

Lower Thames Crossing
6.3 Environmental Statement
Appendices
Appendix 4.3 – Major Accidents
and Disasters Short List

APFP Regulation 5(2)(a)

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

Volume 6

DATE: October 2022

Planning Inspectorate Scheme Ref: TR010032
Application Document Ref: TR010032/APP/6.3

VERSION: 1.0

Lower Thames Crossing

6.3 Environmental Statement Appendices

Appendix 4.3 – Major Accidents and Disasters Short List

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1 Stage 3 short list of potential Major Events (for further consideration)

- 1.1.1 This appendix provides the short list of possible Major Events (major accidents and disasters) developed in Stages 1 and 2 of the Major Events assessment process described in Chapter 4: EIA Methodology (Application Document 6.1). Stage 2 comprised screening and review of the long list that was developed in Stage 1 (refer to Application Document 6.3, Appendix 4.2).
- 1.1.2 In general, Major Events, as they relate to the A122 Lower Thames Crossing (the Project), fall into three categories:
- a. Events that could not realistically occur, due to the type of development that the Project entails or its location
 - b. Events that could realistically occur, but for which the Project and associated receptors are no more vulnerable than any other development
 - c. Events that could occur, and to which the Project is particularly vulnerable, or which the Project has a particular capacity to exacerbate
- 1.1.3 Stage 2 was carried out primarily to identify this third group of Major Events, which would then form the short list of events to be taken forward for further consideration at Stage 3. As part of the Stage 3 assessment presented in Table 1.1, no further consideration was required for the short listed Major Events.

Table 1.1 Major accidents and disasters short listed for further consideration

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Landslips	Unstable ground from geological units or Made Ground/fill could result in ground movement in landfill areas and around the A2.	Road users, walkers, cyclists, and horse riders Infrastructure and property Surrounding environment	Geology and Soils	Appendix 10.2: Stability Report (Application Document 6.3)	No – drainage would be designed and engineered to current standards.
Sink holes/ ground instability	There is the potential to encounter sink holes during construction. Highway drainage soakaways on the North Downs in areas of chalk have the potential to cause rapid flow through fissures and subsequent sudden formation of sink holes.	Surrounding environment Road users, walkers, cyclists, and horse riders Infrastructure and property	Geology and Soils	Appendix 10.2: Stability Report (Application Document 6.3)	No – ground investigation has been carried out and hardware included in the tunnelling machine specification. Potential to encounter sink holes would be taken into consideration during construction and design activities. Drainage would be designed to the current standards. The large area of attenuation basins would dissipate seepage.
Landfill accidents (pollution incidents/gas migration)	Potential for pollution incidents/gas migration associated with landfills. The Project route is adjacent to / within 250m of the following landfill sites: <ul style="list-style-type: none"> Chadwell Hall Pit Landfill Collingwood Farm Landfill Denton-Comma Oil Landfill 	Surrounding environment Road users, walkers, cyclists, and horse riders Infrastructure and property	Geology and Soils	Chapter 10: Geology and Soils (Application Document 6.1) Code of Construction Practice (Application Document 6.3, Appendix 2.2)	No – desk-based studies and ground investigations have been carried out. The Project would be designed to the required standards. During construction, potential effects would be appropriately managed. Construction methods would be adopted as detailed in the Code of

