

STRUCTURAL INSPECTION REPORT



FRANKHAM

Imperial Wharf Flood Defence Inspection

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DOCUMENT VERIFICATION

STRUCTURAL INSPECTION REPORT

ON: IMPERIAL WHARF FLOOD DEFENCE INSPECTION
FOR: FM CONWAY
FRANKHAM PROJECT NO.: 317181

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1.0 INTRODUCTION

Frankham were commissioned by FM Conway to complete a structural inspection of Imperial Wharf flood defence and concrete wall at their site in Gravesend, Kent.

This condition report has been prepared with recommended remedial repairs presented as grades ranging from 1-5 in accordance with the Environment Agency's Condition Assessment Manual and accompanied by defect location sketches.

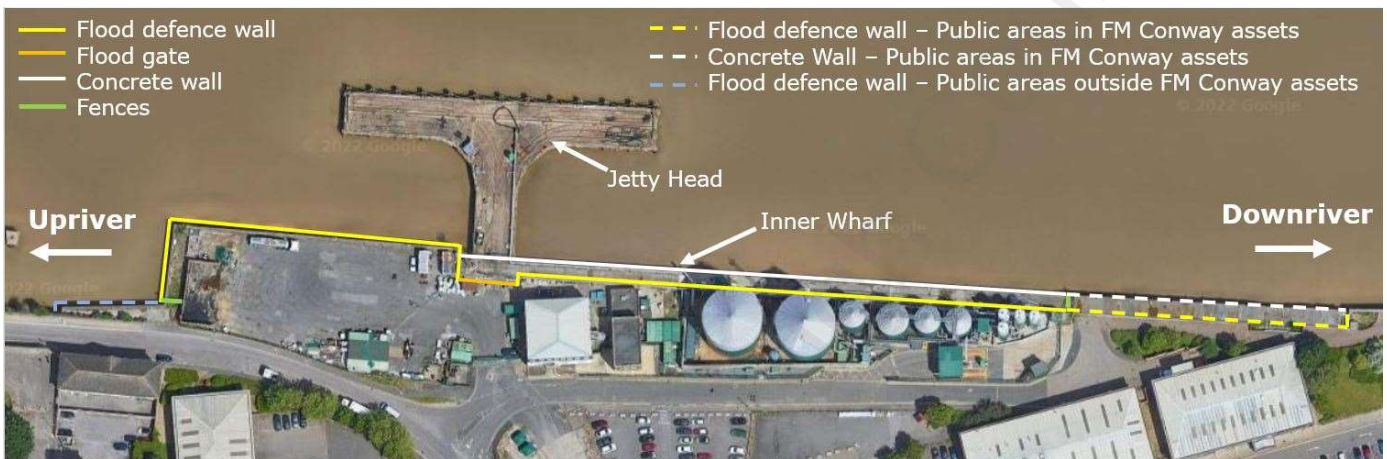


Figure 1 – Aerial view of Imperial Wharf Assets

2.0 **METHODOLOGY**

2.1 **Pre-Inspection Preparation & Planning**

In advance of the inspection works the following activities were completed to aid the effectiveness of the time spent on-site:

- A desktop site reconnaissance via satellite imagery.
- An initial site visit to obtain photographs.
- Preparation of base drawings of the marine assets (based on site reconnaissance via satellite imagery and photos).

2.2 **Structural Inspection**

The structural inspection was conducted by professionally qualified civil engineers from Frankham Consultancy Group.

A tactile inspection was carried out where possible and visual inspections were carried out in areas where tactile access could not be gained. Access was gained by foot and via workboat provided by Thameside Services Marine Ltd.

The timings of inspections were targeted to maximise the amount of inspection time spent at critical areas of the structure. This provided the best opportunity for the inspection engineers to identify Accelerated Low Water Corrosion (ALWC). The scope of the inspection included the structural elements detailed in Table 1 below.

Table 1 – Table showing inspected structural elements.

Port Facility	Access via	Time of Inspection
Flood Defence Wall – Steel Sheet Piled Wall (Upriver)	Foot & workboat	High & Low Tides
Flood Defence Wall – Steel Sheet Piled Wall (Downriver)	Foot	Any
Flood Defence Wall – Concrete Walls (Downriver)	Foot	Any
Flood Gate	Foot	Any
Concrete Riverside Wall	Foot & workboat	High & Low Tides

N.B. Mechanical, electrical and plumbing (MEP) structures and equipment were not included within the scope of these works.

Frankham engineers obtained Ultrasonic Thickness Measurements (UTM) of sheet piles at or close to the low tide levels, high water levels and at the splash zone. The UTM equipment was Tritex Multigauge 5600, serial number 56-2582.

3.0 **OBSERVATIONS**

3.1 **General Construction**

Imperial Wharf comprises an inner wharf and an outer jetty (see Figure 1). The inner wharf consists of an approximately 260 m long wall from the upriver end to the downriver end fence. It is understood that the structure forms part of a flood defence asset located within the Swanscombe and Northfleet Policy Unit governed by the Thames Estuary 2100 (TE2100) plan. General arrangement views of Imperial Wharf are presented in [Photo 1](#) to [Photo 10](#).

The upriver end of the inner wharf comprises Larssen N° 5 sheet piles with a 520 mm x 650 mm concrete capping beam ([Photo 9](#)).

A steel flood gate of approximately 7 m in width is installed to allow traffic access to the jetty head and downriver deck ([Photo 7](#) - [Photo 10](#)). The gate is installed behind concrete walls of approximately 1300 mm height and 300 mm thickness.

At the downriver end a concrete wall comprises the berthing line of the wharf. This concrete wall is approximately 300 mm thick and 8 m in height when measured from the riverbed depth. A visual inspection was undertaken to the structure below the downriver end deck through voids in the wall. A complex system of beams, struts and columns were visible, and it is believed that these comprise the supporting system of the downriver end wharf deck ([Photo 11](#) - [Photo 16](#)).

The downriver flood defence system comprises full section concrete walls at the very end of the wharf and Larssen N° 4 steel sheet piles with a 520 mm x 650 mm concrete capping beam in the areas at the downriver side of the flood gate ([Photo 17](#)).

A tactile and visual inspection was undertaken dividing the assets according to individual elements as per the plan in drawing 317181-FCG-SW-XX-DR-C-3401 in Appendix B.

3.2 **Wall 1**

Wall 1 was found to be in overall fair condition with minor honeycombing ([Photo 23](#)) at 3 m from the downriver end of Wall 1. Along the concrete wall 4 No. voids size 0.6 m x 0.8 m, 0.3 m x 0.35 m, 0.2 x 0.3 m and 0.54 m x 0.19 m each were observed. The origin of the voids is not clear but they are not deemed critical for the stability of the deck, which is supported by concrete beams, columns, and struts, and for the flood capacity of the wharf, which is understood being relied on Walls 2, 3, 4, 5, 6 & 7. It is suspected that the voids were created to allow a hydrostatic balance on both sides of the wall.

