

SILVERTOWN TUNNEL

**Preliminary Environmental Information
Report: Appendix 16.D**

**River Wall
Structural
Condition Survey**

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Appendix 16.D: River Wall Structural Condition Survey

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Abbreviations & Glossary

AOD	Above Ordnance Datum (Newlyn)
CAM	Condition Assessment Manual
EA	Environment Agency
HGV	Heavy Goods Vehicle
SSP	Steel Sheet Piling
TfL	Transport for London

EXECUTIVE SUMMARY

TfL Silvertown team are coordinating with the Environment Agency (EA) to assess the condition and standard of protection offered by the river walls along the North and South banks of Thames adjacent to the Greenwich Peninsula.

To assist in this engagement, TfL procured a visual survey for the lengths of the river wall located within the red line boundary on the both sides of the river as indicated in Appendix A.

TfL commissioned consultants Atkins to complete the visual inspections. The objectives were to:

- Investigate the condition of the flood walls: the walls along Bow Creek had been identified as failing;
- Report on any observations of settlement;
- Identify the need to raise the defences to meet the current and future flood defence levels of +5.18m AOD and +6.20m AOD respectively;
- Comment on whether the existing defences could be raised, if required, to achieve the current or future flood defence levels of +5.18m AOD and +6.20m AOD respectively.

The condition of the river walls was reported using the guidance outlined in the EA's Condition Assessment Manual (CAM), which utilises the following condition grading system:

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Grade	Description of Condition	Extent of deterioration/defects in existing structure
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce overall performance of asset.
3	Fair	Defects that could reduce the performance of asset.
4	Poor	Defects that would significantly reduce performance of asset.
5	Very Poor	Severe defects resulting in complete performance failure.

The table below summarises the condition of the river walls, which has been assessed in accordance with the EA's CAM. The condition grade assigned to each river wall is generally taken to apply to the whole length of the asset. However, in some instances it is appropriate to assign a second score which takes account of a localised section of the frontage which is in worse / better condition than the rest of the asset. In the table below, this "sub-score" is expressed as the number in parenthesis. Where walls are composed of more than one construction type of varying condition grades, the condition is expressed thus: "X / Y" where X and Y are condition grades for the different construction forms.

Land Interest	Plan Tag	EA Map ID (see Appendix C)	Environment Agency Asset ID (see Appendix C)	Condition Grade	Crest Settlement observed	Raising extent req'd to meet defence levels		Flood wall able to support raising to 6.2m AOD
						Current: +5.18mAOD	Future: +6.2mAOD	
ASD Ltd / Crossrail (Bow Creek asset marked *)	1	8508	06304TH000303L03	3 / 2	No	0.1m	1.12m	Yes
	2 *	14898 *	06304TH000303L02 *	4	No	0.13m	1.15m	Yes
	3	8507	06304TH000303L01	2 (3)	No	0.12m	1.14m	Yes
ASD Ltd	4	14897	06304TH000302L39	4	No	0.08m	1.1m	Yes
	5	14896	06304TH000302L38	4 (5)	Yes	0.17m	1.19m	Yes
	6	8506	06304TH000302L37	4	No	0.1m	1.12m	Yes
	7	14895	06304TH000302L36	3 (4)	No	NONE	0.9m	Yes
	8	8505	06304TH000302L35	4	No	0.08m	1.1m	Yes
European Metal Recycling Ltd / Keltbray Ltd	9	14894	06304TH000302L34	4	No	0.15m	1.17m	Yes
	10	8504	06304TH000302L33	4	No	0.15m	1.17m	Yes
Quintain Ltd	11	14782	06304TH000302L32	2 / 3 (4)	No	0.08m	1.1m	Yes
	12	14781	06304TH000302L31	3 / 2 / 3 (4)	No	NONE	0.77m	Yes
	13	8503	06304TH000302L30	2 (3) / 3	No	0.13m	1.15m	Yes
	14	14780	06304TH000302L29	4	No	0.04m	1.06m	Yes
Nuplex Ltd	15	8502	06304TH000302L28	4 / 3	No	NONE	0.9m	Yes

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Land Interest	Plan Tag	EA Map ID (see Appendix C)	Environment Agency Asset ID (see Appendix C)	Condition Grade	Crest Settlement observed	Raising extent req'd to meet defence levels		Flood wall able to support raising to 6.2m AOD
						Current: +5.18mAOD	Future: +6.2mAOD	
GL Authority	16	South Bank		2	No	NONE	0.63m	Yes

As part of this commission, a desk study review of available topographic survey data covering the river walls within the red line boundary was also completed. This was to assess whether the river walls met the current required flood protection level of +5.18m AOD. The findings of this study are summarised in the table above. It should be noted that the topographic survey used was completed by Atkins in 2013 and consequently the crest levels of the flood walls might have varied since the survey. During Atkins' visual inspection, any indications of recent settlement or other lowering of the flood defence level (such as damage to flood parapets) was recorded against each of the flood walls inspected. Such observations are logged in the table above. The table further indicates the flood defence walls' potential ability to accommodate future raising to a flood defence level of +6.2m AOD.

The remainder of this document presents the findings of the inspection in greater detail, together with a qualitative commentary on the potential of the existing river walls to accommodate future raising to +6.2m using standard construction techniques. Appendix B presents a summary of the areas surveyed as part of this commission.

INTRODUCTION

1. Objectives

TfL Silvertown team are coordinating with the Environment Agency (EA) to assess the condition and standard of protection offered by the river walls along the North and South banks of Thames adjacent to the Greenwich Peninsula.

To assist in this engagement, TfL procured a visual survey for the lengths of the river wall located within the red line boundary on the both sides of the river as indicated in Appendix A.

TfL commissioned consultants Atkins to complete the visual inspections. The objectives were to:

- Investigate the condition of the flood walls: the walls along Bow Creek had been identified as failing;
- Report on any observations of settlement of the flood defence level;
- Identify the need to raise the defences to meet the current and future flood defence levels of +5.18m AOD and +6.20m AOD respectively;
- Comment on whether the existing defences could be raised, if required, to achieve the current or future flood defence levels of +5.18m AOD and +6.20m AOD respectively.

This document presents the findings of the inspections and desk studies completed as part of this commission. Appendix B presents a summary of the areas surveyed.

2. Exclusions

This commission does not cover the following items:

- Structural analyses;
- Residual life assessments;
- Recommendations for remedial works;
- A feasibility study of how to implement the required increase in flood protection level.

3. Assumptions & Limitations

3.1 Topographic Data

A desk study review of available topographic survey data covering the river walls in the project area was completed. This was to assess whether the walls met the current required flood protection level of +5.18m AOD. The topographic survey used was completed by Atkins in 2013 and consequently the crest levels of the flood walls might have varied since the survey. During Atkins' visual inspection, any indications of recent settlement or other lowering of the flood defence level (such as damage to flood parapets) was recorded against each of the flood walls inspected.

3.2 As-Built Drawings

As-built drawing for several assets were provided. These have been reviewed as part of this commission to verify the form of construction where possible. However, the information which could be obtained from the drawings was limited owing to their low quality and resolution, and the as-built flood level could not be verified.

SURVEY METHODOLOGY

1. Scope of Surveys

The surveys performed under this commission comprised a series of visual inspections. No intrusive or exploratory works were undertaken.

2. Access

Access to each of the sites was arranged via a land agent prior to the surveys being undertaken. Landside inspections were completed on foot by two Atkins engineers on 16th June, 18th June and 2nd July 2015. These were used to assess the condition and construction of the crest of the flood wall, as well as identify indications of settlement or movement. The landside surveys were also used to establish a chainage system (see Section 3 below).

Between 18th and 19th June, waterside surveys were performed by boat to view the condition of the flood wall structures from water level. Access was timed to coincide with low tides in order to view as much of the flood walls as possible. Additional passes close to the walls were performed as the tide level increased in order to allow the survey team to closely observe the upper sections of each flood wall. Foot access along the foreshore was not undertaken owing to silt levels and the risk of entrapment.

3. Reference system

For each flood wall asset (where an asset is defined as the length of wall with a single EA asset reference number) a chainage system was established to allow the approximate location of defects to be determined. In all cases, chainage 0m was taken as the upstream extent of the asset.

4. Recording techniques

The following records were taken during the surveys:

- Video footage with commentary;
- Photos;
- Written notes;
- Tape measurements, where appropriate.