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<ul style="list-style-type: none"> • Filborough Landfill • Linford Road Landfill • Orsett Heath Recreation Ground Landfill • Southfields Quarry Landfill • Stubbers Outdoor Pursuits Centre Landfill <p>In addition, the following landfills are within the Order Limits:</p> <ul style="list-style-type: none"> • Baldwins Farm Landfill • Buckingham Hill Landfill • Chadwell St Mary Landfill • East Tilbury Landfill • Flint Grit Pond Landfill • Goshems Farm Landfill • Grange Farm Landfill • Groves Farm landfill • Hall Farm Landfill • Linford quarry and landfill • Love Lane landfill • Low Street Brickworks Landfill • Low Street Landfill • Millers Sand and Gravel Pit landfill • Ockendon Grays Areas II & III Landfill 				<p>Construction Practice (Application Document 6.3, Appendix 2.2).</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<ul style="list-style-type: none"> Princess Margaret Road Landfill Rainbow Shaw Quarry Saltings Landfill Shroves Hill Wood Landfill Tilbury Ash Disposal Site - Shed Marsh Landfill Woodview and Sandy Lane Landfills 				
Ground gas production from naturally occurring and made ground	Ground conditions around the North Portal of the tunnel have the potential to generate ground gases. This will be taken forward for further consideration.	Surrounding environment Road users, walkers, cyclists, and horse riders Infrastructure and property	Geology and Soils	Chapter 10: Geology and Soils (Application Document 6.1) CoCP: Code of Construction Practice (Application Document 6.3, Appendix 2.2).	No – the Project has included mitigation measures into the design to reduce this risk.
Tidal flooding/wave/storm surge	Storm surge events have occurred in the past, associated with the adjacent River Thames. There is potential for this to affect construction worksites and contaminate surface waters and soils. Both the vulnerability of the Project to flooding and its potential to exacerbate flooding have been considered.	Surrounding environment Road users, walkers, cyclists, and horse riders Property and people in areas of increased flood risk	Road Drainage and the Water Environment	Chapter 14: Road Drainage and the Water Environment (Application Document 6.1) Appendix 14.6: Flood Risk Assessment (Application Document 6.3)	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of tidal flood risk. The Project includes flood mitigation, protection and resilience measures; these measures reduce the susceptibility and impact of tidal flooding.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Fluvial flooding	The Project is in the catchment area of the Mardyke and West Tilbury Main. Areas at risk are along watercourses in the Tilbury and Ockendon link sections of the Project.	Surrounding environment Road users, walkers, cyclists, and horse riders Property and people in areas of increased flood risk	Road Drainage and the Water Environment	Chapter 14: Road Drainage and the Water Environment (Application Document 6.1) Appendix 14.6: Flood Risk Assessment (Application Document 6.3)	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of fluvial flood risk. The Project includes flood mitigation, protection and resilience measures; these measures reduce the susceptibility and impact of fluvial flooding.
Surface water flooding	Surface water is a source of potential flood risk to the Project. The Project has the potential to increase surface water flooding by building on greenfield land.	Surrounding environment Road users, walkers, cyclists, and horse riders Property and people in areas of increased flood risk	Road Drainage and the Water Environment	Chapter 14: Road Drainage and the Water Environment (Application Document 6.1) Appendix 14.6: Flood Risk Assessment (Application Document 6.3)	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of surface water flood risk. The Project includes flood mitigation, protection and resilience measures; these measures reduce the susceptibility and impact of surface water flooding.
Groundwater flooding/major changes to groundwater levels/quality	The Project would cross areas of high groundwater levels, for example in the London Borough of Havering. The Project also crosses source protection zones (SPZs): <ul style="list-style-type: none"> SPZ1, SPZ 2 and SPZ 3 in Kent SPZ 1, SPZ 2 and SPZ 3 in Essex 	Surrounding environment Road users, walkers, cyclists, and horse riders Property and people in areas of increased flood risk Public potable water supply wells	Road Drainage and the Water Environment	Chapter 14: Road Drainage and the Water Environment (Application Document 6.1) Appendix 14.5: Hydrogeological Risk Assessment (Application Document 6.3) Appendix 14.6: Flood Risk	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of groundwater water flood risk. The Hydrogeological Risk Assessment concludes that the Project would not result in significant changes to groundwater levels, flows and quality. Therefore, no likely significant adverse effects on water environment receptors have been identified.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
		(not currently used at Linford, Essex)		Assessment (Application Document 6.3)	
Cyclonic storms, gales and high winds	Some sections of the Project would need elevated structures to facilitate crossings, for example some junction interchanges, the M2/A2/A122 Lower Thames Crossing junction and the Mardyke Viaduct. These may be exposed to high winds during construction and operation.	Infrastructure and property Road users, walkers, cyclists, and horse riders	N/A	N/A	No – infrastructure (e.g. lighting, signs and bridges) would be designed to the required standards. Risks are considered to be low.
Thunderstorms/lightning strikes	Some sections of the Project would need elevated structures to facilitate crossings, for example some junction interchanges, the M2/A2/A122 Lower Thames Crossing junction and the Mardyke Viaduct. This type of event could result in lightning strikes to temporary elevated structures during construction (such as tower cranes) and new elevated structures (such as bridges). Structures may be prone to lightning strikes once the road is open.	Infrastructure and property Road users, walkers, cyclists, and horse riders	N/A	N/A	No – There is considered to be no greater vulnerability to lightning strikes than any other elevated structure on the road network (during construction and operation) and associated risks are considered to be low.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Coastal fog	The Thames Estuary and Port of Tilbury are within the 3km study area of the Project. A reduction in visibility may increase the likelihood of collisions during construction activity and operation.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – navigation and lighting measures would be used during construction. Operational measures would include weather monitoring on approach to the tunnel, closed-circuit television (CCTV), vehicle detection, lane closure, speed limit control and National Highways fog warnings. Emergency procedures would be put in place to address risk, including operational control to limit vehicle entry to the tunnel.
Low temperatures (sub-zero), blizzards and heavy snow	Southern England can be subject to continental weather influences that bring cold spells in winter. Extreme temperatures could delay construction work. Heavy snow or blizzards could cause road users, walkers, cyclists and horse riders to be trapped on the road or in the tunnel.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – Department for Transport’s (DfT’s) focus is on risks that have the highest impact or the biggest capability gaps (Cabinet Office, 2019). The DfT has a specific engagement programme with industry on winter weather resilience. The open sections of the Project are no more vulnerable than any other roads on the network. Measures would include weather monitoring on approach to the tunnel, CCTV, vehicle detection, lane closure, speed limit control and National Highways weather warnings. Emergency procedures would address risk, including operational control to limit vehicle entry to the