The internal construction of the concrete wall below the inner quay deck was visually inspected through the voids and the concrete columns, beams and struts appeared to be in overall fair condition ([Photo 24](#) - [Photo 27](#)).

Horizontal and vertical cracks were observed throughout the face of the wall, with the thickness ranging from hairline to 4 mm.

Remnants of a steel pipe and wall anchors were observed along the face of Wall 1 ([Photo 29](#)). Generally, these elements were found to be in overall poor condition.

Wall ties and chains were observed throughout the wall and were found to be in overall poor condition with extensive signs of corrosion and delamination ([Photo 30](#)).

The timber fenders were found to be in overall poor condition with severe decay and section loss ([Photo 31](#)). The section loss ranges from 20% to 50%. The anchors holding the fenders to the wall were generally in overall fair condition with signs of minor corrosion.

Brickwork was noted around a chain in the wall, this is assumed to be a previous repair ([Photo 32](#)). The brickwork appeared to be in overall fair condition, with minor signs of spalling around the chain. The concrete kerb at the top of the wall was found to be in overall good condition with isolated areas of spalling with size 50 mm x 50 mm x 10 mm.

3.3 Wall 2

Wall 2 was generally found to be in overall fair condition. Severe corrosion, delamination and 100% of protective coating loss was noted in the splash zone. The protective coating appeared to be failing to <25% of the tidal zone and signs of ALWC were observed to the higher areas of the tidal zone ([Photo 33](#)). No tactile access could be gained to the low water zones due to the limited workboat draught. It is suspected the wall may be affected by ALWC to the areas above the riverbed. Signs of marine growth in the tidal zone along with corrosion and delamination were observed, with the maximum delamination observed being 20 mm ([Photo 34](#)). Fractures were noted on the face of the sheet piles ([Photo 35](#)).

The ladders were found to be deformed, in overall very poor condition and affected by heavy corrosion, and are considered unsafe and not deemed safe for access ([Photo 36 – Photo 38](#)).

The handrails were found to be in overall poor condition with major corrosion and protective coating loss ([Photo 39](#)).

The timber fenders were found to be in overall poor condition with signs of major decay observed to the tidal zone. The section loss ranges from 20% to 60% ([Photo 40 – Photo 43](#)). The anchors holding the fenders to the wall were generally found to be in a fair condition with signs of minor corrosion and delamination throughout. Generally, the further upriver the worse the condition of the fenders.

The concrete capping beams were found to be in overall fair condition with areas of spalling and exposed reinforcement, ranging from 0.3 m x 0.3 m x 0.1 m to 0.3 m x full height x 0.1 m noted ([Photo 44](#)). 75% of the capping beam's length could not be accessed and tactile inspected due to the presence of stored plastic tanks on the deck. Generally, the sealants were found to be in overall fair condition with isolated areas of sealant failing or missing due to vegetation growth or weather decay ([Photo 45](#)).

3.4 Wall 3

Wall 3 was generally found to be in overall fair condition, with 25% of protective coating loss in the splash zone ([Photo 46](#)). Severe corrosion, delamination and approximately 100% of protective coating loss was noted in the splash zone. The protective coating appeared to be failing to <25% of the tidal zone and signs of ALWC were observed to the higher areas of the tidal zone (see [Photo 33](#) for a typical view). No tactile access could be gained to the low water zones due to the limited workboat draught. It is suspected the wall may be affected by ALWC to the areas above the riverbed. Signs of marine growth in the tidal zone along with corrosion and delamination were observed, with the maximum delamination observed being 20 mm ([Photo 34](#) for a typical view). Fractures were noted on the face of the sheet piles ([Photo 35](#) for a typical view).

The timber fenders were found to be in overall fair condition with little to no deterioration and minor signs of splits and shakes observed to high water zones ([Photo 47](#)). No tactile access could be gained to

low water zones where it is suspected that the fenders may be affected by decay. The anchors holding the fenders to the wall were generally found to be in overall fair condition.

The concrete capping beams were found to be in overall fair condition with isolated areas of spalling maximum size 0.1 m x 0.3 m x 0.1 m approximately at 10 m from the upriver end of the sheet wall. Generally, the sealants were found to be in overall fair condition with isolated areas of weathering decay.

3.5 Wall 4

Wall 4 was found to be in a fair condition with 40% of protective coating loss in the splash zone and 75% in the tidal zone ([Photo 49](#)).

The concrete capping beams were found to be in overall good condition with no to negligible signs of spalling or cracking. The sealants were found to be in overall good condition.

3.6 Wall 5

Wall 5 was found to be in overall fair condition. Multiple hairline cracks were observed throughout the wall ([Photo 50 - Photo 51](#)).

A suspected oil leak and calcite deposits were observed to the wall ([Photo 52 - Photo 53](#)) but following a further inspection by FM Conway operatives on both sides of the wall together with the use of a wire brush it was determined that there is no active oil leak from operations and that the stain observed is likely an act of graffiti or other paint thrown to the wall ([Photo 61](#)).

The sealants were generally found in overall fair condition with isolated areas of failing due to vegetation growth ([Photo 54](#)).

3.7 Wall 6

Wall 6 was found to be in overall fair condition with multiple minor cracks throughout the wall ranging from hairline to 3 mm in width ([Photo 55-Photo 56](#)).

Isolated areas of calcite deposits ([Photo 57](#)), spalling and vegetation growth were noted throughout.

Generally, the sealants were found in overall fair condition with isolated areas of decayed and failing sealant due to vegetation growth ([Photo 58](#)).

3.8 Wall 7

Wall 7 comprises Larssen N° 4-20 sheet piles with concrete capping beams.

Generally, Wall 7 was found in overall fair condition with 25% of protective coating failing to the sheet piles and minimal cracking to the concrete ([Photo 59](#)). The sealants were found in overall fair condition with the material in very poor condition with 90% of the sealant missing to the entire thickness at the upriver end of the wall being a leaking point for approximately the total height of the capping beam ([Photo 60](#)).

4.0 DISCUSSION

4.1 Steel Piles

UTMs were undertaken on the sheet piles of Wall 2, Wall 3, Wall 4 and Wall 7, and are reported in Tables 2 and 3. Figure 3 shows the locations of the UTMs

Following the tactile and visual inspection, the protective coatings applied to the sheet piles appeared largely failed to the splash zones of the riverside walls. Moderate to severe surface corrosion with delamination was observed to the splash and tidal zones of the piles whilst signs of ALWC observed at the higher areas of the tidal zone with consequent further section loss. The loss of steel observed was commensurate with BS EN 1993-5, Table 4-2 (Figure 2) where it is reported that the highest corrosion rates are typically found in the splash zone and low water levels.

