



Application for Development Consent

Application Reference Number: WWO10001

Navigational Issues and Preliminary Risk Assessment

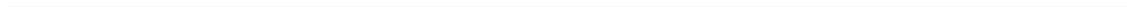
Doc Ref: **7.20.05**

Carnwath Road Riverside - Annexes: Hazard Logs

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in
Box **72** Folder **A**
January 2013

This page is intentionally blank



Annexes

List of annexes in order

Annex A: Hazard log introduction

Annex B: Most likely hazard log - Phase B & C: Delivery and removal of materials

Annex C: Worst credible hazard log - Phase B & C: Delivery and removal of materials

Annex A – Hazard log introduction

A.1 Construction Phases

A.1.1 The assessment has been divided into 4 distinct project phases to allow for assessment of hazards and the proposal of risk reduction measures commensurate with the risk posed by different operations associated with the project. These are:

- Phase A – Site set-up
- Phase B – Removal of excavated material by barge
- Phase C – Delivery of materials to site by barge
- Phase D – Site restoration

A.2 Risk assessment criteria

A.2.1 **Risk Matrix** - The following risk matrix has been used to provide a risk score that combines severity of a particular consequence together with the probability of the consequence occurring.

Likelihood	1 - Rare	1	2	3	4	5
	2 - Unlikely	2	4	6	8	10
	3 - Possible	3	6	9	12	15
	4 - Likely	4	8	12	16	20
	5 - Almost Certain	5	10	15	20	25
Severity		Level 1	Level 2	Level 3	Level 4	Level 5

A.2.2 **Risk Classification** – The risk score indicates the magnitude and acceptability of the risk in accordance with the ALARP principle.

Score	Classification	Definition
1 - 2	Slight	No Action is required
3 - 4	Minor	No additional controls are required, monitoring is required to ensure no changes in circumstances
5 - 9	Moderate	Efforts should be made to reduce risk to 'As Low As Reasonably Practicable' (ALARP). Job can be performed under direct supervision of Senior Officer
10 - 14	High	Efforts should be made to reduce risk to 'As Low As Reasonably Practicable' (ALARP). Job can only be performed after authorisation from Harbour Master and after further additional

		controls required under the circumstances
15 - 25	Extreme	Intolerable risk. Job is not authorised

A.2.3 **Severity** – The criteria used throughout this assessment has been provided by the Port of London Authority. It identifies four distinct areas of risk with the probable consequences associated with each hazard assessed in terms of harm or loss to:

- People (life);
- Environment;
- Operational Impact, and;
- Media Attention.

People	Level
First aid case / Medical treatment case	1
Restricted work case	2
Lost Time Injury / Moderate permanent partial disability injury	3
Single Fatality / Severe permanent partial disability	4
Multiple fatalities	5

Operational Impact	Level
Insignificant or no damage to vessel / equipment	1
Minor or superficial damage to vessel / equipment	2
Moderate damage to vessel / equipment requiring immediate repairs	3
Major damage to vessel / equipment and detention	4
Very serious damage to vessel or equipment possible criminal proceedings	5

Environment	Level
Low impact with no lasting effect	1
Temporary effect / Minor effect to small area	2
Short to medium term impact	3
Medium to long term effect / large area affected	4
Long term impact / severe impact on sensitive area	5

Media Attention	Level
No Coverage	1
Local coverage	2
Regional coverage	3
National coverage	4
International coverage	5

Annex B – Most likely hazard log: Phase B & C – Delivery and removal of materials

B.1 Most likely summary hazard list: Phase B & C – Delivery and removal of materials

