



## Application for Development Consent

Application Reference Number: WWO10001

# Navigational Issues and Preliminary Risk Assessment

Doc Ref: **7.20.08**

## Heathwall Pumping Station - Annexes: Hazard Logs

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

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

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## Annexes

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## 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 - Construction of cofferdam
- Phase B - Construction of drop shaft/culvert/connections
- Phase C - Removal of cofferdam
- Phase D – Permanent works site.

### 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 A - Construction of cofferdam

### B.1 Most likely summary hazard list: Phase A - Construction of cofferdam

| Hazard Id | Hazard Title  | Hazard Description   | Score – Post Mitigation |             |             |       |
|-----------|---|--|-------------------------|-------------|-------------|-------|
|           |   |  | People                  | Environment | Operational | Media |
| 1A        | Increase in Flow  | Changes to the hydrodynamics of the river may affect passing vessels.  | 6                       | 6           | 6           | 6     |
| 2A        | Contact - High Speed passenger vessel with work site                      | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.   | 6                       | 4           | 4           | 4     |
| 3A        | Contact - Class V passenger vessel with work site                         | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 6                       | 4           | 4           | 4     |
| 4A        | Contact - Private leisure vessel with work site                           | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 6                       | 2           | 6           | 4     |
| 5A        | Contact - commercial freight with work site                               | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 6                       | 4           | 6           | 4     |
| 6A        | Contact - Tug and Tow with work site                                      | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.   | 6                       | 4           | 6           | 4     |
| 7A        | Grounding - All vessels due to 'Squat Effect'                             | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.  | 4                       | 4           | 4           | 4     |
| 8A        | Mooring breakout  | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.  | 6                       | 4           | 6           | 4     |
| 9A        | Collision with High Speed Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | 6                       | 4           | 6           | 6     |
| 10A       | Collision with Class V Passenger Vessel (Construction/ Deconstruction)    | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | 6                       | 4           | 6           | 6     |

|     |  |  |     |     |     |     |
|-----|--|--|-----|-----|-----|-----|
| 11A | Collision with Private Leisure Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS.                          | 9   | 6   | 9   | 9   |
| 12A | Collision with commercial freight operator (Construction/ Deconstruction)                            | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.                     | 9   | 6   | 6   | 9   |
| 13A | Collision with tug and tow (Construction/ Deconstruction)  | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.                                     | 9   | 6   | 6   | 9   |
| 14A | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex.                   | 6   | 4   | 6   | 8   |
| 15A | Collision with High Speed Passenger Vessel (delivery/ material removal)                              | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | N/A | N/A | N/A | N/A |
| 16A | Collision with Class V Passenger Vessel (delivery/ material removal)                                 | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | N/A | N/A | N/A | N/A |
| 17A | Collision with Private Leisure Vessel (delivery/ material removal)                                   | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | N/A | N/A | N/A | N/A |
| 18A | Collision with commercial freight operator (delivery/ material removal)                              | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.                       | N/A | N/A | N/A | N/A |
| 19A | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                                       | N/A | N/A | N/A | N/A |
| 20A | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal)   | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex.                     | N/A | N/A | N/A | N/A |

## B.2 Most likely hazard list – Phase A: Construction of cofferdam

### LTTTHPS - Increased Flow

| Hazard ID       | Hazard Title     | Hazard Description  | Hazard Causes   | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|-----------------|------------------|---|---|--|---|--|
| 1A -<br>LTTTHPS | Increase in Flow | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>Restricted work case</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Minor or superficial damage to vessel / equipment</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 2                    | 3           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Pilotage Directions</li> <li>Port Entry Guide</li> <li>Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 2                     | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Assessment Notes  |
|---|
| <ul style="list-style-type: none"> <li>Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

## 2A - LTTTHPS - Contact - High Speed Passenger Vessel with Work Site

| Hazard ID    | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|--|--|--|---|--|---|
| 2A - LTTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |              |
|-----------------------------------|-------------|------------|--------------|
| Severity                          | Probability | Risk Score | Risk Band    |
| 2                                 | 2           | 4          | <b>Minor</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 3A - LTTTHPS - Contact - Class V Passenger Vessel with Work Site

| Hazard ID    | Hazard Title                                      | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|---|--|--|---|--|---|
| 3A - LTTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>High density of leisure traffic</li> <li>Collision avoidance</li> <li>Leisure traffic impedes the passage of vessel navigating the channel</li> <li>Tidal set</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Minor or superficial damage to vessel / equipment</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>BML Local Knowledge Endorsement</li> <li>Qualified Crew</li> <li>Vessel Master Experience</li> <li>Permanent / Temporary Notice to Mariners</li> <li>Aids to Navigation</li> <li>VTS Navigational Broadcast</li> <li>HSC Code</li> <li>Passage Planning</li> <li>COLREGs</li> <li>VHF Communications</li> <li>Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>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.</li> <li>Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Permanent Notice to Mariners</li> <li>Code of Practice Passenger Vessel Operations on the Thames</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |              |
|-----------------------------------|-------------|------------|--------------|
| Severity                          | Probability | Risk Score | Risk Band    |
| 2                                 | 2           | 4          | <b>Minor</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

#### 4A - LTTTHPS - Contact - Private Leisure Vessel with Work Site

| Hazard ID    | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 4A - LTTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Low impact with no lasting effect (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 3                    | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 1                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |               |
|----------------------------|-------------|------------|---------------|
| Severity                   | Probability | Risk Score | Risk Band     |
| 1                          | 2           | 2          | <b>Slight</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 5A - LTTTHPS - Contact - Commercial freight with Work Site

| Hazard ID    | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 5A - LTTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**6A - LTTTHPS - Contact - Tug and Tow with Work Site**

| Hazard ID    | Hazard Title                         | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|--------------------------------------|--|--|---|---|--|
| 6A - LTTTHPS | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7A - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|--|---|--|
| 7A - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Restricted work case</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

| 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"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Post Control - People |             |            |           |
|-----------------------|-------------|------------|-----------|
| Severity              | Probability | Risk Score | Risk Band |
| 2                     | 2           | 4          | Minor     |

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

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

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

| Assessment Notes |
|------------------|
|                  |

**8A - LTTTHPS - Mooring breakout**

| Hazard ID    | Hazard Title     | Hazard Description  | Likely Hazard Causes   | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|------------------|---|--|---|--|---|
| 8A - LTTTHPS | Mooring breakout | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>Misjudgement</li> <li>Inattention</li> <li>Adverse weather conditions</li> <li>Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Tug Operator Procedures</li> <li>Emergency Plans &amp; Procedures</li> <li>Mooring Inspections</li> <li>Inspection Routine</li> <li>Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>Use of reputable marine contractors</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

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

| Assessment Notes  |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

**9A - LTTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)**

| Hazard ID    | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|--|---|--|--|---|---|
| 9A - LTTTHPS | Collision with High Speed Passenger Vessel (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>Inadequate training and experience</li> <li>Tug or line failure</li> <li>Collision avoidance</li> <li>Tidal set</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>BML Local Knowledge Endorsement</li> <li>General Directions</li> <li>Tug Operator Procedures</li> <li>Passage Planning</li> <li>VTS Navigational Broadcast</li> <li>Qualified Crew</li> <li>Vessel Master Experience</li> <li>Thames AIS</li> <li>HSC Code</li> <li>VHF Communications</li> <li>COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 10A - LTTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|---|--|--|---|---|
| 10A - LTTTHPS | Collision with Class V Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Inadequate training and experience</li> <li>• Tidal set</li> <li>• Collision avoidance</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• BML Local Knowledge Endorsement</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• VHF Communications</li> <li>• Tug Operator Procedures</li> <li>• General Directions</li> <li>• Vessel Master Experience</li> <li>• VTS Navigational Broadcast</li> <li>• COLREGs</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**11A - LTTTHPS - Collision with Private Leisure Vessel (construction/deconstruction)**

| Hazard ID   | Hazard Title   | Hazard Description  | Hazard Causes   | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|--|---|---|--|---|--|
| 11A LTTTHPS | Collision with Private Leisure Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Machinery breakdown</li> <li>• Change in river flow due to new in-river structure</li> <li>• General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Vessel Master Experience</li> <li>• Qualified Crew</li> <li>• VHF Communications</li> <li>• VTS Navigational Broadcast</li> <li>• Ship Towing Code of Practice</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Admiralty Charts</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Berth Co-ordinator to monitor VHF</li> <li>• CCTV to provide additional information to Berth Coordinator</li> <li>• Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

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

| 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 |
| 3                             | 4           | 12         | High      |

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

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• River Byelaws 1978 (as amended)</li> <li>• Permanent Notice to Mariners</li> <li>• River Thames Recreational Users Guide</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**12A - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 12A - LTTTHPS | Collision with commercial freight operator (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 3                                | 4           | 12         | <b>High</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 3                             | 4           | 12         | <b>High</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 3           | 9          | <b>Moderate</b> |

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**13A - LTTTHPS - Collision with Tug and Tow (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 13A - LTTTHPS | Collision with tug and tow (Construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Tug Operator Procedures</li> <li>• General Directions</li> <li>• COLREGS</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 3                                | 4           | 12         | <b>High</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 3                             | 4           | 12         | <b>High</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 3           | 9          | <b>Moderate</b> |

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**14A - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)**

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|--|---|---|
| 14A - LTTTHPS | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Ship Towage Operations on the Thames</li> <li>•Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>•Code of Practice for Craft Towage Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>•Port Entry Guide</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 15A - LTTTHPS - Collision with High Speed Passenger Vessel (delivery/material removal)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|--|---|--|--|--|--|
| 15A - LTTTHPS | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 16A - LTTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|--|--|--|--|--|
| 16A - LTTTHPS | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 17A - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)

| Hazard ID   | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|-------------|---|--|--|--|--|--|
| 17A LTTTHPS | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**18A - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 18A - LTTTHPS    | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

**Pre Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Relevant PLA Guidance**

Not relevant for this phase of the project

**Post Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Sub Contractors Risk Assessment**

Not relevant for this phase of the project

### 19A - LTTTHPS - Collision with Tug and Tow (delivery/material removal)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|--|---|--|--|--|--|
| 19A - LTTTHPS | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a tug and tow in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**20A - LTTTHPS - Contact with House Boat at Nine Elms Pier (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>   | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|---|---|--|--|--|--|
| 20A - LTTTHPS    | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

