

1. General information

Location Plan:		Loughor Embankment	
		Assessment Date: 28/07/2020	
		CARRS Exam ID:	2959705
		Exam Type:	Detailed
		Complete Survey:	Yes
		Network Rail ELR:	SWM2
		Structure Reference:	221 49
		Mileage:	221m 1078yds 49chs
		OS Ref:	256200 , 197900
		Operational Area:	North Wales
		Governing SMP2:	Loughor
		SMP2 Policy Unit:	12.7
		SMP2 Policy:	12.7: 2025 = hold the line; 2055 = managed realignment; 2105 = managed realignment

NOTE: This document has been prepared as an Asset Condition Survey Report for Network Rail. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

1.1. Type of structure and general description (to include key components and materials)

Loughor Embankment fronts the A484, connecting Llanelli to Loughor. The defence is split into two sections, Loughor Embankment A and B at 198160, 255551, due to the large area of saltmarsh fronting Section B, affording greater protection to the line.

- Loughor Embankment A – The first section is a rock armour embankment fronted by a small vegetated saltmarsh.
- Loughor Embankment B – The second section is a rock armour embankment fronted by a large vegetated saltmarsh.

The defence ties into a saltmarsh habitat on the high mileage extent, and on the low mileage extent the defence ties into the abutments of Loughor Bridge.

1.2. Summary of condition and critical defects

Sections A and B are considered to be in fair condition without any critical defects, however several smaller defects threaten the longevity of the structure. Those defects that require attention include:

- The embankment rock armour appears to be undersized and vulnerable to wave attack.
- The natural intertidal drainage paths cut dangerously close to the embankment. In time it is possible that this will compromise the structural integrity of the embankment toe.
- Between the 2014 and 2020 inspections the protective extent of the saltmarsh fronting Section A has reduced.

1.3. Access considerations

Network Rail access requirement:	No COSS
Third party/adjacent landowner permissions:	None necessary
Nearest public highway:	A484
Local guidance:	Asset access is available from a track crossing point located at the high mileage tie-in, accessible from the A484. The asset is accessible at a low to mid-tide level.
Tide state during survey:	Not defined (Not defined)
Equipment required for access and examinations:	No COSS

2. Structure information

CERD Hierarchy	Asset Type	Major Elements	Minor Elements	Attributes
Section A	Defence	Embankment	Embankment Armour	Rock
	Defence	Embankment	Embankment Natural	Vegetated
Section B	Defence	Embankment	Embankment Armour	Rock
	Defence	Embankment	Embankment Natural	Vegetated

General Description of Structure:			
Approx. defence length (m):	690m		
Approx. co-ordinates from:	198034 , 255921	to:	198160 , 255551
As built drawing available:	No		
Linked to other Asset Types:	None		
NR Infrastructure protected:	~700m of SWM2 situated between 0 – 5m from the rear defence position.		
Assets type and ownership that the defence ties into at either end:	Unknown ownership of defence ties.		

2.1. Topographic level information

	Defence (Section A)	Defence (Section B)
Track level (mAOD)	6.6	N/A
Crest level of primary defence (mAOD)	7.6	7
Toe level of primary defence (mAOD)	N/A	N/A
Approx. defence height above beach (m)	N/A	N/A
Upper beach level (mAOD)	N/A	N/A
Lower beach level (mAOD)	N/A	N/A
Approx. total beach height (m)	N/A	N/A
Beach crest width (m)	N/A	N/A
Approx. beach gradient (1in ...)	N/A	N/A
Upper beach composition	N/A	N/A
Lower beach composition	N/A	N/A

2.2. Extreme sea level information

Return Period	Extreme sea level (mAOD)	Extreme sea level + climate change (mAOD)
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COASTAL ASSET CONDITION SURVEY REPORT