5. Condition Grading System

The river walls covered by this commission were assessed using the Environment Agency’s (EA) “Condition Assessment Manual” (document reference 166_03_SD01). Table 2.1 of the document cites the following hierarchy of condition grading:

Grade	Description of Condition	Extent of deterioration/defects in existing structure
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce overall performance of asset.
3	Fair	Defects that could reduce the performance of asset.
4	Poor	Defects that would significantly reduce performance of asset.
5	Very Poor	Severe defects resulting in complete performance failure.

The EA condition grade assigned to each river wall is generally taken to apply to the whole length of the asset. However, in some instances it is appropriate to assign a second score which takes account of a localised section of the frontage which is in worse / better condition than the rest of the asset. Throughout this report, this “sub-score” is expressed as the number in parenthesis. Where walls are composed of more than one construction type of varying condition grade, the condition is

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expressed thus: "X / Y" where X and Y are condition grades of the different construction forms.

SURVEY FINDINGS

1. ASD METALWORKS LTD / CROSSRAIL

1.1 EA Asset ID 06304TH000303L03

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Wall Construction	<p>Upstream extent of the frontage is a blockwork wall with a rock armour revetment as toe protection. A sheet pile cut off has been installed in front of the revetment and a concrete bag work section situated in the corner of the flood wall. The remainder of the frontage is steel sheet piling (SSP) with a concrete capping beam which appears to have been raised to afford a greater standard of flood protection. A steel frame supporting rails for a spoil transfer hopper has been constructed in front of the flood wall. The frame is protected by large diameter steel tubular piles with rubber fenders. Horizontal bracing members have been installed between the spoil support frame and the sheet pile wall, presumably to provide lateral support to the frame.</p>
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<p>Structural Condition</p>	<p>Concrete bag work appears to be in good condition with no signs of missing or damaged bags. However, a close inspection was not possible [Figure 5].</p> <p>Sheet pile cut off has been installed at approximately 10m chainage for approx 10m; it has likely been installed to either retain the toe of the rock armour revetment and concrete bag work section or to protect the structures from impact damage. Alternate piles are “left high”[Figure 7]. The cut-off is in good condition with only minor superficial corrosion and no sign of vessel impact.</p> <p>The blockwork wall is generally in good condition and appears stable along the majority of the frontage. Some erosion and scour of the toe is evident at the eastern extent where it meets the bag work [Figure 6].</p> <p>The alignment of the steel sheet piling appeared to be good with no indication of leaning. The piles themselves appeared to be in good condition with limited levels of corrosion. There are no visible waling bolts or anchor bolts in the steel sheet pile section.</p> <p>There are 2 flap valves which are missing from the sheet pile section. One has a large void behind which might indicate loss of fill material [Figure 4].</p> <p>A topside survey could not be carried out on the upstream extent of the steel sheet piling and concrete bagwork sections due to the presence of a temporary structure covering the ground over this asset [Figure 8 and Figure 9].</p> <p>No settlement behind the wall was observed along the sections which could be accessed.</p>
<p>Land Use</p>	<p>Land is owned by ASD Metalworks Ltd and is understood to be leased by Crossrail for spoil transfer operations, although these now appear to have ceased.</p>
<p>Condition Grade</p>	<p>Concrete bag work section – 3</p> <p>Steel sheet piling – 2</p>



Figure 1 - Steel sheet pile wall with large diameter fender piles and rails for spoil transfer system



Figure 2 - Steel sheet pile wall with concrete capping beam and parapet



Figure 3 - Intersection between steel sheet pile capping beam and spoil transfer structure



Figure 4 - Broken flap valve on sheet pile wall



Figure 5 - Concrete bagwork section with steel frame for spoil transfer hopper in foreground



Figure 6 - Blockwork wall frontage with localised erosion at toe of wall



Figure 7 - Steel sheet pile toe protection to block wall



Figure 8 - Temporary structure covering ground at upstream extent of the frontage



Figure 9 - Intersection between temporary structure and existing river wall

	Level from 2013 topographic survey	5.08m AOD
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Flood defence levels	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.1m
	Raising required to meet future flood defence level (+6.2m AOD)	1.12m
	<u>Potential for Raising River Wall Level:</u> Possible - could be achieved by raising the existing concrete parapet, subject to further investigations.	

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1.2 EA Asset ID 06304TH000303L02

Wall Construction	<p>Masonry mass gravity wall with raised concrete parapet, three no. ground anchors at approximately 5m centres. The wall line is advanced, compared to the adjacent asset 06304TH000303L03. A steel frame supporting rails for a spoil transfer hopper has been constructed in front of the flood wall. The frame is protected by large diameter steel tubular piles with rubber fenders. Horizontal bracing members have been installed between the spoil support frame and the masonry wall, presumably to provide lateral support to the frame.</p>
Structural Condition	<p>The wall is in poor condition.</p> <p>There is a section of older masonry at the downstream extent of the frontage with loss of pointing; timber fenders have been attached to the wall at this section, possibly to protect the unstable section of wall from further impact damage [Figure 11].</p> <p>There is a 5m (w) x 3m (h) section of heavily cracked masonry at the top of the wall adjacent to asset 06304TH000303L03 (upstream). This section appears unstable. The masonry units immediately below have suffered considerable erosion and loss of pointing [Figure 10].</p> <p>The frontage as a whole appears to be misaligned and there is evidence of bulging. There is a horizontal crack which runs along a mortar joint across the entire length of the frontage. The crack is approximately mid-height between bed level and the elevation of the restraint anchors [Figure 12 and Figure 13].</p> <p>There is some voiding behind the ground anchor plates.</p> <p>There are several missing bricks at high level below the line of the horizontal bracing for the spoil transfer hopper rails [Figure 11].</p> <p>There does not appear to be any settlement behind the frontage.</p>
Land Use	<p>Land is owned by ASD Metalworks Ltd and is understood to be leased by Crossrail for spoil transfer operations, although these now appear to have ceased.</p>
Condition Grade	4

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Figure 10 - Section of heavily cracked and unstable masonry at upstream end



Figure 11 - View of older masonry and timber fenders at downstream end



Figure 12 - View of misalignment and bulging in wall



Figure 13 - View of horizontal crack in bed joints mid-height between bed level and anchor height



Figure 14 - Crack in concrete parapet with crack monitoring plates

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Flood defence levels	Level from 2013 topographic survey	5.05m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.13m
	Raising required to meet future flood defence level (+6.2m AOD)	1.15m
	<p>Potential for Raising River Wall Level:</p> <p>Possible - could be achieved by raising the concrete parapet. There are likely other raising options available but further information on the defence construction and condition would be required to properly assess alternatives.</p>	

1.3 EA Asset ID 06304TH000303L01

Wall Construction	Anchored steel sheet pile wall with a concrete capping beam. The concrete capping beam has been retrospectively raised by approximately 500mm. There are anchors at 8 pile centres and waling bolts in every in-pan at approximately 2/3 of retained height. A steel frame supporting rails for a spoil transfer hopper has been constructed in front of the flood wall. The frame is protected by large diameter steel tubular piles with rubber fenders. Horizontal bracing members have been installed between the spoil support frame and the piles, presumably to provide lateral support to the frame.
Structural Condition	<p>The piles are generally in good condition. Accelerated corrosion to the sheet piles around the welded connections to the bracing structure is evident [Figure 18]. There is one possible instance of accelerated low water corrosion approximately 20m from the downstream end [Figure 17]</p> <p>There is minor cracking to the raised parapet at isolated locations.</p> <p>The wall alignment appeared to be good with no signs of leaning.</p> <p>No full-depth-thickness corrosion was observed.</p> <p>There does not appear to be any signs of settlement behind the frontage.</p> <p>There are high levels of vegetation growth directly behind the concrete river wall, including buddleia which can cause structural damage [Figure 19].</p>
Land Use	Land is owned by ASD Metalworks Ltd and is understood to be leased by Crossrail for spoil transfer operations, although these now appear to have ceased.
Condition Grade	2 (3 – sections of concrete parapet)



Figure 15 - Steel sheet pile with steel brace and concrete parapet



Figure 16 - Steel sheet pile with large diameter fender piles (left) and frame supporting rails for spoil hopper (behind)



Figure 17 - Localised corrosion, possible Accelerated Low Water Corrosion



Figure 18 - Welded connection to brace hopper support frame. Elevated corrosion of piles around connection evident