Table 4-2: Recommended value for the loss of thickness [mm] due to corrosion for piles and sheet piles in fresh water or in sea water					
Required design working life	5 years	25 years	50 years	75 years	100 years
Common fresh water (river, ship canal,) in the zone of high attack (water line)	0,15	0,55	0,90	1,15	1,40
Very polluted fresh water (sewage, industrial effluent,) in the zone of high attack (water line)	0,30	1,30	2,30	3,30	4,30
Sea water in temperate climate in the zone of high attack (low water and splash zones)	0,55	1,90	3,75	5,60	7,50
Sea water in temperate climate in the zone of permanent immersion or in the intertidal zone	0,25	0,90	1,75	2,60	3,50
Notes:					
1) The highest corrosion rate is usually found in the splash zone or at the low water level in tidal waters. However, in most cases, the highest bending stresses occur in the permanent immersion zone, see Figure 4-1.					
2) The values given for 5 and 25 years are based on measurements, whereas the other values are extrapolated.					

Figure 2 – Corrosion rates – BS EN 1993-5:2007

Table 2 - Table showing piles Ultrasonic Thickness Measurements (UTMs) of the sea wall.

Reading Number	Wharf Element	Sheet Part	Zone	Original Thickness (mm)	Measured Thickness (mm)	Loss of Thickness (mm)
1	Wall 2	Front	Tidal Zone	22.1	21.1	1.0
2	Wall 2	Lateral	Tidal Zone	11.9	11.6	0.3
3	Wall 2	Back	Tidal Zone	22.1	21.3	0.8
4	Wall 2	Front	Tidal Zone	22.1	21.6	0.5
5	Wall 2	Lateral	Tidal Zone	11.9	11.2	0.7
6	Wall 2	Lateral	Tidal Zone	11.9	10.6	1.3
7	Wall 2	Front	Tidal Zone	22.1	18.4	3.7
8	Wall 2	Lateral	Tidal Zone	11.9	11.2	0.7
9	Wall 2	Front	Tidal Zone	22.1	18.8	3.3
10	Wall 2	Front	Tidal Zone	22.1	20.5	1.6
11	Wall 2	Lateral	Tidal Zone	11.9	11.1	0.8
12	Wall 2	Lateral	Tidal Zone	11.9	10.3	1.6
13	Wall 2	Front	Tidal Zone	22.1	21.4	0.7

14	Wall 2	Front	Tidal Zone	22.1	20.8	1.3
15	Wall 2	Lateral	Tidal Zone	11.9	11.3	0.6
16	Wall 2	Back	Splash Zone	22.1	19.5	2.6
17	Wall 2	Front	Splash Zone	22.1	18.8	3.3
18	Wall 2	Lateral	Splash Zone	11.9	11.3	0.6
19	Wall 2	Front	Splash Zone	22.1	18.8	3.3
20	Wall 2	Lateral	Splash Zone	11.9	7.4	4.5
21	Wall 2	Back	Splash Zone	22.1	20.7	1.4
22	Wall 2	Front	Splash Zone	22.1	18.8	3.3
23	Wall 2	Front	Splash Zone	22.1	20.1	2
24	Wall 2	Lateral	Splash Zone	11.9	10.1	1.8
25	Wall 2	Front	Splash Zone	22.1	21.7	0.4
26	Wall 2	Lateral	Splash Zone	11.9	11.4	0.5
27	Wall 2	Lateral	Splash Zone	11.9	7.4	4.5
28	Wall 2	Front	Low Water Zone	22.1	21.2	0.9
29	Wall 2	Lateral	Low Water Zone	11.9	12.1	-0.2
30	Wall 2	Back	Low Water Zone	22.1	20.9	1.2
31	Wall 2	Front	Low Water Zone	22.1	21.3	0.8
32	Wall 2	Front	Low Water Zone	22.1	21.4	0.7
33	Wall 2	Lateral	Low Water Zone	11.9	11.3	0.6
34	Wall 2	Back	Low Water Zone	22.1	21.7	0.4
35	Wall 3	Back	Splash Zone	22.1	18.2	3.9
36	Wall 3	Front	Splash Zone	22.1	18.1	4.0
37	Wall 3	Front	Splash Zone	22.1	21.7	0.4
38	Wall 3	Front	Splash Zone	22.1	21.7	0.4
39	Wall 3	Lateral	Splash Zone	11.9	10.5	1.4
40	Wall 3	Back	Splash Zone	22.1	20.5	1.6
41	Wall 3	Box	Splash Zone	11.9	10.5	1.4
42	Wall 3	Front	Splash Zone	22.1	21.4	0.7
43	Wall 3	Lateral	Splash Zone	11.9	9.4	2.5
44	Wall 3	Back	Splash Zone	22.1	18.2	3.9
45	Wall 3	Front	Splash Zone	22.1	19.7	2.4
46	Wall 3	Lateral	Splash Zone	11.9	11.4	0.5
47	Wall 3	Front	Low Water Zone	22.1	21.1	1
48	Wall 3	Lateral	Low Water Zone	11.9	11.5	0.4
49	Wall 3	Back	Low Water Zone	22.1	21	1.1
50	Wall 3	Front	Tidal Zone	22.1	19.4	2.7
51	Wall 3	Back	Tidal Zone	22.1	21.5	0.6
52	Wall 3	Lateral	Tidal Zone	11.9	11	0.9
53	Wall 3	Front	Low Water Zone	22.1	21.5	0.6
54	Wall 3	Back	Low Water Zone	22.1	21.4	0.7
55	Wall 3	Lateral	Low Water Zone	11.9	11.9	0.0
56	Wall 3	Box	Low Water Zone	11.9	11	0.9

57	Wall 3	Front	Deck Level	22.1	22.1	0.0
58	Wall 3	Lateral	Deck Level	11.9	11.4	0.5
59	Wall 3	Back	Deck Level	22.1	21.4	0.7
60	Wall 3	Box	Deck Level	11.9	10.9	1.0

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Table 3 - Table showing piles Ultrasonic Thickness Measurements (UTMs) of the Flood defence wall.

Reading Number	Wharf Element	Sheet Part	Zone	Protective coating Present	Original Thickness (mm)	Measured Thickness (mm)	Loss of Thickness (mm)
61	Wall 7	Front	Block 2	Protective coating	14.3	14.2	0.1
62	Wall 7	Lateral	Block 2	Protective coating	9.4	9.7	-0.3
63	Wall 7	Back	Block 2	Protective coating	14.3	14.0	0.3
64	Wall 7	Front	Block 2	Protective coating	14.3	13.9	0.4
65	Wall 7	Front	Block 2	Protective coating	14.3	14.2	0.1
66	Wall 7	Lateral	Block 2	Protective coating	9.4	9.8	-0.4
67	wall 7	Front	Block 4	Protective coating	14.3	13.8	0.5
68	wall 7	Lateral	Block 4	Protective coating	9.4	9.1	0.3
69	wall 7	Back	Block 4	Protective coating	14.3	13.9	0.4
70	Wall 7	Front	Block 7	Protective coating	14.3	13.9	0.4
71	Wall 7	Lateral	Block 7	Protective coating	9.4	9.4	0.0
72	Wall 7	Back	Block 7	Protective coating	14.3	13.4	0.9