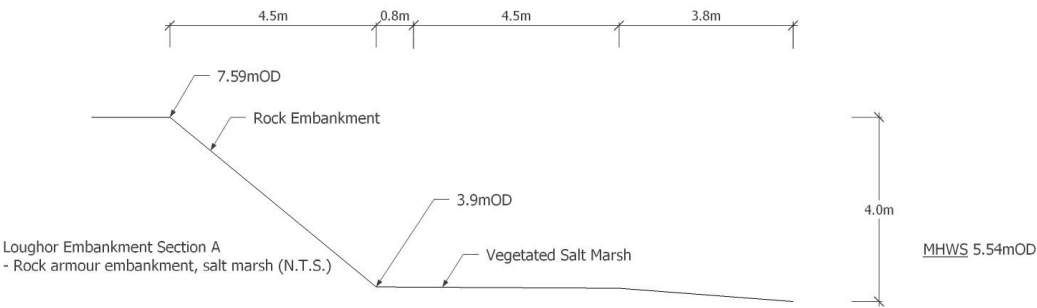
Return Period	Extreme sea level (mAOD)	Extreme sea level + climate change (mAOD)
1	5.171 (2013)	6.000 (2115)
5	5.341 (2013)	6.170 (2115)
10	5.421 (2013)	6.250 (2115)
20	5.491 (2013)	3.320 (2115)
50	5.601 (2013)	6.430 (2115)
100	5.671 (2013)	6.500 (2115)
200	5.741 (2013)	6.570 (2115)

3. Asset site sketch

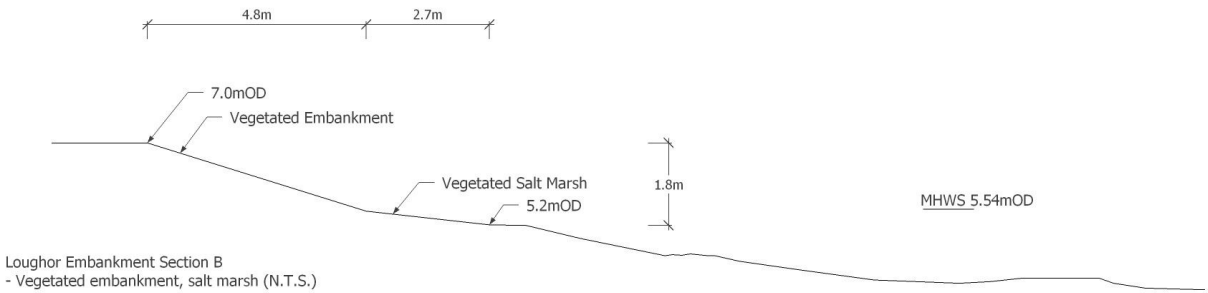
Plan



Sketch



Sketch



4. Visual Condition Survey

Visual Condition Survey (Defence - Section A) Major Element - Embankment

Minor Elements	Photo No.	Attributes and General Notes	Condition Grade	Weighting (1-9)	Overall (CG x W)
Embankment Armour	21	Rock (Rock (ungraded, displaced units, minor erosion of supporting material).).	3	7	21
Embankment Natural	22, 23	Vegetated (Vegetated (loss of vegetation, scour at toe, instability of slope, extensive erosion).).	3	5	15
Sum (W)				12	
Sum (CG x W)					36
Overall Asset Grade	Sum of (Weight x Condition Grades) divided by sum of weightings. Unless weighting of 9 for any element, then condition grade is used.		3		

Visual Condition Survey (Defence - Section B) Major Element - Embankment

Minor Elements	Photo No.	Attributes and General Notes	Condition Grade	Weighting (1-9)	Overall (CG x W)
Embankment Natural	24	Vegetated (Vegetated (loss of vegetation, scour at toe, instability of slope, extensive erosion).).	3	5	15
Embankment Armour		Rock (Rock (ungraded, displaced units, minor erosion of supporting material).).	3	7	21
Sum (W)				12	
Sum (CG x W)					36
Overall Asset Grade	Sum of (Weight x Condition Grades) divided by sum of weightings. Unless weighting of 9 for any element, then condition grade is used.		3		

