SILVERTOWN TUNNEL

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CoCP Passage Plan (including Navigational Risk Assessment)

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P01	24/08/2020	First Issue – Draft submission	n/a
P02	07/09/2020	Updated NRA – Draft submission	Appendix C
P03	23/09/2020	Comments from PLA and TfL addressed. Final submission	Introduction; section 3.7.1. Appendix A removed.

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1. Introduction

The Silvertown Tunnel scheme (STT) will link South East London to East London from the North Greenwich area to the Royal Victoria Dock area. This river tunnel will reduce congestion at the Blackwall Tunnel, supporting environmental improvement and economic growth for east London. STT involves construction of a twin-bore road tunnel c. 1.4km long, accommodating large vehicles including double-deck buses. It will include a dedicated bus, coach and goods vehicle lane, enabling TfL to provide additional cross-river bus routes. TfL will deliver STT through a private finance contract, which best meets the project objectives and constraints.

The Project Co will be responsible for the detailed design, construction, financing and maintenance of the tunnel and supporting infrastructure for 25 years. The Project Co have engaged Riverlinx CJV as their construction joint venture for design and construction.

Works will be achieved ensuring minimal disruption and impact to stakeholders and the public at large. This plan will set out how Riverlinx CJV will ensure our obligations to the DCO and specific Transferred Functions are achieved.

This document is intended to meet the obligations of the DCO and the requirement within the CoCP to submit a Passage Plan with the following content *"to establish cycle times for loading, unloading and both journeys for vessels in relation to tides and will permit informed decision regarding the number of vessels required to meet the production rates achieved for the TBM and civil works, and will include an updated navigational risk assessment which will reflect the findings and recommendations of the Navigational Issues and Preliminary Risk Assessment submitted with the application. To make provision in respect of the River Thames that is equivalent to the provision in respect of the River Thames that is equivalent to the provision for dry land in the Emergency Plan".*

2. Contract Area

Site	Usage
North	London Borough of Newham – Launch Chamber, Approach Structures, Highway Realignments and Tie-in
South	Royal Borough of Greenwich – Rotation Chamber, Approach Structures, Highways Realignment and Tie-in

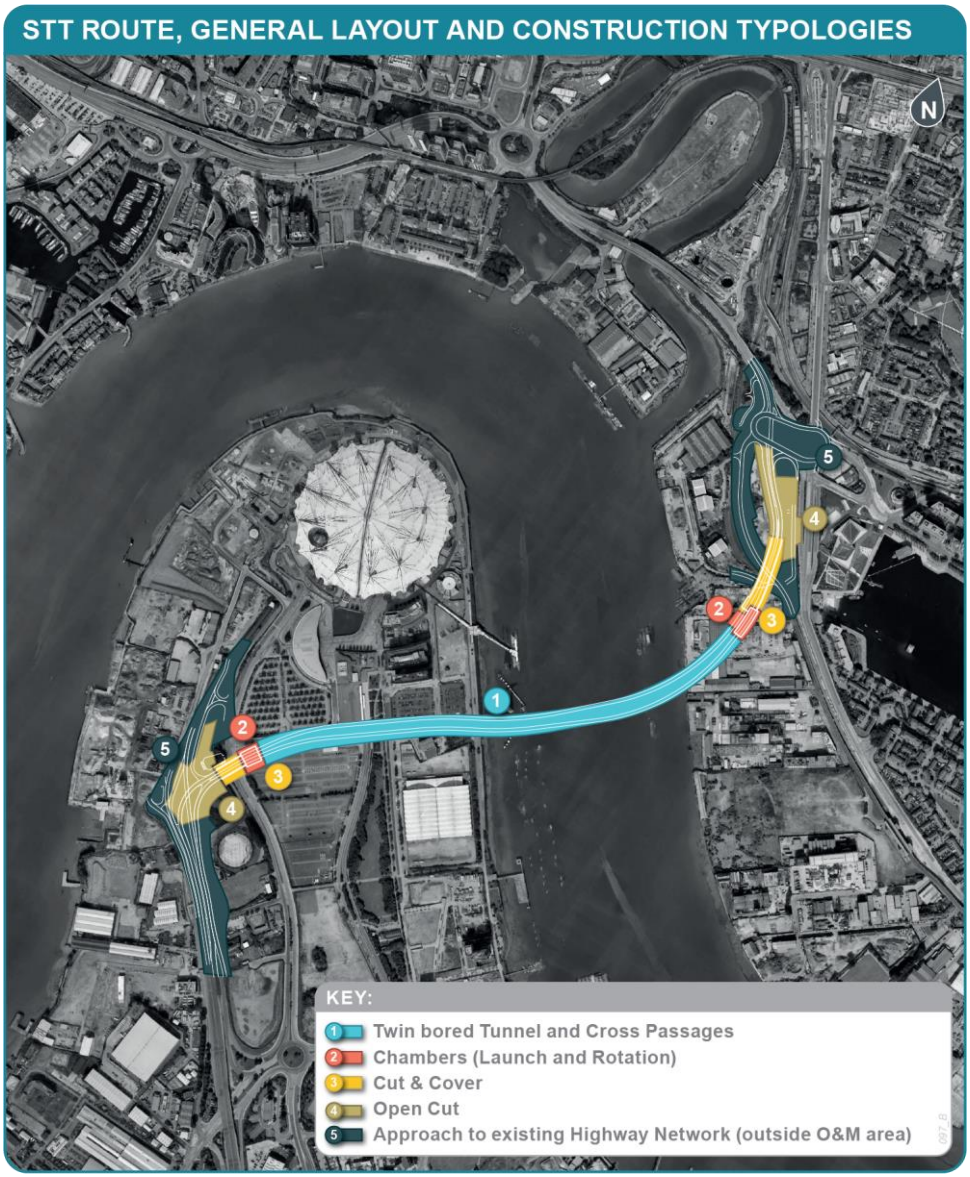

Figure 1 - STT General Scheme Layout

Acronyms, Abbreviations, Definitions and Reference Documents

2.1. Acronyms and Abbreviations

"CJV" – Construction Joint Venture

"CoCP" – Code of Construction Practice

"DCO" – Development Consent Order

"DML" – Deemed Marine Licence

"HGV" – Heavy Goods Vehicle

"PPE" – Personal Protective Equipment

"PLA" – Port of London Authority

"VTS" – Vessel Traffic System

"CMMP" – Construction Materials management plan

"TBM" – Tunnel Boring Machine

"TfL" – Transport for London

"NRA" – Navigational Risk Assessment

"ISMC" – International System Management Code

"SMS" –

"NAABSA" – 'Not always afloat but safely aground'

"COLREG" – International Regulations for Preventing Collisions at Sea

"NM" – Nautical Miles

3. Marine Operations

3.1. General

The purpose of this section of the document is to describe the marine management and control measures that are required to be designed, approved and implemented. These measures will direct and control the movement of marine vessels, plant equipment at the interface of the worksites with the River Thames and on marine transport measures. It will also detail the roles and responsibilities of team members with respect to marine management on the project.

3.2. Overview

3.2.1. Marine works

There are three activities that have the potential to impact the river:

- River wall strengthening works
- Bed levelling
- Marine operations

The first two of these activities are planned to be undertaken from the shore and it is only in the event that this cannot be achieved due to the strength of the river wall that they will be undertaken from the river. The navigational impact of this has been assessed in the Navigation Risk Assessment (as detailed in Appendix B) and this also includes details of the method statements for these activities.

3.3. Site layout

The picture below shows the layout of the Thames Wharf site with the two barge berths identified.

Figure 2 – Thames Wharf

3.4. Expertise

Riverlinx CJV will, through its marine logistics subcontractor, have access to appropriately trained marine logistics expertise to support CJV in its river-based activities. This resource will ensure sufficient tugs and barges are available to support the programme and in addition ensure the safe management of CJVs marine operations.

Where necessary CJV will consult and coordinate with other river users and to communicate the project activities as required.

The Logistics Manager will support project marine activities including:

a. marine operations across the worksites

b. managing marine and river works and transport

c. liaising with the Employer and the Project Manager

d. work with the Consents & Construction teams in the development, submission and implementation of:

   i. river and marine method statements

   ii. Applications for temporary and permanent marine works licenses.

e. the compliance with the correct terms of the:

i. marine works licenses

ii. Notices to Mariners

iii. oversee planning of marine operations across the Contract, the Worksites and the Working Areas

The shore side team will comprise a berthing coordinator to ensure the safe loading of barges and regular checks of moorings lines to ensure barges are appropriately moored.

3.5. Governance

Vessels engaged on the project will undertake implementation and maintenance of a safety management system following the requirements of the International Safety Management Code (ISMC).

All vessels used on the project will be required to meet the Thames Freight Standard (TFS). ISMC is considered to be equivalent to the TFS and may be used in lieu.

Vessels compliance with the Thames Freight Standard shall be verified by the PLA inspecting the vessel and issuing a PLA Licence where an equivalent classification certificate is unavailable. This Licence assigns each vessel with a unique identification number which is marked on the vessel (either by welding plates or by stencilling). This number can be monitored by the PLA. The issue of a PLA licence is subject to vessel surveys comprising an out of water survey every five years and annual condition surveys for motorised vessels and bi-annual for dumb barges. These surveys must be carried out by a PLA appointed surveyor.

Audits and corrective actions - All audits and any corrective actions will be carried out by the Marine Contractor in accordance with the documented procedures of the SMS, ISMC and Thames Freight Standard.

Emergency Response Planning and incident management will be in accordance with the marine contractors SMS with escalation as required to Riverlinx CJV

Any incidents involving tugs and barges engaged on the Project will be reported to Riverlinx CJV and the PLA and be captured in the Marine contractors SMS and ISM systems.

3.6. Operational Plan

3.6.1. Marine logistics supply chain

The Civils and tunnelling activities of the Project will generate significant quantities of excavated materials that, where this cannot be re-used on site, will require disposal.

Riverlinx CJV have contracted with four key supply chain partners to facilitate the disposal of this material:

- Marine transport – GPS Marine Contractors Ltd.
- Disposal facility (inert material) – Ingrebourne Valley Ltd. or Land & Water, Rainham
- Disposal facility (contaminated material) – Keltbray Environmental & Land & Water, Rainham

3.6.2. Numbers and times of vessel movements

Appendix A details the forecast for the numbers of vessel movements associated primarily with the movement of excavated material from the tunnel excavations. At peak production there could be four barges loaded per 24 hours but the long average will be two barges per 24 hours.

This forecast also includes barge movements for other activities e.g. Silvertown Civils, River Wall piling and imported Granular fill material that Riverlinx CJV may also move by river should it be economical and practical to do so. It is this forecast that the Navigational Risk Assessment has been based on so as to assess the worst case for project river activity.

It is also likely that the heavy lift components of the Tunnel Boring Machine (TBM) will be delivered by river. These will be delivered under a Project Tow in agreement with the Harbour Master.

The timings of barge movements from Thames Wharf will be dependent on the final bed levels of the 'Not always afloat but safely aground' (NAABSA) berth. However, barges will require c. 3m of tide above this level for getting onto the berth and 4m for getting off the berth and on the basis of this the expected timings are as follows:

- High Water -3 hours to High Water +2 hours

Once underway barges will be pushed or towed to the appropriate disposal site which are likely to be located at either East Tilbury or Rainham. The transit times for each of these is as follows:

- East Tilbury – 2.5 hours
- Rainham 1.5hrs

The East Tilbury disposal site is tidal and only accessible at certain states of tide. To this extent barges may be left at Denton moorings if the tidal conditions don't allow for direct access. There is no plan at this stage for a site tug to be located at the East Tilbury site to take barges onto and off the berth.

For barges going to Rainham, these will be taken straight onto the berth within the unloading shed for unloading by the operator of this facility.

3.6.3. Cycle times for loading and unloading

There are potentially two loading methodologies:

Launching chamber excavation – it is likely that arisings from the construction of the launch chamber will be loaded into barges via long reach excavator. This operation takes approximately 4 hours to complete.

Loading operations for the arisings from the main tunnel will be undertaken using a tripper system linked by conveyor to the TBM as depicted in the image below:

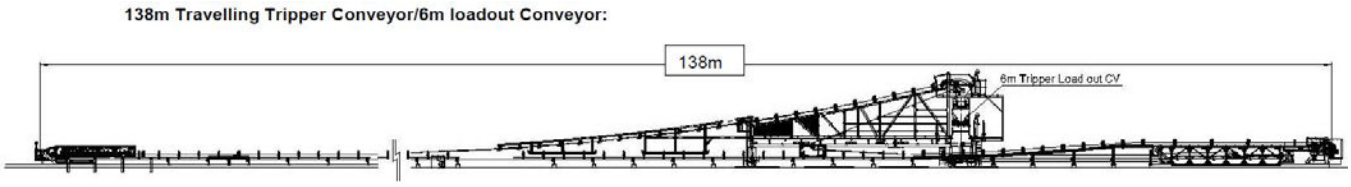

Figure 3 – Tripper System

The capacity of the reclaim conveyor (600t/hr) and the safe loading of barges drives the loading cycle time and the expectation is that a 1,600t barge will take approximately 3.5 hours to load. Once complete the barge decks will be cleaned to ensure safe means of access for any crew member that requires to get onto the barge.

The unloading operation at East Tilbury will make use of one of three berths available at this facility as depicted in the figure below.

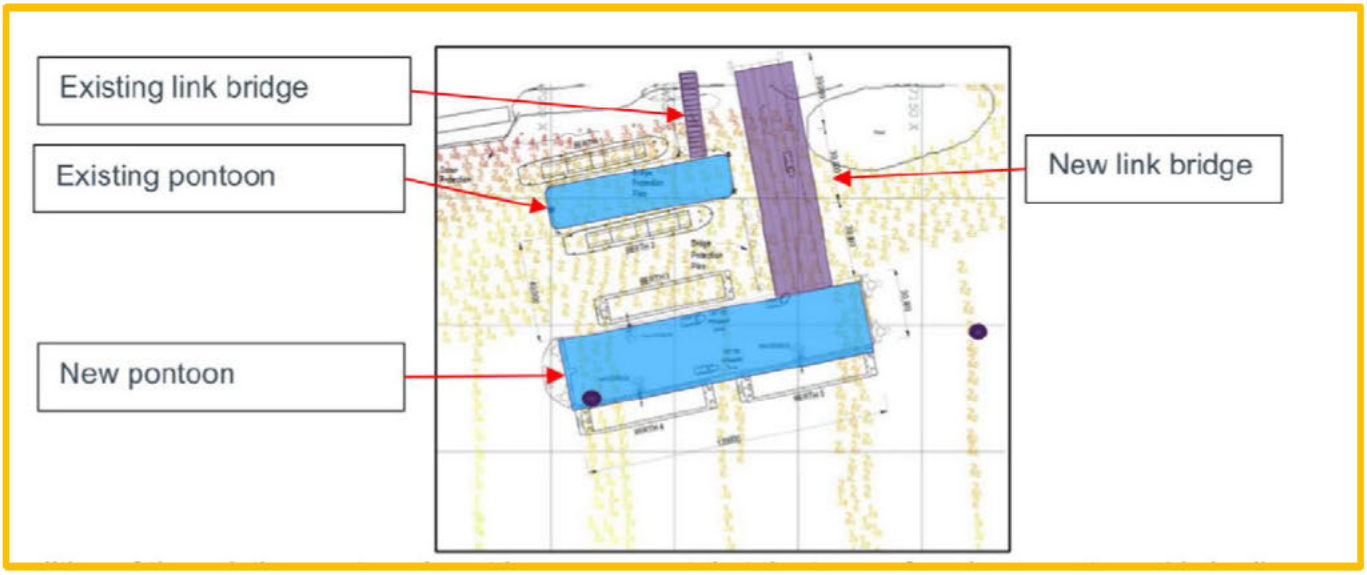

Figure 4 – East Tilbury Facility

The Rainham facility is depicted in the images below:

Figure 5 – Rainham Facility

Figure 6 – Rainham Facility (inside)

Unloading of barges at either East Tilbury or Rainham is typically completed in 4.5 to 6 hours.

3.6.4. Safe means of access, lighting and transfer of personnel

Safe access to the wharf will be via a fixed ladder installed on the wharf. In the event this cannot be achieved then linesman will be used to ensure barges can be moored safely.

The Thames Wharf loading operation will ensure splatter from the loading operation is not left on barge decks, thereby creating a slip, trip, fall risk. The loading team will comprise labour who will use shovels and high-pressure hose facilities to ensure decks remain clean.

Barges unloaded at the disposal facilities will also have their nearside decks cleaned to cater for any material spilled during the unloading process. Both operators have risk assessments for this activity within their Safe Systems of Work procedures.

3.6.5. Personnel/Crew

All marine crew shall be sufficiently trained and qualified to perform their duties. The master has the overriding authority and responsibility to make decisions with respect to safety of the vessel, crew, prevention of pollution and to request the company's assistance as necessary.

3.6.6. Vessel specification

See below table for Tugs and Barges that have been assessed for berthing/un-berthing at Thames Wharf, with suitable tides.

Tugs	GPS Anglia, GPS Cervia, GPS India, GPS Iberia, GPS Ionia, GPS Battler, GPS Racia, GPS Arcadia, GPS Cambria, GPS Illyria, GPS Napia
Barges	Predominantly GPS 1600 series barges

3.6.7. Configuration of Tow

The configuration of tow will depend on the type of tug and barge used. Loaded and empty barges can be towed astern and dependant of the line of site they may be pushed or hipped alongside.

3.6.8. Operational methodology

Barges shall be delivered to Thames Wharf when sufficient under keel clearance allows. The barges shall be moored safely alongside the wharf in preparation for loading or discharging. In the absence of a lighterman, the mooring plan should allow for the range of tide to allow the barge to remain safely alongside the quay and to take the ground safely. Dependant on the program, barges may need to be exchanged on the berth, whereas a loaded barge is exchanged with an empty barge that occupies the same berth. Barges departing from the berth will be depart with sufficient under keel clearance and proceed east to the appropriate receptor site. The master shall provide 10 minutes notice for sailing to London Vessel Traffic System (VTS) and contact them again on departure for permission to sail.

3.6.9. Berthing/Unberthing

Delivery and departure to Thames Wharf is restricted by tide and involves berthing over a controlling depth of 1.8m above Chart Datum. The range of tide is between 7.1m to 0.45m during mean spring tides & 5.94m to 1.4m during mean neap tides.

Before the arrival and departure, the master shall ensure that the vessel (and tow) complies with PLA General Directions, Port of London Byelaws and the International Regulations for Preventing Collisions at Sea (COLREG's), with due regard to other vessels in the area, and adhere to the passage plan in use.

Prior to departure from Thames Wharf, the crew will single up the barge in preparation for sailing. The master shall provide 10 minutes notice for sailing to London VTS and contact them again on departure for permission to sail.

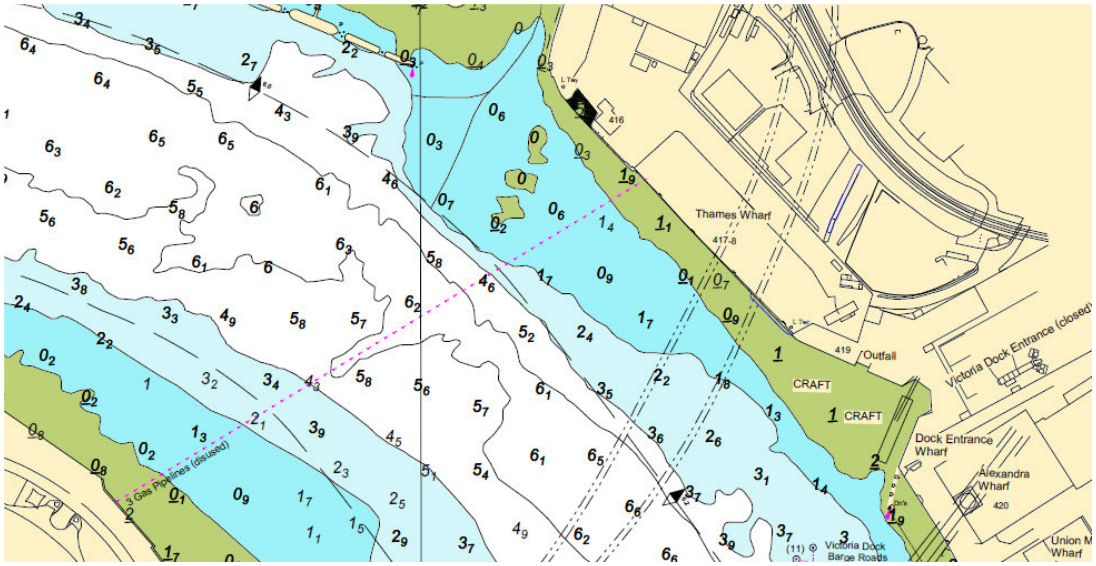

Figure 7 – Thames Wharf over PLA Chartlet

3.6.10. Layby moorings

Riverlinx CJV will not lay any new moorings specific to the STT Project but will make use of existing layby moorings at Woolwich where barges can be left before or after loading at the worksite.

3.6.11. Site mooring Plan

All barges will be moored to a standard configuration as detailed below:

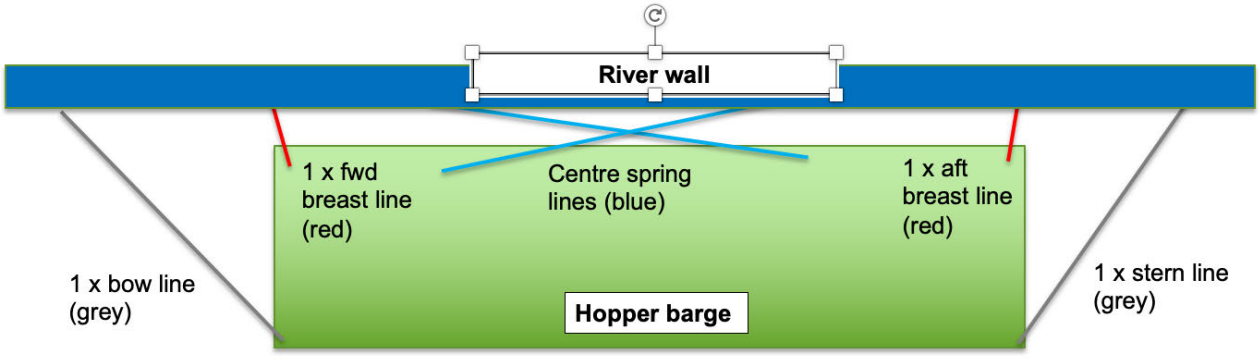

Figure 8 – Standard Mooring Configuration

- arrival and departure with sufficient under keel clearance of minimum 0.5m on flood tide and 1.2m on ebb tide
- standard mooring of 6 ropes when barge is left unattended

- standard mooring of 4 ropes when barge is attended to by tug
- Safe access to the wharf via fixed ladder installed on the wharf (or linesman will be used)

3.7. Navigational Risk Assessment

Navigation Issues and the Preliminary Risk Assessments analyse the potential impact of the proposed contract works at the worksites on existing river users.

The contract approach to the Navigational Risk Assessment (NRA) comprised stakeholder engagement, analysis of Automatic Identification System (AIS) data, observation of current river operations including a desktop review of hazards, and development of potential mitigation measures.

The risk assessment criteria, assessment matrix, terminology and risk classification were provided by the PLA. The assessment also follows the Formal Safety Assessment (FSA) methodology:

a. Stakeholder consultation
b. Identification of hazards
c. Hazard analysis.

The proposed Contract work introduces additional freight movements at the worksite locations where existing freight operators successfully and safely operate. A preliminary NRA was completed for the project back in 2015 and this covered:

a. Interaction with existing river users and operations
b. Intrusions into the river - proximity to authorised channel
c. Proximity to existing structures and potential new developments
d. Number of tugs/barge movements on the river

Riverlinx CJV have undertaken a new NRA with the intention of providing an up to date, independent, evidenced based assessment of current river operations and the likely impact that project operations would have on existing river users.

The overall responsibility for safety on the River Thames lies with the PLA, which needs to determine whether the issues and hazards set out in this CoCP Passage Plan present a ‘tolerable’ navigational risk.

The process for the review of mitigation arrangements will be done in conjunction with the PLA through our engagement stakeholder engagement activities.

The NRA covers all navigational elements relating to the project and is included at Appendix B of this document.

3.7.1. Passage Planning

Riverlinx CJV will, through their marine logistics provider, develop port passage plans which will include:

a. hazards in the area
b. reporting in on Very High Frequency (VHF) channels and or listening in to VHF broadcasts
c. checks on tidal height
d. areas of small craft operating in the area
e. identification of high traffic density areas
f. minimum permitted under keel clearances
g. consideration of wash from other vessels
h. notes on tidal direction and speed
i. attention to weather conditions that may bring on a change in predicted tide heights

j. use of lookout forward if required
k. Areas where assistance may be summoned from if required.

In addition to this Riverlinx CJV will develop a vessel movement forecast which will include details of weekly and monthly movement forecasts.

Should additional information be required then Riverlinx CJV or its marine logistics contractor will follow the PLA's passage planning guidance as detailed at https://www.pla.co.uk/assets/passageplanningguide2013-3.pdf

3.7.2. Working in proximity to other marine operators

Riverlinx CJV will:

a. ensure that legal requirements for the works affecting navigational channels are implemented
b. undertake the works in such a way as to:
   i. maintain existing navigational channels during construction through liaison with the PLA and in accordance with navigational risk assessments
   ii. limit undue inconvenience to the public and other river users arising from increased river vessel movements.

3.7.3. Notices to Mariners

Riverlinx CJV will:

a. be responsible for providing information relevant to the issue of PLA Notices to Mariners
b. liaise with the PLA to both arrange and expedite appropriate Notices to Mariners
c. be responsible for all fees and costs arising to secure Notices to Mariners and actions thereafter.

3.7.4. Passage in restricted visibility

The vessel is not to get underway or continue underway (unless proceeding to a safe anchorage or berth) in visibility less than 0.25 Nautical Miles (NM). If the vessel does not have an operational radar then the above restriction shall be increased to 0.5NM.

The master and mate must be on the bridge at times when the visibility is 0.5NM or less at all times.

3.7.5. Berthing Coordinator & River Response Team

The preliminary navigational risk assessment made reference to two particular risk controls (Berthing Coordinator and River Response Team) that were deemed necessary from the assessment of in river structures and project marine activity when the DCO application was submitted. The updated Navigational Risk Assessment included in this document reviews the risks associated with the latest construction and determines the required risk controls that will need to be included. This document is included at Appendix B and in consultation with the PLA confirm that there is no longer a requirement for such risk controls due to the change in the in river marine works.

4. Stakeholder engagement

Riverlinx CJV will communicate and closely liaise as required with all required stakeholders, including:

a. PLA
b. MMO
c. EA
d. Marine Accident Investigation Branch (MAIB)
e. Relevant Local Authority
f. Thames Clippers
g. Cory Riverside Energy Ltd
h. Class V vessel operators
i. any other river users in the Contract area

Following consultation with the PLA Harbour Master Riverlinx CJV are proposing to hold monthly meetings with the Harbour Master prior to the operational commencement of marine activities and thereafter by agreement. These meetings will typically be operationally focused covering planned activities and interfaces with other river activities as deemed appropriate.

5. Appendix A – Vessel Movement Forecast

2021

					Date:	10/20	11/20	12/20	01/21	02/21	03/21	04/21	05/21	06/21	07/21	08/21	09/21	10/21	11/21	12/21
Export barges	Tonnes per barge		1400			0	0	5	6	3	5	6	6	6	6	4	3	1	0	0
Import barges (fill)	Tonnes per barge		1000			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Import barges (segments)	Tonnes per barge		1250	01/05/2022	31/03/2023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2022

					Date:	01/22	02/22	03/22	04/22	05/22	06/22	07/22	08/22	09/22	10/22	11/22	12/22
Export barges	Tonnes per barge		1400			5	20	50	50	43	10	0	0	12	24	24	24
Import barges (fill)	Tonnes per barge		1000			0	0	0	0	0	0	0	0	0	0	0	0
Import barges (segments)	Tonnes per barge		1250	01/05/2022	31/03/2023	5	5	9	9	5	0	0	6	6	9	9	6

2023

					Date:	01/23	02/23	03/23	04/23	05/23	06/23	07/23	08/23	09/23	10/23	11/23	12/23
Export barges	Tonnes per barge		1400			13	0	0	0	0	0	0	0	0	0	0	0
Import barges (fill)	Tonnes per barge		1000			10	10	20	20	10	0	0	0	0	0	0	0
Import barges (segments)	Tonnes per barge		1250	01/05/2022	31/03/2023	0	0	0	0	0	0	0	0	0	0	0	0

2024

					Date:	01/24	02/24	03/24	04/24	05/24	06/24	07/24	08/24	09/24	10/24	11/24	12/24
Export barges	Tonnes per barge		1400			0	0	0	0	0	0	0	0	0	0	0	0
Import barges (fill)	Tonnes per barge		1000			0	0	0	0	0	0	0	0	0	0	0	0
Import barges (segments)	Tonnes per barge		1250	01/05/2022	31/03/2023	0	0	0	0	0	0	0	0	0	0	0	0

2025

					Date:	01/25	02/25	03/25	04/25	05/25	06/25	07/25	08/25	09/25	10/25	11/25	12/25
Export barges	Tonnes per barge		1400			0	0	0	0	0	0	0	0	0	26	0	0
Import barges (fill)	Tonnes per barge		1000			0	0	0	0	0	0	0	0	0	0	0	0
Import barges (segments)	Tonnes per barge		1250	01/05/2022	31/03/2023	0	0	0	0	0	0	0	0	0	0	0	0

6. Appendix B – Navigation Risk Assessment

RIVERLINX: NAVIGATION RISK ASSESSMENT

02-SEP-2020 IDEACHAIN LTD

Navigation Risk Assessment for the construction and marine operation at Thames Wharf of the RiverLinx project, River Thames.

Project No.: 20-NASH-0061

Issue: Rev 02-00

REPORT TITLE: RIVERLINX NAVIGATION RISK ASSESSMENT

CLIENT: IDEACHAIN LTD

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R02-00	02-Sep-2020	Issue for Use	[redacted]	[redacted]	[redacted]

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ANNEXES

1. INTRODUCTION

NASH Maritime Ltd has been commissioned by IdeaChain Ltd, on behalf of the RiverLinx JV consortium, to undertake a Navigation Risk Assessment (NRA) for the marine operations at Thames Wharf during the construction of the Silvertown Tunnel project (STT) on the river Thames, London.

1.1. DOCUMENT STATUS

This document has been reviewed by RiverLinx JV and with the Port of London Authority (PLA) and is issued for use.

1.2. PROJECT SCHEME

1.2.1. OVERVIEW

The STT involves the construction of a twin bore road tunnel providing a new connection between the A102 Blackwall Tunnel Approach on the Greenwich Peninsula (Royal Borough of Greenwich) and the Tidal Basin roundabout junction on the A1020 Lower Lea Crossing/Silvertown Way (London Borough of Newham). **Figure 1** provides a schematic of the scheme, tunnel route and construction typology.

The project was formally granted development consent through a Development Consent Order (DCO) issued by the Department of Transport in May 2018.

STT will be approximately 1.4km long and able to accommodate large vehicles including double-decker buses. It will include a dedicated bus, coach, and goods vehicle lane, enabling TfL to provide additional cross-river bus routes. The scheme also includes the introduction of free-flow user charging on both the Blackwall Tunnel (northern portal located in London Borough of Tower Hamlets) and the new Silvertown Tunnel.

1.2.2. TRANSPORT BY RIVER AND THAMES WHARF

As part of the construction works, it is intended to utilise the river Thames for marine logistics and transport in support of the Construction Site River Strategy which has been developed in accordance with the project Code of Construction Practice Passage Plan (CoCP Passage Plan) which contains the river transport management plan . Principally this will entail transport by river for removal and export of muck away spoil and import of other materials.

Thames Wharf (as shown in **Figure 1**) will be utilised for the marine logistics and transportation for the project duration. In order to utilise Thames Wharf, upgrades are required to the existing wharf infrastructure and also to the adjacent berth area to ensure barges can be brought onto the wharf, loaded/unloaded safely and removed at appropriate stages of the tidal cycle to meet the needs of the construction schedule.

The relevant activities for consideration on the NRA are limited to the construction phase of the STT project and these are considered in 2 key phases, summarised below and described in more detail within **Section 2**.

- Phase 1: Enabling works at Thames Wharf.

- Phase 2: Marine logistics operational phase associated with the RiverLinx project and includes assessment of navigation risk associated with these phases.

Figure 1: Silvertown Tunnel Route and General Layout

1.3. ACCOMPANYING DOCUMENTS

A number of other project documents are in development at the time of writing and should be considered in conjunction with this assessment although key information is presented below to allow this document to be standalone. Relevant documentation includes as listed in the below table (and is cross referenced through the document).

Table 1: Reference Documentation

Reference / Issue Date	Title	Notes
Preliminary Environmental Information Report Appendix 4.B	Navigational Issues and Preliminary Risk Assessment	
ST150030-RLC-MAC-XX-ZX-STR-CL-0001	Construction Site River Strategy (CSRS)	
ST150030-RLC-MAC-17-ZZ-PEM-TP-0003	Code of Construction Practice Passage Plan (CoCP Passage Plan)	River Transport Management Plan
30-Jun-2020	River transport programme	Marine Logistics Planned Activity Schedule
ST150030-RLC-BAS-17-ZZ-MST-TP-0001 21-May-2020 P01	Construction Method Statement – River Wall installation	
ST150030-RLC-BAS-17-ZZ-MST-TP-0003	Consent Method Statement – Thames Wharf River-Bed Levelling'	
	Passage Plans – Enabling Works	
	Passage Plans – Operational Phase	

1.4. REQUIREMENT, PURPOSE AND SCOPE OF NAVIGATION RISK ASSESSMENT

The requirement for this NRA is as per the DCO and arises from the CSRS as defined within 3.2.7 of the CoCP. During the DCO phase a Navigational Issues and Preliminary Risk Assessment (Preliminary NRA) was undertaken and the project has committed (as per Section 8 of the CSRS) to update this, consult with the Port of London Authority (PLA) Harbour Master (Upper) and undertake an assessment of navigational risk for each phase where deemed necessary.

The marine aspects of the scheme have evolved significantly since the Preliminary NRA was undertaken and, notably, the previous proposal of an earlier in-river jetty has been removed which, together with reduction of in river movements has, in general, reduced the navigational complexity of the scheme. The Preliminary NRA is therefore subject to review and validation and, specifically, the NRA and the arising risk controls and recommendations that were proposed.

