



**REPORT ON CONDITION
SURVEY**

At

**ABERDYFI WHARF
GWYNEDD**

For

GWYNEDD COUNCIL

MARCH 2010



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Approval Sheet and Foreword

Our ref: 3893899

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FOREWORD

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GWYNEDD COUNCIL

DISTRIBUTION			
Date:	Issued to:	Name:	No:
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1.0 BRIEF

- 1.1 This report has been prepared for Gwynedd Consultancy, Environment Directorate, Council Offices, Shirehall Street, Caemarfon, Gwynedd, LL5 upon receipt of an official order No 358979 dated 22nd January 2010
- 1.2 Environmental Services Group Limited were instructed to carry out an inspection and insitu testing on the accessible steel sheet piling at Aberdyfi Wharf as detailed in our quotation dated 12 January 2010.
- 1.3 Attention is drawn to the fact, that whilst every effort has been made to ensure the accuracy of the data provided, there is the possibility of variations occurring in conditions around and between the specific locations described in the report. No liability can be accepted for such variations
- 1.4 Other than the specific area referred to in this report, we have not inspected parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the structure is free from defect.

2.0 INTRODUCTION

- 2.1 This report related to the inspection and insitu testing of the steel sheet piling at Aberdyfi Wharf, Gwynedd
- 2.2 The inspection and insitu testing were carried out on 3rd March 2010 and included the following:-
- Visual inspection including condition of anodes
 - Determination, using a thickness meter of the pile thickness
 - Carry out voltage profile survey
 - Photographs to show typical condition and any other interesting features
 - Provide and issue interpretive report

3.0 METHOD OF TESTING

- 3.1 All of Environmental Scientifics Group's site and laboratory procedures are detailed in our written procedures manuals. The company also hold UKAS accreditation for a number of these procedures. This brief method statement will refer to a test procedure number and indicates if accreditation is held for each test. The full procedure is available for inspection at our offices and a copy of the site procedures was on site during the work.

Site Procedures

- 3.2 **Determination of the Thickness of Steel.** This procedure covers the preparation of the surface and the measurement of the steel thickness using an "Audit 106" ultra sonic thickness meter in accordance with the manufacturers instructions.
- 3.3 **Photographs.** In-house procedure IH/TP. Photo. This procedure covers the method of obtaining a photographic record on site or in the laboratory
- 3.4 **Corrosion Voltage Survey.** IH/CVS Rev 1. This procedure covers the method of obtaining a voltage profile on submerged and partially submerged steel structures

4.0 FINDINGS

- 4.1 From previous inspections the steel sheet piling has been identified as Frodingham type 3 NA section with nominal thickness of 9.7mm for the flat face and 9.5mm for the angled face. The anchor rods are 50mm and 40mm diameter.
- 4.2 General inspection of the wharf wall was carried out along its entire length with thickness readings at selected locations to give an overview of the condition of the steel sheet piling.
- 4.3 The thickness readings are summarised as follows:-
- Atmospheric Zone – thickness ranged from 5.3mm to 9.3mm with an average of 7.2mm
 - Splash Zone - thickness ranged from 5.1mm to 8.9mm with an average of 7.4mm with localised pitting to a depth of 3mm
 - Inter Tidal Zone - thickness ranged from 5.9mm to 9.4mm with an average of 8.0mm.
 - Accelerated Low Water Corrosion Zone – this appears to have been arrested in that no bright orange surface deposits were noted. Thickness readings in the range 4.9mm to 5.9mm were recorded.
 - Bed level Zone - thickness ranged from 6.2mm to 9.8mm with an average of 8.4mm.
- 4.4 The thickness of the restraint bar, installed in April 2004 with an original nominal size of 100mm x 10mm thick, ranged between 8.7mm to 10.0mm.
- 4.5 Corrosion voltage survey gave readings in the immersed zone of the steel sheeting of between 239mv to 259mv.
- 4.6 All anodes were given a general inspection and approximately 12% of the anodes were assessed for loss of material. Of these the estimated losses are as follows:-
- 20% have an estimated material loss of <5%
 - 40% have an estimated material loss of 10%
 - 30% have an estimated material loss of 15%
 - 10% have an estimated material loss of 20%
- 4.7 From the general inspection of the anodes all appear to be adequately attached to the structure, with the exception of the first location, closest to the shore, on the East face. Here the anode is only attached at the top.

- 4.8 On the South face, East end the sheet piling appears to have suffered some impact damage, see photograph in appendix A.

5.0 DISCUSSION

- 5.1 From our inspection and with reference to the previous inspection carried out in April 2006, the pile thickness readings are slightly less suggesting that some ongoing loss of section has occurred.
- 5.2 The period, approximately 4 years, between inspections is made up of roughly two years with anodes fitted and two years without. This does make predicting the effectiveness of the anode protection in term of thickness loss difficult.
- 5.3 We understand that the anodes were installed in April 2008, from the corrosion voltage readings obtained during our survey, maximum 259mv, compared with the April 2006 readings of 600 to 700mv, we are satisfied that the system is working.
- 5.4 During our inspection the absence of bright orange deposits suggests that the anodes have arrested the Accelerated Low Water Corrosion (ALWC) see comparison photographs, August 2003 and March 2010, in appendix A.
- 5.5 On the South face, East end the impact damage, with reference to the photographic plate number 4 from our April 2006, this area needs to be repaired.
- 5.6 We understand that consideration is being given to providing a walkway and floating pontoon along the South side of the wharf, given the known condition of the steel sheet piling we would recommend that no additional load is imposed on the existing structure and that any additional structure will need to be completely free standing. Also consideration needs to be given to limited life expectancy of the existing wharf estimated in April 2006 to be approximately ten years, particularly the SE corner.
- 5.7 We recommend that inspections of the anodes with corrosion voltage readings and limited thickness checks on the steel sheet piling are carried out annually.

