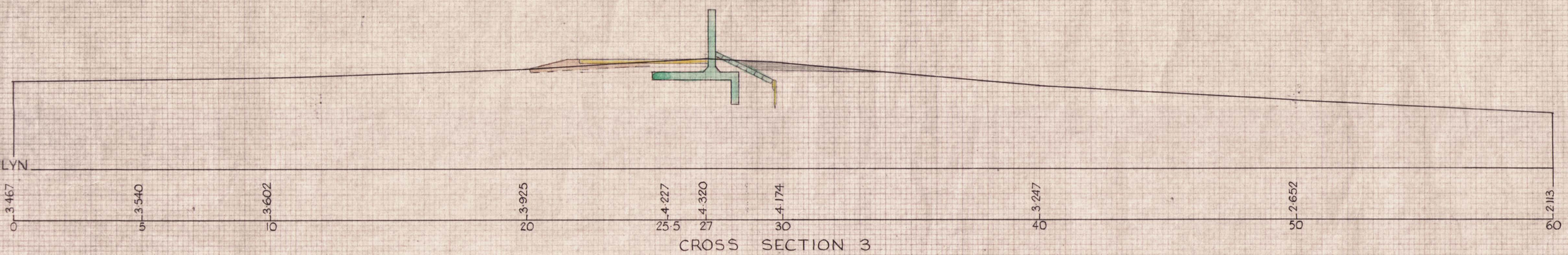


CROSS SECTION 2

CROSS SECTION 2



LOCATION PLAN
1:10560



CROSS SECTION 3

O.D. NEWLYN

ANGLIAN WATER AUTHORITY
ESSEX RIVER DIVISION
DRAWING OFFICE
- 5 SEP 1977

NOTES
1) TEMPORARY WORKS TO BE CONSTRUCTED FOR MAINTAINING EXISTING DEFENCE LEVEL DURING WORKS PERIOD.

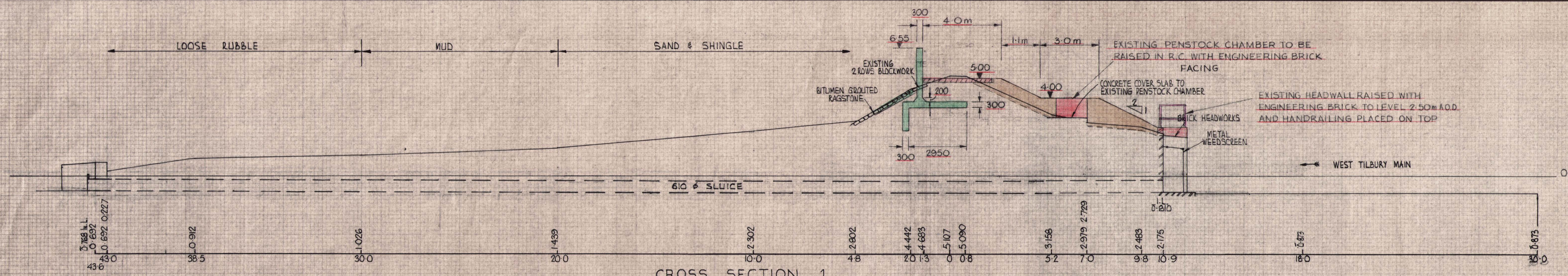
OFFICE COPY

CATCHMENT	ANGLIAN WATER AUTHORITY ESSEX RIVER DIVISION	76/3946/11A	A. Mascall DIVISIONAL ENGINEER
DWGS. FOR REFERENCE	AMENDMENTS	EAST TILBURY TIDAL WALL	SCALES: 1:100 NAT. & AS SHOWN
	A HEIGHT OF WALL & CREST RAISED - ACCESS RAMP ADDED AND OTHER DETAILS. J.L 23·3·77	PROPOSED RAISING OF EXISTING BANK BETWEEN N.E. CORNER OF EAST TILBURY TIP & HIGH GROUND APPROX. 300m WEST OF CHURCH	SURVEYED J.L 22.6.76
	B		DESIGNED P.H.
	C		DRAWN J.L 24·6·76
	D		CHECKED
	E		SERIAL No
	F		CONTRACT No
	G		SERVICES CHECKED
	H		

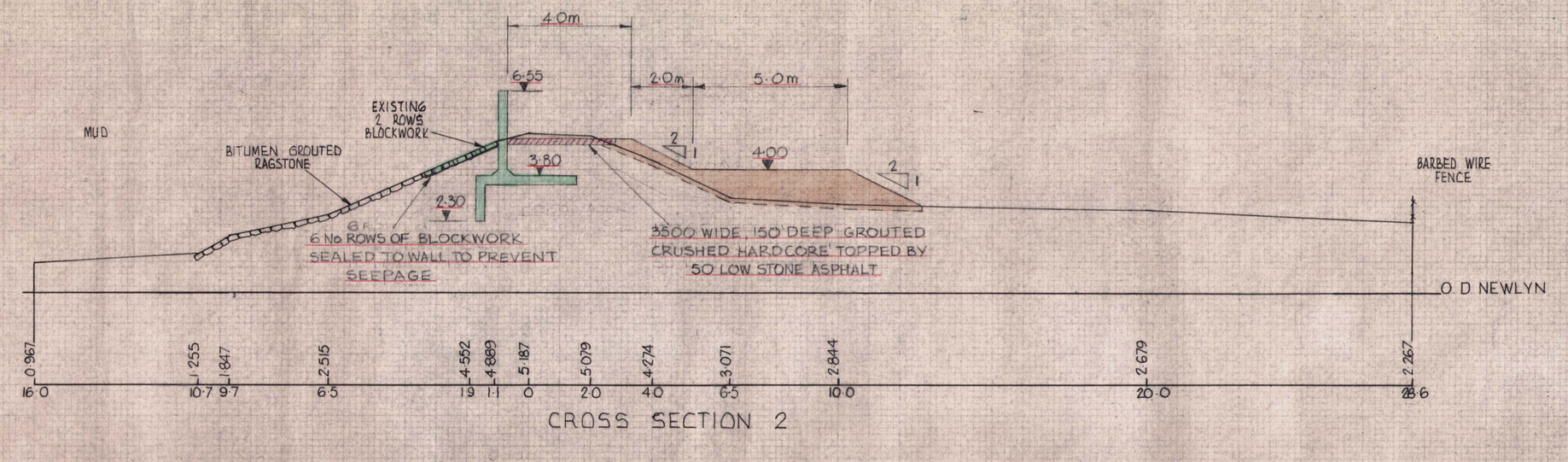

HIGH GROUND
POND
FOOTPATH Nº 200
FOOTPATH Nº 200
PARAPET TO BE SEALED BACK TO TIP BY REGRADING EXISTING TIP MATERIAL TO LEVEL 6.25 A.O.D.(N) MINIMUM
TIP
DIVERSION OF FOOTPATH Nº 200 AROUND TIP END OF PARAPET WALL
SITE PLAN
1:500
ENLARGED FROM O.S. TQ 6876
CROSS SECTION 1
CROSS SECTION 2
CROSS SECTION 3
DOZED TIP MATERIAL
TIP
CREST LEVEL 6.55 A.O.D.(N)
HIGH GROUND
1:10 VEHICLE RAMP ON LANDWARD SIDE OF WALL
CROSS SECTION 4
375×375×65 BLOCKWORK
1:3 SLOPE
1:3 SLOPE
150 CRUSHED HARDCORE OR CINDER TRACK
TIMBER TOE BOARDS
150 TOPSOIL STRIP
CROSS SECTION 1
W.L. 0.785 5.7.76
APPROX. 300⌀ CULVERT
CROSS SECTION 2
CROSS SECTION 2
O.D. NEWLYN
CROSS SECTION 3
EAST TILBURY
COALHOUSE FORT
EAST TILBURY TIP
RIVER THAMES
LOCATION PLAN
1:10560
ANGLIAN WATER AUTHORITY
ESSEX RIVER DIVISION
DRAWING OFFICE
25 MAY 1979
NOTES
1) TEMPORARY WORKS TO BE CONSTRUCTED FOR MAINTAINING EXISTING DEFENCE LEVEL DURING WORKS PERIOD
OFFICE COPY
CATCHMENT
DWGS. FOR REFERENCE
ANGLIAN WATER AUTHORITY
ESSEX RIVER DIVISION
AMENDMENTS
A HEIGHT OF WALL & CREST RAISED - ACCESS RAMP ADDED AND OTHER DETAILS J.L 23.3.77
B Blockwork Dimensions 18.5.79
76/3946/11B
EAST TILBURY TIDAL WALL
PROPOSED RAISING OF EXISTING BANK BETWEEN N.E. CORNER OF EAST TILBURY TIP & HIGH GROUND APPROX. 300m WEST OF CHURCH
A. Mascall
DIVISIONAL ENGINEER
SCALES: 1:100 NAT. & AS SHOWN
SURVEYED J.L 22.6.76
DESIGNED P.W.
DRAWN J.L 24.6.76
CHECKED
SERIAL No
CONTRACT No
SERVICES CHECKED

NOTES.
1) TEMPORARY WORKS TO BE CONSTRUCTED FOR MAINTAINING EXISTING DEFENCE LEVEL DURING WORKS PERIOD.
2) LEVELS BASED ON O.B.M. ON LANDWARD HEADWORKS OF BOWATERS SLUICE - VALUE 1·511m A.O.D.(N)

CATCHMENT	ANGLIAN WATER AUTHORITY ESSEX RIVER DIVISION	76/3946/12c	A. Mascall DIVISIONAL ENGINEER
DWGS. FOR REFERENCE	AMENDMENTS		
	EAST TILBURY TIDAL WALL	SCALES 1:100 NAT & AS SHOWN	SURVEYED / DESIGNED / DRAWN / CHECKED
	PROPOSED IMPROVEMENT AT BOWATERS SLUICE		SERIAL No / CONTRACT No / SERVICES CHECKED
	SITE PLAN AND CROSS SECTIONS		