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1A	Interaction with Cory Environmental Ltd operations	It is acknowledged that Thames Tideway Tunnel barges and Cory barges will be operating in the area in close proximity and at the same time. Any delays to Cory's operations are likely to have a negative impact on their ability to operate this service. Due to the proximity of the Thames Tunnel jetty to Cory operations, a river incident occurs.	6	6	9	6
2A	Mooring breakout	A vessel involved in Thames Tideway Tunnel construction activities breaks free from temporary/layup moorings.	2	2	2	2
3A	Collision with Commercial Freight Operator - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction material collides with a commercial freight operator in the vicinity of the Carnwath Road site.	9	6	9	6
4A	Collision with High Speed Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a High Speed Passenger Vessel in the vicinity of the Carnwath Road site.	6	2	6	4
5A	Collision with Class V Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Class V Passenger Vessel in the vicinity of the Carnwath Road site.	9	3	9	6

6A	Collision with Private Leisure Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Private Leisure Vessel in the vicinity of the Carnwath Road site.	9	3	9	6
7A	Collision with Commercial Freight Operator - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Commercial Freight Operator.	9	6	9	6
8A	Collision with Class V Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a High Speed Passenger Vessel.	6	4	6	6
9A	Collision with High Speed Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Class V Passenger Vessel.	6	4	6	6
10A	Collision with Private Leisure Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Private Leisure Vessel.	9	6	9	9

B.2 Most likely hazard list – Phase B & C – Delivery and removal of materials

1A - LTTTCR - Interaction with Cory Environmental Ltd operations

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1A- LTTTCR	Interaction with Cory Environmental Ltd operations	<p>It is acknowledged that Thames Tideway Tunnel barges and Cory barges will be operating in the area in close proximity and at the same time.</p> <p>Any delays to Cory's operations are likely to have a negative impact on their ability to operate this service.</p> <p>Due to the proximity of the Thames Tunnel jetty to Cory operations, a river incident occurs.</p>	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Machinery breakdown Collision avoidance 	<ul style="list-style-type: none"> Restricted work case Temporary effect / Minor effect to small area Moderate damage to vessel / equipment requiring immediate repairs Local coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs 	<ul style="list-style-type: none"> Regular communication between Thames Tideway Tunnel marine contractors and Cory Environmental Ltd. Dedicated berthing Co-ordination Manager – responsible for liaising and communicating with all operators in the local area, on hand to deal with potential areas of concern / conflict and provide de-confliction advice. Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towing Operations on the Thames Code of Practice for Craft Towing Operations on the Thames Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis. Assessment based on Thames Tideway Tunnel using existing river frontage at Carnwath Road (Hurlingham/Trinity/Whiffin Wharf).

2A - LTTTCR - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2A - LTTTCR	Mooring breakout	A vessel involved in Thames Tideway Tunnel construction activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> Restricted work case Temporary effect / Minor effect to small area Minor damage to vessel / equipment Local coverage 	<ul style="list-style-type: none"> Tug Operator Procedures Emergency Plans & Procedures Mooring Inspections Inspection Routine Qualified Crew 	<ul style="list-style-type: none"> Use of reputable marine contractors Explore the prospect of using ground moorings to ensure a further level of safety.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Assessment Notes

3A - LTTCR - Collision with Commercial Freight Operator - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3A - LTTCR	Collision with Commercial Freight Operator - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction material collides with a commercial freight operator in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Temporary effect / Minor effect to small area • Moderate damage to vessel / equipment requiring immediate repairs • Local coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People

Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment

Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Post Control - People

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact

Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention

Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance

- General Directions for Navigation in the Port of London
- Schedule to the General Directions for Navigation in the Port of London
- Pilotage Directions
- River Byelaws 1978 (as amended)
- Permanent Notice to Mariners
- Ship Towing Operations on the Thames
- Code of Practice for Craft Towing Operations on the Thames
- Port Entry Guide
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes

- Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis.
- An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

4A - LTTTCR - Collision with High Speed Passenger Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4A - LTTTCR	Collision with High Speed Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a High Speed Passenger Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Low impact with no lasting environmental effect • Moderate damage to vessel / equipment requiring immediate repairs • Local coverage 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs • Speed restrictions 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Slight