Figure 19 - Vegetation growth behind the raised flood wall

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Flood defence levels	Level from 2013 topographic survey	5.06m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.12m
	Raising required to meet future flood defence level (+6.2m AOD)	1.14m
	<p>Potential for Raising River Wall Level:</p> <p>Possible - could be achieved by raising the concrete parapet. There are likely other raising options available but further information on the defence construction and condition would be required to properly assess alternatives.</p>	

2. ASD METALWORKS LTD

2.1 EA Asset ID 06304TH000302L39

Wall Construction	Masonry mass gravity wall with timber cladding and sections of concrete repair.
Structural Condition	<p>This frontage is in poor condition.</p> <p>Where exposed, the masonry is badly eroded and there is a large vertical crack in the eastern curved section where the wall returns to meet the adjacent frontage [Figure 21 and Figure 22].</p> <p>Attempts have been made to patch either damaged or missing masonry with mass concrete or a repair grout. These repairs are up to 3m² in area. Some of these repaired sections appear unintegrated with some separation lines evident [Figure 22].</p> <p>There is no visible cracking on the parapet.</p> <p>The upstream section of the wall is clad in timber and thus it was not possible to view the structure behind. The timber cladding is severely rotted. There is a steel channel section approximately 1-2m below the top of the wall which is severely corroded and whose connections to the wall have become loose. It is not clear whether this channel is intended to provide restraint to the wall or only the cladding [Figure 20 and Figure 21].</p>
Land Use	Land is owned by ASD Metalworks Ltd and is understood to be leased by Crossrail for spoil transfer operations, although these now appear to have ceased.
Condition Grade	4



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Figure 20 - Corroded steel restraint channel which is separating from the wall



Figure 21 - Interface between exposed masonry sections and timber clad section. Masonry is badly eroded or missing. Large repairs using (sprayed) concrete



Figure 22 - Large vertical crack in masonry section

Figure 23 - Loss of pointing in masonry section, together with rotten timber cladding

Flood defence levels	Level from 2013 topographic survey	5.1m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.08m
	Raising required to meet future flood defence level (+6.2m AOD)	1.1m
	Potential for Raising River Wall Level: Possible - could be achieved by raising the concrete parapet. There are likely to be other raising options available but further information on the defence construction would be required to properly assess alternatives. The condition of this asset may also impact on choice of option.	

2.2 EA Asset ID 06304TH000302L38

Wall Construction	Concrete apron with masonry wing walls and a concrete upstand as a flood defence parapet, which has been raised retrospectively. The apron itself also appears to have been a retrospective addition to the frontage, potentially as a means of stabilising the original frontage behind.
Structural Condition	<p>This frontage is in poor condition.</p> <p>There is significant voiding of the apron [Figure 24 and Figure 25].</p> <p>There are visible sections where voids have been repaired with concrete multiple times [Figure 25].</p> <p>The surfacing to the remainder of the apron is cracked and unstable, particularly around the area surrounding the void at the eastern extent [Figure 24 and Figure 25].</p> <p>There is potential settlement of the ground behind the frontage [Figure 26].</p> <p>The raised section of the upstand is cracked and some sections (up to 3m) are missing. At some locations, this appears to be the result of damage caused by vehicular impact, causing damage to the parapet and handrails [Figure 26 and Figure 28].</p> <p>There is slight misalignment of the capping beam which could potentially be due to settlement.</p> <p>The masonry wing walls either side of the apron have eroded and there is loss of pointing. The walls have been repaired with new bricks in some areas but repairs do not appear fully embedded or integral [Figure 27].</p>
Land Use	The area directly behind the frontage is used for heavy goods vehicles (HGV) access and parking.
Condition Grade	4 (5)

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Figure 24 - Concrete apron and masonry abutments



Figure 25 - Void in concrete apron



Figure 26 - Impact damage to concrete parapet and possible settlement behind the frontage



Figure 27 - Repaired section of masonry wall



Figure 28 - Missing section of raised concrete parapet

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Flood defence levels	Level from 2013 topographic survey	5.01m AOD
	Evidence of crest settlement	Yes
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.17m
	Raising required to meet future flood defence level (+6.2m AOD)	1.19m
	<p>Potential for Raising River Wall Level:</p> <p>Possible – could be achieved by raising the concrete parapet. There are likely other raising options available but further information on the defence construction and condition would be required to properly assess alternatives.</p>	

2.3 EA Asset ID 06304TH000302L37

Wall Construction	Masonry mass gravity wall with remnants of timber fenders.
Structural Condition	<p>This frontage is in poor condition.</p> <p>There is heavy erosion to the masonry units with loss of pointing [Figure 30 and Figure 31].</p> <p>Large sections of missing masonry have been replaced with newer brickwork [Figure 29].</p> <p>There are remnants of an anchored horizontal steel waling beam approximately 1.5-2m below crest level. This steel section is now missing although the ties are still visible [Figure 30].</p> <p>Voiding of the masonry was observed behind the remnants of a timber fender at high level [Figure 31].</p> <p>Algal growth precluded a more thorough assessment of the condition of the masonry [Figure 32].</p> <p>There is no evidence of settlement behind the structure.</p>
Land Use	The land immediately behind the frontage is occupied by the site office for ASD Metalworks Ltd.
Condition Grade	4



Figure 29 - Interface between masonry wall and masonry abutment. View of large sections of replacement masonry



Figure 30 – View of eroded masonry wall with concrete parapet and remnants of steel waling beam.



Figure 31 - Voided masonry behind remains of timber fender



Figure 32 – View of algal growth and remains of timber fenders at downstream extent of asset

Flood defence levels	Level from 2013 topographic survey	5.08m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.1m

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	Raising required to meet future flood defence level (+6.2m AOD)	1.12m
	<p>Potential for Raising River Wall Level:</p> <p>Possible - could be achieved by raising the concrete parapet. There are likely other raising options available but further information on the defence construction and condition would be required to properly assess alternatives.</p>	

2.4 EA Asset ID 06304TH000302L36

Wall Construction	Sheet pile construction with a set-back concrete flood defence parapet which has been raised after construction. It is believed the piles are anchored.
Structural Condition	<p>This wall is in fair condition.</p> <p>Sheet piles appear to have been installed in front of the existing frontage.</p> <p>The upper reaches of the sheet piles were observed to have been backfilled with concrete at eastern extent of the frontage.</p> <p>Aside from superficial corrosion, the piles are generally in good condition. Some full-thickness corrosion of the piling was observed at the downstream extent of the frontage [Figure 36].</p> <p>The interface between this asset and the adjoining masonry structure is in the form of a concrete transition or “plug” which is likely unreinforced. Several horizontal cracks were noted in the concrete mass [Figure 34].</p> <p>There is a section of flood parapet missing (at 33m - 47m chainage).</p> <p>The capping beam has cracked and rotated at the eastern extent of the frontage.</p> <p>There is no sign of settlement behind the structure.</p>
Land Use	The land behind the frontage is occupied by the site office for ASD Metalworks Ltd and employee parking.
Condition Grade	3 (4 – for sections of piling which exhibit full-thickness corrosion and missing flood parapet)



Figure 33 - Waling bolt on sheet pile wall



Figure 34 – Damage to concrete interface between sheet pile wall and downstream adjacent masonry wall



Figure 35 – View of steel sheet pile wall and concrete interface



Figure 36 – Full-thickness corrosion at the downstream extent of the frontage





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Figure 37 - Concrete backfill behind sheet piles and concrete parapet

Flood defence levels	Level from 2013 topographic survey	5.3m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	NONE
	Raising required to meet future flood defence level (+6.2m AOD)	0.9m
	Potential for Raising River Wall Level: Possible - could be achieved by raising the existing concrete parapet. There are likely other raising options available but further information on the defence construction and condition would be required to properly assess alternatives.	