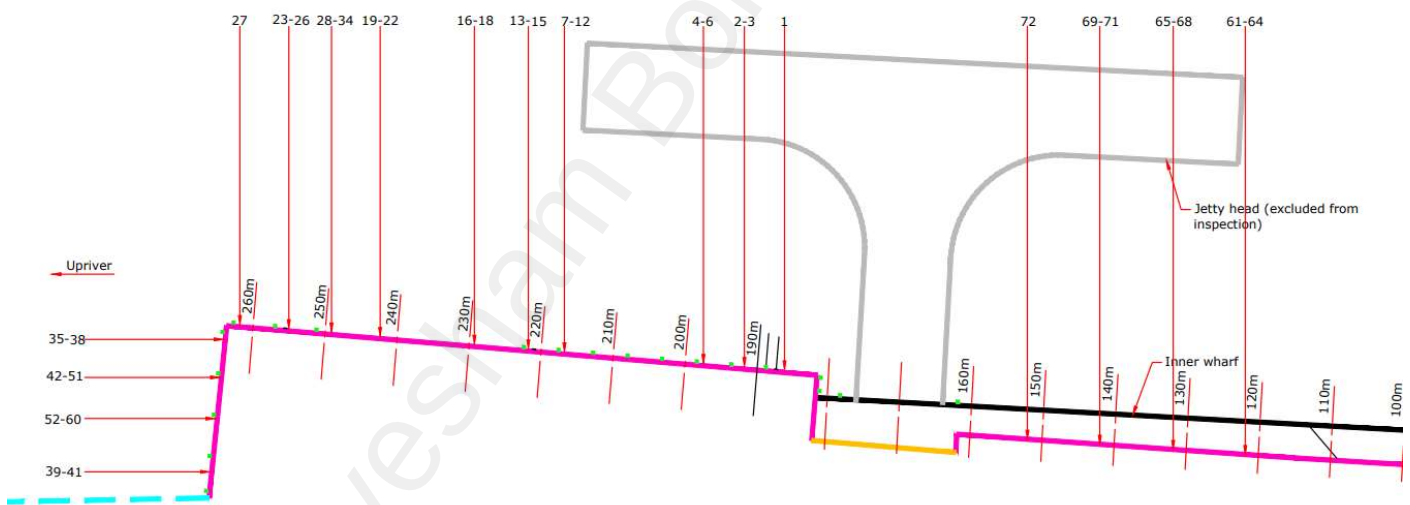


Figure 3 - Diagram showing the locations of the Ultrasonic Thickness Measurements (UTMs)

5.0 RECOMMENDATIONS

Remedial recommendations are presented in

Table 5 below. Recommendations provided consider the severity of defects observed. Each recommendation provided is allocated a "Grade" from 1 to 5 and relates to both extent of the defects provided by the Environmental Agency in the SC060078 Guidance Report. The intended application of each risk level is denoted in 4 below.

Table 4 – Table showing risk level intended application.

Grade	Description of Grade	Extent of defects
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 performance of asset
4	Poor	Defects that would significantly reduce performance of asset
5	Very Poor	Severe defects resulting in complete performance failure

Table 5 – Table Showing wharf Repair Recommendations.

Defect	Grade	Recommendation
Cracks to Wall 1 concrete	3	All cracks should be chased out and repaired with a suitable sealant.
Wall 1 voids	3	It should be found out if the voids to Wall 1 are handmade to for hydrostatic purposes on the concrete wall.
Wall 1 steel pipe	5	Steel pipe should be removed and the wall made good locally.
Wall 1 anchors	4	Disused anchors should be removed and the wall made good locally.
Wall 1 timber fender	4	Replace with like for like (hardwood) timber fenders.
Wall 1 brickwork	3	Brickwork is to be repointed.
Wall 1 concrete kerb	2	All cracks should be chased out and repaired with a suitable sealant.
Wall 1 wall tie	4	Wall ties are to be removed and the holes to be filled.
Wall 1 chains	4	Mechanically clean chains.

Wall 2 ladders	5	Ladders are to be removed and replaced with a like for like ladder.
Wall 2 sheet piles	3	A regime of inspections to measure the thicknesses of the piles should be established to ensure excessive loss of section is not occurring over the next 24 months. Mechanically clean and reapply suitable protective coating to the splash zone and low water zones on all piles.
Wall 2 timber fender	4	Fenders with section loss above 50% are to be removed and replaced.
Wall 2 handrail	5	Handrails should be replaced.
Wall 2 concrete capping beam	3	Break out defective concrete and apply a suitable concrete repair material to the affected area ensuring full surround of reinforcement by repair material is achieved.
Wall 2 sealant	3	Failing or weather decayed sealants should be raked out and replaced with a like for like sealant.
Wall 3 fender	3	Monitor fenders over a 24-month period to ensure decay at the base of the fender does not significantly worsen. Splice repairs may be required.
Wall 3 sheet piles	3	A regime of inspections to measure the thicknesses of the piles should be established to ensure excessive loss of section is not occurring over the next 24 months. Mechanically clean and reapply suitable protective coating to the splash zone and low water zones on all piles.
Wall 3 concrete capping beam	3	Break out defective concrete and apply a suitable concrete repair material to the affected area ensuring full surround of reinforcement by repair material is achieved.
Wall 3 sealant	3	Sealants are to be raked out, vegetation is to be removed where present and sealant is to be replaced.
Wall 4 concrete capping beam	2	Break out defective concrete and apply a suitable concrete repair material to the affected area ensuring full surround of reinforcement by repair material is achieved.
Wall 4 sheet piles	3	Mechanically clean and reapply suitable protective coating to the splash zone and low water zones on all piles.
Wall 4 sealant	2	Failing or weather decayed sealants should be raked out and replaced with a like for like sealant.
Wall 5 concrete blocks	3	Break out defective concrete and apply a suitable concrete repair material to the affected area ensuring full surround of reinforcement by repair material is achieved. All cracks are to be chased out and concrete repaired.
Wall 5 sealant	3	Failing or weather decayed sealants should be raked out and replaced with a like for like sealant.
Wall 6 concrete blocks	3	All cracks are to be chased out and concrete repaired.
Wall 6 sealants	3	Failing or weather decayed sealants should be raked out and replaced with a like for like sealant.

Crack to wall 7 concrete block	3	Cracks are to be chased out and concrete repaired.
Wall 7 concrete capping beam	3	All cracks are to be chased out and concrete repaired.
Wall 7 sealant	3	Failing or weather decayed sealants should be raked out and replaced with a like for like sealant.
Wall 7 sheet piles	3	Mechanically clean sheet piles and apply a suitable protective coating.