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

5A - LTTTCR - Collision with Class V Passenger Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5A - LTTTCR	Collision with Class V Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Class V Passenger Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> Misjudgement Inattention Improper lookout Lack of communications Adverse weather conditions Machinery breakdown Inadequate training and experience Collision avoidance 	<ul style="list-style-type: none"> Lost time injury / Moderate permanent partial disability injury Low impact with no lasting environmental effect Moderate damage to vessel / equipment requiring immediate repairs Local coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs Speed restrictions 	<ul style="list-style-type: none"> Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity Berth Co-ordinator Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	4	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towing Operations on the Thames Code of Practice for Craft Towing Operations on the Thames Port Entry Guide Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

6A - LTTCR - Collision with Private Leisure Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6A - LTTCR	Collision with Private Leisure Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Private Leisure Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Low impact with no lasting environmental effect • Moderate damage to vessel / equipment requiring immediate repairs • Local coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	4	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

7A - LTTCR - Collision with Commercial Freight Operator - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
7A - LTTCR	Collision with Commercial Freight Operator - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Commercial Freight Operator.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Restricted work case • Low impact with no lasting environmental effect • Moderate damage to vessel / equipment requiring immediate repairs • Local coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towage Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes
<ul style="list-style-type: none"> • Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis. • An additional control measure ‘Sub Contractors Risk Assessment’ has been identified during this assessment. The ‘Sub Contractors Risk Assessment’ is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

8A - LTTTCR - Collision with Class V Passenger Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8A - LTTTCR	Collision with Class V Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a High Speed Passenger Vessel.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Lost time injury / Moderate permanent partial disability injury • Low impact with no lasting environmental effect • Moderate damage to vessel / equipment requiring immediate repairs • Local coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs • Speed restrictions 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towing Operations on the Thames •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners •Code of Practice Passenger Vessel Operations on the Thames

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

9A - LTTCR - Collision with High Speed Passenger Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9A - LTTCR	Collision with High Speed Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Class V Passenger Vessel.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • Collision avoidance • River Incident 	<ul style="list-style-type: none"> • Multiple Minor Injuries • Minor Damage - Barge • Minor Damage - Tug • Moderate Damage - High Speed Passenger Vessel • Minor Pollution 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs • Speed restrictions 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> •General Directions for Navigation in the Port of London •Schedule to the General Directions for Navigation in the Port of London •Pilotage Directions •River Byelaws 1978 (as amended) •Permanent Notice to Mariners •Ship Towage Operations on the Thames •Code of Practice for Craft Towage Operations on the Thames •Port Entry Guide •Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

10A - LTTTCR - Collision with Private Leisure Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10A - LTTTCR	Collision with Private Leisure Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Private Leisure Vessel.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Machinery breakdown Collision avoidance River Incident 	<ul style="list-style-type: none"> Lost time injury / Moderate permanent partial disability injury Low impact with no lasting environmental effect Moderate damage to vessel / equipment requiring immediate repairs Local coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs 	<ul style="list-style-type: none"> Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration. Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	4	8	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	4	12	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Permanent Notice to Mariners Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes
<ul style="list-style-type: none">

Annex C– Worst credible hazard log: Phase B & C – Delivery and removal of materials

C.1 Worst credible summary hazard list: Phase B & C – Delivery and removal of materials

Hazard Id	Hazard Title	Hazard Description	People	Environment	Operational	Media
1B	Interaction with Cory Environmental Ltd operations	<p>It is acknowledged that Thames Tideway Tunnel barges and Cory barges will be operating in the area in close proximity and at the same time.</p> <p>Any delays to Cory's operations are likely to have a negative impact on their ability to operate this service.</p> <p>Due to the proximity of the Thames Tunnel jetty to Cory operations, a river incident occurs.</p>	8	4	8	6
2B	Mooring breakout	A vessel involved in Thames Tideway Tunnel construction activities breaks free from temporary/layup moorings.	3	2	3	2
3B	Collision with Commercial Freight Operator - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction material collides with a commercial freight operator in the vicinity of the Carnwath Road site.	8	6	8	6
4B	Collision with High Speed Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a High Speed Passenger Vessel in the vicinity of the Carnwath Road site.	4	2	4	4
5B	Collision with Class V Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Class V Passenger Vessel in the vicinity of the Carnwath Road site.	4	2	4	4

