TECHNICAL MEMORANDUM

TO:	Derek Ormerod, P.E. (Anchor QEA)	**DATE:**	September 8th, 2016
FROM:	James O'Reilly, P.Eng. Structural Engineer Klohn Crippen Berger Ltd.	**FILE NO:**	P09824A01
SUBJECT:	Structural Condition Assessment of the D Jetty Timber Fender System		

This Technical Memorandum summarizes Klohn Crippen Berger's (KCB's) structural condition assessment of the D Jetty Fender System, completed in support of the Department of National Defence (DND) Colwood Jetties Remediation Project (CJRP), specifically addressing;

- The existing condition of the timber fender components which comprise the East and North Berth Fender systems at the D Jetty, DND Colwood Base, Esquimalt Harbour.

The following supporting information has been appended to this memorandum;

- Appendix I – KCB Field Inspection Observations
- Appendix II – Relevant Site Drawings
- Appendix III – KCB Field Inspection Photographs
- Appendix IV – Dive Inspection Field Report (South Coast Diving).

This Memorandum is intended to be read in combination with the following KCB Technical Memorandum;

- *D Jetty Structural Reconnaissance, February 2016*

1 CONDITION INSPECTION OVERVIEW

The current scope of work for the CJRP includes the dredging of contaminated material from the sea bed in close proximity to the existing D Jetty structures. The D Jetty structures comprise the North Berth and the East Berth. Presently, the structure perimeter is protected by a timber fendering system (see general arrangements and details shown on drawings, **Appendix II**). Due to a number of accessibility, design and risk mitigation factors, the remediation design requires temporary removal of the fender system on the North Berth face in order to complete dredging works. Following dredging, the fender system will be reinstated as per the existing configuration. The remediation design at the East Berth face is somewhat different and does not require temporary removal of the East Berth fender system during dredging works, with the exception of the floating camel fenders (which will be temporarily removed and reinstated following dredging activities). Pre-construction draft drawings illustrating the fender system on each berth face are included in **Appendix II**.

The intent of the structural condition assessment was to quantify the general condition of the timber components comprising the fender system and to assess the approximate number of members that should prove suitable for reinstatement following dredging activities, and hence to quantify the requirements for disposal and replacement of un-reusable fender piles / other components. Although the fender system on the East Berth is intended to remain in place during the remediation work, it was agreed that the East Berth fender system should be included in this condition assessment, regardless. If timber members on the North berth face are deemed unsuitable (by this condition assessment) for reinstatement, the intention is that they will be replaced with new members as part of the remediation contract work.

During June 21st-23rd, 2016, KCB engineers conducted the condition assessment of the D Jetty fender system at the CFB Colwood Base. Underwater dive inspection tasks were carried out by South Coast Diving Ltd (SCDL), under technical direction from KCB. SCDL's dive report is attached in **Appendix IV**.

2 CONDITION INPECTION OBSERVATIONS

The condition assessment was carried out visually from SCDL's vessel and also through foot access along the floating camel and tire fenders at both the North and East Berths. Weather and tide conditions were favorable during the inspection, providing excellent opportunity to review the lower elevation components (lower waler beams, lateral bracing at North East corner) not normally visible outside of the low tide window.

The assessment was primarily based on visual observation, however extensive marine growth was noted on all fender elements located below water and within the intertidal zone. Spot cleaning was carried out at a variety of locations in an attempt to assess the surface condition of the timber beneath the marine growth. Due to the difficulty in closely examining fender elements covered in marine growth, only visually observable degradation/damage was noted during the inspection. Estimations of general condition for each fender element are included in **Appendix I**.

All timber fender components were given a condition rating in order to assess suitability for reinstatement, the condition rating was judged based on the following parameters;

- 80% - 100% - Very good to excellent condition, suitable for reinstatement.
- 65% - 80% - Some signs of wear and/or minor damage, suitable for reinstatement but lifespan may be limited.
- 50% - 65% - Visibly worn, damaged or old but remaining functional, may be difficult to extract and reinstate without further damage, replacement recommended.
- 40-50% - Extensive damage/wear, may be somewhat functional in present condition, replacement recommended.
- 0-40% - Not suitable for reinstatement. Replacement required.

The following points summarize the major findings of the condition inspection with regard to the intended remediation dredging works. For additional information on individual component condition ratings, please refer to **Appendix I**.

1. Generally, the most obvious damage and wear of the fender components was observed within the intertidal zone, presumably due a combination of friction from the floating camel/tire fenders and air/elements exposure. Fender elements which were permanently submerged (located below low tide) were found to be in better condition than the above water portions. SCDL's dive report findings correlate closely with the above water observations made by KCB engineers (see observation data, **Appendix I**).
2. In general, the lateral timber bracing at the North East corner of D Jetty was observed to be in good condition. This includes the steel beam splices and the steel hexagonal collar ties connecting the lateral bracing to the hexagonal concrete piles, supporting the jetty structure. The lateral bracing is shown on the original design drawings at Low Water Level (EL 0.0 m Chart Datum (CD)); by field measurement we concluded that this is not accurate. During inspection low tide was at approximately EL +0.3 m (CD). The topside of the lateral bracing was measured at 0.5 m above the water level at low tide, so approximately EL +0.8 m (CD).
3. Many of the fender pile groups along the eastern half of the North Berth were observed to be in similar heavily worn condition. Some pile groups were missing rubbing poles which had been completely dislodged. Some rubbing poles were partially dislodged due to broken bolts. Rubbing strips were missing in some areas. Several rubbing poles showed signs of heavy wear with over 50% of the cross sectional area worn away due to friction/exposure.
4. Pile groups along the western half of the North Berth were generally in good condition and appeared suitable for re-use.
5. The North Berth lower waler beam was noted as missing between pile groups 4-6.
6. The timber elements above the intertidal zone (i.e. chock beams, upper waler beams, cap beams) were generally found to be in very good condition with a few exceptions noted in **Appendix I**.
7. Along the entire East Berth, the lower waler beam was not present. SCDL divers confirmed the waler beams were not visible on the sea bed. Bolt holes were present at the locations shown on original design drawings (Low Water Level), indicating that the lower waler beam had been

installed at some point in the past. The waler beam may have been purposely removed at some point in the past or simply degraded to the point where it dislodged from the connecting timber pile groups. No further information on this topic was available at the time of this report.

8. Floating tire fenders and camel fenders (referred to as "tree savers" in SCDL's dive inspection report) were generally in good condition and configured as per the design drawings.
9. Ladders showed heavy marine growth in intertidal zones and were configured as per the design drawings.
10. The East Berth fender system is not planned for removal as part of the CJRP; however, several of the rubbing poles and fender piles have degraded to the point of non-functionality. East Berth observations are also included in **Appendix I**. Replacement of these elements is recommended in order to protect the D Jetty structure as the original fender system design intended; however, it is recognized that any rehabilitation of the East Berth fender system is beyond the scope of the CJRP project.

3 CONCLUSION

The fender piles at D Jetty North Berth are the most expensive elements to replace due to extraction/driving costs. DND has clarified that the scope of work requires that the D Jetty fender system be returned to an 'as-is' pre dredge condition.

It is likely that some of the piles in fair condition will be damaged during removal and thus be unsuitable for reinstatement (to be determined on site). Some piles are marginally suitable for reinstatement.

Assuming that elements with a condition rating of greater than or equal to 65% are suitable for reinstatement, the following table provides an estimate of the amount of new elements likely to be required for reinstating the North Berth Fender System;

North Berth	Reinstate	Reinstate (%)	Replace	Replace (%)
Fender Piles	84	74%	30	26%
Upper Waler Beam	37	100%	0	0%
Lower Waler Beam	25	68%	12	32%
Cap Beam	32	86%	5	14%
Chock Beam	35	95%	2	5%

Table 3-1: North Berth Reinstatement/Replacement Recommendation Table

The following table has been prepared for the East Berth in order to provide information for future upgrade/repair considerations, not covered within the Colwood Jetties Remediation Project.

East Berth	Reinstate	Reinstate (%)	Replace	Replace (%)
Fender Piles	76	71%	31	29%
Upper Waler Beam	31	91%	3	9%
Lower Waler Beam	0	0%	34	100%
Cap Beam	30	88%	4	12%
Chock Beam	32	97%	1	3%

Table 3-2: East Berth Reinstatement/Replacement Recommendation Table

This report summarizes all the findings of KCB's structural condition inspection and assessment of the D Jetty Fender System. Our field observations and SCDL's dive inspection report, as summarized herein, may be utilized during construction planning for the Colwood Jetties Remediation Project.

KLOHN CRIPPEN BERGER LTD.

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APPENDIX I

D JETTY – FENDER SYSTEM CONDITION INSPECTION RESULTS

Project No: P09824A01
Project: AQ-DND Esq Harbour Environmental Remediation
Title: D Jetty - Fender System Condition Assessment
Date: 21-Jun-16
Eng: James O'Reilly

Objective: To assess the condition of the exisiting timber fender components and their potential suitability for reinstatement following temporary removal for
On Site: KCB/SCDL on site at DND Colwood, KCB to inspect structures from SCDL vessel only.
Tides: Tue, High (5.30am), Low (12.50pm), High (8.28pm)
Wed, High (6.06am), Low (1.26pm), High (9.02pm)
Thur, High (6.49am), Low (2.04pm), High (9.37pm)

For the purpose of this inspection the following definitions of damage estimates have been used in assessing damage
Light < 10% cross-section loss
Moderate 10% to 50% cross-section loss
Heavy > 50% cross-section loss

Rating % **Condition Rating %**

- 80% - 100% - Very good to excellent condition, suitable for reinstatement.
- 65% - 80% - Some signs of wear and/or minor damage, suitable for reinstatement but lifespan may be limited.
- 50% - 65% - Visibly worn, damaged or old but remaining functional, may be difficult to extract and reinstate without further damage, replacement recommended.
- 40-50% - Extensive damage/wear, may be somewhat functional in present condition but highly unlikely to be usable for reinstatement.
- 0-40% - Not suitable for reinstatement. Replacement required.

North Berth - Above Water Observations

		Extent of Damage					
Pile Group	**Component**	**Light**	**Moderate**	**Heavy**	**Rating (%)**	**Recommend**	**Comments**
1	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole			X	40	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam		X		75	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
2	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2		X		60	REPLACE	
	Rubbing Pole		X		60	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam		X		75	REINSTATE	Longitudinal Cracking
	Chock Beam	X			90	REINSTATE	
	Other						
3	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole		X		70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	Longitudinal Cracking
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
4	Fender Pile 1		X		65	REINSTATE	Lower bolt holes exposed
	Fender Pile 2			X	55	REPLACE	Lower bolt holes exposed
	Rubbing Pole			X	60	REPLACE	Disconnected @ bottom
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	0	REPLACE	Not present
	Cap Beam			X	55	REPLACE	Heavily cracked
	Chock Beam		X		75	REINSTATE	Longitudinal cracking @ pile group 5
	Other						
5	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2		X		65	REINSTATE	
	Rubbing Pole			X	60	REPLACE	Lower UHMWPE strips detached @ bottom
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	0	REPLACE	Not present
	Cap Beam		X		65	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
	Fender Pile 1	X			70	REINSTATE	Lower bolt holes exposed