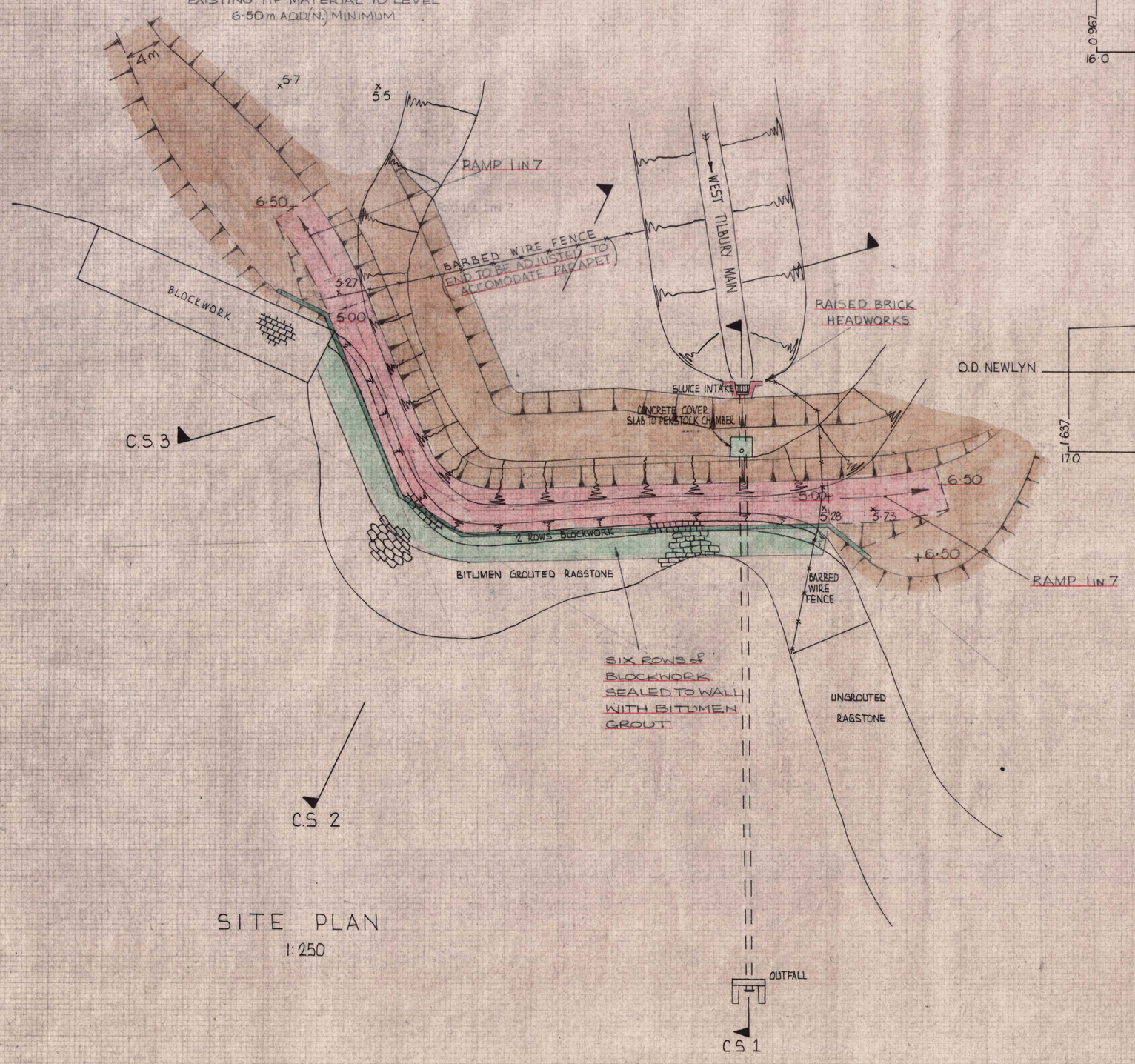


CROSS SECTION 1

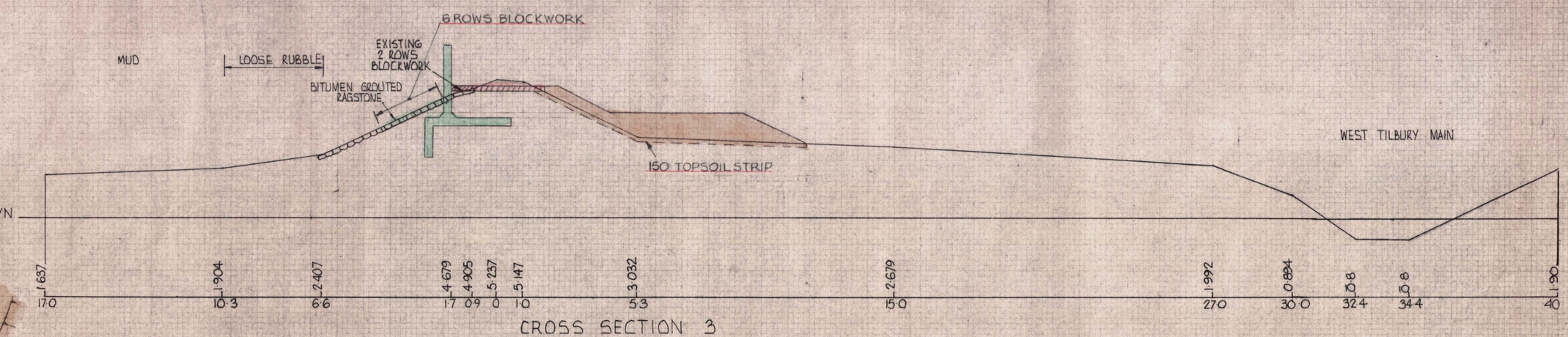


CROSS SECTION 2

NOTE.
PARAPET TO BE SEALED BACK TO TIP AT EACH END BY REGRADING EXISTING TIP MATERIAL TO LEVEL 6.50 m AOD(N.) MINIMUM.



SITE PLAN
1:250



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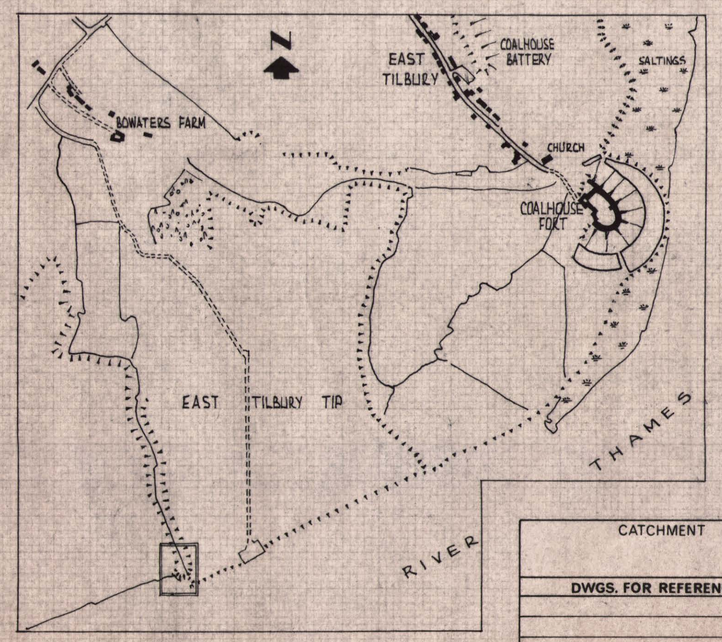


LOCATION PLAN
1:10560

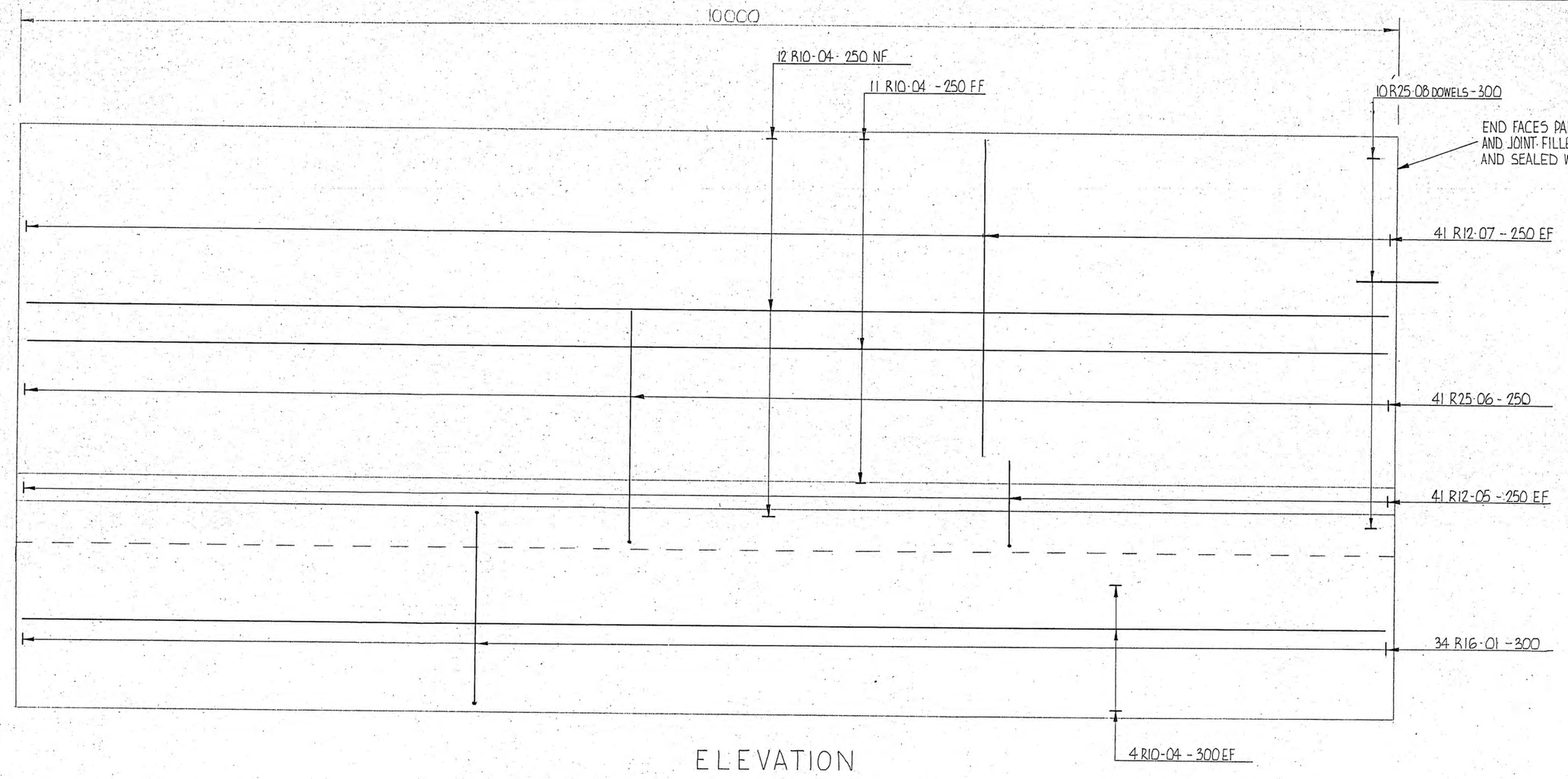
NOTES
1) TEMPORARY WORKS TO BE CONSTRUCTED FOR MAINTAINING EXISTING DEFENCE LEVEL DURING WORKS PERIOD
2) LEVELS BASED ON O.B.M. ON LANDWARD HEADWORKS OF BOWATERS SLUICE - VALUE 1.511m A.O.D.(N)

