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Dhún na nGall**
Donegal County Council

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Underwater Inspection Report

Pier Condition Surveys – County Donegal

Rathmullan Pier



Document Control

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Executive Summary

The overall Condition of the underwater pier elements is rated as **1 – GOOD**

- The underwater concrete elements are generally in good condition.
- Limited, minor defects were noted
- More significant defects were located above the water level, particularly to the soffit level beams and tops of diagonal members within the splash zone. These were inspected separately to the underwater inspection.
- There is some scour to base of the columns, particularly to the East and North edges of the pier head. This has exposed a larger diameter concrete ring at 3 locations that might be part of the column foundation or socket.

Recommendations

There are no urgent recommendations following the underwater inspection. However, the separate principle inspection report should also be consulted.

1. Introduction & Methodology

Introduction

Norfolk Marine Ltd was engaged to carry out an underwater inspection of the underwater concrete elements at Rathmullan Pier. The inspection was carried out in conjunction with a principle inspection by Nicholas O'Dwyer.

The inspection at Rathmullan consisted of a visual and tactile survey of the Pier's columns which remain fully submerged at all states of the tide. Nicholas O'Dwyer carried out an inspection of elements above MLWS from a boat at the same time.

The objective of the inspection was to provide details of the current condition of the pier and identify any defects, to enable assessment of the pier condition and any necessary remedial works required.

Methodology

Diving operations were carried out in accordance with the HSA Safety, Health & Welfare at Work (Diving) Regulations 2018 and associated inland / inshore code of practice, using surface supplied diving equipment. A diving project plan was developed along with Risk Assessment / Method Statements for the works.

Access was provided by suitable ladders, slipways or revetment depending on the location.

The inspection was carried out over 2 days and at varying tide levels which ensured that the topside principle inspection overlapped the underwater inspection.

Inspection Location	Rathmullan Pier
Date of Inspection	25/02/2021 & 26/02/2021
Conditions	General – Dry / Showers Wind – Moderate to Strong 15kt – 30kt Temp - 9° In water visibility – Varied 1m near surface – Poor at bed level.

2. Location Plan



Fig 2.1 – Location Plan



Fig 2.2 – Pier Layout

3. Details of Structure

3.1 Description

Rathmullan Pier is located in North Donegal on the West side of Lough Swilly. The pier is used primarily by larger boats in the local aquaculture industry, for unloading and collection by vehicles. There is also a seasonal pontoon accesses from the pier viaduct which is used by leisure and small charter boats. A slipway to the North side of the pier is used by a landing craft type ferry that runs between Rathmullan and Buncrana.

The pier arrangement consists of a long viaduct section which is oriented in a roughly WNW to ESE direction, and the pier head which is oriented in a roughly ENE to WSW direction.

The pier is of concrete construction and is built on a number of frames with connecting beams and diagonal members. The viaduct frames consist of 4 square section columns with longitudinal and lateral beams at tidal and soffit level, with vertical and horizontal diagonal members bracing the structure. The pier head has large \varnothing 1.5m columns with the beam and diagonal member arrangement. (Pics B1 to B5)

The lower horizontal beams are situated in the mid tidal zone and were above water level for much of the underwater inspection period. Observations were made on elements that were covered during the inspection, but the topside principle inspection captured these and should be regarded as the primary source.

3.2 Recorded Information

No previous inspection reports were provided prior to the inspection.

The general layout drawing 70487-200 is shown in Appendix A and shows the general arrangement of the pier and the frame reference numbers as used in this report.

4. Condition of Structure

The overall Condition of the underwater pier elements is rated as **1 – GOOD**

4.1 General Findings

The submerged concrete elements are generally in good condition. The concrete is sound and notable defects are limited. (Pics B6 to B9)

It was noted that defects to the concrete structure were evident at higher levels, particularly to both the soffit level longitudinal and lateral beams, within the splash zone. These show evidence of delamination, particularly at the corners where reinforcement bar has corroded and ‘blown’ the concrete off the corner. There is rust staining evident in these locations and surrounding areas. There are similar defects to lower level beams and diagonal members but at a reduced concentration. These defects were not accessible from the water during the inspection but were inspected as part of the principle inspection by Nicholas O’Dwyer.