## Annex C– Most likely hazard log: Phase B - Construction of drop shaft/culvert/connection

### C.1 Summary most likely hazard list: Phase B - Construction of drop shaft/culvert/connections

| Hazard Id | Hazard Title   | Hazard Description  | Score – Post Mitigation |             |             |       |
|-----------|--|---|-------------------------|-------------|-------------|-------|
|           |  |   | People                  | Environment | Operational | Media |
| 1B        | Increase in Flow                                     | Changes to the hydrodynamics of the river may affect passing vessels.   | 6                       | 6           | 6           | 6     |
| 2B        | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                            | 9                       | 6           | 6           | 6     |
| 3B        | Contact - Class V passenger vessel with work site    | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                               | 9                       | 6           | 6           | 6     |
| 4B        | Contact - Private leisure vessel with work site      | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.         | 9                       | 3           | 9           | 6     |
| 5B        | Contact - commercial freight with work site          | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                                       | 6                       | 4           | 6           | 4     |
| 6B        | Contact - Tug and Tow with work site                 | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 6                       | 4           | 6           | 4     |
| 7B        | Grounding - All vessels due to 'Squat Effect'        | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | 4                       | 4           | 4           | 4     |
| 8B        | Mooring breakout                                     | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.                                       | 9                       | 6           | 9           | 6     |

|     |   |   |     |     |     |     |
|-----|---|---|-----|-----|-----|-----|
| 9B  | Collision with High Speed Passenger Vessel (construction/deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 10B | Collision with Class V Passenger Vessel (construction/deconstruction)                                 | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.  | N/A | N/A | N/A | N/A |
| 11B | Collision with Private Leisure Vessel (construction/deconstruction)                                   | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS.  | N/A | N/A | N/A | N/A |
| 12B | Collision with commercial freight operator (construction/deconstruction)                              | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 13B | Collision with tug and tow (construction/deconstruction)  | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 14B | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (construction/deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/deconstruction of the temporary cofferdam. | N/A | N/A | N/A | N/A |

|     |   |  |   |   |   |   |
|-----|---|--|---|---|---|---|
| 15B | Collision with High Speed Passenger Vessel (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers.     | 6 | 4 | 6 | 6 |
| 16B | Collision with Class V Passenger Vessel (delivery/ material removal)    | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | 6 | 4 | 6 | 6 |
| 17B | Collision with Private Leisure Vessel (delivery/ material removal)      | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | 9 | 6 | 9 | 9 |

|     |  |  |   |   |   |   |
|-----|--|--|---|---|---|---|
| 18B | Collision with commercial freight operator (delivery/ material removal)                            | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.   | 9 | 9 | 6 | 9 |
| 19B | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                   | 9 | 9 | 6 | 9 |
| 20B | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | 6 | 4 | 6 | 8 |

## C.2 Most likely hazard list – Phase B: Construction of drop shaft/culvert/connections

### 1B - LTTTHPS - Increased Flow

| Hazard ID    | Hazard Title     | Hazard Description  | Hazard Causes   | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|------------------|---|---|--|---|--|
| 1B - LTTTHPS | Increase in Flow | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>Restricted work case</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Minor or superficial damage to vessel / equipment</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 2                    | 3           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Pilotage Directions</li> <li>Port Entry Guide</li> <li>Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 2                     | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Assessment Notes  |
|---|
| <ul style="list-style-type: none"> <li>Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

## 2B - LTTTHPS - Contact - High Speed Passenger Vessel with Work Site

| Hazard ID    | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|--|--|--|---|--|---|
| 2B - LTTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 3                    | 4           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 4           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 4           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 3B - LTTTHPS - Contact - Class V Passenger Vessel with Work Site

| Hazard ID    | Hazard Title                                      | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|---|---|--|---|--|---|
| 3B - LTTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 3                    | 4           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 4           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 4           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 4B - LTTTHPS - Contact - Private Leisure Vessel with Work Site

| Hazard ID    | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 4B - LTTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Low impact with no lasting effect (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 3                    | 4           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |              |
|---------------------------|-------------|------------|--------------|
| Severity                  | Probability | Risk Score | Risk Band    |
| 1                         | 4           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 3                                | 4           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 4           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Mariners Guide to Bridges on the Tidal Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 1                          | 3           | 3          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 3           | 9          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 5B - LTTTHPS - Contact - Commercial freight with Work Site

| Hazard ID    | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 5B - LTTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**6B - LTTTHPS - Contact - Tug and Tow with Work Site**

| Hazard ID    | Hazard Title                         | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|--------------------------------------|--|--|---|---|--|
| 6B - LTTTHPS | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7B - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|--|---|--|
| 7B - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Restricted work case</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

| 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"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Post Control - People |             |            |           |
|-----------------------|-------------|------------|-----------|
| Severity              | Probability | Risk Score | Risk Band |
| 2                     | 2           | 4          | Minor     |

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

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

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

| Sub Contractors Risk Assessment |
|---------------------------------|
|                                 |

**8B - LTTTHPS - Mooring breakout**

| Hazard ID    | Hazard Title     | Hazard Description  | Likely Hazard Causes   | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|------------------|---|--|---|--|---|
| 8B - LTTTHPS | Mooring breakout | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>Misjudgement</li> <li>Inattention</li> <li>Adverse weather conditions</li> <li>Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Tug Operator Procedures</li> <li>Emergency Plans &amp; Procedures</li> <li>Mooring Inspections</li> <li>Inspection Routine</li> <li>Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>Use of reputable marine contractors</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

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

| Assessment Notes  |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

### 9B - LTTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)

| Hazard ID    | Hazard Title   | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|--------------|--|---|--|--|--|--|
| 9B - LTTTHPS | Collision with High Speed Passenger Vessel (construction/deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**10B - LTTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>   | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|---|--|--|--|--|--|
| <b>10B - LTTTHPS</b> | Collision with Class V Passenger Vessel (construction/deconstruction) | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

**Pre Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Relevant PLA Guidance**

Not relevant for this phase of the project

**Post Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Sub Contractors Risk Assessment**

Not relevant for this phase of the project

### 11B - LTTTHPS - Collision with Private Leisure Vessel (construction/deconstruction)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|--|--|--|--|--|
| 11B - LTTTHPS | Collision with Private Leisure Vessel (construction/deconstruction) | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 12B - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 12B - LTTTHPS    | Collision with commercial freight operator (construction/deconstruction) | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 13B - LTTTHPS - Collision with Tug and Tow (construction/deconstruction)

| <i>Hazard ID</i> | <i>Hazard Title</i>                                      | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s)<br/>Most Likely</i>      | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 13B - LTTTHPS    | Collision with tug and tow (construction/deconstruction) | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 14B - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)

| Hazard ID     | Hazard Title  | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|---|--|--|--|--|
| 14B - LTTTHPS | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (construction/deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/deconstruction of the temporary cofferdam. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 15B - LTTGPS - Collision with High Speed Passenger Vessel (delivery/material removal)

| Hazard ID    | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|--|---|--|--|---|---|
| 15B - LTTGPS | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>Inadequate training and experience</li> <li>Tug or line failure</li> <li>Collision avoidance</li> <li>Tidal set</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>BML Local Knowledge Endorsement</li> <li>General Directions</li> <li>Tug Operator Procedures</li> <li>Passage Planning</li> <li>VTS Navigational Broadcast</li> <li>Qualified Crew</li> <li>Vessel Master Experience</li> <li>Thames AIS</li> <li>HSC Code</li> <li>VHF Communications</li> <li>COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**16B - LTTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)**

| Hazard ID     | Hazard Title  | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|---|--|--|---|---|
| 16B - LTTTHPS | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>Inadequate training and experience</li> <li>Tug or line failure</li> <li>Collision avoidance</li> <li>Tidal set</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>BML Local Knowledge Endorsement</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>VHF Communications</li> <li>Tug Operator Procedures</li> <li>General Directions</li> <li>Vessel Master Experience</li> <li>VTS Navigational Broadcast</li> <li>COLREGs</li> <li>Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>Port Entry Guide</li> <li>Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**17B - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes   | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|---------------|---|--|---|--|---|--|
| 17B - LTTTHPS | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Machinery breakdown</li> <li>• Change in river flow due to new in-river structure</li> <li>• General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Vessel Master Experience</li> <li>• Qualified Crew</li> <li>• VHF Communications</li> <li>• VTS Navigational Broadcast</li> <li>• Ship Towage Code of Practice</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Admiralty Charts</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Berth Co-ordinator to monitor VHF</li> <li>• CCTV to provide additional information to Berth Coordinator</li> <li>• Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

| 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      |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• River Byelaws 1978 (as amended)</li> <li>• Permanent Notice to Mariners</li> <li>• River Thames Recreational Users Guide</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| 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  |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 18B - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|--|---|---|
| 18B - LTTTHPS | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

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

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

| 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      |

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

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

| Post Control - Environment |             |            |           |
|----------------------------|-------------|------------|-----------|
| Severity                   | Probability | Risk Score | Risk Band |
| 3                          | 3           | 9          | Moderate  |

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

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**19B - LTTTHPS - Collision with Tug and Tow (delivery/material removal)**

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|--|---|---|
| 19B - LTTTHPS | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

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

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

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

| Post Control - Environment |             |            |           |
|----------------------------|-------------|------------|-----------|
| Severity                   | Probability | Risk Score | Risk Band |
| 3                          | 3           | 9          | 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           | 6          | Moderate  |

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

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

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

## 20B - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|---|--|--|---|---|
| 20B - LTTTHPS | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> </ul> |

| 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 |
| 4                             | 3           | 12         | High      |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Ship Towage Operations on the Thames</li> <li>• Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>• Code of Practice for Craft Towage Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| 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 |
| 4                              | 2           | 8          | Moderate  |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

## Annex D– Most likely hazard log: Phase C – Removal of of cofferdam

### D.1 Most likely summary hazard list: Phase C - Removal of cofferdam

| Hazard Id | Hazard Title   | Hazard Description  | People | Environment | Operational | Media |
|-----------|--|---|--------|-------------|-------------|-------|
| 1C        | Increase in Flow                                     | Changes to the hydrodynamics of the river may affect passing vessels.   | 6      | 6           | 6           | 6     |
| 2C        | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                            | 6      | 4           | 4           | 4     |
| 3C        | Contact - Class V passenger vessel with work site    | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                               | 6      | 4           | 4           | 4     |
| 4C        | Contact - Private leisure vessel with work site      | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.         | 6      | 2           | 6           | 4     |
| 5C        | Contact - commercial freight with work site          | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                                       | 6      | 4           | 6           | 4     |
| 6C        | Contact - Tug and Tow with work site                 | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 6      | 4           | 6           | 4     |
| 7C        | Grounding - All vessels due to 'Squat Effect'        | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | 4      | 4           | 4           | 4     |
| 8C        | Mooring breakout                                     | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.                                       | 6      | 4           | 6           | 4     |

|     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| 9C  | Collision with High Speed Passenger Vessel (Construction/ Deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS.  | 6 | 4 | 6 | 6 |
| 10C | Collision with Class V Passenger Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.   | 6 | 4 | 6 | 6 |
| 11C | Collision with Class V Passenger Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.   | 9 | 6 | 9 | 9 |
| 12C | Collision with commercial freight operator (Construction/ Deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.  | 9 | 6 | 6 | 9 |
| 13C | Collision with tug and tow (Construction/ Deconstruction)  | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.  | 9 | 6 | 6 | 9 |
| 14C | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/ deconstruction of the temporary cofferdam. | 6 | 4 | 6 | 8 |

|     |   |  |     |     |     |     |
|-----|---|--|-----|-----|-----|-----|
| 15C | Collision with High Speed Passenger Vessel (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | N/A | N/A | N/A | N/A |
| 16C | Collision with Class V Passenger Vessel (delivery/ material removal)    | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | N/A | N/A | N/A | N/A |
| 17C | Collision with Private Leisure Vessel (delivery/ material removal)      | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | N/A | N/A | N/A | N/A |

|     |  |  |     |     |     |     |
|-----|--|--|-----|-----|-----|-----|
| 18C | Collision with commercial freight operator (delivery/ material removal)                            | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 19C | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                   | N/A | N/A | N/A | N/A |
| 20C | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | N/A | N/A | N/A | N/A |

## D.2 Most likely hazard list – Phase C: Removal of cofferdam

### 1C - LTTTHPS - Increased Flow

| Hazard ID    | Hazard Title     | Hazard Description  | Hazard Causes   | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|------------------|---|---|--|---|--|
| 1C - LTTTHPS | Increase in Flow | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>Restricted work case</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Minor or superficial damage to vessel / equipment</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 2                    | 3           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Pilotage Directions</li> <li>Port Entry Guide</li> <li>Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 2                     | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 2                              | 3           | 6          | <b>Moderate</b> |

| Assessment Notes  |
|---|
| <ul style="list-style-type: none"> <li>Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