ANGLIAN WATER AUTHORITY
ESSEX RIVER DIVISION
DRAWING OFFICE
2.5 MAY 1979

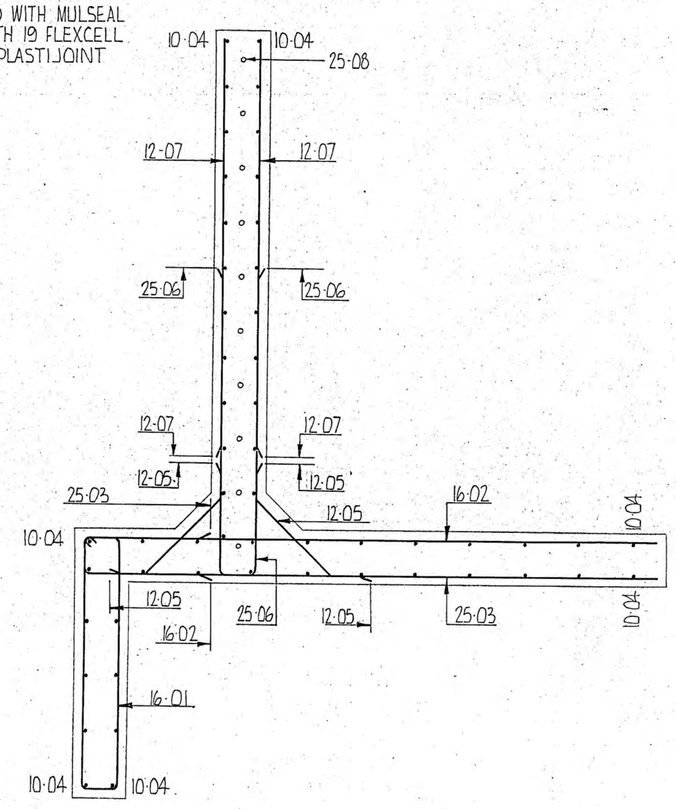
OFFICE COPY

CATCHMENT	ANGLIAN WATER AUTHORITY ESSEX RIVER DIVISION	76/3946/12c	A. Mascall DIVISIONAL ENGINEER
DWGS. FOR REFERENCE	AMENDMENTS	EAST TILBURY TIDAL WALL	SCALES: 1:100 NAT & AS SHOWN
	A WEIGHT OF WALL & APPROX CREST RAISED AND OTHER DETAIL AMENDED 6.77	PROPOSED IMPROVEMENT AT BOWATERS SLUICE	SURVEYED J.L. 28.6.76
	B END OF R.C. CANTILEVER WALL AMENDED & REGRADED TO MATERIAL ALREADY TIPPED J.L. 1.2.77	SITE PLAN AND CROSS SECTIONS	DESIGNED P.W. 25.2.77
	C R.C. CANTILEVER WALL MOVED SEAWARD & BERM ADDED J.L. 23-10-78		DRAWN J.L.
	D		CHECKED P.W. 28.3.77
	E		SERIAL No.
	F		CONTRACT No.
	G		SERVICES CHECKED
	H		

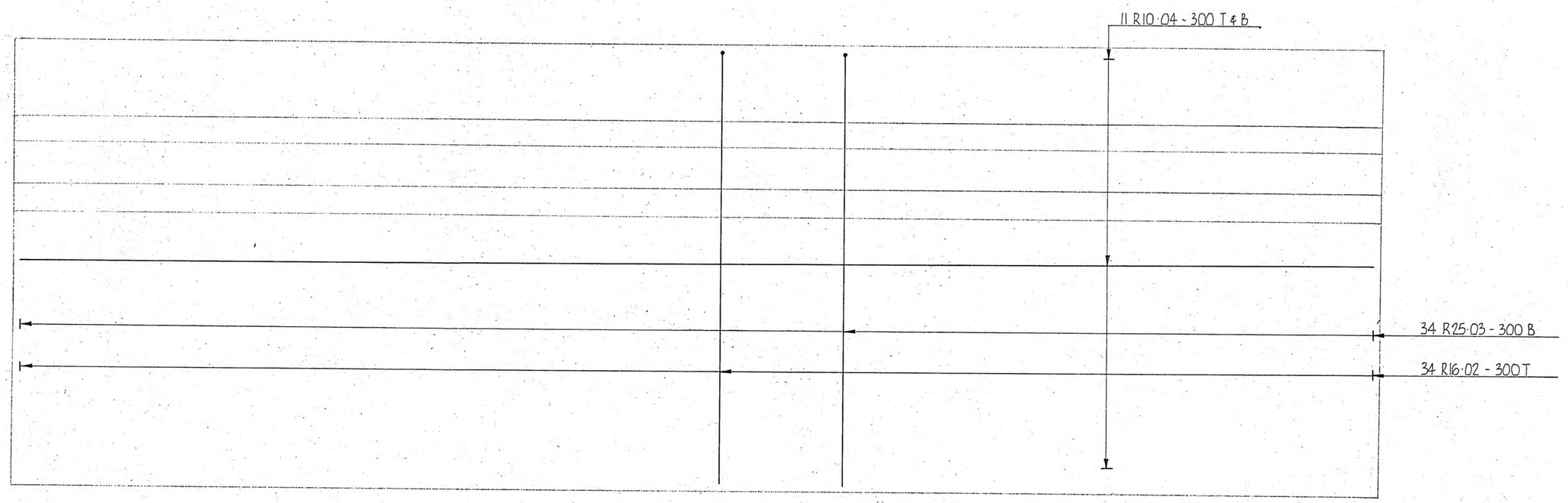
EY.1234



ELEVATION



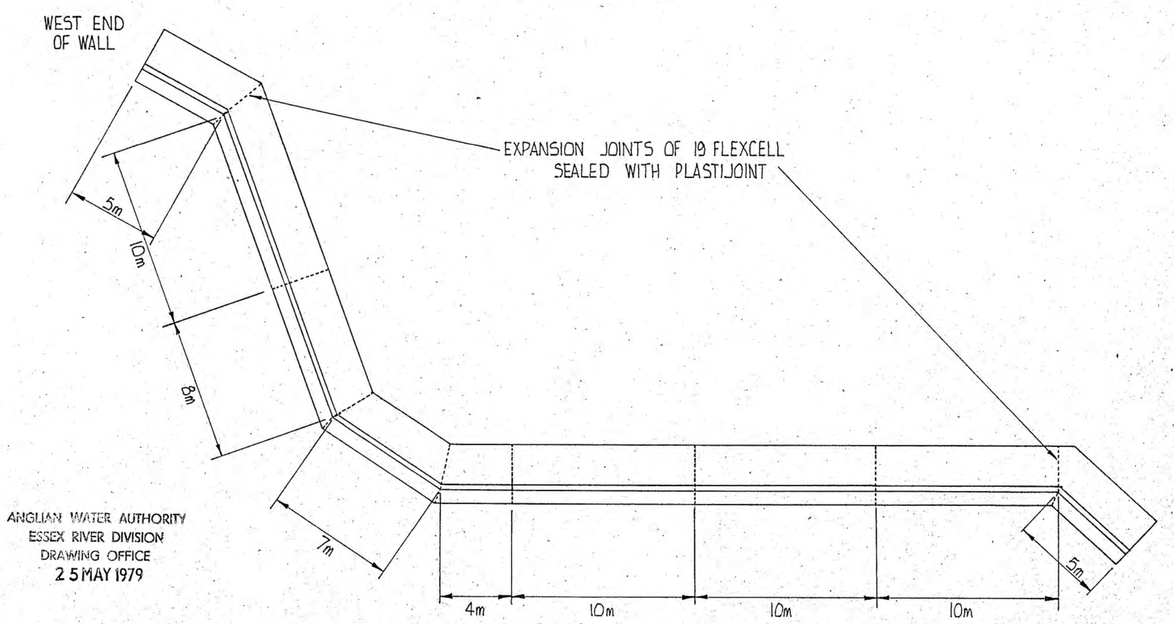
SECTION



PLAN

REINFORCEMENT DETAIL FOR ONE TYPICAL 10m LONG BAY

NOTES :
1) CONCRETE TO BE 1 : 1½ : 3
2) MINIMUM COVER TO REINFORCEMENT TO BE 50
3) BAR Mk 04 ON DRAWING CORRESPONDS WITH BAR Mks 09, 10, 11, 12 OR 13 ON BENDING SCHEDULE IN BAYS OF LESS THAN 10m LENGTH



ANGLIAN WATER AUTHORITY
ESSEX RIVER DIVISION
DRAWING OFFICE
25 MAY 1979

1:200 PLAN SHOWING ARRANGEMENT OF BAYS AT BOWATERS SLUICE

DO NOT SCALE

CATCHMENT	ANGLIAN WATER AUTHORITY ESSEX RIVER DIVISION	79/3946/14	A. Mascall DIVISIONAL ENGINEER
DWGS. FOR REFERENCE	AMENDMENTS	EAST TILBURY TIDAL WALL	SCALES: 1:20
	A, B, C, D, E, F, G, H	LINK WALLS AT BOWATERS SLUICE AND N.E. CORNER OF TIP (COALHOUSE FORT)	SURVEYED DESIGNED PEW DRAWN JL CHECKED SERIAL No CONTRACT No SERVICES CHECKED
	OFFICE COPY	REINFORCEMENT DETAILS	

E.T.1274

Annex C.12 Agreed Statements

Flood Risk Assessment - Environment Agency Agreed Statement

Site proposal and address: Lower Thames Crossing
Date: 10 October 2022

Thank you for engaging with us regarding the Flood Risk Assessment prior to your formal examination submission of the Lower Thames Crossing (LTC) Nationally Significant Infrastructure Project (NSIP).

We can confirm that we support the content in the Flood Risk Assessment and are unlikely to raise any objections to the LTC NSIP you proceed to make based on this submitted information and discussions.