6B	Collision with Private Leisure Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Private Leisure Vessel in the vicinity of the Carnwath Road site.	10	2	10	8
7B	Collision with Commercial Freight Operator - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Commercial Freight Operator.	8	6	8	6
8B	Collision with Class V Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a High Speed Passenger Vessel.	4	2	4	4
9B	Collision with High Speed Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Class V Passenger Vessel.	4	2	4	4
10B	Collision with Private Leisure Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Private Leisure Vessel.	10	2	10	8

C.2 Worst credible hazard list – Phase B & C – Delivery and removal of materials

1B - LTTTCR - Interaction with Cory Environmental Ltd operations

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
1B- LTTTCR	Interaction with Cory Environmental Ltd operations	<p>It is acknowledged that Thames Tideway Tunnel barges and Cory barges will be operating in the area in close proximity and at the same time.</p> <p>Any delays to Cory's operations are likely to have a negative impact on their ability to operate this service.</p> <p>Due to the proximity of the Thames Tunnel jetty to Cory operations, a river incident occurs.</p>	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Machinery breakdown Collision avoidance 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Temporary effect / Minor effect to small area Major damage to vessel / equipment and detention Regional coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs 	<ul style="list-style-type: none"> Regular communication between Thames Tideway Tunnel marine contractors and Cory Environmental Ltd. Dedicated berthing Co-ordination Manager – responsible for liaising and communicating with all operators in the local area, on hand to deal with potential areas of concern / conflict and provide de-confliction advice. Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	High

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towing Operations on the Thames Code of Practice for Craft Towing Operations on the Thames Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis. Assessment based on Thames Tideway Tunnel using existing river frontage at Carnwath Road (Hurlingham/Trinity/Whiffin Wharf).

2B - LTTTCR - Mooring breakout

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
2B - LTTTCR	Mooring breakout	A vessel involved in Thames Tideway Tunnel construction activities breaks free from temporary/layup moorings.	<ul style="list-style-type: none"> Misjudgement Inattention Adverse weather conditions Equipment failure (ropes/wires) 	<ul style="list-style-type: none"> Lost time injury / Moderate permanent partial disability injury Temporary effect / Minor effect to small area Moderate damage to vessel / equipment requiring immediate repairs Local coverage 	<ul style="list-style-type: none"> Tug Operator Procedures Emergency Plans & Procedures Mooring Inspections Inspection Routine Qualified Crew 	<ul style="list-style-type: none"> Use of reputable marine contractors Explore the prospect of using ground moorings to ensure a further level of safety.

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	2	4	Minor

Relevant PLA Guidance
<ul style="list-style-type: none"> Code of Practice for the Safe Mooring of Vessels on the Thames 2010

Post Control - People			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
3	1	3	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Assessment Notes

3B - LTTTCR - Collision with Commercial Freight Operator - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
3B - LTTTCR	Collision with Commercial Freight Operator - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction material collides with a commercial freight operator in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Short to medium term impact (environmental) • Major damage to vessel / equipment and detention • Regional coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	High

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Assessment Notes
<ul style="list-style-type: none"> • Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis. • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

4B - LTTTCR - Collision with High Speed Passenger Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
4B - LTTTCR	Collision with High Speed Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a High Speed Passenger Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Temporary effect / Minor effect to small area • Major damage to vessel / equipment and detention • National coverage 	<ul style="list-style-type: none"> • Boat Masters Licence • BML Local Knowledge Endorsement • General Directions • Tug Operator Procedures • Passage Planning • VTS Navigational Broadcast • Qualified Crew • Vessel Master Experience • Thames AIS • HSC Code • VHF Communications • COLREGs • Speed restrictions 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