This NRA document is embedded within the CoCP Passage Plan and is to be read in parallel with:

- **Passage Plans.** Passage Plans provide a comprehensive berth to berth guide of the barge operation voyage to determine and document the most favourable route, identify and mitigate any issues or hazards and ensure overall safe passage. The Passage Plans are also subject to PLA approval.
- **Construction Method Statements and Associated Plans:** The various CMS's are prepared to set out the procedures and method statements for the activities or operations. The method statements provide the fundamental basis of assumed activities for the NRA and are also used to support and evidence the consultation process. CMS's, where relevant, are identified within Table 1 and summarised, in navigational terms, within **Section 2** for ease of reference.

The objective of the NRA is to define any impact the proposed project may have on the safety of navigation, ensuring that the baseline disposition of marine users is defined, hazards are identified, risks are assessed (in terms of 'likelihood' and 'consequence') and risk controls proposed and implemented to ensure residual risk levels are appropriate.

The NRA requires approval by the PLA due to their primary statutory regulator role as the navigation authority at the project area.

1.5. METHODOLOGICAL FRAMEWORK

The International Maritime Organisation (IMO) provide guidelines in the form of the Formal Safety Assessment (FSA) which provides a basis for making decisions in maritime risk. The FSA is a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and cost-benefit assessment (see **Figure 2** for schematic of the FSA process).

The PLA have mandated the use of the IMO FSA methodology in the assessment of navigation risk for projects on the river Thames. The structure and format of this risk assessment, whilst conforming to the PLA published methodology does so with refence to the IMO FSA.

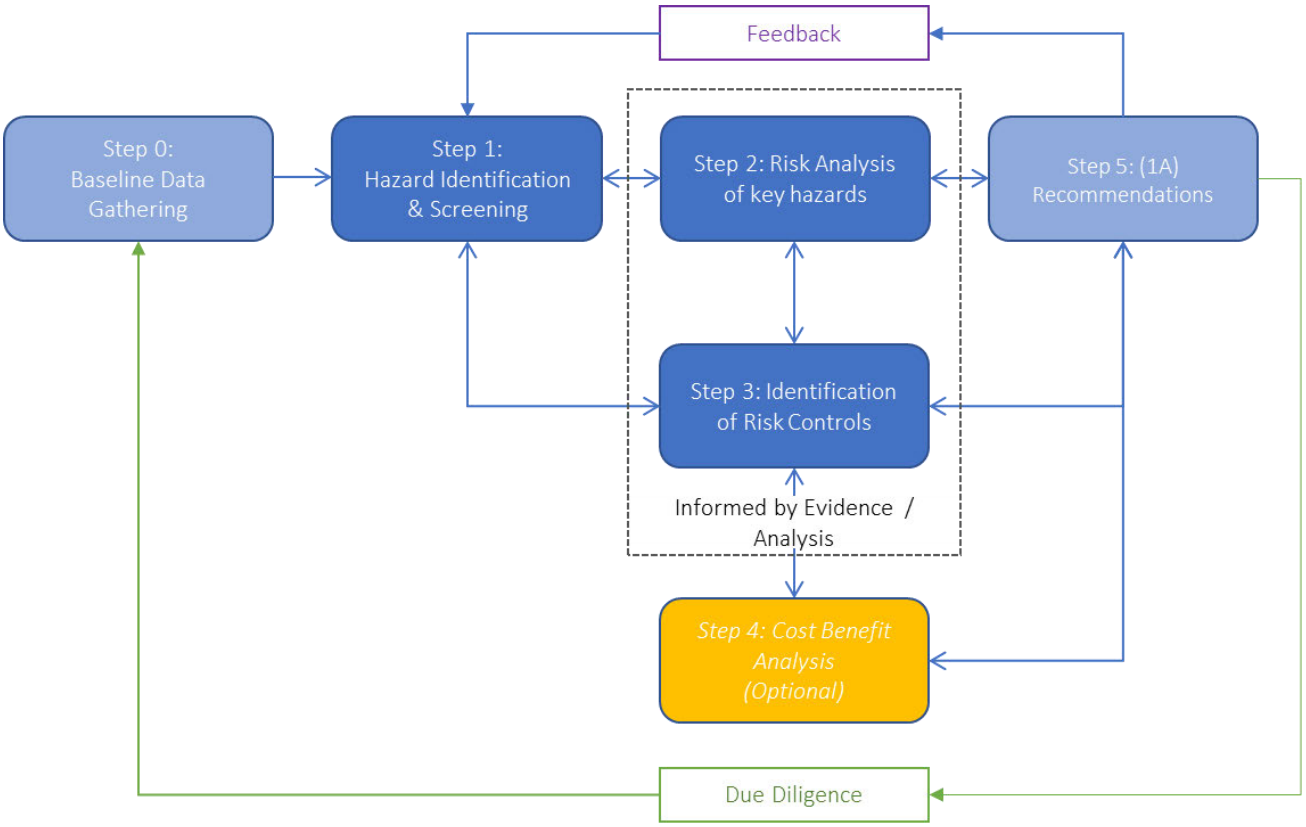

Figure 2: Formal Safety Assessment (Step 4 optional).

The FSA process has five steps which are considered in this Navigation Risk Assessment as follows:

- **Step 0:** Baseline data gathering and review (see **Section 3** Navigation Overview).
- **Step 1:** Identification and Screening of Hazards – using the PLA NRA (See **Section 0**).

- **Step 2**: Risk Analysis of key hazards identified in Step 1 (see **Section 6** Risk Analysis).
- **Step 3**: Identification and effectiveness of Risk Control Options (see **Section 7** Risk Control Options).
- **Step 4**: Cost-benefit assessment (*optional*) – not included in this assessment due to its nature.
- **Step 5** Recommendations for decision-making (see **Section 8** Study Findings).

2. PROPOSED WORKS

2.1. SUMMARY

This section provides a more detailed overview and summary of the proposed works and operations across the following two phases:

- Phase 1: Enabling works at Thames Wharf
- Phase 2: Marine Operations Phase (of Thames Wharf)

The presented content is with reference to Table 1 and derived from this information.

2.2. PHASE 1: ENABLING WORKS

2.2.1. RIVER WALL, SHEET PILE WALL, FLOOD DEFENCES AND INTERTIDAL AREAS

This phase of works includes for river wall works at Thames Wharf and the adjacent frontage (which is covered outside the DCO in a regulated works application and detailed in ST150030-RLC-BAS-17-ZZ-MST-TP-0001. Along some of the frontage a second river wall (retaining concrete wall) will be installed to provide a permanent statutory flood defence wall and creation of intertidal area. Works will include the removal of obstructions (including potential extraction of redundant berthing dolphins), pile line clearance activity and river wall upgrades.

Additionally, the river wall adjacent to the site will be upgraded with a new anchor wall and sheet pile wall immediately in front of the existing river wall to ensure integrity for its subsequent usage during the construction of the tunnel. Subsequently, marine furniture will be installed (including timber marker posts, grab chains, ladders) and cathodic protection to protect against microbial corrosion. The majority of these works will be undertaken from land or intertidally and are not considered to require further assessment within the NRA.

Figure 3: Typical Section of existing Thames Wharf frontage (Source: PLA)

2.2.2. BED LEVELLING

This phase of works also includes for bed levelling at Thames Wharf to ensure a stable level platform free of obstructions at an appropriate elevation level and in order to load and unload barges and bring them onto and off the wharf at appropriate stages of the tidal cycle. On completion it is intended that Not Always Afloat But

Safely Aground (NAABSA) berthing can be safely achieved in all tide conditions. More detailed description of these works is provided in the 'Consent Method Statement – Thames Wharf River-Bed Levelling'.

Figure 4 and **Figure 5** show, in plan and section respectively, the outline area and levels proposed. In total there will be a planned 750m² of excavation, extending circa 20m from the sheet pile wall, to create a level of +1.2m CD (not including the levelling tolerance) in an area of 150m long by 20m wide. The excavation could increase to 1,125m² of excavation when the additional allowed levelling tolerance of 0.5m is included into these figures giving a final level of +0.7m CD. The bed levelling is planned to have an equal cut and fill profile. If any excess material arises due to the natural flow of sediment up and down the river Thames, or unsuitable material is identified, it will be required to be removed.

The works are scheduled to be undertaken in November and December 2020.

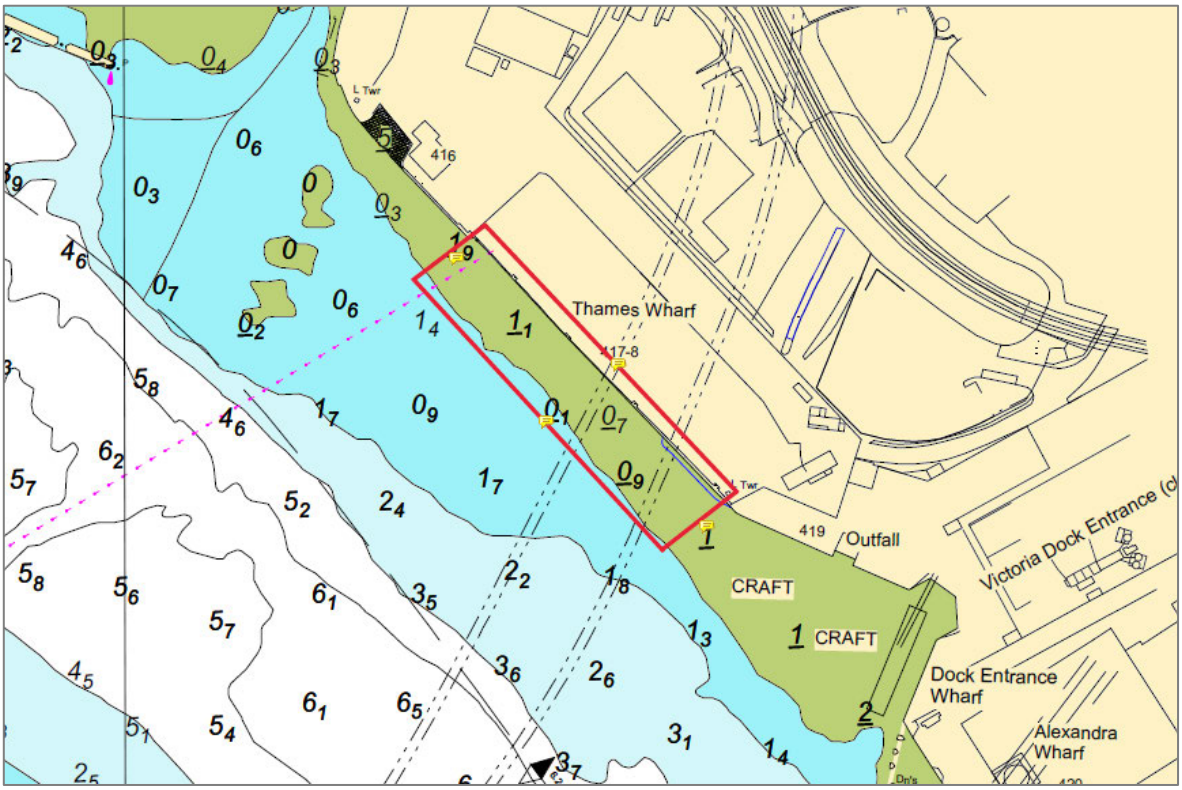

Figure 4: Bed Levelling at Thames Wharf (Source: Riverlinx JV).

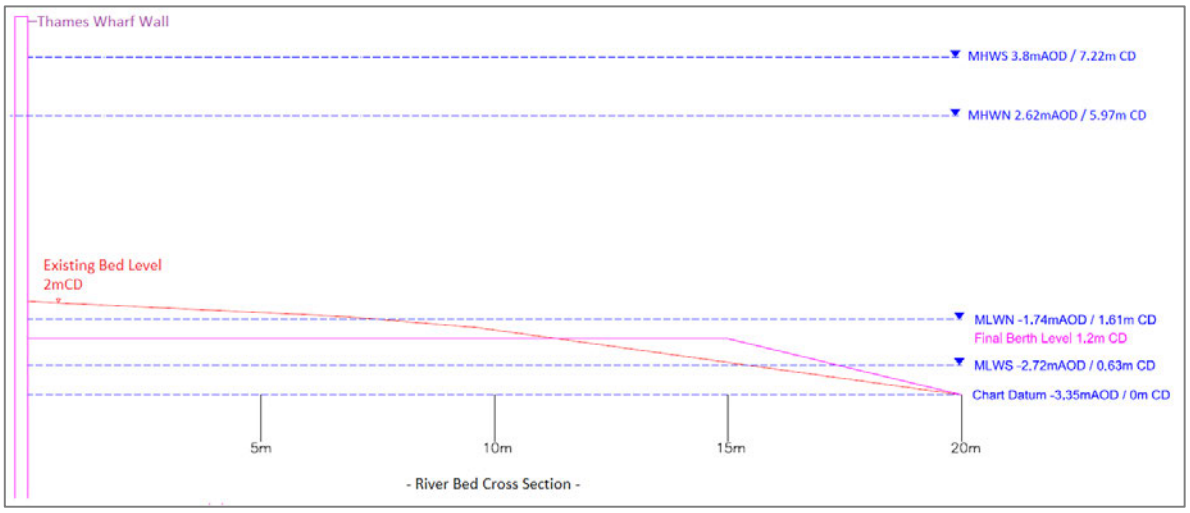

Figure 5: Representative Cross Section of Thames Wharf Bed Levelling (Source: RiverLinx JV).

Two methods of work are being considered for the levelling works and the choice is dependent on the current structural capacity of the river wall.

One method (the Contractor preferred method) involves placing a long reach excavator onto Thames Wharf (see **Figure 6**), this method relies on the existing strength of the river wall which will be assessed by a competent designer. If the outcome is not positive or a large enough machine cannot be sourced then the bed levelling will be undertaken from floating plant as the alternative method (see **Figure 7**). The floating plant will consist of a flat top spud leg moored barge which will be moved by tug between the working area and a nominal deeper water layby mooring so as not interfere with navigation (indicative location shown and subject to agreement).

In both instances, a hopper barge is assumed so that any surplus or unsuitable material that is designated can be removed by river for subsequent processing and/or disposal.

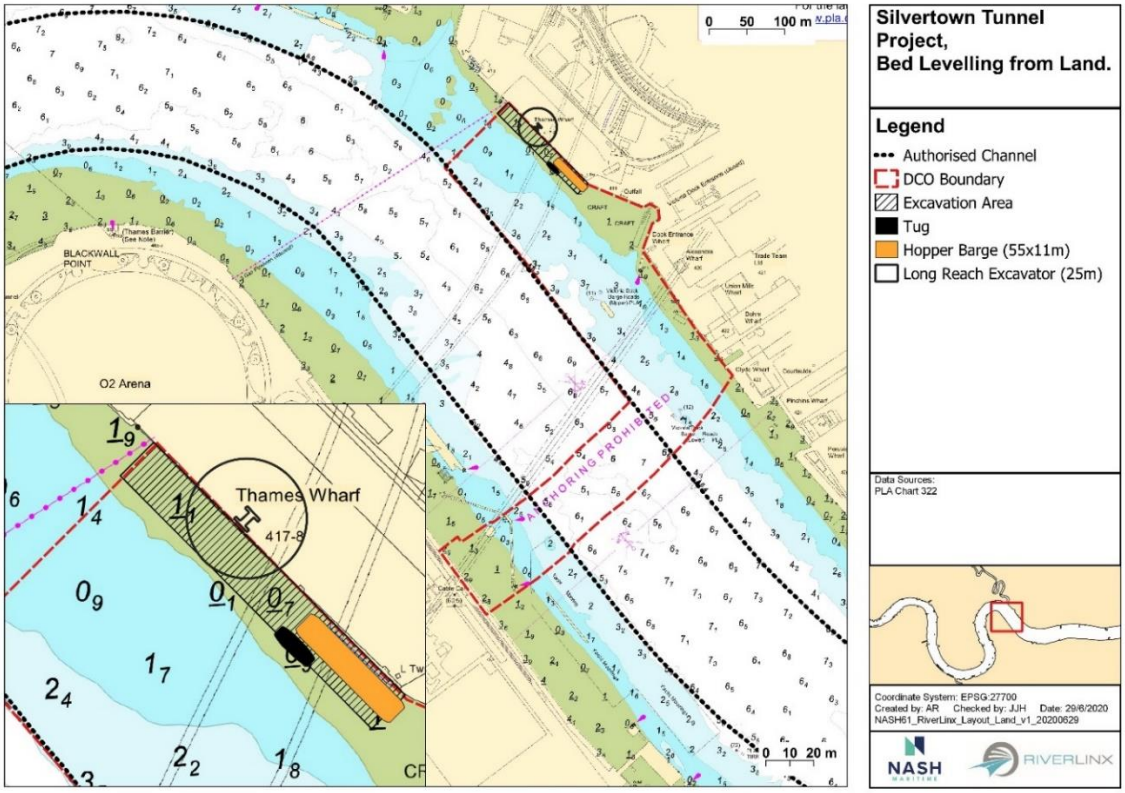

Figure 6: Phase 1: Bed Levelling from Land.

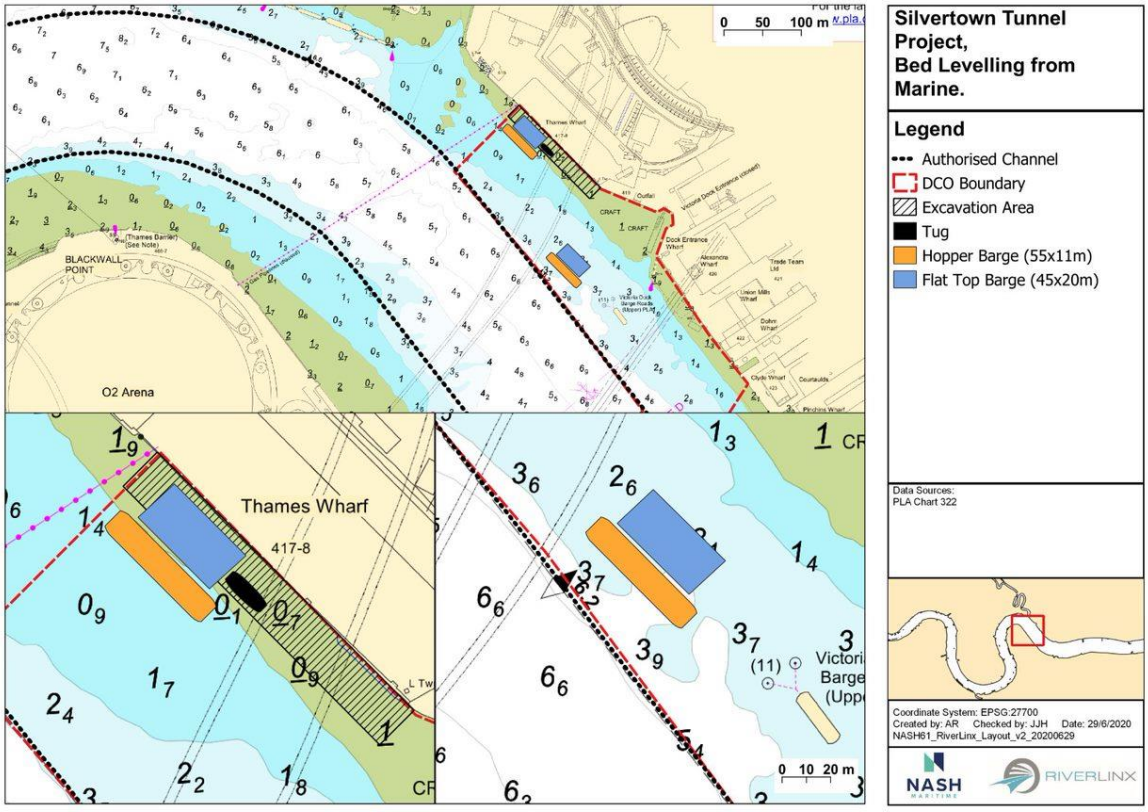

Figure 7: Phase 1: Bed levelling from Marine.

2.3. PHASE 2: MARINE LOGISTICS – OPERATIONAL PHASE

Once the Phase 1 works have been completed at Thames Wharf the operational phase will commence. As shown in **Figure 9**, Thames Wharf will have capacity for alongside mooring of two barges concurrently of circa 56m x 11m (approx. 1,400T category) and a level bed at a maximum of circa +1.2m, extending circa 20m from the river wall.

Further details are provided within the CoCP Passage Plan to which this NRA is annexed although key points are summarised below to enable this document to be read in isolation.

It is anticipated that all movements at the site will be using a tug and tow arrangement and materials being handled will principally consist of the following, which are encompassed within the passage plan:

- Export: Muck away (tunnel spoil) using 1,400T barges.
- Import: Granular fill using 1,400T barges.
- Import: Tunnel Segments: Using barges.
- Import: Sheet Piles: Using barges.

Additionally, there may be isolated project moves of major cargo items (e.g. the Tunnel Boring Machine) which, because of their individual nature or isolated occurrence, will be assessed through an individual passage plan and considered as a 'project move'. An estimated marine logistics planned activity schedule is shown at **Figure 8**, providing an overview of potential movements by month (no of moves on the y axis – 1 x move includes an arrival and departure). The primary moves are associated with muck-away export operations. There are some early exports from the enabling works, but the main tunnel drive is seen as two distinct peaks through 2022 (the trough is associated with the turning of the tunnel boring machine and direction change).

During normal operations it is assumed that arrivals will be on a peak or off-peak tidal cycle. During peak operations (e.g. Q1 and Q2 2022 where circa 50-60 movements: i.e. up to 2 per 24hr period are anticipated) it is assumed that 2 barges will be moved on the daytime tide or, more normally, 1 per day and 1 per night time tide.

For export of muck-away, Passage Plans provide further detail although it is envisaged that arrivals will be at circa HW-3.5hrs (all times relative to Silvertown where a minimum of 3.5m CD is required) and barges will be loaded over the tide and depart at circa HW +2hrs. For imports and other movements which do not require loading/unloading over a tide the latest (precautionary) arrival time would be HW-2hrs with the earliest departure time of HW-1hrs.

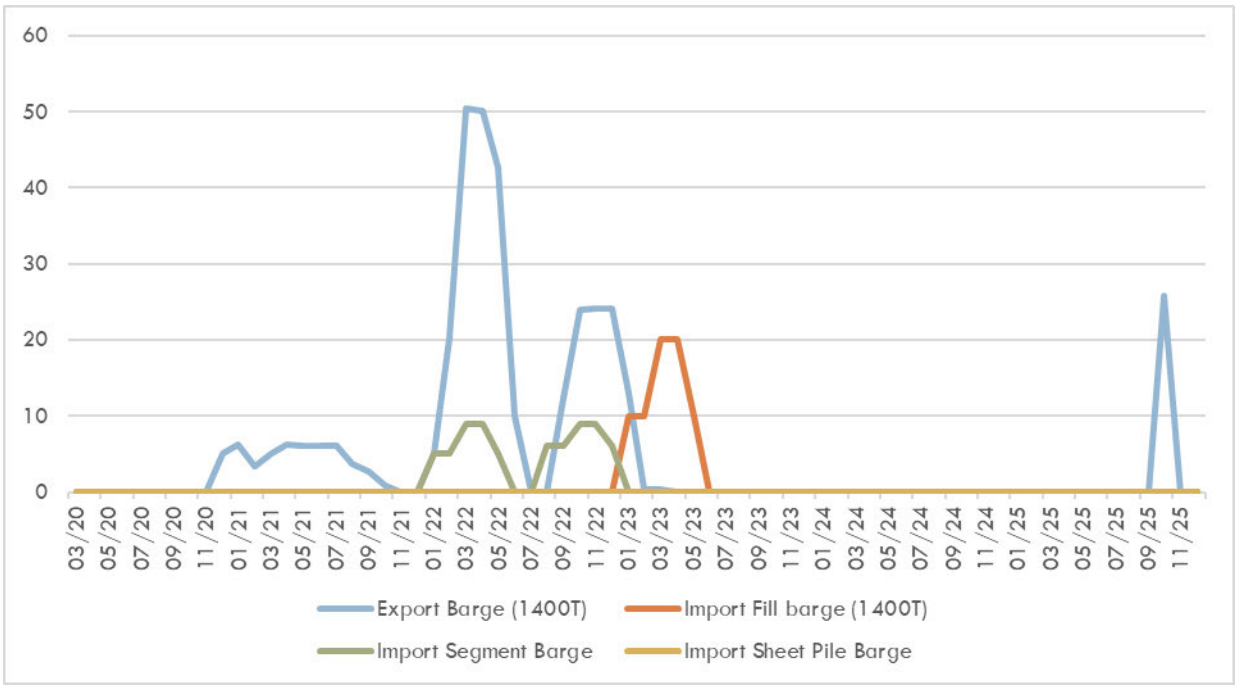

Figure 8: Thames Wharf movements schedule ESTIMATE (Source: RiverLinx JV).

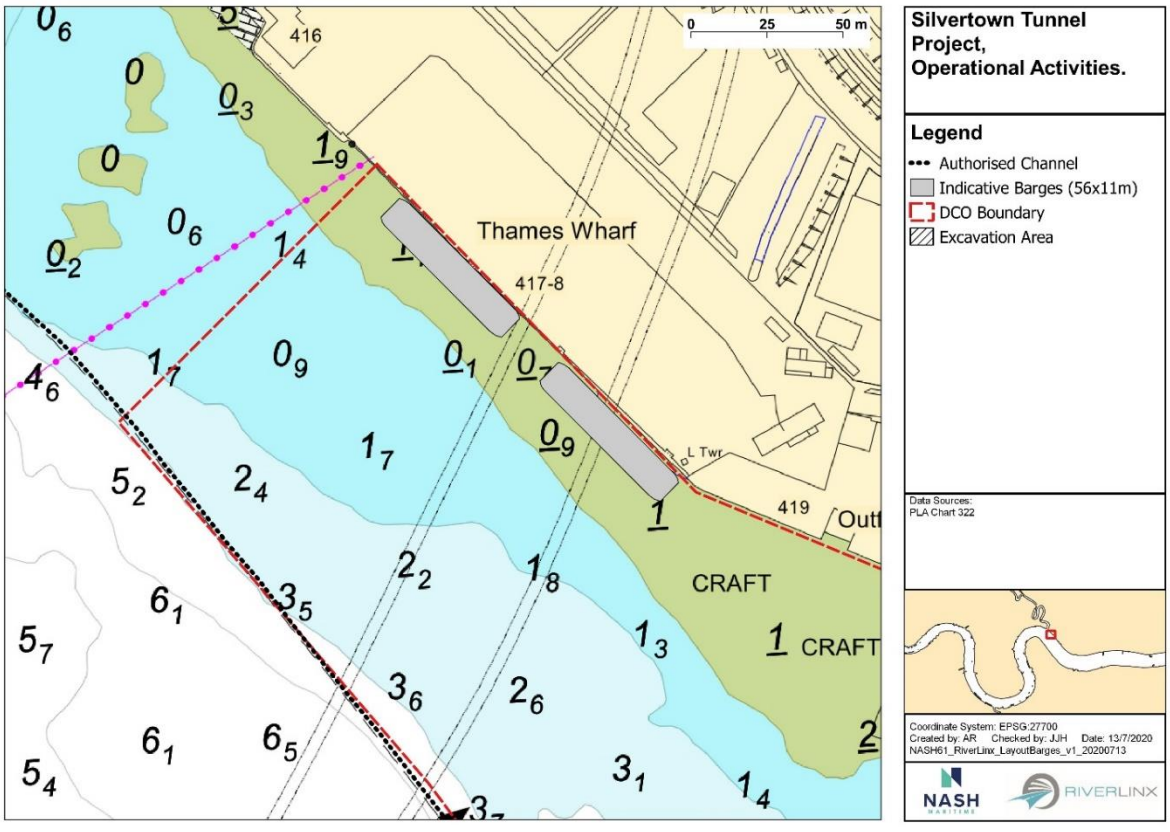

Figure 9: Phase 2: Thames Wharf berthing arrangement.

3. NAVIGATION OVERVIEW

The disposition of navigation on the River Thames is varied and composed of a mixture of different vessel types including vessels engaged on international trade (operated in accordance with international maritime regulations), vessels engaged on intra-port trade on the River Thames and Thames Estuary (both cargo and passenger which are operated in accordance with domestic and local (PLA) regulations) and recreational vessels (largely operated in accordance with voluntary guidance).

The project area is located on the Bugsby's/Woolwich Reach of the River Thames, which has all the vessel types mentioned above navigating close by and in general the vessel types transiting the Reach can be considered in the following categories and notably different types operate to either tidal times or a day/time based schedule:

- Large sea going commercial vessels – operating according to tidal times (day and night-time).
- High Speed Craft (HSC):
  - River Bus – operating to a timetable
  - RIB experiences – operating to a timetable (predominantly daytime only).
- River Tour – operating to a timetable (predominantly daytime only).
- Freight / cargo (intra port trade) – operating to tidal times (day and night-time).
- Recreational – operating according to recreational demand (strong seasonally and weekly distribution and mostly daytime only).
- Service vessels – largely operating in daytime based on operational requirements.

3.1. METOCEAN CHARACTERISTICS

The tide is a dominant factor in how an operation is planned and managed on the river Thames. This is both in terms of having the right depth of water, and coping with the tidal rate, which can get up to 4 knots during a spring tide ebb in the project area, although 2.5 – 3 knots is more usual. The flood tide is generally of shorter duration than the ebb and the stream invariably sets to the outside of the bend, which causes silting on the inside bend. The uneven nature of the bottom compounded by the many obstructions of piers, moorings and shoals that exist on the river Thames cause localised phenomena such as eddies and other hydrodynamic features.

Tidal characteristics for North Woolwich/Silvertown (closest PLA predictions to the project area) are given in **Table 2.**

Table 2: Tidal Heights.

North Woolwich (Silvertown) Tidal Height Characteristics [m]		
Level of Chart Datum below Ordnance Datum (Newlyn)		3.35
Standard levels above local C.D.	Mean Low Water Springs	0.6
	Mean Low Water Neaps	1.6
	Mean High Water Neaps	5.8
	Mean High Water Springs	7.0
	Highest Astronomical Tide	7.7

3.2. VESSEL TRAFFIC DATA

The range of vessel sizes and types, and their respective mode of operation (principally between tidally restricted and timetable controlled), means that the vessel traffic disposition in Bugsby's/Woolwich Reach changes, based on time of day and state of tide as well as the day of the week and seasonality.

Vessel traffic analysis was conducted on 14 days of AIS data[1] for September 2018 provided by the PLA to inform the baseline understanding of vessel traffic disposition in Bugsby's/Woolwich Reach.

The supporting data was reviewed with PLA at commencement and agreed as appropriate for the assessment. It was agreed that summer 2018 would provide a seasonality peak (relative to a reduction in some vessel operations in the comparative winter). Whilst it was noted that some minor differences had occurred since the 2018 period (e.g. commenced/cessation of operations from various wharves/piers) – these had occurred following the 2019 summer period (but prior to the summer 2020 period which could not be considered representative as a baseline for the assessment due to the impacts of COVID-19 on vessel traffic). Where the baseline traffic profile has changed since the presented data this is identified and reviewed anecdotally through stakeholder consultation.

This section presents a range of vessel traffic plots for the study area utilising the data. To provide navigational and spatial context, these are presented with navigation charts and the PLA authorised channel and DCO limits are also shown.

3.3. MANAGEMENT OF NAVIGATION SAFETY - PORT OF LONDON AUTHORITY

The PLA is the Statutory Harbour Authority (SHA) for the river Thames, responsible for "*defining and enforcing the regulations needed to support and manage the safety of navigation on the 95 miles of the tidal River Thames*". The project is located within the jurisdiction of the Upper District of the PLA with the Harbour Master Upper being responsible for navigational safety between Teddington Lock in the west and Crossness in the east.

3.4. RELEVANT WHARVES AND MOORINGS IN STUDY AREA

The study area includes a number of working and non-working wharves. **Figure 10** shows an excerpt from the PLA's definitive berths chartlet and reference is made to these in the interpretation and analysis.

The presence of the Victoria Dock Barge Roads Upper mooring should be noted (See **Figure 6)** which is located within the DCO boundary although to the south-east of Thames Wharf and opposite Dock Entrance Wharf. This mooring is operated by Collins Waterage and Lighterage and used to moor the Haven Supporter tug and Malamute workboat – generally for short periods and overnight durations.

[1] AIS data is vessel position data transmitted by vessels engaged in commercial cargo or passenger operations navigating on the River Thames. AIS data is transmitted periodically (between 1 sec to 6 minutes) by VHF radio, depending on vessel mode of operation (transiting speed, turning, berthed, or anchored etc.), and includes vessel specification termed "static" information (e.g. identification, size, type, etc.) and "dynamic" information (e.g. speed, heading, position, etc.).

3.5. VESSEL TRAFFIC IN VICINITY OF THAMES WHARF

The following sections provides details on the frequency and types of vessels navigating in close proximity to the project and in the area. This provides a baseline understanding and characterisation of vessel traffic that informs the assessment of risk. **Figure 11** shows the vessel traffic density for September 2018, which is broken down into vessel types in the proceeding sections.

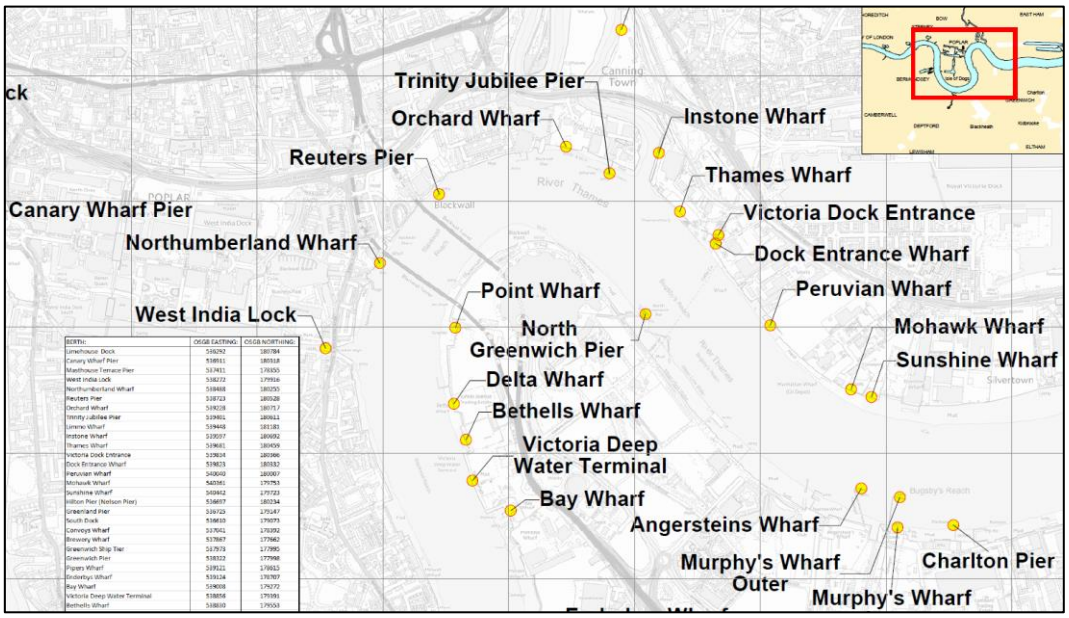

Figure 10: Principal Wharves in Study Area (Source: PLA).