The concrete columns are covered in a 100% layer of marine growth, with hard growth including barnacles and mussels within the tidal zone and a heavy covering of soft marine growth in the fully submerged zone.

There is a significant amount of debris underneath the pier, largely from the fishing / aquaculture activities. The bed is generally coarse sand / shale and is firm.

4.2 Defects / Specific Findings

Details of notable findings or defects are provided in the table below.

The first section of the table gives references to lower level horizontal beams and diagonal members. This is an example of typical defects and were accessible at high tide on the day of the inspection. It should not be considered as a conclusive list of defects at this level. As the tide dropped the lower level beams could not be accessed by the diver.

Frame No.	Element	Description	Pic Ref.
22	VDM Q22 – P22	Hairline crack to underside of member, 600mm above joint with P22	
22	VDM P22 – P21	Minor surface crack 1m long from joint with longitudinal beam at P21	B10
21	Lat Beam P21 – Q21	Delamination cracks along top corners of beam	B11
21	VDM Q21 – R21	Blown concrete on underside of VDM at R21 end. Full width of member, 1m long. Corrosion staining evident	B12
20	VDM R20 – Q20	Loss of concrete on underside of VDM near joint with beam at R20 end. 200 x 100 x 70mm deep. Corrosion staining evident.	B13

The continued table below refers only to the column elements below the lower beams.

22	P22	Tie bar protruding from column opposite knuckle joint with horizontal beam.	B14
19	P19	Loss of concrete to column 1.5m below beam level, at joint between pours. Bottom of higher pour has eroded / washed out over a distance of 3m round the circumference x 400mm high x 200 max penetration depth.	B15
18	P18	There is a larger diameter concrete ring exposed at the base of the column, where there is 500mm of scour. Possibly a foundation or socket pour. No apparent defects to concrete.	B16
17	P17	Larger diameter ring exposed as at P18, for 1.5m round circumference x 100mm high. No visible defects.	B17
16	P16	Large volume of debris resting against base of column. 4 off Ø1m columns are protruding 1.5m from the bed in this area. Possibly previous piles or temporary works.	B18
16	Q16	Small horizontal gap at the underside of the longitudinal beam between Q16 and Q17. 250mm long x 20mm gap x 50mm penetration.	
16	Q16	700mm scour at base of pile exposing larger diameter concrete ring as above. Larger section exposed 600mm high most of the way round column. There is a concrete apron that extends away from the ring to the surrounding seabed. Possible grout return from a socket pour.	B19

There were no notable defects to the columns below water level along the viaduct section.

4.3 Scour

There is generally in the region of 300mm scour around the base of the concrete columns of the pier head. It was noted that there is a strong tidal current that flows South on the flood tide and North on the Ebb tide.

Columns with increased scour were noted at:

P21 – 400mm
P20 – 500mm
P19 – 500mm
R19 – 500mm
P18 – 500mm
P17 – 500mm
P16 – 500mm
Q16 – 700mm
S15 – 500mm

Scour to the columns of the viaduct varied between 300mm to the offshore (East) end to minimal scour closer to the shore end.

5. Conclusions & Recommendations

Conclusions

The overall Condition of the underwater pier elements is rated as **1 – GOOD**

- The underwater concrete elements are generally in good condition.
- Limited, minor defects were noted
- More significant defects were located above the water level, particularly to the soffit level beams and tops of diagonal members within the splash zone. These were inspected separately to the underwater inspection.
- There is some scour to base of the columns, particularly to the East and North edges of the pier head. This has exposed a larger diameter concrete ring at 3 locations that might be part of the column foundation or socket.

Recommendations

There are no urgent recommendations following the underwater inspection. However, the separate principle inspection report should also be consulted.