This is subject to:

- The listed documents being submitted as part of the application

The below updates were sent to us following our comments set out in our comments tracker – Sep 21 v2 Oct update sent on 11 November 2021. We reviewed the following updates and provided our comments via email as referenced below.

Documents

- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 1 (version received July 2022) -** *email ref 'FRA comments' dated 6/7/22*
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 2 (version received July 2022) -** *email ref 'FRA comments' dated 6/7/22*
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 3 (version received July 2022) -** *email ref 'FRA comments' dated 6/7/22*
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 4 (version received July 2022)**
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 5 (version received July 2022) –** *Subject to confirmation if a revised model will be submitted for further consultation referenced in our email dated 15/9/22.*
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 6 (version received July 2022) –** *email from Michael Wilson dated 18/8/22 attaching the Breach modelling: Considering TE2100 future barrier options as per our email dated 21/7/22 ref 'Response to FRA - Part 6'*

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 7 (version received July 2022) –** *Surface Water drainage comments provided by Lead Local Flood Authority*
- **6.3 Environmental Statement Appendices – Appendix 14.6 Flood Risk Assessment – Part 10 (version received July 2022) –***email dated 7/7/22 ref 'FRA comments'*
- **Flood Hydraulic Model Mardyke (version received May 2022) –** *email dated 1/6/22 ref 'LTC CONSULTATION - Mardyke and Tilbury Main'*
- **Flood Hydraulic Model Tilbury Main (version received May 2022) -** *email dated 1/6/22 ref 'LTC CONSULTATION - Mardyke and Tilbury Main'*

Please note this response is based on the information you have made available and our best available datasets at the time of this response. It is based on current national planning policy, associated legislation and environmental data / information. If any of these elements change we may need to reconsider our position.

Yours faithfully,

[redacted]

Environment Agency

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

creating a better place

Environment Agency

Water Framework Directive Assessment - Environment Agency Agreed Statement

Site proposal and address: Lower Thames Crossing
Date: 10 October 2022

Thank you for engaging with us regarding the Water Framework Directive Assessment prior to your formal examination submission of the Lower Thames Crossing (LTC) Nationally Significant Infrastructure Project (NSIP).

We can confirm that we support the content in the Water Framework Directive Assessment and are unlikely to raise any objections to the LTC NSIP you proceed to make based on this submitted information and discussions.

This is subject to:

- The listed documents being submitted as part of the application

Documents

- **6.3 Environmental Statement Appendices – Appendix 14.7 Water Framework Directive (version received 1 August 2022)**
- Subject to the document being updated following our comments **07: Lower Thames Crossing – Water Framework Directive Assessment Review (ref: KT/2018/125061/07-L01; dated 30 August 2022)**
  These updates were requested following our comments 07: Lower Thames Crossing - Water Framework Directive Assessment Review (ref: KT/2018/125061/07-L01; dated 30 August 2022)'. LTC provided comments and an updated document for review on 29 September 2022. This has not been reviewed before NSIP submission.)

Please note this response is based on the information you have made available and our best available datasets at the time of this response. It is based on current national planning policy, associated legislation and environmental data / information. If any of these elements change we may need to reconsider our position.

Yours faithfully,

[redacted]

Environment Agency

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

creating a better place

Environment Agency

Hydrogeological Risk Assessment - Environment Agency Agreed Statement

Site proposal and address: Lower Thames Crossing
Date: 10 October 2022

Thank you for engaging with us regarding the Hydrogeological Risk Assessment prior to your formal examination submission of the Lower Thames Crossing (LTC) Nationally Significant Infrastructure Project (NSIP).

We can confirm that we support the content in the Hydrogeological Risk Assessment and are unlikely to raise any objections to the LTC NSIP you proceed to make based on this submitted information and discussions.

This is subject to:

- The listed documents being submitted as part of the application

Documents

- **6.3 Environmental Statement Appendices – Appendix 14.5 Hydrogeological Risk Assessment (version received 7 July 2022)**
- Subject to the document being updated as set out in **the letter from the Lower Thames Crossing Principal Hydrogeologist, National Highways, titled 'Final response to EA comments 5 Aug 2022_v2' including 'Table 1: LTC response to Environment Agency comments of 5/8/2022' (dated 12 September 2022).**
  These updates were requested following our comments '(04) Hydrogeological Risk Assessment (HyRA) finalised 07.07.2022 (ref: KT/2020/127281/05-L01; dated 5 August 2022)'. We reviewed and agreed the updates in our comments '(05) Hydrogeological Risk Assessment (HyRA) (ref: KT/2020/127281/06/L01; dated 10 October 2022)'.

Please note this response is based on the information you have made available and our best available datasets at the time of this response. It is based on current national planning policy, associated legislation and environmental data / information. If any of these elements change we may need to reconsider our position.

Yours faithfully,

[redacted]

Environment Agency

Environment Agency
Orchard House Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH
Customer services line: 03708 506 506
Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

Annex C.13 Allowing for new information since completing the DCO Application Flood Risk Assessment

national highways

Lower Thames Crossing

Allowing for new information since completing the DCO application Flood Risk Assessment

Technical Note
Status: Final

DATE: November 2023
DEADLINE: 7

Lower Thames Crossing

Allowing for new information since completing the DCO application Flood Risk Assessment

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Page number

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Page number

Executive Summary

Since the Lower Thames Crossing (the Project) Development Consent Order (DCO) application was submitted the following new information relevant to flood risk has become available:

a. The Environment Agency (EA) has provided updated River Thames Estuary Extreme Water Level (EWL) data.

b. The EA has published a revised Thames Estuary 2100 (TE2100) Plan (EA, April 2023).

In addition to the above new information, the government's Ministerial Statement (UK Parliament, 2023) has delayed the planned completion of the Project by two years. The Project programmed completion date and Project lifetime will therefore shift by two years from 2030 and 2130 respectively to 2032 and 2132.

This technical note considers the implications of the new information, and the two-year delay, on the conclusions, Flood Risk Assessment (FRA) which was submitted in support of the DCO Application as follows:

a. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 1 [**APP-460**]

b. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 2 [**APP-461**]

c. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 3 [**APP-462**]

d. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 4 [**APP-463**]

e. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 5 [**APP-464**]

f. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 6 [**REP1-171**]

g. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 7 [**APP-466**]

h. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 8 [**APP-467**]

i. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 9 [**APP-468 - APP-476**]

j. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 10 [**APP-477**]

This review is presented in Table 2.1 and, where further clarification is required, detailed analysis is presented in Section 2.3.

This technical note concludes that the new information and the planned two-year delay in completion of the Project, do not have a significant impact on the conclusions of the FRA submitted with the DCO application.

1 Introduction

1.1.1 Since the Lower Thames Crossing (the Project) Development Consent Order (DCO) application was submitted the following new information relevant to flood risk has become available:

a. The Environment Agency (EA) has provided updated River Thames Estuary Extreme Water Level (EWL) data.

b. The EA has published a revised Thames Estuary 2100 (TE2100) Plan (EA, April 2023).

1.1.2 In addition to the above new information, the government's Ministerial Statement (UK Parliament, 2023) has delayed the planned completion of the Project by two years. The Project programmed completion date and Project lifetime will therefore shift by two years from 2030 and 2130 respectively to 2032 and 2132.

1.1.3 This technical note considers the implications of the new information, and the two-year delay, on the conclusions, Flood Risk Assessment (FRA) which was submitted in support of the DCO Application as follows:

k. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 1 [**APP-460**]

l. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 2 [**APP-461**]

m. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 3 [**APP-462**]

n. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 4 [**APP-463**]

o. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 5 [**APP-464**]

p. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 6 [**REP1-171**]

q. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 7 [**APP-466**]

r. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 8 [**APP-467**]

s. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 9 [**APP-468 - APP-476**]

t. Environmental Statement - Appendix 14.6 - Flood Risk Assessment - Part 10 [**APP-477**]

1.2 Report Structure

1.2.1 The report is structured as follows:

a. Section 2 considers the updated EWL dataset, and the two-year delay in planned completion of the Project.

b. Section 3 considers the revised TE2100 Plan.

c. Conclusions are summarised in Section 4.

2 Extreme Water Levels (EWL)

2.1 The updated EWL dataset

2.1.1 The EA has provided the updated tidal River Thames EWL dataset for use in the Project's Coalhouse Point wetland flood risk assessment modelling.

2.1.2 The dataset provided includes modelled EWL for locations in the tidal River Thames for a range of climate epochs (ranging from 2020 epoch to 2170 epoch), for various climate change scenarios ("M", "H" and "HPP"). The EA has confirmed that:

a. EWL have been provided for two potential future Thames barrier upgrade options: (i) improvements at the current Thames barrier location; and (ii) a new barrier at the "Long Reach" location.

b. The "H" and "HPP" climate change scenarios equate to the Representative Concentration Pathway 8.5 (as defined in Met Office, 2018) 95th percentile and H++ climate change scenarios respectively. These climate change scenarios are equivalent to the Upper end scenario and H++ scenario applied in the DCO application FRA, and specified in Flood risk assessments: climate change allowances (Environment Agency, 2022).

2.1.3 Plate 2.1 tabulates EWL values applied in the DCO application FRA modelling and those in the updated EWL dataset (for a future Thames barrier at the existing Thames barrier location) and their differences. Plate 2.2 compares EWL values applied in the DCO application FRA modelling with those in the updated EWL dataset for a future Thames barrier at Long Reach.

2.1.4 The DCO application FRA EWL in Plate 2.1 are specified for 2030 and 2130, as these were applied in the assessment. The updated EWL in Plate 2.1 and Plate 2.2 are specified for 2032 and 2132, as this accounts for the two-year shift in the Project's programmed completion date and Project lifetime (Section 0).

2.1.5 Where the differences in EWL tabulated in Plate 2.1 and Plate 2.2 show higher EWL values for the updated EWL dataset, these are highlighted with blue shading. The "greyed out" text entries in Plate 2.1 and Plate 2.2 are for tidal events that are not applied in the DCO application FRA modelling simulations (i.e. the design tidal conditions are not required in the DCO application FRA modelling design simulations), and the in-progress Coalhouse Point wetland modelling.

2.1.6 The potential impact of the updated EWL on conclusions drawn from the DCO application FRA modelling is considered in Section 2.2 and Section 2.3.