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					tunnel. The risk is no different to similar roads (including tunnels) for road users, walkers, cyclists, and horse riders.
Heatwaves	Consideration has been given to sensitivity to heatwave conditions, although it is likely that a tunnel will be less sensitive than the open road, which is directly exposed to the sun.	Surrounding environment Road users, walkers, cyclists, and horse riders	N/A	N/A	No – the tunnel is below ground by several metres or tens of metres, which means it maintains a steadier temperature range influenced by the ground temperatures, which are approximately 15°C. There would be some warm air brought into the tunnel by the passage of traffic or ventilation system, but this would not lead to a significant change in tunnel air temperature due to the air volume. The open sections of the Project are no more vulnerable than any other roads on the network.
Geomagnetic storms	Solar wind shock waves can affect the earth’s magnetic field. This disrupts electrical power and communications networks, and Global Positioning System (GPS). Geomagnetic storms also pose a threat to the electrical power grid. This could interfere with the tunnel operating systems as well as smart technology and the life-saving systems proposed.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – the power for the tunnel would be supplied from two separate sources, with resilience in the capacity to allow the loss of one supply. A battery backup system would also maintain essential life safety systems (including tunnel lighting systems) in the unlikely event of complete loss of power from both independent sources. The risk of disruption is low, so it is unnecessary to consider any

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Solar flares	Solar flare events can interrupt electrical power, radio, and other electronic communication networks. The increased reliance on roadside technology could mean the Project is more vulnerable than existing roads.				environmental effects that would result from system failure. The DfT is engaging with a number of Government and industry stakeholders to build awareness and plan for the impacts of space weather on transport control and communication systems (Cabinet Office, 2019).
Disease epidemics and animal/plant diseases	Disease epidemics have the potential to affect the safe operation of the infrastructure by impacting the safety critical staff in the construction, operation and maintenance phases.	Road users, walkers, cyclists, and horse riders Local residents	N/A	N/A	No – resilience would be ensured by reducing vulnerability through mitigation measures such as business continuity plans and digital operations. Public Health England’s (2014) Communicable Disease Outbreak management: Operational Guidance would be followed in the event of a disease epidemic to mitigate the risks. During construction and operation, the Government’s guidance will be regularly reviewed, and relevant processes and procedures updated to reflect the latest guidance to reduce resultant effects on activities.
Ports and harbours	A new terminal (Tilbury2) has been built adjacent to the current Port of Tilbury (Planning Inspectorate, 2020b). Facilities include a roll-on/roll-off ferry	Surrounding environment	Population and Human Health	Chapter 13: Population and Human Health (Application Document 6.1)	No – there is a small area of temporary land-take required for access to the North Portal construction area. Once operational, the route would be approximately