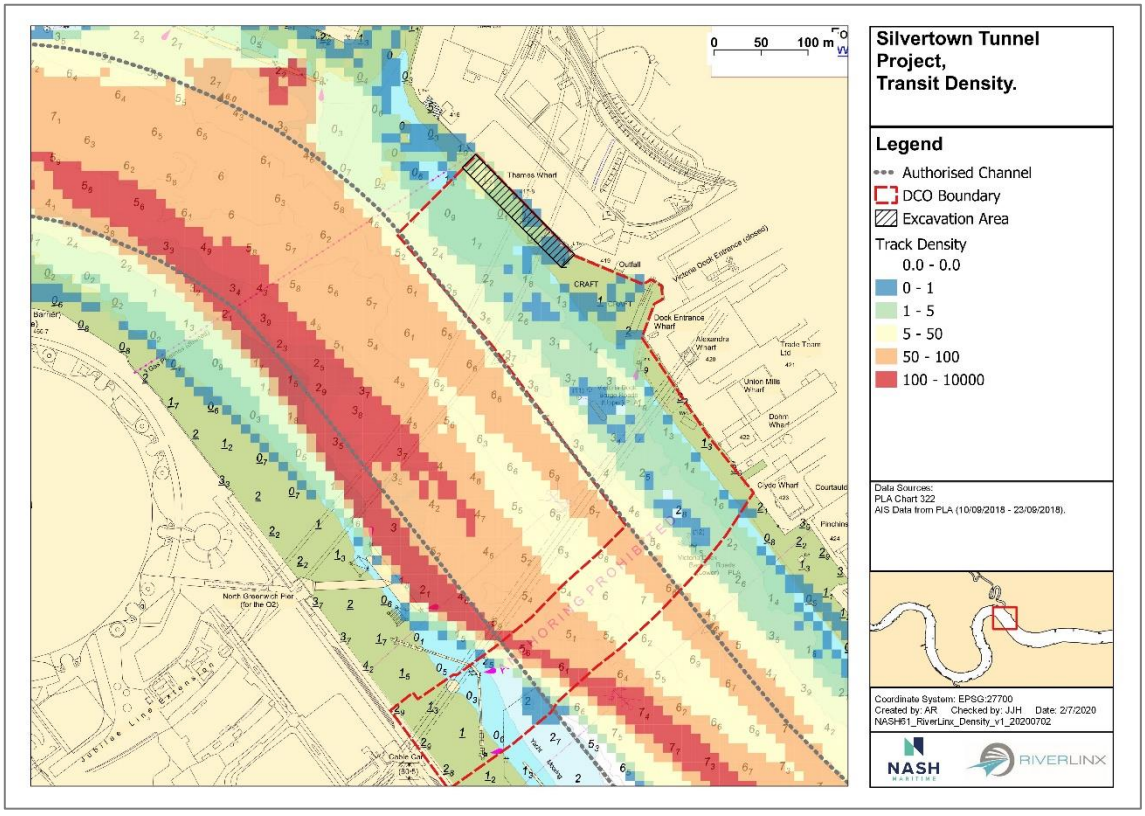

Figure 11: Combined vessel traffic density for September 2018.

3.5.1. LARGE SEA-GOING COMMERICAL VESSELS

3.5.1.1. Tower Bridge Upper Mooring

Large sea-going commercial vessels, defined as those vessels with lengths overall of greater than 100m, typically transit through Bugsby's Reach to berth at Tower Bridge Upper Mooring (alongside HMS Belfast) or the Greenwich Ship Tier. To analyse these vessels, an extract of all vessels that had lengths greater than 100m. In total 8 unique vessel transits were identified, which are summarised in **Table 3**. Most transits were recorded to occur at, or around HW given the deep draughts of the vessels and the requirement for greatest navigational area to manoeuvre to / from their berth. Most vessels are cruise ships between 130 and 180m in length overall.

Table 3: Sea Going Commercial Vessel Transits (September 2018).

Date and Time	Vessel	Direction	Tidal State
11/09/2018 01:56	Azamara Journey (Cruise)	Outbound	HW-0.5
12/09/2018 16:18	Aviva (Superyacht)	Outbound	HW+1
17/09/2018 19:00	Silver Wind	nbound	HW+0.5
18/09/2018 17:33	Astor	nbound	HW-2
19/09/2018 20:26	Silver Wind	Outbound	HW-0.5
19/09/2018 10:54	Astor	Outbound	HW+3
20/09/2018 06:30	Star Breeze	nbound	HW-3
21/09/2018 22:34	Star Breeze	Outbound	HW-1

For each of the large vessel transits, swept paths showing the to-scale footprint of the vessel as it transits were constructed from their AIS offsets. **Figure 12** shows the cumulative swept paths of each of the eight vessel transits through the study area. The typical route of sea going vessels can be seen transiting to the north of the channel towards Woolwich Reach, before transitioning to the southern section of the channel at Blackwall Point. Immediately adjacent to Thames Wharf, vessels are typically in the middle of the channel with at least 125m separation from Thames Wharf. **Figure 13** and **Figure 14** shows the swept paths of two of these transits.

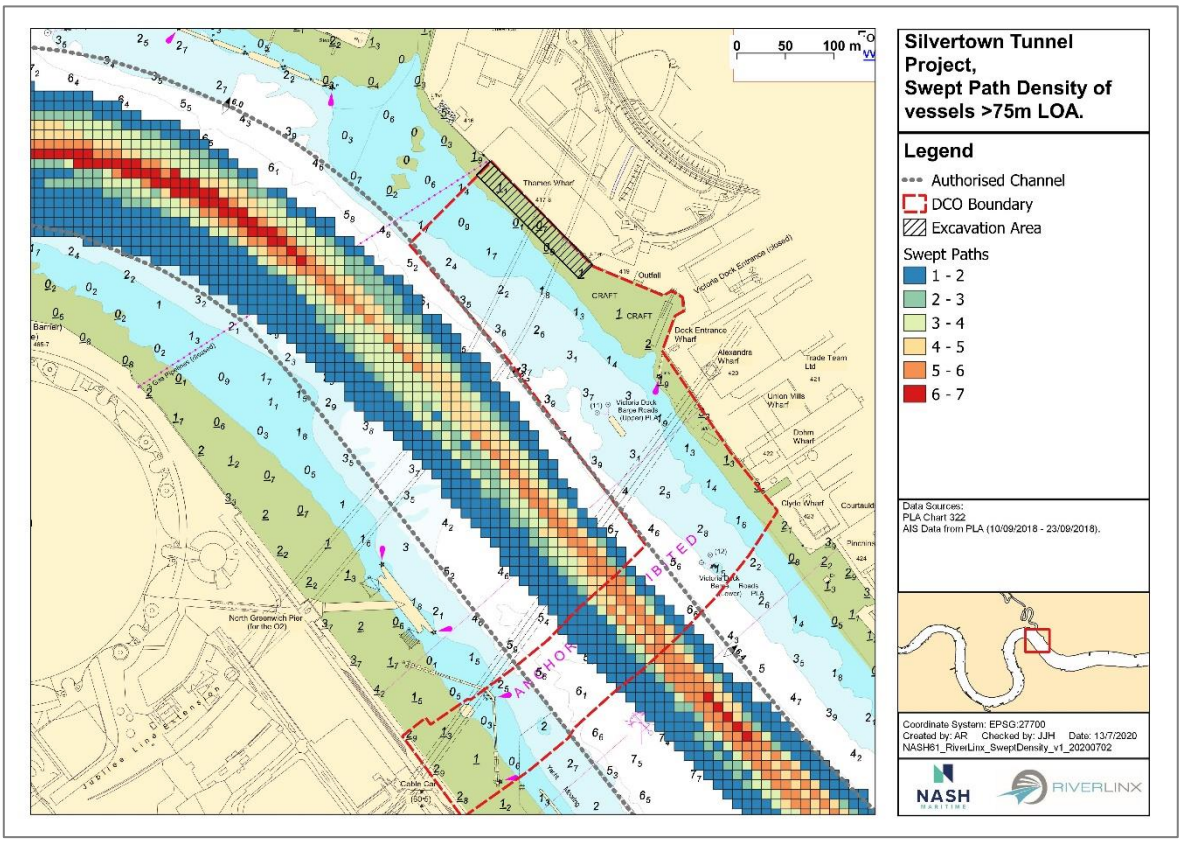

Figure 12: Swept Path of Vessels Greater than 100m LOA Density.

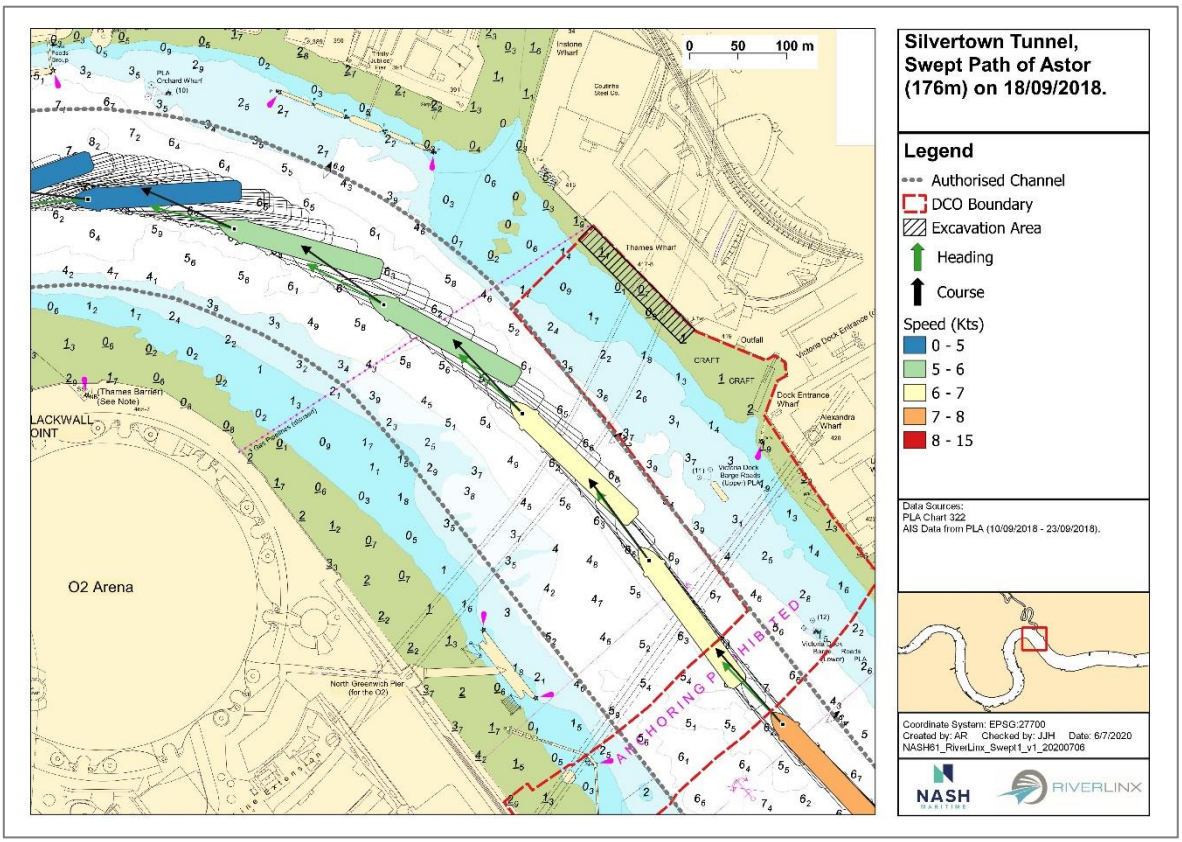

Figure 13: Inbound transit of Astor (18/09/2018).

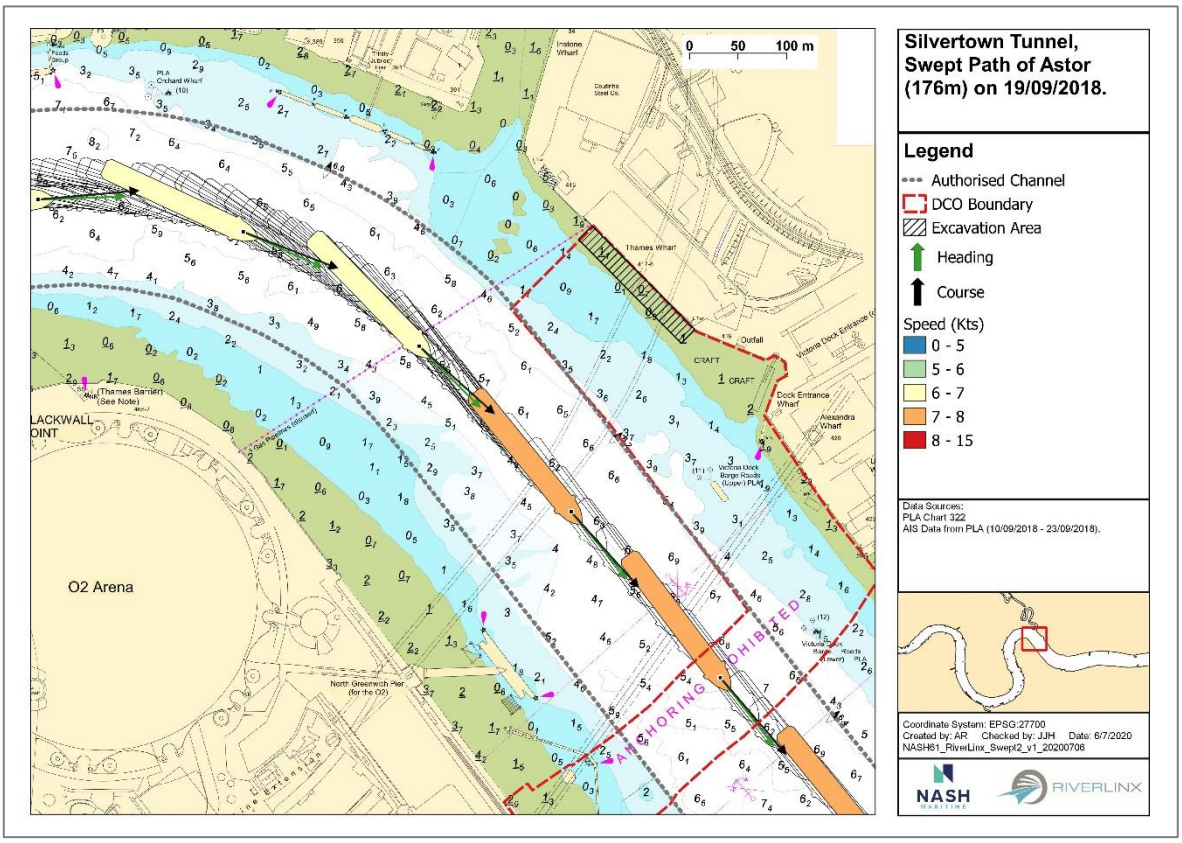

Figure 14: Outbound transit of Astor (19/09/2018).

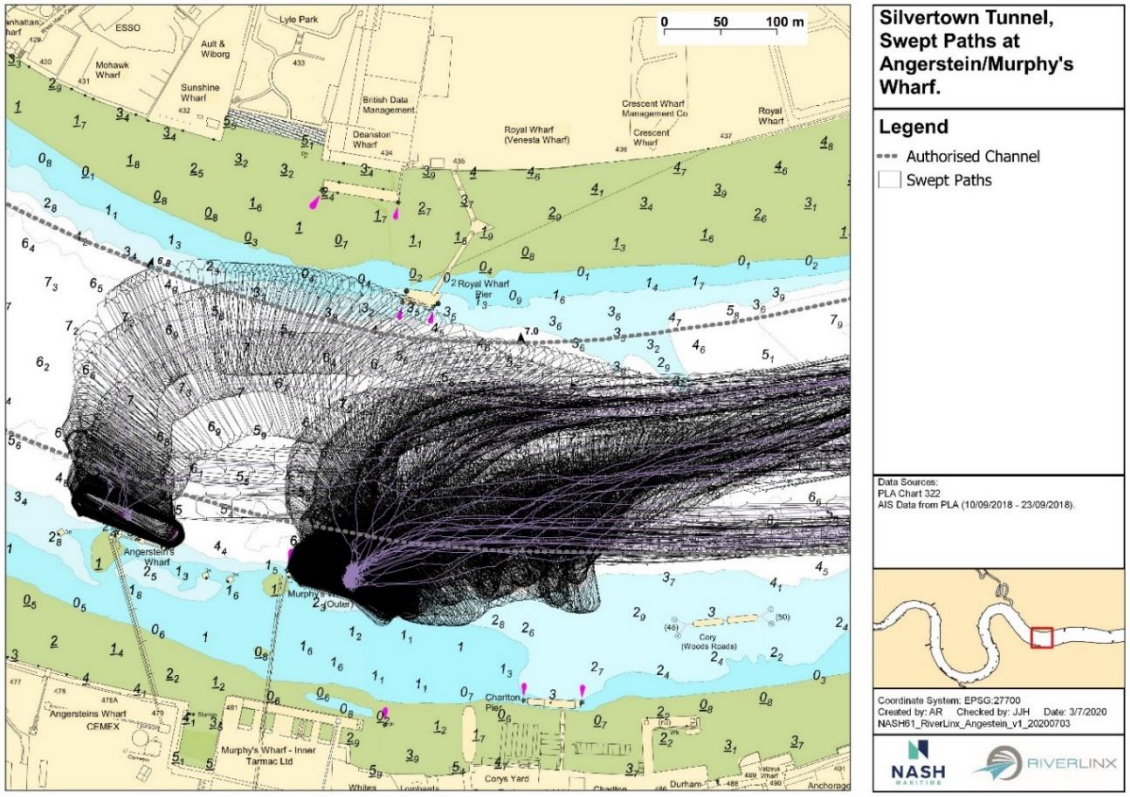

Figure 15: Angerstein and Murphy's Wharf

3.5.1.2. Angerstein and Murphy's Wharf

Located to the east of the study area is Angerstein and Murphy's Wharves which are a large aggregate import dock which are visited periodically by large sea going dredgers. Whilst this is to the east of the immediate study area, the arrival and departure of these large vessels has contextual relevance (**Figure 15** shows the swept path of two example vessels). It is noted that Royal Wharf Pier shown in **Figure 15** has recently opened (since November 2019) to provide an additional Pier on the Thames Clippers network (see also **Section 3.5.2**).

3.5.2. HIGH SPEED CRAFT

The predominant HSC vessel types are the River Bus services, passenger vessels operated by Thames Clippers, engaged in the transportation of commuters on regular timetabled routes rather than leisurely cruises. They account for the single most active vessel type in the study area and, at peak can be transiting every 15 minutes. On average, 165 HSC movements per day occur through the reach. A primary Thames Clippers base is located at Trinity Buoy Wharf, immediately upstream of Thames Wharf. This location and its facilities are used for crewing, refuelling, layby, and maintenance.

Figure 16 shows the tracks of River Bus services during the data periods. The majority of through transit River Bus vessels are calling at North Greenwich Pier which is used by both River Bus 1 (RB1) and River Bus 6 (RB6) service:

- RB1 is a 30-minute regular stopping service operating at both weekdays and weekends.
- RB6 is a commuter service and calls at Canary Wharf only during weekday commuter hours.

Weekday operations can be considered to commence 0500 and extend through to 0100-0200 with a 20-minute interval. Weekend operations commence 0730 and extend through to 0100 with a 15-minute interval. Whilst the Royal Wharf Pier located to the east of the study area only became operational after the September 2018 data, it is not expected to impact the distribution of vessel tracks shown in **Figure 16** due to the nature of navigation albeit it is an additional stop on the services.

Whilst the Royal Wharf Pier located to the east of the study area only became operational in November 2019 (after the September 2018 data), it is not expected to impact the distribution of vessel tracks shown in **Figure 16** due to the nature of navigation albeit it is an additional stop on the services.

Thames Clippers are classified as HSC and so are subject to the High-Speed Craft Code (HSC Code), issued by the IMO. Among other conditions the HSC Code requires that HSC comply with the International Safety Management Code (ISM), a much more rigorous standard than the Domestic Safety Management Code (DSMC)[2] and other regulation, applied to Class V vessels. The fact that both the vessels and crew of Thames Clippers are subject to much more rigorous regulation than other passenger vessels operating on the Thames is a significant risk control factor that the NRA must consider fully. To give some examples of the constraints imposed by the HSC Code, to which other traffic are not necessarily subject:

- Comply with the ISM code – today, most freight operations are also ISM compliant.

[2] The HSC Code says specifically: "*The Domestic Safety Management Code referred to in MSN 1754 and S.I. 2001 No. 3209 is not considered appropriate to domestic HSC vessels due to the speeds travelled by HSC and the risk based methodology applied in the HSC Codes.*"

- All passengers and crew must have fitted seats.
- Achievement of evacuation times in the event of abandonment to be proven by actual demonstration.
- Fixed firefighting systems.
- Specific requirements for the field of vision from the 'operating compartment' or wheelhouse.
- *"The crew complement shall be such that **two**[3] officers are on duty in the operating compartment when the craft is under way, one of whom may be the master".*
- *"Crew qualifications and training, including competence in relation to the particular type of craft and service intended, and their instructions in regard to safe operational procedures".*

An additional category shown within **Figure 16** is the Rigid Inflatable Boat (RIB) experience tours which consist of a number of operating companies who utilise this area for high speed transits. In areas of the river, where safe to do so, these operators will also undertake high speed turns and manoeuvres.

The number of operations offering these high-speed rides in RIBs, where 'experiencing thrills' is very much part of the ride has proliferated over the past decade. These vessels are not governed by the HSC Code, but they are required to obtain a Certificate of Compliance (CoC), renewed annually as described at the PLA's Thames Byelaws 16.3 and 16.4. To gain a CoC, owners are required, among other things, to:

- Prove that boats are of approved construction.
- The Boats should have certain features such as fitted seats for each passenger.
- Manned by competent crew.
- Embark another crew member, additional to the helm to improve the ability to keep a proper lookout.
- Develop a safety management system incorporating passage plans and risk assessments.
- Be fitted with and operate Thames AIS.
- Show a yellow flashing light.
- The Coxswain at least must hold the PLA Local Knowledge Endorsement.

[3] Emphasis by the writer of this report

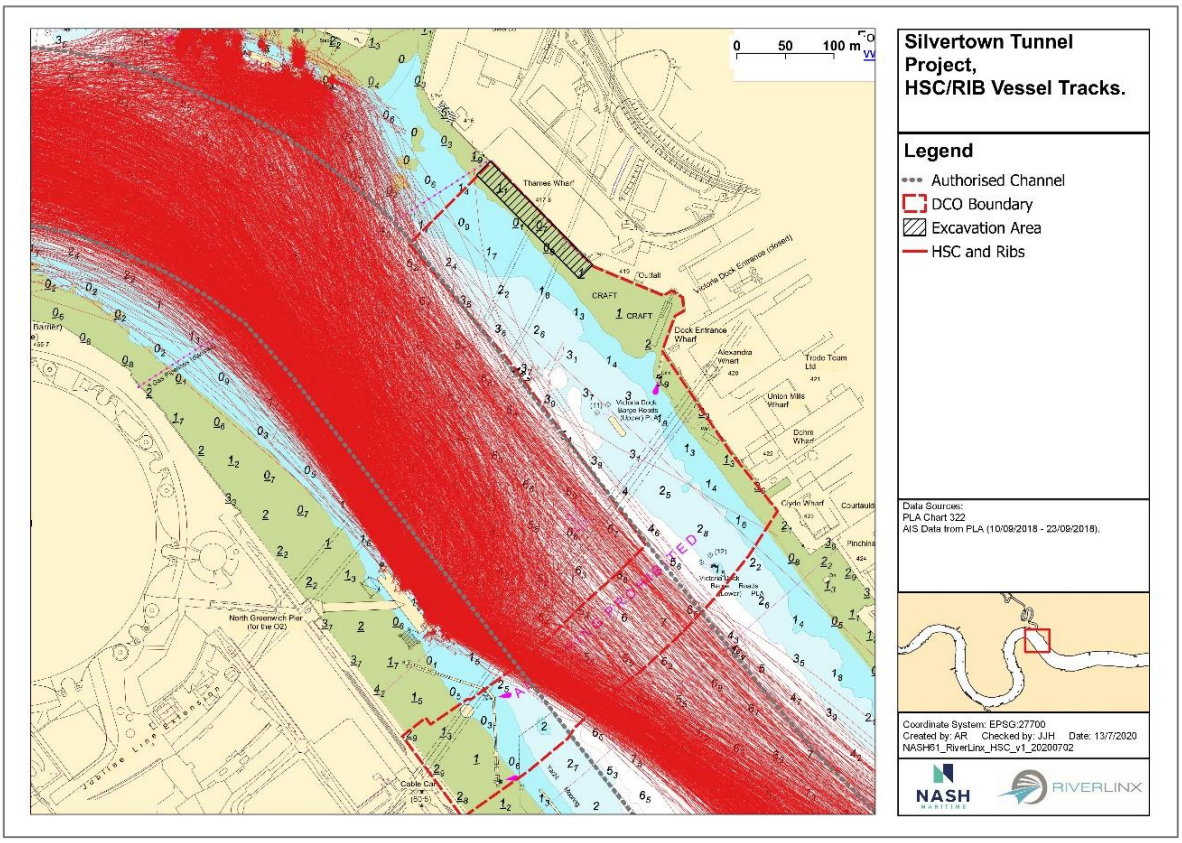

Figure 16: River Bus Vessel Tracks.

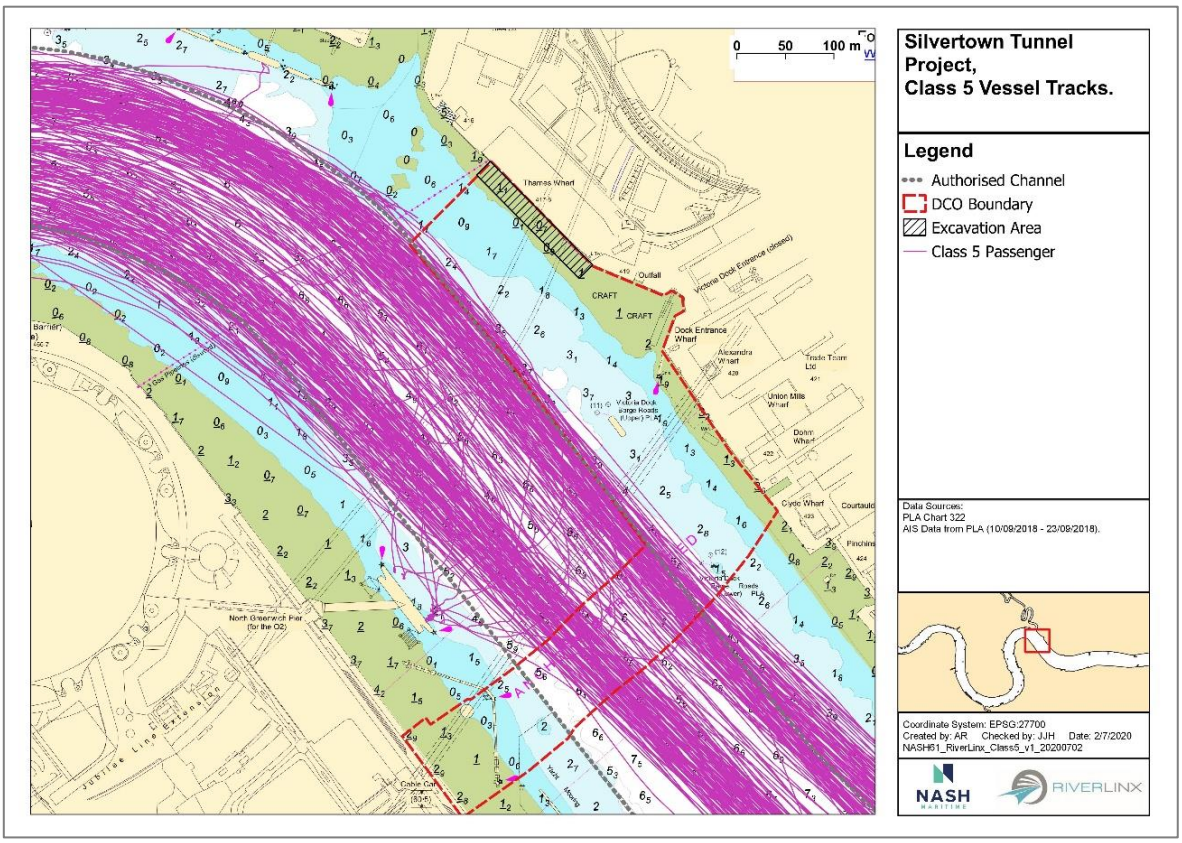

Figure 17: River Tour Vessel Tracks.

3.5.3. CLASS V PASSENGER VESSELS - RIVER TOUR

River Tour vessels are Class V passenger vessels, classified by Transport for London (TfL) as engaged in leisure trips including hop-on/hop-off services, themed cruises, dining experiences and sightseeing tours. River Tour vessels includes a wide variety of vessels, from City Cruise Millennium class vessels (e.g. *Millennium Time*) primarily servicing the public directly, to large corporate vessels engaged in pre-booked corporate events (e.g. *Silver Sturgeon*).

Figure 17 shows the tracks of River Tour services during the September 2018 data periods. There are on average 18 transits per day through the study area. These vessels range from the larger Silver Sturgeon (61m) and Dixie Queen (57m) to the smaller (approx. 20m) London Belle, Mayflower Garden and Chay Blyth. In general, Class V vessels transit through the Reach, however on six occasions, a vessel came alongside North Greenwich Pier (Golden Jubilee/Golden Sunrise, Mercia and Salient). On one occasion the Elizabethan came alongside Trinity Jubilee Pier.

3.5.4. FREIGHT / CARGO (INTRA PORT TRADE)

Figure 18 shows transits of freight and cargo vessels through Bugsby's Reach. These include the motorised freight barge *Polla Rose*, and tug ang tows operated variously by Cory Tug and Tows, GPS, SMS and Bennets Barges and several other smaller operators. This also include Thames Tideway Tunnel traffic – which is a relevant interfacing project with significant number of tug and tow operations on the river. It should be noted that Thames Tideway Tunnel traffic will have declined significantly prior to the proposed activities at Thames Wharf and therefore this count is precautionary.

A number of working wharves are seen in the AIS data as referenced within **Section 3.4** and **Figure 10** and are detailed within this section with the vessel activities broken out by sub category/activity to assist in interpretation.

3.5.4.1. Thames Wharf and Royal Primrose Wharf

In the data presented, and as extracted in **Figure 19**, Thames Wharf has approximately 17 movements on and off the wharf, the majority of which are GPS vessels exporting non-hazardous spoil material under contract to Keltbray who currently occupy an area on the site. Keltbray are due to vacate the Thames Wharf site prior to STT project commencing and relocate activities to Royal Primrose Wharf which has been afforded Safeguarded Wharf Status in light of the release of Thames Wharf from safeguarded status (due to its use on STT).

The movements of GPS are notable as a reference and representative of the indicative footprint and track that tug and tows will take when utilising Thames Wharf under Phase 2 (it is understood that a similar state of tide will be used).

Once activities relocate to Royal Primrose Wharf a similar activity level to that which currently takes place at Thames Wharf is anticipated.

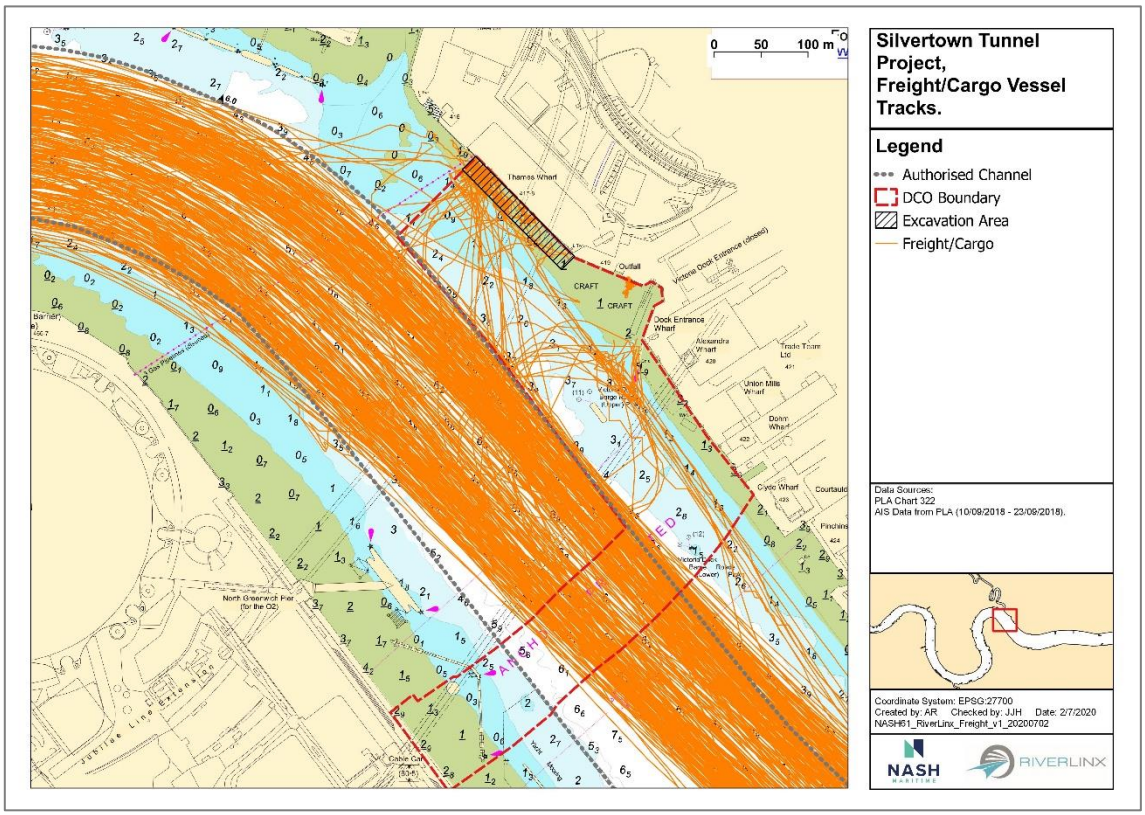

Figure 18: Inland Freight/Cargo vessel tracks.