## 2C - LTTTHPS - Contact - High Speed Passenger Vessel with Work Site

| Hazard ID    | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|--|--|--|---|--|---|
| 2C - LTTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |              |
|-----------------------------------|-------------|------------|--------------|
| Severity                          | Probability | Risk Score | Risk Band    |
| 2                                 | 2           | 4          | <b>Minor</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**3C - LTTTHPS - Contact - Class V Passenger Vessel with Work Site**

| Hazard ID    | Hazard Title                                      | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely  | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|---|---|--|---|--|---|
| 3C - LTTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |              |
|-----------------------------------|-------------|------------|--------------|
| Severity                          | Probability | Risk Score | Risk Band    |
| 2                                 | 2           | 4          | <b>Minor</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Code of Practice Passenger Vessel Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 4C - LTTHPS - Contact - Private Leisure Vessel with Work Site

| Hazard ID   | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|---|---|--|---|---|--|
| 4C - LTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Low impact with no lasting effect (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 3                    | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 1                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |               |
|----------------------------|-------------|------------|---------------|
| Severity                   | Probability | Risk Score | Risk Band     |
| 1                          | 2           | 2          | <b>Slight</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 5C - LTTTHPS - Contact - Commercial freight with Work Site

| Hazard ID    | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 5C - LTTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**6C - LTTTHPS - Contact - Tug and Tow with Work Site**

| Hazard ID    | Hazard Title                         | Hazard Description   | Hazard Causes  | Consequence(s) Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|--------------------------------------|--|--|---|---|--|
| 6C - LTTTHPS | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7C - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|--|---|--|
| 7C - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Restricted work case</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Minor or superficial damage to vessel / equipment</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

| 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"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Post Control - People |             |            |           |
|-----------------------|-------------|------------|-----------|
| Severity              | Probability | Risk Score | Risk Band |
| 2                     | 2           | 4          | Minor     |

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

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

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

| Assessment Notes |
|------------------|
|                  |

## 8C - LTTTHPS - Mooring breakout

| Hazard ID    | Hazard Title     | Hazard Description  | Likely Hazard Causes   | Consequence(s)<br>Most Likely   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|------------------|---|--|---|--|---|
| 8C - LTTTHPS | Mooring breakout | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>Misjudgement</li> <li>Inattention</li> <li>Adverse weather conditions</li> <li>Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Tug Operator Procedures</li> <li>Emergency Plans &amp; Procedures</li> <li>Mooring Inspections</li> <li>Inspection Routine</li> <li>Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>Use of reputable marine contractors</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Assessment Notes  |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

**9C - LTTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)**

| Hazard ID    | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely   | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|--|---|--|--|---|---|
| 9C - LTTTHPS | Collision with High Speed Passenger Vessel (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• Tug Operator Procedures</li> <li>• Passage Planning</li> <li>• VTS Navigational Broadcast</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Thames AIS</li> <li>• HSC Code</li> <li>• VHF Communications</li> <li>• COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 10C - LTTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|---|--|--|---|---|
| 10C - LTTTHPS | Collision with Class V Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>High density of leisure traffic</li> <li>Inadequate training and experience</li> <li>Tidal set</li> <li>Collision avoidance</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>BML Local Knowledge Endorsement</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>VHF Communications</li> <li>Tug Operator Procedures</li> <li>General Directions</li> <li>Vessel Master Experience</li> <li>VTS Navigational Broadcast</li> <li>COLREGs</li> <li>Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 3           | 9          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>Port Entry Guide</li> <li>Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 11C - LTTGPS - Collision with Private Leisure Vessel (construction/deconstruction)

| Hazard ID    | Hazard Title  | Hazard Description   | Hazard Causes   | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|--|---|--|---|--|
| 11C - LTTGPS | Collision with Private Leisure Vessel (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Leisure traffic impedes the passage of vessel navigating the channel</li> <li>Collision avoidance</li> <li>High density of leisure traffic</li> <li>Machinery breakdown</li> <li>Change in river flow due to new in-river structure</li> <li>General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>BML Local Knowledge Endorsement</li> <li>Vessel Master Experience</li> <li>Qualified Crew</li> <li>VHF Communications</li> <li>VTS Navigational Broadcast</li> <li>Ship Towing Code of Practice</li> <li>Tug Operator Procedures</li> <li>COLREGs</li> <li>General Directions</li> <li>Admiralty Charts</li> <li>Perm / Temp Notice to Mariners</li> <li>Emergency Plans &amp; Procedures</li> <li>Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Use of reputable and experienced marine contractor</li> <li>Sub-Contractors Risk Assessment</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Berth Co-ordinator to monitor VHF</li> <li>CCTV to provide additional information to Berth Coordinator</li> <li>Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

#### 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      |

#### Relevant PLA Guidance

- 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
- River Thames Recreational Users Guide
- Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners
- Port Entry Guide

#### 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  |

#### Sub Contractors Risk Assessment

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. The assessment is to include (but is not limited to) the following activities:

- |                    |                                |
|--------------------|--------------------------------|
| Working at height  | Loading / Unloading operations |
| Lifting operations | Movement of materials          |
| Slips and trips    | Mooring                        |
| Fire safety        | Welfare Amenities              |

## 12C - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 12C - LTTTHPS | Collision with commercial freight operator (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Machinery breakdown</li> <li>Collision avoidance</li> <li>High density of leisure traffic</li> <li>Leisure traffic impedes the passage of vessel navigating the channel</li> <li>Change in river flow due to new in-river structure</li> <li>Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>Bridge Special Signal Lights</li> <li>Emergency Plans &amp; Procedures</li> <li>VTS Navigational Broadcast</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>Ship Towage Code of Practice</li> <li>BML Local Knowledge Endorsement</li> <li>Tug Operator Procedures</li> <li>Perm / Temp Notice to Mariners</li> <li>COLREGS</li> <li>General Directions</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 3                                | 4           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 3                             | 4           | 12         | <b>High</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 3           | 9          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 3           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 3           | 9          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 13C - LTTTHPS - Collision with Tug and Tow (construction/deconstruction)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Most Likely  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 13C - LTTTHPS | Collision with tug and tow (Construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Machinery breakdown</li> <li>Collision avoidance</li> <li>High density of leisure traffic</li> <li>Leisure traffic impedes the passage of vessel navigating the channel</li> <li>Change in river flow due to new in-river structure</li> <li>Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>Bridge Special Signal Lights</li> <li>Emergency Plans &amp; Procedures</li> <li>VTS Navigational Broadcast</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>Ship Towage Code of Practice</li> <li>BML Local Knowledge Endorsement</li> <li>Perm / Temp Notice to Mariners</li> <li>Tug Operator Procedures</li> <li>General Directions</li> <li>COLREGS</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

#### Pre Control - People

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 3        | 3           | 9          | <b>Moderate</b> |

#### Pre Control - Environment

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 2        | 4           | 8          | <b>Moderate</b> |

#### Pre Control - Operational Impact

| Severity | Probability | Risk Score | Risk Band   |
|----------|-------------|------------|-------------|
| 3        | 4           | 12         | <b>High</b> |

#### Pre Control - Media Attention

| Severity | Probability | Risk Score | Risk Band   |
|----------|-------------|------------|-------------|
| 3        | 4           | 12         | <b>High</b> |

#### 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 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       |
|----------|-------------|------------|-----------------|
| 3        | 3           | 9          | <b>Moderate</b> |

#### Post Control - Environment

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 2        | 3           | 6          | <b>Moderate</b> |

#### Post Control - Operational Impact

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 3        | 3           | 6          | <b>Moderate</b> |

#### Post Control - Media Attention

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 3        | 3           | 9          | <b>Moderate</b> |

#### Sub Contractors Risk Assessment

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. The assessment is to include (but is not limited to) the following activities:

- |                    |                                |
|--------------------|--------------------------------|
| Working at height  | Loading / Unloading operations |
| Lifting operations | Movement of materials          |
| Slips and trips    | Mooring                        |
| Fire safety        | Welfare Amenities              |

### 14C - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes   | Consequence(s)<br>Most Likely  | Existing Safeguards  | Proposed Additional Mitigation  |
|---------------|---------------|--|---|--|--|---|
| 14C - LTTTHPS | 14A - LTTTHPS | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/ deconstruction of the temporary cofferdam. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Ship Towage Operations on the Thames</li> <li>•Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>•Code of Practice for Craft Towage Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>•Port Entry Guide</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 15C - LTTTHPS - Collision with High Speed Passenger Vessel (delivery/material removal)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|--|---|--|--|--|--|
| 15C - LTTTHPS | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**16C - LTTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)**

| <b>Hazard ID</b>     | <b>Hazard Title</b>   | <b>Hazard Description</b>  | <b>Hazard Causes</b>                       | <b>Consequence(s)<br/>Most Likely</b>      | <b>Existing Safeguards</b>                 | <b>Proposed Additional Mitigation</b>      |
|----------------------|---|--|--|--|--|--|
| <b>16C - LTTTHPS</b> | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

**Pre Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Relevant PLA Guidance**

Not relevant for this phase of the project

**Post Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Sub Contractors Risk Assessment**

Not relevant for this phase of the project

### 17C - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|--|--|--|--|--|
| 17C - LTTTHPS | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 18C - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 18C - LTTTHPS    | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**19C - LTTTHPS - Collision with Tug and Tow (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>                                    | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Most Likely</i>          | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>  |
|------------------|--|---|--|--|--|--|
| 19C - LTTTHPS    | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a tug and tow in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | <ul style="list-style-type: none"> <li>Not relevant for this phase of the project</li> </ul> |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

### 20C - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description  | Hazard Causes                              | Consequence(s)<br>Most Likely              | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|---|--|--|--|--|
| 20C - LTTTHPS | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

## Annex E– Worst credible hazard log: Phase A - Construction of cofferdam

### E.1 Worst credible summary hazard list: Phase A - Construction of cofferdam

| Hazard Id | Hazard Title  | Hazard Description   | People | Environment | Operational | Media |
|-----------|---|--|--------|-------------|-------------|-------|
| 1D        | Increase in Flow  | Changes to the hydrodynamics of the river may affect passing vessels.  | 8      | 6           | 8           | 6     |
| 2D        | Contact - High Speed passenger vessel with work site                      | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.   | 10     | 6           | 8           | 10    |
| 3D        | Contact - Class V passenger vessel with work site                         | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 10     | 6           | 8           | 10    |
| 4D        | Contact - Private leisure vessel with work site                           | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 10     | 4           | 8           | 8     |
| 5D        | Contact - commercial freight with work site                               | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 8      | 6           | 8           | 8     |
| 6D        | Contact - Tug and Tow with work site                                      | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.   | 8      | 6           | 8           | 8     |
| 7D        | Grounding - All vessels due to 'Squat Effect'                             | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected.  | 6      | 4           | 6           | 6     |
| 8D        | Mooring breakout  | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.  | 6      | 4           | 6           | 4     |
| 9D        | Collision with High Speed Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | 10     | 4           | 10          | 10    |
| 10D       | Collision with Class V Passenger Vessel (Construction/ Deconstruction)    | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | 10     | 4           | 10          | 10    |

|     |  |  |     |     |     |     |
|-----|--|--|-----|-----|-----|-----|
| 11D | Collision with Private Leisure Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS.                          | 10  | 4   | 10  | 10  |
| 12D | Collision with commercial freight operator (Construction/ Deconstruction)                            | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.                     | 8   | 6   | 8   | 8   |
| 13D | Collision with tug and tow (Construction/ Deconstruction)  | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.   | 8   | 6   | 8   | 8   |
| 14D | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex.                   | 8   | 4   | 8   | 8   |
| 15D | Collision with High Speed Passenger Vessel (delivery/ material removal)                              | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | N/A | N/A | N/A | N/A |
| 16D | Collision with Class V Passenger Vessel (delivery/ material removal)                                 | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | N/A | N/A | N/A | N/A |
| 17D | Collision with Private Leisure Vessel (delivery/ material removal)                                   | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | N/A | N/A | N/A | N/A |
| 18D | Collision with commercial freight operator (delivery/ material removal)                              | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.                       | N/A | N/A | N/A | N/A |
| 19D | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                                       | N/A | N/A | N/A | N/A |
| 20D | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal)   | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex.                     | N/A | N/A | N/A | N/A |