Plate 2.1 Comparison of EWL values applied in the DCO application FRA modelling with those in the updated EWL dataset for future Thames barrier at the existing Thames barrier location

EWLs aplied in DCO application FRA modelling (Upper end sea level rise allowances)

		Extreme Water Level (EWL) values (mAOD) for return periods (years)							
		2030 Upper end				2130 Upper end			
Location	TE2100 model node	2	5	200	1000	2	5	200	1000
Mardyke breach and downstream boundary of fluvial	3.15	Not available	5.005	5.693	6.067	Not available	6.005	6.723	7.079
Breach TIL005	3.26		4.815	5.503	5.877		5.817	6.533	6.890
Breach TIL006 (Bowaters Sluice) and Coalhouse Point	3.28		4.675	5.363	5.737		5.764	6.473	6.834

Updated TE2100 EWLs (TE2100 "H" sea level rise allowances)

		Extreme Water Level (EWL) values (mAOD) for return periods (years)							
		2032 "H" (interpolated between 2020 and 2040)				2132 "H" (interpolated between 2120 and 2135)			
Location	TE2100 model node	2	5	200	1000	2	5	200	1000
Mardyke breach and downstream boundary of fluvial	3.15u	4.91	5.06	5.65	5.98	6.33	6.47	6.94	7.16
Breach TIL005	3.26	4.55	4.70	5.35	5.68	5.98	6.13	6.66	6.94
Breach TIL006 (Bowaters Sluice)	3.27i	4.49	4.64	5.29	5.61	5.92	6.07	6.62	6.90
Coalhouse Point	3.28	4.47	4.62	5.26	5.59	5.90	6.05	6.60	6.89

Difference between updated TE2100 EWLs and EWLs applied in DCO application FRA modelling (m)

		Difference between updated EWLs and EWLs applied in DCO application FRA modelling (m) for return periods (years)							
		Updated EWLs 2032 "H" minus DCO FRA Upper end 2030				Updated EWLs 2132 "H" minus DCO FRA Upper end 2130			
Location	TE2100 model node	2	5	200	1000	2	5	200	1000
Mardyke breach and downstream boundary of fluvial	3.15u	Not available	0.05	-0.04	-0.09	Not available	0.47	0.22	0.08
Breach TIL005	3.26		-0.12	-0.15	-0.20		0.31	0.13	0.05
Breach TIL006 (Bowaters Sluice)	3.27i		-0.04	-0.07	-0.13		0.31	0.15	0.06
Coalhouse Point	3.28		-0.05	-0.10	-0.15		0.29	0.13	0.05

Plate 2.2 Comparison of EWL values applied in the DCO application FRA modelling with those in the updated EWL dataset for future Thames barrier at Long Reach

		Updated EWLs (mAOD) for return periods (years). Long Reach barrier option "H" 2132 (interpolated between 2120 and 2135). (mAOD)				Difference (m) Updated EWLs (Long Reach barrier option "H", 2132) minus EWLs applied in DCO application FRA modelling (Upper end, 2130) for return periods (years)			
Location	**TE2100 model node**	**2**	**5**	**200**	**1000**	**2**	**5**	**200**	**1000**
Mardyke breach and downstream boundary of fluvial	3.15u	1.09	1.53	2.89	3.67	Not available	-4.48	-3.83	-3.41
Breach TIL005	3.26	6.11	6.28	6.87	7.11		0.46	0.34	0.22
Breach TIL006 (Bowaters Sluice)	3.27i	6.04	6.20	6.82	7.06		0.44	0.35	0.23
Coalhouse Point	3.28	6.03	6.19	6.80	7.05		0.43	0.33	0.22

2.2 Impact of the updated EWL on the DCO application FRA conclusions

2.2.1 In order to provide comfort, analysis has been undertaken applying updated EWL in the DCO application FRA modelling assessment to show whether there is a potential to change the conclusions drawn from the modelling.

2.2.2 Table 2.1 lists aspects of the DCO application FRA modelling and a consideration of the potential impact of applying the updated EWL on conclusions drawn from the FRA modelling. Table 2.1 also considers whether further analysis is required to account for the updated EWL in the FRA.

Table 2.1 Potential impact of updated EWL on modelling conclusions

Assessment aspect	Potential impact of updated EWL on modelling conclusions	Further analysis required?
Mardyke fluvial modelling	The DCO application FRA Mardyke fluvial modelling was found to be insensitive to downstream tidal EWL. The Mardyke fluvial modelling applied a five-year return period tidal EWL when simulating the 1,000-year return period fluvial event (during which the Project road is required to remain operational), and mean high water springs (MHWS) condition for the 100 year return period fluvial event (relevant for assessing flood risk impacts elsewhere and mitigation). While the updated five-year return tidal EWL applied during the 1,000-year return period fluvial event in 2132 is 0.47m higher than that applied in the FRA modelling, the Project road levels in the Mardyke floodplain were dictated by factors other than fluvial flood levels such that the Project road level would be more than 5m above the simulated 1,000-year return period flood level in 2130. Applying the higher EWL in the modelling would therefore not change the conclusion that the Project road would remain operational during the 1,000-year return period flood event in 2130 (and in 2132). The updated EWL do not change the MHWS values applied in the FRA modelling, and therefore would not change the assessment of flood risk impacts elsewhere, or mitigation requirements.	None

Assessment aspect	Potential impact of updated EWL on modelling conclusions	Further analysis required?
Mardyke breach modelling	The FRA modelling simulated a breach at Mardyke Sluice during the 1,000-year return period tidal event in 2130. Results indicated breach flooding remains in-channel at the Project road location and so the Project road would not be affected by a breach, and would not impact on breach flood risk elsewhere. The updated EWL is only 0.08m higher (in 2132) and so it is considered that applying the updated EWL would not change the FRA conclusions.	None
Tilbury Main fluvial modelling	The updated EWL are not significant for the Tilbury Main fluvial modelling as the "sluice blocked" modelling simplification results in no tidal influence on model results.	None
Tilbury Main breach modelling Breach west of project (TIL005) Bowater Sluice breach modelling (TIL006)	The FRA modelling includes an assessment of the impact of a breach on the Project road (during the 1,000-year return period tidal event in 2130), and the impact of the Project on flood risk elsewhere during a breach (during the 200-year return period tidal event in 2030 and 2130). **Breach during 1,000-year return period event** The updated EWL are 0.05m and 0.06m higher (in 2132) at breach locations TIL005 (former power station site) and TIL006 (Bowaters Sluice) respectively than those applied in the assessment for the 1,000-year return period event in 2130 (with Upper end sea level rise allowances applied). This difference is considered insignificant as: • The Project road is designed to remain operational during a 1,000-year return period flood in 2130 based on a projection of River Thames design levels to the Project site i.e. the flood level during a simulated breach event is significantly lower than the design flood level applied • A slightly higher EWL applied for the breach event simulations would therefore not impact the Project road operation **Breach during 200-year return period event** The updated EWL are (with Upper end sea level rise allowances applied): • 0.15m and 0.07m lower at breach locations TIL005 and TIL006 respectively (in 2032) than those applied in the assessment for the 200-year return period event in 2030 • 0.13m and 0.15m higher (in 2132) at breach locations TIL005 and TIL006 respectively than those applied in the DCO application FRA	**Breach during 1,000-year return period event** No further model results required. **Breach during 200-year return period event** Consider breaches at TIL005 and TIL006 locations during the 200-year return period River Thames EWL in 2132, for the pre- and post-development cases to review assessed offsite impacts during a breach of River Thames tidal flood defences. This is discussed further in Section 2.3.

Assessment aspect	Potential impact of updated EWL on modelling conclusions	Further analysis required?
	assessment for the 200-year return period event in 2130 Applying the higher 200-year return period EWL in 2132 (compared to the 2130 EWL applied in the DCO application FRA modelling) has potential to affect the assessed impacts of the Project road on flooding during a breach of River Thames tidal flood defences.	
North Portal standard of protection	The North Portal flood protection design level is specified as the 1,000-year return period River Thames EWL in 2130 with an uncertainty allowance added (+1.0m). **Design level** The updated EWL (in 2132) are 0.06m higher than those applied in the assessment for the 1,000-year return period event in 2130 (with Upper end sea level rise allowances applied). Applying the same uncertainty allowance (+1.0m) would require an increase in design level for the North Portal flood protection of 0.06m, which is within the vertical limit of deviation of 0.5m. No further analysis is therefore required. **Credible maximum climate change level (H++ sea level rise allowances)** For the H++ scenario the updated EWL in 2132 are 0.76m higher than those applied in the assessment (8.04mAOD compared to 7.28mAOD). The North Portal flood defences and surrounding infrastructure could be adapted, if required, to account for future change, which may be triggered for example by a requirement to provide a higher standard of protection to the H++ EWL. This is demonstrated through a sensitivity check presented in technical note reference: HE540039-CJV-EFR-GEN-TNT-ENV-00022.	None
TE2100 future barrier options	The DCO application FRA considered the impact of the proposed scheme on flood risk elsewhere following a breach of the River Thames tidal defences during the tidal design event (200-year return period) in 2030 and 2130. The DCO application FRA breach assessment is based on the current Thames barrier arrangement. The DCO application FRA also considered the potential impacts of alternative future Thames barrier options on the FRA breach assessment, for two alternative future barrier options specified by the EA (new barrier at Long Reach and new barrier at Gravesend), and concluded the DCO application FRA breach modelling was robust with regard to	Consider offsite impacts following breaches at TIL005 and TIL006 locations during the 200-year return period River Thames EWL in 2132, for the Long Reach future barrier option. See Section 2.3.

Assessment aspect	Potential impact of updated EWL on modelling conclusions	Further analysis required?
	potential alternative Thames barrier options (i.e. considering the alternative options does not impact the DCO application FRA conclusions). Updated EWL have been provided for future barrier options at the existing Thames barrier location and at Long Reach, but not for the Gravesend future barrier option, or for options including floodplain storage. The Environment Agency has confirmed that updated EWL are not available for the Gravesend future barrier option, or options with floodplain storage. However, previously the Gravesend barrier option EWL were lower than other barrier options, and options with storage would have lower EWL than options without storage. The updated EWL provided are therefore considered to represent the worst case. The different EWL of the various barrier options may require different design defence levels. These have not been provided by the Environment Agency. ***Potential impact on FRA breach assessment (impacts on flood risk elsewhere):*** Compared to the EWL applied in the DCO application FRA breach modelling (2130), the 200-year return period updated EWL in 2132 for the Long Reach barrier option are 0.34m and 0.35m higher for the TIL005 and TIL006 breach locations respectively (and 0.24m and 0.23m higher than the equivalent updated EWL with the future barrier at the existing Thames barrier location). For the previous version of EWL applied in the DCO application FRA, the maximum increase in 200-year return period EWL (compared to a barrier at the existing Thames barrier location) for alternative future barrier options considered was 0.03m. It was therefore concluded that a modelled assessment would not be required. The updated EWL for the Long Reach future Thames barrier option are higher than for the current Thames barrier location, and higher than applied in the DCO application FRA modelling (by 0.34m and 0.35m higher for the TIL005 and TIL006 breach locations respectively).	
Coalhouse Point wetland area	The Coalhouse Point wetland area modelling is in progress and will apply the updated EWL. The updated EWL (2032 and 2132) will be applied within the ongoing Coalhouse Point wetland area modelling programme.	None (the modelling is currently in progress to progress SoCG item 2.1.35 [**REP1-059**]).