6	Fender Pile 2		X		70	REINSTATE	Lower bolt holes exposed
	Rubbing Pole			X	20	REPLACE	Disconnected @ bottom; heavy rot
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	0	REPLACE	Not present
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			80	REINSTATE	
	Other						
7	Fender Pile 1			X	10	REPLACE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		65	REINSTATE	Bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	Disconnected @ pile group 7
	Cap Beam	X			75	REINSTATE	
	Chock Beam		X		70	REINSTATE	Connection dislodged @ pile group 7
	Other						
8	Fender Pile 1		X		70	REINSTATE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		65	REINSTATE	Bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			85	REINSTATE	
	Other						
9	Fender Pile 1		X		70	REINSTATE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		75	REINSTATE	Bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam		X		60	REPLACE	
	Chock Beam		X		70	REINSTATE	Damage present @ pile group 9
	Other						
10	Fender Pile 1		X		60	REPLACE	Heavily worn; bolt holes from rubbing pole exposed
	Fender Pile 2		X		70	REINSTATE	Bolt holes from rubbing pole exposed
	Rubbing Pole					REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		70	REINSTATE	Longitudinal cracking
	Cap Beam		X		75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
11	Fender Pile 1		X		70	REINSTATE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		65	REINSTATE	Appears very old; bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		65	REINSTATE	Longitudinal cracking
	Cap Beam		X		80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
12	Fender Pile 1		X		65	REINSTATE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		55	REPLACE	Appears very old; bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam		X		80	REINSTATE	
	Chock Beam		X		80	REINSTATE	Damage @ pile group 12
	Other						
13	Fender Pile 1		X		65	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	55	REPLACE	Large crack of unknown depth
	Cap Beam	X			85	REINSTATE	
	Chock Beam		X		75	REINSTATE	Damage @ pile group 14
	Other						Detached rubbing pole wedged between concrete pile and timber pile group 13
	Fender Pile 1		X		55	REPLACE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		55	REPLACE	Appears very old; bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present

14	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		60	REPLACE	
	Cap Beam		X		75	REINSTATE	
	Chock Beam		X		70	REINSTATE	Damage @ pile group 15
	Other					REPLACE	
15	Fender Pile 1		X		65	REINSTATE	Appears very old; bolt holes from rubbing pole exposed
	Fender Pile 2		X		65	REINSTATE	Appears very old; bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	50	REPLACE	Large cracks
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		80	REINSTATE	Longitudinal cracking
	Other						
16	Fender Pile 1		X		65	REINSTATE	
	Fender Pile 2		X		65	REINSTATE	
	Rubbing Pole			X	10	REPLACE	Heavy rot and abrasion damage
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		70	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		70	REINSTATE	rubbing damage
	Other					REPLACE	
17	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole		X		55	REPLACE	Missing UHMWPE strips
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		60	REPLACE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam			X	50	REPLACE	Large longitudinal cracking
	Other						
18	Fender Pile 1		X		55	REPLACE	Bolt holes from rubbing pole exposed
	Fender Pile 2		X		65	REINSTATE	Bolt holes from rubbing pole exposed
	Rubbing Pole			X	0	REPLACE	Not present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		75	REINSTATE	
	Cap Beam		X		65	REINSTATE	
	Chock Beam		X		80	REINSTATE	Minor impact damage
	Other						
19	Fender Pile 1		X		75	REINSTATE	
	Fender Pile 2		X		75	REINSTATE	
	Rubbing Pole		X		75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		70	REINSTATE	Longitudinal cracking
	Other						
20	Fender Pile 1	X			85	REINSTATE	
	Fender Pile 2	X			85	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	UHMWPE strips are not fully connected
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
21	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole			X	15	REPLACE	Heavy rot & abrasion
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
22	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		60	REPLACE	UHMWPE strips are dislodged and the rubbing pole is heavily worn.
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		70	REINSTATE	Connections moderately corroded
	Cap Beam		X		70	REINSTATE	
	Chock Beam	X			90	REINSTATE	

	Other						
23	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		65	REINSTATE	fungal damage is present
	Cap Beam		X		70	REINSTATE	
	Chock Beam	X			80	REINSTATE	
	Other						
24	Fender Pile 1		X		75	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole			X	55	REPLACE	Heavy fungal damage
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam		X		70	REINSTATE	
	Chock Beam			X	40	REPLACE	heavy cracking; member has failed.
	Other						
25	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam			X	50	REPLACE	
	Chock Beam		X		70	REINSTATE	abrasion damage
	Other						
26	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		60	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			70	REINSTATE	
	Cap Beam	X			75	REINSTATE	
	Chock Beam		X		70	REINSTATE	
	Other						
27	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		65	REINSTATE	fungal damage is present
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						Only one UHMWPE rub strip
28	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						Only one UHMWPE rub strip
29	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole			X	40	REPLACE	Fungal damage is present; UHMWPE strip has been dislodged
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		80	REINSTATE	transverse cracking
	Other						Only one UHMWPE rub strip
30	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole		X		55	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			75	REINSTATE	
	Cap Beam	X			80	REINSTATE	Beam is twisted; torsional displacement @ pile group 31
	Chock Beam		X		85	REINSTATE	
	Other						Only one UHMWPE rub strip
31	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			70	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	

31	Lower Waler Beam		X		65	REINSTATE	Minor section loss
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						Only one UHMWPE rub strip
32	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			70	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other					REPLACE	Only one UHMWPE rub strip
33	Fender Pile 1	X			70	REINSTATE	
	Fender Pile 2	X			70	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	Particularly heavy marine growth
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			70	REINSTATE	
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		70	REINSTATE	Longitudinal cracking
	Other						Only one UHMWPE rub strip
34	Fender Pile 1	X			70	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole		X		65	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam			X	40	REPLACE	Connection failed @ pile set 35
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other					REPLACE	Only one UHMWPE rub strip
35	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		65	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam		X		60	REPLACE	
	Cap Beam	X			90	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						Only one UHMWPE rub strip
36	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam	X			90	REINSTATE	
	Cap Beam	X			90	REINSTATE	
	Chock Beam		X		70	REINSTATE	Longitudinal cracking
	Other						Only one UHMWPE rub strip
37	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			85	REINSTATE	
	Lower Waler Beam	X			85	REINSTATE	
	Cap Beam	X			90	REINSTATE	
	Chock Beam	X			75	REINSTATE	
	Other						Only one UHMWPE rub strip
38	Fender Pile 1	X			85	REINSTATE	
	Fender Pile 2	X			85	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	

Project No: P09824A01
Project: AQ-DND Esq Harbour Environmental Remediation
Title: D Jetty - Fender System Condition Assessment
Date: 21-Jun-16
Eng: James O'Reilly

Objective: To assess the condition of the exisiting timber fender components and their potential suitability for reinstatement following temporary removal for remed
On Site: KCB/SCDL on site at DND Colwood, KCB to inspect structures from SCDL vessel only.
Tides: Tue, High (5.30am), Low (12.50pm), High (8.28pm)
Wed, High (6.06am), Low (1.26pm), High (9.02pm)
Thur, High (6.49am), Low (2.04pm), High (9.37pm)

For the purpose of this inspection the following definitions of damage estimates have been used:

Light	< 10% cross-section loss
Moderate	10% to 50% cross-section loss
Heavy	> 50% cross-section loss

North Berth - Diver Observations

		Extent of Damage				
Pile Group	Component	Light	Moderate	Heavy	Rating (%)	Comments
1	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Fender Pile 3	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
2	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
3	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
4	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
5	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
6	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers

	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
7	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
8	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
9	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
10	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
11	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
12	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
13	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
14	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole				0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers

	Other					
15	Fender Pile 1			X	40	taken
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
16	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	30	available.
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
17	Fender Pile 1	X			80	pictures available
	Fender Pile 2	X			80	pictures available
	Rubbing Pole	X			80	pictures available
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
18	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole			X	0	Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
19	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
20	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
21	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
22	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					

23	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
24	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
25	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
26	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
27	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
28	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
29	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
30	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
	Fender Pile 1	X			80	

31	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
32	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
33	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
34	Fender Pile 1	X			80	pictures available
	Fender Pile 2	X			80	pictures available
	Rubbing Pole	X			80	pictures available
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
35	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
36	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
37	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Above water surface. Inspected by KCB Engineers
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
38	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	

Project No: P09824A01
Project: AQ-DND Esq Harbour Environmental Remediation
Title: D Jetty - Fender System Condition Assessment
Date: 21-Jun-16
Eng: James O'Reilly

Objective: To assess the condition of the exisiting timber fender components and their potential suitability for reinstatement following temporary removal for remediation dredging works.
On Site: KCB/SCDL on site at DND Colwood, KCB to inspect structures from SCDL vessel only.
Tides: Tue, High (5.30am), Low (12.50pm), High (8.28pm)
Wed, High (6.06am), Low (1.26pm), High (9.02pm)
Thur, High (6.49am), Low (2.04pm), High (9.37pm)

For the purpose of this inspection the following definitions of damage estimates have been used:
Light < 10% cross-section loss
Moderate 10% to 50% cross-section loss
Heavy > 50% cross-section loss

Condition Rating %
- 80% - 100% - Very good to excellent condition, suitable for reinstatement.
- 65% - 80% - Some signs of wear and/or minor damage, suitable for reinstatement but lifespan may be limited.
- 50% - 65% - Visibly worn, damaged or old but remaining functional, may be difficult to extract and reinstate without further damage,
- 40-50% - Extensive damage/wear, may be somewhat functional in present condition but highly unlikely to be usable for reinstatement.
- 0-40% - Not suitable for reinstatement. Replacement required.

East Berth - Above Water Observations

		Extent of Damage					
Pile Group	**Component**	**Light**	**Moderate**	**Heavy**	**Rating (%)**	**Recommend**	**Comments**
A	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Fender Pile 3		X		75	REINSTATE	
	Rubbing Pole 1		X		70	REINSTATE	
	Rubbing Pole 2	X			75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam			X	50	REPLACE	Impact damage
	Chock Beam	X			90	REINSTATE	
	Other						
B	Fender Pile 1			X	45	REPLACE	
	Fender Pile 2		X		60	REPLACE	No aluminum cap
	Rubbing Pole			X	10	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
C	Fender Pile 1		X		60	REPLACE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole			X	40	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
D	Fender Pile 1		X		60	REPLACE	
	Fender Pile 2		X		55	REPLACE	Heavily worn
	Rubbing Pole		X		60	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	Longitudinal cracking
	Chock Beam		X		70	REINSTATE	Longitudinal cracking
	Other						
	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2		X		65	REINSTATE	
	Rubbing Pole		X		50	REPLACE	

E	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		75	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
F	Fender Pile 1		X		55	REPLACE	
	Fender Pile 2		X		60	REPLACE	
	Rubbing Pole		X		65	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		70	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other				30		
G	Fender Pile 1			X	65	REINSTATE	apparent flexural failure of pile
	Fender Pile 2		X		60	REPLACE	
	Rubbing Pole		X		90	REINSTATE	Lower connection failed
	Upper Waler Beam	X			0	REPLACE	
	Lower Waler Beam				30	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						0
1A	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2		X		65	REINSTATE	
	Rubbing Pole		X		55	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			80	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
3A	Fender Pile 1		X		65	REINSTATE	
	Fender Pile 2		X		60	REPLACE	
	Rubbing Pole			X	45	REPLACE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
5A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole		X		55	REPLACE	UHMWPE rub strips dislodged
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam					REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam		X		80	REINSTATE	
	Other						
7A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole		X		70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			80	REINSTATE	
	Chock Beam		X		80	REINSTATE	
	Other						
9A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			75	REINSTATE	
	Rubbing Pole		X		55	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
	Fender Pile 1		X		55	REPLACE	
	Fender Pile 2	X			70	REINSTATE	

11A	Rubbing Pole			X	40	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
13A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		55	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
15A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		50	REPLACE	Heavily worn
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
17A	Fender Pile 1			X	0	REPLACE	Appears snapped beneath the waterline; divers to confirm
	Fender Pile 2		X		50	REPLACE	Heavily worn
	Rubbing Pole				0	REPLACE	Not present
	Upper Waler Beam	X			90		Small length required
	Lower Waler Beam				0		Small length required
	Cap Beam	X			80		Small length required
	Chock Beam	X			80		None
	Other			X	20		Quarter dolphin
19A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2		X		70	REINSTATE	
	Rubbing Pole			X	20	REPLACE	Heavily worn
	Upper Waler Beam		X		60	REPLACE	Warped and cracking
	Lower Waler Beam					REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		65	REINSTATE	Longidtudinal cracking; wear
	Chock Beam	X			90	REINSTATE	
	Other						
21A	Fender Pile 1	X			75	REINSTATE	Upper bolts bent
	Fender Pile 2		X		70	REINSTATE	Upper bolts bent
	Rubbing Pole			X	50	REPLACE	Rotten
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam					REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		65	REINSTATE	Longitudinal cracking
	Chock Beam		X		80	REINSTATE	
	Other						
23A	Fender Pile 1		X		70	REINSTATE	
	Fender Pile 2	X			70	REINSTATE	
	Rubbing Pole			X	50	REPLACE	Rot present; UHMWPE strips loose; bolts bent
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
25A	Fender Pile 1	X			75	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole		X		50	REPLACE	Heavy wear
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam		X		80	REINSTATE	
	Other						
	Fender Pile 1	X			75	REINSTATE	