### E.2 Most credible hazard list – Phase A: Construction of cofferdam

**1D - LTTTHPS - Increased Flow**

| <i>Hazard ID</i>    | <i>Hazard Title</i> | <i>Hazard Description</i>   | <i>Hazard Causes</i>  | <i>Consequence(s)<br/>Worst Credible</i>  | <i>Existing Safeguards</i>  | <i>Proposed Additional Mitigation</i>  |
|---------------------|---------------------|---|---|---|---|--|
| <b>1D - LTTTHPS</b> | Increase in Flow    | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>• Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>• A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| <b>Pre Control - People</b> |             |            |                 |
|-----------------------------|-------------|------------|-----------------|
| Severity                    | Probability | Risk Score | Risk Band       |
| 4                           | 2           | 8          | <b>Moderate</b> |

| <b>Pre Control - Environment</b> |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| <b>Pre Control - Operational Impact</b> |             |            |                 |
|---|-------------|------------|-----------------|
| Severity                                | Probability | Risk Score | Risk Band       |
| 4                                       | 2           | 8          | <b>Moderate</b> |

| <b>Pre Control - Media Attention</b> |             |            |                 |
|--------------------------------------|-------------|------------|-----------------|
| Severity                             | Probability | Risk Score | Risk Band       |
| 3                                    | 2           | 6          | <b>Moderate</b> |

| <b>Relevant PLA Guidance</b>   |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Pilotage Directions</li> <li>• Port Entry Guide</li> <li>• Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| <b>Post Control - People</b> |             |            |                 |
|------------------------------|-------------|------------|-----------------|
| Severity                     | Probability | Risk Score | Risk Band       |
| 4                            | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Environment</b> |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 2                                 | 3           | 6          | <b>Moderate</b> |

| <b>Post Control - Operational Impact</b> |             |            |                 |
|--|-------------|------------|-----------------|
| Severity                                 | Probability | Risk Score | Risk Band       |
| 4  | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Media Attention</b> |             |            |                 |
|---------------------------------------|-------------|------------|-----------------|
| Severity                              | Probability | Risk Score | Risk Band       |
| 3                                     | 2           | 6          | <b>Moderate</b> |

| <b>Assessment Notes</b>   |
|---|
| <ul style="list-style-type: none"> <li>• Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

## 2D - LTTTHPS- Contact - High Speed Passenger Vessel with Work Site

| Hazard ID    | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|--|--|--|--|--|---|
| 2D - LTTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

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

| 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 |
| 5                             | 3           | 15         | Extreme   |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

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

| 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 |
| 5                              | 2           | 10         | High      |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Working at height</td> <td style="width: 50%;">Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**3D - LTTTHPS - Contact - Class V Passenger Vessel with Work Site**

| Hazard ID    | Hazard Title                                      | Hazard Description  | Hazard Causes  | Consequence(s) Worst Credible  | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|---|---|--|--|--|---|
| 3D - LTTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Code of Practice Passenger Vessel Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**4D - LTTTHPS - Contact - Private Leisure Vessel with Work Site**

| Hazard ID    | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 4D - LTTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

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

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 5D - LTTTHPS - Contact - Commercial freight with Work Site

| Hazard ID    | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|--|---|--|
| 5D - LTTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 4                    | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 3                         | 3           | 9          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 6D - LTTTHPS - Contact - Tug and Tow with Work Site

| Hazard ID | Hazard Title                         | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|-----------|--------------------------------------|--|--|--|---|--|
| 6D - LTCW | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 4                    | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 3                         | 3           | 9          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7D - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s)<br>Most Likely   | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|---|---|--|
| 7D - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |              |
|---------------------------|-------------|------------|--------------|
| Severity                  | Probability | Risk Score | Risk Band    |
| 2                         | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 2           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 2           | 6          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Assessment Notes |
|------------------|
|                  |

## 8D - LTTTHPS - Mooring breakout

| Hazard ID    | Hazard Title     | Hazard Description  | Likely Hazard Causes   | Consequence(s)<br>Worst Credible  | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|------------------|---|--|---|--|---|
| 8D - LTTTHPS | Mooring breakout | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>Misjudgement</li> <li>Inattention</li> <li>Adverse weather conditions</li> <li>Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>Lost time injury / Moderate permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Tug Operator Procedures</li> <li>Emergency Plans &amp; Procedures</li> <li>Mooring Inspections</li> <li>Inspection Routine</li> <li>Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>Use of reputable marine contractors</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 2                             | 3           | 6          | <b>Moderate</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |              |
|--------------------------------|-------------|------------|--------------|
| Severity                       | Probability | Risk Score | Risk Band    |
| 2                              | 2           | 4          | <b>Minor</b> |

| Assessment Notes  |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

**9D - LTTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)**

| Hazard ID    | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|---|--|--|---|---|---|
| 9D - LTTTHPS | Collision with High Speed Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Very serious damage to vessel / equipment possible criminal proceedings</li> <li>• International coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• Tug Operator Procedures</li> <li>• Passage Planning</li> <li>• VTS Navigational Broadcast</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Thames AIS</li> <li>• HSC Code</li> <li>• VHF Communications</li> <li>• COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 5                                | 3           | 15         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

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

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |             |
|-----------------------------------|-------------|------------|-------------|
| Severity                          | Probability | Risk Score | Risk Band   |
| 5                                 | 2           | 10         | <b>High</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 10D - LTTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|---|--|---|---|---|
| 10D - LTTTHPS | Collision with Class V Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>High density of leisure traffic</li> <li>Inadequate training and experience</li> <li>Tidal set</li> <li>Collision avoidance</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Multiple fatalities</li> <li>Temporary effect / Minor effect to small area</li> <li>Very serious damage to vessel / equipment possible criminal proceedings</li> <li>International coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>BML Local Knowledge Endorsement</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>VHF Communications</li> <li>Tug Operator Procedures</li> <li>General Directions</li> <li>Vessel Master Experience</li> <li>VTS Navigational Broadcast</li> <li>COLREGs</li> <li>Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 5                                | 3           | 15         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>Port Entry Guide</li> <li>Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |             |
|-----------------------------------|-------------|------------|-------------|
| Severity                          | Probability | Risk Score | Risk Band   |
| 5                                 | 2           | 10         | <b>High</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**11D - LTTGPS - Collision with Private Leisure Vessel (construction/deconstruction)**

| Hazard ID    | Hazard Title   | Hazard Description  | Hazard Causes   | Consequence(s) Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|--|---|---|---|---|--|
| 11D - LTTGPS | Collision with Private Leisure Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Machinery breakdown</li> <li>• Change in river flow due to new in-river structure</li> <li>• General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Very serious damage to vessel / equipment possible criminal proceedings</li> <li>• International coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Vessel Master Experience</li> <li>• Qualified Crew</li> <li>• VHF Communications</li> <li>• VTS Navigational Broadcast</li> <li>• Ship Towing Code of Practice</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Admiralty Charts</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Berth Co-ordinator to monitor VHF</li> <li>• CCTV to provide additional information to Berth Coordinator</li> <li>• Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 5                                | 3           | 15         | <b>Extreme</b> |

| Post Control - Operational Impact |             |            |             |
|-----------------------------------|-------------|------------|-------------|
| Severity                          | Probability | Risk Score | Risk Band   |
| 5                                 | 2           | 10         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• River Byelaws 1978 (as amended)</li> <li>• Permanent Notice to Mariners</li> <li>• River Thames Recreational Users Guide</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**12D - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 12D - LTTTHPS | Collision with commercial freight operator (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 4                    | 4           | 16         | <b>Extreme</b> |

| Pre Control - Environment |             |            |             |
|---------------------------|-------------|------------|-------------|
| Severity                  | Probability | Risk Score | Risk Band   |
| 3                         | 4           | 12         | <b>High</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 4                                | 4           | 16         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 4                             | 4           | 16         | <b>Extreme</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment   |                                |                                |                   |                    |                       |             |                 |         |  |
|---|--------------------------------|--------------------------------|-------------------|--------------------|-----------------------|-------------|-----------------|---------|--|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table> | Working at height              | Loading / Unloading operations | Welfare Amenities | Lifting operations | Movement of materials | Fire safety | Slips and trips | Mooring |  |
| Working at height   | Loading / Unloading operations | Welfare Amenities              |                   |                    |                       |             |                 |         |  |
| Lifting operations  | Movement of materials          | Fire safety                    |                   |                    |                       |             |                 |         |  |
| Slips and trips   | Mooring                        |                                |                   |                    |                       |             |                 |         |  |

**13D - LTTTHPS - Collision with Tug and Tow (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s) Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 13D - LTTTHPS | Collision with tug and tow (Construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Tug Operator Procedures</li> <li>• General Directions</li> <li>• COLREGS</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |           |
|----------------------|-------------|------------|-----------|
| Severity             | Probability | Risk Score | Risk Band |
| 4                    | 4           | 16         | Extreme   |

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

| Pre Control - Operational Impact |             |            |           |
|----------------------------------|-------------|------------|-----------|
| Severity                         | Probability | Risk Score | Risk Band |
| 4                                | 4           | 16         | Extreme   |

| Pre Control - Media Attention |             |            |           |
|-------------------------------|-------------|------------|-----------|
| Severity                      | Probability | Risk Score | Risk Band |
| 4                             | 4           | 16         | Extreme   |

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

| 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 |
| 4                              | 2           | 8          | Moderate  |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 14D - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|---|---|---|
| 14D - LTTTHPS | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single fatality / Severe permanent partial injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 4                    | 4           | 16         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 4                                | 4           | 16         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 4                             | 4           | 16         | <b>Extreme</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Ship Towage Operations on the Thames</li> <li>• Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>• Code of Practice for Craft Towage Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**15D - LTTTHPS - Collision with High Speed Passenger Vessel (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 15D - LTTTHPS    | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

**Pre Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Pre Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Relevant PLA Guidance**

Not relevant for this phase of the project

**Post Control - People**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Environment**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Operational Impact**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Post Control - Media Attention**

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

**Sub Contractors Risk Assessment**

Not relevant for this phase of the project

### 16D - LTTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Worst Credible           | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|--|--|--|--|--|
| 16D - LTTTHPS | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 17D - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes                              | Consequence(s)<br>Worst Credible           | Existing Safeguards                        | Proposed Additional Mitigation             |
|---------------|---|--|--|--|--|--|
| 17D - LTTTHPS | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 18D - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s)<br/>Worst Credible</i>   | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 18D - LTTTHPS    | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