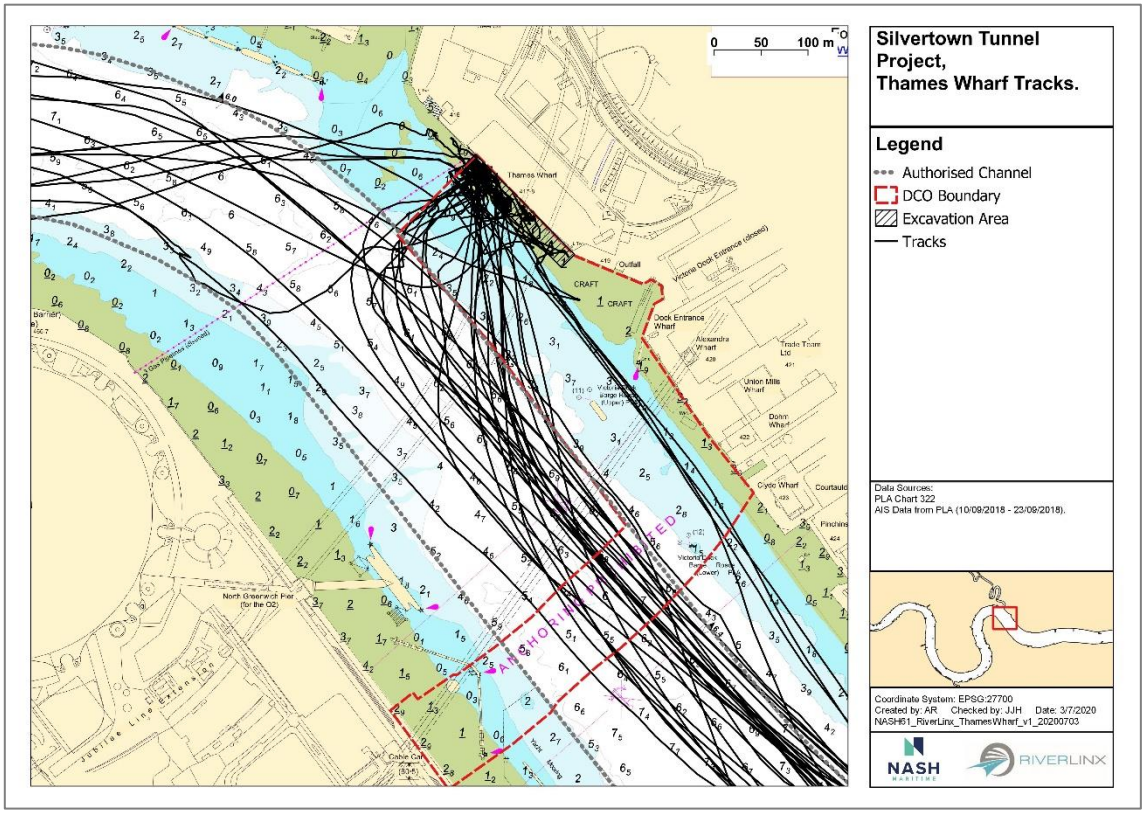

Figure 19: Movements at Thames Wharf.

3.5.4.2. Dock Entrance Wharf

Figure 20 shows the Polla Rose and Yasam Rose, of Thames Shipping, coming alongside Dock Entrance Wharf with approaches and departures from upstream and downstream and splitting either side of the Victoria Dock Barge Roads Upper mooring. This activity has ceased at time of this assessment and will not recommence so therefore usage of Dock Entrance Wharf will not be considered further.

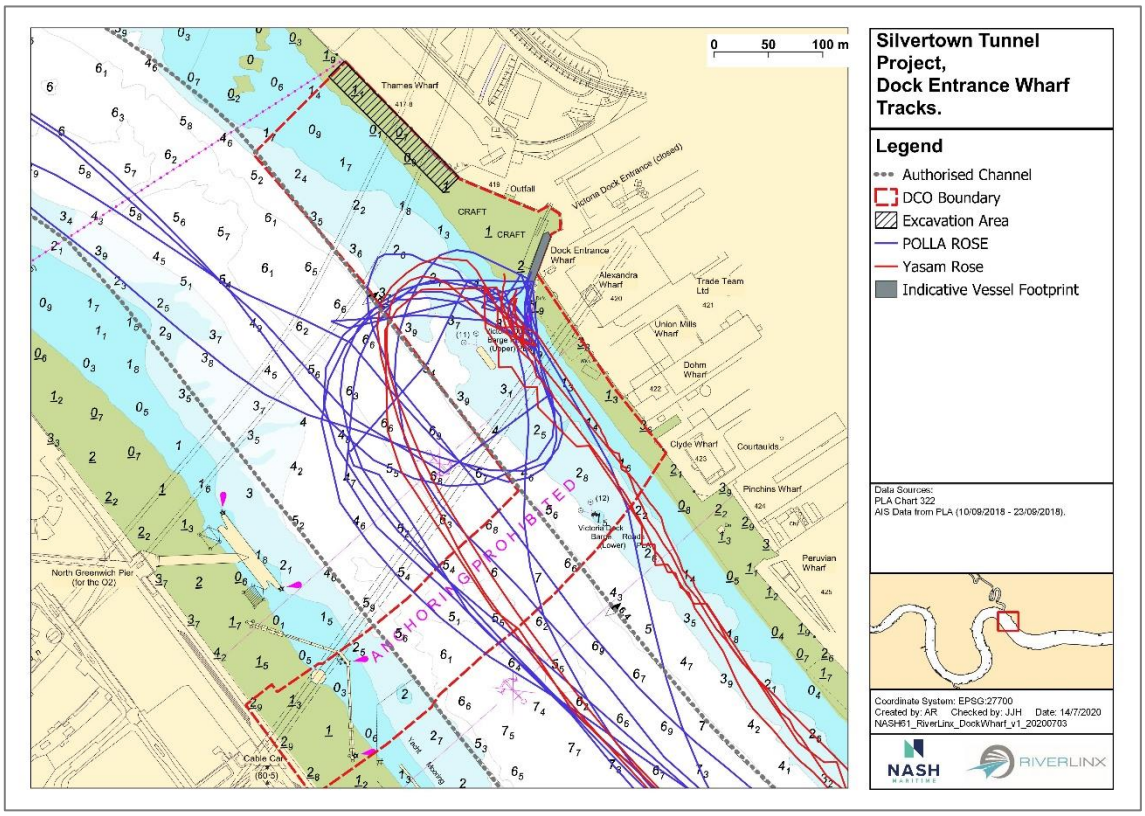

Figure 20: Movements at Dock Entrance Wharf.

3.5.4.3. Cory

Cory Riverside Energy (Cory) are a significant tug and tow operator running a fleet of five tugs and over 50 barges transporting residual waste and aggregate. The waste is collected from riparian transfer stations located along the river through Central London, in sealed containers that are crane loaded onto barges for transhipment down river. Cory operate to a tidally related schedule with their marine operations operating from Charlton riverside and moorings at Atlas Barge Roads (both to the east of the study area). They are primarily a through transit operation in relation to the project.

Figure 21 highlights the movements of Cory tug and tows through the study area with the inset showing manoeuvring is limited to the waters around Atlas Barge Roads.

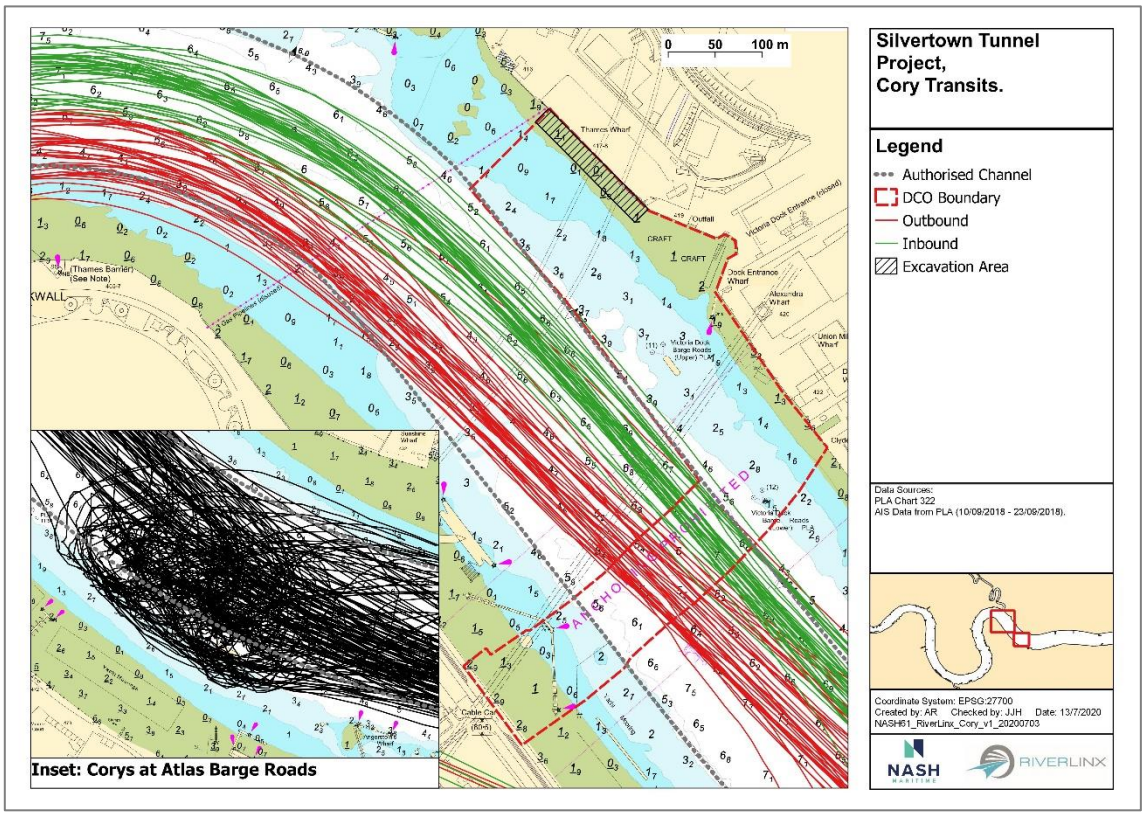

Figure 21: Cory Movements in Study Area.

3.5.4.4. Peruvian Wharf

Consideration should also be given to recently commenced activity at Peruvian Wharf. Peruvian Wharf is a Safeguarded Wharf and was re-opened in September 2019 with Brett Aggregates opening a hub site for aggregates and with a co-located concrete batching plant (for onwards road transportation into London). At present; shipment of aggregates from Cliffe Terminal, located further downstream in the Thames estuary, total approximately 3 movements per week although, being located downstream of Thames Wharf, this has no appreciable interaction with the project.

3.5.5. SERVICE VESSELS

Service vessels include other routine vessels operating on the Thames, such as law enforcement, port tenders, Search and Rescue (SAR) and workboats, the tracks of which are shown in **Figure 22.** This also shows the usage of Bow Creek which is the entrance to the River Lea.

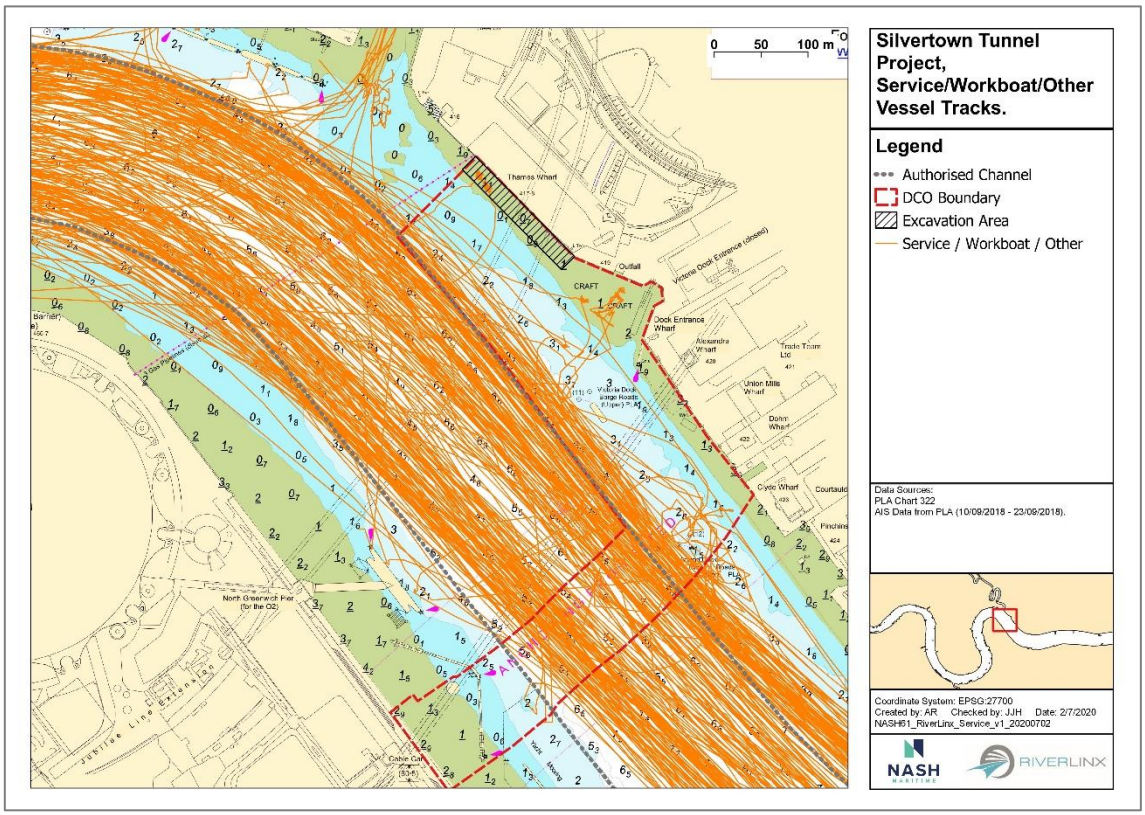

Figure 22: Service Vessel Tracks.

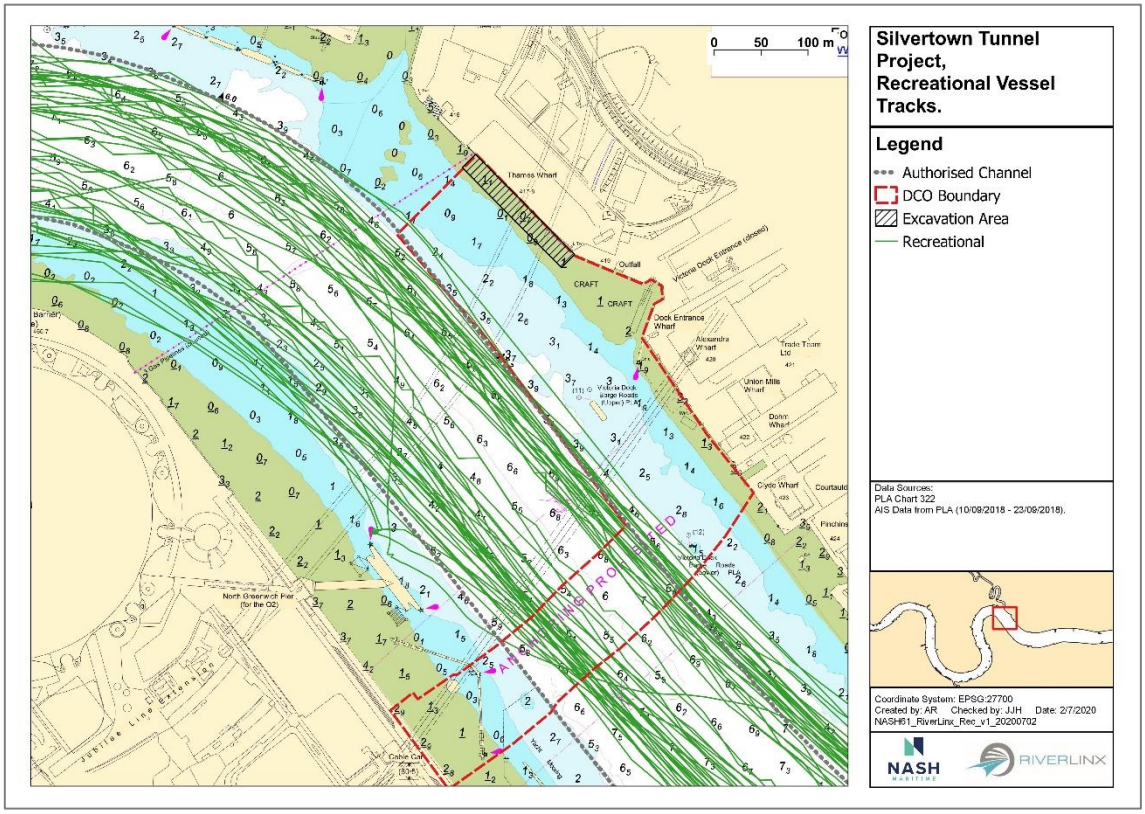

Figure 23: Recreational Vessel Tracks.

3.5.6. RECREATIONAL

Figure 23 shows large yachts and powered pleasure craft but does not show all recreational transits as most recreational vessels are not required to carry AIS. It is expected that less than 10% of yachts or pleasure craft carry AIS, and therefore based on the data it could be expected that up to 40 transit each day during a seasonal peak. In addition, rowers, sailing boats and other small recreational craft are numerous in this part of the river. Most vessels are transiting at the edges of the authorised channel, keeping space for commercial vessels to transit within the channel, and utilised designated crossing points.

The River Lea (known as Bow Creek) which is an extensive network of waterway frequently used by small recreational craft, including narrowboats, also joins the river at the northern end of Thames Wharf.

3.5.6.1. Rowing and Paddling

Figure 24 shows an extract from the Tideway Code for recreational craft (rowing and paddling) where the Lower Tideway Code Area applies and, as such, this Code of Practice provides a good spatial understanding of how this class of user operates.

Rowing boats are obliged to work the slacks and on the ebb tide, inbound vessels should navigate on the starboard channel up to Blackwall Crossing before crossing to the port side. Outbound vessels should generally stay on the starboard side of the channel. On the flood tide, inbound vessels would transit close to Thames Wharf, on the starboard side of the channel, whilst outbound vessels stay on the inside of Blackwall Point.

It should be noted that PLA guidance is that recreational craft should not cross the channel immediately upstream of the Thames Barrier. Therefore, any outbound vessels intending to turn around before reaching the Barrier, should remain on the northern side of the channel having passed Blackwall Crossing.

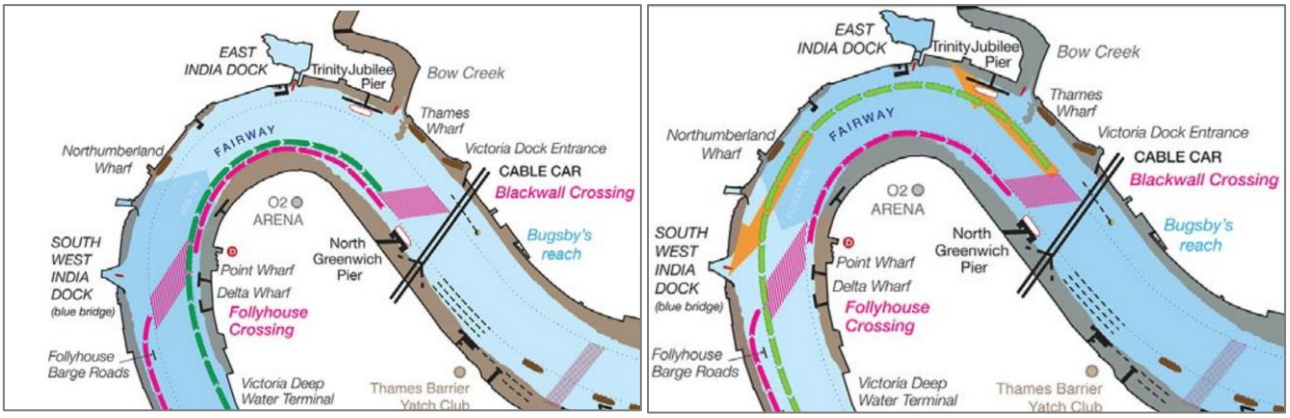

Figure 24: Thames Tideway Code (Left – Ebb, Right - Flood).

3.5.6.2. Sailing

A number of sailing clubs are active, operating from facilities in the lower end of the study area. Notably Greenwich Yacht Club at Pear Tree Wharf with over 400 members cruiser sailors, dinghy sailors, motor-boaters, and rowers. Together with Thames Barrier Yacht Club there are an extensive number of mud and deep water moorings for boats up to 12m length on the southern side of the river (see **Figure 24**).

Figure 25: GYC Moorings in foreground at low water and GYC on Pear Tree Wharf in mid shot. Angersteins and Murphy's Wharves to rear (Source: Chris Whippet via: geograph.org.uk).

3.6. TRANSECT AND TEMPORAL ANALYSIS

A transect was created across the channel in the location of the piers, with key statistics extracted for the vessels which pass it. **Figure 26** shows the transit distribution across the channel from the September 2018 dataset. Typically, a clear starboard side navigation distribution is evident, however, in this location the presence of North Greenwich Pier skews the resultant gate. Inbound and outbound vessels to North Greenwich Pier may transit briefly on the wrong side of the channel, hence the significant number of transits in this area.

Figure 27 shows the distribution of transits by type and time. The majority of transits are Thames Clippers, between 4am and midnight, however peak hours are between 1000 to 2200, with a peak at 1400. Also notable is an evening peak around 2100, after commuting traffic has reduced and as evening Class V party boats start operating. The data shows minimal difference between weekday or weekends.

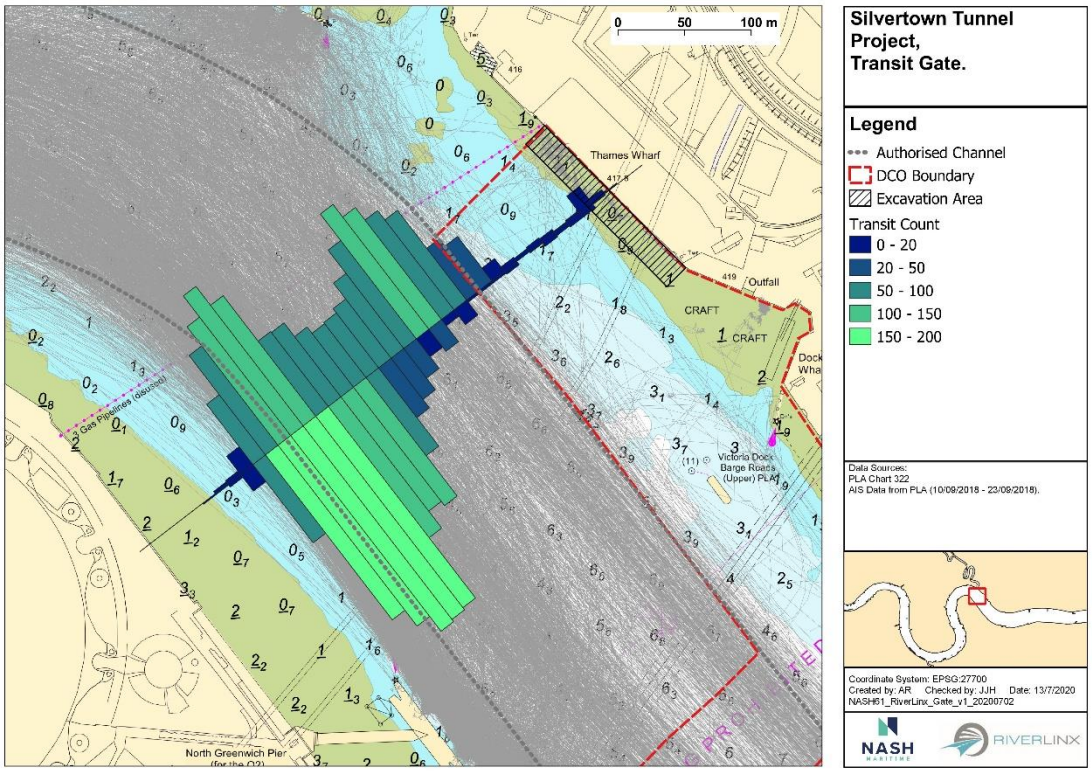

Figure 26: Analysis of Transit Distribution during September 2018.

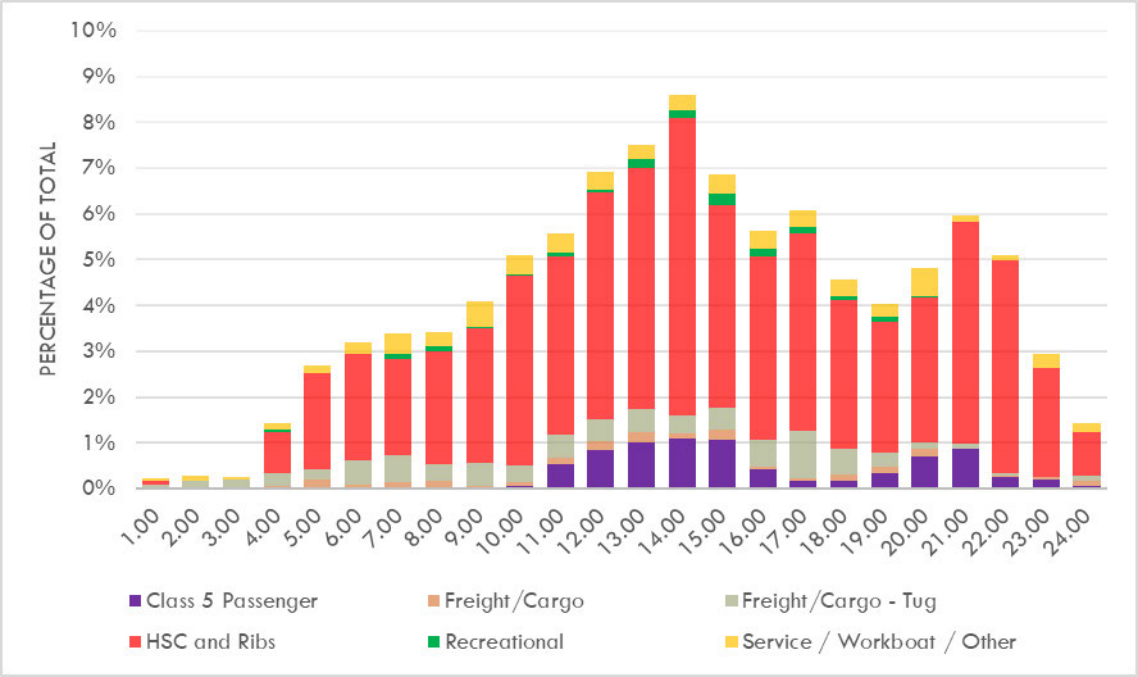

Figure 27: Temporal distribution of transits (BST).

3.7. INCIDENT ANALYSIS

The PLA Incident Database was provided, and all incidents that have occurred between 2010 and 2018 were extracted. The incident data was filtered to extend approximately between the Blackwall Tunnel and Murphy's Wharf. 84 unique incidents were identified, excluding non-navigational incidents such as security threats or man-

overboard. Where collisions occur, the incident has been duplicated to include both vessels involved in the collision, increasing the number of records to 91.

Figure 28 shows the location and frequency of different types of incident, based on the location description. A variety of incidents are seen to occur in the vicinity of Thames Wharf; including Collisions, Machinery Failure, Contacts, Wash, Breach of Byelaws and other incident types. A few incidents contain specific references to activities at Thames Wharf, none of which had significant consequences.

- Minor grounding off Bow Creek of Sail Greenwich vessel.
- Complaint of wash against Thames Clipper during heavy lift operation at Thames Wharf.
- Steering failure of tug and tow departing Thames Wharf.
- GPS vessel inbound to Thames Wharf attempting to turn in the channel was obstructed by a Thames Clipper.

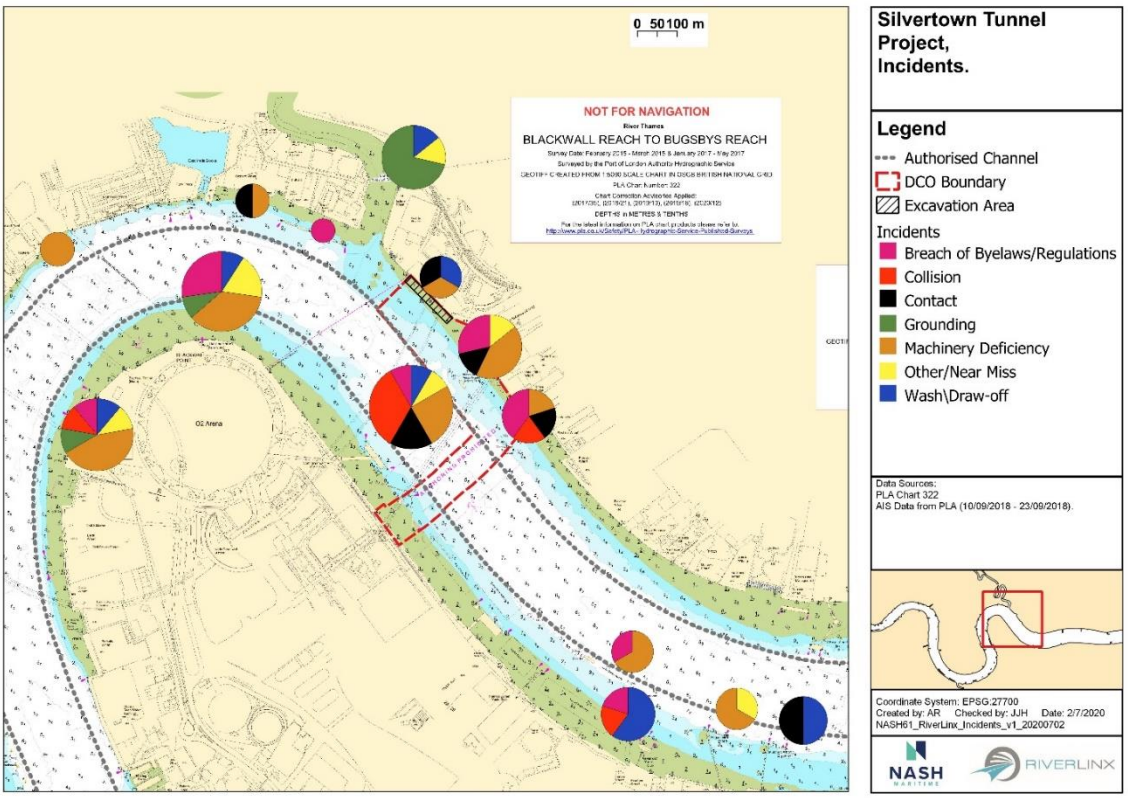

Figure 28: Incident location and types.

Figure 29 shows a summary of the incident data. Passenger vessels (principally Thames Clippers) accounted for 25% of the incidents, recreational craft accounted for 32% of incidents, but the majority were tug and service vessels at 40%.

Of the 84 incidents, seven were collisions, 8 were contacts and 7 were groundings. The most common incident types were machinery failure/deficiency (38%) and breach of byelaws (23%).

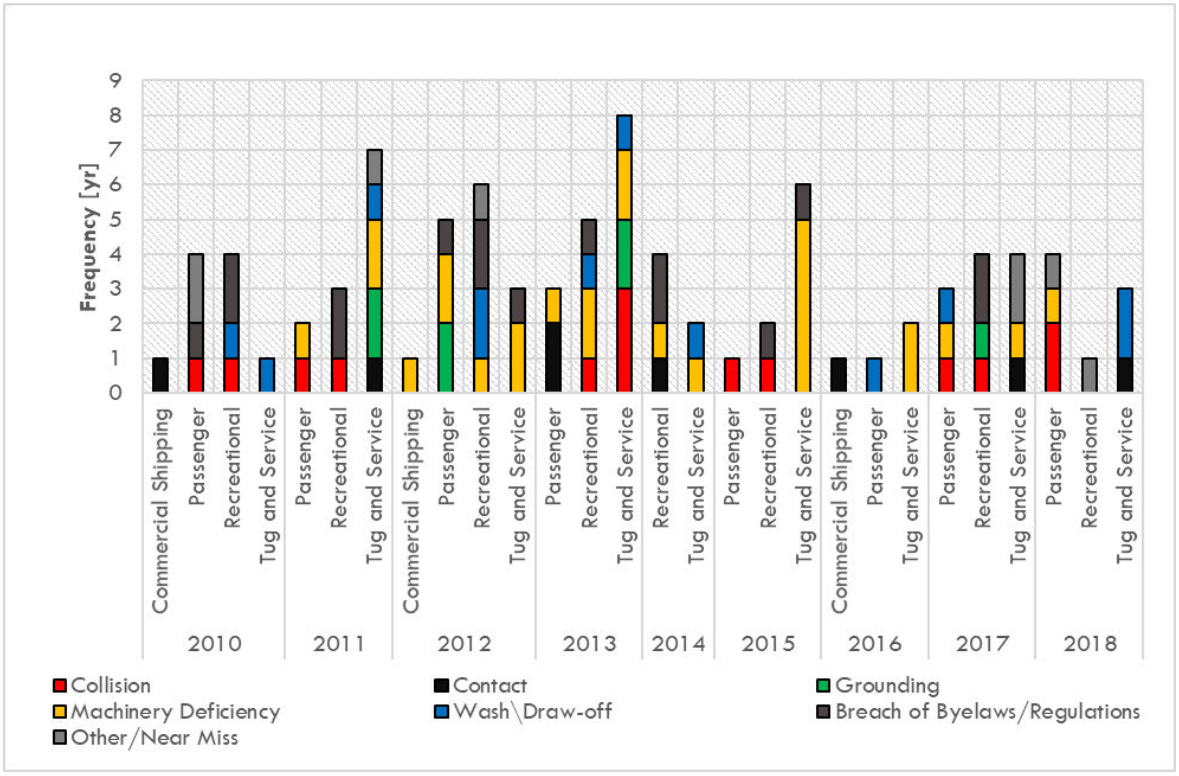

Figure 29: Incident Analysis.

Based on analysis of vessel traffic in **Section 3.6,** annual vessel counts have been calculated and used to determine the number of incidents per vessel type per movement.