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<p>terminal; a Construction Materials and Aggregate Terminal for importing, processing, manufacturing, and distributing construction materials; and a new nationally strategic rail and road connection providing access to the new terminal.</p> <p>The Order Limits for the Project intersect the Order Limits for the Tilbury2 development (Planning Inspectorate, 2020b).</p>			<p>Preliminary Navigational Risk Assessment (Application Document 7.15)</p>	<p>1.2km away from the edge of the Tilbury2 Order Limits. The risk of collision is assessed within the Preliminary Navigational Risk Assessment and is considered to be no greater than for the existing highway network.</p>
<p>Major Accident Hazard pipelines</p>	<p>The following Major Accident Hazard pipelines cross the Order Limits:</p> <ul style="list-style-type: none"> • Barking Power Station >7barg (high-pressure gas) pipeline • Cadent Gas >7barg (high-pressure gas) pipelines • National Grid >7barg (high-pressure gas) pipelines • Southern Gas Network >7barg (high-pressure gas) pipelines • Thurrock Flexible Generation Plant >7barg (high pressure gas) pipeline 	<p>Surrounding environment Road users, walkers, cyclists, and horse riders Local population</p>	<p>N/A</p>	<p>N/A</p>	<p>No – consultation has been carried out with the pipeline operators, and agreements are being sought with regard to diverting or applying protective provisions to third party assets where needed. It is therefore not considered likely that the Project would increase the risk of utilities failure.</p> <p>The potential risk of construction-related incidents when carrying out diversion works as part of the Project would be covered by safe working practices and current legislation.</p> <p>In all cases, no work shall be undertaken in the vicinity of a major</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	Pipelines could fail and damage the Project.				pipeline without the formal written consent of the asset owner.
Overhead electric power transmission and distribution networks	<p>The following overhead electric power transmission and distribution networks cross the Order Limits:</p> <ul style="list-style-type: none"> National Grid 400kV and 275kV transmission networks UK Power Networks 132kV distribution networks <p>Overhead electric power transmission and distribution networks could fail and damage the Project.</p>	<p>Surrounding environment</p> <p>Road users, walkers, cyclists, and horse riders</p> <p>Local population</p>	N/A	N/A	<p>No – consultation has been carried out with the overhead electric power transmission system and distribution network operators, and agreements are being sought with regard to diverting or applying protective provision to third party assets where needed. It is therefore not considered likely that the Project would increase the risk of utilities failure.</p> <p>The potential risk of construction-related incidents when carrying out diversion works as part of the proposed development would be covered by safe working practices and current legislation.</p>
Energy industry/fuel filling stations	<p>There are no existing energy industry facilities close to the Project.</p> <p>Thurrock Power Ltd submitted a Development Consent Order (DCO) application for a Nationally Significant Infrastructure Project in May 2020 (Planning Inspectorate, 2020a). The proposal is for a flexible electricity generation plant on land north of the</p>	<p>Surrounding environment</p> <p>Road users, walkers, cyclists, and horse riders</p>	N/A	N/A	<p>No – The Project is engaging with Thurrock Power Ltd to identify appropriate protection measures (e.g. reinforced sleeve or protection slabs over crossing points) for the high-pressure gas pipeline which forms part of the Thurrock Power Ltd application, to enable the Project to be constructed and to operate adjacent to/over the pipeline.</p> <p>The Environmental Statement accompanying the Thurrock Power</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<p>decommissioned Tilbury substation, Thurrock, approximately 700m from the Project route.</p> <p>This scheme was granted consent in 2022: Thurrock Flexible Generation Plant Development Consent Order 2022 (Planning Inspectorate, 2022). The entire flexible generation plant may be built in one phase, which is expected to take around 12 to 18 months (Planning Inspectorate, 2020a).</p>				<p>Ltd application concludes that, taking into account the existing legislative controls and Thurrock Power’s management approach, regulated by the Environment Agency and the Health and Safety Executive, the risk of accidents and disasters is expected to be as low as reasonably practical. Major accidents or disasters with the potential for significant environmental effects are not considered to be likely. Regulation and management of fire and explosion risk is set out in Volume 6, Appendix 2.2: Accident and Emergency Management of the Thurrock Power Ltd Environmental Statement (Planning Inspectorate, 2020a). This concludes that the flexible electricity generation plant is not in itself considered to be a major accident hazard. The flexible generation plant will require an environmental permit and an accident management plan.</p> <p>The operational plant will have a management system to deal with potential accidents that may pose a risk of environmental pollution including fires and loss of material containment. The management</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					system will include plans dealing with: <ul style="list-style-type: none"> • roles and responsibilities/lines of communication • competence and training • operating and maintenance procedures • incident investigation and reporting • emergency response • auditing