APPENDIX A

PHOTO GALLERY



Photo 1 - General photo of wall 1



Photo 2 - General photo of wall 2



Photo 3 - General photo of wall 3



Photo 4 - General photo of wall 4



Photo 5 - General photo of wall 5

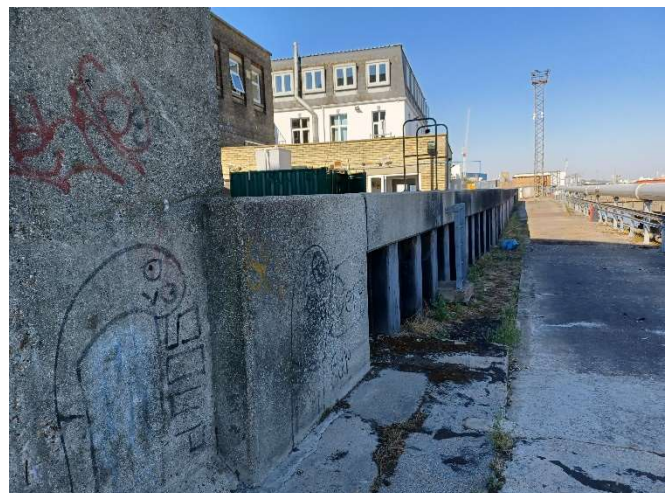


Photo 6 - General photo of wall 7



Photo 7 – General photo of flood gate



Photo 8 – General view of upriver flood gate



Photo 9 – Typical view of Larssen N°5 pile



Photo 10 – General view of downriver flood gate



Photo 11 – View of internal structure of wall 1



Photo 12 - View of internal structure of wall 1



Photo 13 - View of internal structure of wall 1



Photo 14 - View of internal structure of the masonry wall through wall 1



Photo 15 - View of internal structure showing the concrete beams and Masonry wall through wall 1



Photo 16 - View of internal structure of wall 1



Photo 17 – Typical view of Larssen N°4-20 sheet



Photo 18 – View of downriver flood defence wall from the floodgate



Photo 19 – View of slope upriver next to wall 7



Photo 20 – View of slope downriver next to wall 7



Photo 21 – View of wall 1 fenders



Photo 22 – View of wall 1 fenders



Photo 23- View of honeycombing on wall 1



Photo 24 – View of 0.3 x 0.35 x 0.14 m void with rebar visible on wall 1



Photo 25 – View of 0.6 x 0.8 x 0.15 m void on wall 1



Photo 26 – View of 0.2 x 0.3 x 0.15 m void on wall 1



Photo 27 – View of 0.5 m x 0.4 m x 0.19 m void on wall 1



Photo 28 – View of void on wall 1



Photo 29 – View of remains of steel pipe on wall 1

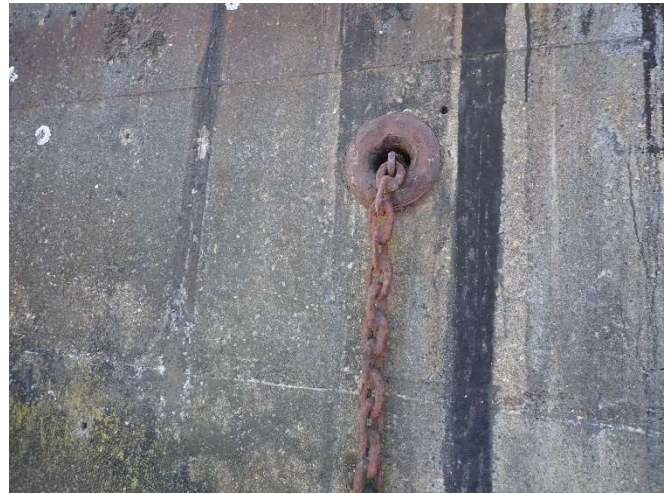


Photo 30 – Typical view of wall chain on wall 1



Photo 31 – View of wall 1 timber fender



Photo 32 – View of wall 1 brickwork



Photo 33 – Typical view of accelerated low water corrosion to wall 2



Photo 34 – View of 20 mm delamination to wall 2



Photo 35 – View of sheet splitting to wall 2



Photo 36 – General view of ladder 1 on wall 2



Photo 37 – General view of ladder 2 on wall 2



Photo 38 – General view of ladder 3 on wall 2



Photo 39 – View of ladder 2 handrail fixing on wall 2

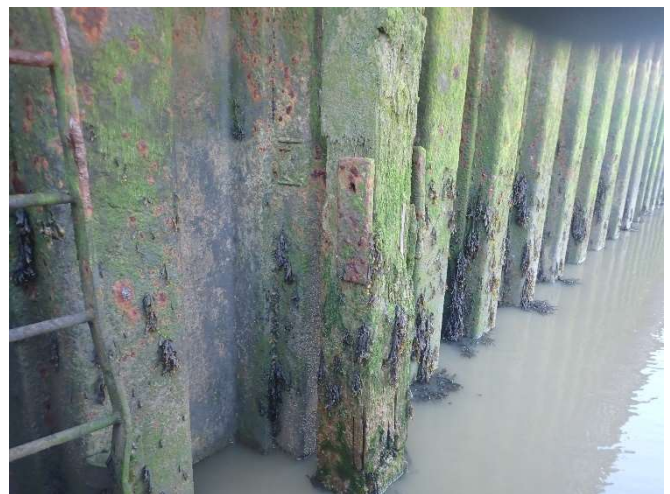


Photo 40 – Typical view of wall 2 fender



Photo 41 – Typical view of wall 2 fender



Photo 42 – Typical view of wall 2 fender

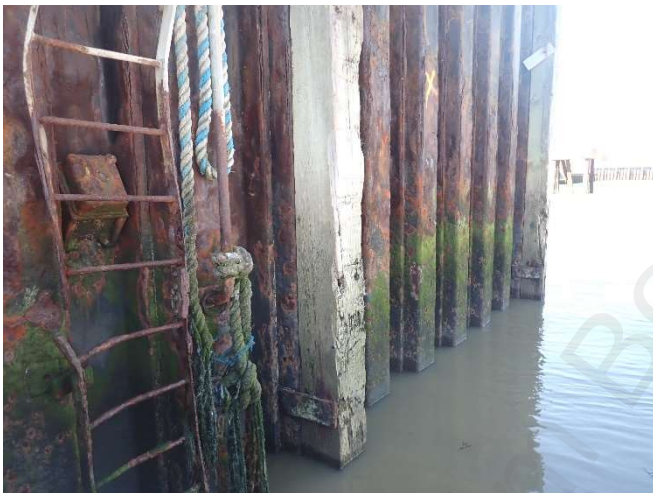


Photo 43 – Typical view of wall 2 fender



Photo 44 – View of exposed rebar to wall 2 capping beam



Photo 45 – View of vegetation growth to sealant



Photo 46 – View of 25% protective coating loss above splash zone to wall 3



Photo 47 - General view of wall 3 fenders



Photo 48 - View of 40% protective coating loss at splash zone on wall 4



Photo 49 - View of 75% protective coating loss below splash zone



Photo 50 - View of cracking to wall 5



Photo 51 - View of cracking to wall 5



Photo 52 - View of calcite deposit on wall 5



Photo 53 - View of stains and graffiti to wall 5.