2.3 Further analysis

Introduction

2.3.1 The only further analysis identified as necessary in Table 2.1 relates to the offsite impacts following breaches at TIL005 and TIL006 locations during the 200-year return period River Thames EWL in 2132, applying the updated EWL. This is identified Table 2.1 for the future Thames barrier options at the current Thames barrier location and at Long Reach. As the 200-year return period River Thames updated EWL in 2132 are higher for the Long Reach barrier option (Table 2.1) assessing the Long Reach barrier option only is therefore considered sufficient, as this is the worst case.

2.3.2 The 200-year return period River Thames updated EWL in 2132 applicable for the TIL005 and TIL006 breach locations are 6.87 mAOD and 6.82 mAOD respectively, for the Long Reach barrier option. These EWL are slightly lower than the DCO application FRA modelling 1,000-year return period EWL in 2130, which are 6.89 mAOD and 6.83 mAOD respectively. Breach modelling for these slightly higher EWL has already been undertaken as part of the DCO application FRA modelling. These results (DCO application FRA modelling 1,000-year return period EWL in 2130) are considered to provide an equivalent, and conservative, assessment of the 200-year return period River Thames updated EWLs in 2132 for the TIL005 and TIL006 breach locations, for the Long Reach barrier option, and hence are used here to meet the further analysis requirement.

Analysis of breach at TIL005 location

2.3.3 Figure 1 shows differences between pre- and post-development flood depths following a breach at TIL005 location during the 1,000-year return period River Thames EWL in 2130, applying the DCO application FRA EWL and model results. Figure 2 shows differences between pre- and post-development flood hazard categories for the same simulation.

2.3.4 Figure 1 shows that the Project would result in floodplain volume displacement with an increase in flood depths of approximately 0.01m to 0.03m on the western side adjacent to the Project road. The areas shown with an increase in flood depth in Figure 1 are all low vulnerability (undeveloped land), located between the Project road and Tilbury to the west, except for part of Tilbury urban area directly west of Fort Road (this is not the case for the DCO application FRA modelled breach event during a 200-year return period EWL).

2.3.5 Figure 1 shows localised increases in flood depth at low points along Fort Road, which is above the simulated breach flood level for most of its length. Figure 1 also shows an increase in flood depths along Tilbury Loop railway (0.09m to 0.35m), however for the pre-development case the railway would be impassable during a breach (with flood depths up to approximately 1m to 2m at some locations).

2.3.6 Figure 2 shows an increase in hazard categories in some scattered areas on the western side of the Project road. The areas showing an increase in flood hazard category are all low vulnerability (undeveloped land), located between

the Project road and Tilbury to the west, except for the same part of Tilbury urban area directly west of Fort Road referred to in paragraph 2.3.4 above.

2.3.7 Figure 2 shows localised increases in flood hazard category at low points along, and adjacent to, Fort Road, which is above the simulated breach flood level for most of its length. Figure 2 also shows isolated pixels with an increase in flood hazard category along Tilbury Loop railway, however for the pre-development case the railway would be impassable during a breach (with flood hazard category 'Danger for most' along most of its length within the breach flood extent).

2.3.8 Simulated peak flood depths in the Tilbury urban area with impacts are shown for the pre- and post-development cases in Figures 3 and 4 respectively (following a breach at TIL005 location during the 1,000-year return period River Thames EWL in 2130, applying the DCO application FRA EWL and model results). Figures 5 and 6 show simulated hazard categories for the same simulated events as Figures 3 and 4 respectively.

2.3.9 For both the pre- and post-development cases peak flood depths in the Tilbury urban area with impacts are mostly in the range 0.1m to 0.5m. Simulated peak flood depths for the post-development case are approximately 0.03m higher than the pre-development case in the Tilbury urban area with impacts. This increase is seen in Figures 3 and 4 as an increase in plotted depth class for some pixels for the post-development case (compared to the pre-development case).

2.3.10 For both the pre- and post-development cases, Figures 5 and 6 show peak flood hazard categories in the Tilbury urban area with impacts are mostly categories 1 (Very low hazard) and 2 (Danger for some), with smaller areas showing category 3 (Danger for most). The increase in flood depths for the post-development case results in an increase in flood hazard category (compared to the pre-development case), by one category, for some pixels in the Tilbury urban area with impacts, as shown in Figure 2.

2.3.11 A summary of peak flood depths and hazard categories in the Tilbury urban area with impacts is presented in Table 2.2.

Table 2.2 Summary of peak flood depths and hazard categories in the Tilbury urban area with impacts

Parameter	Pre-development	Post-development	Difference (Post-development minus pre-development)
Maximum flood depth (m)	Mostly in the range 0.1m to 0.5m	Mostly in the range 0.1m to 0.5m	Approximately 0.03m
Maximum flood hazard category	Mostly categories 1 (Very low hazard) and 2 (Danger for some), with smaller areas of category 3 (Danger for most)	Mostly categories 1 (Very low hazard) and 2 (Danger for some), with smaller areas of category 3 (Danger for most)	Mostly no change in hazard category, some localised increases by one category

2.3.12 While the model results show that there are impacts in Tilbury urban area, the impacts are considered low (increase in simulated peak flood depth in this area by only 0.03m, with a resulting increase in simulated hazard score category for some pixels). Furthermore, this residual risk is very unlikely to be realised within the Project's lifetime as:

a. The impacts require an extreme River Thames flood condition to occur as well as failure of the River Thames flood defences at the TIL005 modelled breach location (near former power station), which are monitored and maintained (subject to funding availability) to reduce the risk of failure in accordance with the Environment Agency's Thames Estuary 2100 (TE2100) programme.

b. The modelling shows impacts in Tilbury urban area only for events exceeding the 200-year return period EWL assessed in the DCO application breach modelling, i.e. for EWL values exceeding 6.53 mAOD. For the updated EWL with the Long Reach future Thames barrier option considered here, the 200-year return period EWL would not exceed 6.53 mAOD until 2113 (based on interpolation of the 2100 and 2120 updated EWL values). The potential for the design breach event to impact Tilbury urban area would therefore only be after 2113, i.e. during the final 19 years of the Project lifetime (and after 2126, i.e. during the final six years of the Project lifetime for the future Thames barrier option at the current Thames barrier location).

2.3.13 The impact of the Project on residual risk in Tilbury urban area is therefore considered to be not significant.

2.3.14 Overall, applying the revised EWL and allowing for the two-year delay in planned completion of the Project, does not result in a significant change in the assessed residual risk associated with a breach of the River Thames flood defences at TIL005 location compared to the DCO application FRA (i.e. insignificant increase in residual risk for properties, and no significant change to flood risk along Fort Road and Tilbury Loop railway).

2.3.15 Allowing for the revised EWL and the two-year delay in planned completion of the Project is therefore considered to have an insignificant impact on the DCO application FRA conclusions, with regard to the residual risk associated with a breach of the River Thames flood defences at TIL005 location.

Breach at TIL006 location

2.3.16 Figure 7 shows differences between pre- and post-development flood depths following a breach at TIL006 location during the 1,000-year return period River Thames EWL in 2130, applying the DCO application FRA EWL and model results. Figure 8 shows differences between pre- and post-development flood hazard categories for the same simulation.

2.3.17 Figure 7 shows that the Project would result in reduced conveyance of breach flows from east to west across the Project road, and floodplain volume displacement, with an increase in flood depths on (i) the eastern side of the

Project road of higher than 1m for the floodplain constrained by the proposed embankment on the west (the highest increase on the eastern side of the road is approximately 3.5m, typical values are approximately 2.0m to 2.5m), (ii) Star Dam defence on the east and the surrounding hilly areas, and (iii) an increase of typically 0.2m to 0.5m (with some locally higher values up to 0.7m) east of Star Dam. Figure 7 also shows a significant reduction in flood depths on the western side of the Project road including in the Tilbury urban area by approximately 0.20m to 1m. The areas with an increase in flood depth are all low vulnerability (undeveloped land).

2.3.18 The difference (post-development minus pre-development) in hazard score category in Figure 8 shows that the Project would result in an increase in hazard category in some areas on the eastern side of the Project road by 1 to 4 categories. The highest increases are where the post-development flood extents increase beyond the pre-development flood extents. Figure 8 also shows a reduction on the western side of the road, with a reduction in Tilbury urban area by 1 to 3 categories, with the largest reductions generally at locations that are outside of the post-development breach flood extent, but inside the pre-development extent. The areas with an increase in hazard category are all low vulnerability (undeveloped land). Overall, the impact of the Project on flood risk elsewhere following a breach at TIL006 is an increase in hazard score category for areas of undeveloped land, while showing a clear benefit (reduction in flood hazard category) in Tilbury urban area, where vulnerable receptors are located (i.e. properties). Some of the impacted areas of undeveloped land will be on land for which National Highways will be seeking permanent acquisition, and some will be on third-party land.

2.3.19 It is noted that this risk is very unlikely to be realised within the Project's lifetime as it requires an extreme River Thames flood condition to occur as well as failure of the River Thames flood defences, which are monitored and maintained (subject to funding availability) to reduce the risk of failure in accordance with the Environment Agency's Thames Estuary 2100 (TE2100) programme, at the TIL006 modelled breach location (Bowaters Sluice).

2.3.20 Overall, applying the revised EWL and allowing for the two-year delay in planned completion of the Project, does not result in a qualitative change in the assessed residual risk associated with a breach of the River Thames flood defences at TIL006 location compared to the DCO application FRA (i.e. benefits in Tilbury urban area and localised increases in flood depths on undeveloped land on the eastern side of the Project road).