5B - LTTCR - Collision with Class V Passenger Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
5B - LTTCR	Collision with Class V Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Class V Passenger Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> Misjudgement Inattention Improper lookout Lack of communications Adverse weather conditions Machinery breakdown Inadequate training and experience Collision avoidance 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Temporary effect / Minor effect to small area Major damage to vessel / equipment and detention National coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs Speed restrictions 	<ul style="list-style-type: none"> Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity Berth Co-ordinator Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Pilotage Directions River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towing Operations on the Thames Code of Practice for Craft Towing Operations on the Thames Port Entry Guide Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Assessment Notes
<ul style="list-style-type: none"> An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

6B - LTTCR - Collision with Private Leisure Vessel - Delivery Vessel

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
6B - LTTCR	Collision with Private Leisure Passenger Vessel - Delivery Vessel	A vessel delivering Thames Tideway Tunnel construction materials collides with a Private Leisure Vessel in the vicinity of the Carnwath Road site.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Multiple fatalities • Low impact with no lasting environmental effect • Very serious damage to vessel or equipment possible criminal proceedings • National coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towage Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
5	3	15	Extreme

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
5	3	15	Extreme

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towage Operations on the Thames • Code of Practice for Craft Towage Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
5	2	10	High

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
5	2	10	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

7B - LTTTCR - Collision with Commercial Freight Operator - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
7B - LTTTCR	Collision with Commercial Freight Operator - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Commercial Freight Operator.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Improper lookout • Lack of communications • Adverse weather conditions • Machinery breakdown • Inadequate training and experience • Collision avoidance 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Short to medium term impact (environmental) • Major damage to vessel / equipment and detention • Regional coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	3	9	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	3	9	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
3	2	6	Moderate

Assessment Notes
<ul style="list-style-type: none"> • Analysis of Cory Environmental Ltd vessel track movements conducted for this area. Further information contained in Appendix A – Freight Tracks and AIS analysis. • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

8B - LTTTCR - Collision with Class V Passenger Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
8B - LTTTCR	Collision with Class V Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a High Speed Passenger Vessel.	<ul style="list-style-type: none"> Misjudgement Inattention Improper lookout Lack of communications Adverse weather conditions Machinery breakdown Inadequate training and experience Collision avoidance 	<ul style="list-style-type: none"> Single fatality / Severe permanent partial disability Temporary effect / Minor effect to small area Major damage to vessel / equipment and detention National coverage 	<ul style="list-style-type: none"> Boat Masters Licence BML Local Knowledge Endorsement General Directions Tug Operator Procedures Passage Planning VTS Navigational Broadcast Qualified Crew Vessel Master Experience Thames AIS HSC Code VHF Communications COLREGs Speed restrictions 	<ul style="list-style-type: none"> Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity Berth Co-ordinator Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London River Byelaws 1978 (as amended) Permanent Notice to Mariners Ship Towage Operations on the Thames Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners Code of Practice Passenger Vessel Operations on the Thames

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Assessment Notes
<ul style="list-style-type: none"> An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

9B - LTTCR - Collision with High Speed Passenger Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
9B - LTTCR	Collision with High Speed Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Class V Passenger Vessel.	<ul style="list-style-type: none"> • Misjudgement • Inattention • Adverse weather conditions • Machinery breakdown • Collision avoidance • River Incident 	<ul style="list-style-type: none"> • Single fatality / Severe permanent partial disability • Temporary effect / Minor effect to small area • Major damage to vessel / equipment and detention • National coverage 	<ul style="list-style-type: none"> • BML Local Knowledge Endorsement • Qualified Crew • Vessel Master Experience • Thames AIS • VHF Communications • Tug Operator Procedures • Ship Towing Code of Practice • Aids to Navigation • Emergency Plans & Procedures • COLREGs • Speed restrictions 	<ul style="list-style-type: none"> • Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. • Sub-Contractors Risk Assessment • Use of reputable and experienced marine contractor • Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity • Berth Co-ordinator • Berth Co-ordinator to monitor VHF