Photo 54 - View of vegetation growth to sealant on wall 5



Photo 55 - View of crack on wall 6



Photo 56 - View of crack on wall 6



Photo 57 – View of calcite deposits on wall 6



Photo 58 – View of vegetation growth on sealant on wall 6



Photo 59 – View of 25% protective coating loss to sheet piling on wall 7



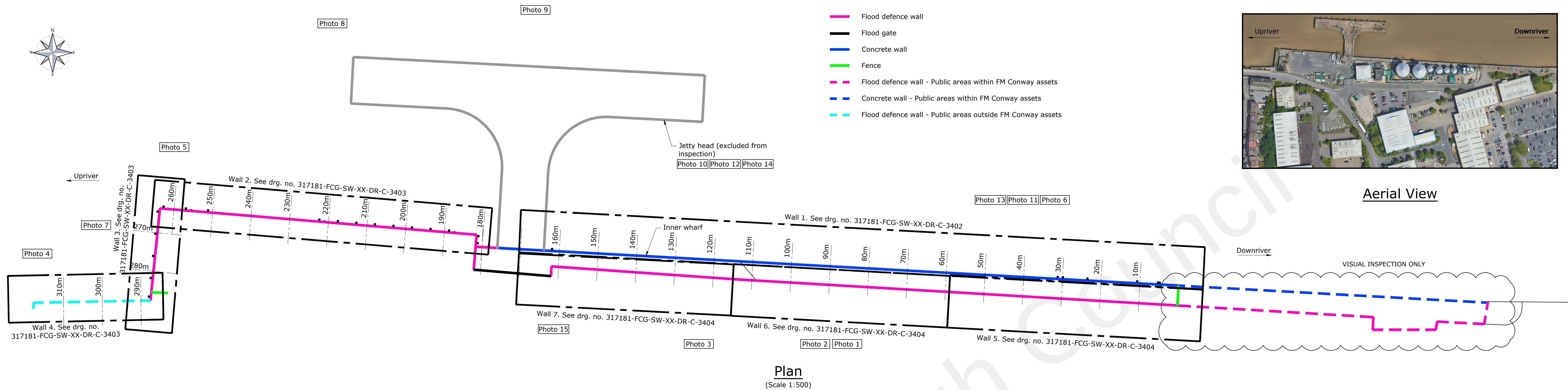
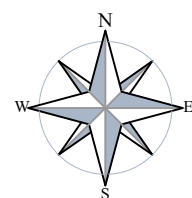
Photo 60 – View of missing sealant between capping beams on wall 7



Photo 61 – Stain to wall 5 following wire brushing (by FM Conway).

APPENDIX B

DEFECT LOCATION SKETCHES



NOTES

1. This drawing is to be read in conjunction with structural inspection report 317181-FCG-SW-XX-RP-C-3101
2. Defect location sketch is based on inspection operative measurements only and are not to scale.
3. Dimensions provided are approximations based on inspection engineer site visit and should be verified by a measured survey prior to any design or construction works.
4. A tactile inspection was carried out where possible and visual inspections were carried out in areas where tactile access could not be gained.
5. The timings of inspections were targeted to maximise the amount of time spent at periods of low and high tides where required. The scope of the inspection included the structural elements detailed in the table below.
6. The UTM equipment was Tritex Multigaugage 5600, serial number 56-2582. Handheld wire brushes were used where necessary to remove marine growth and corrosion products to prepare the pile surfaces for UTM readings to be taken. Prior to use each shift, the gauge accuracy was verified against a 15 mm calibrated test block.
7. Refer to structural inspection report, Table 1 for table showing inspected structural elements, Table 2 & Table 3 for tables showing piles UTMs.