2.3.21 Allowing for the revised EWL and the two-year delay in planned completion of the Project is therefore considered to have an insignificant impact on the DCO application FRA conclusions, with regard to the residual risk associated with a breach of the River Thames flood defences at TIL006 location.

3 Revised TE2100 Plan

3.1 Impact of the revised TE2100 Plan on the DCO application FRA conclusions

3.1.1 The EA has published a revised TE2100 Plan. Items in the revised TE2100 Plan considered relevant for the DCO application FRA, and their suggested resolution, are listed in Table 3.1.

Table 3.1 Relevant items in the revised TE2100 Plan

Issue	National Highways' Consideration
Coalhouse Point wetland area was outside of the previous version of the TE2100 Plan policy units, but now lies within the Purfleet, Grays and Tilbury policy unit, with policy choice P4 (*"take further action to keep up with climate and land use change so that flood risk does not increase"*).	The Environment Agency has confirmed (during meeting dated 20 June 2023) that inclusion of the Coalhouse Point wetland area in the TE2100 Plan policy units is a publishing mistake, and the policy unit boundaries will be re-issued such that the Coalhouse Point wetland area remains outside of the TE2100 Plan policy units.
The DCO application FRA breach assessment is based on the current Thames barrier arrangement. The DCO application FRA also considered the potential impacts of alternative future Thames barrier options on the FRA breach assessment, for two alternative future barrier options specified by the EA (new barrier at Long Reach and new barrier at Gravesend). The revised TE2100 Plan future barrier options (and the updated TE2100 EWL dataset) may affect this assessment.	The significance of the updated EWL dataset is considered in Section 2, including consideration of the future Thames barrier options in the revised TE2100 plan.

4 Conclusions

4.1 Conclusions

4.1.1 Since the DCO application FRA was completed, the Environment Agency's Thames estuary EWL have been updated and the revised TE2100 Plan has been published. Additionally, the planned completion date of the Project has been delayed by two years.

4.1.2 This technical note considers the potential for these changes to impact the DCO application FRA conclusions.

Updated EWLs and two-year delay in planned Project completion

4.1.3 The only further analysis required to account for the updated EWL and two-year delay in planned Project completion was the requirement to consider offsite impacts following breaches at TIL005 and TIL006 locations (i.e. residual risk) during the 200 year return period River Thames EWL in 2132, applying the updated EWL (and allowing for future Thames barrier options in the revised TE2100 plan). This analysis has been completed and is reported in Section 2.3 of this document.

4.1.4 Taking the additional analysis into account, allowing for the revised EWL and the two-year delay in planned completion of the Project is considered to have an insignificant impact on the DCO application FRA conclusions, with regard to the residual risk associated with a breach of the River Thames flood defences at TIL005 and TIL006 simulated breach locations.

4.1.5 Therefore, the updated EWL and two-year delay in planned Project completion do not have a significant impact on the DCO application FRA conclusions.

Revised TE2100 Plan

4.1.6 The revised TE2100 Plan does not have a significant impact on the DCO application FRA conclusions, including the consideration of future Thames barrier options in the revised TE2100 plan.

5 References

Environment Agency, 2022. Flood risk assessments: climate change allowances. Available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances (last updated May 2022)

Environment Agency, 2023.Thames Estuary 2100 (TE2100). Available at https://www.gov.uk/government/collections/thames-estuary-2100-te2100#contents

Met Office, 2018. UKCP18 Guidance: Representative Concentration Pathways

UK Parliament, 2023. Transport Update Statement made on 9 March 2023 by Mark Harper MP. Available at: https://questions-statements.parliament.uk/written-statements/detail/2023-03-09/hcws625?utm_source=POLITICO.EU&utm_campaign=bfb46d9660-EMAIL_CAMPAIGN_2023_03_10_05_54&utm_medium=email&utm_term=0_10959edeb5-bfb46d9660-%5BLIST_EMAIL_ID%5D

Appendix A: Figures

Figure number	Drawing number	Description	Simulated event
1	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91021	Difference in maximum flood depth: Post-(with mitigation) minus pre-development	Breach at TIL005 1000 year event in 2130
2	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91022	Difference in maximum flood hazard category: Post-(with mitigation) minus pre-development	Breach at TIL005 1000 year event in 2130
3	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91023	Maximum flood depth Pre-development Detail in Tilbury urban area west of Fort Road	Breach at TIL005 1000 year event in 2130
4	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91024	Maximum flood depth Post-development (with mitigation) Detail in Tilbury urban area west of Fort Road	Breach at TIL005 1000 year event in 2130
5	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91025	Maximum flood hazard category: Pre-development Detail in Tilbury urban area west of Fort Road	Breach at TIL005 1000 year event in 2130
6	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91026	Maximum flood hazard category: Post-development (with mitigation) Detail in Tilbury urban area west of Fort Road	Breach at TIL005 1000 year event in 2130
7	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91027	Difference in maximum flood depth: Post-(with mitigation) minus pre-development	Breach at TIL006 1000 year event in 2130
8	HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91028	Difference in maximum flood hazard category: Post-(with mitigation) minus pre-development	Breach at TIL006 1000 year event in 2130

Scenario / Flood Estimation Point	Breach TIL005
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.5 KM

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Legend

- Route Alignment
- Earthworks
- NMU Routes
- Order Limits
- 2D Model domain
- TIL005 breach location
- 1D Channel
- 1D Channel diversions
- Compensation area
- Existing reservoir infilled
- Revised reservoir footprint

Difference in maximum flood depth (m)

- < -1.0
- -1.0 - -0.5
- -0.5 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- > 1.0

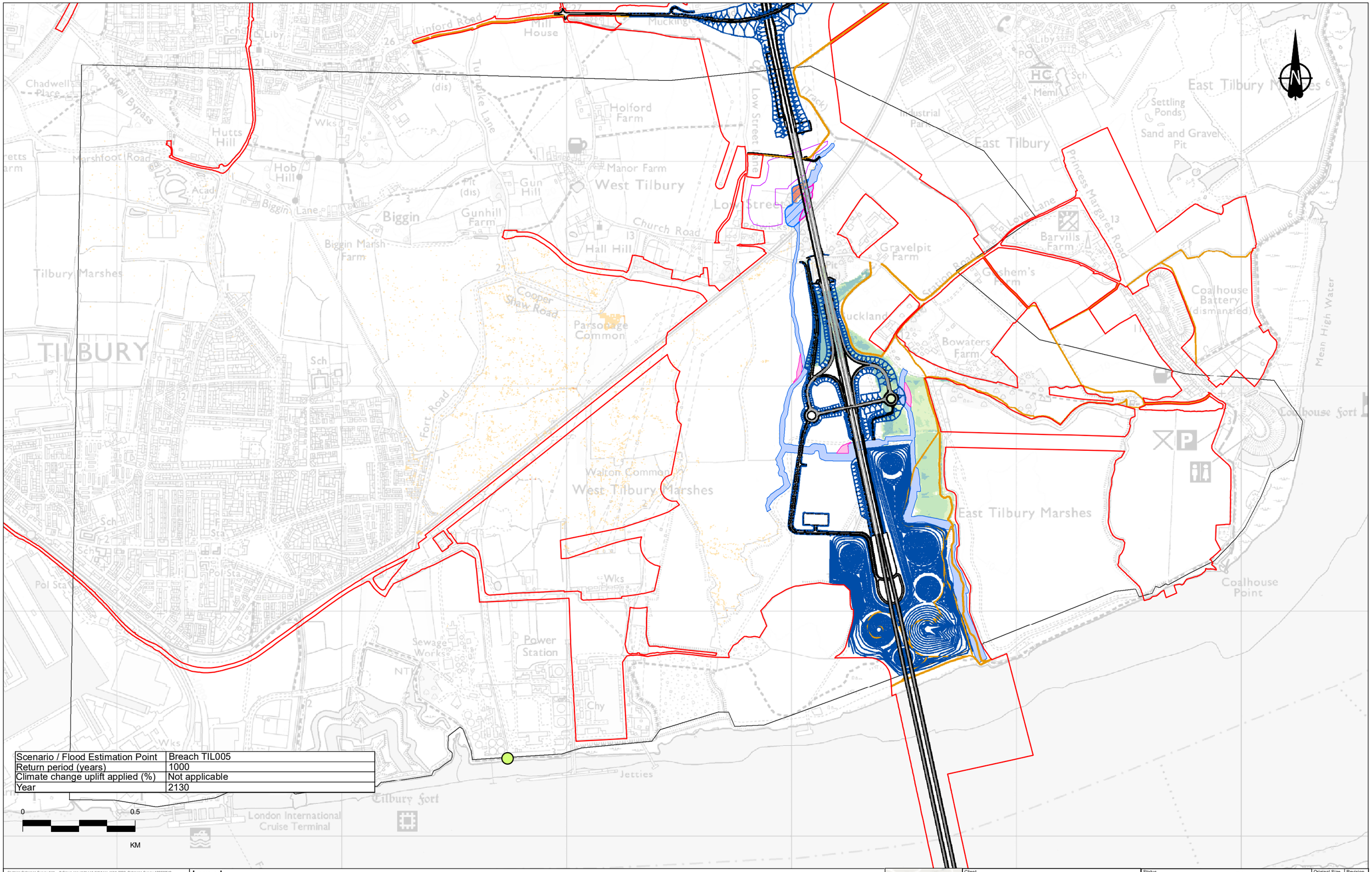
Client: national highways

Project: LOWER THAMES CROSSING

Status	S9	Original Size	A3
Application Document Number	N/A	Revision	P02
		Scale	1:15,000

Drawing title: FRA - Tilbury Modelling Results
Difference in maximum flood depth
Post-(with mitigation) minus pre-development
Figure 1

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91021



Scenario / Flood Estimation Point	Breach TIL005
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.5 KM

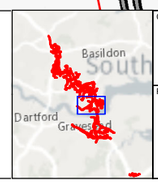
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Legend

- Route Alignment
- Earthworks
- NMU Routes
- Order Limits
- 2D Model domain
- TIL005 breach location
- 1D Channel
- 1D Channel diversions
- Compensation area
- Existing reservoir infilled
- Revised reservoir footprint

Difference in maximum flood hazard category

- Degree of hazard increased by 4 category
- Degree of hazard increased by 3 category
- Degree of hazard increased by 2 category
- Degree of hazard increased by 1 category
- No change on degree of hazard
- Degree of hazard decreased by 1 category
- Degree of hazard decreased by 2 category
- Degree of hazard decreased by 3 category
- Degree of hazard decreased by 4 category