	There is a retail fuel station located at the proposed M2/A2/A122 Lower Thames Crossing junction that needs to be demolished.	Surrounding environment Road users, walkers, cyclists, and horse riders	N/A	Chapter 10: Geology and Soils (Application Document 6.1) Code of Construction Practice (Application Document 6.3, Appendix 2.2). Appendix 10.9: Generic Quantitative Risk Assessment Report for the Phase 2 Investigation (Annex A-D) (Application Document 6.3)	No – the potential for ground contamination was assessed during the ground investigation and reported in the Environmental Statement. The permits held by the fuel station would be surrendered and the tanks and pipework infrastructure removed. As part of the permit surrender process, investigation work would be carried out to demonstrate that any pre-existing contamination is removed, or the site is left at a level that is suitable for its proposed use.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Mining/quarrying industry	There are no active mines or quarries in the area. Historical mineral extraction activity for chalk, primarily along the A2 alignment at the Gravesend link crossing with Thong Lane. There are multiple sand and gravel pits between the Tilbury Loop railway line and the A13, including small-scale borrow pit(s). There is the potential for unstable ground conditions.	Road users, walkers, cyclists, and horse riders	Geology and Soils Materials Assets and Waste	Appendix 10.2: Stability Report (Application Document 6.3) Appendix 11.2 Mineral Safeguarding Assessment (Application Document 6.3) Code of Construction Practice (Application Document 6.3 Appendix 2.2)	No – Geotechnical risks on the Project would be managed through the application of DMRB CD 622 - Managing geotechnical risk.
Unexploded ordnance (UXO)	There is potential for UXO in areas surrounding the Project that were subject to bombing during World War II, including areas around the River Thames, Milton Rifle Range, the former airfield at Gravesend and the sites of two World War II aircraft crashes (near Orsett and North Ockendon).	Surrounding environment Road users, walkers, cyclists, and horse riders	Geology and Soils	Appendix 10.10: Unexploded Ordnance (UXO) Desk Study Report (Application Document 6.3) Chapter 10: Geology and Soils (Application Document 6.1) Code of Construction Practice (Application Document 6.3, Appendix 2.2)	No – Further consideration in the Major Accidents and Disasters assessment not required as control measures have been identified as part of the Project design to control the risks of adverse effects of UXO. Measures would be carried out during construction to define appropriate response strategies during the works.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Road traffic incidents	<p>The risk posed by spillages in construction plant.</p> <p>The risk posed during operation from hazardous loads as a result of a road traffic incident (e.g. fuel tankers).</p> <p>A road incident involving an explosion of a hazardous load has the potential to pose a risk of structural failure/flood defence failure.</p>	<p>Road users, walkers, cyclists, and horse riders</p> <p>Surrounding environment</p>	<p>Road Drainage and the Water Environment</p>	<p>Chapter 14: Road Drainage and the Water Environment (Application Document 6.1)</p> <p>Code of Construction Practice (Application Document 6.3, Appendix 2.2)</p>	<p>No – the traffic management plan would manage construction traffic and reduce the risk of accidents. The Code of Construction Practice would set out procedures to deal with fuel spillages from vehicles.</p> <p>The Project has been designed to take account of any accidental spillages through modern drainage and treatment systems. The environmental risks posed by spillages of hazardous loads as a result of road traffic incidents during operation has been considered within ES Chapter 14: Road Drainage and the Water Environment.</p> <p>The tunnel would be designed to specific safety standards with appropriate plans in place for dealing with emergency scenarios, fire-fighting, emergency response access, provision for traffic crossover/ turnaround, tunnel ventilation, informative signage and technology to warn road users. A Regional Operating Centre would monitor traffic, and tunnel control systems would be linked to the wider network if the tunnel closed for long periods. Road traffic</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					incidents would be monitored by CCTV. Other measures to be provided include vehicle detection, lane closure, speed limit control and National Highways signage warnings to monitor road traffic incidents. Emergency procedures would be in place to address risk.
Property or bridge demolition accident	The Project would require demolition work to take down a number of buildings and structures.	Surrounding environment Road users, walkers, cyclists, and horse riders	N/A	Chapter 11: Material Assets and Waste (Application Document 6.1) Outline Materials Handling Plan (Application Document 6.3, Appendix 2.2, Annex B)	No – risks during demolition would be taken into consideration by the appointed Contractor. ES Chapter 11: Material Assets and Waste identifies that asbestos surveys would be carried out before demolition and the work would be carried out in accordance with relevant legislation. Demolition materials would be identified and quantified, including potential sources of recycled aggregate to be reused onsite, as well as hazardous materials such as asbestos.
Rail accidents	The risk posed due to proximity of the Project alignment to railway lines and therefore the potential for ground movements and rail accidents: <ul style="list-style-type: none"> The Project would run adjacent to a section of High Speed 1. 	Road users, walkers, cyclists, and horse riders Rail users Surrounding environment	N/A	N/A	No – the potential for possible ground movements to affect railway lines has been considered in the Project design. The presence of the railway would be considered during detailed design for construction, operation and maintenance (e.g. barrier and parapet heights). Construction