4.1. Asset condition grade summary

	Defence (Section A)	Defence (Section B)
Target condition grade	2	2
Overall surveyed condition grade	3	3
Total time taken to reach CG1	N/A	N/A

COASTAL ASSET CONDITION SURVEY REPORT



Total time taken to reach CG2	N/A	N/A
Total time taken to reach CG3	N/A	N/A
Total time taken to reach CG4	17	17
Total time taken to reach CG5	25	25

4.2. Additional information

General description and effect of any coastal erosion noted:	The saltmarsh at the toe of Loughor Embankment has eroded due to river flow and tidal activity in the area. Troughs have been cut out from the saltmarsh and could threaten the long-term stability of the embankment.
General description and effect of any wave overtopping noted:	No noted effects during inspection (not subject to direct wave attack).
General description and effect of any longshore / cross-shore sediment transport noted:	No noted effects during inspection (not subject to direct wave attack).

COASTAL ASSET CONDITION SURVEY REPORT



5. Identification of defects and recommendations

Defect Ref No.	Defect Location (NGR)	Major Element	Minor Element	Photo Ref	Severity	Probability	Risk Score	Below MHWS	Defect Description	Recommendations	Defect Priority
D1	255929, 198040	Embankment	Embankment Armour	25, 34	1	2	2	False	Undercutting of concrete armour sections. No change between 2014 and 2020 inspections.	Monitor and consider replacing with rock armour.	5
D2	255793, 198084	Embankment	Embankment Armour	27, 26	3	2	6	False	Undersized rock armour on embankment. In storm conditions these units may provide inadequate protection. No change between 2014 and 2020 inspections.	Monitor and consider redesigning rock armour embankment.	3
D3	255721, 198103	Embankment	Embankment Natural	28, 35, 36, 37	2	3	6	True	Reduced protective extent of saltmarsh. Continued erosion will increase the vulnerability of the embankment. Between 2014 and 2020 further minor deterioration of the protective extent of the saltmarsh was observed.	Monitor and consider building embankment toe protection.	1
D4	255707, 198107	Embankment	Embankment Armour	29, 38	2	2	4	True	Expelled rock armour units. No change between 2014 and 2020 inspections.	Monitor and consider redesigning rock armour embankment.	4
D5	255697, 198113	Embankment	Embankment Armour	30, 39	3	2	6	False	Narrow crest, reduced protection to the railway. No change between 2014 and 2020 inspections.	Monitor and consider redesigning rock armour embankment.	2

COASTAL ASSET CONDITION SURVEY REPORT



Defect Ref No.	Defect Location (NGR)	Major Element	Minor Element	Photo Ref	Severity	Probability	Risk Score	Below MHWS	Defect Description	Recommendations	Defect Priority
D6	255652, 198126	Embankment	Embankment Armour	31, 40	3	2	6	True	Bulge in embankment indicating, a minor slip failure. No change between 2014 and 2020 inspections.	Monitor and consider redesigning rock armour embankment.	2
D7	255638, 198128	Embankment	Embankment Armour	32, 41	2	3	6	True	Intertidal drainage eroding saltmarsh protection for embankment. Risk of undercutting toe. No change between 2014 and 2020 inspections.	Monitor and consider building embankment toe protection.	1
D8	255532, 198165	Embankment	Embankment Armour	33, 42	2	3	6	True	Intertidal drainage eroding saltmarsh protection for embankment. Risk of undercutting toe. No change between 2014 and 2020 inspections.	Monitor and consider building embankment toe protection.	1

6. Health and safety check

Health and Safety Check (Defence - Section A)