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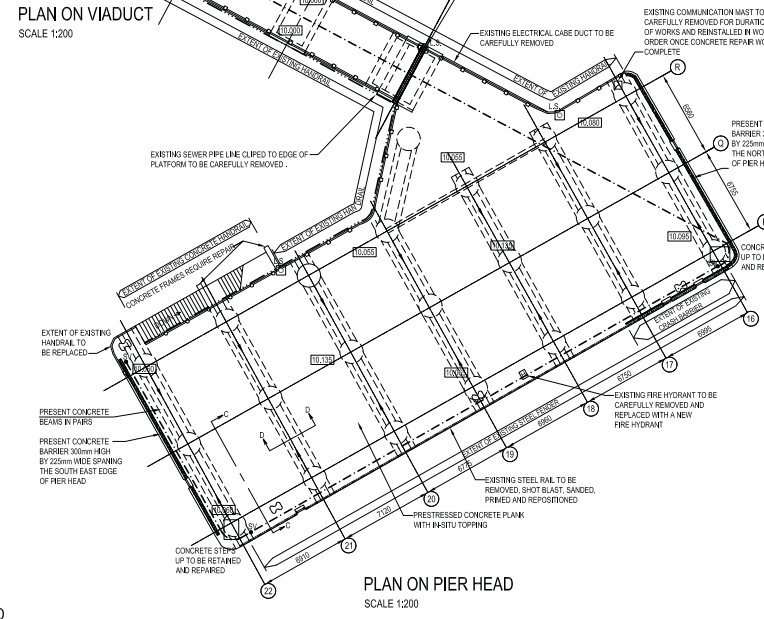
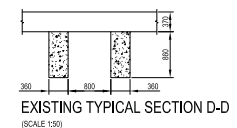
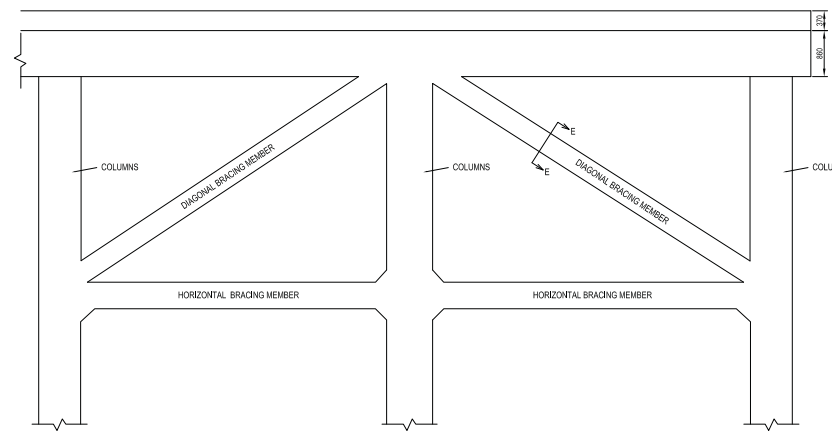
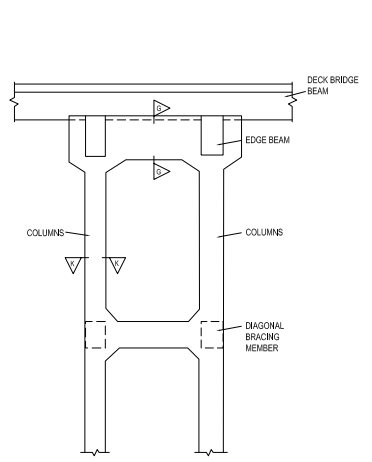
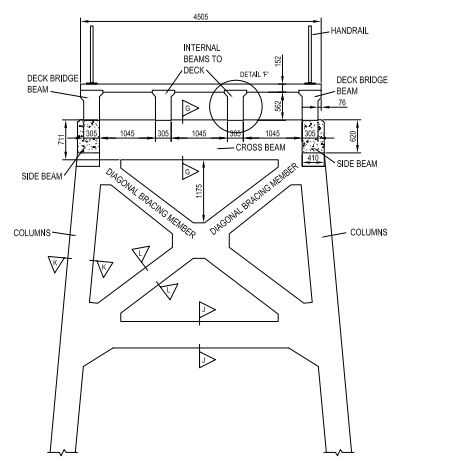
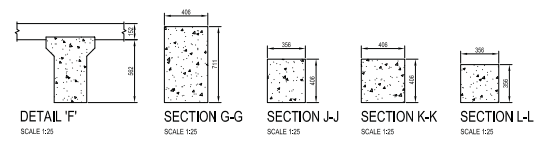
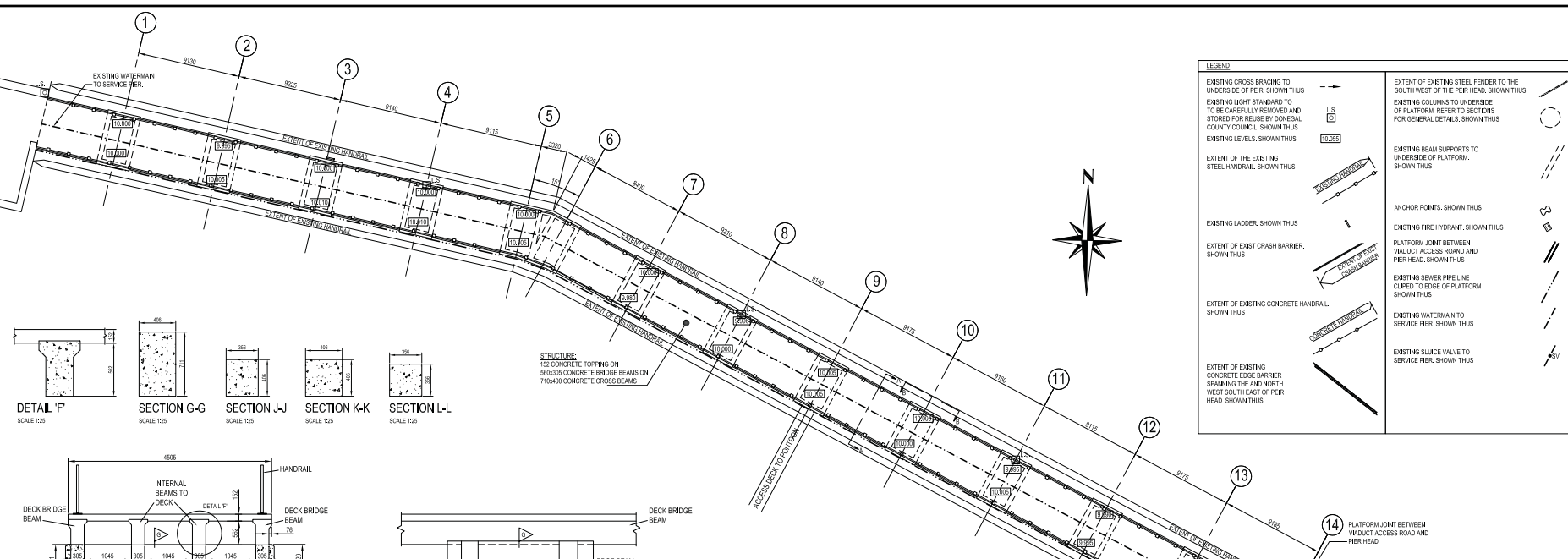
Appendix A – Drawings