2.5 EA Asset ID 06304TH000302L35

Wall Construction	Masonry mass gravity wall	
Structural Condition	<p>The wall is in poor condition.</p> <p>The masonry wall is badly eroded and cracked, with several surface voids [Figure 38 and Figure 39].</p> <p>There is a large crack and hole at the base of the wall at the eastern extent of the frontage.</p> <p>The alignment of the wall appeared to be fair with no sign of bulging.</p> <p>There is no sign of crest settlement behind the frontage.</p>	
Land Use	Car park for ASD Metalworks Ltd	
Condition Grade	4	
	 	
	<p>Figure 38 - Masonry wall with car park behind the frontage</p> <p>Figure 39 – Cracking in masonry wall</p>	
Flood defence levels	Level from 2013 topographic survey	5.1m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.08m
	Raising required to meet future flood defence level (+6.2m AOD)	1.1m

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	<p>Potential for Raising River Wall Level:</p> <p>Possible - could be achieved by raising the existing concrete parapet. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives. The condition of this asset may also impact on choice of option.</p>
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3. KELTBRAY LTD / EUROPEAN METAL RECYCLING LTD

3.1 EA Asset ID 06304TH000302L34

Wall Construction	Steel sheet pile wall with ground anchors at 8 pile centres and a mid-height waling beam with bolts at every in-pan. There is an additional waling beam at approximately 1/3 retained height at the western extent of the frontage. The type of steel sheet pile section changes at approximately 53m chainage.
Structural Condition	<p>The sheet piles are generally in poor condition. At the downstream extent, the toes of the piles appear to be “kicking out” which might indicate toe bearing failure of the wall. There appears to be forward leaning of the piles at the location of a mooring bollard used to secure barges associated with spoil transfer.</p> <p>The piles exhibit superficial corrosion. There are isolated areas of more extensive and concentrated corrosion to full thickness [Figure 43].</p> <p>There is consistent damage and crumpling to the tops of the piles across the whole of the frontage [Figure 40].</p> <p>Impact damage to the sheet piles was observed at 60m chainage [Figure 42].</p>
Land Use	The land behind the frontage is used for spoil transfer and disposal. There is regular HGV traffic and excavators traversing the area immediately behind the frontage.
Condition Grade	4 (pending further investigation of the cause for the piles’ non-verticality)

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 Appendix 16.D: River Wall Structural Condition Survey



Figure 40 - Steel sheet pile wall with crumple damage to the top of the piles



Figure 41 - Waling and anchor bolts



Figure 42 - Impact damage to steel sheet piles



Figure 43 - Localised full-thickness corrosion to sheet piles

Flood defence levels	Level from 2013 topographic survey	5.03m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.15m
	Raising required to meet future flood defence level (+6.2m AOD)	1.17m
	Potential for Raising River Wall Level: Possible - could be achieved by constructing a concrete capping beam on the sheet piles with an integral flood defence parapet. There are likely	

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Appendix 16.D: River Wall Structural Condition Survey

	other raising options available but further information on the defence construction would be required to properly assess alternatives.
--	--

3.2 EA Asset ID 06304TH000302L33

<p>Wall Construction</p>	<p>Sheet pile wall with alternating ground anchors and waling bolts at 4 pile centres. Frontage appears to have been piled in front of existing defence.</p> <p>A review of available as-built drawings confirms that the sheet piles comprising this frontage were driven in front of the existing flood wall, and that the piles are anchored back to a dead man wall. The drawings reviewed are of insufficient quality to discern the date of construction or additional details.</p>
<p>Structural Condition</p>	<p>The frontage is in poor condition.</p> <p>The piles lean backwards along this frontage. This could be the manner in which they were driven, or it could indicate instability of the wall whereby the toe of the wall is “kicking-out”.</p> <p>The piles exhibit primarily superficial corrosion.</p> <p>There is consistent damage and warping to the tops of the piles across the whole of the frontage.</p> <p>The tops of the sheet piles have been backfilled using mass concrete [Figure 48].</p> <p>The sheet piles are slightly misaligned and lean slightly to the right when viewed from in front; this is likely to be the result of poor driving.</p> <p>Near the downstream extent of the frontage there is a missing flap valve [Figure 44].</p>
<p>Land Use</p>	<p>The land behind the frontage is used for spoil transfer and disposal. There is regular HGV traffic and excavators traversing the area immediately behind the frontage.</p>
<p>Condition Grade</p>	<p>4 (pending further investigation of the cause for the piles’ non-verticality)</p>



Figure 44 – Pile non-verticality



Figure 45 – View of upstream end of asset, showing how the piles have been driven in front of existing frontage



Figure 46 - Hole in sheet piling indicating missing flap valve



Figure 47 - Steel sheet pile wall



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Appendix 16.D: River Wall Structural Condition Survey

Figure 48 - Concrete back filling behind piles

Flood defence levels	Level from 2013 topographic survey	5.03m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.15m
	Raising required to meet future flood defence level (+6.2m AOD)	1.17m
	<p>Potential for Raising River Wall Level:</p> <p>Possible - could be achieved by constructing a concrete capping beam on the sheet piles with an integral flood defence parapet. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.</p>	

4. QUINTAIN LTD

4.1 EA Asset ID 06304TH000302L32

Wall Construction	Steel sheet piling capped with a steel plate and in-situ mass concrete coping. There is a Thames Water outfall structure at 47.5m chainage.
Structural Condition	<p>This frontage is generally in good condition.</p> <p>There are no signs of settlement to the land behind the frontage.</p> <p>There are some minor cracks in the capping beam at 16m chainage. There is also heavy damage to the coping adjacent to the mooring bollards [Figure 51].</p> <p>There is some minor pitting corrosion of the sheet piles. Otherwise, the piles appear in good condition.</p> <p>The alignment of the piles appeared to be good with no sign of leaning.</p> <p>The mooring of barges along this frontage appears common and the absence of fenders means that both the piling and the coping receive impact damage.</p> <p>It should be noted that a large proportion of the frontage was obscured from view due to the presence of moored vessels.</p>
Land Use	General storage of plant, equipment and scrap.
Condition Grade	<p>Steel sheet pile wall – 2</p> <p>Concrete capping beam – 3 (4)</p>



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Appendix 16.D: River Wall Structural Condition Survey

Figure 49 - Steel sheet pile wall and concrete Thames Water outfall

Figure 50 - Steel sheet pile wall adjacent to Thames Water outfall



Figure 51 – Damage to coping adjacent to mooring bollard

Flood defence levels	Level from 2013 topographic survey	5.1m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.08m
	Raising required to meet future flood defence level (+6.2m AOD)	1.1m
	Potential for Raising River Wall Level: Possible - could be achieved by constructing a new concrete capping beam to the sheet piling with an integrated flood wall. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.	

4.2 EA Asset ID 06304TH000302L31

Wall Construction	<p>The asset is comprised of the old steel lock gates to the Royal Victoria Dock, together with concrete abutment walls. Downstream of the east abutment, the asset construction changes to a steel sheet pile wall section. The abutments are of concrete construction with vertical in-cast steel rails used presumably as a means of reinforcement. The steel gates are clad with close centred timber planking. The steel sheet pile wall has ground anchors at 8 pile centres and waling bolts at every in-pan. The piles are capped using an in-situ concrete coping. There is no discernible flood parapet across the frontage.</p>
Structural Condition	<p>The lock gates appear to be in fair condition, although the timber cladding precluded a more rigorous visual assessment. It is not known whether sufficient modifications were made to the gate structure and supports to allow it to function as an earth-retaining structure [Figure 54 and Figure 55].</p> <p>The abutments appeared to be in good condition with no signs of cracking or other structural distress.</p> <p>The steel sheet piling appeared to be in generally good condition with only low levels of corrosion evident. However, at least one waling bolt was observed to have completely perished [Figure 56].</p> <p>The pile alignment appeared to be good with no sign of leaning.</p> <p>The coping to the sheet piles is in generally fair condition – some impact damage and erosion is evident.</p> <p>There was no sign of ground settlement at any location behind the whole frontage. A linkspan has been positioned near to the western extent of the lock gates which is used to provide access to a floating barge. The use of the linkspan has caused some localised damage to the ground used to provide access to a floating barge.</p>
Land Use	General storage of plant, equipment and scrap.
Condition Grade	<p>Steel lock gates – 3</p> <p>Concrete abutment walls – 2</p> <p>Steel sheet piling – 3 (4 – missing waling bolts)</p>

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Appendix 16.D: River Wall Structural Condition Survey



Figure 52 - Steel sheet pile wall with waling, anchor bolts and concrete coping



Figure 53 - Concrete abutments with steel railing reinforcement



Figure 54 - Steel lock gates with close centred timber cladding



Figure 55 - Steel lock gates with close centred timber cladding



Figure 56 - Perished waling bolts

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Appendix 16.D: River Wall Structural Condition Survey