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<ul style="list-style-type: none"> • The Project would pass beneath the Kent and Medway railway line. • It is proposed to construct a new bridge over the existing Tilbury Loop railway line. • The Project would run adjacent to the Upminster and Grays Branch railway line. 				<p>working methods and the construction programme would also take into consideration proximity to rail infrastructure. Network Rail would review and agree construction works before any work begins.</p> <p>In the case of a bridge strike, this would be dealt with as an incident, and managed appropriately under a risk assessment and method statement.</p> <p>Any maintenance or inspections close to or over the railway would be discussed with the rail authority and permissions (e.g. Network Rail’s Basic Asset Protection Agreement) and sign-off of method statements would be carried out prior to any work starting.</p>
Maritime accidents	<p>The Thames Estuary is a navigable river used by pleasure craft and trade vessels. Any materials coming by river in the construction phase would use an existing port to receive the goods. The Project requires construction of outfalls to the River Thames.</p>	Surrounding environment Maritime users	Population and Human Health	Chapter 13: Population and Human Health (Application Document 6.1) Chapter 9: Marine Biodiversity (Application Document 6.1) Preliminary Navigational Risk	<p>No – a Preliminary Navigational Risk Assessment has been produced (Application Document 7.15). By using existing navigational infrastructure, no new navigational risks would be created.</p> <p>The design of the outfalls and construction methods would be developed in consultation with the Marine Management Organisation (MMO) and Port of London Authority</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
				Assessment (Application Document 7.15)	<p>to reduce the risk of maritime accidents. Navigational risks associated with construction of the outfalls would also be considered in this process.</p> <p>Potential effects arising from the maintenance, use and decommissioning of marine structures would be controlled by the measures agreed with the MMO as detailed in the Deemed Marine Licence (Consents and Agreements Position Statement (Application Document 3.3)).</p> <p>A marine pollution contingency plan would be prepared for the MMO to approve. The marine pollution contingency plan would set out the licence holder's assessment of the likely risks that could arise as a result of a spill or collision during the carrying out of the licensed activities, and the methods and procedures the licence-holder intends to put in place to address those risks.</p>
Tunnel failure/fire/explosion/tidal breach or inundation	The Project includes a tunnel.	Road users, walkers, cyclists, and horse riders Surrounding environment	N/A	Project Design Report (Application Document 7.4)	No – during construction, standard control measures would be put in place by the appointed Contractor, to manage risk.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					<p>The tunnel is designed as a Category A structure without restriction on dangerous goods. The design considers the potential for fire and explosion of the dangerous goods vehicles that are allowed to pass through it.</p> <p>The tunnel features a range of safety measures. The design complies with the current standards and regulations, which are as follows:</p> <ul style="list-style-type: none"> • EU Directive 2004/54/EC on minimum safety requirements for tunnels in the trans-European road network • Road Tunnel Safety (Amendment) Regulations 2021 • Design Manual for Roads and Bridges, CD 352 Design of Road Tunnels (Highways England, 2020) • Regulatory Reform (Fire Safety) Order 2005 • Building Regulations 2010 (for Tunnel Service Buildings) <p>There would be water tanks at each tunnel portal to provide water supply for fire-fighting. These water tanks would hold enough water for one</p>