70487-200 General Arrangement

- GENERAL**
1. This drawing and any design thereof is the copyright of Nicholas O'Dwyer Consulting Engineers and may only be duplicated following written consent of same.
 2. Engineering content represented on this drawing is specific to the noted project and may only be relied upon as directed by the Engineer.
 3. This drawing and all other drawings shall be read in conjunction with all the Architectural and Engineering drawings and all other relevant drawing and specifications.
 4. DO NOT SCALE FROM THE DRAWINGS, work to figure dimensions only. Any discrepancies in dimensions are to be referred to the Structural Engineer before works begin in hand.
 5. All dimensions and levels are to be cross referenced and checked on site. All dimensions for new bridge beams and new concrete deck to be confirmed on site.
 6. All existing fixtures and fittings are to be removed unless noted otherwise.

LEGEND

EXISTING CROSS BRACING TO UNDERSIDE OF PEIR, SHOWN THUS		EXTENT OF EXISTING STEEL FENDER TO THE SOUTH WEST OF THE PEIR HEAD, SHOWN THUS	
EXISTING LIGHT STANDING TO BE CAREFULLY REMOVED AND STORED FOR REUSE BY DONEGAL COUNTY COUNCIL, SHOWN THUS		EXISTING COLUMNS TO UNDERSIDE OF PLATFORM, REFER TO SECTIONS FOR GENERAL DETAILS, SHOWN THUS	
EXTENT OF THE EXISTING STEEL HANDRAIL, SHOWN THUS		EXISTING BEAM SUPPORTS TO UNDERSIDE OF PLATFORM, SHOWN THUS	
EXISTING LADDER, SHOWN THUS		ANCHOR POINTS, SHOWN THUS	
EXTENT OF EXIST CRASH BARRIER, SHOWN THUS		EXISTING FIRE HYDRANT, SHOWN THUS	
EXTENT OF EXISTING CONCRETE HANDRAIL, SHOWN THUS		PLATFORM JOINT BETWEEN WINDUCT ACCESS ROAD AND PEIR HEAD, SHOWN THUS	
EXTENT OF EXISTING CONCRETE EDGE BARRIER SPANNING THE AID NORTH WEST SOUTH EAST OF PEIR HEAD, SHOWN THUS		EXISTING SEWER PIPE LINE CLIPPED TO EDGE OF PLATFORM SHOWN THUS	
		EXISTING WATERMAIN TO SERVICE PEIR, SHOWN THUS	
		EXISTING SLUCE VALVE TO SERVICE PEIR, SHOWN THUS	