Flood defence levels	Level from 2013 topographic survey	5.43m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	NONE
	Raising required to meet future flood defence level (+6.2m AOD)	0.77m
	<p>Potential for Raising River Wall Level:</p> <p>Possible – could be achieved by constructing a new flood wall directly onto the concrete abutments. The concrete coping along the piled wall could be replaced with a new capping beam with integral flood wall / parapet. At the old steel lock gates an L-section free standing parapet would likely be required but further information on how the gates have been modified (if at all) would be needed to properly assess alternative options.</p>	

4.3 EA Asset ID 06304TH000302L30

Wall Construction	<p>Steel sheet pile wall with concrete capping beam and concrete flood wall which has been raised retrospectively to afford a higher standard of flood protection. There are ground anchors at 8 pile centres directly below the capping beam. There are no visible waling bolts along the frontage.</p> <p>As-built drawings verify that the piled wall is anchored to “dead men” and that the flood parapet was raised in or around 1971. According to the dates of the drawings, the wall was originally constructed in or around 1966. The quality of the drawings is insufficient to allow more detailed information to be obtained.</p>
Structural Condition	<p>This frontage is in good-to-fair condition. The wall alignment is good with no sign of leaning.</p> <p>The soffit of the capping beam is eroded along the whole frontage with some areas of exposed and corroded steel reinforcement. There are also areas of spalling which could either be the result of vessel impact or corrosion of the reinforcement brought on by insufficient concrete cover. There is a significant section of exposed steel reinforcement at 60m chainage [Figure 60].</p> <p>Large cracks visible from riverside at 10m and 55m chainage.</p> <p>There is resurfacing on the landside at 55m chainage adjacent to the vertical crack in the flood wall [Figure 61].</p> <p>There are small vertical cracks in the flood wall at 70m chainage.</p> <p>The piles at 0m chainage have been formed by splicing shorter sections together using welds. There are no indications that these piles are under any form of distress and no misalignment or leaning is evident [Figure 62].</p> <p>There is a break in the piling at 50m chainage where there is a concrete “plug” in place of a pile. There is no evidence to suggest a pile has been lost [Figure 58].</p> <p>There are accelerated levels of corrosion at welded connections formally used to secure fenders [Figure 59].</p>
Land Use	<p>Construction traffic and construction material storage</p> <p>Warehouse storage</p>

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 Appendix 16.D: River Wall Structural Condition Survey

<p>Condition Grade</p>	<p>Steel sheet piling – 2(3) Concrete capping beam – 3</p>
 <p>Figure 57 – Splash zone corrosion and erosion of soffit of the concrete capping beam</p>	 <p>Figure 58 – View of break in construction – joint in capping beam and concrete “plug” in place of pile below joint</p>
 <p>Figure 59 - Accelerated corrosion of steel sheet piles at welded connections</p>	 <p>Figure 60 - Spalling to soffit of concrete capping beam with exposed corroded steel reinforcement</p>

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Appendix 16.D: River Wall Structural Condition Survey



Figure 61 - Crack in river wall with resurfacing on the land directly behind the frontage



Figure 62 - Section of sheet piles which have been horizontally spliced

Flood defence levels	Level from 2013 topographic survey	5.05m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.13m
	Raising required to meet future flood defence level (+6.2m AOD)	1.15m
	Potential for Raising River Wall Level: Possible – could be achieved by raising the existing flood wall. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.	

4.4 EA Asset ID 06304TH000302L29

Wall Construction	Steel sheet pile wall with external waling beam and grouted ground anchors at 12 pile centres. The top sections behind the piles have been backfilled with concrete. Between 0m and 12m chainage, the river wall has been raised by approx. 400mm. The frontage is connected to the upstream asset (06304TH000302L30) with a concrete plug, likely unreinforced.
Structural Condition	<p>This frontage is in poor condition.</p> <p>The concrete connection between assets has a large horizontal crack at around mid-height [Figure 63].</p> <p>The piles lean backwards – this could be the result of the manner in which they were driven, or could be the result of toe bearing failure causing the toes of the piles to “kick out”.</p> <p>There is vegetation growing out of the wall at 17m chainage.</p> <p>There are multiple large corrosion holes above the waling beam with voids behind indicating fill has been lost [Figure 64].</p> <p>There is impact damage to the waling beam at approximately 22m chainage [Figure 66].</p> <p>There is impact damage to the top of the piles at various locations across the frontage.</p> <p>The movement joints observed did not appear to have sealant present [Figure 67].</p> <p>The ground surfacing behind the frontage is cracked and uneven indicating possible movement [Figure 68].</p>
Land Use	The land behind the frontage is used by The Old Basket Company for storage
Condition Grade	4



Figure 63 - Interface between steel sheet pile wall and adjacent upstream asset



Figure 64 - Full depth corrosion of steel sheet piles with voids in the concrete back fill



Figure 65 - Steel sheet pile wall with external waling beam. Piles leaning backwards



Figure 66 - Impact damage to waling beam

Silvertown Tunnel Preliminary Environmental Information Report
 Appendix 16.D: River Wall Structural Condition Survey

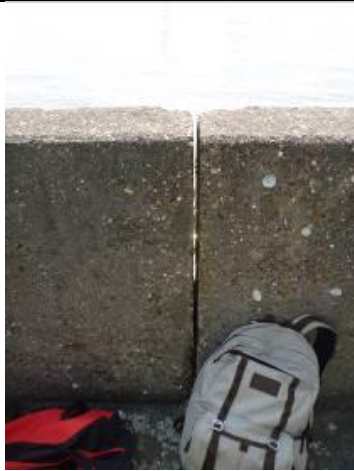


Figure 67 - Movement joint with no sealant present



Figure 68 - Cracked and uneven surfacing behind the frontage

Flood defence levels	Level from 2013 topographic survey	5.14m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	0.04m
	Raising required to meet future flood defence level (+6.2m AOD)	1.06m
	Potential for Raising River Wall Level: Possible – could be achieved by raising the existing flood wall. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.	

5. NUPLEX RESIN LIMITED

5.1 EA Asset ID 06304TH000302L28

Wall Construction	Frontage is an old dock of steel sheet pile construction with ground anchors generally at 6 pile centres, and waling bolts at every other in-pan. There are timber fenders mounted on the piles at the entrance. There is a set-back concrete parapet which runs around the perimeter of the dock embayment. At the Western extent of the dock there is a section of timber wall which appears to have been backfilled with mass concrete. There is a steel section which appears to be acting as a restraint to the timber.
Structural Condition	<p>The sheet piles appeared to be in good condition with low levels of corrosion. Given their sheltered location, very little in the way of impact damage was noted [Figure 69].</p> <p>The alignment of the sheet piles appeared to be good with no signs of leaning.</p> <p>There are no signs of settlement in the land behind the frontage.</p> <p>Elevated levels of corrosion to the anchor and waling bolts were noted [Figure 72].</p> <p>The timber wall section of the frontage is in poor condition. Large sections of timber are missing and the concrete behind has multiple voids [Figure 75]. The steel section, which is assumed to be a wall restraint, is corroded but there is no sign of full depth corrosion.</p>
Land Use	The land directly behind the frontage is owned by Nuplex Ltd but appears largely unused.
Condition Grade	<p>Steel sheet piling – 2</p> <p>Timber wall – 4</p>

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Appendix 16.D: River Wall Structural Condition Survey



Figure 69 - Steel sheet pile dock



Figure 70 - Timber fenders on entrance to the dock



Figure 71 - Steel sheet pile walls with waling and anchor bolts



Figure 72 - Corroded waling and anchor bolts



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Appendix 16.D: River Wall Structural Condition Survey

Figure 73 - Timber wall section at upstream extent of asset

Figure 74 - Timber wall with concrete fill behind



Figure 75 - Timber wall and voids in concrete at intersection with steel sheet piling

Flood defence levels	Level from 2013 topographic survey	5.3m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	NONE
	Raising required to meet future flood defence level (+6.2m AOD)	0.9m
	Potential for Raising River Wall Level: Possible - could be achieved by raising the concrete parapet. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.	