ALL DIMENSIONS, LEVELS AND CLEARANCES TO BE CHECKED ON SITE PRIOR TO WORKS COMMENCING

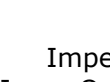
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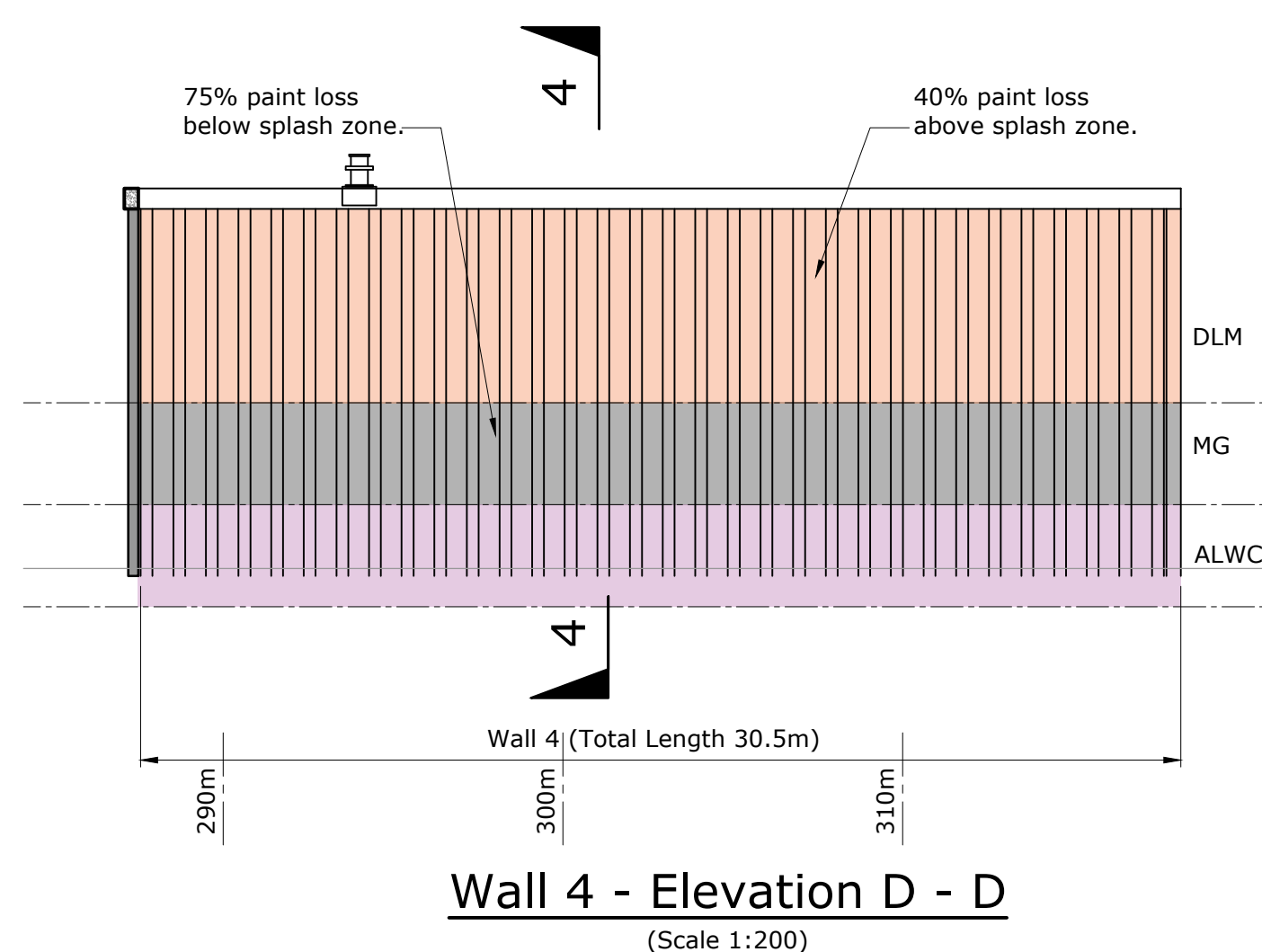
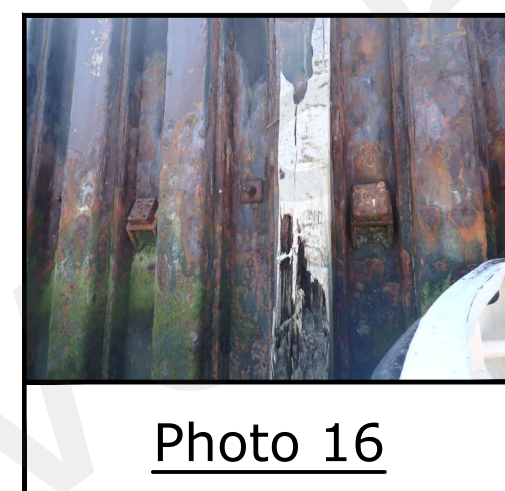
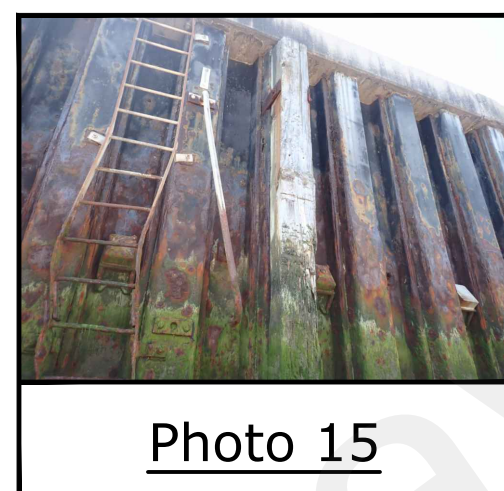
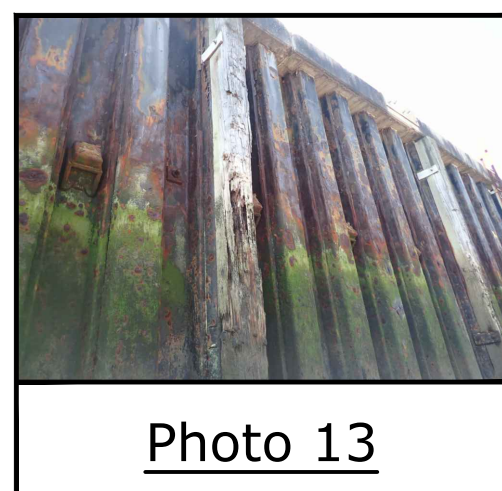
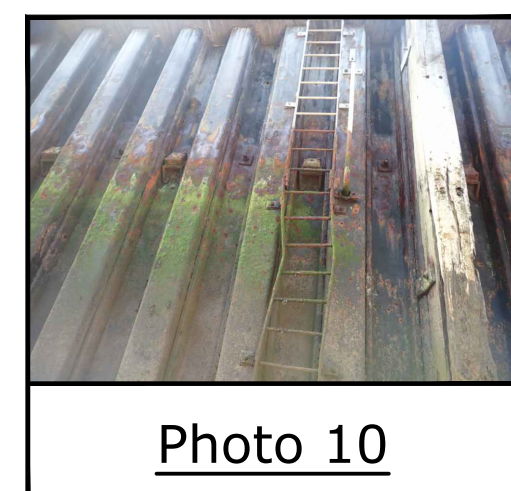
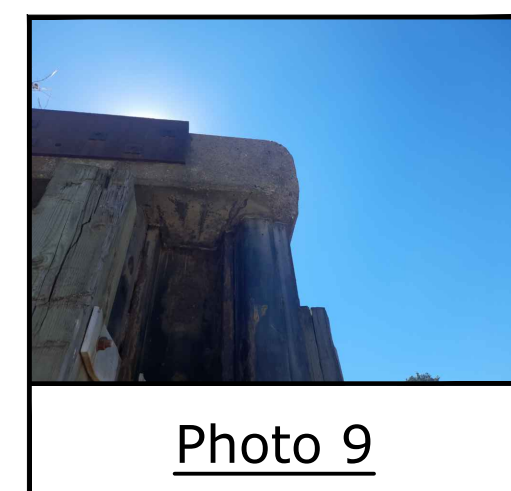
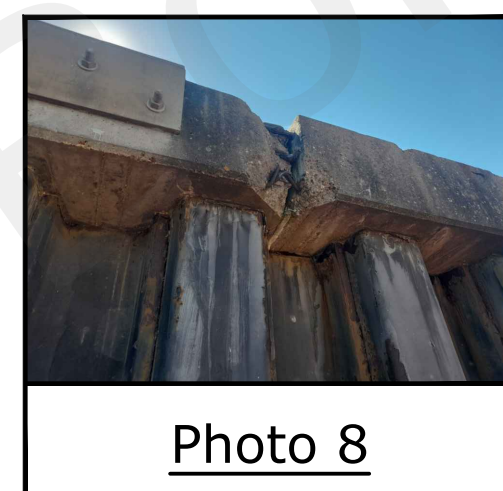
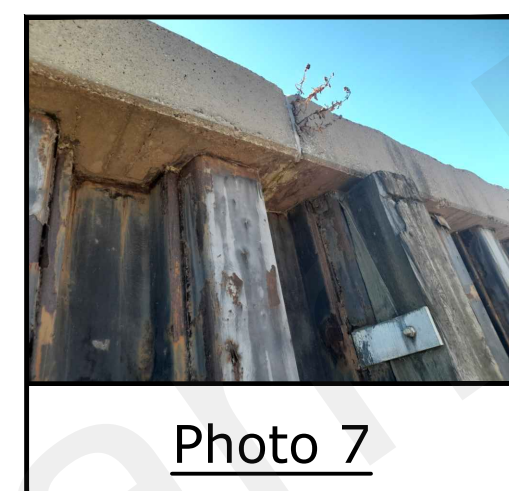
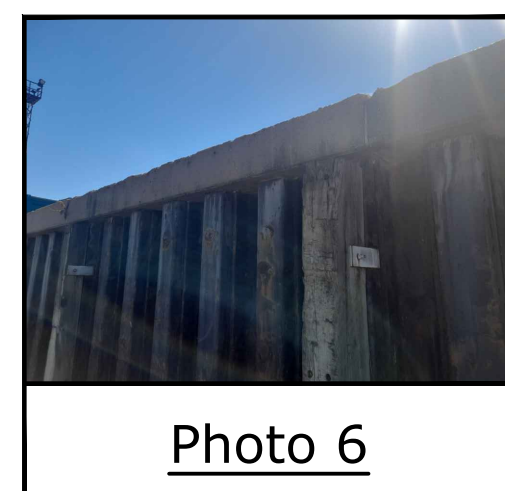
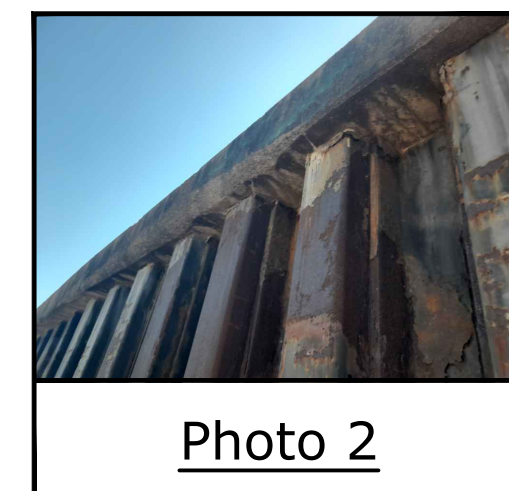
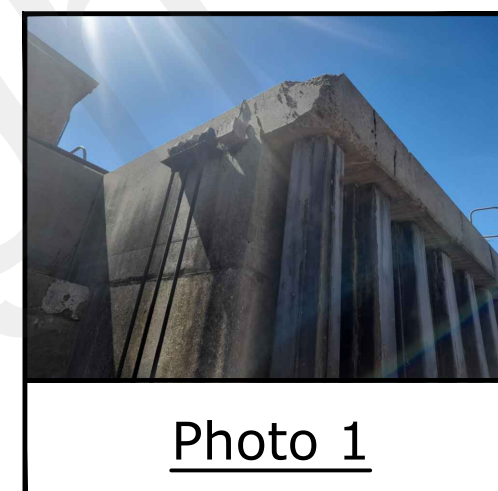
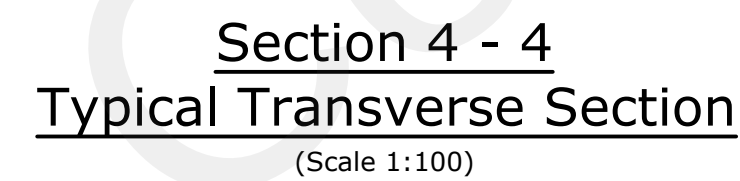
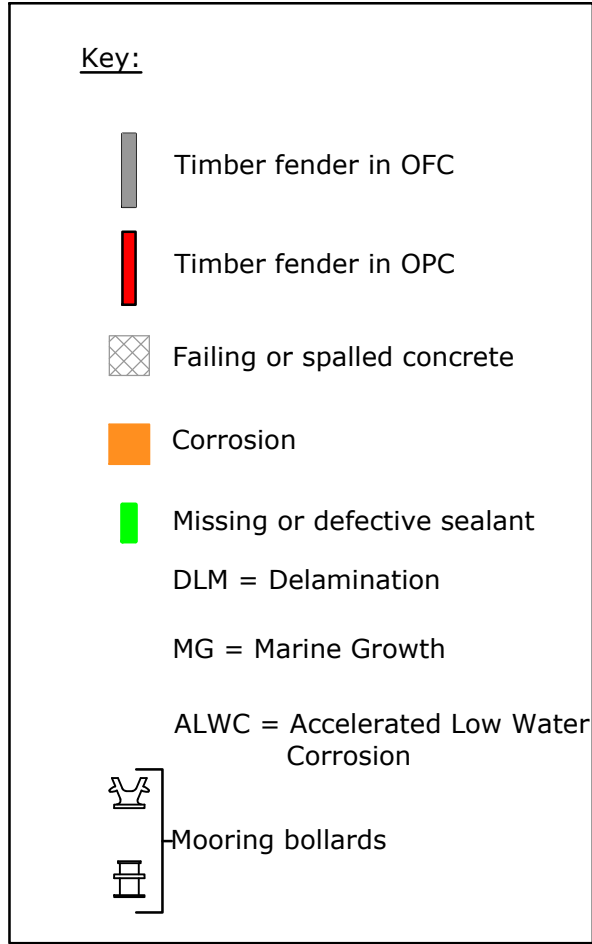
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P02	06.10.22	KC	LD	RM	Preliminary Issue	
P01	14.09.22	KC	LD	RM	Preliminary Issue	
Rev	Date	By	Chk	Apr	Comment	