27A	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	Detached @ bottom
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		65	REINSTATE	Longitudinal cracking
	Chock Beam	X			80	REINSTATE	
	Other						
29A	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		65	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
31A	Fender Pile 1	X			80	REINSTATE	
	Fender Pile 2	X			80	REINSTATE	
	Rubbing Pole			X	40	REPLACE	Heavy rot/wear
	Upper Waler Beam	X			80	REINSTATE	Longitudinal cracking
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
33A	Fender Pile 3			X	40	REPLACE	Hole on face with heavy rot
	Fender Pile 4	X			70	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
35A	Fender Pile 5	X			80	REINSTATE	
	Fender Pile 6	X			80	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	
	Chock Beam	X			90	REINSTATE	
	Other						
37A	Fender Pile 7	X			80	REINSTATE	
	Fender Pile 8	X			80	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	Longitudinal cracking; minor impact damage
	Chock Beam	X			70	REINSTATE	
	Other						
39A	Fender Pile 9			X	40	REPLACE	Large crack with havey internal rot
	Fender Pile 10	X			75	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	
	Upper Waler Beam	X			85	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam			X	55	REPLACE	Heavy cracking
	Chock Beam	X			75	REINSTATE	Minor impact damage
	Other						
41A	Fender Pile 11	X			80	REINSTATE	
	Fender Pile 12	X			80	REINSTATE	
	Rubbing Pole	X			80	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		65	REINSTATE	Longitudinal cracking
	Chock Beam	X			75	REINSTATE	
	Other						

43A	Fender Pile 13	X			80	REINSTATE	
	Fender Pile 14		X		70	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam		X		60	REPLACE	Longitudinal cracking
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		55	REPLACE	Heavy cracking
	Chock Beam		X		60	REPLACE	Heavy Cracking
	Other						
45A	Fender Pile 15	X			75	REINSTATE	
	Fender Pile 16	X			70	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam		X		60	REPLACE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
47A	Fender Pile 17	X			75	REINSTATE	
	Fender Pile 18	X			70	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
49A	Fender Pile 19	X			75	REINSTATE	
	Fender Pile 20	X			75	REINSTATE	
	Rubbing Pole		X		65	REINSTATE	UHMWPE strips loose
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			75	REINSTATE	Longitudinal cracking
	Chock Beam	X			80	REINSTATE	
	Other						
51A	Fender Pile 21	X			75	REINSTATE	
	Fender Pile 22	X			80	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	
	Upper Waler Beam	X			90	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	Longitudinal cracking
	Chock Beam	X			90	REINSTATE	
	Other						
53A	Fender Pile 23	X			75	REINSTATE	
	Fender Pile 24	X			80	REINSTATE	
	Rubbing Pole	X			70	REINSTATE	
	Upper Waler Beam	X			80	REINSTATE	
	Lower Waler Beam				0	REPLACE	Not present; no remnants of walers, only bolt holes in piles remain; removal appears deliberate
	Cap Beam	X			70	REINSTATE	Longitudinal cracking
	Chock Beam	X			70	REINSTATE	
	Other						
55A	Fender Pile 25	X			75	REINSTATE	
	Fender Pile 26	X			75	REINSTATE	
	Rubbing Pole	X			75	REINSTATE	

Project No: P09824A01
Project: AQ-DND Esq Harbour Environmental Remediation
Title: D Jetty - Fender System Condition Assessment
Date: 21-Jun-16
Eng: James O'Reilly

Objective: To assess the condition of the exisiting timber fender components and their potential suitability for reinstatement following temporary removal for remediation dredging works.
On Site: KCB/SCDL on site at DND Colwood, KCB to inspect structures from SCDL vessel only.
Tides: Tue, High (5.30am), Low (12.50pm), High (8.28pm)
Wed, High (6.06am), Low (1.26pm), High (9.02pm)
Thur, High (6.49am), Low (2.04pm), High (9.37pm)

For the purpose of this inspection the following definitions of damage estimates have been used:
Light < 10% cross-section loss
Moderate 10% to 50% cross-section loss
Heavy > 50% cross-section loss

East Berth - Dive Observations

		Extent of Damage				
Pile Group	Component	Light	Moderate	Heavy	Rating (%)	Comments
A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Fender Pile 3	X			80	
	Rubbing Pole 1	X			80	
	Rubbing Pole 2	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
B	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
C	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
D	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
	Fender Pile 1	X			80	

E	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
F	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					
	Chock Beam					
	Other					
G	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
1A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
3A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
5A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
7A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers

	Other					
9A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
11A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	Appears to be driven
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
13A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
15A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
17A	Fender Pile 1			X	0	Pile severed; pictures available
	Fender Pile 2	X			80	
	Rubbing Pole			X		Not present
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
19A	Fender Pile 1	X			80	Scraped near the surface, mid water, and at bottom; pic #3 low
	Fender Pile 2	X			80	Scraped near the surface, mid water, and at bottom; pic #1 high
	Rubbing Pole	X			80	Scraped near the surface, mid water, and at bottom; pic #2 mid
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
	Fender Pile 1	X			80	
	Fender Pile 2	X			70	hole in pile 6" long x 2" wide x 4" deep; pictures available at bottom

21A	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
23A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
25A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
27A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
29A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
31A	Fender Pile 1	X			80	
	Fender Pile 2	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
33A	Fender Pile 3	X			80	
	Fender Pile 4	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					

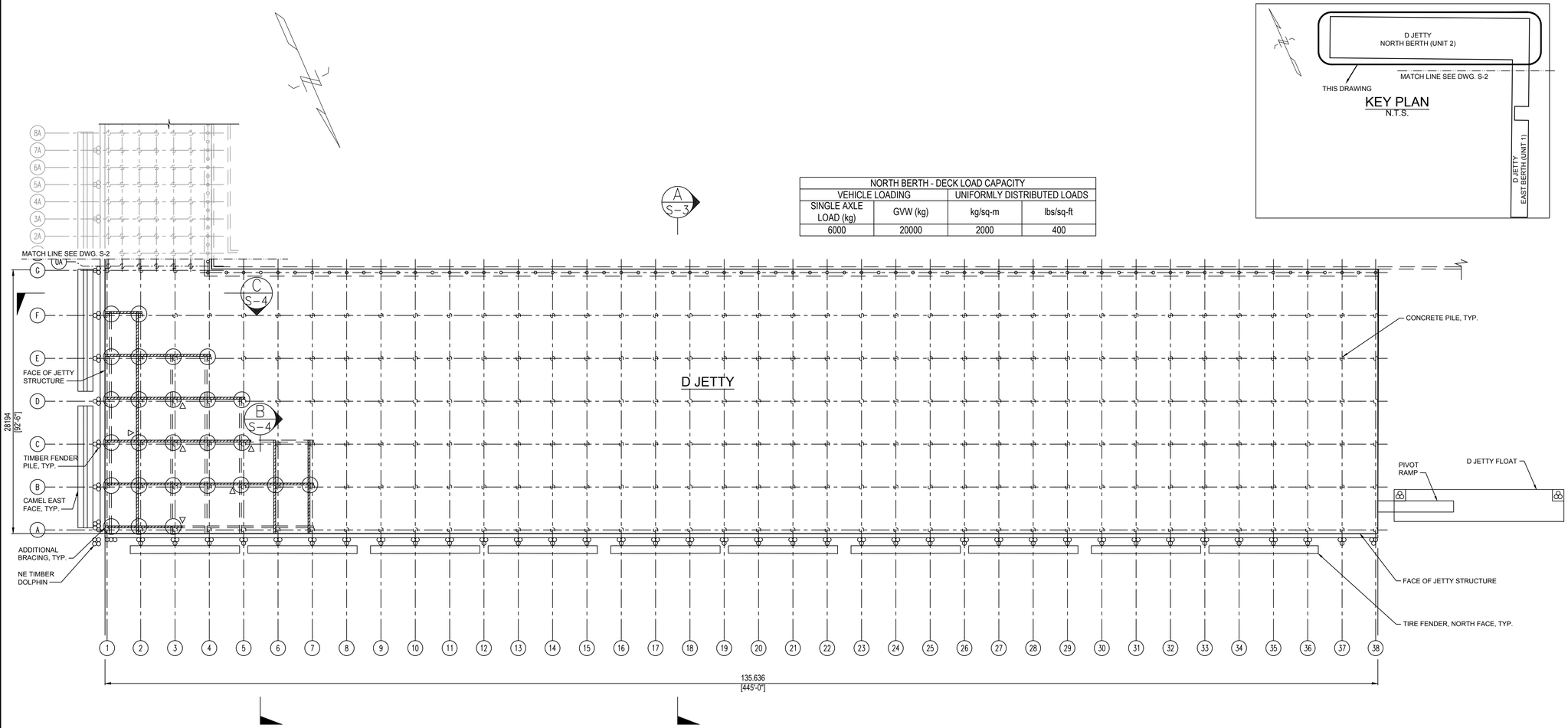
35A	Fender Pile 5	X			80	
	Fender Pile 6	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
37A	Fender Pile 7	X			80	
	Fender Pile 8	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
39A	Fender Pile 9	X			80	
	Fender Pile 10	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
41A	Fender Pile 11	X			80	
	Fender Pile 12	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
43A	Fender Pile 13	X			80	
	Fender Pile 14	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
45A	Fender Pile 15	X			80	
	Fender Pile 16	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
47A	Fender Pile 17	X			80	
	Fender Pile 18	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers

	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
49A	Fender Pile 19	X			80	
	Fender Pile 20	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
51A	Fender Pile 21	X			80	Scraped near the surface, mid water, and at bottom; pictures available
	Fender Pile 22	X			80	Scraped near the surface, mid water, and at bottom; pictures available
	Rubbing Pole	X			80	Scraped near the surface, mid water, and at bottom; pictures available
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					Pictures taken of overall marine growth
53A	Fender Pile 23	X			80	
	Fender Pile 24	X			80	
	Rubbing Pole	X			80	
	Upper Waler Beam					Above water surface. Inspected by KCB Engineers
	Lower Waler Beam					Not present; no remnants of walers, only bolt holes in piles remain; lower waler appears deliberate
	Cap Beam					Above water surface. Inspected by KCB Engineers
	Chock Beam					Above water surface. Inspected by KCB Engineers
	Other					
55A	Fender Pile 25			X	50	hollowing out at ground level, 4" deep x 8" wide x 6" long; pictures available
	Fender Pile 26	X			80	
	Rubbing Pole			X	50	Hollow at bottom, 8" diameter by 10" cavity depth; picture attempted
	Upper Waler Beam					
	Lower Waler Beam					
	Cap Beam					
	Chock Beam					
	Other					