6. SOUTH BANK

Wall Construction	<p>The flood defence is of multi-tiered construction. The riverside toe of the defence is a mixture of gabion baskets and steel sheet piling, which support a vegetated inter-tidal terrace. Behind the terrace is a cantilevered L-shaped concrete wall, which supports a 3m wide Thames Path. Behind the path there are 4 No (120mm high, 1000mm wide) paved steps up to the flood defence level.</p> <p>The above construction details are verified in the available as-built drawings.</p>
Structural Condition	<p>The concrete wall appears to be in good condition, although, visibility of the frontage from the riverside was impaired due to vegetation cover [Figure 76].</p> <p>The crest level of gabion baskets appeared to undulate although the baskets themselves appeared to be in reasonably good condition with no signs of tears or loss of ballast [Figure 76].</p> <p>The finish level of the sheet piling likewise appeared to undulate although the condition of the capping beam would seem to indicate that these undulations have existed since construction. The condition of the piles could not be viewed due to tidal and foreshore conditions. The alignment of the piles appeared to be generally good [Figure 77].</p> <p>The paving and handrails along the path and crest are in good condition [Figure 78 and Figure 79].</p>
Condition Rating	2



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Appendix 16.D: River Wall Structural Condition Survey

Figure 76 - Concrete wall is obstructed by reeds but gabion baskets at the toe are visible



Figure 77 - Section of the river wall with sheet piled toe



Figure 78 - Lower Thames Path directly behind the frontage

Figure 79 - Concrete steps up to second Thames Path - this is the flood defence level

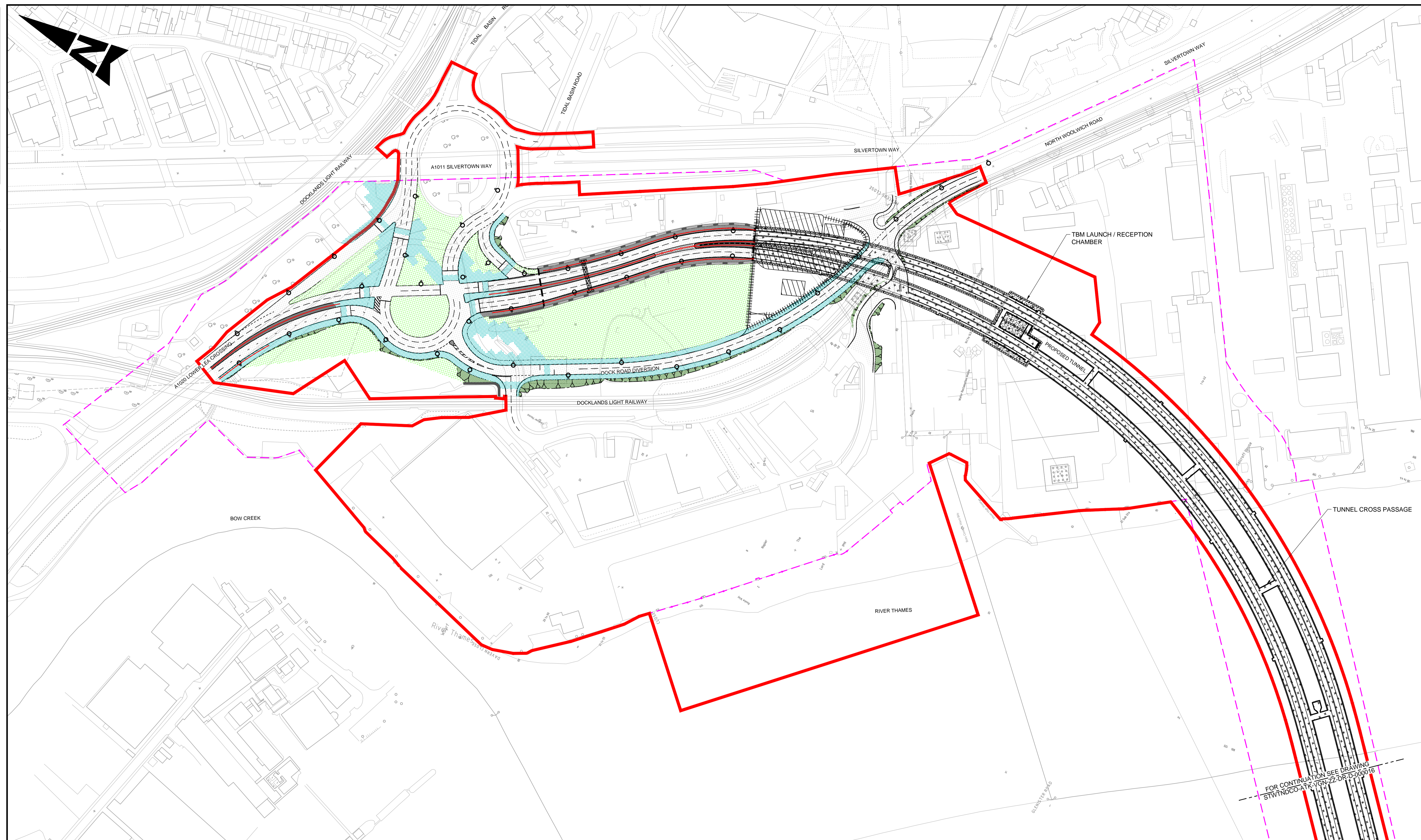
Flood defence levels	Level from 2013 topographic survey	5.57m AOD
	Evidence of crest settlement	No
	Raising required to meet current statutory flood defence level (+5.18m AOD)	NONE
	Raising required to meet 2100 statutory flood defence level (+6.2m AOD)	0.63m
	Potential for Raising River Wall Level: Possible - could be achieved by incorporating an upstand or flood wall at the crest. There are likely other raising options available but further information on the defence construction would be required to properly assess alternatives.	

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APPENDIX A: TUNNEL WORKS RED LINE BOUNDARY PLAN

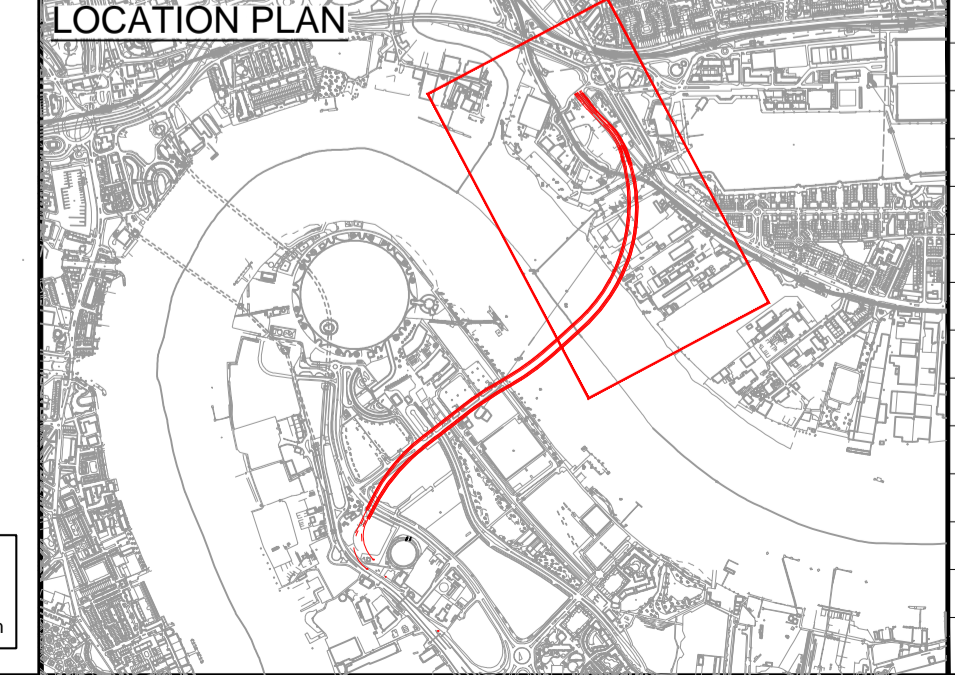
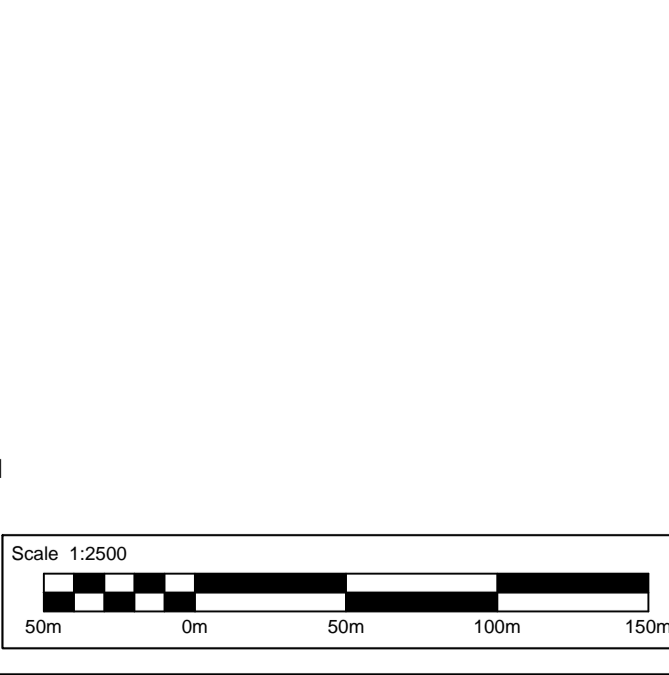
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KEY:

	SCHEME FOOTPRINT		LANDSCAPING
	SAFEGUARDED BOUNDARY		EARTHWORK
	RETAINING WALL		HARDENED VERGE
	SECANT WALL WITH VERTICAL UPSTAND		NON MOTORIZED USER ROUTE
	SECANT WALL TO UNDERSIDE OF CARRIAGEWAY		CROSSOVER
	GANTRY STRUCTURES		TUNNEL SERVICES AND VENTILATION BUILDINGS
	10m DOUBLE OR SINGLE ARM LIGHTING COLUMN		PROPOSED TUNNEL
	ANTI-RECIRCULATION WALL		FENCE BOUNDARY OF TUNNEL SERVICE BUILDINGS
	ROADS RESTRAINT SYSTEM		
	REMOVABLE ROADS RESTRAINT SYSTEM		



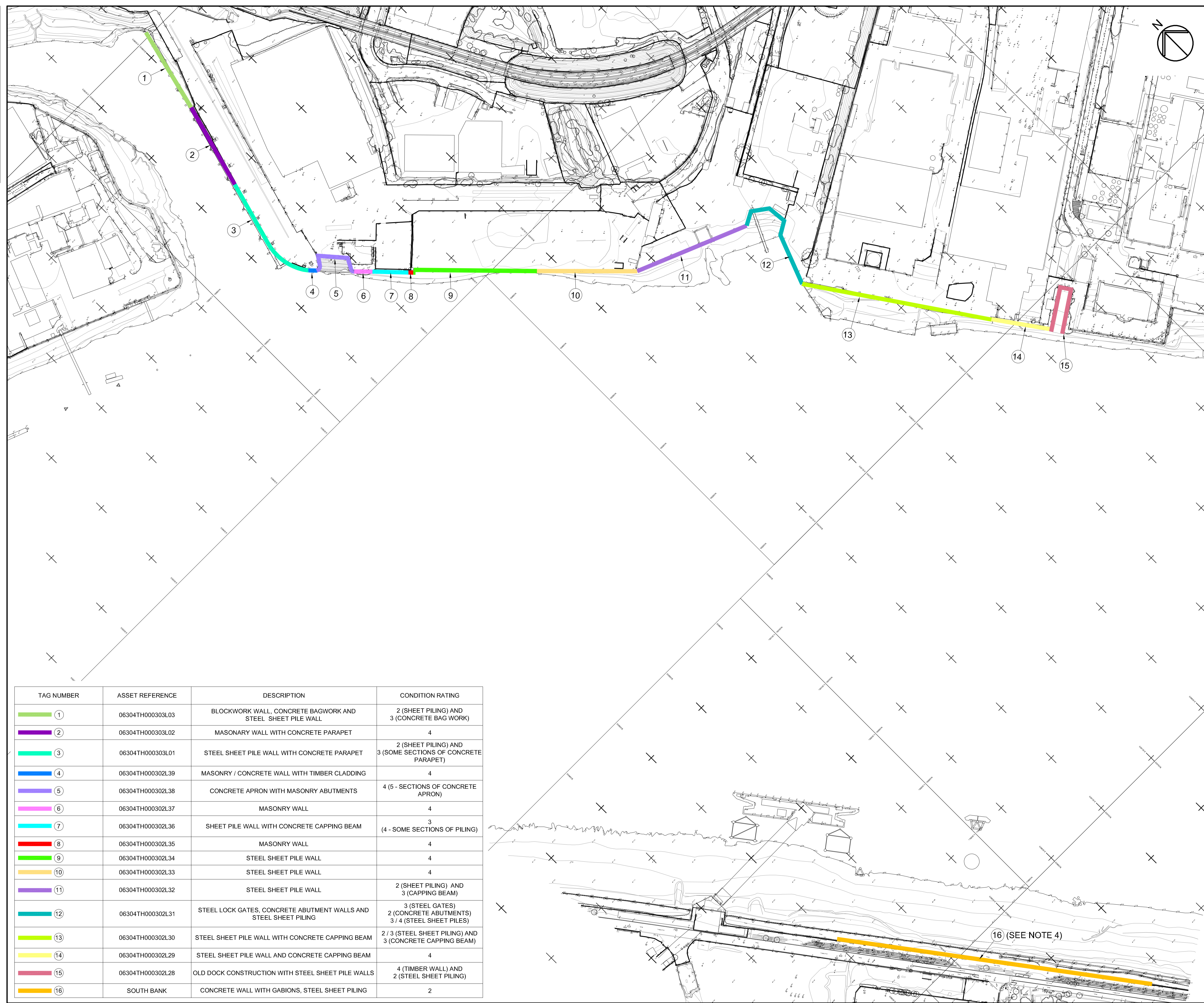
Rev.	Date	Description	By	Chkd	App'd
P1.1	00/00/00	DRAWING CREATED			XXX

Drawing Status: WORK IN PROGRESS		Subsidiary: SO	Project Title: SILVERTOWN TUNNEL		
PROJECT LOGO TBC		Drawing Title: GENERAL ARRANGEMENT PLANS SHEET 1 of 3			
		Scale: 1:1250	Designed: 00/00/00	Drawn: 00/00/00	Checked: 00/00/00
Client: Transport for London		Project: STWTNDCO - ATK - VGN - ZZ - DR - D - 000015			
Project Reference: 5123288		Revision: P01			

APPENDIX B: SURVEY EXTENTS

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

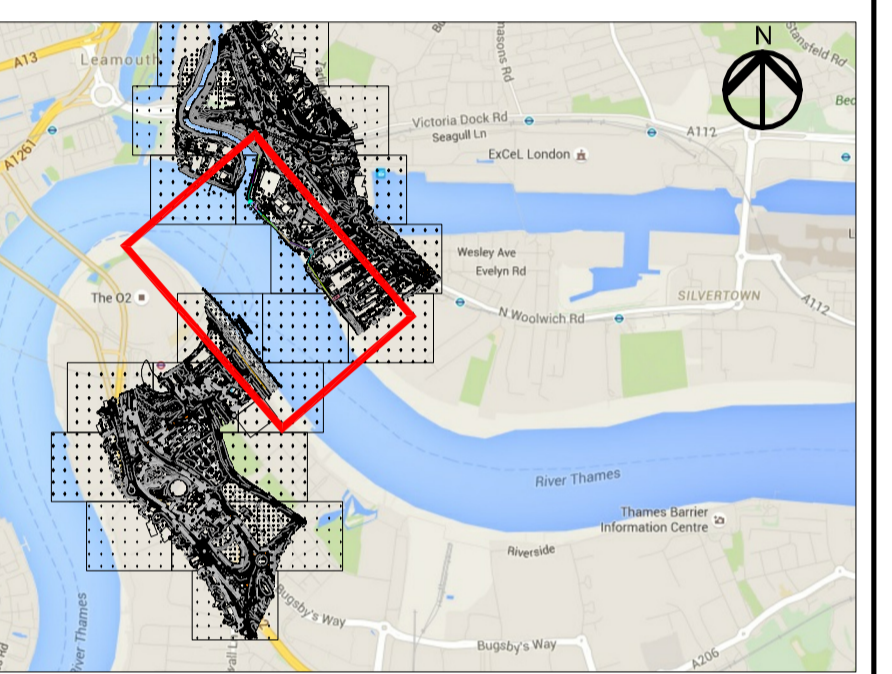
CONSTRUCTION

MAINTENANCE/CLEANING

DECOMMISSIONING/DEMOLITION

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 2. ALL LEVELS ARE IN METRES TO ORDNANCE SURVEY DATUM (NEWLYN).
 3. HIGHLIGHTED WALLS WERE SURVEYED BETWEEN 16/06/2015 AND 02/07/2015.
 4. SOUTH BANK WAS SURVEYED FROM EASTERN EXTENT OF QUANTUM SCULPTURE FOR APPROXIMATELY 225m.