### 19D - LTTTHPS - Collision with Tug and Tow (delivery/material removal)

| <i>Hazard ID</i> | <i>Hazard Title</i>                                    | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s)<br/>Worst Credible</i>   | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 19D - LTTTHPS    | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a tug and tow in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

#### Pre Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Pre Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Relevant PLA Guidance

Not relevant for this phase of the project

#### Post Control - People

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Environment

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Operational Impact

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Post Control - Media Attention

| Severity     | Probability  | Risk Score   | Risk Band    |
|--------------|--------------|--------------|--------------|
| Not Assessed | Not Assessed | Not Assessed | Not Assessed |

#### Sub Contractors Risk Assessment

Not relevant for this phase of the project

**20D - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (delivery/material removal)**

| <b>Hazard ID</b>     | <b>Hazard Title</b>   | <b>Hazard Description</b>   | <b>Hazard Causes</b>                       | <b>Consequence(s) Worst Credible</b>       | <b>Existing Safeguards</b>                 | <b>Proposed Additional Mitigation</b>      |
|----------------------|---|---|--|--|--|--|
| <b>20D - LTTTHPS</b> | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

## Annex F– Worst credible hazard log: Phase B - Construction of drop shaft/culvert/connection

### F.1 Summary worst credible hazard list: Phase B - Construction of drop shaft/culvert/connections

| Hazard Id | Hazard Title   | Hazard Description  | Score – Post Mitigation |             |             |       |
|-----------|--|---|-------------------------|-------------|-------------|-------|
|           |  |   | People                  | Environment | Operational | Media |
| 1E        | Increase in Flow                                     | Changes to the hydrodynamics of the river may affect passing vessels.   | 8                       | 6           | 8           | 6     |
| 2E        | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                            | 10                      | 6           | 8           | 10    |
| 3E        | Contact - Class V passenger vessel with work site    | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                               | 10                      | 6           | 8           | 10    |
| 4E        | Contact - Private leisure vessel with work site      | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.         | 10                      | 4           | 8           | 8     |
| 5E        | Contact - commercial freight with work site          | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                                       | 8                       | 6           | 8           | 8     |
| 6E        | Contact - Tug and Tow with work site                 | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 8                       | 6           | 8           | 8     |
| 7E        | Grounding - All vessels due to 'Squat Effect'        | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | 6                       | 4           | 6           | 6     |
| 8E        | Mooring breakout                                     | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.                                       | 6                       | 4           | 6           | 4     |

|     |   |   |     |     |     |     |
|-----|---|---|-----|-----|-----|-----|
| 9E  | Collision with High Speed Passenger Vessel (construction/deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 10E | Collision with Class V Passenger Vessel (construction/deconstruction)                                 | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.  | N/A | N/A | N/A | N/A |
| 11E | Collision with Private Leisure Vessel (construction/deconstruction)                                   | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS.  | N/A | N/A | N/A | N/A |
| 12E | Collision with commercial freight operator (construction/deconstruction)                              | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 13E | Collision with tug and tow (construction/deconstruction)  | A vessel conducting Thames Tunnel construction/deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.   | N/A | N/A | N/A | N/A |
| 14E | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (construction/deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/deconstruction of the temporary cofferdam. | N/A | N/A | N/A | N/A |

|     |   |  |    |   |   |    |
|-----|---|--|----|---|---|----|
| 15E | Collision with High Speed Passenger Vessel (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers.     | 10 | 6 | 8 | 10 |
| 16E | Collision with Class V Passenger Vessel (delivery/ material removal)    | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | 10 | 6 | 8 | 10 |
| 17E | Collision with Private Leisure Vessel (delivery/ material removal)      | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | 10 | 4 | 8 | 8  |

|     |  |  |   |   |   |   |
|-----|--|--|---|---|---|---|
| 18E | Collision with commercial freight operator (delivery/ material removal)                            | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.   | 8 | 6 | 8 | 8 |
| 19E | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                   | 8 | 6 | 8 | 8 |
| 20E | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | 6 | 4 | 6 | 8 |

## F.2 Worst credible hazard list – Phase B: Construction of drop shaft/culvert/connections

### 1E - LTTTHPS - Increased Flow

| Hazard ID    | Hazard Title     | Hazard Description  | Hazard Causes   | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|------------------|---|---|---|---|--|
| 1E - LTTTHPS | Increase in Flow | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>Single Fatality / Severe permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 4                    | 2           | 8          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 4                                | 2           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 2           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Pilotage Directions</li> <li>Port Entry Guide</li> <li>Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Assessment Notes  |
|---|
| <ul style="list-style-type: none"> <li>Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

**2E - LTTTHPS - Contact - High Speed Passenger Vessel with Work Site**

| Hazard ID    | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards  | Proposed Additional Mitigation  |
|--------------|--|--|--|--|--|---|
| 2E - LTTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Code of Practice Passenger Vessel Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 Tunnel Project Team to conduct tug &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

### 3E - LTTHPS - Contact - Class V Passenger Vessel with Work Site

| Hazard ID   | Hazard Title                                      | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards  | Proposed Additional Mitigation  |
|-------------|---|---|--|--|--|---|
| 3E - LTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Permanent Notice to Mariners</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 Tunnel Project Team to conduct tug &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**4E - LTTTHPS - Contact - Private Leisure Vessel with Work Site**

| Hazard ID    | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|--------------|---|---|--|---|---|--|
| 4E - LTTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Mariners Guide to Bridges on the Tidal Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 Tunnel Project Team to conduct tug &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**5E - LTTHPS - Contact - Commercial freight with Work Site**

| Hazard ID   | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|---|---|--|--|---|--|
| 5E - LTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Severity | Probability | Risk Score | Risk Band   |
|----------|-------------|------------|-------------|
| 4        | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 3                         | 3           | 9          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

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

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 4        | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 Tunnel Project Team to conduct tug &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**6E - LTTHPS - Contact - Tug and Tow with Work Site**

| <b>Hazard ID</b>   | <b>Hazard Title</b>                  | <b>Hazard Description</b>  | <b>Hazard Causes</b>   | <b>Consequence(s)<br/>Worst Credible</b>   | <b>Existing Safeguards</b>  | <b>Proposed Additional Mitigation</b>  |
|--------------------|--------------------------------------|--|--|--|---|--|
| <b>6E - LTTHPS</b> | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Severity | Probability | Risk Score | Risk Band   |
|----------|-------------|------------|-------------|
| 4        | 3           | 12         | <b>High</b> |

| <b>Pre Control - Environment</b> |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| <b>Pre Control - Operational Impact</b> |             |            |             |
|---|-------------|------------|-------------|
| Severity                                | Probability | Risk Score | Risk Band   |
| 4                                       | 3           | 12         | <b>High</b> |

| <b>Pre Control - Media Attention</b> |             |            |             |
|--------------------------------------|-------------|------------|-------------|
| Severity                             | Probability | Risk Score | Risk Band   |
| 4                                    | 3           | 12         | <b>High</b> |

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

| Severity | Probability | Risk Score | Risk Band       |
|----------|-------------|------------|-----------------|
| 4        | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Environment</b> |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| <b>Post Control - Operational Impact</b> |             |            |                 |
|--|-------------|------------|-----------------|
| Severity                                 | Probability | Risk Score | Risk Band       |
| 4  | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Media Attention</b> |             |            |                 |
|---------------------------------------|-------------|------------|-----------------|
| Severity                              | Probability | Risk Score | Risk Band       |
| 4                                     | 2           | 8          | <b>Moderate</b> |

| <b>Sub Contractors Risk Assessment</b>   |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7E - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely  | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|---|---|--|
| 7E - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

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

| Post 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     |

| Post 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  |

| 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                             | 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"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Assessment Notes |
|------------------|
|                  |

**8E - LTTHPS - Mooring breakout**

| <i>Hazard ID</i>   | <i>Hazard Title</i> | <i>Hazard Description</i>   | <i>Likely Hazard Causes</i>  | <i>Consequence(s)<br/>Worst Credible</i>  | <i>Existing Safeguards</i>   | <i>Proposed Additional Mitigation</i>   |
|--------------------|---------------------|---|--|---|--|---|
| <b>8E - LTTHPS</b> | Mooring breakout    | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Tug Operator Procedures</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Mooring Inspections</li> <li>• Inspection Routine</li> <li>• Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable marine contractors</li> </ul> |

| <b>Pre Control - People</b> |             |            |                 |
|-----------------------------|-------------|------------|-----------------|
| Severity                    | Probability | Risk Score | Risk Band       |
| 3                           | 3           | 9          | <b>Moderate</b> |

| <b>Pre Control - Environment</b> |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 2                                | 3           | 6          | <b>Moderate</b> |

| <b>Pre Control - Operational Impact</b> |             |            |                 |
|---|-------------|------------|-----------------|
| Severity                                | Probability | Risk Score | Risk Band       |
| 3                                       | 3           | 9          | <b>Moderate</b> |

| <b>Pre Control - Media Attention</b> |             |            |                 |
|--------------------------------------|-------------|------------|-----------------|
| Severity                             | Probability | Risk Score | Risk Band       |
| 2                                    | 3           | 6          | <b>Moderate</b> |

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

| <b>Post Control - People</b> |             |            |                 |
|------------------------------|-------------|------------|-----------------|
| Severity                     | Probability | Risk Score | Risk Band       |
| 3                            | 2           | 6          | <b>Moderate</b> |

| <b>Post Control - Environment</b> |             |            |              |
|-----------------------------------|-------------|------------|--------------|
| Severity                          | Probability | Risk Score | Risk Band    |
| 2                                 | 2           | 4          | <b>Minor</b> |

| <b>Post Control - Operational Impact</b> |             |            |                 |
|--|-------------|------------|-----------------|
| Severity                                 | Probability | Risk Score | Risk Band       |
| 3  | 2           | 6          | <b>Moderate</b> |

| <b>Post Control - Media Attention</b> |             |            |              |
|---------------------------------------|-------------|------------|--------------|
| Severity                              | Probability | Risk Score | Risk Band    |
| 2                                     | 2           | 4          | <b>Minor</b> |

| <b>Assessment Notes</b>   |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

**9E - LTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)**

| <i>Hazard ID</i> | <i>Hazard Title</i>   | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|---|--|--|--|--|--|
| 9E - LTTHPS      | Collision with High Speed Passenger Vessel (construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <i>Relevant PLA Guidance</i>               |
|--|
| Not relevant for this phase of the project |

| <i>Sub Contractors Risk Assessment</i>     |
|--|
| Not relevant for this phase of the project |

**10F - LTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)**

| <i>Hazard ID</i>    | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|---------------------|--|---|--|--|--|--|
| <b>10E - LTTHPS</b> | Collision with Class V Passenger Vessel (construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <i>Relevant PLA Guidance</i>               |
|--|
| Not relevant for this phase of the project |

| <i>Sub Contractors Risk Assessment</i>     |
|--|
| Not relevant for this phase of the project |