		Photos and Notes
Handrails		
Are handrails necessary?	No	
Are handrails present?	No	
Are handrails secured?	-	
Handrail construction material	-	
Are handrails corroded?	-	
Is handrail paint in good condition?	-	
Ladders / Steps		
Are ladders / steps necessary for access?	No	
Are ladder / steps present?	No	
Steps construction material	-	
Are steps in good condition?	-	
Are steps free of algae growth?	-	
Are ladders secured?	-	
Are ladders corroded?	-	
Is ladder paint in good condition?	-	
Ramps and walkways		
Are ramps and walkways necessary for access?	No	
Are ramps and walkways present?	No	
Ramp construction material	-	
Are ramps in good condition?	-	
Are ramps free of algae growth?	-	
Safety Harness Attachments		
Are attachments necessary for inspection?	No	
Are attachments present?	No	
Are attachments in good condition?	-	
Summary of health and safety items		

COASTAL ASSET CONDITION SURVEY REPORT



Health and Safety Check (Defence - Section B)		
		Photos and Notes
Handrails		
Are handrails necessary?	No	
Are handrails present?	No	
Are handrails secured?	-	
Handrail construction material	-	
Are handrails corroded?	-	
Is handrail paint in good condition?	-	
Ladders / Steps		
Are ladders / steps necessary for access?	No	
Are ladder / steps present?	No	
Steps construction material	-	
Are steps in good condition?	-	
Are steps free of algae growth?	-	
Are ladders secured?	-	
Are ladders corroded?	-	
Is ladder paint in good condition?	-	
Ramps and walkways		
Are ramps and walkways necessary for access?	No	
Are ramps and walkways present?	No	
Ramp construction material	-	
Are ramps in good condition?	-	
Are ramps free of algae growth?	-	
Safety Harness Attachments		
Are attachments necessary for inspection?	No	
Are attachments present?	No	
Are attachments in good condition?	-	
Summary of health and safety items		

7. Asset Assessment

7.1. Recommended works

Band A: Emergency works (Defect posing an immediate safety hazard. Immediate action required.)

No defects identified in this band

Band B: Short-term remedial works (Defect posing a potential safety hazard. Work recommended within 12 month period.)

Defect Ref No.	Works Category	Recommendations	Recommended Closure Date	Latest Status
D3	Other	Monitor and consider building embankment toe protection.		Active Defect (Approved)

Band C: Medium-term remedial works (Defect posing a potential safety hazard. Work recommended within 12 to 30 month period.)

Defect Ref No.	Works Category	Recommendations	Recommended Closure Date	Latest Status
D1		Monitor and consider replacing with rock armour.		Active Defect (Approved)
D2	Other	Monitor and consider redesigning rock armour embankment.		Active Defect (Approved)
D4	Brickwork/Stone Repairs	Monitor and consider redesigning rock armour embankment.		Active Defect (Approved)
D6	Other	Monitor and consider redesigning rock armour embankment.		Active Defect (Approved)
D7	Other	Monitor and consider building embankment toe protection.		Active Defect (Approved)
D8	Other	Monitor and consider building embankment toe protection.		Active Defect (Approved)

Band D: Long-term maintenance works (Defect resulting in long-term deterioration of structure or affecting performance. Work recommended within 30 to 48 month period.)

Defect Ref No.	Works Category	Recommendations	Recommended Closure Date	Latest Status
D5	Other	Monitor and consider redesigning rock armour embankment.		Active Defect (Approved)