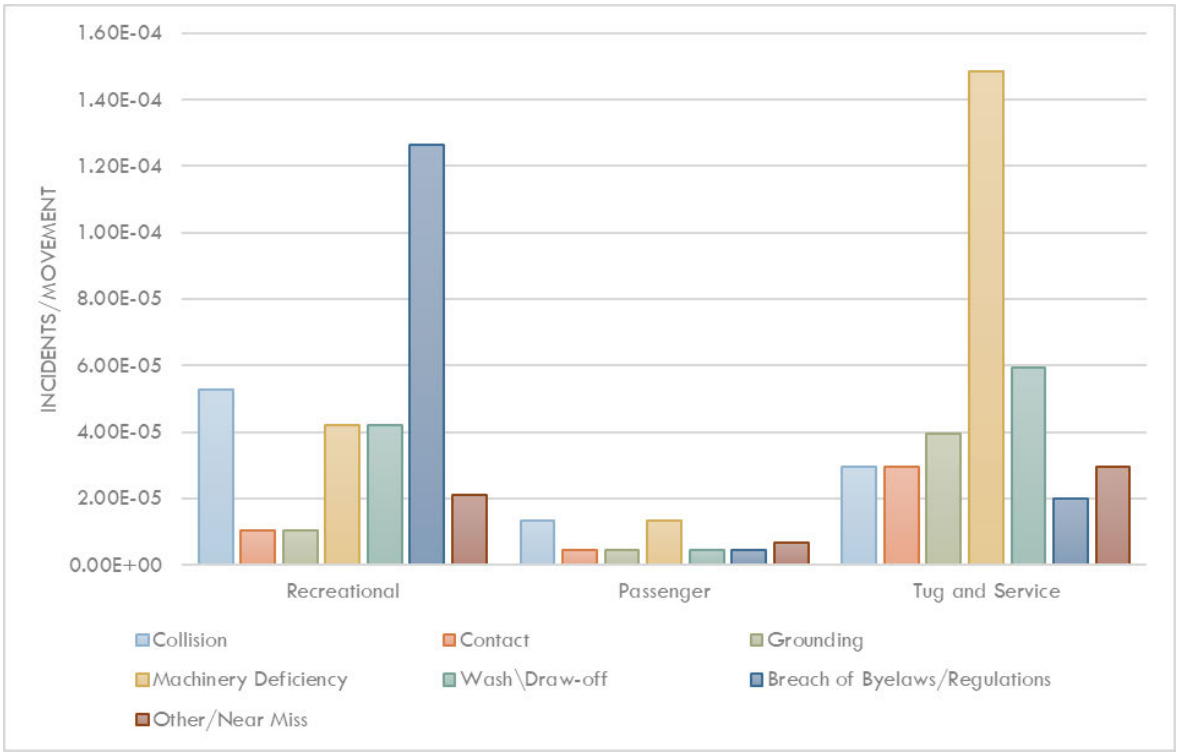

Figure 30: Incident Rates (Note that Commercial Shipping is omitted due to low sample size).

3.7.1. NOTABLE AND RELEVANT INCIDENTS

There have been a few incidents on the tidal river Thames and elsewhere that are pertinent to this risk assessment:

3.7.1.1. Typhoon Clipper – Workboat Alison

On 5 December 2016 the Typhoon Clipper collided with the workboat Alison at Tower Pier, capsizing the Alison and putting her crew of two into the river; para 2.6 of the MAIB[4] Report 24/2017 dated November 2017 stated the following:

> *"In congested waters, maintaining a good lookout by all means available is critical to navigational safety.*
>
> *Typhoon Clipper was constructed to meet the requirements of UK Class V inshore passenger vessel regulations. Post-build (and as required by the MCA), Thames Clippers recoded its River Runner 200 vessels to comply with the HSC Code. This Code had different and more stringent wheelhouse visibility requirements, which the vessels did not meet. This particular area of non-compliance with the HSC Code was not identified at the time of the recoding. Had it been so, Thames Clippers would have been required to apply to the MCA for an exemption from the HSC Code's visibility requirements. Such an application would have needed to demonstrate to the MCA that satisfactory equivalent wheelhouse visibility arrangements were in place.*
>
> *The PLA's General Direction 28 (Section 1.9.3) required vessels operating on the Thames with limited visibility, including high-speed craft, to have a lookout posted forward or suitable technical arrangements to cover the area of limited visibility. This General Direction was ambiguous as it did not define what limited visibility or suitable technical arrangements meant. Additionally, the PLA did not inspect Typhoon Clipper and accepted the vessel's MCA's certification under the HSC Code. However, the bridge visibility did not comply with the HSC Code and the PLA did not require any additional improvements or technical capability.*

3.7.1.2. Contact Thames Tigers RIB Tiger One with Mooring Buoy at Greenwich 17 January 2019

This incident, the findings of the MAIB investigation and subsequent changes in risk management are pertinent to this risk assessment: This incident is pertinent because of the prevalence of RIBs in the area.

> *"The skipper did not see the mooring buoy in time to take avoiding action. The buoy's light was possibly difficult to see against the back scatter of shore lights and might also have been obscured to some degree by birds. The skipper had limited experience of commercial passages in darkness in the area. He was navigating solely by eye and had either thought that Tiger One was closer to the centre of the navigable channel or had forgotten that the buoy was there."*

The lack of a proper lookout was the prime cause and as a direct result of this incident the PLA have stopped open-deck, HSC from operating above 12 knots during the hours of darkness.

[4] Marine Accident Investigation Branch – a part of the Department for Transport

3.8. BASELINE RISK CONTROL MEASURES

Baseline risk controls are those risk controls that are currently in place on the river Thames and apply irrespective of the project. They include:

- Health and Safety Controls, e.g. provision of life jackets and Marine Personal Protective equipment for crew working on or near the water (including means of raising alarm (e.g. Handheld radio, flares, etc.))
- Port of London Authority Risk Controls - As noted in **Section 3.3**, the PLA Harbour Master Upper is responsible for the management of navigation safety on the River in the vicinity of the proposed project, and they administer a suite of risk control measures aimed at reducing navigation risk, including the following strategic level control measures:
    - PLA Act 1968.
    - Pilotage Directions.
    - General Directions – including reporting vessel requirements.
    - Special Directions (as per powers of the Harbour Master and deputies).
    - Bye-Laws.
    - Codes of Practice and Guidance.
    - Aids to Navigation.
    - Emergency Preparedness and Response.
    - Harbour Service launch and patrols.
    - Charting.
    - Vessel Traffic Services (VTS) and vessel traffic management.
    - Promulgation of information – e.g. Notices to Mariners, Navigation Warnings.

In addition to this there are a variety of risk control measures administered by the Maritime and Coastguard Agency (MCA) and Hydrographic Organisation, which are applicable to all UK territorial waters, including:

- Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972
- International Convention on Maritime Search and Rescue (SAR), 1979
- International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended - Regulation on training, qualification and certification (including 2006 Boatmasters' Regulations and International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW))

3.8.1. THAMES BARRIER CONTROL ZONE (TBNC)

A permanent Control Zone encompassing the Thames Barrier is established between Margaretness (next to the entrance to Barking Creek) and Blackwall Point representing a significant layer of risk control within the project area and active management.

London VTS control TBNC ensure that the approaches and transit through the Thames Barrier is safely managed. Overtaking and manoeuvring restrictions apply in the zone apply – and require permission from London VTS. Recreational sailing vessels should take in their sails and use motor power when transiting the barrier and all small vessels and craft of less than 13.7m length such as yachts, dinghies, power boats, sculls, rowing boats and

canoes not fitted with VHF radio are to navigate inwards through the northern most span and outwards through the southern-most span which is open to navigation (indicated by green arrows) and which has sufficient depth of water.

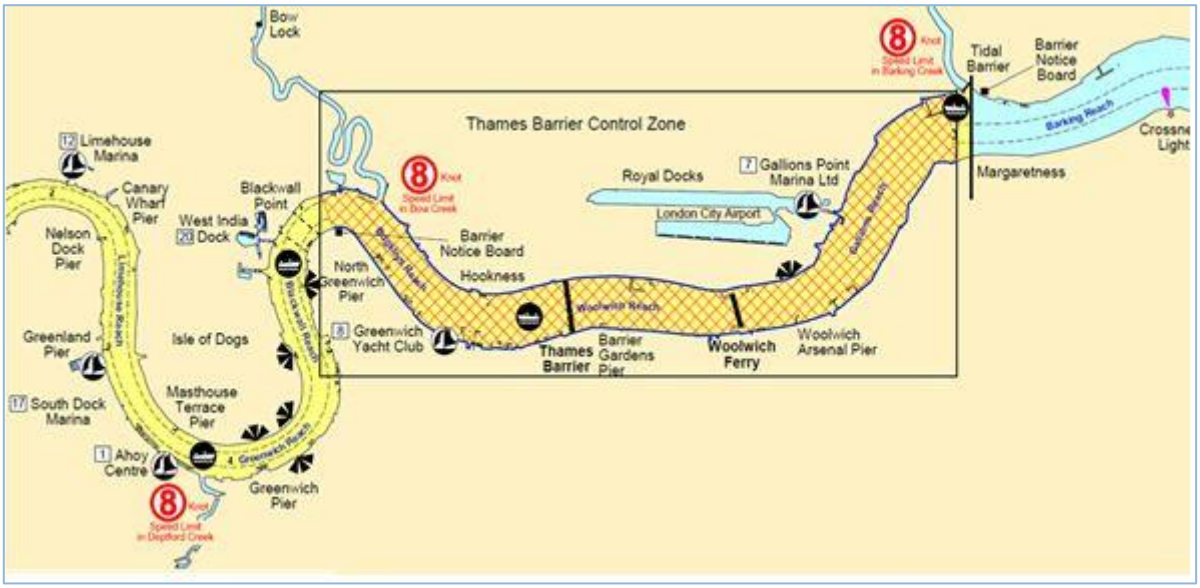

Figure 31: Thames Barrier Control Zone (TBNC) (Source: PLA).

3.9. FUTURE VESSEL TRAFFIC

In 2016, the PLA launched the Thames Vision which set a number of goals for future vessel traffic on the River Thames for 2035. Within this vision the following relevant goals for vessel traffic were identified which are commented on below and benchmarked with commentary identified from the 2019 vision progress report:

- Double the underlying intra-port freight to over four million tonnes as shown in **Figure 32** - between 2015 and 2017 this increased by 41%.
- Double the number of people travelling by river – reaching 20 million commuter and tourist trips per year - between 2015 and 2018 this reduced by 4%, however new piers and new vessels are being brought into service.
- Greater participation in sport and recreation on and alongside the water.

In addition, several key infrastructure projects are proposed or are in operation which would increase the river traffic during the lifetime of RiverLinx Project:

- Thames Tideway Tunnel – increasing freight vessel movements (anticipated completion by 2023). It should be noted that movements within the baseline AIS data as analysed are from a peak Tideway phase and therefore, during RiverLinx Project lifecycle these movements will be less however and inherently precautionary approach has been undertaken by utilising the data with elevated levels of Tideway movements.
- Cory Riverside Energy Park – increase in Cory movements (anticipated commencement of 2024).

However, both the forecast trends on future vessel traffic and the localised Thames projects will have been impacted by the 2020 COVID pandemic, which has resulted in significant reductions in vessel activity on the river Thames through 2020 and potentially beyond, and may also impact the projects as identified above, likely delaying their completion.

In summary, it is likely that vessel traffic on the River Thames will increase during the lifetime of the project as the downturn from the current COVID pandemic eases, however it is unlikely that vessel traffic will be significantly greater than 2018/19, and will most likely be less. There is however uncertainty as to how many additional vessels will be on the river Thames and what additional management practices will be implemented to maintain tolerable risk levels.

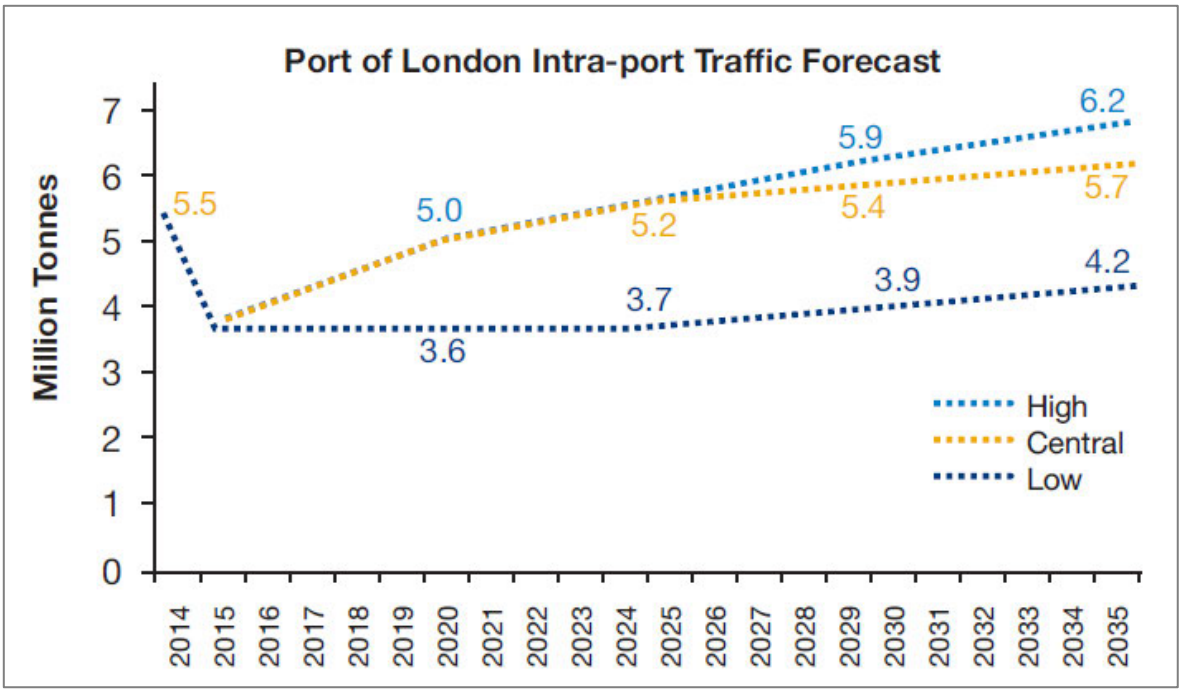

Figure 32: Forecast trends in intra-port trade (source: Stamford Research Group, 2015).

4. CONSULTATION

Navigation stakeholder consultation was undertaken to elicit local knowledge from marine operators and users of the Thames in close proximity to the project site at Thames Wharf. The list of consultees was discussed with the RiverLinx project team and the PLA at the project outset, with a finalised stakeholder consultation list defined from review of the following by user types:

- Large Commercial
  - PLA
- HSC, Class V and Passenger Vessels:
  - Thames Clippers
  - RIB Operators
- Towage and Freight Operators:
  - GPS (see also wharves)
  - Cory Environmental
  - Thames Shipping (see also wharves).
- Recreational:
  - Greenwich Yacht Club.
- Interfacing projects where relevant such as:
  - Tideway.

4.1. PRELIMINARY AND STATUTORY REGULATOR CONSULTATION

Preliminary consultation with the PLA as the Navigation Authority for the river Thames was undertaken to review the project concept and assessment methodology and elicit any navigational concerns the PLA may have and ensure they are addressed within the NRA (and can also be considered by the project team if modifications are required).

A consultation meeting was held with the PLA on 06-July 2020 attended by:

- Port of London Authority
  - [redacted] - Harbour Master Upper – Projects
- RiverLinx / IdeaChain
  - [redacted] – Logistics Manager
  - [redacted] – Marine Logistics
- NASH Maritime
  - [redacted] – Navigation Risk (meeting chair)
  - [redacted] – Navigation Risk

The meeting agenda included the following:

- Overview of the project / scheme.
- Review of vessel traffic analysis.

- Navigation discussion including supporting data and methodology of assessment.

A slide deck was presented at the meeting.

In general, the PLA Harbour Master was comfortable that navigation risk of the proposed project/scheme and could be adequately dealt with through identification of appropriate and fit for purpose risk controls measures that would be defined through this NRA.

Discussion was undertaken on the detail of the risk control measures identified as part of the Preliminary NRA (Ref), and the change in scope and extent of the project between the DCOS and the project today (which has been very much reduced in extent). The PLA agreed that as the scope and extent is reduced the need for the risk control should be driven from those identified in this assessment and, following PLA review and agreement, they shall supersede the Preliminary NRA risk controls.

4.2. STAKEHOLDER CONSULTATION MEETINGS

The stakeholder consultation list was agreed and reviewed as per **Table 4**. Meeting minutes are provided for key meetings (see **Annex A**).

Table 4: Stakeholder Consultation Summary

Date	Organisation	User Type	Attendees
06-Jul-2020	PLA	Statutory Regulator Large Commercial	[redacted] [redacted] [redacted] (Marine Logistics) [redacted] (Marine Operations) [redacted] (Harbour Master)
10-Jul-2020	Tideway	Interfacing Project	[redacted] [redacted] (Marine Logistics)
10-Jul-2020	GPS	Freight & Marine Operator	[redacted] [redacted] (Marine Operations)
07-Aug-2020	Thames Shipping	Freight Operator	[redacted] (Director)
13-Aug-2020	Cory	Freight	[redacted] [redacted] (Head of Lighterage &Ship Repair Services) [redacted] (Marine Operations Manager)
14-Aug-2020	Thames RIB Experience	HSC (RIBS)	[redacted] [redacted] (Director) [redacted] (Director)
14-Aug-2020	Greenwich Yacht Club	Recreation	[redacted] [redacted] (Commodore)
19-Aug-2020	Thames Clippers	HSC (and Class V)	[redacted] [redacted] (Head of Fleet)

Thames Shipping were consulted due to their historical use of Dock Entrance Wharf by the *Polla Rose* and *Yassam Rose*. However, at the time of the assessment they had ceased operating at this location and so the only interest,

which was limited, was with regards to their transit through the area with Polla Rose. Following the consultation meeting Thames Shipping ceased operating on the river. Notwithstanding this – the telephone call offered some useful observations in relation to Thames Shipping operations in the area -and particularly noting they operated in close proximity to Thames Wharf and the adjacent Victoria Dock Barge Roads Upper mooring with no issues.

5. IDENTIFICATION AND SCREENING OF HAZARDS

5.1. INTRODUCTION

The following section outlines the identification and screening of navigation hazards utilising the PLA's standard risk assessment methodology for river developments

5.2. PLA RISK ASSESSMENT METHODOLOGY

The PLA risk assessment methodology requires that navigation hazards are identified and assessed in relation to hazard likelihood and hazard consequence to generate a hazard risk score:

$$Navigation\ Risk = likelihood\ of\ hazard\ occurence \times consequence\ of\ hazard\ occurence$$

The assessment of navigation risk is made for two risk scenarios:

- **Inherent Assessment of Navigation Risk** – an assessment of hazard risk with the project/scheme/development in place including existing risk control or mitigation measures (e.g. those already in place and managed by the PLA).
- **Residual Assessment of Navigation Risk** – an assessment of hazard risk with the project/scheme/development in place including existing risk control or mitigation measures, and additional project / scheme / development risk control or mitigation measures.

The inherent and residual assessment enables the determination of hazard risk reduction brought about by either an additional individual project/scheme/development risk control or in most cases a suite of project/scheme/development related risk control measures.

In order to determine hazard likelihood assessments, the PLA use a likelihood classification table to allocate likelihood scores to hazards – see **Table 5**. Hazard consequence classifications are as shown in **Table 6**).

Table 5: Hazard Likelihood Classifications.

Hazard Likelihood Classifications
Rare: Very unusual - not common or frequent
Unlikely: Not probable or likely to happen
Possible: Not certain – might or might not happen
Likely: Will probably happen or is expected
Almost Certain: More than likely/in all likelihood

Table 6: Hazard Consequence Classifications

Consequence Classifications	People	Environment	Property	Reputation	Port Impact
Minor:	-Minor or No njuries.	-Insignificant impact on environment and port operation.	-Insignificant or no damage to vessel / equipment / structure.	-Little or no risk to company image.	-Insignificant port costs. *Guidance: up to approx. £5,000*
Moderate:	-Moderate injuries.	-Minor impact on environment and port operation with no lasting effects	-Vessel / equipment / structure incurs minor damage but remains in service / safe to use. Some adjustments to working / operational methods may be required.	-Local news coverage and control measures required to manage publicity.	-Moderate cost mplications for Port. *Guidance approx. between £5,000 & £50,000*
Serious:	-Major / life changing injuries.	-Limited impact on environment and port operation with short term or long-term effects.	-Vessel / Equipment / structure un-operational and in need of repairs.	-Regional news coverage with potential for reputational damage.	-Serious cost mplications for Port. *Guidance approx. between £50,000 & £250,000*
Very Serious:	-Single Fatality.	-Significant impact on environment and Port operation with short term or long-term effects	-Vessel / Equipment / Structure un-operational and in need of extensive repairs / dry docking.	-National news coverage with significant potential for reputational damage	-Very Serious cost mplications for Port. *Guidance approx. between £250,000 & £500,000*
Severe:	-Multiple fatalities.	-Serious long-term mpact on environment and / or permanent damage.	-Vessel / equipment / structure unsalvageable. -Serious long-term mpact on port operational effectiveness.	-International news coverage with severe potential for reputational damage.	-Severe cost mplications for Port. *Guidance approx. over £500,000*

A risk matrix is used to combine the 'likelihood' and 'consequence' score for each hazard and the resulting risk score benchmarked to the acceptability ratings identified.

Based on the evaluation of the impact of the development each hazard is scored using the matrix as defined below in **Table 7**.

Table 7: PLA's Risk Score Matrix.

Risk Score Matrix					
Almost Certain	5	10	15	20	25
Likely	4	8	12	16	20
Possible	3	6	9	12	15
Unlikely	2	4	6	8	10
Rare	1	2	3	4	5
Likelihood	**Minor**	**Moderate**	**Serious**	**Very Serious**	**Severe**

5.3. ACCEPTABILITY

The PLA methodology does not state the acceptability of risk scores, however, it is assumed that risk scored at "Moderate" and "Minor" would be deemed acceptable, which puts the acceptability threshold at risk scores lower than 9.0 / 25.

Table 8: PLA's Acceptability Ratings for Navigation Hazard Risk Scores

Total Risk Score	
Minor	1-3.9
Moderate	4-8.9
Serious	9-14.9
Very Serious	15-19.9
Severe	20-25

5.4. HAZARD IDENTIFICATION AND REFINEMENT

Navigation hazards were identified by the project team during an internal HAZID workshop drawing together a review of the proposed project together with the analysis, consultation and local knowledge and expertise.

Hazards were identified by phase and an approach was taken to consider all user types (as per **Section 3.5**) and group, where appropriate to a 'refined hazard' collating the user type and hazard type. Consideration was also given to the hazard groupings as defined in the Preliminary NRA – ensuring all hazard groups were identified, considered, and grouped appropriately.

As a result, the assessment has focussed on 10 key hazards per phase as showing in **Sections 0** and **0.**

Table 9: Phase 1 – Enabling Works Hazards

Initial Haz ID	Initial Hazards	Type	Haz ID	Refined Hazards
1	RiverLinx Construction Vessel	Contact	1	Contact of RiverLinx Infrastructure (or construction vessels) by RiverLinx construction vessels
2	Tug /tow, freight, service and other	Contact	2	Contact of RiverLinx Infrastructure (or construction vessels) by Commercial vessels (All types)
3	Sea Going	Contact		
4	Class V & HSC	Contact		
5	Recreational	Contact	3	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels
6	RiverLinx Construction Vessel icw Tug /tow, freight, service and other	Collision	4	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels
7	RiverLinx Construction Vessel icw Sea Going	Collision		
8	RiverLinx Construction Vessel icw Class V / HSC	Collision		
9	RiverLinx Construction Vessel icw Recreational	Collision	5	Collision of RiverLinx construction vessels with Recreational vessels
10	Non RiverLinx Construction Vessel icw Non RiverLinx Construction Vessel	Collision	6	Collision of Commercial / recreational vessels as a result of RiverLinx Construction operations (All types)
11	RiverLinx Construction Vessel	Grounding	7	Grounding of vessels as a result of RiverLinx construction operations (All types)
12	Tug /tow, freight, service and other	Grounding		
13	Sea Going	Grounding		
14	Class V & HSC	Grounding		
15	Recreational	Grounding		
16	RiverLinx Construction Vessel	Breakout/Jacking Failure	8	Breakout of RiverLinx construction vessels whilst working at Thames Wharf
17	RiverLinx Construction Vessel	Foundering	9	Foundering of RiverLinx construction vessels whilst working at Thames Wharf
18	Man overboard from RiverLinx Construction Vessel or Infrastructure	Personnel	10	Man overboard from RiverLinx construction vessels or Infrastructure

Table 10: Phase 2 – Marine Logistics – Operational Phase Hazards

Initial Haz ID	Initial Hazards	Type	Haz ID	Refined Hazards
1	RiverLinx	Contact	1	Contact of RiverLinx Infrastructure by RiverLinx vessels (tug/tow)
2	Tug /tow, freight, service and other	Contact	2	Contact of RiverLinx Infrastructure by Commercial (All types)
3	Sea Going	Contact		
4	Class V & HSC	Contact		
5	Recreational	Contact	3	Contact of RiverLinx Infrastructure by passing Recreational vessels
6	RiverLinx icw Tug /tow, freight, service and other	Collision	4	Contact of RiverLinx Infrastructure by passing Recreational vessels
7	RiverLinx icw Sea Going	Collision		
8	RiverLinx icw Class V / HSC	Collision		
9	RiverLinx icw Recreational	Collision	5	Collision of RiverLinx vessels (tug/tow) with Recreational vessels
10	Non RiverLinx icw Non RiverLinx	Collision	6	Collision of Commercial / recreational vessels as a result of RiverLinx Marine operations (All types)
11	RiverLinx	Grounding	7	Grounding of vessels as a result of of RiverLinx Marine operations (All types)
12	Tug /tow, freight, service and other	Grounding		
13	Sea Going	Grounding		
14	Class V & HSC	Grounding		
15	Recreational	Grounding		
16	RiverLinx	Breakout	8	Breakout of RiverLinx vessels (tug/tow) during berthing / alongside
17	RiverLinx Vessels	Foundering	9	Foundering of RiverLinx vessels (tug/tow) during berthing / alongside
18	Man overboard from RiverLinx Vessel or Infrastructure	Personnel	10	Man overboard from RiverLinx vessels (tug/tow) or Infrastructure

5.5. HAZARD SCORING

Each hazard was subsequently scored by the workshop attendees for the likelihood and consequence of occurrence using the PLA methodology and based on the:

- Vessel traffic analysis presented in **Section 3.5** and **3.6.**

- Incident Analysis presented in **Section 3.7.**
- Consultation as documented in **Section 4.**
- Expertise and local knowledge of the project team.

5.6. NAVIGATION RISK ASSESSMENT RESULTS

The results of the navigation risk assessment are contained in full in the "*Risk Assessment Logs*" which are at **Annex B** (note the logs have been updated as per **Section 8.2**). The "*Risk Assessment Logs*" are based on the PLA template and consider hazard risk in terms of:

- Hazard ID.
- Inherent Hazard Risk Rank (based on inherent severity score).
- Residual Hazard Risk Rank ((based on residual severity score).
- Hazard Area (project study area).
- Hazard Comments on Disposition - overview of vessel disposition.
- Hazard Causes.
- Hazard Consequences (broken down into "*Most Likely Consequences*" and "*Reasonable Worst Credible Consequences*").
- Inherent Risk Assessment (no project risk controls in place):
    - Hazard Likelihood Score.
    - Hazard Consequence Score.
    - Hazard Severity Score.
- Control Measures – project risk control or mitigation measures:
- Residual Risk (project risk controls in place)
    - Hazard Likelihood Score
    - Hazard Consequence Score
    - Hazard Severity Score.

5.6.1. INHERENT RISK ASSESSMENT RESULTS – PHASE 1 ENABLING WORKS

The results of the inherent assessment of risk are contained in **Table 11**, which relates to an assessment of risk for the proposed works. Following the scoring process the inherent scores were benchmarked with the Preliminary NRA to ensure consistency and, where scores for comparable hazards had been made, these were justifiable.

Table 11: Summary Inherent Risk Assessment Results

Hazard ID	Inherent Risk Rank	Hazard	Inherent Risk		
			Likelihood	Severity	Score
8	1	Breakout of RiverLinx construction vessels whilst working at Thames Wharf	2	5	10
3	1	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels	2	5	10
1	3	Contact of RiverLinx Infrastructure (or construction vessels) by RiverLinx construction vessels	3	3	9
2	4	Contact of RiverLinx Infrastructure (or construction vessels) by Commercial vessels (All types)	2	4	8
6	4	Collision of Commercial / recreational vessels as a result of RiverLinx Construction operations (All types)	2	4	8
5	4	Collision of RiverLinx construction vessels with Recreational vessels	2	4	8
10	7	Man overboard from RiverLinx construction vessels or Infrastructure	2	3	6
7	7	Grounding of vessels as a result of RiverLinx construction operations (All types)	2	3	6
4	9	Collision of RiverLinx construction vessels with Commercial vessels	1	5	5
9	10	Foundering of RiverLinx construction vessels whilst working at Thames Wharf	2	2	4

The results indicate that in the inherent assessment of risk that the following hazards would be unacceptable to the PLA and that risk control are necessary to mitigate risk to acceptable levels.

- Haz ID: 8 – Rank 1: Breakout of RiverLinx construction vessel whilst working at Thames Wharf – due to the potential severity of consequence - classified as "Serious".
- Haz ID: 3- Rank 2: Contact of RiverLinx infrastructure by passing recreational vessels – due to the potential severity of consequence - classified as "Serious".
- Haz ID: 1- Rank 3: Contact of RiverLinx infrastructure by RiverLinx construction vessels – due to the potential severity of consequence - classified as "Serious".

5.6.2. INHERENT RISK ASSESSMENT RESULTS – PHASE 2 MARINE LOGISTICS

The results of the inherent assessment of risk are contained in **Table 11**, which relates to an assessment of risk for the proposed phase.

Table 12: Summary Inherent Risk Assessment Results

Hazard ID	Inherent Risk Rank	Hazard	Inherent Risk		
			Likelihood	Severity	Score
5	1	Collision of RiverLinx vessels (tug/tow) with Recreational vessels	3	4	12
4	2	Collision of RiverLinx vessels (tug/tow) with Commercial vessels	3	4	12
1	3	Contact of RiverLinx Infrastructure by RiverLinx vessels (tug/tow)	3	3	9
8	3	Breakout of RiverLinx vessels (tug/tow) during berthing / alongside	3	3	9
3	5	Contact of RiverLinx Infrastructure by passing Recreational vessels	2	4	8
2	5	Contact of RiverLinx Infrastructure by Commercial (All types)	2	4	8
6	5	Collision of Commercial / recreational vessels as a result of RiverLinx Marine operations (All types)	2	4	8
10	8	Man overboard from RiverLinx vessels (tug/tow) or Infrastructure	2	3	6
7	8	Grounding of vessels as a result of of RiverLinx Marine operations (All types)	2	3	6
9	10	Foundering of RiverLinx vessels (tug/tow) during berthing / alongside	1	2	2

The results indicate that in the inherent assessment of risk that the following hazards would be unacceptable to the PLA and that risk control are necessary to mitigate risk to acceptable levels.

- **Haz ID: 5** – Rank 1: Collision of RiverLinx vessels (tug/tow) with recreational vessels – due to the increased likelihood coupled with the potential severity of consequence - classified as "Serious".
- **Haz ID: 4** - Rank 2: Collision of RiverLinx vessels (tug/tow) with commercial vessels – due to the potential severity of consequence - classified as "Serious".

6. RISK ANALYSIS AND REVIEW

6.1. OVERVIEW

The following section provides analysis and overview on navigation hazards associated with the project and unpacks the basis behind the inherent risk score results as presented in Section **5.6**.

6.2. COLLISION RISK

Collision for the project is not appreciably increased or changed by the project during Phase 1 or to levels on concern. It is considered that collision risk does increase during Phase 2 (and this represented the top 2 ranked hazards) with the project tug & tow traffic in collision with either recreational vessels or commercial vessels.

It is noted that there will be manoeuvring of RiverLinx tug and tows on and off Thames Wharf, however this is benchmarkable to existing activities at the site. RiverLinx vessels may interact with passing commercial vessels or recreational vessels (and with severity scores of 4 or 5 due to risk of injury to people). Of particularly note is the sea room used when large sea-going commercial vessels, such as cruise ships, pass past the site. These vessels will have priority and as such the passage plan of RiverLinx tugs and tows should include provision to deconflict with large sea going commercial vessel movements in the area. It is also the case that whilst the speed limit of 30kts for certain HSC in this reach is the highest on the Thames, the density of traffic is not the highest and apart from when passage of a sea going vessel passes the site, there is good sea room available for manoeuvring on and off the berth. This is evidenced by the historical tracks of access to Thames Wharf and the incident data.

The potential for a resultant collision between third party vessels due to the RiverLinx vessels is a possibility albeit considered low.

6.3. CONTACT RISK

Contact likelihood for the project is not significant due to the minimal change in the footprint of the project. Nevertheless, the use of the inshore area (in accordance with the Tideway Code) by rowing vessels proceeding inbound on the flood, coupled with the tidal set to the outside (north of the bend) may influence the likelihood of small recreational vessels contacting the works plant. Whilst this is considered a low likelihood (2), there is potentially a greater severity consequence due to risk of injury primarily to recreational personnel.

A significant number of commercial vessels, including passenger vessels, HSC and freight vessels pass Thames Wharf engaged on commercial operations. The vessels may be transiting at high speed (in accordance with HSC regulations). Thames Wharf however is located some distance from the PLA Authorised Channel, and very few commercial vessels currently transit close past the site (see vessel traffic analysis) unless approaching the wharves or frontage. Review of incident data evidences this conclusion. This combined with the proposed design, which does not extend any further into the river than presently means contact with the RiverLinx infrastructure is very unlikely.

Contact of the project by its own vessels is not considered significant. RiverLinx vessels calling at Thames Wharf will be tug and tows, generally set up to tow in a "Hip" or "Push" tow configuration for loaded barges and a "Pull" or "Push" configuration for unloaded barges. It is understood that GPS, who have historically serviced

Thames Wharf, will be providing the marine operation, and as such they will be familiar with the navigational disposition of Thames Wharf, which is not, by Thames standards, considered to be a particularly arduous wharf for berthing/departing. Additionally, the detailed passage plans will serve to identify and mitigate any potential issues.

6.4. GROUNDING RISK

Grounding hazards are not thought to be significant or different due to the project and the levelling of the berth during Phase 1 will, as a results, create a better defined berth for usage by barges that will purposely take the ground and will be verified by hydrographic assessment post levelling.

6.5. BREAKOUT RISK

Breakout hazards related to the proposed project/scheme are associated with a RiverLinx vessel alongside Thames Wharf or (at layby) and 'breaking out' from its moorings unintentionally. This could occur either when the RiverLinx barges are "laid over" and not in operation or when the vessels are operational and manned and could occur when loading/unloading cargo.