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	3	6	Moderate

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> • General Directions for Navigation in the Port of London • Schedule to the General Directions for Navigation in the Port of London • Pilotage Directions • River Byelaws 1978 (as amended) • Permanent Notice to Mariners • Ship Towing Operations on the Thames • Code of Practice for Craft Towing Operations on the Thames • Port Entry Guide • Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
2	1	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	1	4	Minor

Assessment Notes
<ul style="list-style-type: none"> • An additional control measure 'Sub Contractors Risk Assessment' has been identified during this assessment. The 'Sub Contractors Risk Assessment' is to be produced by the Sub Contractor appointed by the Thames Tideway Tunnel Project Team to conduct tug & barge operations and berth / jetty management activities.

10B - LTTTCR - Collision with Private Leisure Vessel - Excavated Material

Hazard ID	Hazard Title	Hazard Description	Likely Hazard Causes	Consequence(s) Most Likely	Existing Safeguards	Proposed Additional Mitigation
10B - LTTTCR	Collision with Private Leisure Passenger Vessel - Excavated Vessel	A vessel taking excavated material away from the Carnwath Road site collides with a Private Leisure Vessel.	<ul style="list-style-type: none"> Misjudgement Inattention Improper lookout Lack of communications Adverse weather conditions Machinery breakdown Inadequate training and experience Collision avoidance 	<ul style="list-style-type: none"> Multiple fatalities Low impact with no lasting environmental effect Very serious damage to vessel or equipment possible criminal proceedings National coverage 	<ul style="list-style-type: none"> BML Local Knowledge Endorsement Qualified Crew Vessel Master Experience Thames AIS VHF Communications Tug Operator Procedures Ship Towing Code of Practice Aids to Navigation Emergency Plans & Procedures COLREGs 	<ul style="list-style-type: none"> Notice to Mariners - informing operators and river users of planned operations in area, highlighting times when Thames Tideway Tunnel vessels are likely to be operating in this area. Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration. Sub-Contractors Risk Assessment Use of reputable and experienced marine contractor

Pre Control - People			
Severity	Probability	Risk Score	Risk Band
5	3	15	Extreme

Pre Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	3	3	Minor

Pre Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
5	3	15	Extreme

Pre Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	3	12	High

Relevant PLA Guidance
<ul style="list-style-type: none"> General Directions for Navigation in the Port of London Schedule to the General Directions for Navigation in the Port of London Permanent Notice to Mariners Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners

Post Control - People			
Severity	Probability	Risk Score	Risk Band
5	2	10	High

Post Control - Environment			
Severity	Probability	Risk Score	Risk Band
1	2	2	Slight

Post Control - Operational Impact			
Severity	Probability	Risk Score	Risk Band
5	2	10	High

Post Control - Media Attention			
Severity	Probability	Risk Score	Risk Band
4	2	8	Moderate

Assessment Notes
<ul style="list-style-type: none">

This page is intentionally left blank

Copyright notice

Copyright © Thames Water Utilities Limited January 2013.
All rights reserved.

Any plans, drawings, designs and materials (materials) submitted by Thames Water Utilities Limited (Thames Water) as part of this application for Development Consent to the Planning Inspectorate are protected by copyright. You may only use this material (including making copies of it) in order to (a) inspect those plans, drawings, designs and materials at a more convenient time or place; or (b) to facilitate the exercise of a right to participate in the pre-examination or examination stages of the application which is available under the Planning Act 2008 and related regulations. Use for any other purpose is prohibited and further copies must not be made without the prior written consent of Thames Water.

Thames Water Utilities Limited

Clearwater Court, Vastern Road, Reading RG1 8DB

The Thames Water logo and Thames Tideway Tunnel logo are © Thames Water Utilities Limited. All rights reserved.

DCO-DT-000-ZZZZZ-072005