Appendix 1 – Photographs

Asset Structure Photos

Photo number: 1

No photo available

Photo number: 2

No photo available

Photo number: 3

Date Taken:
28/07/2020 09:32



Photo number: 4

Date Taken:
28/07/2020 09:32



Section Photos

Section A
Photo number: 5



Section A
Photo number: 6



Section A
Photo number: 7



Section A
Photo number: 8



Section A
Photo number: 12

Date Taken:
28/07/2020 08:56



Section A
Photo number: 13

Date Taken:
28/07/2020 08:56



Section A
Photo number: 14

Date Taken:
28/07/2020 08:56



Section A
Photo number: 15

Date Taken:
28/07/2020 09:05



Section A
Photo number: 16

Date Taken:
28/07/2020 09:05



Section B
Photo number: 9



Section B
Photo number: 10



Section B
Photo number: 11



Section B
Photo number: 17

Date Taken:
28/07/2020 09:14



Section B
Photo number: 18

Date Taken:
28/07/2020 09:20



Section B
Photo number: 19

Date Taken:
28/07/2020 09:20



Section B
Photo number: 20

Date Taken:
28/07/2020 09:20



Element Survey Photos

**Section A
Embankment
Armour
Photo number: 21**

Date Taken:
28/07/2020 08:56



**Section A
Embankment
Natural
Photo number: 22**

Date Taken:
28/07/2020 09:13



Section A
Embankment
Natural
Photo number: 23

Date Taken:
28/07/2020 09:14



Section B
Embankment
Natural
Photo number: 24

Date Taken:
28/07/2020 09:30



Defect Photos

**Section A
Embankment
Armour
Defect Ref: D1
Description:**
Undercutting of
concrete armour
sections. No change
between 2014 and
2020 inspections.
Photo number: 25



**Section A
Embankment
Armour
Defect Ref: D1
Description:**
Undercutting of
concrete armour
sections. No change
between 2014 and
2020 inspections.
Photo number: 34

Date Taken:
28/07/2020 09:01



Section A
Embankment
Armour
Defect Ref: D2
Description:
Undersized rock armour on embankment. In storm conditions these units may provide inadequate protection. No change between 2014 and 2020 inspections.
Photo number: 27



Section A
Embankment
Armour
Defect Ref: D2
Description:
Undersized rock armour on embankment. In storm conditions these units may provide inadequate protection. No change between 2014 and 2020 inspections.
Photo number: 26



Section A
Embankment
Natural
Defect Ref: D3
Description:
Reduced protective extent of saltmarsh. Continued erosion will increase the vulnerability of the embankment. Between 2014 and 2020 further minor deterioration of the protective extent of the saltmarsh was observed.
Photo number: 28



Section A
Embankment
Natural
Defect Ref: D3
Description:
Reduced protective extent of saltmarsh. Continued erosion will increase the vulnerability of the embankment. Between 2014 and 2020 further minor deterioration of the protective extent of the saltmarsh was observed.
Photo number: 35

Date Taken:
28/07/2020 09:08



Section A
Embankment
Natural
Defect Ref: D3
Description:
Reduced protective extent of saltmarsh. Continued erosion will increase the vulnerability of the embankment. Between 2014 and 2020 further minor deterioration of the protective extent of the saltmarsh was observed.
Photo number: 36

Date Taken:
28/07/2020 09:08



Section A
Embankment
Natural
Defect Ref: D3
Description:
Reduced protective extent of saltmarsh. Continued erosion will increase the vulnerability of the embankment. Between 2014 and 2020 further minor deterioration of the protective extent of the saltmarsh was observed.
Photo number: 37

Date Taken:
28/07/2020 09:09



**Section B
Embankment
Armour**

Defect Ref: D4

Description:

Expelled rock armour units. No change between 2014 and 2020 inspections.

Photo number: 29



**Section B
Embankment
Armour**

Defect Ref: D4

Description:

Expelled rock armour units. No change between 2014 and 2020 inspections.

Photo number: 38

Date Taken:

28/07/2020 09:22



Section B
Embankment
Armour
Defect Ref: D5
Description: Narrow crest, reduced protection to the railway. No change between 2014 and 2020 inspections.
Photo number: 30



Section B
Embankment
Armour
Defect Ref: D5
Description: Narrow crest, reduced protection to the railway. No change between 2014 and 2020 inspections.
Photo number: 39

Date Taken:
28/07/2020 09:24



Section B
Embankment
Armour
Defect Ref: D6
Description: Bulge in embankment indicating, a minor slip failure. No change between 2014 and 2020 inspections.
Photo number: 31



Section B
Embankment
Armour
Defect Ref: D6
Description: Bulge in embankment indicating, a minor slip failure. No change between 2014 and 2020 inspections.
Photo number: 40

Date Taken:
28/07/2020 09:26



**Section B
Embankment
Armour**

Defect Ref: D7

Description:

Intertidal drainage eroding saltmarsh protection for embankment. Risk of undercutting toe. No change between 2014 and 2020 inspections.