Causes of breakout could be due to strong tidal flows, periods of adverse weather or from a wash/draw-off from passing vessels and this was a notable theme discussed during consultation. However, it is envisaged that there will be suitably designed and installed marine furniture to accommodate vessels alongside. It is also the case that GPS (the marine operator) have significant experience of berthing barges at Thames Wharf and so will be familiar with any localised mooring issues.

It should be noted that 'ease downs' are commonly used to reduce vessel speeds and wash. Whilst this is generally effective, there is not always a direct correlation between the speed of any vessel and the wash it creates (this can vary by hull form, displacement mode for example). Stakeholder consultation noted that prolonged or excessive durations of ease downs can cause significant impacts on schedules.

6.6. FOUNDERING RISK

Foundering of the RiverLinx construction vessels or tug and tows could be due to a multitude of causes including collisions, contact, grounding (which are dealt with as consequences of the other assessed hazards), however mechanical failure could be a separate cause of a foundering, e.g. due to mechanical failure, or human error. This is considered a low likelihood or consequence hazard under both phases.

6.7. MAN-OVERBOARD RISK

Man Overboard (MOB) scenarios were considered from RiverLinx construction vessels, tug and tows, launch or Thames Wharf itself due to their consideration in the Preliminary NRA. A MOB event can occur due to a multitude of reasons, particularly as Thames Wharf will be accessed by a number of workmen, including some that may not be familiar with working in a maritime capacity. This is generally not considered a high risk and can be effectively managed.

7. RISK CONTROL OPTIONS

7.1. RECONCILIATION OF RISK CONTROLS WITH PRELIMINARY NRA

The Preliminary NRA put forward a number of risk controls which are summarised in **Table 13**. Additionally, they were cross related with 4 overarching recommendations (as listed below) which had cross-over with the risk controls:

- Berthing co-ordinator.
- Construction river response team.
- Continued communication with project parties and stakeholders and navigation rules.
- Early identification of suitably trained marine staff and pilots.

The risk control mitigations and recommendations were carefully considered by the project team and a fresh consideration taken to them in light of the revised scheme. Importantly, many of these risk controls (ID 1, 3 and 7) were considered to be appropriate albeit through regulation, good practice or stated Contractor intent, could be considered as embedded in the inherent assessment and therefore already applied. An example is risk controls ID 1 (Comply with Thames Freight Standard) which can be considered an inherent requirement as, without compliance, the vessel would not be permitted to operate.

Table 13: Preliminary NRA – Risk Controls

Risk Control Measure	Pre. NRA Risk Control Measure	Pre. NRA Risk Control Measure details
1	Comply with Thames Freight Standards	Wheelhouse to have adequate all-round visibility
		Manoeuvrability of vessel assessed by HM. Defined weight/power displacement ratios and maintenance
		Vessel to have a Planned Maintenance System (PMS) in place
		Vessel anchors to be appropriately sized to the vessel and have enough cable for required water depth
		Vessels to have an approved Safety
		Management System in place (ISM, PLA, CoP etc).
		Emergency steering/power to be tested on a regular basis and crew to be familiar with use (company operating procedures)
2	Construction River Response Team	Construction river response team to check site daily
		CRRT to have trained personnel on board
		CRRT to warn stray vessels
3	Passage Plan	Allowance for appropriate, safe and suitable manoeuvring areas in design and construction
		Provide detail of tide operation windows
		Include general directions and reference to NRA 8, 12.
		Minimum visibility for manoeuvring to be 0.5 miles
		Minimum Keel clearance to be defined.

Risk Control Measure	Pre. NRA Risk Control Measure	Pre. NRA Risk Control Measure details
		Adjust delivery/construction times to allow safe passage conditions (tides/floods)
		Define suitable abort points.
		Identify emergency anchorage zones/restrictions
		Define vessel traffic management requirements.
		Limit speed of vessels and define speed zones.
		Define safe berthing and mooring options.
4	Pilotage and LKE	Ensure Master has PEC and has been approved by HM. Captain to have LKE
5	Establish works exclusions zones	During any lift During piling and associated lifting activities Restrict heavy lift activities to periods of low commercial and recreational river use. During any offloading activities Ensure any lift equipment is rigorously tested and implement permits to operate systems.
6	Updated river signalling systems	Ensure adequate signal lighting is designed for temporary structures and appropriate signalling systems such as tiger boards informing of work zones are implemented. Promote and adopt, use of AIS transponders on construction plant. Establish temporary navigation lights and signage
7	Hours at work regulations	Regular breaks for ship pattern in line with international and inland waterway regulations. Working hours to be monitored by the captain of the vessel and shore side personnel and the Berthing Coordinator

7.2. IDENTIFIED RISK CONTROLS

Through consultation, analysis and the expertise of the project personnel, the following list of possible additional risk control options have been identified which would mitigate the likelihood or consequence of hazards occurring and are considered per Phase of work (see **Table 14**).

Table 14: Possible Project / Scheme Risk Control Measures

Id	Title	Detail	Phase 1	Phase 2
1	Promulgation of Information	Effective communication or RiverLinx project navigation matters, including: Notices to Mariners etc…. This risk control works with RC ID#10 Marine Co-ordinator and reflects Recommendation #3 Continued Communication with project parties and stakeholders and navigation rules from PEIR NRA.	Ph1	Ph2
2	Aids to navigation	Fixed navigation lights installed onto RiverLinx Thames Wharf.	Not taken forwards	Not taken forwards

Id	Title	Detail	Phase 1	Phase 2
3	RiverLinx Specific Vessel Passage Plan and RAMS	RiverLinx vessels passage plans and RAMS for review and acceptance by PLA.	Ph1	Ph2
4	Riparian Lifesaving Equipment	Lifesaving equipment in line with PLA guidance - "Lifesaving Provision Tidal River Thames Guidance 2019"	n/a	Ph2
5	Marine Furniture	Mooring bollards, fenders and Campshed designed to accommodate RiverLinx Tug and Tows	n/a	Ph2
6	Exclusion Area	Identification of an exclusion area for 3rd party vessels to minimise collision, grounding and contact risk and wash / ease down effects from passing vessels during construction at Thames Wharf. The extent and nature of the exclusion area to be agreed with the PLA prior to commencement.	Ph1	n/a
7	Easedown	Easedown to apply when vessels at Thames Wharf are grounding or fleeting. The extent and nature of ease down parameters to be optimised to minimise effects on passing vessels and to be agreed with the PLA prior to commencement. Easedown to apply when vessels grounding or fleeting.	n/a	Ph2
8	Safety Boat	Provision of a safety boat in line with PLA definition and of suitable draught whilst construction activities over or near the water are taking place. Safety boat shall provide safety services to Contractor and shall also be available to provide response rescue third parties (e.g. recreational vessels) within vicinity	Ph1	n/a
9	Layby Location review/relocation/provision	Review and confirmation of layby location of spudded flat top barge (and hopper) as per Fig 7.. To be determined in passage plan and detailed in PLA NtM	Ph1	n/a
10	Marine Co-Ordination Function	Nominated person(s) within Project Team to provide marine co-ordination function across the following responsibilities for marine safety and operations: 1. Statutory regulator liaison (PLA HM, PLA VTS) 2. Non-statutory regulator liaison with external Stakeholders (other river users) as required 3. Safe loading, berthing and mooring of barges at worksite The role supersedes the CRRT, Berthing Coordinator Co-ordination as identified in the PEIR Navigation Risk Assessment (recommendations 1-3 inclusive). This risk control works with RC#1	Ph1	Ph2

7.3. APPLICATION OF RISK CONTROL MEASURES

7.3.1. PHASE 1 ENABLING WORKS

The risk controls, and which hazards they are associated with, are identified in **Table 15.**

Table 15: Risk Control Application by Hazard: Phase 1 Enabling Works

Risk Control		Phase 1 Hazards									
Id	Title	1	2	3	4	5	6	7	8	9	10
		Contact of RiverLinx Infrastructure (or construction vessels) by RiverLinx construction vessels	Contact of RiverLinx Infrastructure (or construction vessels) by Commercial vessels (All types)	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels	Collision of RiverLinx construction vessels with Commercial vessels	Collision of RiverLinx construction vessels with Recreational vessels	Collision of Commercial / recreational vessels as a result of RiverLinx Construction operations (All types)	Grounding of vessels as a result of of RiverLinx construction operations (All types)	Breakout of RiverLinx construction vessels whilst working at Thames Wharf	Foundering of RiverLinx construction vessels whilst working at Thames Wharf	Man overboard from RiverLinx construction vessels or Infrastructure
1	Promulgation of Information	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Aids to navigation										
3	RiverLinx Specific Vessel Passage Plan and RAMS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Riparian Lifesaving Equipment										
5	Marine Furniture										
6	Exclusion Area	✓	✓	✓	✓	✓					
7	Easedown										
8	Safety Boat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Layby Location review/relocation/provision					✓	✓	✓	✓		
10	Marine Co-ordination Function	✓			✓	✓	✓	✓			

7.3.2. PHASE 2 MARINE LOGISTICS

The risk controls, and which hazards they are associated with, are identified in **Table 16.**

Table 16: Risk Control Application by Hazard: Phase 2 Marine Logistics

Risk Control		Phase 2 Hazards									
		1	2	3	4	5	6	7	8	9	10
Id	Title	Contact of RiverLinx Infrastructure by RiverLinx vessels (tug/tow)	Contact of RiverLinx Infrastructure by Commercial (All types)	Contact of RiverLinx Infrastructure by passing Recreational vessels	Collision of RiverLinx vessels (tug/tow) with Commercial vessels	Collision of RiverLinx vessels (tug/tow) with Recreational vessels	Collision of Commercial / recreational vessels as a result of RiverLinx Marine operations (All types)	Grounding of vessels as a result of of RiverLinx Marine operations (All types)	Breakout of RiverLinx vessels (tug/tow) during berthing / alongside	Foundering of RiverLinx vessels (tug/tow) during berthing / alongside	Man overboard from RiverLinx vessels (tug/tow) or Infrastructure
1	Promulgation of Information	✓	✓	✓	✓	✓	✓	✓		✓	✓
2	Aids to navigation										
3	RiverLinx Specific Vessel Passage Plan and RAMS	✓			✓	✓	✓	✓	✓	✓	✓
4	Riparian Lifesaving Equipment	✓	✓	✓				✓	✓		
5	Marine Furniture								✓		
6	Exclusion Area										
7	Easedown								✓		
8	Safety Boat										
9	Layby Location review/relocation/provision										
10	Marine Co-ordination Function	✓			✓	✓	✓	✓			

7.4. RESIDUAL RISK ASSESSMENT RESULTS

7.4.1. RESIDUAL RISK ASSESSMENT RESULTS – PHASE 1 ENABLING WORKS

The residual risk assessment rescores the inherent risk scores (see **Section 5.6**) by including proposed project risk control and mitigation measures, and summary results are presented in **Table 17**. As a result of the risk control options proposed, the risks are reduced to:

- 0 hazards are scored as "Severe", "Very Serious" or "Serious" risk.
- 7 hazards are scored as "Moderate" risk.
- 3 hazards are scored as "Minor" risk.

Table 17: Summary Residual Risk Assessment Results – Phase 1

Hazard ID	Inherent Risk Rank	Residual Risk Rank	Hazard	Inherent Risk			Residual Risk		
				Likelihood	Severity	Score	Likelihood	Severity	Score
8	1	1	Breakout of RiverLinx construction vessels whilst working at Thames Wharf	2	5	10	2	4	8
3	1	2	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels	2	5	10	2	3	6
1	3	3	Contact of RiverLinx Infrastructure (or construction vessels) by RiverLinx construction vessels	3	3	9	2	2	4
2	4	3	Contact of RiverLinx Infrastructure (or construction vessels) by Commercial vessels (All types)	2	4	8	1	4	4
6	4	3	Collision of Commercial / recreational vessels as a result of RiverLinx Construction operations (All types)	2	4	8	1	4	4
10	7	3	Man overboard from RiverLinx construction vessels or Infrastructure	2	3	6	2	2	4
4	9	3	Collision of RiverLinx construction vessels with Commercial vessels	1	5	5	1	4	4
5	4	8	Collision of RiverLinx construction vessels with Recreational vessels	2	4	8	1	3	3
7	7	9	Grounding of vessels as a result of of RiverLinx construction operations (All types)	2	3	6	1	2	2
9	10	9	Foundering of RiverLinx construction vessels whilst working at Thames Wharf	2	2	4	1	2	2

7.4.2. RESIDUAL RISK ASSESSMENT RESULTS – PHASE 2 MARINE LOGISTICS

The residual risk assessment rescores the inherent risk scores (see **Section 5.6**) by including proposed project risk control and mitigation measures, and summary results are presented in **Table 18**. As a result of the risk control options proposed, the risks are reduced to:

- 0 hazards are scored as "Severe", "Very Serious" or "Serious" risk.
- 7 hazards are scored as "Moderate" risk.
- 3 hazards are scored as "Minor" risk.

Table 18: Summary Residual Risk Assessment Results – Phase 2.

Hazard ID	Inherent Risk Rank	Residual Risk Rank	Hazard	Inherent Risk			Residual Risk		
				Likelihood	Severity	Score	Likelihood	Severity	Score
5	1	1	Collision of RiverLinx vessels (tug/tow) with Recreational vessels	3	4	12	2	4	8
4	2	2	Collision of RiverLinx vessels (tug/tow) with Commercial vessels	3	4	12	2	3	6
3	5	2	Contact of RiverLinx Infrastructure by passing Recreational vessels	2	4	8	2	3	6
1	3	4	Contact of RiverLinx Infrastructure by RiverLinx vessels (tug/tow)	3	3	9	2	2	4
2	5	4	Contact of RiverLinx Infrastructure by Commercial (All types)	2	4	8	1	4	4
6	5	4	Collision of Commercial / recreational vessels as a result of RiverLinx Marine operations (All types)	2	4	8	1	4	4
10	8	4	Man overboard from RiverLinx vessels (tug/tow) or Infrastructure	2	3	6	2	2	4
8	3	8	Breakout of RiverLinx vessels (tug/tow) during berthing / alongside	3	3	9	1	3	3
7	8	9	Grounding of vessels as a result of of RiverLinx Marine operations (All types)	2	3	6	1	2	2
9	10	9	Foundering of RiverLinx vessels (tug/tow) during berthing / alongside	1	2	2	1	2	2

8. STUDY FINDINGS

8.1. SUMMARY

This NRA has summarised the following:

1. Bugsby's and Woolwich Reach is a busy stretch of the river Thames with numerous vessel types and activities taking place, including large sea-going commercial vessels, River Tours, River Bus, adventure RIBs, recreational, freight and service vessels:
    a. Vessels greater than 100m pass through Bugsby's Reach towards Tower Bridge Upper berth (HMS Belfast). These transits typically occur at or around HW and use the centre of the navigation channel, albeit positioning as best suits the transit around the river bend.
    b. River Bus operators are a very frequent operator in this stretch year round, operating from Trinity Buoy Wharf, and on their timetabled service on through transit and calling at North Greenwich Pier and Royal Wharf Pier which also results in them crossing the river. Vessels transit at high-speed but pass clear of the Thames Wharf.
    c. River Tour operators are far more seasonal and commonly pass through Bugsby's Reach.
    d. RIB Experience operators are also seasonal users of this stretch of the river at high-speed through the barrier and returning to central London. RIBs use the greatest lateral distribution of the river.
    e. Freight and cargo vessels tend to transit between HW-4 and HW-3 when inbound and at HW when outbound. Baseline traffic volumes as reviewed were precautionary due to the elevated levels of Thames Tideway Tunnel Movements which will have decreased by the time RiverLinx Project progresses
    f. Recreational craft are also seasonal, with peak movements between May and September. Vessels navigate clear of the authorised channel and are more common around high water.
    g. Service vessels, including port tenders and law enforcement, navigate to the edges of the authorised channel.
2. Analysis of a vessel traffic data showed that, the main hours of operation are between 0600 and 2100, but with a peak between 1200 and 1500.
3. On average there are circa 10 incidents a year in the area. Passenger vessels (principally Thames Clippers) accounted for 25% of the incidents, recreational craft accounted for 32% of incidents, but the majority were tug and service vessels at 40%. The majority of the remaining incidents were breach of byelaws, mechanical failure/deficiency and wash incidents.
4. Analysis of future traffic predictions for the river using the Thames Vision and other sources, determined that there would likely be an increase in vessel traffic, however there was significant uncertainty related to the RiverLinx project timescales associated with stagnation of vessel growth, but predominantly the current COVID-19 pandemic.
5. Identification, grouping and screening of hazards was performed using the analysed vessel traffic and incident data as well as through consultation with the PLA. 10 hazards were identified as a result of the

project per phase and the likelihood and consequence of each was assessed. The 10 hazards were assessed for both the Phase 1: Enabling Works and the Phase 2: Marine Logistics operation.

6. Risk analysis of the most significant hazards was conducted through detailed analysis of vessel traffic data.
7. In the inherent assessment of risk then:
    a. Phase 1: Enabling Works - three hazards were classed as "Serious" (Breakout of RiverLinx construction vessel whilst working at Thames Wharf and Contact of RiverLinx infrastructure by passing recreational vessels or RiverLinx construction vessels) whilst the remainder were classed as "Moderate" or less.
    b. Phase 2: Marine Logistics operation – two hazards were classed as "Serious" (Collision of RiverLinx vessels (tug/tow) with recreational vessels and Collision of RiverLinx vessels (tug/tow) with commercial vessels) whilst the remainder were classed as "Moderate" or less.
8. Based on the earlier Preliminary NRA, the assessment of risk, the analysis of vessel traffic data, consultation with the PLA and other local river users and the expertise of the project team, a total of 10 risk control options were identified and evaluated. It was determined that if these were put in place, the residual navigation risk of the project / scheme would be reduced to:
    a. Phase 1: Enabling Works – All hazards to "Moderate" or less.
    b. Phase 2: Marine Logistics Operation - All hazards to "Moderate" or less.

8.2. RECOMMENDATIONS AND ADOPTED RISK CONTROLS

In light of the risk profile, risk controls have been proposed and are variously applicable across Phase 1 and/or Phase 2. These risk controls are repeated below together with detail and description around the basis for their inclusion and around their implementation. With the adoption of these risk controls all hazards can be mitigated to an acceptable/tolerable levels.

Following completion of the initial risk assessment, these 10 risk controls have been reviewed with the project team and the PLA. Confirmation was made on those risk controls selected and subsequently 9 adopted risk controls are taken forwards (shown in **Table 19** by project phase).

An update of the NRA was undertaken to reflect these risk controls and the update logs are presented in **Annex B**.

Table 19: Adopted Risk Controls post Project Team and PLA Review

Id	Title	Detail	Phase 1	Phase 2
1	Promulgation of Information	Effective communication or RiverLinx project navigation matters, including: Notices to Mariners etc.. This risk control works with RC ID#10 Marine Co-ordinator and reflects Recommendation #3 Continued Communication with project parties and stakeholders and navigation rules from PEIR NRA.	Ph1	Ph2
2	Aids to navigation	Fixed navigation lights installed onto RiverLinx Thames Wharf.	Not Adopted	Not adopted
3	RiverLinx Specific Vessel Passage Plan and RAMS	RiverLinx vessels passage plans and RAMS for review and acceptance by PLA.	Ph1	Ph2
4	Riparian Lifesaving Equipment	Lifesaving equipment in line with PLA guidance - "Lifesaving Provision Tidal River Thames Guidance 2019"	n/a	Ph2
5	Marine Furniture	Mooring bollards, fenders and Campshed designed to accommodate RiverLinx Tug and Tows	n/a	Ph2
6	Exclusion Area	Identification of an exclusion area for 3rd party vessels to minimise collision, grounding and contact risk and wash / ease down effects from passing vessels during construction at Thames Wharf. The extent and nature of the exclusion area to be agreed with the PLA prior to commencement.	Ph1	n/a
7	Easedown	Easedown to apply when vessels at Thames Wharf are grounding or fleeting. The extent and nature of ease down parameters to be optimised to minimise effects on passing vessels and to be agreed with the PLA prior to commencement. Easedown to apply when vessels grounding or fleeting.	n/a	Ph2
8	Safety Boat	Provision of a safety boat in line with PLA definition and of suitable draught whilst construction activities over or near the water are taking place. Safety boat shall provide safety services to Contractor and shall also be available to provide response rescue third parties (e.g. recreational vessels) within vicinity	Ph1	n/a
9	Layby Location review/relocation/provision	Review and confirmation of layby location of spudded flat top barge (and hopper) as per Fig 7.. To be determined in passage plan and detailed in PLA NtM	Ph1	n/a
10	Marine Co-Ordination Function	Nominated person(s) within Project Team to provide marine co-ordination function across the following responsibilities for marine safety and operations: 1. Statutory regulator liaison (PLA HM, PLA VTS) 2. Non-statutory regulator liaison with external Stakeholders (other river users) as required 3. Safe loading, berthing and mooring of barges at worksite The role supersedes the CRRT, Berthing Coordinator Co-ordination as identified in the PEIR Navigation Risk Assessment (recommendations 1-3 inclusive). This risk control works with RC#1	Ph1	Ph2

8.3. SUMMARY RISK STATEMENT

This NRA has considered the impacts of the RiverLinx project/scheme on navigational safety in Bugsby's Reach through the enabling works at Thames Wharf and its subsequent usage through the construction of the STT.

The results demonstrate that all hazards can be mitigated to acceptable risk levels. However, no matter how much hazards are reduced both in terms of hazard 'consequence' or 'likelihood' there still remains a possibility that they will be realised and as such this NRA and the associated risk controls that it mandates should be reviewed, in consultation with the PLA, if any aspect of the scheme, including any hazards or the risk controls change during the project life.

ANNEX A: CONSULTATION MINUTES

RiverLinx
Silvertown Tunnel
Navigation Risk Assessment

PLA – Briefing Meeting

06-Jul-2020

19-NASH-0061

RIVERLINX

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Overview / Agenda

- **Objective: Provide briefing on scheme, identify early issues, agree scope and method of NRA**

1. Scheme Overview
2. Proposed Works
    1. Phase 1: Enabling Works
    2. Phase 2: Operational Phase
3. NRA:
    1. DCO Preliminary Navigation Assessment – recap as reference/validation
    2. Post DCO Marine Documentation
        1. Interface with RTMP /Passage Planning
        2. Proposed NRA and Methodology
4. Key navigation issues / risks / impacts discussion
    1. Review analysis
    2. Stakeholder Consultation
5. Confirm NRA scope and methodology

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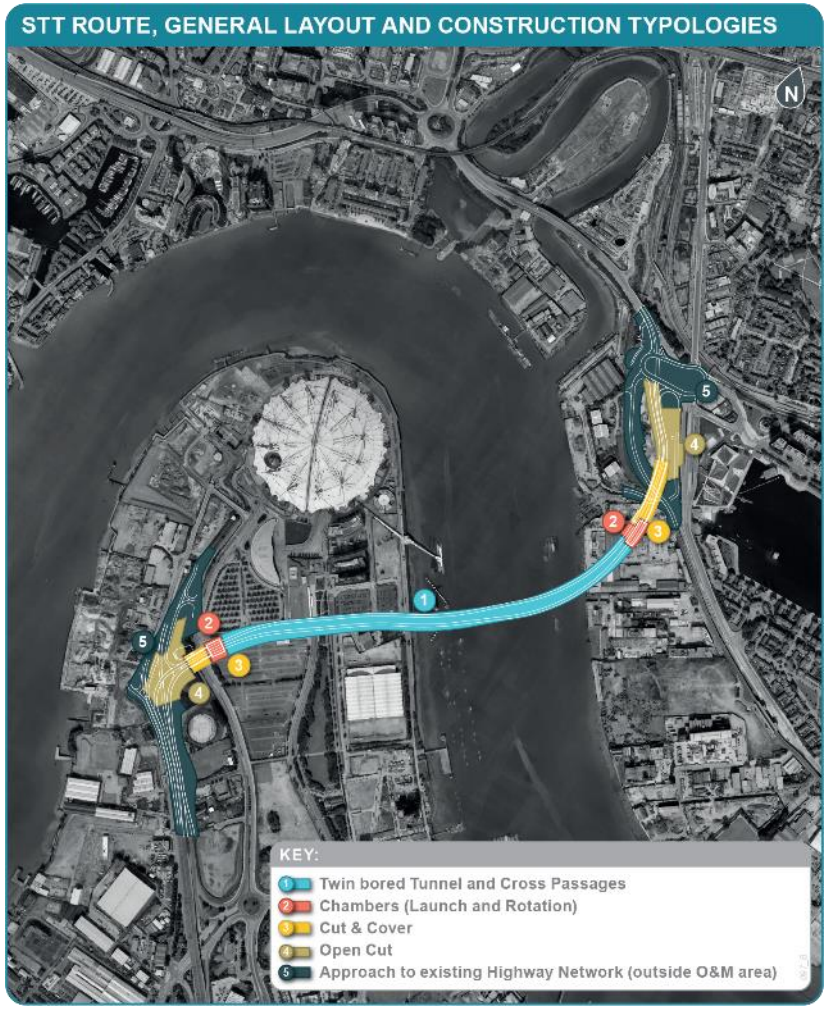
1. Scheme Overview

- RiverLinx:
  - J/V
  - Private Finance Contract: Design, Construct, Finance, Maintain
- DCO Project
- Twin Bore road tunnel
- Marine usage in construction being developed
- Schedule



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2. Proposed Works

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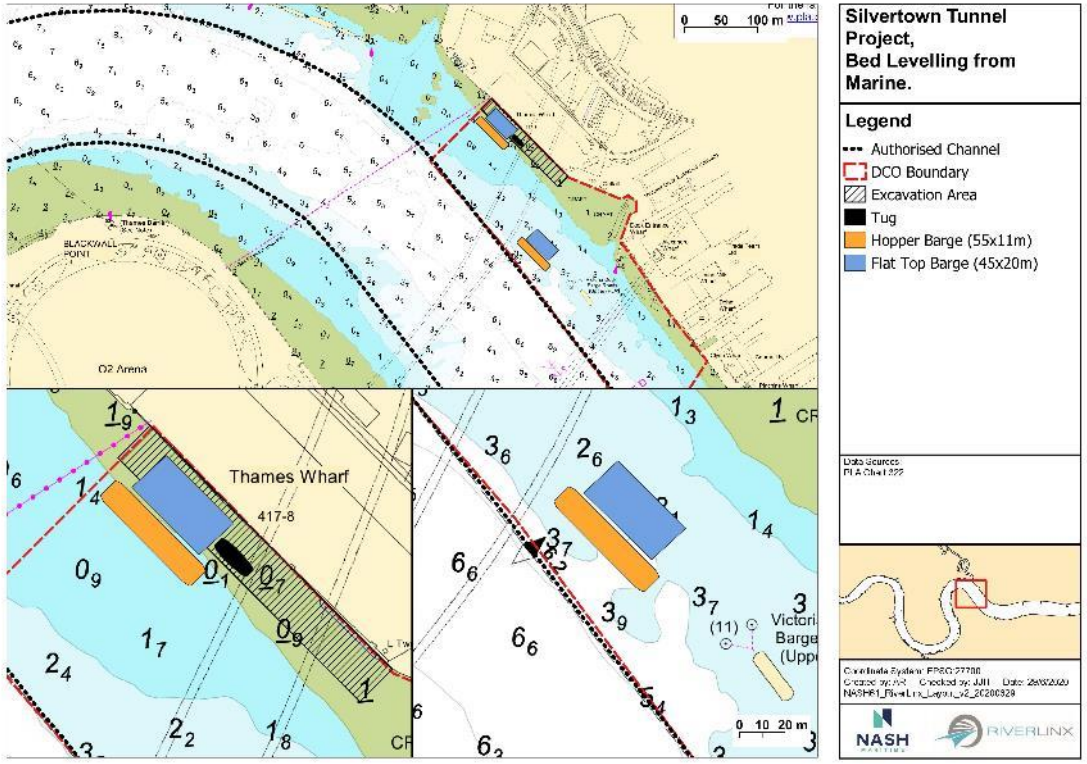
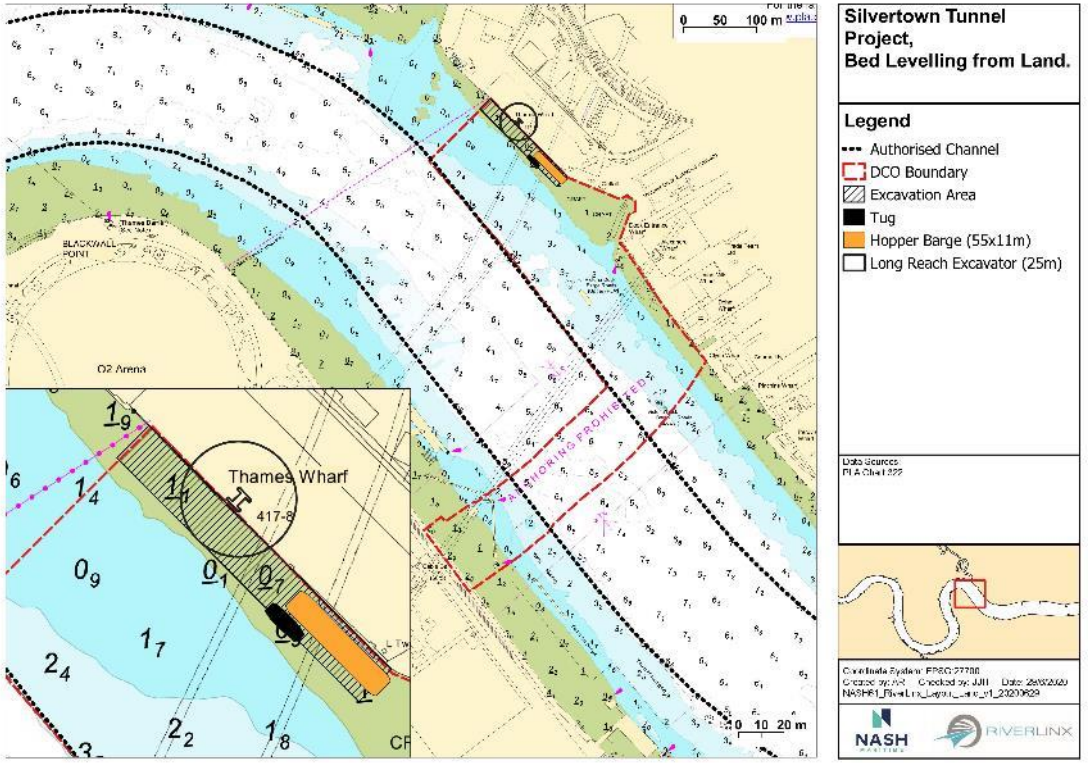
Phase 1 – Bed Levelling



- Option 1: From Marine Plant
  - 20m wide cut/fill
  - 45mx25m flat top and 55x11 hopper barge
  - Layby mooring requirement [TBC]



- Option 2: From Land
  - Long reach excavator from land
  - Barge removal of unsuitable material

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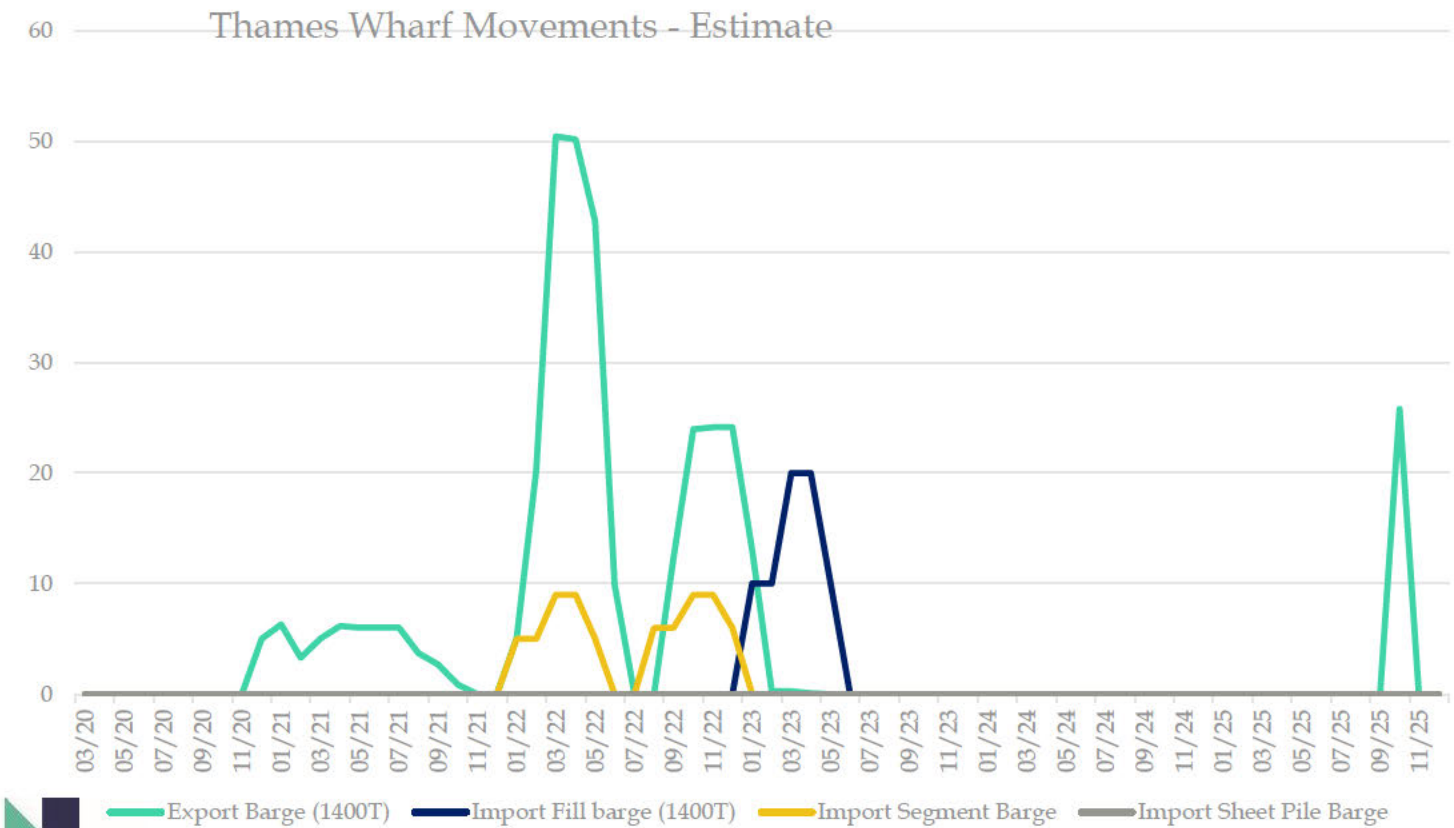
Phase 2 – Marine Operation