Appendix II

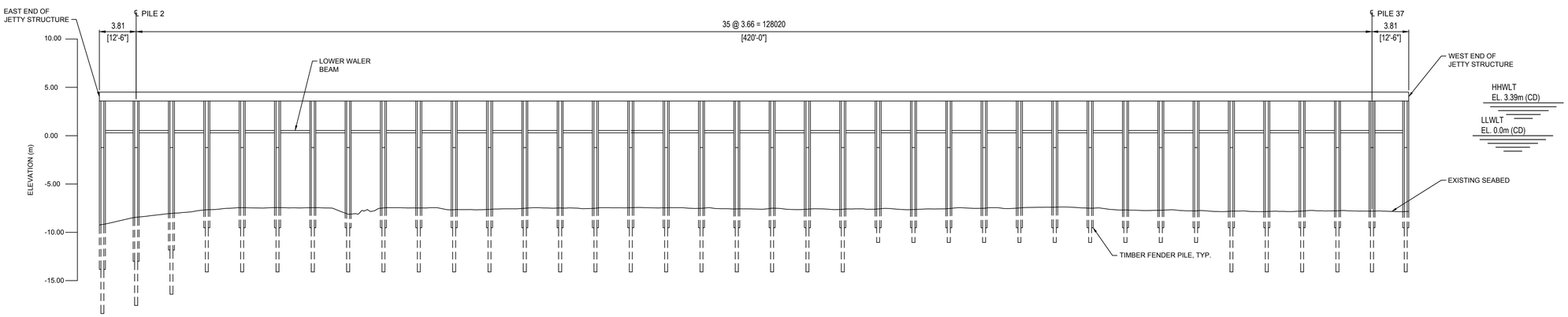
D JETTY – DRAWINGS

NORTH BERTH - DECK LOAD CAPACITY			
VEHICLE LOADING		UNIFORMLY DISTRIBUTED LOADS	
SINGLE AXLE LOAD (kg)	GVW (kg)	kg/sq-m	lbs/sq-ft
6000	20000	2000	400



PLAN - NORTH BERTH (UNIT 2)
SCALE: 1:250

0 5 10 15m
1:250



ELEVATION - NORTH BERTH (UNIT 2)
SCALE: 1:250

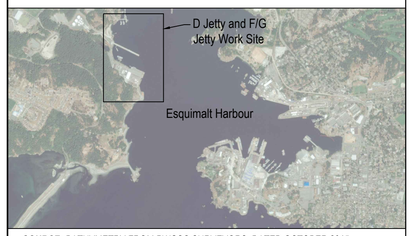
0 5 10 15m
1:250

Government of Canada / Gouvernement du Canada

LEVEL OF SECURITY | NIVEAU DE SÉCURITÉ
TO BE REVIEWED | À ÊTRE REVISER

ANCHOR QEA

Klohn Crippen Berger



SOURCE: BATHYMETRY FROM PWGSC SURVEYORS, DATED OCTOBER 2015.
HORIZONTAL DATUM: UTM ZONE 10N, NAD83.
VERTICAL DATUM: CHART DATUM (CD).
NOTES:

1. CHART DATUM (CD) IS 1.89m BELOW CANADIAN GEODETIC DATUM (GD).
2. PRIMARY DIMENSIONS SHOWN IN mm, ORIGINAL IMPERIAL DIMENSIONS SHOWN IN PARENTHESES, E.G. 3048 [10'-0"].
3. REFERENCE DRAWINGS:
   2007 SANDWELL REPAIR DRAWINGS
   1955 CONSTRUCTION DRAWINGS
   1983 STRUCTURAL REPAIR DRAWINGS
4. SPACING SHOWN FOR CONCRETE PILES, U.N.O.
5. FOR MAXIMUM ALLOWABLE LIVE LOAD ON D JETTY DECK, SEE REFERENCE DRAWING 99145-00-003 (AUGUST 2010-DND).

NO.	DATE	REVISION	APPR.
0	2016/08/01	ISSUED FOR TENDER	

SCALE | ÉCHELLE
AS NOTED

LOCATION | EMPLACEMENT
D JETTY AND F/G JETTY
CFB ESQUIMALT COLWOOD

PROJECT | PROJET
COLWOOD JETTIES REMEDIATION PROJECT

TRADE | MÉTIER: CIVIL/ENVIRONMENTAL
DATE: 2016/05/16

SUBJECT | SUJET
EXISTING ARRANGEMENT
SHEET 1 OF 2
D JETTY

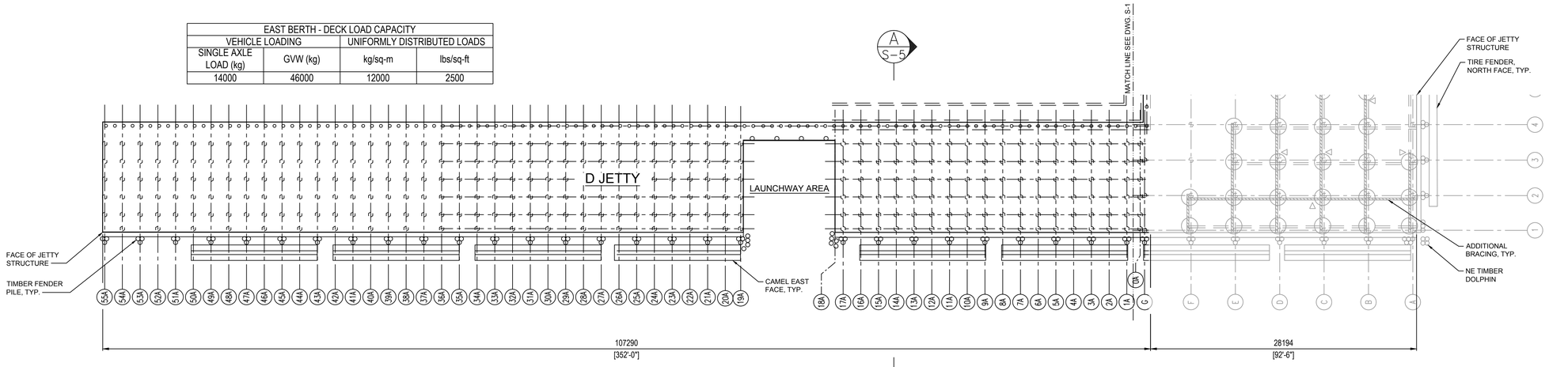
PRODUCTION	REVIEWED | REVU	
DESIGNED | ÉTUDIÉ: J.O.	XX | XX	DES O | AGENT CONC
DRAWN | DESSINÉ: M.B.		PROJ MGR | GEST PROJ
CHECKED | VÉRIFIÉ: ----		DES MGR | GEST CONC
COORDINATION: ----		FIRE | INCENDIE

WBS NO. | NO. OTP:
PF NO. | NO. DP: R.081525.001/R.081526.001

DWG. NO. | NO. DESSIN: S-1

Canada

EAST BERTH - DECK LOAD CAPACITY			
VEHICLE LOADING		UNIFORMLY DISTRIBUTED LOADS	
SINGLE AXLE LOAD (kg)	GVW (kg)	kg/sq-m	lbs/sq-ft
14000	46000	12000	2500

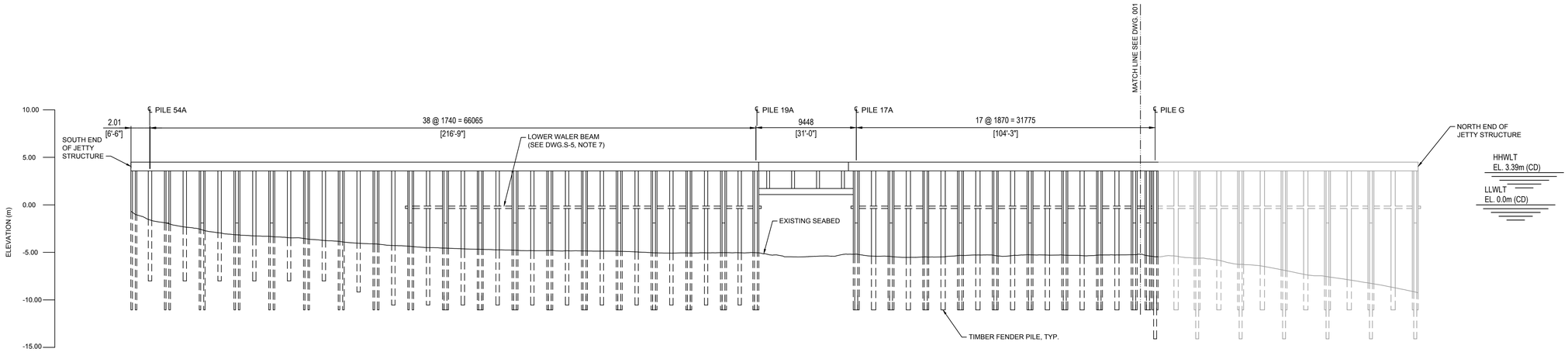


PLAN - EAST BERTH (UNIT 1)

SCALE: 1:250

0 5 10 15m

1:250



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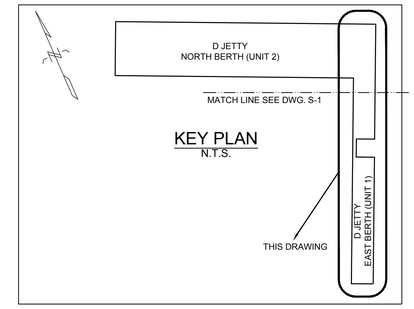
SCALE: 1:250

0 5 10 15m

1:250

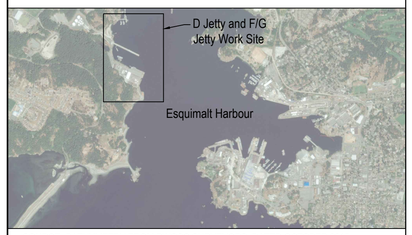


Government of Canada / Gouvernement du Canada

LEVEL OF SECURITY | NIVEAU DE SÉCURITÉ
TO BE REVIEWED | À ÊTRE REVISER

ANCHOR QEA

Klohn Crippen Berger



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NO.	DATE	REVISION	APPR.
0	2016/08/01	ISSUED FOR TENDER	

SCALE | ÉCHELLE
AS NOTED

LOCATION | EMPLACEMENT
D JETTY AND F/G JETTY
CFB ESQUIMALT COLWOOD

PROJECT | PROJET
COLWOOD JETTIES REMEDIATION PROJECT

TRADE | MÉTIER	DATE
CIVIL/ENVIRONMENTAL	2016/05/16

SUBJECT | SUJET
EXISTING ARRANGEMENT
SHEET 2 OF 2
D JETTY

PRODUCTION	REVIEWED | REVU	
DESIGNED | ÉTUDIÉ J.O.	XX | XX	DES O | AGENT CONC
DRAWN | DESSINÉ M.B.		PROJ MGR | GEST PROJ
CHECKED | VÉRIFIÉ ----		DES MGR | GEST CONC
COORDINATION ----		FIRE | INCENDIE