Photo number: 32



**Section B
Embankment
Armour**

Defect Ref: D7

Description:

Intertidal drainage eroding saltmarsh protection for embankment. Risk of undercutting toe. No change between 2014 and 2020 inspections.

Photo number: 41

Date Taken:

28/07/2020 09:27



Section B
Embankment
Armour
Defect Ref: D8
Description:
Intertidal drainage
eroding saltmarsh
protection for
embankment. Risk of
undercutting toe. No
change between
2014 and 2020
inspections.
Photo number: 33



Section B
Embankment
Armour
Defect Ref: D8
Description:
Intertidal drainage
eroding saltmarsh
protection for
embankment. Risk of
undercutting toe. No
change between
2014 and 2020
inspections.
Photo number: 42

Date Taken:
28/07/2020 09:29



Appendix 2 – Asset descriptors

Asset Type	Major Element	Minor Elements	Attributes
Defence	Embankment	Apron	Stone, concrete, masonry
		Capping Wall	Stone, concrete, masonry
		Modular Blocks	Concrete
		Drainage	Pipe, masonry, Concrete Headline
		Gabions	Gabions
		Natural	Vegetated, un-vegetated
		Pitching	Stone, Concrete, Masonry
		Armour	Rock, concrete
		Toe	As above
Defence	Wall	Apron	Stone, concrete, masonry
		Parapet / Capping	Stone, concrete, masonry, timber
		Wall section	Stone, concrete, masonry, timber, sheet piles
		Armour	Rock, concrete
		Drainage	
		Toe	Concrete, natural, rock
Defence	Cliff / Slope	Drainage	
		Face protection	Netting, pinning, other
		Infill	Stone, concrete, masonry
		Natural	Vegetated, un-vegetated
		Toe	
Beach Structure	Groyne	Capping Beam	Concrete, timber (whaling)
		Piles	Steel, timber
		Groyne main section	Rock, stone, masonry, timber (planking), concrete
		Groyne landward connection	Rock, stone, masonry, timber (planking), concrete
		Groyne – seaward roundhead	Rock, stone, masonry, timber (planking), concrete
		Sheet piling	Steel
Beach Structure	Breakwater	Capping Beam	Concrete
		Breakwater Section	Stone, masonry, concrete
Land	Salt Marsh	Salt marsh edge	Vegetation (loss or growth), reduction in area
		Channel / creeks	Channels or creeks becoming wider, loss of vegetation on edge etc.
Land	Tidal Flats	Mudflats	Reduction in area
		Channel	Channels becoming wider, changing course etc.
Land	Sand Dune	Crest	sand
		Front face	sand
Land	Beach	Crest	Shingle, sand, cobbles, mixed
		Front face	Shingle, sand, cobbles, mixed
Structure	Outfall (>0.45m)	Outfall pipe	
		Upstream headwall	
		Downstream headwall	
		Apron	
		Frame	
		Screen	
		Penstock	
		Flap valve	

Appendix 3 – EA Condition Grades

10 Environment Agency Condition Assessment Manual

2.0 Visual inspection condition grades

The condition grading and descriptions given below are the standards adopted by the Environment Agency. The five condition grades, ranging from ‘very good’ to ‘very poor’, remain as before. However, the descriptions have been redefined, compared to the previous versions of the Condition Assessment Manual, to reflect condition according to flood defence performance.

2.1 General assessment

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce performance of the asset
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed
5	Very Poor	Severe defects resulting in complete performance failure