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					<p>hour of both hydrant and fixed fire-fighting system activity.</p> <p>An emergency evacuation plan would be in place for tidal breach/tidal inundation.</p> <p>The power system for the tunnel would be resilient, including dual supplies on both sides and redundancy in the capacity, allowing for complete loss of supply from any source. A battery backup system would maintain essential life safety systems, including tunnel lighting, in the unlikely event of complete loss of power from both independent sources. The pump system would include duty and standby pumps to provide resilience.</p> <p>Provision has been made within the tunnel drainage design to contain contaminated water from fire-fighting activities to prevent it from entering the watercourse the contaminated water would drain into (were prevention measures not in place).</p>
Tunnel/bridge closure and traffic diversion	Closure of the road/tunnel would divert traffic onto local roads.	Road users, walkers, cyclists, and horse riders Surrounding environment	N/A	Project Design Report (Application Document 7.4)	No – a Regional Operating Centre would monitor incidents, linked to the wider network for diversions. If the tunnel is closed for long periods, plans would be put in place to deal with emergency scenarios and clear

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					incidents quickly. While incidents would affect traffic flows, they would be temporary. Although vehicle emissions can contribute to poor air quality and the noise climate would change, it is not considered necessary to carry out any further assessment for such short-term events.
Bridge failure	The bridge supports of the junction interchanges and other overbridges form part of the Project design.	Surrounding environment Road users, walkers, cyclists, and horse riders	N/A	N/A	No – appropriate bridge design to current design standards is an integral part of the Project design.
Dam/reservoir failure	Risk from flooding of the road from failures of the lakes at the following locations: <ul style="list-style-type: none"> • Unnamed lake north-east of Grangewaters • Church Lake (Thorndon Country Park) • Sticking Hill Reservoir • Hobletts Reservoir 	Surrounding environment Road users, walkers, cyclists, and horse riders	Road Drainage and the Water Environment	Chapter 14: Road Drainage and the Water Environment (Application Document 6.1) Appendix 14.6: Flood Risk Assessment (Application Document 6.3)	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of reservoir flood risk. Flood risk from reservoirs is very low due to stringent legislation governing their maintenance.
Flood defence failure	Could lead to flooding of the Project during construction and operation. There are existing tidal defences along substantial sections of the	Surrounding environment Road users, walkers, cyclists, and horse riders	Project Description Road Drainage and the Water Environment	Appendix 14.6: Flood Risk Assessment (Application Document 6.3)	No – ES Appendix 14.6: Flood Risk Assessment includes an assessment of flood risk due to failure of flood defences. The Project includes flood mitigation, protection and resilience

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	River Thames (raised embankments and flood walls). The Mardyke Sluice is in Purfleet, and Tilbury Main Sluice is at Bowaters.				measures; these measures reduce the susceptibility and impact of flooding due to failure of the flood defences.
Mast/pylon collapse	Existing and proposed masts and towers along the Project route to be diverted. Topple distance has been assumed to be 60m. There are 32 pylons within topple distance of the Project's operational footprint at the point of road opening – 26 National Grid Electricity Transmission towers, and 6 UK Power Networks (UKPN) pylons. There are a further 25 temporary or existing pylons to be removed as part of the Project that are within topple distance of the Project's operational footprint during construction.	Road users, walkers, cyclists, and horse riders Local Population	N/A	N/A	No – the potential risk of construction-related incidents when carrying out diversion works as part of the Project would be covered by safe working practices and current legislation. Should an unusual event occur, such as vandalism, pylon or mast failure, or a significant weather/geological event, there is a risk that the pylons or masts could topple onto the Project. All the pylons would be designed to take into account proximity to the road, ground conditions and other external factors. Suitable foundations and pylon types would then be erected. The design would take into account the build of the overhead line, maintenance and future demolition. Utilities are considered below.
Building explosion/ structural collapse or fire	Fires could be started by construction-related activities, potentially affecting areas	Surrounding environment,	N/A	Project Design Report (Application Document 7.4)	No – During construction, standard control measures would be implemented by the appointed Contractor to manage risk.