WBS NO. | NO. OTP	PF NO. | NO. DP
	R.081525.001/R.081526.001

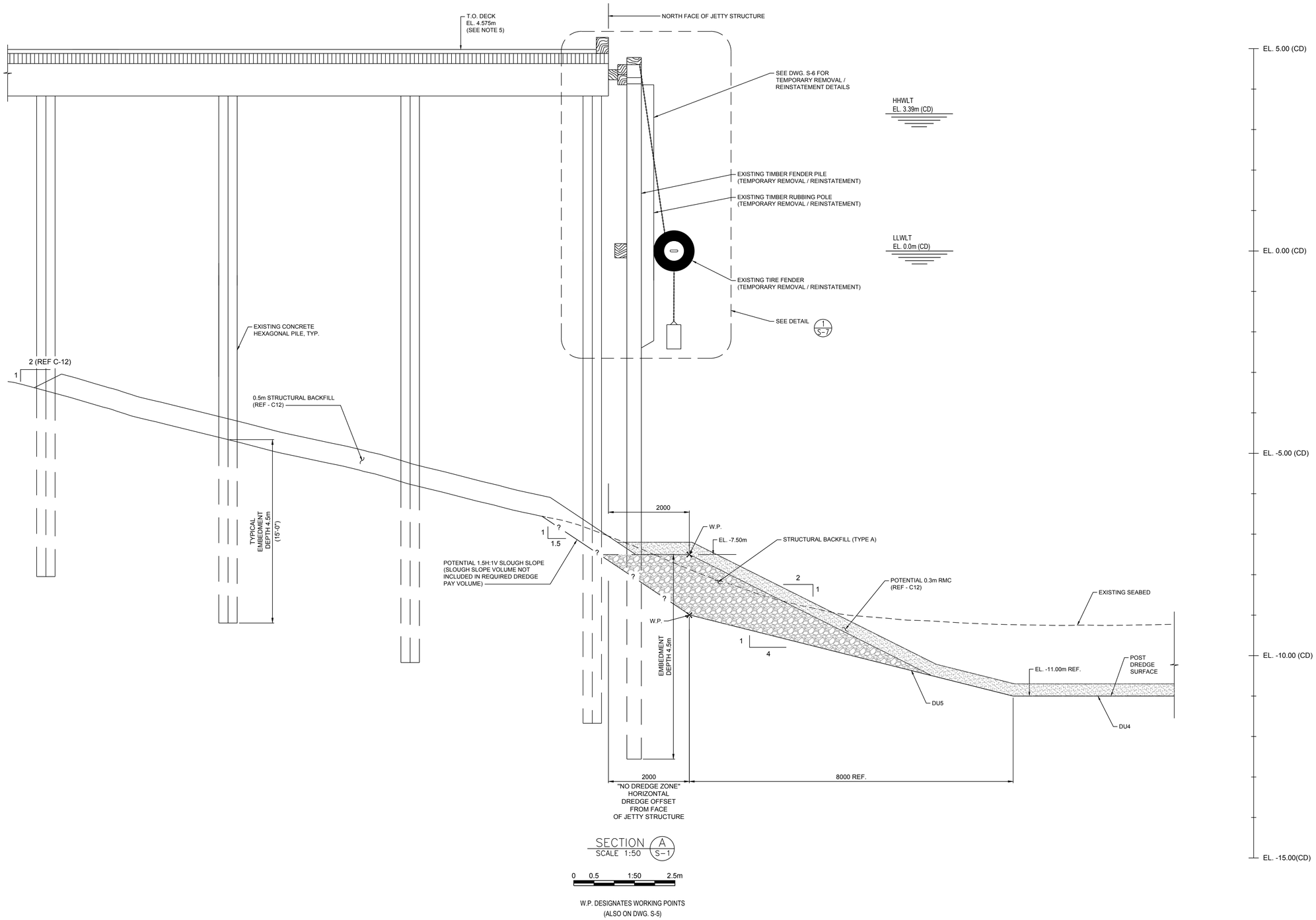
DWG. NO. | NO. DESSIN
S-2

Canada

BORDER LAST UPDATED 2012-04-01

2016/Jul/28, 6:10pm kkhaira G-1 \\int.kkohn.com\Proj\Data\P\VCR\P09824A01 AQ-DND Est Harbour Env Remed\400 Drawings\2016\001 - Drawings\D Jetty\S-1 - S-9.dwg

Sheet### of ##



SECTION A S-1
SCALE 1:50

0 0.5 1:50 2.5m

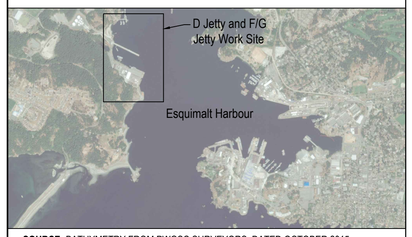
W.P. DESIGNATES WORKING POINTS
(ALSO ON DWG. S-5)

Government of Canada / Gouvernement du Canada

LEVEL OF SECURITY | NIVEAU DE SÉCURITÉ
TO BE REVIEWED | À ÊTRE REVISER

ANCHOR QEA

Klohn Crippen Berger



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6. REFER TO DREDGING DRAWINGS FOR DREDGE GRADES, LIMITS AND TOLERANCES.

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0	2016/08/01	ISSUED FOR TENDER	

SCALE | ÉCHELLE
AS NOTED

LOCATION | EMPLACEMENT
D JETTY AND F/G JETTY
CFB ESQUIMALT COLWOOD

PROJECT | PROJET
COLWOOD JETTIES
REMEDIATION PROJECT

TRADE | MÉTIER	DATE
CIVIL/ENVIRONMENTAL	2016/05/16

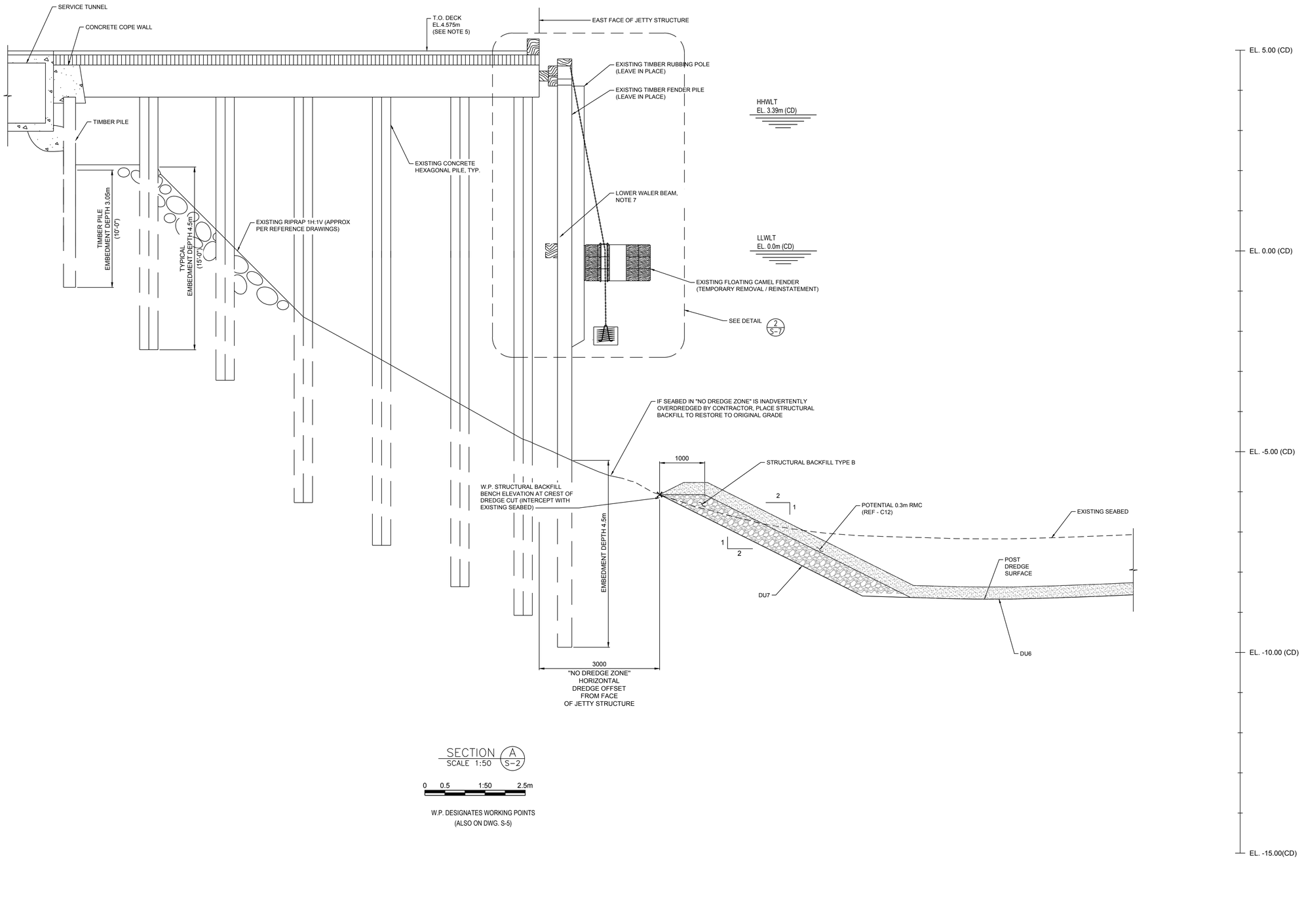
SUBJECT | SUJET
NORTH BERTH - SECTION
D JETTY

PRODUCTION	REVIEWED | REVU	
DESIGNED | ÉTUDIÉ J.O.	XX | XX	DES O | AGENT CONC
DRAWN | DESSINÉ M.B.		PROJ MGR | GEST PROJ
CHECKED | VÉRIFIÉ ----		DES MGR | GEST CONC
COORDINATION ----		FIRE | INCENDIE

WBS NO. | NO. OTP	PF NO. | NO. DP
	R.081525.001/R.081526.001

DWG. NO. | NO. DESSIN
S-3

Canada



SECTION A
SCALE 1:50 S-2

0 0.5 1:50 2.5m

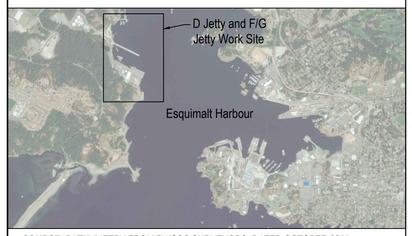
W.P. DESIGNATES WORKING POINTS
(ALSO ON DWG. S-5)

Government of Canada / Gouvernement du Canada

LEVEL OF SECURITY | NIVEAU DE SÉCURITÉ
TO BE REVIEWED | À ÊTRE REVISER

ANCHOR QEA

Klohn Crippen Berger



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6. REFER TO DREDGING DRAWINGS FOR DREDGE GRADES, LIMITS AND TOLERANCES.
7. THE LOWER WALER BEAM AT THE EAST BERTH, SHOWN ON ORIGINAL DESIGN DRAWINGS, WAS NOTED AS MISSING DURING A FENDER SYSTEM CONDITION ASSESSMENT IN JUNE 2016 (KCB).

NO.	DATE	REVISION	APPR.
0	2016/08/01	ISSUED FOR TENDER	

SCALE | ÉCHELLE
AS NOTED

LOCATION | EMPLACEMENT
D JETTY AND F/G JETTY
CFB ESQUIMALT COLWOOD

PROJECT | PROJET
COLWOOD JETTIES
REMEDIATION PROJECT

TRADE | MÉTIER	DATE
CIVIL/ENVIRONMENTAL	2016/05/16

SUBJECT | SUJET
EAST BERTH - SECTION
D JETTY

PRODUCTION	REVIEWED | REVU	
DESIGNED | ÉTUDIÉ J.O.	XX | XX	DES O | AGENT CONC
DRAWN | DESSINÉ M.B.		PROJ MGR | GEST PROJ
CHECKED | VÉRIFIÉ ---		DES MGR | GEST CONC
COORDINATION ---		FIRE | INCENDIE

WBS NO. | NO. OTP	PF NO. | NO. DP
	R.081525.001/R.081526.001

DWG. NO. | NO. DESSIN
S-5

Canada

BORDER LAST UPDATED 2012-04-01

2016/Jul/28, 6:11pm kkhaira G-1 \\int.klohn.com\Proj\Data\PVCR\P09824A01 AQ-DND Esq Harbour Env Remed\400 Drawings\2016\001 - Drawings\D Jetty\S-1 - S-9.dwg

Appendix III

PHOTOS

Photo 1: Rubbing pile missing, major section loss of fender pile

Photo 2: Lower waler missing at North Berth – Pile Group 3, abrasion damage, rubbing strip partially dislodged