Client: national highways

Project: LOWER THAMES CROSSING

Status: S9 | Original Size: A3 | Revision: P02

Application Document Number: N/A | Scale: 1:15,000

Drawing title: FRA - Tilbury Modelling Results
Difference in maximum flood hazard category
Post-(with mitigation) minus pre-development
Figure 2

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91022

Galsworthy Road

Portsea Road

Byron Gardens

Fort Road

Brennan Road

Scenario / Flood Estimation Point	Breach TIL005
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.05 KM

Legend

Maximum flood depth (m)

- <= 0.125
- 0.125 - 0.25
- 0.25 - 0.375
- 0.375 - 0.5
- 0.5 - 0.625
- 0.625 - 0.75
- 0.75 - 0.875
- > 0.875

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

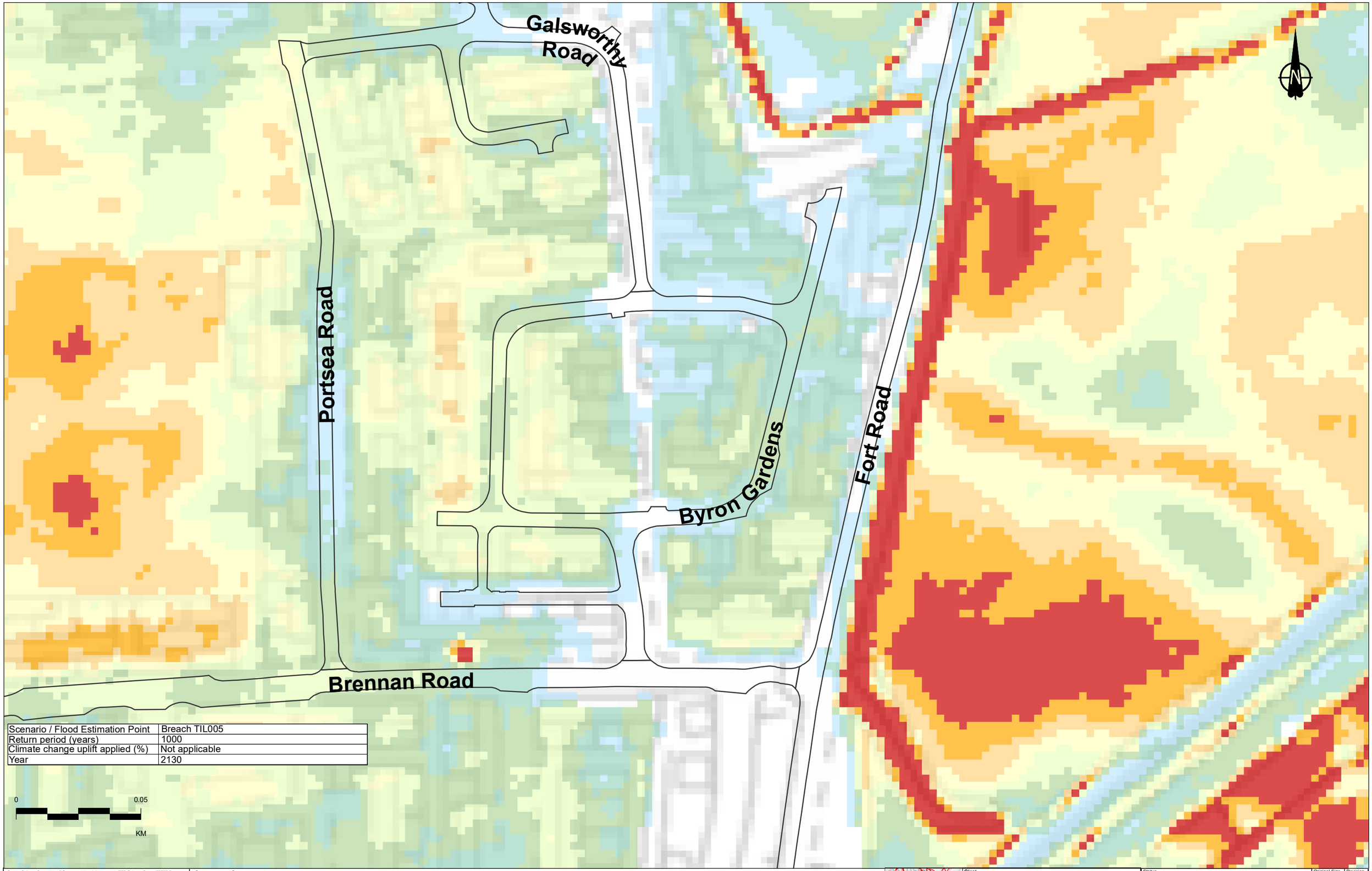
Client: national highways

Project: LOWER THAMES CROSSING

Status	Original Size	Revision
S9	A3	P02
Application Document Number: N/A	Scale: 1:1,351	

Drawing title: FRA - Tilbury Modelling Results
Maximum flood depth
Pre-development
Figure 3

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91023



Scenario / Flood Estimation Point	Breach TIL005
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

Legend

Maximum flood depth (m)

<= 0.125	0.25 - 0.375	0.625 - 0.75
0.125 - 0.25	0.375 - 0.5	0.75 - 0.875
	0.5 - 0.625	> 0.875

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Client: national highways

Project: LOWER THAMES CROSSING

Status	S9
Original Size	A3
Revision	P02
Application Document Number	N/A
Scale	1:1,351

Drawing title: FRA - Tilbury Modelling Results
Maximum flood depth
Post-development (with mitigation)
Figure 4

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91024

Galsworthy Road

Portsea Road

Byron Gardens

Fort Road

Brennan Road

Scenario / Flood Estimation Point	Breach TIL006
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.05 KM

Legend

Maximum flood hazard category

- 1: Very low hazard
- 2: Danger for some
- 3: Danger for most
- 4: Danger for all

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Client: national highways

Project: LOWER THAMES CROSSING

Status	S9
Original Size	A3
Revision	P02
Application Document Number	N/A
Scale	1:1,351

Drawing title: FRA - Tilbury Modelling Results
Maximum flood hazard category
Pre-development
Figure 5

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91025

Galsworthy Road

Portsea Road

Byron Gardens

Fort Road

Brennan Road

Scenario / Flood Estimation Point	Breach TIL005
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.05 KM

Legend

Maximum flood hazard category

- 1: Very low hazard
- 2: Danger for some
- 3: Danger for most
- 4: Danger for all

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Client: national highways

Project: LOWER THAMES CROSSING

Status	S9
Original Size	A3
Revision	P02
Application Document Number	N/A
Scale	1:1,351

Drawing title: FRA - Tilbury Modelling Results
Maximum flood hazard category
Post-development (with mitigation)
Figure 6

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91026

Scenario / Flood Estimation Point	Breach TIL006
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.5 KM

Legend

- Route Alignment
- Earthworks
- NMU Routes
- Order Limits
- 2D Model domain
- TIL006 breach location
- 1D Channel
- 1D Channel diversions
- Compensation area
- Existing reservoir infilled
- Revised reservoir footprint

Difference in maximum flood depth (m)

- < -1.0
- -1.0 - -0.5
- -0.5 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - -0.02
- -0.02 - -0.01
- -0.01 - 0.01
- 0.01 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- > 1.0

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Client: national highways

Project: LOWER THAMES CROSSING

Status: S9 | Original Size: A3 | Revision: P02

Application Document Number: N/A | Scale: 1:15,000

Drawing title: FRA - Tilbury Modelling Results
Difference in maximum flood depth
Post-(with mitigation) minus pre-development
Figure 7

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91027

Scenario / Flood Estimation Point	Breach TIL006
Return period (years)	1000
Climate change uplift applied (%)	Not applicable
Year	2130

0 0.5 KM

Rev	Status	Rev. Date	Purpose of revision	Drawn	Chck'd	Apprv'd
P02	S9	10/11/2023	DCO Application	KK	RB	BF

Legend

- Route Alignment
- Earthworks
- NMU Routes
- Order Limits
- 2D Model domain
- TIL006 breach location
- 1D Channel
- 1D Channel diversions
- Compensation area
- Existing reservoir infilled
- Revised reservoir footprint

Difference in maximum flood hazard category

- Degree of hazard increased by 4 category
- Degree of hazard increased by 3 category
- Degree of hazard increased by 2 category
- Degree of hazard increased by 1 category
- No change on degree of hazard
- Degree of hazard decreased by 1 category
- Degree of hazard decreased by 2 category
- Degree of hazard decreased by 3 category
- Degree of hazard decreased by 4 category

Client: national highways

LOWER THAMES CROSSING

Status: S9 | Original Size: A3 | Revision: P02 | Scale: 1:15,000

Application Document Number: N/A

Drawing title: FRA - Tilbury Modelling Results
Difference in maximum flood hazard category
Post-(with mitigation) minus pre-development
Figure 8

Drawing number: HE540039-CJV-EFR-SZP_GNZZZZZZZZ-DR-LF-91028

Annex C.14 Environment Agency acceptance of LTC's 'Allowing for new information since completing the DCO Application Flood Risk Assessment' technical note

creating a better place

Environment Agency

[redacted]

Our ref: [redacted]
Your ref: Lower Thames Crossing

Date: 24 October 2023

Dear [redacted]

LTC Tech Note- Allowing For New Information Since Completing The DCO Application Flood Risk Assessment

Thank you for consulting us on the above document.

We are satisfied with the findings of the Technical Note HE540039-CJV-EFR-GEN-TNT-ENV-00024 following submission of the Environmental Statement addendum, which was published to address the impacts of the two year re-phasing of the Project.

The technical note considers the updated Extreme Water Levels, revised Thames Estuary 2100 Plan and the additional two years due to the delayed completion date and their potential for these changes to impact the flood risk conclusions.

Please do not hesitate to contact us should you require any further information.

Yours sincerely

[redacted]

[redacted]

Annex C.15 Environment Agency acceptance of LTC's 'Coalhouse Fort Flood Risk Assessment and Modelling'

creating a better place

Environment Agency

[redacted]

Our ref: [redacted]
Your ref: Lower Thames Crossing

Date: 03 November 2023

Dear [redacted]

Lower Thames Crossing 9.147 Coalhouse Fort Flood Risk Assessment and Modelling (October 2023)

Thank you for consulting us on the Coalhouse Fort Flood Risk Assessment and Modelling (ref TR010032/EXAM/9.147).

We can confirm that we are satisfied with the results and do not have any further comments.

Please do not hesitate to contact us should you require any further information.

Yours sincerely

[redacted]

[redacted]

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