- Activities:
  - Export – muck away
  - Import – Granular Fill
  - Import – Tunnel Segments
  - Import - Sheet Piles
- Project Moves [TBC]: TBM
- Two berths
  - Peak Scenario:
    - 2 per day - daytime tide
    - 2 per day - split tide
  - Off-Peak

NASH MARITIME

Phase 2 – Marine Operation



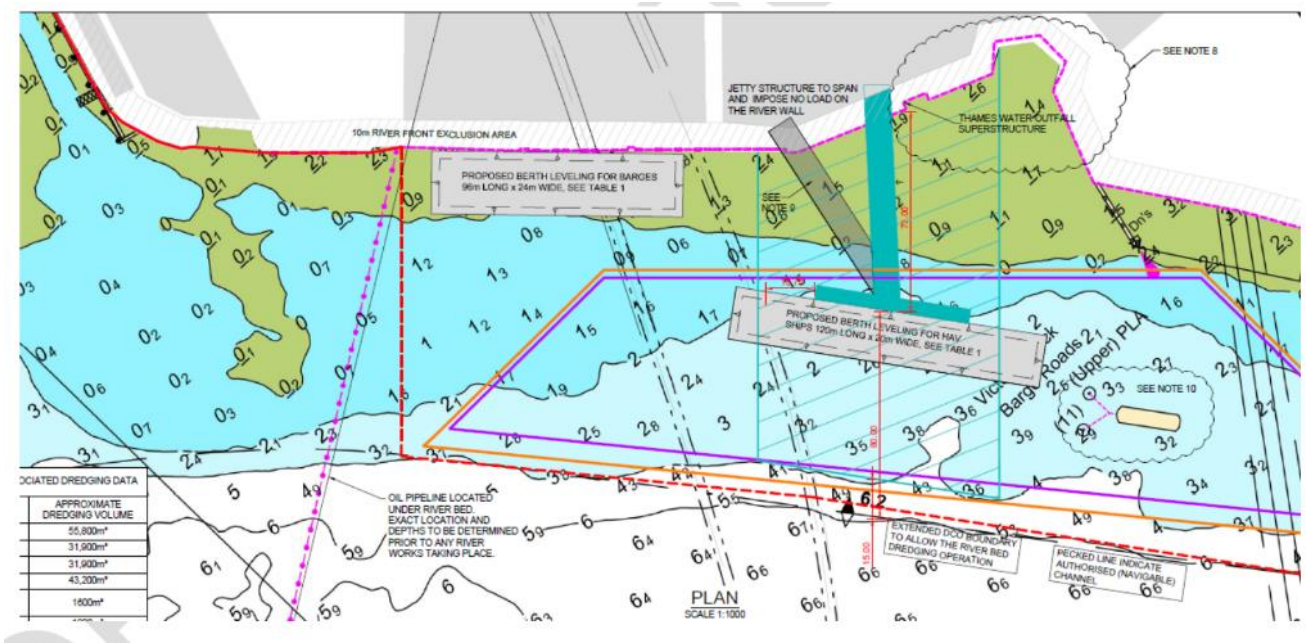
- Activities:
  - Export – muck away
  - Import – Granular Fill
  - Import – Tunnel Segments
  - Import - Sheet Piles
- Project Moves [TBC]: TBM
- Two berths
  - Peak Scenario:
    - 2 per day - daytime tide
    - 2 per day - split tide
  - Off-Peak

NASH MARITIME

3. Navigation Risk Assessment

DCO Preliminary Risk Assessment

- Preliminary Environmental Information Report (October 2015)
  - Title: 'Navigational Issues and Preliminary Risk Assessment' (NIPRA)
  - Appendix 4.B



- **Construction**
  - Reinstate NABSA Berth at Thames Wharf
  - New temporary jetty
- **Operation**
  - Assumed 1000t barges (NABSA berth) and 2000t HAV ships (jetty)
  - up to 350,000m^3 tunnel boring material
- **Decommissioning / dismantlement**
  - Removal of temporary jetty [Option]

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DCO Preliminary Risk Assessment

- Study Area: East India Pier to Hook Ness
- Qualitative
- Data: 2x 8 hour (0900-1700) visual surveys in Jul 2015
- PLA Consultation
- TBCZ poses no specific constraints beyond those existing
- Key users 'special attention':
  - Thames Clippers: North Greenwich Pier and Trinity Buoy Wharf
  - Large vessels
  - Wharf and Pier Operators
  - Bow Creel
  - Recreational Users – GYC and Greenwich rowing clubs
- Stakeholder Consultation as per Page 49 – 52

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DCO Preliminary Risk Assessment

- 21 hazards, 1>10 in baseline (Collision of Construction vessel with recreational or service vessel) and all reduced to <9 (moderate) in residual with risk controls
- Good practice risk controls and 'additional' risk controls (see pages 73-74):
  - "The appointment of a berthing coordinator for the duration of the project riverine activities to assist with planning, managing and ensuring that safe berthing, approach and manoeuvring practices are adopted and maintained during the project duration. *Includes liaison with PLA, local stakeholders and contractor*
  - The establishment of a permanent construction river response team to manage the construction and river user vessel interface in particular with any recreational users. The river response team would ensure that any exclusion zones are enforced and that safe distances are maintained between construction plant and construction related vessel movements in particular when and if river conditions change. *Includes interface management, 24/7 marine patrols, enforcement of exclusion zones*
  - The continuation of stakeholder engagement and the need to employ suitably qualified staff, pilots and marine operators." *Includes establishing a communication channels (linking with above), temporary navigational rules, exclusion zones)*
- "Increase in risk to navigation is low and temporary…". ….."scheme's proposals would not compromise navigational safety."

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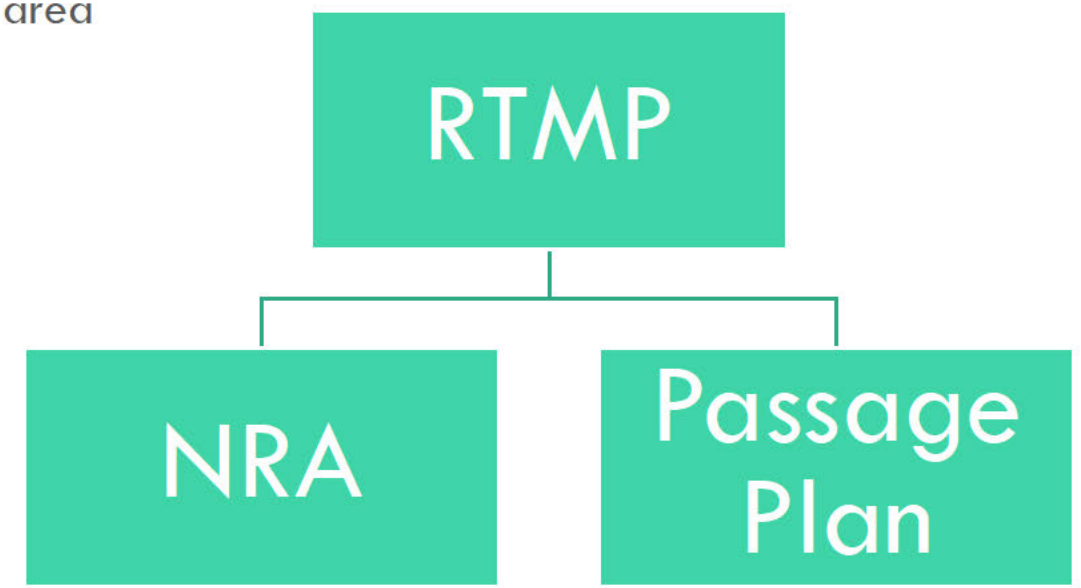
Post DCO Marine Documentation – Proposed Approach

- DCO/ Tender Stage document commitment being reviewed
- Proposed:
  - Construction River Strategy Document
  - River Transport Management Plan (*DCO terminology is CoCp Passage Plan*)
    - Navigation Risk Assessment – localised to site/study area
    - Passage Plan – for passage



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RTMP – Proposed Contents

- Intro
- Contract Area
- Glossary, acronyms etc.
- Operations
  - Overview
  - Site layout drawing
  - Loading operations incl. relevant landside SSOW
  - Marine transport
    - NRA summary
    - Vessels – tugs, barges
    - Crew – qualifications etc.
    - SSOW – PPE etc.
    - Communications
    - Passage Plan – movements, cycle time, layby moorings
  - Disposal faciltiies
- Stakeholder engagement – PLA specifically, weekly/monthly meeting
- Derogations
- Appendices
  - NRA document
  - Passage plan (generic)

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NRA (within RTMP) – Proposed Plan

Task-ID	Task Title	Sub-ID	Task Details	Schedule of Work 1	2	3	4	5	6	7	8	9	10
0	Project Management, QA/QC and Project Controls	0.1	Project Inception										
		0.2	Project Kick-Off Meeting (video/telecon) - undertake Task 1.1 prior/concurrent where possible										
		0.3	Develop/confirm project plan inc. SOW and schedule/milestones										
		0.4	QA/QC and project controls										
		0.5	Client liaison (assume progress telecons and reports)										
1	Document and Hazard Review	1.1	Review scheme inc. Project Phases (client provided material inc. project descriptions, dwgs, MS, schedules, updated Marine Operation Plan etc…)										
		1.2	Obtain baseline vessel traffic analysis and prepare initial plots										
		1.3	Review and develop Preliminary hazard themes and issues for assessment										
			Review impacts/themes against DCO documentation (Preliminary NRA & CoCP), gap analysis and hazard validation										
		1.5	Prepare for PLA Meeting										
		1.6	PLA meeting to review scheme, navigation issues, NRA assessment method/SOW and consultation plan (split with 3.2)										
2	Vessel traffic / characterisation	2.1	Procure, extract, process and baseline analysis of AIS data in study area (see also Task 1.2)*										
		2.2	Consider and incorporate non AIS vessel traffic (exp judgement, CoP & local knowledge)										
		2.3	Vessel analysis by Type and Density										
		2.4	Vessel analysis by Gate										
		2.5	Procure & collate PLA updated Incident Data (& other sources where available)										
		2.6	Localised specific analysis on passing vessels interaction - e.g. cruise ships/large commercial, Thames Clippers, Trinity Buoy Wharf and Bow Creek										
3	Stakeholder Consultation	3.1	Consultation liaison and preparation/consolidation of material										
		3.2	Consultation - Regulator PLA (see also 1.5)										
		3.3	Consultation - River User Groups (see Preliminary NRA with revised finalised list to be agreed with PLA)										
		3.4	Consultation Follow-up - meeting minutes and notes										
4	Risk Assessment: Enabling Works	4.1	Incorporate analysis, consultation and expert judgement/local knowledge										
		4.2	ID hazards, establish risk assessment matrix										
		4.3	Score baseline risk										
		4.4	ID risk controls										
		4.5	Score risk control effectiveness (frequency/likelihood)										
		4.6	Update and finalise risk assessment matrix and logs to PLA methodology										
5	Risk Assessment: Operational Phase	5.1	Incorporate analysis, consultation and expert judgement/local knowledge										
		5.2	ID hazards, establish risk assessment matrix										
		5.3	Score baseline risk										
		5.4	ID risk controls										
		5.5	Score risk control effectiveness (frequency/likelihood)										
		5.6	Update and finalise risk assessment matrix and logs to PLA methodology										
6	Reporting	6.1	Prepare Draft Report (R01-00) for review										
		6.2	Prepare Final report (R02-00)										
		6.3	PLA review telecon to finalise project/navigation issues, project outputs and key risk outcomes										

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4. Key navigation issues / impacts and discussion

- Use NRA Task 1: Document and Preliminary Hazard Review
- Use NRA Task 2: (Baseline Vessel Traffic / Characterisation)

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Task 1: Document and Preliminary Hazard Review

- Ongoing
- Input to scheme and RTMP
- Validation / review in context with DCO preliminary NRA
- Scheme complexity comparison
- Actions:
  - Review whether DCO commitments (Risk Controls) are applicable
  - Confirm approach to RTMP (NRA and Passage Plan)

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Task 2: Baseline Vessel Traffic / Characterisation

- AIS Data – 2 weeks summer 2018
- Early Analysis
  - Passing traffic
  - Class V
  - HSC Class V
  - Large commercial (cruise)
  - Use of adjacent wharves/terminals/jetties (seeking to confirm 'new' baseline)
  - Benchmarking comparable activity

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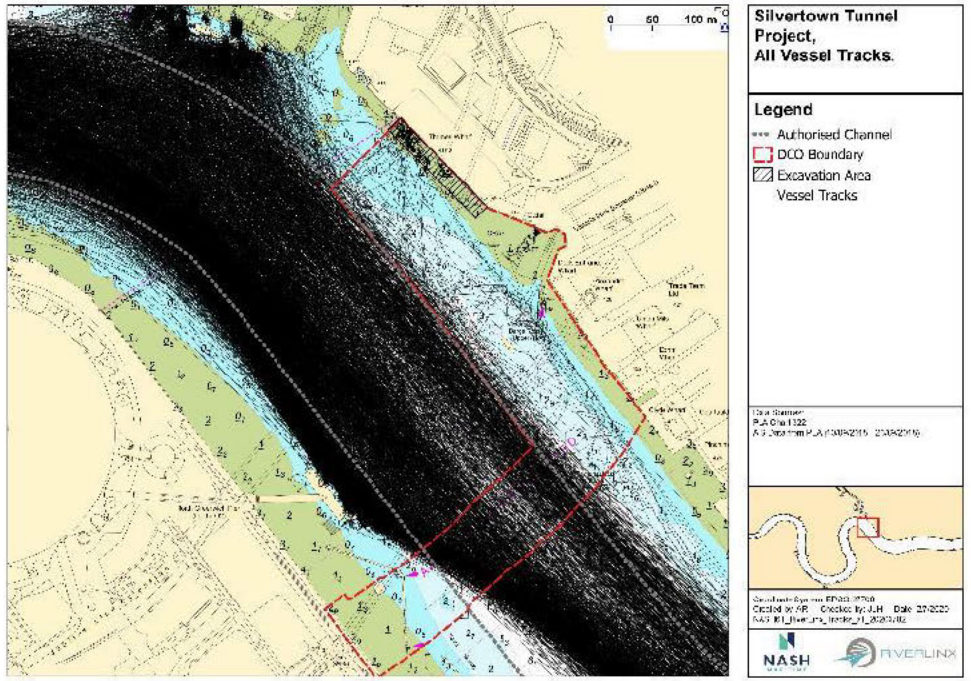

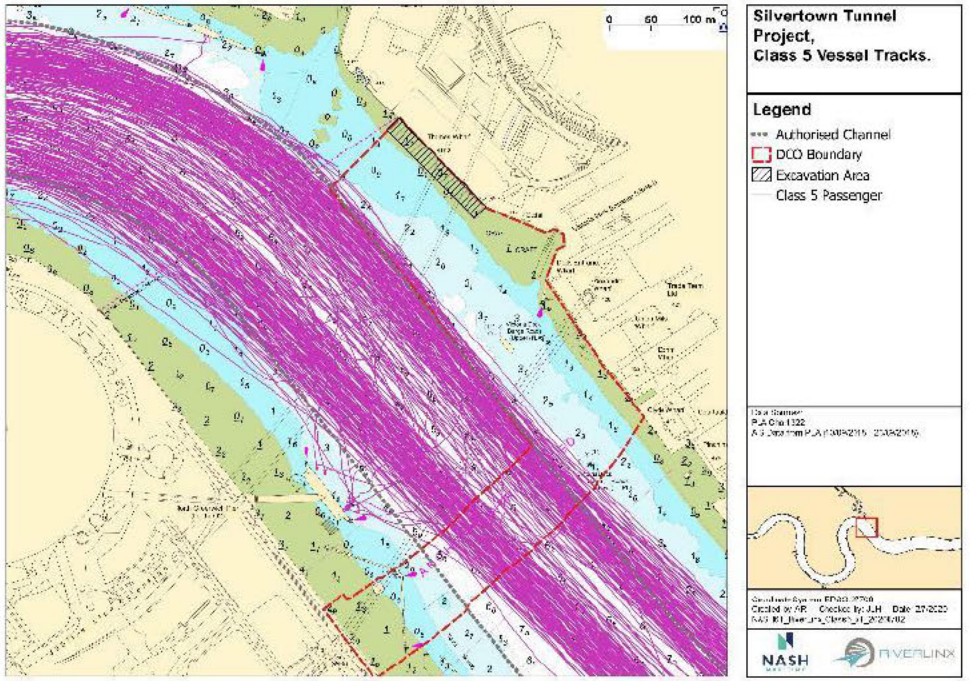

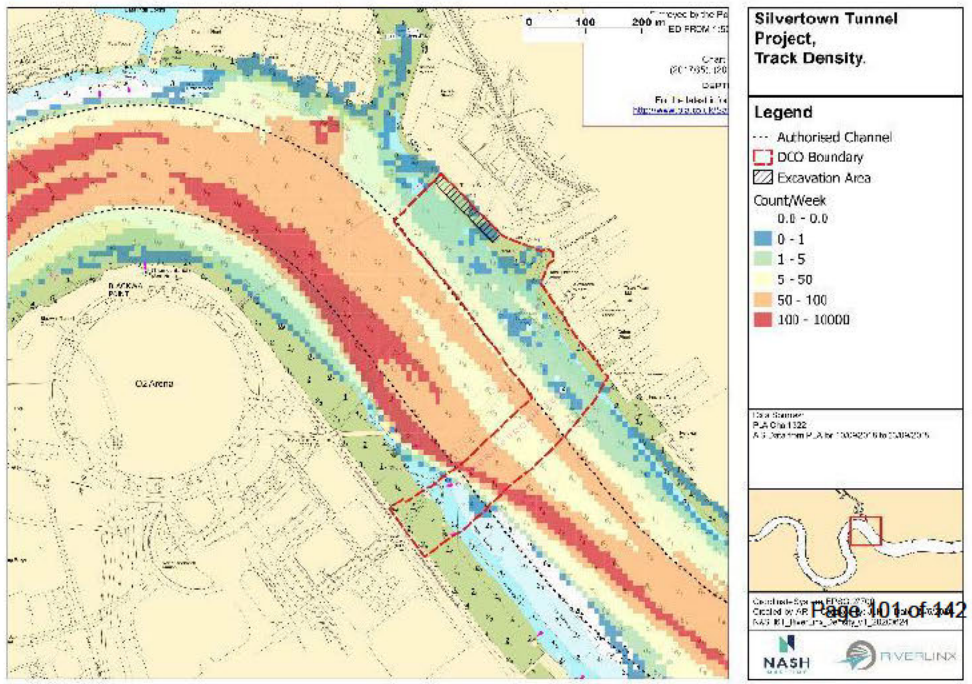

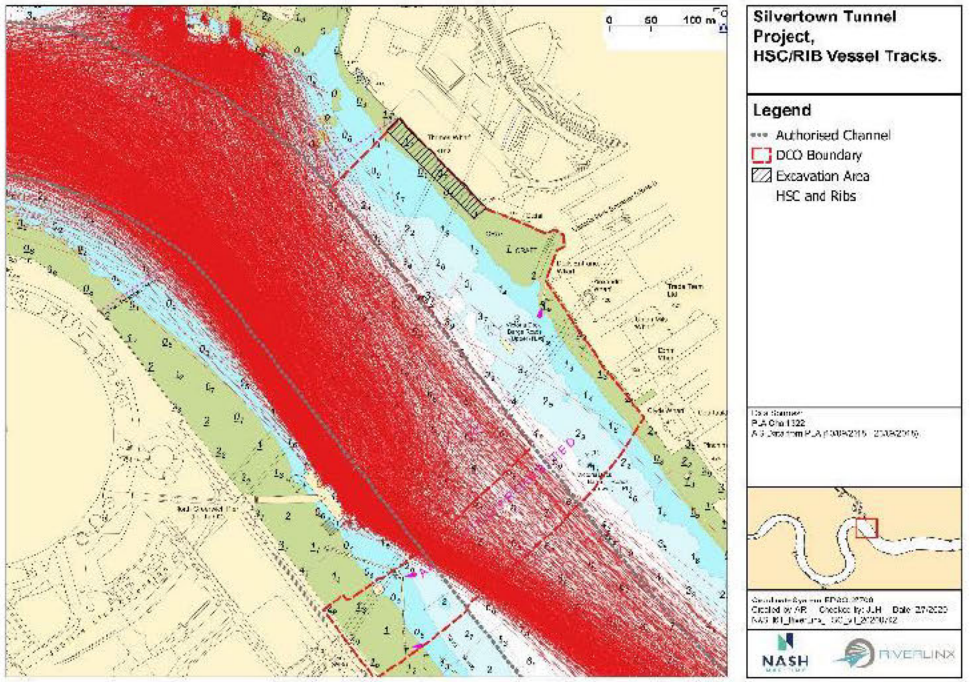

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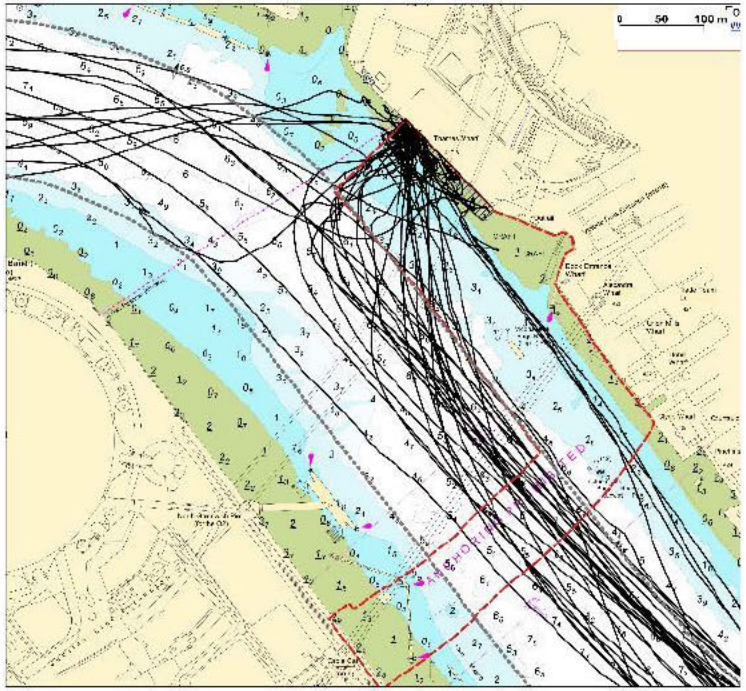
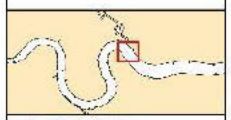


Silvertown Tunnel Project, Thames Wharf Tracks.

Legend
- Authorised Channel
- DCO Boundary
- Excavation Area
- Tracks



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PLA Chart 322
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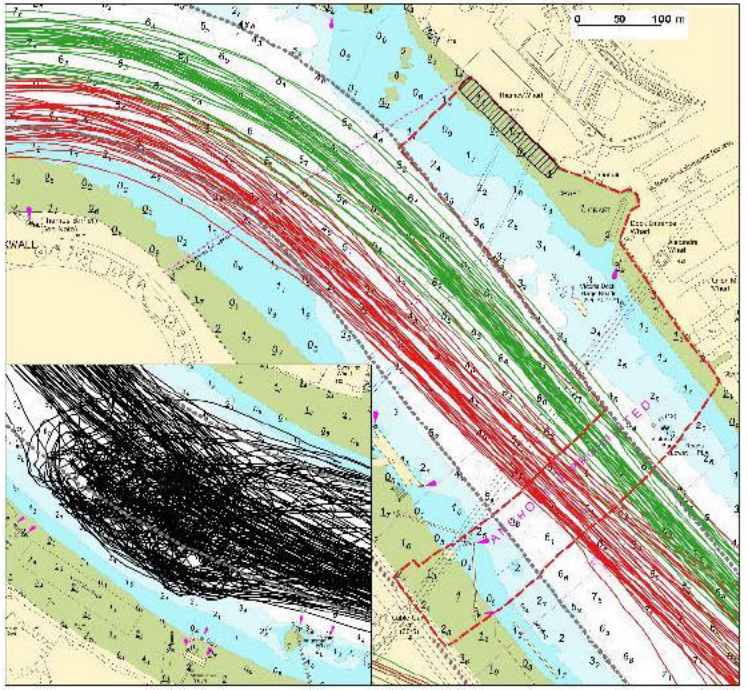
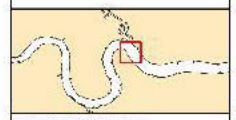
NASH
RIVERLINX



Silvertown Tunnel Project, Cory Transits.

Legend
- Authorised Channel
- DCO Boundary
- Excavation Area
- Outbound
- Inbound



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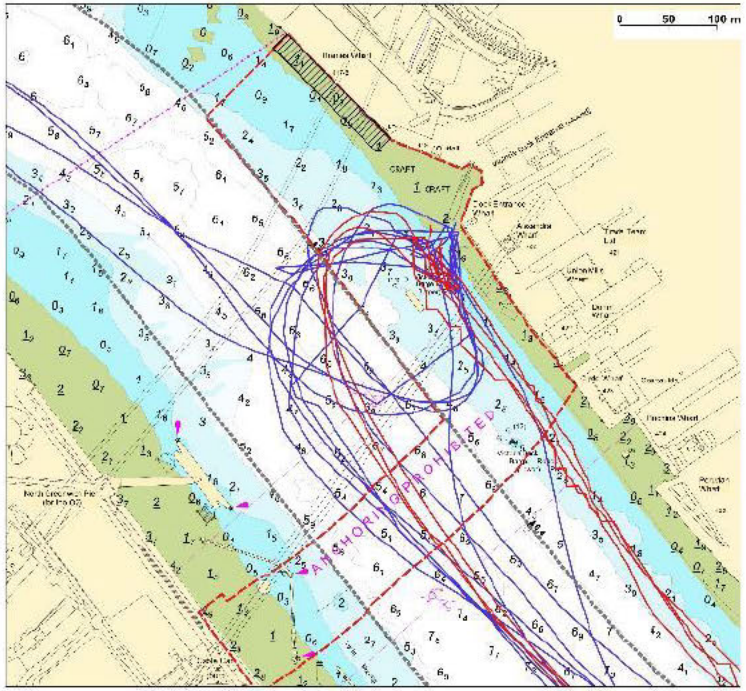
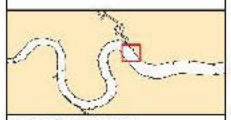


Silvertown Tunnel Project, Dock Entrance Wharf Tracks.

Legend
- Authorised Channel
- DCO Boundary
- Excavation Area
- POLLA ROSE
- Yasam Rose



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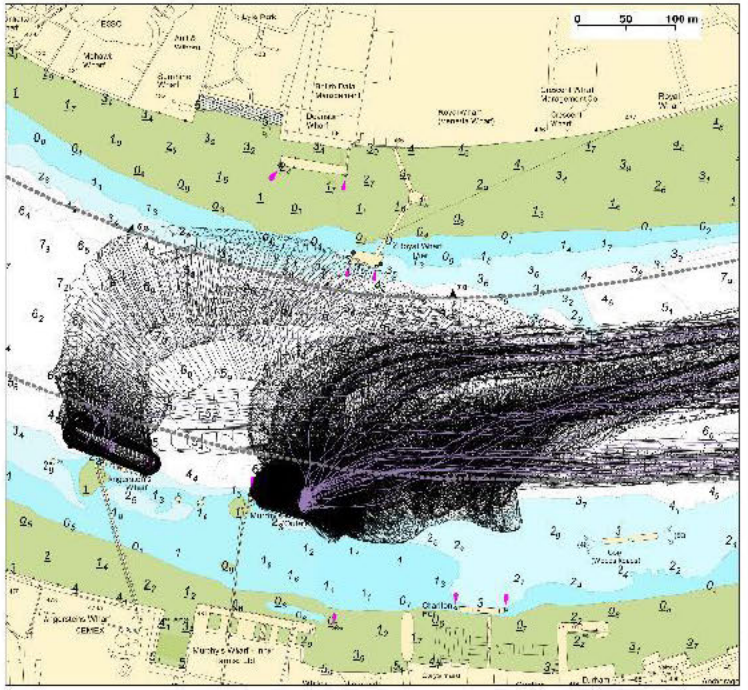
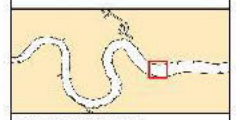
RIVERLINX



Silvertown Tunnel, Swept Paths at Angerstein/Murphy's Wharf.

Legend
- Authorised Channel
- Swept Paths



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RIVERLINX

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Stakeholder Consultation and Interfacing Projects

- Large Commercial
  - Via PLA / TBNC ? Necessary?
- Class V and Passenger Vessels:
  - Thames Clippers
  - RIB Operators
- Towage and Freight Operators:
  - GPS (see also wharves)
  - Cory Environmental
  - Thames Shipping (see also wharves)
- Recreational
  - GYC
  - Others?

- Interfacing projects where relevant such as:
  - Tideway
  - Orchard Wharf
  - Enderby Wharf (Status TBC)
- Local marine operations / Jetties / Wharves
  - Thames Wharf displacement to Primrose Wharf
  - Dock Entrance Wharf
  - Trinity Buoy Wharf
  - Peruvian Wharf (commenced late 2019)
  - Bow Creek
  - Royal Wharf (commenced late 2019)
  - Angersteins & Murphys
- Key events

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5. Confirm NRA scope and methodology

- Post DCO Documentation (RTMP - Passage Plan and NRA)
- NRA approach
  - Status of DCO NRA and comparative complexity of scheme
  - Data inputs
  - Stakeholder consultation
  - Key issues/concerns
  - Risk controls

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Any Other Business

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Notes of Meeting – Cory

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	13-Aug-2020
Present:	
Cory	[redacted] (Head of Lighterage & Ship Repair Services) [redacted] [redacted] (Marine Operations Manager) [redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted]shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted]gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel

	Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018. [redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025.

	[redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.
5.	**Preliminary NRA**
5.1	[redacted]noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted]explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). Discussion: [redacted] explained that whilst the project is of interest they don't have specific concerns navigationally. Thames Wharf is well setback and, as evidenced by the analysis and tracks, Cory traffic does not come within any distance of concern. Cory activities can be considered as through traffic in the vicinity of Thames Wharf. No manoeuvres in the area. [redacted]noted that they would have concern if the tug & tow operations at Thames Wharf impeded Cory traffic due to schedule sensitivities. However, this is not envisaged as Cory traffic departs Charlton and transits past the site at circa HW-4 (London Bridge) [i.e. ahead of Thames Wharf Phase 2 traffic] due to the operational requirements at the various London waste transfer locations. Return journeys are more distributed although HW+1 is a useful proxy. No major issues with other freight users. No major interface issues with RIBs or recreational vessels. Periodically a conflict with the annual GYC regatta. Noted the Atlas Road moorings which are heavily used by Cory albeit displaced from the site and area of interest. Twin moorings with 8 barges which are split between 3-4 vessels. Generally - the area is well managed by London VTS due to TBNC zone and CH and JA expressed they consider this a primary and effective risk control. Would welcome regular communication and information on schedules/movements.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation.

Notes of Meeting – Greenwich Yacht Club

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	14-Aug-2020
Present:	
Greenwich Yacht Club	[redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted]gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018.

	[redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025. [redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.

5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted] explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). Clearly recreational traffic is underreported in this (due to not carrying AIS) and so importance of the Tideway Code (Code of Practice) and stakeholder consultation in order to understand usage of the area. [redacted] showed and overview vessel traffic analysis split by user type and short discussion on typical usage by other users. [redacted] provided overview of GYC activities: • Noted that currently COVID restricted which impacts activities although implementing a return to usage plan. • Multiple activities operate from GYC. Clubhouse which is located at Pear Tree Wharf with over 400 members cruiser sailors, dinghy sailors, motor-boaters and rowers. • A slipway allows launching of dinghies, rowing boats (and trailer boats and larger yachts) • Large number of moorings allocated for boats up to 12m length in the river, orientated in 3 shore parallel lines and some are drying (fore/aft mooring), some are in deeper water. Extending up to the Emirates Skyline from the clubhouse. They are accessed via tender or the club trot boat which is periodically operational • Dinghies: Operate in vicinity of club with a mix of club and member owned boats. o Summer and winter racing series. o Organised sailing has accompanying 2x safety/rescue boats - weekends o Racing area extends up to Emirates Skyline and down to Royal Wharf with periodic trips to further afield. o Stay on one side and in vicinity of the club. Strong protocols in place not to impede commercial traffic and rules around tacking o Unsupervised sailing occurs mid-week • Cruisers and yachts: o 20-30 yachts active

	○ Operate extensively with 'free sailing' year round – albeit with a seasonal summer focus. ○ Weekend dominant. Some casual mid week sailing. ○ Organise club races, mostly day races, about every two weeks in the summer, and about every month during the winter. Racing can extend to Cutty Sark pub upstream and Jenning Tree buoy donwstream • Rowing ○ Two boats: A Thames Waterman cutter (6 persons) and a jollyboat (4 persons) ○ Typically row every 2 weeks on weekends (Sun) ○ Often go to Tower Bridge and up Bow Creek to Channelsea Island and Three Mills. Various monthly trips inc. Isle of Dogs, into Greenland Dock or the Royal Docks, down to Erith, to the Olympic Park, Deptford Creek, South Bank, Victoria Park or Springfield Park. ○ No safety boat Navigation safety • GYC take a very proactive approach to safety – including a Harbour Master appointment. A number of guides and check in/out policies and procedures are in place. • Thames Clippers: very frequent operations in this area and frequent crossing between their various wharves. Good working practices and radio protocols are effective. • Historic issues with RIB's. ND made reference to incidents in the past (collision) and the nature of their dynamic movements and change of heading speed. • No major issues with tug and tows and other freight. No interface with Angerstein/Murphys • Wash impacts significantly impact GYC users and, in particular, causes issues for the moorings. Mooring gear wear and tear rate is high and warps, chains require frequent replacement. • No specific incident comments or observations Concerns / Risk Controls • Query on constraints at weekends – not seen likely • Has never had issues with Thames Wharf and consider this to be comparable or insignificant in measurable difference. • Would welcome regular communication and information on schedules/movements – this would be useful.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

Notes of Meeting – Thames RIB Experience

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	14-Aug-2020
Present:	
Thames RIB Experience	[redacted] (CTM)
	[redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted] gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel

	Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018. [redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025.