REV	DATE	DESCRIPTION	D	C	A

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CLIENT
Donegal County Council

PROJECT
Rathmullan Pier Refurbishment

TITLE
Existing Layout General Arrangement of Viaduct and Pier Head

SCALES	DRAWN	CHECKED	APPROVED
Plan 1:200 @ A1 Section 1:50 @ A1 Section 1:25 @ A1	A Magan		
DATE	DATE	DATE	DATE
07-01-09			
DRAWING NO.			
70487-200			

Appendix B – Photographs



Fig B1 – General View of Pier



Fig B2 – View of Viaduct from Shore end.



Fig B3 – View of Viaduct from Pier Head – Typical Frame arrangement



Fig B4 – View of Pier Head from Viaduct



Fig B5 – Typical Pier Head Frame Arrangement



Fig B6 - Typical Pier Head Column Condition



Fig B7 - Typical Concrete Condition



Fig B8 - Viaduct Column – Typical Condition



Fig B9 - Typical Concrete Condition

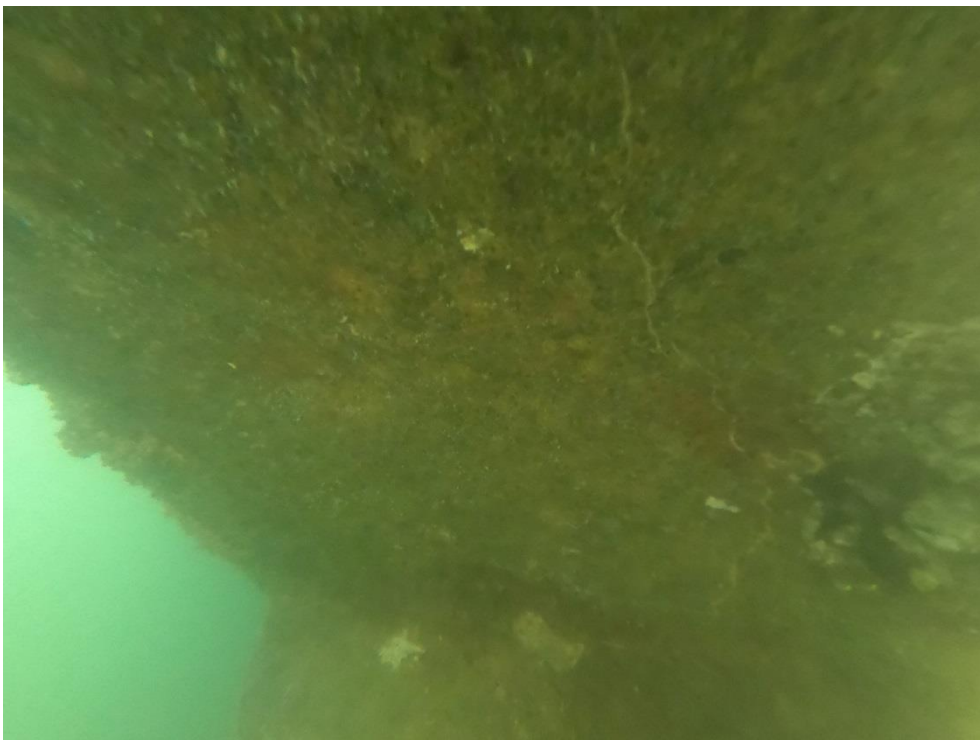


Fig B10 - Minor Hairline crack to underside of VDM



Fig B11 - Typical Delamination crack to bottom corners of VDM



Fig B12 - Blown concrete to underside of VDM



Fig B13 - Loss of concrete to underside of VDM (Frame 20)