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<p>adjacent to the construction activities. Urban buildings within the 3km study area of the Project are low-rise and predominantly residential, although taller residential/commercial properties exist. No buildings are close enough to the Project to present significant risk.</p> <p>Heat from fires associated with vehicles and machinery during construction and operation could affect structural integrity.</p>	<p>Road users, walkers, cyclists, and horse riders</p>			<p>Provision has been made within the tunnel drainage design to contain contaminated water from fire-fighting activities to prevent it from entering the receiving watercourse.</p>
<p>Utilities failure (gas, electricity, water, sewerage and communication)</p>	<p>Many utilities are located near the Project (including the UKPN and National Grid networks). These are the responsibility of the relevant utility companies. Utilities could fail and damage the Project.</p>	<p>Surrounding environment Road users, walkers, cyclists, and horse riders</p>	<p>N/A</p>	<p>Chapters 5 to 16 of the ES. (Application Document 6.1)</p>	<p>No – consultation has been carried out with statutory undertakers and agreements are being sought with regard to diverting or applying protective provisions to third party utilities where needed. The potential for construction-related incidents is covered by safe working practices and current legislation.</p> <p>Environmental impacts associated with utilities diversion works are considered as part of the overall assessment of the Project.</p> <p>It is not considered likely that the Project would increase the risk of utilities failure.</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
					In terms of utilities failure affecting the Project, there would be backup systems and procedures in place, specifically designed to provide resilience to utilities failure.
Bomb/vehicle attack on people/ infrastructure	<p>Construction and operation of the tunnel may make the Project more of a malicious attack target than other roads within the road network.</p> <p>The transport sector continues to face enduringly high levels of threat from international terrorism. With the continual diversification of the threat, the ambition and capability of terrorist groups to target UK infrastructure is likely to continue to evolve.</p>	Road users, walkers, cyclists, and horse riders	N/A	N/A	<p>No – the DfT engages with industry, cross-Government colleagues and international partners to put in place effective and proportionate mitigation measures to protect the transport network (Cabinet Office, 2019). The DfT engages with the intelligence community, other departments, local responders and industry, and has well-exercised internal response procedures (Cabinet Office, 2019).</p> <p>How the incident will be managed, by whom and from where, and how resources and information will be made available to those who will manage the situation, will be in accordance with the Centre for the Protection of National Infrastructure’s (CPNI’s) (2011) Protecting Against Terrorism.</p> <p>The Project Team collates risks as they develop and submits to National Highways’ Risk Management Team. Discussions are held with the DfT to ensure that Project risks are considered and any necessary actions are taken.</p>

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
Suicide risk from people jumping off high structures	The Project includes a number of high structures over the Project road.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – this has been taken into consideration in the design of the Project, to provide a deterrent and delay approach (increased height parapets and vegetation planting). A Regional Control Centre would monitor the road using CCTV and traffic officers would be dedicated to the route.
Cyberattack	The increasing reliance on roadside technology could render the Project more vulnerable to a cyberattack. The National Cyber Security Centre judges that there is a growing cyber threat. With the growth of dependence on technology comes increased risk. Hostile states and cyber criminals may seek to exploit UK organisations and infrastructure. Campaigns can be persistent.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – the Project is not considered to be more vulnerable to attack than similar Critical National Infrastructure. The DfT has an active cyber security programme, working closely with industry as well as government and international partners to identify and mitigate cyber risks and vulnerabilities across all transport modes (Cabinet Office, 2019). National Highways is accountable to the Secretary of State for Transport for ensuring the resilience of its strategic road network to national security risks, including cyberattack. Resilience would be ensured by reducing vulnerability through cyber security measures.
Industrial action/rioting/civil unrest/protest groups	These events can cause significant disruption to the travelling public.	Road users, walkers, cyclists, and horse riders	N/A	N/A	No – the DfT is engaging with industry and lead Government departments to understand the risk and mitigate the impact of this issue

Major Event	Reason for consideration on short list	Potential receptors	Source topics	Where addressed in the DCO Application	Further consideration required
	<p>The Project could be a target for this type of incident during construction and operation.</p>				<p>on the public and wider industry (Cabinet Office, 2019). Measures identified by UK government would be implemented by the Project to limit disruption should an event occur.</p> <p>The Project Team collates risks as they develop and submits them to National Highways' Risk Management Team. Discussions are held with the DfT to ensure that Project risks are considered and any necessary actions are taken.</p>

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Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ

National Highways Company Limited registered in England and Wales number 09346363