**11E - LTTTHPS - Collision with Private Leisure Vessel (construction/deconstruction)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|--|---|--|--|--|--|
| <b>11E - LTTTHPS</b> | Collision with Private Leisure Vessel (construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a private leisure vessel in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**12E - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>   | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|---|--|--|--|--|--|
| <b>12E - LTTTHPS</b> | Collision with commercial freight operator (construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**13E - LTTTHPS - Collision with Tug and Tow (construction/deconstruction)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>                                       | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|---|--|--|--|--|--|
| <b>13E - LTTTHPS</b> | Collision with tug and tow (construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Chambers Wharf. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**14E - LTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)**

| <b>Hazard ID</b>    | <b>Hazard Title</b>   | <b>Hazard Description</b>   | <b>Hazard Causes</b>                       | <b>Consequence(s) Worst Credible</b>       | <b>Existing Safeguards</b>                 | <b>Proposed Additional Mitigation</b>      |
|---------------------|---|---|--|--|--|--|
| <b>14E - LTTHPS</b> | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (construction/deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/deconstruction of the temporary cofferdam. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**15E - LTTTHPS - Collision with High Speed Passenger Vessel (delivery/material removal)**

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s) Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|---|--|--|---|---|
| 15E - LTTTHPS | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• Tug Operator Procedures</li> <li>• Passage Planning</li> <li>• VTS Navigational Broadcast</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Thames AIS</li> <li>• HSC Code</li> <li>• VHF Communications</li> <li>• COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

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

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**16F - LTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)**

| Hazard ID    | Hazard Title  | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|---|---|--|--|---|---|
| 16E - LTTHPS | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Lack of communications</li> <li>Adverse weather conditions</li> <li>Machinery breakdown</li> <li>Inadequate training and experience</li> <li>Tug or line failure</li> <li>Collision avoidance</li> <li>Tidal set</li> <li>Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>Multiple fatalities</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Major damage to vessel / equipment and detention</li> <li>International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>Qualified Crew</li> <li>BML Local Knowledge Endorsement</li> <li>Thames AIS</li> <li>Passage Planning</li> <li>VHF Communications</li> <li>Tug Operator Procedures</li> <li>General Directions</li> <li>Vessel Master Experience</li> <li>VTS Navigational Broadcast</li> <li>COLREGs</li> <li>Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Sub-Contractors Risk Assessment</li> <li>Use of reputable and experienced marine contractor</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>Berth Co-ordinator to monitor VHF</li> </ul> |

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

| 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 |
| 5                             | 3           | 15         | Extreme   |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>Port Entry Guide</li> <li>Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

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

| 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 |
| 5                              | 2           | 10         | High      |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**17E - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes   | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|---------------|---|--|---|---|---|--|
| 17E - LTTTHPS | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Machinery breakdown</li> <li>• Change in river flow due to new in-river structure</li> <li>• General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Vessel Master Experience</li> <li>• Qualified Crew</li> <li>• VHF Communications</li> <li>• VTS Navigational Broadcast</li> <li>• Ship Towage Code of Practice</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Admiralty Charts</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Berth Co-ordinator to monitor VHF</li> <li>• CCTV to provide additional information to Berth Coordinator</li> <li>• Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• River Byelaws 1978 (as amended)</li> <li>• Permanent Notice to Mariners</li> <li>• River Thames Recreational Users Guide</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**18E - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)**

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|--|---|---|
| 18E - LTTTHPS | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

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

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

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

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

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

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

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

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

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**19E - LTTTHPS - Collision with Tug and Tow (delivery/material removal)**

| Hazard ID     | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|--|--|--|---|---|
| 19E - LTTTHPS | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Chambers Wharf. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

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

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

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

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

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

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

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

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

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**20E - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (delivery/material removal)**

| Hazard ID            | Hazard Title  | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|----------------------|---|---|--|--|---|---|
| <b>20E - LTTTHPS</b> | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 3           | 9          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Ship Towage Operations on the Thames</li> <li>•Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>•Code of Practice for Craft Towage Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>•Port Entry Guide</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

## Annex G– Worst credible hazard log: Phase C – Removal of of cofferdam

### G.1 Worst credible summary hazard list: Phase C - Removal of cofferdam

| Hazard Id | Hazard Title   | Hazard Description  | People | Environment | Operational | Media |
|-----------|--|---|--------|-------------|-------------|-------|
| 1F        | Increase in Flow                                     | Changes to the hydrodynamics of the river may affect passing vessels.   | 8      | 6           | 8           | 6     |
| 2F        | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                            | 10     | 6           | 8           | 10    |
| 3F        | Contact - Class V passenger vessel with work site    | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                               | 10     | 6           | 8           | 10    |
| 4F        | Contact - Private leisure vessel with work site      | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS.         | 10     | 4           | 8           | 8     |
| 5F        | Contact - commercial freight with work site          | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS.                                       | 8      | 6           | 8           | 8     |
| 6F        | Contact - Tug and Tow with work site                 | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS.  | 8      | 6           | 8           | 8     |
| 7F        | Grounding - All vessels due to 'Squat Effect'        | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | 6      | 4           | 6           | 6     |
| 8F        | Mooring breakout                                     | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings.                                       | 6      | 4           | 6           | 4     |

|     |  |   |    |   |    |    |
|-----|--|---|----|---|----|----|
| 9F  | Collision with High Speed Passenger Vessel (Construction/ Deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS.  | 10 | 4 | 10 | 10 |
| 10F | Collision with Class V Passenger Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.   | 10 | 4 | 10 | 10 |
| 11F | Collision with Class V Passenger Vessel (Construction/ Deconstruction)                                 | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.   | 10 | 4 | 10 | 10 |
| 12F | Collision with commercial freight operator (Construction/ Deconstruction)                              | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS.  | 8  | 6 | 8  | 8  |
| 13F | Collision with tug and tow (Construction/ Deconstruction)  | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS.  | 8  | 6 | 8  | 8  |
| 14F | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/ deconstruction of the temporary cofferdam. | 8  | 4 | 8  | 8  |

|     |   |  |     |     |     |     |
|-----|---|--|-----|-----|-----|-----|
| 15F | Collision with High Speed Passenger Vessel (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | N/A | N/A | N/A | N/A |
| 16F | Collision with Class V Passenger Vessel (delivery/ material removal)    | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS.                          | N/A | N/A | N/A | N/A |
| 17F | Collision with Private Leisure Vessel (delivery/ material removal)      | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS.                            | N/A | N/A | N/A | N/A |
| 18F | Collision with commercial freight operator (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS.                       | N/A | N/A | N/A | N/A |

|     |  |  |     |     |     |     |
|-----|--|--|-----|-----|-----|-----|
| 19F | Collision with tug and tow (delivery/ material removal)  | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities collides with a tug and tow in the vicinity of Heathwall PS.                   | N/A | N/A | N/A | N/A |
| 20F | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/ material removal) | A vessel conducting Thames Tideway Tunnel delivery/ material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | N/A | N/A | N/A | N/A |

## G.2 Worst credible hazard list – Phase C: Removal of cofferdam

### 1F - LTTHPS - Increased Flow

| Hazard ID   | Hazard Title     | Hazard Description  | Hazard Causes   | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|------------------|---|---|---|---|--|
| 1F - LTTHPS | Increase in Flow | Changes to the hydrodynamics of the river may affect passing vessels. | <ul style="list-style-type: none"> <li>Shape and position of temporary cofferdam</li> </ul> | <ul style="list-style-type: none"> <li>Single Fatality / Severe permanent partial disability injury</li> <li>Temporary effect / Minor effect to small area (Environmental)</li> <li>Moderate damage to vessel / equipment requiring immediate repairs</li> <li>Regional Coverage</li> </ul> | <ul style="list-style-type: none"> <li>None identified for this hazard</li> </ul> | <ul style="list-style-type: none"> <li>A Notice to Mariners to advice of any increases in river flow.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 4                    | 2           | 8          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 4                                | 2           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 2           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>Pilotage Directions</li> <li>Port Entry Guide</li> <li>Mariners Guide to Bridges on the Tidal Thames</li> </ul> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 2                          | 3           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Assessment Notes  |
|---|
| <ul style="list-style-type: none"> <li>Changes in flow at this site expected to be minimal due to size of the structure at river width</li> </ul> |

**2F - LTTHPS - Contact - High Speed Passenger Vessel with Work Site**

| Hazard ID   | Hazard Title   | Hazard Description   | Hazard Causes  | Consequence(s) Worst Credible  | Existing Safeguards  | Proposed Additional Mitigation  |
|-------------|--|--|--|--|--|---|
| 2F - LTTHPS | Contact - High Speed passenger vessel with work site | A High Speed passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Code of Practice Passenger Vessel Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**3F - LTTHPS - Contact - Class V Passenger Vessel with Work Site**

| Hazard ID   | Hazard Title                                      | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards  | Proposed Additional Mitigation  |
|-------------|---|---|--|--|--|---|
| 3F - LTTHPS | Contact - Class V passenger vessel with work site | A Class V passenger vessel comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• International Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• VTS Navigational Broadcast</li> <li>• HSC Code</li> <li>• Passage Planning</li> <li>• COLREGs</li> <li>• VHF Communications</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing commercial operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Permanent Notice to Mariners</li> <li>•Code of Practice Passenger Vessel Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> </ul> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**4F - LTTHPS - Contact - Private Leisure Vessel with Work Site**

| Hazard ID   | Hazard Title                                    | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|---|---|--|---|---|--|
| 4F - LTTHPS | Contact - Private leisure vessel with work site | Private leisure vessels, including narrow boats, comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Aids to Navigation</li> <li>• VHF Communications</li> <li>• COLREGs</li> <li>• General Directions</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• VTS Navigational Broadcast</li> </ul> | <ul style="list-style-type: none"> <li>• Regular 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.</li> <li>• Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

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

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**5F - LTTHPS - Contact - Commercial freight with Work Site**

| Hazard ID   | Hazard Title                                | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|---|---|--|--|---|--|
| 5F - LTTHPS | Contact - commercial freight with work site | Commercial freight comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| 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 |
| 4                             | 3           | 12         | High      |

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

| 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 |
| 4                              | 2           | 8          | Moderate  |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**6F - LTTHPS - Contact - Tug and Tow with Work Site**

| Hazard ID   | Hazard Title                         | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|-------------|--------------------------------------|--|--|--|---|--|
| 6F - LTTHPS | Contact - Tug and Tow with work site | A Tug and Tow comes into contact with Thames Tideway Tunnel work site at Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> <li>• Aids to Navigation</li> <li>• Passage Planning</li> <li>• Ship Towing Code of Practice</li> <li>• COLREGs</li> <li>• Oil Spill Contingency Plan</li> <li>• Tug Operator Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Regular communication between Thames Tideway Tunnel marine contractors and existing freight operators.</li> <li>• 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.</li> <li>• Sub-Contractors Risk Assessment.</li> </ul> |

| Pre Control - People |             |            |             |
|----------------------|-------------|------------|-------------|
| Severity             | Probability | Risk Score | Risk Band   |
| 4                    | 3           | 12         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 3                         | 3           | 9          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |             |
|----------------------------------|-------------|------------|-------------|
| Severity                         | Probability | Risk Score | Risk Band   |
| 4                                | 3           | 12         | <b>High</b> |

| Pre Control - Media Attention |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Severity                      | Probability | Risk Score | Risk Band   |
| 4                             | 3           | 12         | <b>High</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**7F - LTTHPS - Vessels subject to increased interaction during periods of low water**

| Hazard ID   | Hazard Title                                  | Hazard Description  | Hazard Causes  | Consequence(s) Most Likely  | Existing Safeguards   | Proposed Additional Safeguards   |
|-------------|---|---|--|---|---|--|
| 7F - LTTHPS | Grounding - All vessels due to 'Squat Effect' | At periods of low water, vessels may be affected by the 'Squat Effect', causing them to be closer to the river bed than expected. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Permanent / Temporary Notice to Mariners</li> </ul> | <ul style="list-style-type: none"> <li>• No additional safeguards identified for this potential hazard for this site.</li> </ul> |