LOCATION PLAN

SCALE 1 : 1250
10 m 0 100 m

TAG NUMBER	ASSET REFERENCE	DESCRIPTION	CONDITION RATING
①	06304TH000303L03	BLOCKWORK WALL, CONCRETE BAGWORK AND STEEL SHEET PILE WALL	2 (SHEET PILING) AND 3 (CONCRETE BAG WORK)
②	06304TH000303L02	MASONRY WALL WITH CONCRETE PARAPET	4
③	06304TH000303L01	STEEL SHEET PILE WALL WITH CONCRETE PARAPET	2 (SHEET PILING) AND 3 (SOME SECTIONS OF CONCRETE PARAPET)
④	06304TH000302L39	MASONRY / CONCRETE WALL WITH TIMBER CLADDING	4
⑤	06304TH000302L38	CONCRETE APRON WITH MASONRY ABUTMENTS	4 (5 - SECTIONS OF CONCRETE APRON)
⑥	06304TH000302L37	MASONRY WALL	4
⑦	06304TH000302L36	SHEET PILE WALL WITH CONCRETE CAPPING BEAM	3 (4 - SOME SECTIONS OF PILING)
⑧	06304TH000302L35	MASONRY WALL	4
⑨	06304TH000302L34	STEEL SHEET PILE WALL	4
⑩	06304TH000302L33	STEEL SHEET PILE WALL	4
⑪	06304TH000302L32	STEEL SHEET PILE WALL	2 (SHEET PILING) AND 3 (CAPPING BEAM)
⑫	06304TH000302L31	STEEL LOCK GATES, CONCRETE ABUTMENT WALLS AND STEEL SHEET PILING	3 (STEEL GATES) 2 (CONCRETE ABUTMENTS) 3 / 4 (STEEL SHEET PILES)
⑬	06304TH000302L30	STEEL SHEET PILE WALL WITH CONCRETE CAPPING BEAM	2 / 3 (STEEL SHEET PILING) AND 3 (CONCRETE CAPPING BEAM)
⑭	06304TH000302L29	STEEL SHEET PILE WALL AND CONCRETE CAPPING BEAM	4
⑮	06304TH000302L28	OLD DOCK CONSTRUCTION WITH STEEL SHEET PILE WALLS	4 (TIMBER WALL) AND 2 (STEEL SHEET PILING)
⑯	SOUTH BANK	CONCRETE WALL WITH GABIONS, STEEL SHEET PILING	2

P1	01/07/2015	FOR INFORMATION	MT	PV	-
Rev.	Date	Description	By	Chk'd	App'd

Drawing Status: **FOR INFORMATION** Suitability: **S1**

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Client: **TRANSPORT FOR LONDON**

Project Title: **SILVERTOWN TUNNEL RIVER WALL SURVEY**

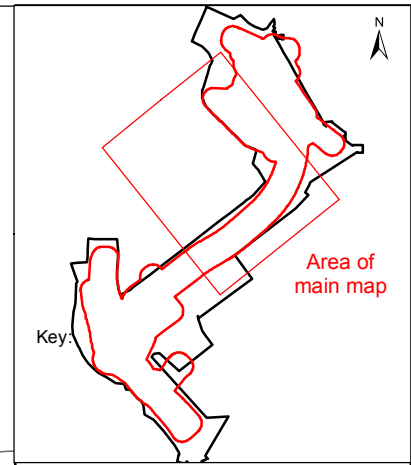
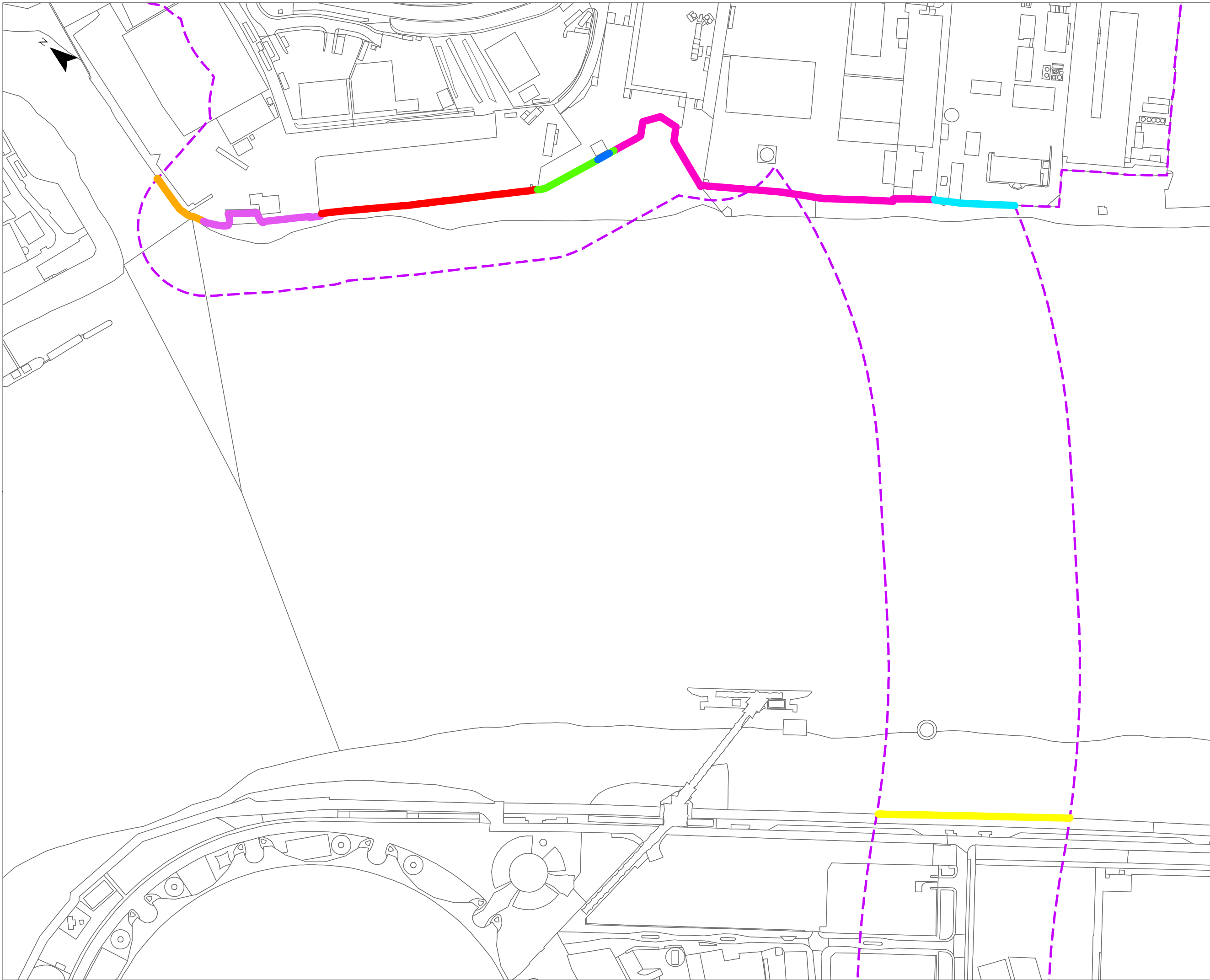
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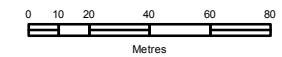
Drawing Number: **5123288-ATK-ZZ-922-DR-C-0001** Revision: **P1**

APPENDIX C: SURVEY AREA BY LAND INTEREST

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- Key**
- Scheme Limits 2014-08-11
 - ASD Limited
 - Greater London Authority (Freehold) & ASD Limited (Leasehold)
 - European Metal Recycling Limited
 - Quintain (No.8) Limited
 - Thames Water Utilities Limited
 - Greater London Authority & Quintain (No.8) Limited
 - Silvertown Land Holding Limited
 - Greater London Authority



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Date : 2015/03/10
 Projection : British National Grid



Title:
**Silvertown Tunnel
 Water Front Land Interest
 Sheet Number 1 of 1**