Photo 3: Minor damage to chock beam

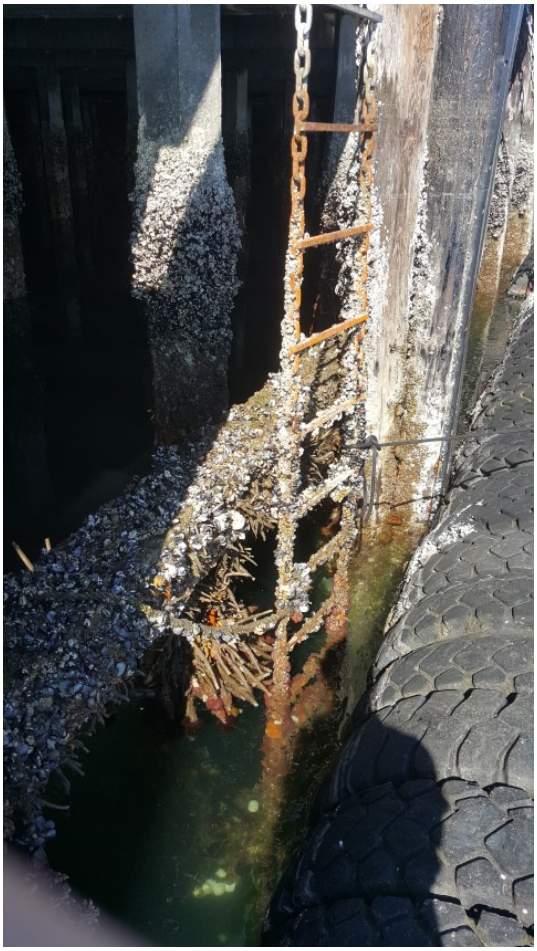

Photo 4: Heavy marine growth

Photo 5: Longitudinal cracking in lower waler

Photo 6: Abrasion damage on timber chock beam

Photo 3: Fender pile in excellent condition

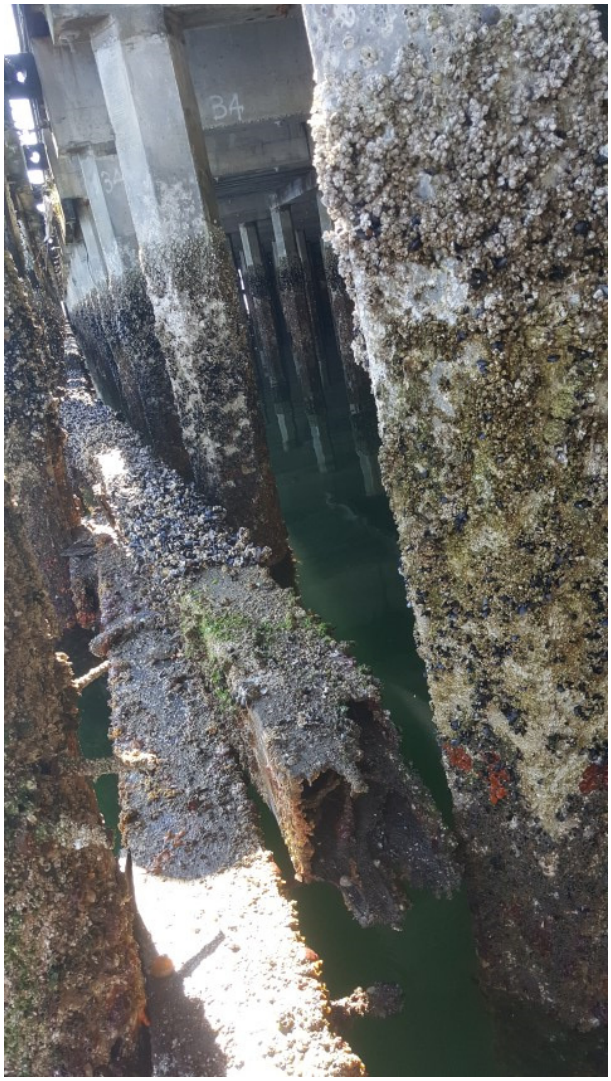

Photo 4: Broken lower waler at North Berth

Appendix IV

SOUTH COAST DIVING LIMITED – FIELD REPORT

SOUTH COAST DIVING LTD.

SETTING THE STANDARD FOR EXCELLENCE
IN UNDERWATER SERVICE

CSA Z275.4-97 Standard

CADC

825 Admirals Road
Victoria, BC
V9A 2P1
Tel: 250-361-1556
Fax: 250-361-1595
scdl@telus.net
www.southcoastdiving.com

Klohn Crippen Berger
D-Jetty Fender Pile System Survey
In-Water Field Survey Report
June 25, 2016

Contents

Patrick R. Thompson
President/General Manager

SOUTH COAST DIVING LTD.

SETTING THE STANDARD FOR EXCELLENCE
IN UNDERWATER SERVICE

CSA Z275.4-97 Standard

CADC

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June 25, 2016

Klohn Crippen Berger
500-2955 Virtual Way
Vancouver, B.C.
V5M 4X6

Attention: James O'Reilly, M.Sc., P.Eng, ENV SP,
Structural Engineer

RE: UNDERWATER FENDER PILE SYSTEM INSPECTION, D-JETTY

Date(s):	June 21-22, 2016
Time(s):	08:30 hrs
Location:	D-Jetty (Colwood)
Item(s):	Fender pile groups, cross bracing, camel fenders and tree savers
Methodology:	Visual recording c/w digital still photographs
Dive Supervisor:	Patrick R. Thompson
Dive Tech(s):	Ian Swan
	Graydon Tait
	David Littlejohn

WORK PROCEDURE:

One (1) crew support vessel and tending vehicle with a CAN/CSA certified four(4) man diving/inspection crew was deployed in Esquimalt Harbour equipped with diver to surface air/communications, digital camera equipment, related tooling and supplies to conduct in water visual/tactile inspection requirements of the pile groups and related fender systems of the north and east sections of the pier at D-Jetty in order to gather a general overview of the structures where possible for a general assessment.

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WORK SPECIFICATIONS:

A dive inspection was requested by Anchor QEA LLC. This particular survey had no written specifications and it was established at the initial site briefing between Klohn Crippen Berger (KCB) and ourselves South Coast Diving Ltd (SCDL) that we would provide a baseline overview that would incorporate the most important aspect being the fender pile groups in order to establish an overall percentage of timber pile remaining below water. Additional photographs of general conditions of the camel fenders, tree savers and exposed cross bracing were also taken. The low tides of +/- 0.30m each day provided an excellent opportunity to gather above water information of exposed beams. Marine biological growth was found to be very extensive on all structures.

INSPECTION NOTES/OBSERVATIONS:

North Berth Pile Deficiencies Observed by Divers Below Waterline

Pile group 7 rubbing pole was observed not present.
Pile group 8 rubbing pole was observed not present.
Pile group 9 rubbing pole was observed not present.
Pile group 10 rubbing pole was observed not present.
Pile group 11 rubbing pole was observed not present.
Pile group 12 rubbing pole was observed not present.
Pile group 14 rubbing pole was observed not present.
Pile group 15 Fender pile 1 was observed with heavy wear with a hole 12" long x 2" wide x 7" deep. Pile percentage rating was 40% below waterline. Rubbing pole was observed not present.
Pile group 16 rubbing pole was observed with heavy damage hollowed out with pile rot. Pile estimated at a percentage rating as low as 30% below waterline.
Pile group 17 was spot cleaned for inspection purposes. All three(3) piles were observed light and estimated at a percentage rating of 80% below waterline.
Pile group 18 rubbing pole was observed not present.
Pile group 34 was spot cleaned for inspection purposes. All three(3) piles were observed light and estimated at a perentage rating of 80% below waterline.

North Berth Tree Saver Fenders Observed by Divers Below Waterline

A total of nine(9) separate tree savers were observed in place each identified with two(2) separate suspended mooring chains traveling through steel guide sleeves. Each chain is fitted with a counterweight. Upon spot cleaning of the tree savers, sacrificial anodes were observed at each plated end. Anodes are 100% depleted. Overall tree saver condition is very good.

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East Berth Pile Deficiencies Observed by Divers Below Waterline

Pile group 17A Fender pile 1 was observed with heavy damage. Pile is severed and estimated at a percentage rating of 0%. Rubbing pole was observed not present.
Pile group 19A was spot cleaned for inspection purposes. All three(3) piles were observed light and estimated at a percentage rating of 80% below waterline.
Pile group 21A Fender pile 2 was observed with light to moderate wear with a hole 6" long x 2" wide x 4" deep. Percentage rating of 70% was observed below waterline.
Pile group 51A was spot cleaned for inspection purposes. All three(3) piles were observed light and estimated at a percentage rating of 80% below waterline.
Pile group 55A Fender pile 25 was observed with heavy wear and hollowed out at ground level with a hole 4" deep x 8" wide x 6" long. Pile percentage rating was 50%. Rubbing pole was observed with heavy wear and hollowed out bottom with a hole 8" deep x 10" cavity. Pile percentage rating was 50%.

East Berth Camel Fenders Observed by Divers Below Waterline

A total of eight(8) separate wooden camel fenders were observed in place each identified with two(2) separate suspended mooring chains traveling through steel guide sleeves. Each chain is fitted with a counterweight. Each camel fender comprises timber beams. The overall condition of the timber was good.

Octagonal Concrete Pile Bracing North Berth/East Berth Corner

A full series of timber cross bracing beams were observed fully exposed at the offshore corner of the north and east berths. The bracing comprises of seven(7) beams numbered 1 through 7 from east to west. These upper beams are bolted to six(6) lower beams that are fixed to octagonal steel clamps placed on the octagonal concrete piles. They are labeled A though F from north to south. The two(2) part octagonal steel clamps were observed well fitted with bolt fasteners in place. The steel clamp thickness was measured at 19mm. The length of the beams were tiered and due to the overall length required to provide pile stability, most lengths of beam were spliced. Splice plates and fastening bolts were also observed intact. Splice plate metal thickness measured at 13mm.
Splice plates were observed on upper beams runs 1 through 5 and lower beam runs A though D. The overall percentage rating of the reinforcing beams was estimated at 85-90%.

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CONCLUSION:

Fender pile system for the two(2) active berths at D-Jetty were inspected and documented as per specification requirements ordered. Upon initial arrival it became very evident that a large majority of the structures in question became exposed on the dropping tide. The low tide provided the Engineering crew a wide perspective and ample time to make necessary visual documentions in collaboration with visual information provided by the dive technicians. The biological marine growth proved to be very extensive and may or may not hide several further deficiencies that will only be seen upon full extraction. However, the overall assessment proved to be quite valuable in determining that the majority of the fender pile damage was localized to the intertidal area of the piles by way of extensive rub wear from both the tree savers and camel fenders alike. That said, the overall cndition of the remaining timber throughout most of the piles was generally observed with light to moderate damage and with an overall rating of +/- 70-80% remaining.

Please reference the still photographs supplied for a full visual documentation and representation of the structures as viewed in order to provide an indication of the present condition mentioned herein.

I trust this information meets your requirements.

If I can be of further service or assistance, please do not hesitate to call me.