| Pre Control - People |             |            |                 |
|----------------------|-------------|------------|-----------------|
| Severity             | Probability | Risk Score | Risk Band       |
| 3                    | 2           | 6          | <b>Moderate</b> |

| Pre Control - Environment |             |            |              |
|---------------------------|-------------|------------|--------------|
| Severity                  | Probability | Risk Score | Risk Band    |
| 2                         | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 2           | 6          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                 |
|-------------------------------|-------------|------------|-----------------|
| Severity                      | Probability | Risk Score | Risk Band       |
| 3                             | 2           | 6          | <b>Moderate</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 3                     | 2           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 3                              | 2           | 6          | <b>Moderate</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•MCA Guidance document – Dangers of interaction - MGN 199 (M)</li> </ul> |

| Assessment Notes |
|------------------|
|                  |

**8F - LTTTHPS - Mooring breakout**

| <i>Hazard ID</i>    | <i>Hazard Title</i> | <i>Hazard Description</i>   | <i>Likely Hazard Causes</i>  | <i>Consequence(s)<br/>Worst Credible</i>  | <i>Existing Safeguards</i>   | <i>Proposed Additional Mitigation</i>   |
|---------------------|---------------------|---|--|---|--|---|
| <b>8F - LTTTHPS</b> | Mooring breakout    | A vessel involved in Thames Tideway Tunnel activities breaks free temporary/layup moorings. | <ul style="list-style-type: none"> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Adverse weather conditions</li> <li>• Equipment failure (ropes/wires)</li> </ul> | <ul style="list-style-type: none"> <li>• Lost time injury / Moderate permanent partial disability injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Moderate damage to vessel / equipment requiring immediate repairs</li> <li>• Local Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Tug Operator Procedures</li> <li>• Emergency Plans &amp; Procedures</li> <li>• Mooring Inspections</li> <li>• Inspection Routine</li> <li>• Qualified Crew</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable marine contractors</li> </ul> |

| <b>Pre Control - People</b> |             |            |             |
|-----------------------------|-------------|------------|-------------|
| Severity                    | Probability | Risk Score | Risk Band   |
| 4                           | 3           | 12         | <b>High</b> |

| <b>Pre Control - Environment</b> |             |            |                 |
|----------------------------------|-------------|------------|-----------------|
| Severity                         | Probability | Risk Score | Risk Band       |
| 3                                | 3           | 9          | <b>Moderate</b> |

| <b>Pre Control - Operational Impact</b> |             |            |             |
|---|-------------|------------|-------------|
| Severity                                | Probability | Risk Score | Risk Band   |
| 4                                       | 3           | 12         | <b>High</b> |

| <b>Pre Control - Media Attention</b> |             |            |                 |
|--------------------------------------|-------------|------------|-----------------|
| Severity                             | Probability | Risk Score | Risk Band       |
| 3                                    | 3           | 9          | <b>Moderate</b> |

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

| <b>Post Control - People</b> |             |            |                 |
|------------------------------|-------------|------------|-----------------|
| Severity                     | Probability | Risk Score | Risk Band       |
| 4                            | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Environment</b> |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 3                                 | 2           | 6          | <b>Moderate</b> |

| <b>Post Control - Operational Impact</b> |             |            |                 |
|--|-------------|------------|-----------------|
| Severity                                 | Probability | Risk Score | Risk Band       |
| 4  | 2           | 8          | <b>Moderate</b> |

| <b>Post Control - Media Attention</b> |             |            |                 |
|---------------------------------------|-------------|------------|-----------------|
| Severity                              | Probability | Risk Score | Risk Band       |
| 3                                     | 2           | 6          | <b>Moderate</b> |

| <b>Assessment Notes</b>   |
|---|
| <p>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 &amp; barge operations and berth / jetty management activities.</p> |

**9F - LTTHPS - Collision with High Speed Passenger Vessel (construction/deconstruction)**

| Hazard ID   | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s) Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|-------------|--|---|--|---|---|---|
| 9F - LTTHPS | Collision with High Speed Passenger Vessel (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Very serious damage to vessel / equipment possible criminal proceedings</li> <li>• International coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• Tug Operator Procedures</li> <li>• Passage Planning</li> <li>• VTS Navigational Broadcast</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Thames AIS</li> <li>• HSC Code</li> <li>• VHF Communications</li> <li>• COLREGs</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 5                                | 3           | 15         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

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

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Post Control - Operational Impact |             |            |             |
|-----------------------------------|-------------|------------|-------------|
| Severity                          | Probability | Risk Score | Risk Band   |
| 5                                 | 2           | 10         | <b>High</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**10F - LTTTHPS- Collision with Class V Passenger Vessel (construction/deconstruction)**

| Hazard ID     | Hazard Title   | Hazard Description  | Hazard Causes  | Consequence(s)<br>Worst Credible  | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|--|---|--|---|---|---|
| 10F - LTTTHPS | Collision with Class V Passenger Vessel (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• High density of leisure traffic</li> <li>• Inadequate training and experience</li> <li>• Tidal set</li> <li>• Collision avoidance</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Multiple fatalities</li> <li>• Temporary effect / Minor effect to small area</li> <li>• Very serious damage to vessel / equipment possible criminal proceedings</li> <li>• International coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• BML Local Knowledge Endorsement</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• VHF Communications</li> <li>• Tug Operator Procedures</li> <li>• General Directions</li> <li>• Vessel Master Experience</li> <li>• VTS Navigational Broadcast</li> <li>• COLREGs</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

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

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

| 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 |
| 5                                | 3           | 15         | Extreme   |

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

| Pre Control - Media Attention |             |            |           |
|-------------------------------|-------------|------------|-----------|
| Severity                      | Probability | Risk Score | Risk Band |
| 5                             | 3           | 15         | Extreme   |

| Post Control - Media Attention |             |            |           |
|--------------------------------|-------------|------------|-----------|
| Severity                       | Probability | Risk Score | Risk Band |
| 5                              | 2           | 10         | High      |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>• General Directions for Navigation in the Port of London</li> <li>• Schedule to the General Directions for Navigation in the Port of London</li> <li>• Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>• Port Entry Guide</li> <li>• Code of Practice Passenger Vessel Operations on the Thames</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**11F - LTTTHPS - Collision with Private Leisure Vessel (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes   | Consequence(s) Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation   |
|---------------|---|--|---|---|---|--|
| 11F - LTTTHPS | Collision with Private Leisure Vessel (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/deconstruction activities collides with a private leisure vessel in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>Reduced effective river width</li> <li>Misjudgement</li> <li>Inattention</li> <li>Non Compliance with procedures</li> <li>Improper lookout</li> <li>Lack of communications</li> <li>Leisure traffic impedes the passage of vessel navigating the channel</li> <li>Collision avoidance</li> <li>High density of leisure traffic</li> <li>Machinery breakdown</li> <li>Change in river flow due to new in-river structure</li> <li>General lack of marine knowledge</li> </ul> | <ul style="list-style-type: none"> <li>Multiple fatalities</li> <li>Temporary effect / Minor effect to small area</li> <li>Very serious damage to vessel / equipment possible criminal proceedings</li> <li>International coverage</li> </ul> | <ul style="list-style-type: none"> <li>Boat Masters Licence</li> <li>BML Local Knowledge Endorsement</li> <li>Vessel Master Experience</li> <li>Qualified Crew</li> <li>VHF Communications</li> <li>VTS Navigational Broadcast</li> <li>Ship Towage Code of Practice</li> <li>Tug Operator Procedures</li> <li>COLREGs</li> <li>General Directions</li> <li>Admiralty Charts</li> <li>Perm / Temp Notice to Mariners</li> <li>Emergency Plans &amp; Procedures</li> <li>Aids to Navigation</li> </ul> | <ul style="list-style-type: none"> <li>Light Warnings - providing visual warning that barge is about to depart berth</li> <li>Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>Use of reputable and experienced marine contractor</li> <li>Sub-Contractors Risk Assessment</li> <li>Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>Berth Co-ordinator to monitor VHF</li> <li>CCTV to provide additional information to Berth Coordinator</li> <li>Temporary Notice to Mariners - providing notice that construction activities are being conducted in the area</li> <li>Information provided to local recreational clubs and marinas providing an overview of the works being conducted and expected duration</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 5                    | 3           | 15         | <b>Extreme</b> |

| Post Control - People |             |            |             |
|-----------------------|-------------|------------|-------------|
| Severity              | Probability | Risk Score | Risk Band   |
| 5                     | 2           | 10         | <b>High</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 3           | 6          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 5                                | 3           | 15         | <b>Extreme</b> |

| Post Control - Operational Impact |             |            |             |
|-----------------------------------|-------------|------------|-------------|
| Severity                          | Probability | Risk Score | Risk Band   |
| 5                                 | 2           | 10         | <b>High</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 5                             | 3           | 15         | <b>Extreme</b> |

| Post Control - Media Attention |             |            |             |
|--------------------------------|-------------|------------|-------------|
| Severity                       | Probability | Risk Score | Risk Band   |
| 5                              | 2           | 10         | <b>High</b> |

| Relevant PLA Guidance  |
|--|
| <ul style="list-style-type: none"> <li>General Directions for Navigation in the Port of London</li> <li>Schedule to the General Directions for Navigation in the Port of London</li> <li>River Byelaws 1978 (as amended)</li> <li>Permanent Notice to Mariners</li> <li>River Thames Recreational Users Guide</li> <li>Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>Port Entry Guide</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**12F - LTTTHPS - Collision with Commercial Freight Operator (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|--|--|--|---|---|
| 12F - LTTTHPS | Collision with commercial freight operator (Construction/ Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities collides with a commercial freight operator in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Tug Operator Procedures</li> <li>• Perm / Temp Notice to Mariners</li> <li>• COLREGS</li> <li>• General Directions</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 4                    | 4           | 16         | <b>Extreme</b> |

| Pre Control - Environment |             |            |             |
|---------------------------|-------------|------------|-------------|
| Severity                  | Probability | Risk Score | Risk Band   |
| 3                         | 4           | 12         | <b>High</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 4                                | 4           | 16         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 4                             | 4           | 16         | <b>Extreme</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment   |                                |                                |                   |                    |                       |             |                 |         |  |
|---|--------------------------------|--------------------------------|-------------------|--------------------|-----------------------|-------------|-----------------|---------|--|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> <td>Welfare Amenities</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> <td>Fire safety</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> <td></td> </tr> </table> | Working at height              | Loading / Unloading operations | Welfare Amenities | Lifting operations | Movement of materials | Fire safety | Slips and trips | Mooring |  |
| Working at height   | Loading / Unloading operations | Welfare Amenities              |                   |                    |                       |             |                 |         |  |
| Lifting operations  | Movement of materials          | Fire safety                    |                   |                    |                       |             |                 |         |  |
| Slips and trips   | Mooring                        |                                |                   |                    |                       |             |                 |         |  |