	[redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.
5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted]noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted] explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). [redacted] presented vessel traffic analysis split by user type. Noting HSC included principally Thames Clippers (who are being consulted separately) and RIB's. CTM and DM summarised Thames RIB Experience activities • Peak season is Apr – Sep. Operate in winter as well although principally weekends and holidays. Operate a flexible schedule – in response to variability in demand (e.g. weather) • Heavily impacted by COVID and, although still operating, are on a significnatly reduced tempo of operations and impact duration unknown. • Key relevant route is Tower/Embankment to Barrier and return. At peak this may happen 20 times per day. A trip will typically pass Thames Wharf, transit through barrier and return past Thames Wharf circa 10-15mins later. • Fleet of 5 vessels • Noted that their movements are highly controlled and TBNC / London VTS means that, in their experience, this area is well controlled. • They do not tend to undertake high speed turns in this area (as evidenced by the track plots) and typically undertake these in vicinity of Masthouse Terrace Pier on their return journey. • They transit the study area at maximum of 30kts and displaying yellow flashing lights and using thr CoC as per PLA Byelaws (which cover areas such as construction, crewing, SMS and risk assessment) • Has had no interaction operational issues with Thames Wharf operations previously Other HSC and RIB Operators

	• Thames Clippers: very frequent operations in this area and frequent crossing between their various wharves. Good working practices and radio protocols are effective. • Thames Rockets (5 boats) • Thames Jet (City Cruises) (3 boats). Ceased activities until Apr-2021 earliest due to COVID • Thames Tigers (2 boats) [redacted] asked whether either has any observations on other users/incidents in the area. No specific observations or concerns. Noted PLA incident database and wider RIB tour incident records are useful references although the industry has implemented significant risk management protocols around these vessels as their operations have expanded. Recreation traffic conflicts are reduced. Concerns / Risk Controls • Query on constraints at weekends – not seen likely • Has never had issues with Thames Wharf and consider this to be comparable or insignificant in measurable difference. • Query on easedowns. They would seek these to be minimal and focussed to relevant activity and removed when the activity is completed. Some easedowns remain in place when activity has ended and this is very restricting and impactful on the RIB schedules • Would welcome regular communication and information on schedules/movements – this would be useful.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

Notes of Meeting – Thames Clippers

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	18-Aug-2020
Present:	
Thames Clippers	[redacted]
NASH Maritime Ltd	[redacted])

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted]gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018.

	[redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025. [redacted]noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.

5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted] explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). [redacted] presented vessel traffic analysis split by user type. [redacted] and [redacted] noted presence of Victoria Dock Barge Roads Upper mooring. Collins Waterage and Lighterage use to moor the Haven Supporter tug and Malamute workboat – generally for short periods and overnight durations. Not seen in data. [redacted] summarised Thames Clipper activities within area: • Key base at Trinity Buoy Wharf (TBW) where activities include maintenance, refuelling, cleaning and other operations 24/7 • Servicing North Greenwich Pier (NGP) – scheduled service and events • Operate a charter service from TBW to NGP (for charter and crew transfers) • Royal Wharf Pier is a scheduled service (commenced since the data included within analysis) and doesn't appreciably change the navigation pattern • Weekday operations can be considered to commence 0500 and extend through to 0100-0200 with a 20 minute interval. Weekend operations commence 0730 and extend through to 0100 with a 15 minute interval • When transiting West to East they are clear on the starboard side and so no major issues foreseen – and the analysis evidences this. • Likely seeking to increase transits in 2022 onwards (unable to provide more detail due ton commercial confidentiality) • Noted the considerable control of TBNC in the area as risk management tool • Has had no operations issues with Thames Wharf operations previously – Clippers avoid the area as per normal operations [redacted] asked whether Clippers have any observations on other users/incidents in the area. No specific observations or concerns. Concerns:

	• Would be concerned where any operations impact schedule (e.g. swinging barges or ease down) • Would seek to understand ease down requirements. Noted that experience form other projects is that ease down restrictions sometimes remained in place on a continuous basis and longer than necessary - this would be a concern to Clippers. Suggestion to consider that when the barge has taken the bottom and/or is loading spoil easedowns could be reviewed. Other cargo transfers (e.g. imports material and heavy lifting) may be more sensitive. • Noted sensitivity of TWB to depth and inner berths on the pier are sensitive to deposition. Would seek to ensure that Phase 1 works at TWB do not create any deposition in this area which would reduce berthing window on inner face of TWB. • Would request regular communication from STT project team on movements given that construction and marine movements schedule will likely significantly alter as project evolves. This will allow any interface issues to be identified and addressed.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

Notes of Meeting – Cory

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	13-Aug-2020
Present:	
Cory	[redacted] (Head of Lighterage & Ship Repair Services) – [redacted] [redacted] (Marine Operations Manager) [redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted] gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel

	Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018. [redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025.

	[redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.
5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted]explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). Discussion: [redacted] and [redacted] explained that whilst the project is of interest they don't have specific concerns navigationally. Thames Wharf is well setback and, as evidenced by the analysis and tracks, Cory traffic does not come within any distance of concern. Cory activities can be considered as through traffic in the vicinity of Thames Wharf. No manoeuvres in the area. [redacted]noted that they would have concern if the tug & tow operations at Thames Wharf impeded Cory traffic due to schedule sensitivities. However, this is not envisaged as Cory traffic departs Charlton and transits past the site at circa HW-4 (London Bridge) [i.e. ahead of Thames Wharf Phase 2 traffic] due to the operational requirements at the various London waste transfer locations. Return journeys are more distributed although HW+1 is a useful proxy. No major issues with other freight users. No major interface issues with RIBs or recreational vessels. Periodically a conflict with the annual GYC regatta. Noted the Atlas Road moorings which are heavily used by Cory albeit displaced from the site and area of interest. Twin moorings with 8 barges which are split between 3-4 vessels. Generally - the area is well managed by London VTS due to TBNC zone and CH and JA expressed they consider this a primary and effective risk control. Would welcome regular communication and information on schedules/movements.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation.

Notes of Meeting – Greenwich Yacht Club

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	14-Aug-2020
Present:	
Greenwich Yacht Club	[redacted] – Commodore [redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted] gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018.

	[redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025. [redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.

5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted] explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). Clearly recreational traffic is underreported in this (due to not carrying AIS) and so importance of the Tideway Code (Code of Practice) and stakeholder consultation in order to understand usage of the area. [redacted] showed and overview vessel traffic analysis split by user type and short discussion on typical usage by other users. [redacted] provided overview of GYC activities: • Noted that currently COVID restricted which impacts activities although implementing a return to usage plan. • Multiple activities operate from GYC. Clubhouse which is located at Pear Tree Wharf with over 400 members cruiser sailors, dinghy sailors, motor-boaters and rowers. • A slipway allows launching of dinghies, rowing boats (and trailer boats and larger yachts) • Large number of moorings allocated for boats up to 12m length in the river, orientated in 3 shore parallel lines and some are drying (fore/aft mooring), some are in deeper water. Extending up to the Emirates Skyline from the clubhouse. They are accessed via tender or the club trot boat which is periodically operational • Dinghies: Operate in vicinity of club with a mix of club and member owned boats. o Summer and winter racing series. o Organised sailing has accompanying 2x safety/rescue boats - weekends o Racing area extends up to Emirates Skyline and down to Royal Wharf with periodic trips to further afield. o Stay on one side and in vicinity of the club. Strong protocols in place not to impede commercial traffic and rules around tacking o Unsupervised sailing occurs mid-week • Cruisers and yachts: o 20-30 yachts active

	○ Operate extensively with 'free sailing' year round – albeit with a seasonal summer focus. ○ Weekend dominant. Some casual mid week sailing. ○ Organise club races, mostly day races, about every two weeks in the summer, and about every month during the winter. Racing can extend to Cutty Sark pub upstream and Jenning Tree buoy donwstream • Rowing ○ Two boats: A Thames Waterman cutter (6 persons) and a jollyboat (4 persons) ○ Typically row every 2 weeks on weekends (Sun) ○ Often go to Tower Bridge and up Bow Creek to Channelsea Island and Three Mills. Various monthly trips inc. Isle of Dogs, into Greenland Dock or the Royal Docks, down to Erith, to the Olympic Park, Deptford Creek, South Bank, Victoria Park or Springfield Park. ○ No safety boat Navigation safety • GYC take a very proactive approach to safety – including a Harbour Master appointment. A number of guides and check in/out policies and procedures are in place. • Thames Clippers: very frequent operations in this area and frequent crossing between their various wharves. Good working practices and radio protocols are effective. • Historic issues with RIB's. ND made reference to incidents in the past (collision) and the nature of their dynamic movements and change of heading speed. • No major issues with tug and tows and other freight. No interface with Angerstein/Murphys • Wash impacts significantly impact GYC users and, in particular, causes issues for the moorings. Mooring gear wear and tear rate is high and warps, chains require frequent replacement. • No specific incident comments or observations Concerns / Risk Controls • Query on constraints at weekends – not seen likely • Has never had issues with Thames Wharf and consider this to be comparable or insignificant in measurable difference. • Would welcome regular communication and information on schedules/movements – this would be useful.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

Notes of Meeting – Thames RIB Experience

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	14-Aug-2020
Present:	
Thames RIB Experience	[redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted] gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel

	Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018. [redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025.

	[redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.
5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted] explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). [redacted] presented vessel traffic analysis split by user type. Noting HSC included principally Thames Clippers (who are being consulted separately) and RIB's. [redacted] and [redacted] summarised Thames RIB Experience activities • Peak season is Apr – Sep. Operate in winter as well although principally weekends and holidays. Operate a flexible schedule – in response to variability in demand (e.g. weather) • Heavily impacted by COVID and, although still operating, are on a significnatly reduced tempo of operations and impact duration unknown. • Key relevant route is Tower/Embankment to Barrier and return. At peak this may happen 20 times per day. A trip will typically pass Thames Wharf, transit through barrier and return past Thames Wharf circa 10-15mins later. • Fleet of 5 vessels • Noted that their movements are highly controlled and TBNC / London VTS means that, in their experience, this area is well controlled. • They do not tend to undertake high speed turns in this area (as evidenced by the track plots) and typically undertake these in vicinity of Masthouse Terrace Pier on their return journey. • They transit the study area at maximum of 30kts and displaying yellow flashing lights and using thr CoC as per PLA Byelaws (which cover areas such as construction, crewing, SMS and risk assessment) • Has had no interaction operational issues with Thames Wharf operations previously Other HSC and RIB Operators

	• Thames Clippers: very frequent operations in this area and frequent crossing between their various wharves. Good working practices and radio protocols are effective. • Thames Rockets (5 boats) • Thames Jet (City Cruises) (3 boats). Ceased activities until Apr-2021 earliest due to COVID • Thames Tigers (2 boats) [redacted] asked whether either has any observations on other users/incidents in the area. No specific observations or concerns. Noted PLA incident database and wider RIB tour incident records are useful references although the industry has implemented significant risk management protocols around these vessels as their operations have expanded. Recreation traffic conflicts are reduced. Concerns / Risk Controls • Query on constraints at weekends – not seen likely • Has never had issues with Thames Wharf and consider this to be comparable or insignificant in measurable difference. • Query on easedowns. They would seek these to be minimal and focussed to relevant activity and removed when the activity is completed. Some easedowns remain in place when activity has ended and this is very restricting and impactful on the RIB schedules • Would welcome regular communication and information on schedules/movements – this would be useful.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

Notes of Meeting – Thames Clippers

Silvertown Tunnel (STT)

Client:	IdeaChain Ltd / RiverLinx
Project:	Silvertown Tunnel Project Navigation Risk Assessment
Venue:	Microsoft Teams Meeting
Date of Meeting:	18-Aug-2020
Present:	
Thames Clippers	[redacted]
NASH Maritime Ltd	[redacted]

1.	**Introductions**
1.1	All made introductions. [redacted] shared a presentation on screen and introduced the agenda and objectives:
2.	**Meeting Objectives and Agenda**

2.1	[redacted] gave an overview of the meeting objectives and presented the agenda.
	Objectives:
	• Provide briefing on the marine aspects of the project
	• Understand potential for navigation risk and impact to users to inform the Navigation Risk Assessment (NRA) being undertaken by NASH Maritime
	Agenda:
	• Project Overview
	• Proposed works
	  ○ Phase 1: Works at Thames Wharf (bed levelling at berth)
	  ○ Phase 2: Marine operations at Thames Wharf
	• Review Preliminary NRA (undertaken at DCO)
	• Discussion to input to NRA
	  ○ Review analysis and understand user activity
	  ○ Discussion on potential impacts, risks and risk controls

3.	**Project Overview**
3.1	RiverLinx is a JV appointed, under private finance contract to design, construct, finance and maintain the tunnel Development Consent Order (DCO) Project due to project being categorised as Nationally Significant Infrastructure Projects (NSIP) and was granted in May 2018.

	[redacted] showed plot providing key features and layout of tunnel. Noted also adjacent Thames Wharf. Transport by water is a KPI for the project and a commitment to utilise the river Thames for import/export of materials is being developed. NASH Maritime appointed, via IdeaChain Ltd, to undertake NRA for the project as per the DCO requirement to update the Preliminary NRA at that time. RiverLinx JV have revised the project since DCO (for example the removal of the previously assessed in river jetty). The NRA is addressing the impacts and risk associated with the works that will be undertaken to Thames Wharf and the subsequent usage of the wharf during the construction of the tunnel for import/export of material. The Preliminary NRA is relevant (and remains valid) although, due to the revised project and greater understanding of the marine logistics at this stage, the scheme is being assessed standalone. The NRA is being developed in conjunction with passage plans.
4.	**Proposed Works**
4.1	Phase 1 of the project entails enabling works at Thames Wharf which will be vacated. The wider package of works will include for sheet pile and river wall upgrade works to the flood defences and some intertidal working. There is a requirement for bed levelling works up to 20m from the wall to ensure a stable level platform for mooring barges and access at appropriate tidal states. Two options are being considered for these works: • By Land (preferred subject to wall stability and excavator reach) • By water 0-using a spudded flat top barge and mounted excavator which will step away from the works when water depth prevents access [redacted] illustrated these scenarios with plots, showing also the DCO boundary and navigational features. Noted that a barge has been allowed for should some material be unsuitable and require removal by water. Phase 2 is the use of Thames Wharf by tug and tow operations for import/export. Two berths are allowed for post Phase 1. • Export: Muck away (tunnel spoil) using 1400T barges • Import: Granular fill using 1400T barges • Import: Tunnel Segments: Using barges • Import: Sheet Piles: Using barges • Option of some project moves (e.g TBM) [redacted] showed an estimated barge movement schedule. The majority of moves will be associated with the export. • Through 2021: movements will be <10/month • A peak scenario (in Q1 and Q2 2022 during the tunnel drive) is 2 movements per 24 hour period (which may be either on a split tide or daytime tide). Export barges will likely lay over a tide to allow for loading. • The second peak scenarios is circa 1 movement per 24 hour period in Q3 and Q4 2022 (second stage tunnel drive). • At all other times movements will be less than 10-20 per month. • Minimal movements from Q3 2023 to Q3 2025 and movements cease end of 2025. [redacted] noted, for benchmarking purposes, similarity with existing movements at Thames Wharf in nature of activities (tug & tow) and with circa 30 movements per month.

5.	**Preliminary NRA**
5.1	[redacted] noted that the preliminary NRA was undertaken at DCO stage and is publicly available. See link: Preliminary Environmental Information Report (October 2015) Key difference in scheme was a previously proposed in-river jetty (for duration of STT construction) immediately downstream of Thames Wharf and use of ships (at jetty) in addition to the barges. The Preliminary NRA was qualitative and included PLA consultation. Wider consultees were identified for the subsequent work (as currently being undertaken). The Preliminary NRA concluded: "Increase in risk to navigation is low and temporary…". …..”scheme's proposals would not compromise navigational safety." A suite of good practice risk controls were proposed together with recommendations around stakeholder engagement, co-ordination and a response team. [redacted] noted that the current scheme is broadly considered less onerous in navigation risk terms due to its reduced footprint (following removal of jetty), fewer marine movements of tug/tow only (i.e small coaster/ships dropped from proposals).
6.	**Discussion and Navigation Risk Assessment**
6.1	[redacted]explained that the assessment of risk is informed by analysis of vessel traffic data, incident data, stakeholder consultation, incident data and knowledge/expertise of project team. Vessel traffic data has been obtained from summer 2018 and is considered representative for a baseline traffic scenario (noting that some wharf activity is altered). [redacted] presented vessel traffic analysis split by user type. [redacted] and [redacted]noted presence of Victoria Dock Barge Roads Upper mooring. Collins Waterage and Lighterage use to moor the Haven Supporter tug and Malamute workboat – generally for short periods and overnight durations. Not seen in data. [redacted] summarised Thames Clipper activities within area: • Key base at Trinity Buoy Wharf (TBW) where activities include maintenance, refuelling, cleaning and other operations 24/7 • Servicing North Greenwich Pier (NGP) – scheduled service and events • Operate a charter service from TBW to NGP (for charter and crew transfers) • Royal Wharf Pier is a scheduled service (commenced since the data included within analysis) and doesn't appreciably change the navigation pattern • Weekday operations can be considered to commence 0500 and extend through to 0100-0200 with a 20 minute interval. Weekend operations commence 0730 and extend through to 0100 with a 15 minute interval • When transiting West to East they are clear on the starboard side and so no major issues foreseen – and the analysis evidences this. • Likely seeking to increase transits in 2022 onwards (unable to provide more detail due ton commercial confidentiality) • Noted the considerable control of TBNC in the area as risk management tool • Has had no operations issues with Thames Wharf operations previously – Clippers avoid the area as per normal operations [redacted] asked whether Clippers have any observations on other users/incidents in the area. No specific observations or concerns. Concerns:

	• Would be concerned where any operations impact schedule (e.g. swinging barges or ease down) • Would seek to understand ease down requirements. Noted that experience form other projects is that ease down restrictions sometimes remained in place on a continuous basis and longer than necessary - this would be a concern to Clippers. Suggestion to consider that when the barge has taken the bottom and/or is loading spoil easedowns could be reviewed. Other cargo transfers (e.g. imports material and heavy lifting) may be more sensitive. • Noted sensitivity of TWB to depth and inner berths on the pier are sensitive to deposition. Would seek to ensure that Phase 1 works at TWB do not create any deposition in this area which would reduce berthing window on inner face of TWB. • Would request regular communication from STT project team on movements given that construction and marine movements schedule will likely significantly alter as project evolves. This will allow any interface issues to be identified and addressed.
8	A.O.B
8.1	[redacted] thanked for their attendance and agreed to share meeting minutes in due course for comment prior to finalisation. Meeting ENDS

ANNEX B: RISK ASSESSMENT LOGS

Phase 1 – Enabling Works R02-00

Hazard ID	Inherent Risk Rank	Residual Risk Rank	Area/Task	Hazard	Comments on Disposition	Cause	Consequence	Inherent Risk					Control Measures	Residual Risk				
								Likelihood		Severity		Score		Likelihood		Severity		Score
1	3	3	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure (or construction vessels) by R verLinx construction vessels	RiverLinx Construction Vessels will work on site at Thames Wharf to undertake remedial works to the berth including construction of a campshed. It is possible that these vessels may contact with	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew on RiverLinx - Minor damage to vessel - Minor damage Thames Wharf - Negligible impact on the environment with no lasting effects - Unlikely to generate any adverse public ty REASONABLE WORST CREDIBLE OUTCOME - Possibility of major injuries to crew and workers - Major damage to vessel - Moderate Damage to Thames Wharf - Slight impact on the environment with no lasting effects (Tier 1) - Local / National adverse publicity	3	Possible	3	Serious	9	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 6-Exclusion Area 8-Safety Boat 10-Marine Co-Ordinator	2	Unlikely	2	Moderate	4
2	4	3	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure (or construction vessels) by Commercial vessels (All types)	A signif cant number of commercial vessels, including passenger vessels, high speed craft and fre ght vessels pass RiverLinx engaged on commercial operations. The vessels may be transiting at high speed (in accordance with High Speed Craft regulations). Thames Wharf however is located some distance from the PLA Authorised Channel, and very few commercial vessels currently transit close past the site (see vessel traffic analysis). This combined with the proposed design, which does not extend any further into the river means contact with the RiverLinx infrastructure and therefore construction works is very unlikely. It is possible that passing vessels may make contact with RiverLinx Construction vessels, although this would be unlikely given the geometry of the site and distance from passing users.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew on RiverLinx - Minor damage to vessel - Minor damage Thames Wharf - Negligible impact on the environment with no lasting effects - Unlikely to generate any adverse public ty REASONABLE WORST CREDIBLE OUTCOME - Possibility of major injuries of fatalities to crew, passengers and workers - Major damage to vessel - Moderate Damage to Thames Wharf - Slight impact on the environment with no lasting effects (Tier 1) - Local / National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 6-Exclusion Area 8-Safety Boat	1	Rare	4	Very Serious	4
3	1	2	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure (or construction vessels) by passing Recreational vessels	Recreational vessels are currently advised to pass between the PLA authorised channel and Thames Wharf when inbound on the flood tide as defined by the Tideway Code. They are therefore, the most likely passing vessel to come into close proximity to the R verLinx Construction Works. However, contact with the RiverLinx Construction Vessels by recreational vessels is unl kely as there is sufficient sea room and recreational vessel traffic activity remain low in the area. However, there is a chance that recreational vessels could become entangled with construction vessels working alongside the wharf.	Master / Skipper /Pilot error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - Negligible damage to RiverLinx - Slight impact on the environment with no lasting effects (Tier 1) - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries to crew - Moderate damage to vessel - Minor damage to RiverLinx - Slight impact on the environment with no lasting effects (Tier 1) - National adverse publicity	2	Unlikely	5	Severe	10	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 6-Exclusion Area 8-Safety Boat	2	Unlikely	3	Serious	6
4	9	3	RiverLinx and surrounding area	Collision of RiverLinx construction vessels with Commercial vessels	It is noted that there will be manoeuvring of RiverLinx construction vessels on and off Thames Wharf. RiverL nx construct on vessels will therefore interact with passing commercial vessels. Of particularly note is the sea room needed when large sea-going commercial vessels, such as cruise ships, pass past the site. These vessels will have priority and as such the passage plan of RiverLinx construction vessels should include provision to de-conflict with large sea going commercial vessel movements in the area. It is also the case that whilst the speed limit for certain HSC in this reach is the highest on the Thames, the density of traffic is not the highest and apart from when passage of a sea going vessel passes the site, there is good sea room available for manoeuvring on and off the berth.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessels - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew, and/or passengers - Major damage to vessels - Slight impact on the environment with no lasting effects (Tier 1) - National adverse publicity	1	Rare	5	Serious	5	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 6-Exclusion Area 8-Safety Boat 10-Marine Co-Ordinator	1	Unlikely	4	Serious	4
5	4	8	RiverLinx and surrounding area	Collision of RiverLinx construction vessels with Recreational vessels	The passage of recreational vessels in accordance with the Tideway code, may bring them into conflict with RiverLinx construction vessels navigating on and off the construction site.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew - Moderate damage to vessel - No impact on the environment - National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 6-Exclusion Area 8-Safety Boat 9-Layby Location review / relocation / provis on 10-Marine Co-Ordinator	1	Rare	3	Serious	3

6	4	3	RiverLinx and surrounding area	Collision of Commercial / recreational vessels as a result of RiverLinx Construction operations (All types)	It is noted that there will be manoeuvring of RiverLinx construction vessels on and off Thames Wharf and as s result of this other passing traffic maybe compressed whilst has the potential to cause a collision between 3rd party vessels.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessels - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew - Moderate damage to vessels - No impact on the environment - National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 8-Safety Boat 9-Layby Location review / relocation / provis on 10-Marine Co-Ordinator	1	Rare	4	Very Serious	4
7	7	9	RiverLinx and surrounding area	Grounding of vessels as a result of of RiverLinx construction operations (All types)	Grounding of passing 3rd party vessels as a result of the RiverLinx Construction vessels is minimal and could only occur due to avoiding action taken for a RiverLinx Construction Vessels. This hazard is not considered an issue for construction vessels that will purposely take the ground to undertake the works.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Minor / Moderate injuries to crew and workers - Moderate damage to vessel - No impact on the environment - National adverse publicity	2	Unlikely	3	Serious	6	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 8-Safety Boat 9-Layby Location review / relocation / provis on 10-Marine Co-Ordinator	1	Rare	2	Moderate	2
8	1	1	RiverLinx and surrounding area	Breakout of RiverLinx construction vessels whilst working at Thames Wharf	It is possible for the RiverLinx Construction Vessels could either break free whilst undertaking works at Thames Wharf, or could suffer a jacking failure. This could be a particularly problem with strong tidal flows, periods of adverse weather or from wash / draw off from pass ng vessels. However, it is envisaged that the suitably of vessels will be confirmed for the conditions on the Thames.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream	MOST LIKELY OUTCOME - No injuries - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or single fatality to crew and workers - Moderate damage to vessel - No impact on the environment - National adverse publicity	2	Unlikely	5	Severe	10	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 8-Safety Boat 9-Layby Location review / relocation / provis on	2	Unlikely	4	Very Serious	8
9	10	9	RiverLinx and surrounding area	Foundering of RiverLinx construction vessels whilst working at Thames Wharf	Foundering of the RiverLinx Construction Vessels includes a multitude of causes including coll sions, contact, grounding (which are dealt w th as consequences of these hazards), however mechanical failure could be a separate cause of a foundering, e.g. due to mechanical failure, or human error.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - No injuries - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Minor injuries - Moderate damage to vessel - Minor environmental impact - Regional adverse publicity	2	Unlikely	2	Moderate	4	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 8-Safety Boat	1	Rare	2	Moderate	2
10	7	3	RiverLinx and surrounding area	Man overboard from RiverLinx construction vessels or Infrastructure	Man Overboard from RiverLinx construction Vessel, launch or Thames Wharf can occur due to a multitude of reasons.	Slip / Trip and falls. Mechanical defect / failure Adverse weather conditions	MOST LIKELY OUTCOME - Minor injuries - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injury or single fatalities - International adverse publicity	2	Unlikely	3	Serious	6	1-Promulgation of Information 3-RiverLinx Spec fic Vessel Passage Plan and RAMS 8-Safety Boat	2	Unlikely	2	Moderate	4

Phase 2 – Marine Logistics Operation R02-00

Hazard ID	Inherent Risk Rank	Residual Risk Rank	Area/Task	Hazard	Comments on Disposition	Cause	Consequence	Inherent Risk					Control Measures	Residual Risk				
								Likelihood		Severity		Score		Likelihood		Severity		Score
1	3	4	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure by RiverLinx vessels (tug/tow)	RiverLinx vessels calling at Thames Wharf will be tug and tows, generally set up to tow in a "Hip" or "Push" tow configuration for loaded barges and a "Pull" or "push" configuration for unloaded barges. It is understood that GPS, who have historically serviced Thames Wharf, will be providing the marine operation, and as such they will be familiar with the navigational disposition of Thames Wharf, which is not, by Thames standards, considered to be a particularly arduous wharf for berthing / departing.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew on RiverLinx - Minor damage to vessel - Minor damage Thames Wharf - Negligible impact on the environment with no lasting effects - Unlikely to generate any adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Possibility of major injuries to crew and workers - Major damage to vessel - Moderate Damage to Thames Wharf - Slight impact on the environment with no lasting effects (Tier 1) - Local / National adverse publicity	3	Possible	3	Serious	9	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS 4-Riparian Lifesaving Equipment 10-Marine Co-Ordination Function	2	Unlikely	2	Moderate	4
2	5	4	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure by Commercial (All types)	A significant number of commercial vessels, including passenger vessels, high speed craft and freight vessels pass RiverLinx engaged on commercial operations. The vessels may be transiting at high speed (in accordance with High Speed Craft regulations). Thames Wharf however is located some distance from the PLA Authorised Channel, and very few commercial vessels currently transit close past the site (See vessel traffic analysis). This combined with the proposed design, which does not extend any further into the river means contact with the RiverLinx infrastructure is very unlikely to change a result of the proposed development and would be very low due to vessel traffic density off the berth. It is possible that passing vessels may make contact with barges moored alongside Thames Wharf, although this would be unlikely given the geometry of the site and distance from passing users and the familiarity of Thames users to the presence of barges being on the berth at Thames Wharf which has historically been a common occurrence.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew on RiverLinx - Minor damage to vessel - Minor damage Thames Wharf - Negligible impact on the environment with no lasting effects - Unlikely to generate any adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Possibility of major injuries of fatalities to crew, passengers and workers - Major damage to vessel - Moderate Damage to Thames Wharf - Slight impact on the environment with no lasting effects (Tier 1) - Local / National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 4-Riparian Lifesaving Equipment	1	Rare	4	Very Serious	4
3	5	2	RiverLinx and surrounding area	Contact of RiverLinx Infrastructure by passing Recreational vessels	Recreational vessels are currently advised to pass between the PLA authorised channel and Thames Wharf when inbound on the flood tide as defined by the Tideway Code. They are therefore, the most likely passing vessel to come into close proximity to the Wharf. However, as the proposed design does not extend any further into the river, contact with the RiverLinx/ Thames Wharf infrastructure by recreational vessels is unlikely to materially change a result of the proposed development and is likely to remain at low levels. However there is a chance that recreational vessels could become entangled with barges laid alongside the wharf, but as this is a current hazard there is considered to be no difference for the RiverLinx project.	Master / Skipper /Pilot error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - Negligible damage to RiverLinx - Slight impact on the environment with no lasting effects (Tier 1) - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries to crew - Moderate damage to vessel - Minor damage to RiverLinx - Slight impact on the environment with no lasting effects (Tier 1) - National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 4-Riparian Lifesaving Equipment	2	Unlikely	3	Serious	6
4	1	2	RiverLinx and surrounding area	Collision of RiverLinx vessels (tug/tow) with Commercial vessels	It is noted that there will be manoeuvring of RiverLinx tug and tows on and off Thames Wharf, however this is also is no different to current activates. RiverLinx vessels will therefore interact with passing commercial vessels. Of particularly not is the sea room used when large Sea-going commercial vessels, such as cruise ships, pass past the site. These vessels will have priority and as such the passage plan of RiverLinx tugs and tows should include provision to deconflict with large sea going commercial vessel movements in the area. It is also the case that whilst the speed limit for certain HSC in this reach is the highest on the Thames, the density of traffic is not the highest and apart from when passage of a sea going vessel passes the site, there is good sea room available for manoeuvring on and off the berth.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessels - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew, and/or passengers - Major damage to vessels - Slight impact on the environment with no lasting effects (Tier 1) - National adverse publicity	3	Possible	4	Serious	12	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS 10-Marine Co-ordination Function	2	Unlikely	3	Serious	6

5	1	1	RiverLinx and surrounding area	Collision of RiverLinx vessels (tug/tow) with Recreational vessels	The passage of recreational vessels in accordance with the Tideway code, may bring them into conflict with RiverLinx vessels navigating on and off the construction site.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew - Moderate damage to vessel - No impact on the environment - National adverse publicity	3	Possible	4	Very Serious	12	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS 10-Marine Co-ordination Function	2	Unlikely	4	Very Serious	8
6	5	4	RiverLinx and surrounding area	Collision of Commercial / recreational vessels as a result of RiverLinx Marine operations (All types)	It is noted that there will be manoeuvring of RiverLinx Vessels on and off Thames Wharf and as s result of this other passing traffic maybe compressed whilst has the potential to cause a collision between 3rd party vessels.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessels - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or multiple fatalities to crew - Moderate damage to vessels - No impact on the environment - National adverse publicity	2	Unlikely	4	Very Serious	8	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS 10-Marine Co-ordination Function	1	Rare	4	Very Serious	4
7	8	9	RiverLinx and surrounding area	Grounding of vessels as a result of of RiverLinx Marine operations (All types)	Grounding of passing 3rd party vessels as a result of the RiverLinx project is minimal as it could only occur due to avoiding action by a 3rd party vessel for a RiverLinx vessel. Given the density of vessel traffic is very low around Thames Wharf the risk of grounding to 3rd party vessels is also very low. In terms of RiverLinx vessels, then the berth will be a campshed and grounding could be possible on entry / exit to the berth especially due to the presence of shallow spots immediately up river of Thames Wharf berth, and as such the berthing / unberthing parameters should be considered in the RiverLinx vessel passage plans.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - Minor injuries to crew - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Minor / Moderate injuries to crew and workers - Moderate damage to vessel - No impact on the environment - National adverse publicity	2	Unlikely	3	Serious	6	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS 4-Riparian Lifesaving Equipment 10-Marine Co-ordination Function	1	Rare	2	Moderate	2
8	3	8	RiverLinx and surrounding area	Breakout of RiverLinx vessels (tug/tow) during berthing / alongside	It is possible for the RiverLinx tug and tows (barges) to break free whilst moored alongside Thames Wharf. This could be a particularly problem with strong tidal flows, periods of adverse weather or from wash / draw off from passing vessels. However, it is envisaged that there will be suitably designed and installed marine furniture to accommodate vessels alongside. It is also the case that GPS (the marine operator) have significant experience of berthing barges at Thames Wharf and so will be familiar with any localised mooring issues.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream	MOST LIKELY OUTCOME - No injuries - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injuries or single fatality to crew and workers - Moderate damage to vessel - No impact on the environment - National adverse publicity	3	Possible	3	Serious	9	3-RiverLinx Vessel Passage Plan & RAMS 4-Riparian Lifesaving Equipment 5-Marine Furniture 7-Easedown	1	Rare	3	Serious	3
9	10	9	RiverLinx and surrounding area	Foundering of RiverLinx vessels (tug/tow) during berthing / alongside	Foundering of the RiverLinx tug and tows includes a multitude of causes including collisions, contact, grounding (which are dealt with as consequences of these hazards), however mechanical failure could be a separate cause of a foundering, e.g. due to mechanical failure, or human error.	Master / Skipper error Mechanical defect / failure Adverse weather conditions / reduced visibility Action of the tidal stream Avoidance of third party vessel	MOST LIKELY OUTCOME - No injuries - Minor damage to vessel - No impact on the environment - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Minor injuries - Moderate damage to vessel - Minor environmental impact - Regional adverse publicity	1	Rare	2	Moderate	2	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS	1	Rare	2	Moderate	2
10	8	4	RiverLinx and surrounding area	Man overboard from RiverLinx vessels (tug/tow) or Infrastructure	Mano Overboard from RiverLinx tug and tows, launch or Thames Wharf can occur due to a multitude of reasons, particularly as Thames Wharf will be accessed by a number of workmen, including some that may not be familiar with working in a maritime facility.	Slip / Trip and falls. Mechanical defect / failure Adverse weather conditions	MOST LIKELY OUTCOME - Minor injuries - Local adverse publicity REASONABLE WORST CREDIBLE OUTCOME - Major injury or single fatalities - International adverse publicity	2	Unlikely	3	Serious	6	1-Promulgation of Information 3-RiverLinx Vessel Passage Plan & RAMS	2	Unlikely	2	Moderate	4