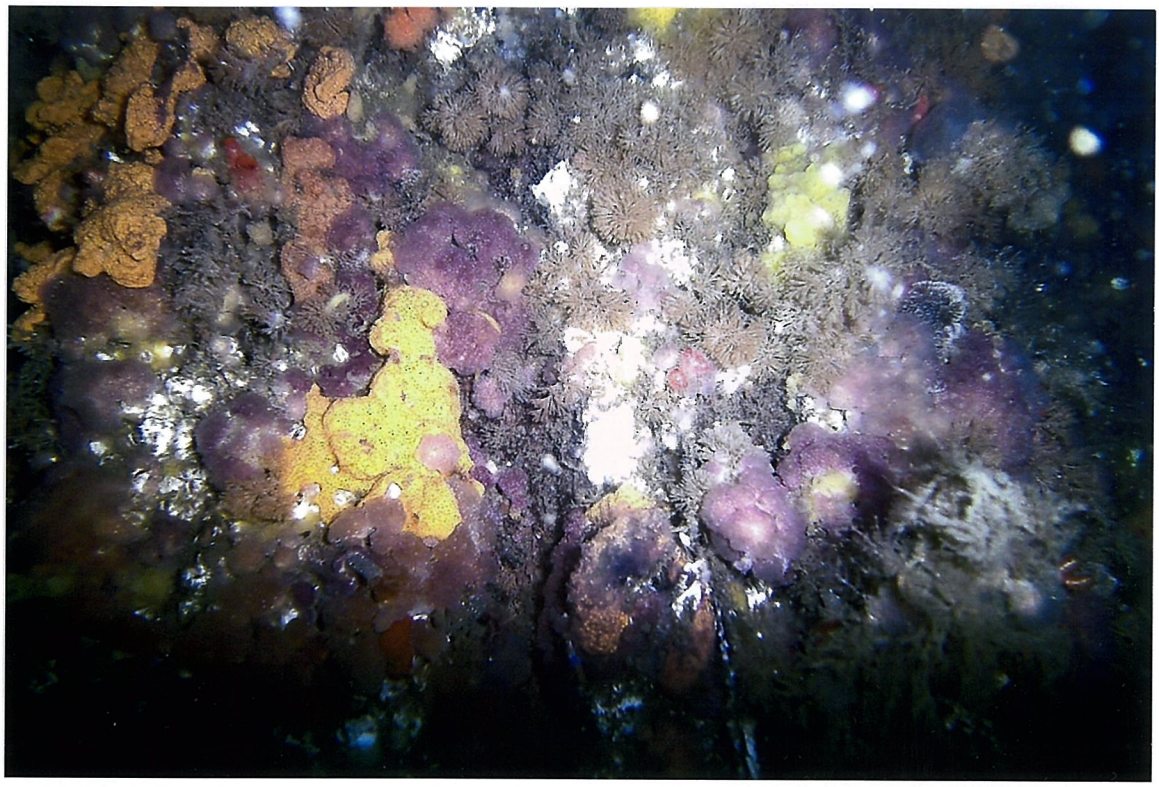
Sincerely yours,

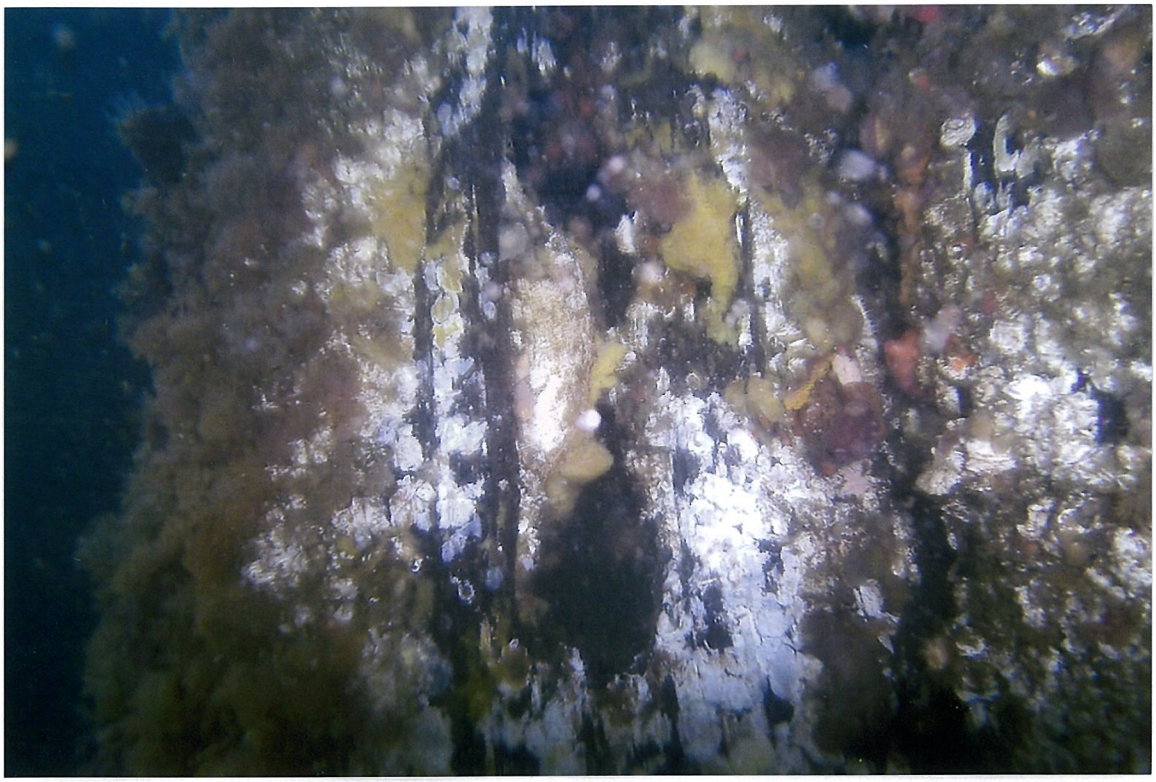
Patrick R. Thompson
President/General Manager

Policy Schedule

BINDER AGREEMENT REFERENCE:	B6012BEAZPLLIAB15
UMR:	W0035615PNVE
TYPE:	Marine Liability PI/Logistics
BROKER:	Aon Reed Stenhouse Inc. 401 West Georgia Street, Suite 1200 PO Box 3228 Vancouver Canada V6B 3X8
INSURED:	South Coast Diving Ltd
ADDRESS:	825 Admirals Road Victoria V9A 2PI Canada
PERIOD:	Effective from: 30 November 2015 To: 29 November 2016 Both days inclusive, Local Standard Time at the domicile of the (Re) Insured being CANADA
INTEREST:	To indemnify the Insured against their legal liability, costs or expenses arising out of the Insured's services: **Marine Surveyor** **Marine Consultant** **Ship Inspector** **Pipeline Inspector**
TRADING AREA:	Worldwide (please see policy wording and sanctions limitation clause for territorial exclusions)
LIMIT OF LIABILITY COVER SECTION 1:	CAD 1,000,000.00 Each occurrence and in total for the policy period
GENERAL DEDUCTIBLE COVER SECTION 1:	CAD 5,000.00 Each Occurrence