 FRANKHAM Frankham Consultancy Group Limited E: enquire@frankham.com www.frankham.com	Project Title: Imperial Wharf Inner Quay Inspection		Client: 									
	Drawing Title: General Arrangement		Drawn By: KC	Designed By: BA	Checked By: LD	Approved By: RM						
	Original Issue Date: 14/09/2022		Scale @ A1: As shown									
STATUS: PRELIMINARY ISSUE												
SIDCUP OFFICE Trene House Five Arches Business Park Maldenstone Road Sidcup, Kent DA14 5AF T: 020 8309 7777	OXFORD OFFICE Citibase Oxford New Barclay House 234 Botley Road Oxford OX2 0HP T: 01865 323500	STVENAGE OFFICE Suite 237, Second Floor Kings Court Business Centre London Street, Stevenage Hertfordshire SG1 2NG T: 020 3714 7063	LONDON OFFICE First Floor Bridge House 181 Queen Victoria Street London EC4Q 4EG T: 020 7651 0790	Job No / File Ref 317181	Originator FCG	Zone SW	Level XX	Type DR	Discipline C	Number 3401	Suitability S2	Revision P02





P02	06.10.22	KC	LD	RM	Preliminary issue	
P01	14.09.22	KC	LD	RM	Preliminary issue	

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Client:



Project Title:

Imperial Wharf
Inner Quay Inspection

Drawing Title:

Defect Location Sketches for Walls 2, 3 & 4

Status:	
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PRELIMINARY ISSUE

Drawn By: KC	Designed By: BA	Checked By: LD	Approved By: RM
Original Issue Date: 14/09/2022		Scale @ A1: As shown	

Job No/ File Ref		Originator	Zone	Level
317181		FCG	SW	XX
Type	Discipline	Number	Suitability	Revision
DR	C	3403	S2	P02