Fig B14 - Tie Bar protruding from column P22



Fig B15 - Loss of section between pours – Column P19



Fig B16 - Larger Diameter section exposed at base of column P18



Fig B17 - Larger ring exposed at base of column P17



Fig B18 - Ø1m Column 1.5m high adjacent to Column P16

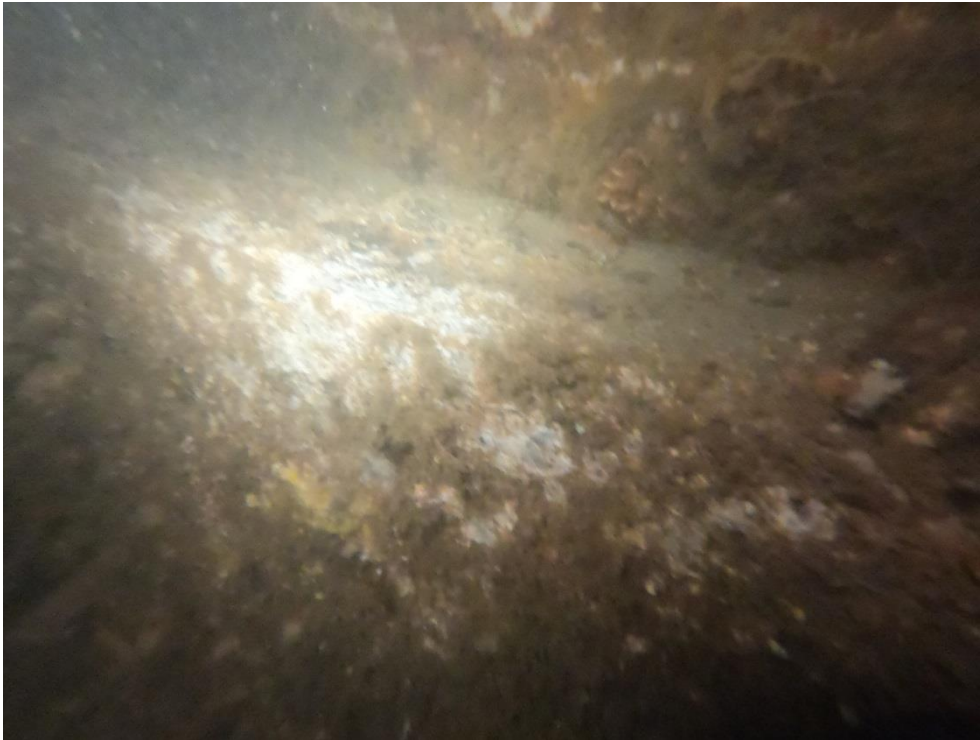


Fig B19 - Exposed ring at base of Column Q16



Fig B20 - Typical high-level beam delamination crack.

Appendix C – Underwater Inspection Summary

Date of Inspection: 25/02/2021 & 26/02/2021
Structure: Rathmullan Pier
Location: Rathmullan, County Donegal

Structure Condition Ratings	
Excellent Condition	0
Good Condition	1
Fair Condition	2
Poor Condition	3
Critical Condition	4
Unsafe Condition	5

Structural Element	Condition Rating
Viaduct Columns	1 - GOOD
Pier Head Columns	1 - GOOD
Scour	1 - GOOD

OVERALL RATING	1 - GOOD
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Condition Rating Assessment Guide

Rating	Description
0	Excellent Condition. The structural element is of recent construction and exhibits no signs of deterioration.
1	Good Condition. The structural element exhibits no significant deterioration or defects. Minor defects/deterioration noted to not more than 5% of any structural element.
2	Fair condition. The structural element is intact and its load carrying capacity is considered to be unaffected. Moderate defects/deterioration noted to not more than 30% of the structural element.
3	Poor condition. Advanced deterioration or numerous moderate defects noted to the structural element with the load carrying capacity and /or functionality of the element considered to be affected.
4	Critical condition. Advanced deterioration and significant defects noted to the structural element with the functionality and/or load carrying capacity of the element considered to be significantly reduced with local failures possible.
5	Unsafe condition. Localised failures observed with future and widespread failures of failures of structural element likely to occur. Structural integrity of the structure is compromised.