6.0 CONCLUSIONS AND RECOMMENDATIONS

- 6.1 With regard to the residual lifespan of the structure, if we assume that the small amount of loss in steel section that has occurred since our May 2006 report, occurred mainly before the installation of the anodes and that little has occurred since, then we estimate the remaining lifespan of the sheet piling due to corrosion to be six years. This estimate is based on an assumed corrosion rate and published data on the effective life for 'Frodingham' piling and assumes that the anodes are inspected and maintained, the site condition remain the same i.e. no increased loadings, alterations to tidal flow around the piling, etc. (4.3, 4.5, 5.1, 5.2, 5.3 and 5.4)
- 6.2 Repairs which should be undertaken within the next 6 months, re-fix bottom of anode on the east face (4.7) and repair impact damage to the top section of the piling on the south face near to the SE corner (4.8 and 5.5)
- 6.3 Replacement of the anodes will need to be determined by inspection and measurement of the corrosion voltage at least every 12 months. Based on our recent inspection the anodes are being depleted at differing rates (4.6) and assuming that the rate of depletion remains the same we would expect approximately 5% of the anodes to need replacing in the five years.

Note : References made to paragraphs within this report are indicated thus (5.5).

Appendix A

Photographs



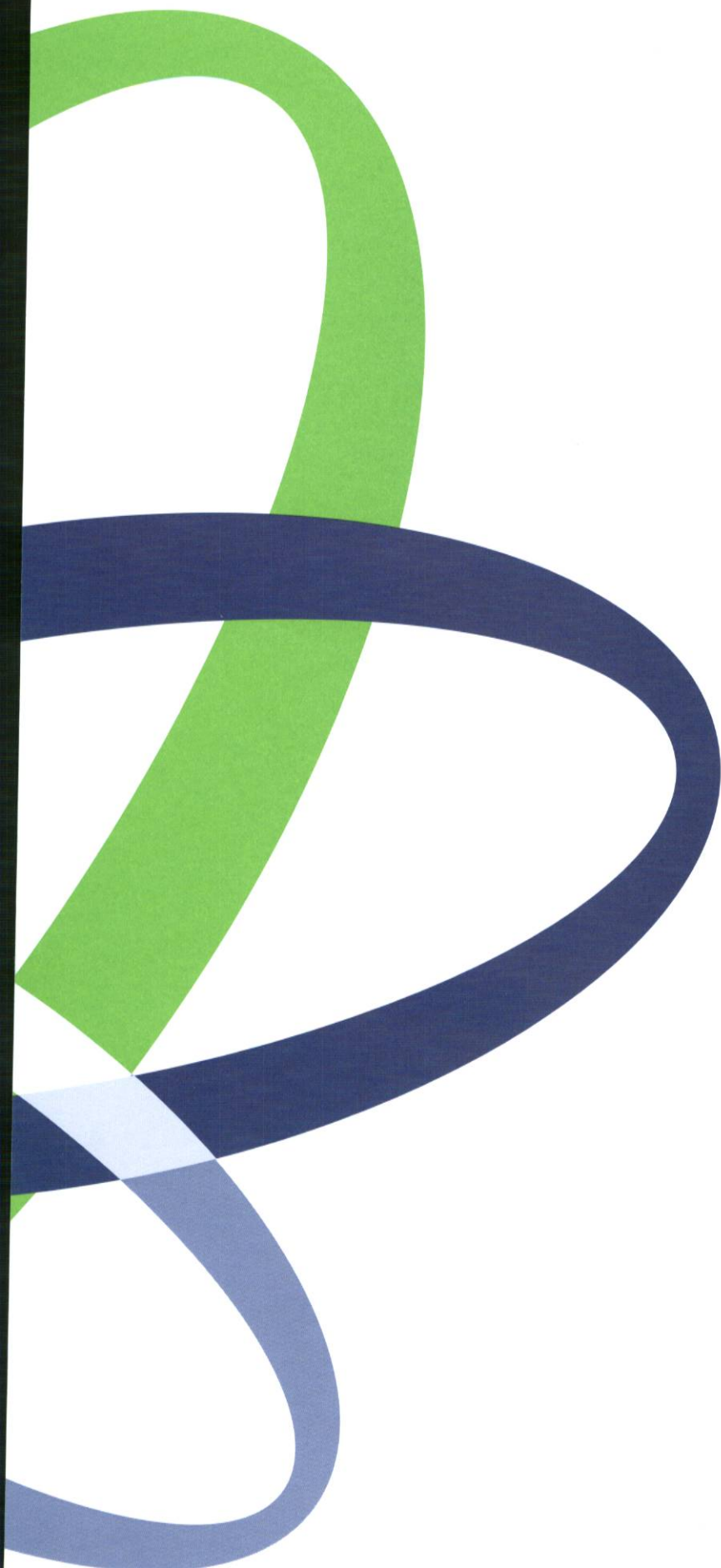
Impact damage to top of wharf wall.



August 2003, note bright orange deposits at bottom of piling.



March 2010, No bright orange deposits.



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