**13F - LTTHPS - Collision with Tug and Tow (construction/deconstruction)**

| Hazard ID    | Hazard Title  | Hazard Description   | Hazard Causes  | Consequence(s)<br>Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|--------------|---|--|--|--|---|---|
| 13F - LTTHPS | Collision with tug and tow (Construction/ Deconstruction) | A vessel conducting Thames Tunnel construction/ deconstruction activities collides with a tug and tow in the vicinity of Heathwall PS. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Improper lookout</li> <li>• Lack of communications</li> <li>• Machinery breakdown</li> <li>• Collision avoidance</li> <li>• High density of leisure traffic</li> <li>• Leisure traffic impedes the passage of vessel navigating the channel</li> <li>• Change in river flow due to new in-river structure</li> <li>• Tidal set</li> </ul> | <ul style="list-style-type: none"> <li>• Single Fatality / Severe permanent partial disability injury</li> <li>• Short to medium term impact (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• Qualified Crew</li> <li>• Bridge Special Signal Lights</li> <li>• Emergency Plans &amp; Procedures</li> <li>• VTS Navigational Broadcast</li> <li>• Thames AIS</li> <li>• Passage Planning</li> <li>• Ship Towage Code of Practice</li> <li>• BML Local Knowledge Endorsement</li> <li>• Perm / Temp Notice to Mariners</li> <li>• Tug Operator Procedures</li> <li>• General Directions</li> <li>• COLREGS</li> </ul> | <ul style="list-style-type: none"> <li>• Light Warnings - providing visual warning that barge is about to depart berth</li> <li>• Sound Warnings - providing audio warning that barge is about to depart berth</li> <li>• Sub-Contractors Risk Assessment</li> <li>• Use of reputable and experienced marine contractor</li> <li>• Berth Co-ordinator – Responsible for Kirtling Street and Heathwall PS</li> <li>• Provision of Thames AIS receiver at berth location - providing greater visibility of vessels in near vicinity</li> <li>• Berth Co-ordinator to monitor VHF</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 4                    | 4           | 16         | <b>Extreme</b> |

| Pre Control - Environment |             |            |             |
|---------------------------|-------------|------------|-------------|
| Severity                  | Probability | Risk Score | Risk Band   |
| 3                         | 4           | 12         | <b>High</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 4                                | 4           | 16         | <b>Extreme</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 4                             | 4           | 16         | <b>Extreme</b> |

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

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |                 |
|----------------------------|-------------|------------|-----------------|
| Severity                   | Probability | Risk Score | Risk Band       |
| 3                          | 2           | 6          | <b>Moderate</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**14F - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (construction/deconstruction)**

| Hazard ID     | Hazard Title  | Hazard Description  | Hazard Causes  | Consequence(s) Worst Credible   | Existing Safeguards   | Proposed Additional Mitigation  |
|---------------|---|---|--|---|---|---|
| 14F - LTTTHPS | Contact with a house boat at Nine Elms Pier or Nine Elms Marina complex (Construction/Deconstruction) | A vessel conducting Thames Tideway Tunnel construction/ deconstruction activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex during the construction/ deconstruction of the temporary cofferdam. | <ul style="list-style-type: none"> <li>• Reduced effective river width</li> <li>• Misjudgement</li> <li>• Inattention</li> <li>• Non Compliance with procedures</li> <li>• Lack of communications</li> <li>• Adverse weather conditions</li> <li>• Machinery breakdown</li> <li>• Inadequate training and experience</li> <li>• Tug or line failure</li> <li>• Collision avoidance</li> <li>• Tidal set</li> <li>• Change in river flow due to new in-river structure</li> </ul> | <ul style="list-style-type: none"> <li>• Single fatality / Severe permanent partial injury</li> <li>• Temporary effect / Minor effect to small area (Environmental)</li> <li>• Major damage to vessel / equipment and detention</li> <li>• National Coverage</li> </ul> | <ul style="list-style-type: none"> <li>• Boat Masters Licence</li> <li>• BML Local Knowledge Endorsement</li> <li>• General Directions</li> <li>• PLA Bridge Guide</li> <li>• Passage Planning</li> <li>• Accurate Tidal Information</li> <li>• Qualified Crew</li> <li>• Vessel Master Experience</li> <li>• Tug Operator Procedures</li> <li>• COLREGs</li> <li>• Ship Towage Code of Practice</li> <li>• Emergency Plans &amp; Procedures</li> </ul> | <ul style="list-style-type: none"> <li>• Use of reputable and experienced marine contractor</li> <li>• Sub-Contractors Risk Assessment</li> </ul> |

| Pre Control - People |             |            |                |
|----------------------|-------------|------------|----------------|
| Severity             | Probability | Risk Score | Risk Band      |
| 4                    | 4           | 16         | <b>Extreme</b> |

| Post Control - People |             |            |                 |
|-----------------------|-------------|------------|-----------------|
| Severity              | Probability | Risk Score | Risk Band       |
| 4                     | 2           | 8          | <b>Moderate</b> |

| Pre Control - Environment |             |            |                 |
|---------------------------|-------------|------------|-----------------|
| Severity                  | Probability | Risk Score | Risk Band       |
| 2                         | 4           | 8          | <b>Moderate</b> |

| Post Control - Environment |             |            |              |
|----------------------------|-------------|------------|--------------|
| Severity                   | Probability | Risk Score | Risk Band    |
| 2                          | 2           | 4          | <b>Minor</b> |

| Pre Control - Operational Impact |             |            |                |
|----------------------------------|-------------|------------|----------------|
| Severity                         | Probability | Risk Score | Risk Band      |
| 4                                | 4           | 16         | <b>Extreme</b> |

| Post Control - Operational Impact |             |            |                 |
|-----------------------------------|-------------|------------|-----------------|
| Severity                          | Probability | Risk Score | Risk Band       |
| 4                                 | 2           | 8          | <b>Moderate</b> |

| Pre Control - Media Attention |             |            |                |
|-------------------------------|-------------|------------|----------------|
| Severity                      | Probability | Risk Score | Risk Band      |
| 4                             | 4           | 16         | <b>Extreme</b> |

| Post Control - Media Attention |             |            |                 |
|--------------------------------|-------------|------------|-----------------|
| Severity                       | Probability | Risk Score | Risk Band       |
| 4                              | 2           | 8          | <b>Moderate</b> |

| Relevant PLA Guidance   |
|---|
| <ul style="list-style-type: none"> <li>•General Directions for Navigation in the Port of London</li> <li>•Schedule to the General Directions for Navigation in the Port of London</li> <li>•Ship Towage Operations on the Thames</li> <li>•Code of Practice for the Safe Mooring of Vessels on the Thames</li> <li>•Code of Practice for Craft Towage Operations on the Thames</li> <li>•Navigational Risk Assessments in the Port of London - Guidance to Operators and Owners</li> <li>•Port Entry Guide</li> </ul> |

| Sub Contractors Risk Assessment  |                                |                                |                    |                       |                 |         |             |                   |
|--|--------------------------------|--------------------------------|--------------------|-----------------------|-----------------|---------|-------------|-------------------|
| <p>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 &amp; barge operations and berth / jetty management activities. The assessment is to include (but is not limited to) the following activities:</p> <table border="0"> <tr> <td>Working at height</td> <td>Loading / Unloading operations</td> </tr> <tr> <td>Lifting operations</td> <td>Movement of materials</td> </tr> <tr> <td>Slips and trips</td> <td>Mooring</td> </tr> <tr> <td>Fire safety</td> <td>Welfare Amenities</td> </tr> </table> | Working at height              | Loading / Unloading operations | Lifting operations | Movement of materials | Slips and trips | Mooring | Fire safety | Welfare Amenities |
| Working at height  | Loading / Unloading operations |                                |                    |                       |                 |         |             |                   |
| Lifting operations   | Movement of materials          |                                |                    |                       |                 |         |             |                   |
| Slips and trips  | Mooring                        |                                |                    |                       |                 |         |             |                   |
| Fire safety  | Welfare Amenities              |                                |                    |                       |                 |         |             |                   |

**15F - LTTHPS - Collision with High Speed Passenger Vessel (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 15F - LTTHPS     | Collision with High Speed Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a High Speed Passenger Vessel (e.g. Thames Clipper) in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**16F - LTTHPS- Collision with Class V Passenger Vessel (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>   | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|---|--|--|--|--|--|
| 16F - LTTHPS     | Collision with Class V Passenger Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a Class V passenger vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**17F - LTTTHPS - Collision with Private Leisure Vessel (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>   | <i>Hazard Description</i>  | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|---|--|--|--|--|--|
| 17F - LTTTHPS    | Collision with Private Leisure Vessel (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a private leisure vessel in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**18F - LTTTHPS - Collision with Commercial Freight Operator (delivery/material removal)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>  | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|--|---|--|--|--|--|
| <b>18F - LTTTHPS</b> | Collision with commercial freight operator (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a commercial freight operator in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**19F - LTTTHPS - Collision with Tug and Tow (delivery/material removal)**

| <i>Hazard ID</i> | <i>Hazard Title</i>                                    | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|------------------|--|---|--|--|--|--|
| 19F - LTTTHPS    | Collision with tug and tow (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities collides with a tug and tow in the vicinity of Heathwall PS. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

**20F - LTTTHPS - Contact with Cherry Gardens Pier or the Floating Gardens (delivery/material removal)**

| <i>Hazard ID</i>     | <i>Hazard Title</i>   | <i>Hazard Description</i>   | <i>Hazard Causes</i>                       | <i>Consequence(s) Worst Credible</i>       | <i>Existing Safeguards</i>                 | <i>Proposed Additional Mitigation</i>      |
|----------------------|---|---|--|--|--|--|
| <b>20F - LTTTHPS</b> | Contact with House Boat at Nine Elms Pier or Nine Elms Marina complex (delivery/material removal) | A vessel conducting Thames Tideway Tunnel delivery/material removal activities makes contact with a house boat at Nine Elms Pier or Nine Elms Marina complex. | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project | Not relevant for this phase of the project |

| <b>Pre Control - People</b> |              |              |              |
|-----------------------------|--------------|--------------|--------------|
| Severity                    | Probability  | Risk Score   | Risk Band    |
| Not Assessed                | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - People</b> |              |              |              |
|------------------------------|--------------|--------------|--------------|
| Severity                     | Probability  | Risk Score   | Risk Band    |
| Not Assessed                 | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Environment</b> |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| Severity                         | Probability  | Risk Score   | Risk Band    |
| Not Assessed                     | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Environment</b> |              |              |              |
|-----------------------------------|--------------|--------------|--------------|
| Severity                          | Probability  | Risk Score   | Risk Band    |
| Not Assessed                      | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Operational Impact</b> |              |              |              |
|---|--------------|--------------|--------------|
| Severity                                | Probability  | Risk Score   | Risk Band    |
| Not Assessed                            | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Operational Impact</b> |              |              |              |
|--|--------------|--------------|--------------|
| Severity                                 | Probability  | Risk Score   | Risk Band    |
| Not Assessed                             | Not Assessed | Not Assessed | Not Assessed |

| <b>Pre Control - Media Attention</b> |              |              |              |
|--------------------------------------|--------------|--------------|--------------|
| Severity                             | Probability  | Risk Score   | Risk Band    |
| Not Assessed                         | Not Assessed | Not Assessed | Not Assessed |

| <b>Post Control - Media Attention</b> |              |              |              |
|---------------------------------------|--------------|--------------|--------------|
| Severity                              | Probability  | Risk Score   | Risk Band    |
| Not Assessed                          | Not Assessed | Not Assessed | Not Assessed |

| <b>Relevant PLA Guidance</b>               |
|--|
| Not relevant for this phase of the project |

| <b>Sub Contractors Risk Assessment</b>     |
|--|
| Not relevant for this phase of the project |

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A decorative graphic at the bottom of the page consisting of several overlapping, wavy, organic shapes in various shades of green, ranging from a light lime green to a dark forest green. The shapes flow from the left side towards the right, creating a sense of movement and depth.