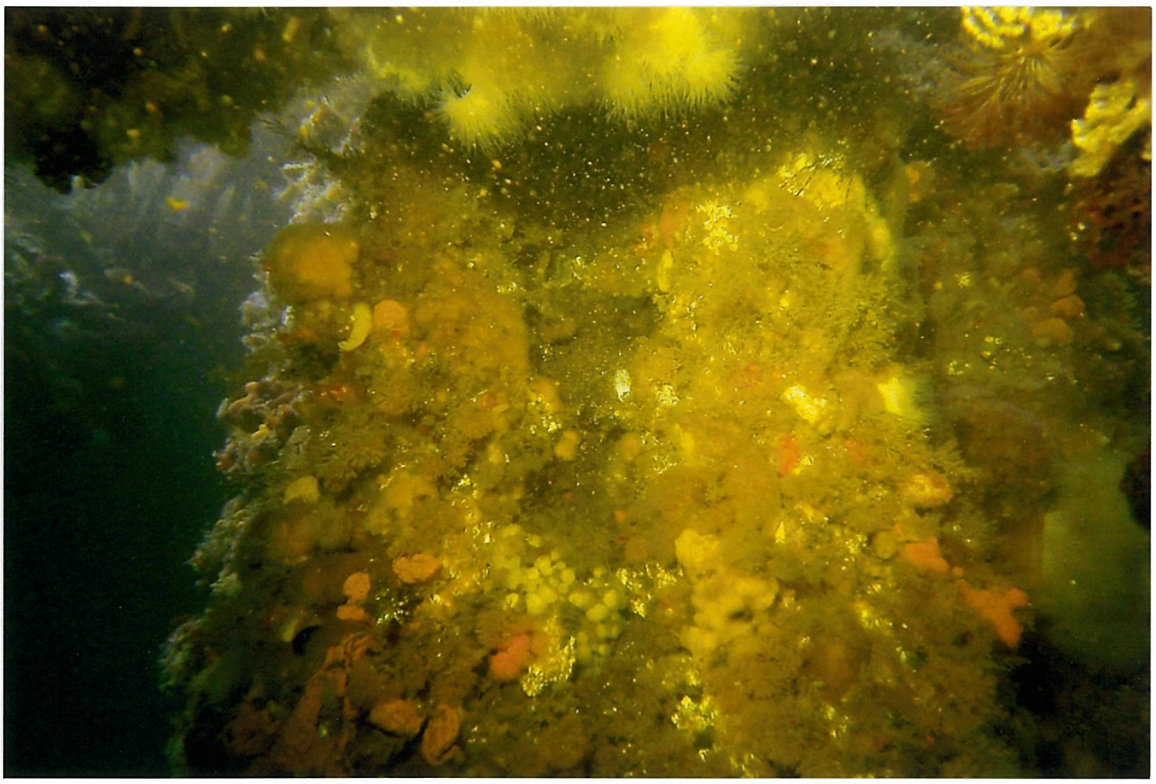
GENERAL CONDITION VIEWS OF EXTENT OF MARINE GROWTH ON PILES





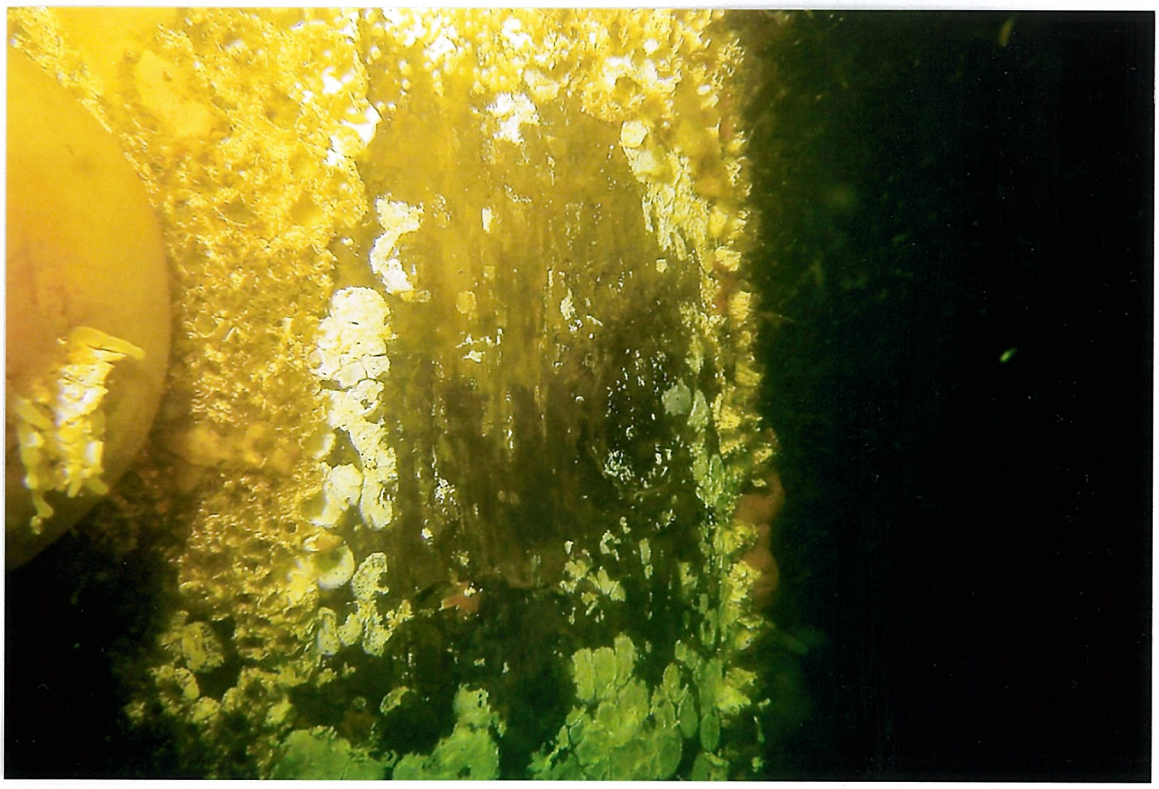
PILE GROUP 15 PILE #1 DAMAGE

PILE GROUP 16 RUBBING POLE DAMAGE

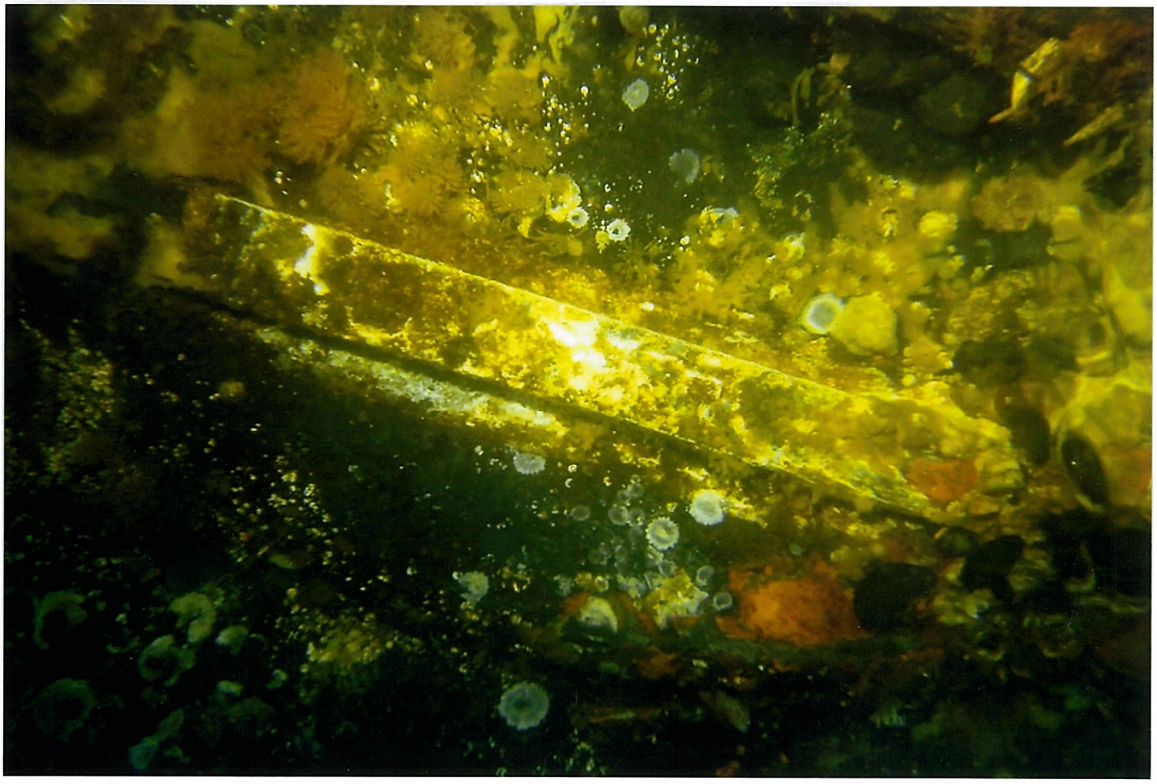


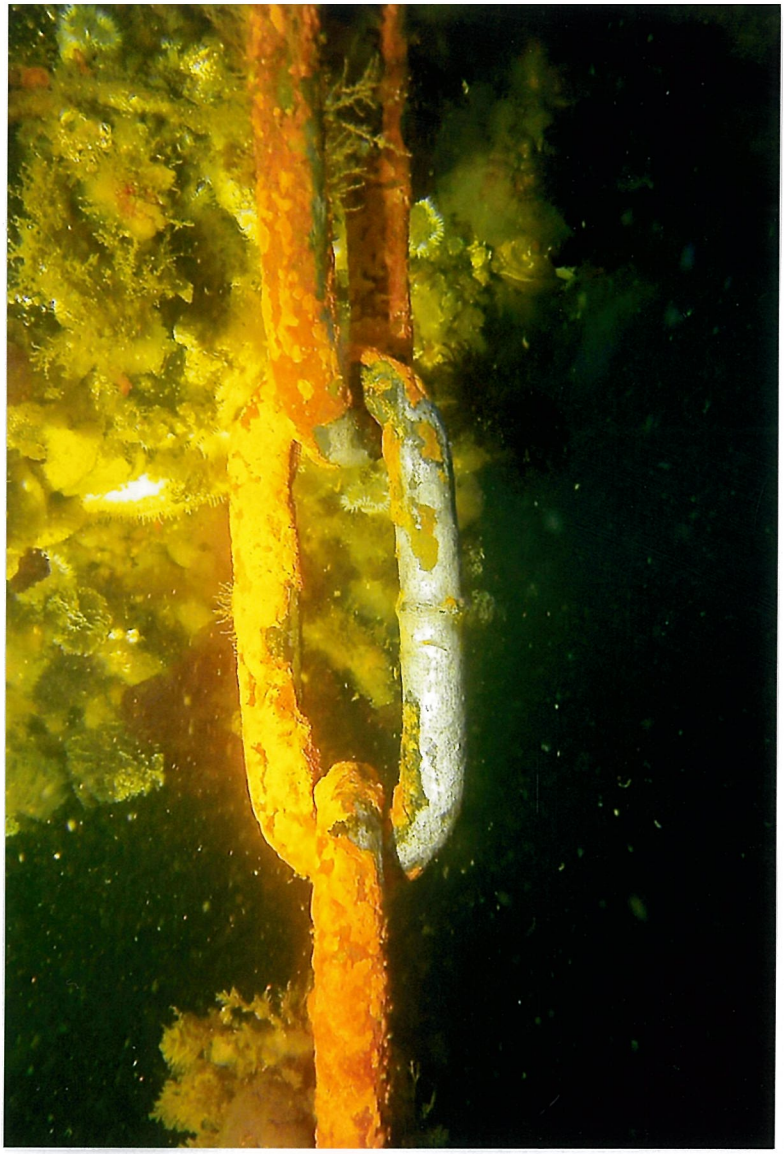
SPOT CLEANING VIEWS ON PILE GROUP 17

SPOT CLEANING VIEWS ON PILE GROUP 34

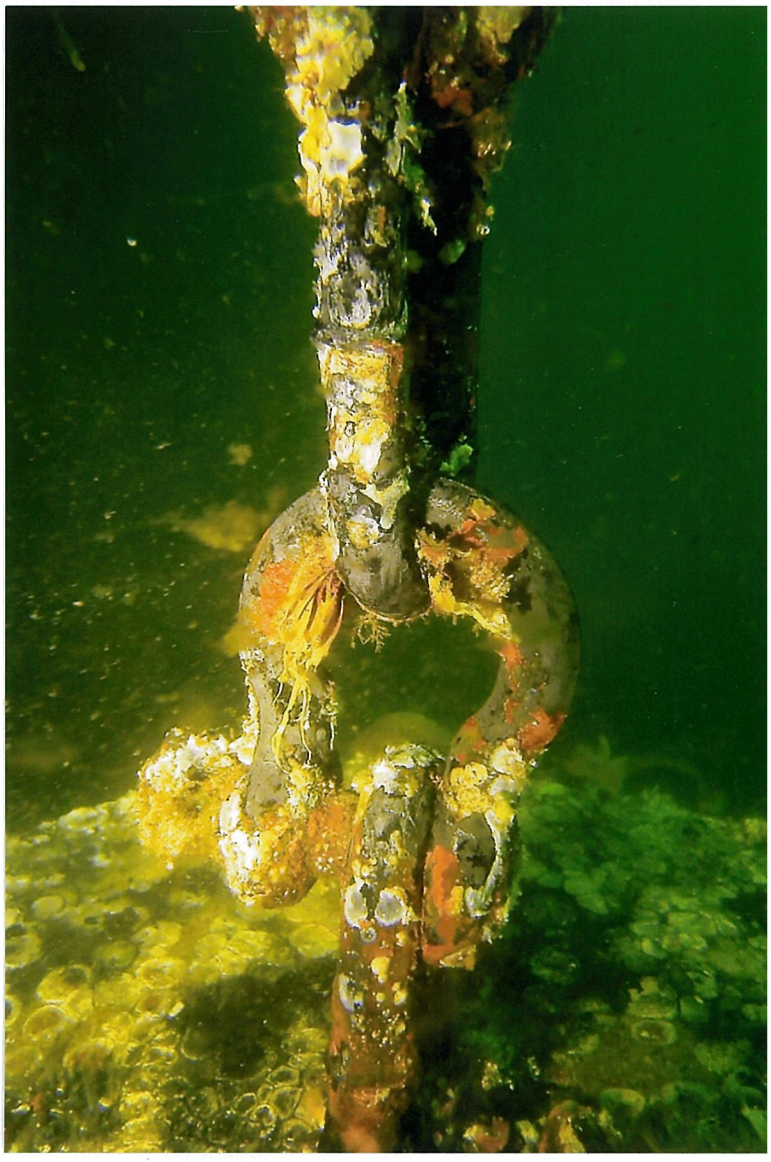


TREE SAVER STEEL CHAIN GUIDE CONDITION AFTER CLEANING
AND VIEW OF DEPLETED BAR ANODE

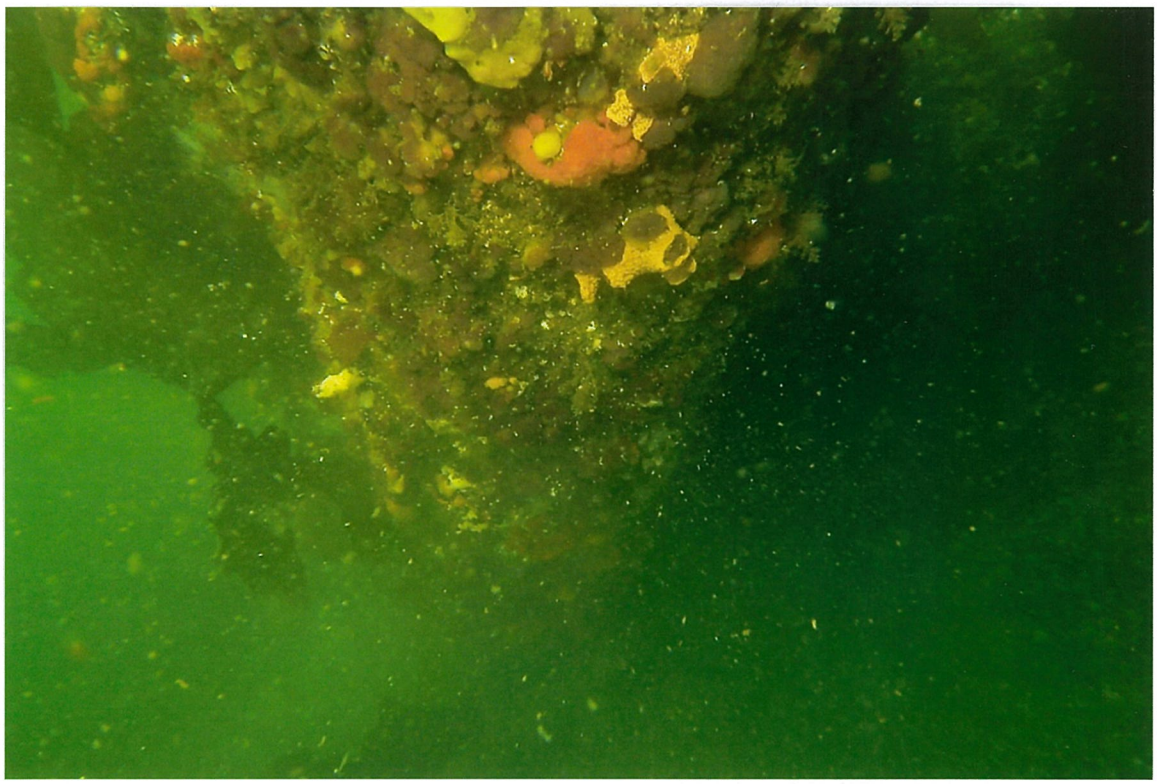




OVERALL TREE SAVER MOORING CHAIN CONDITION

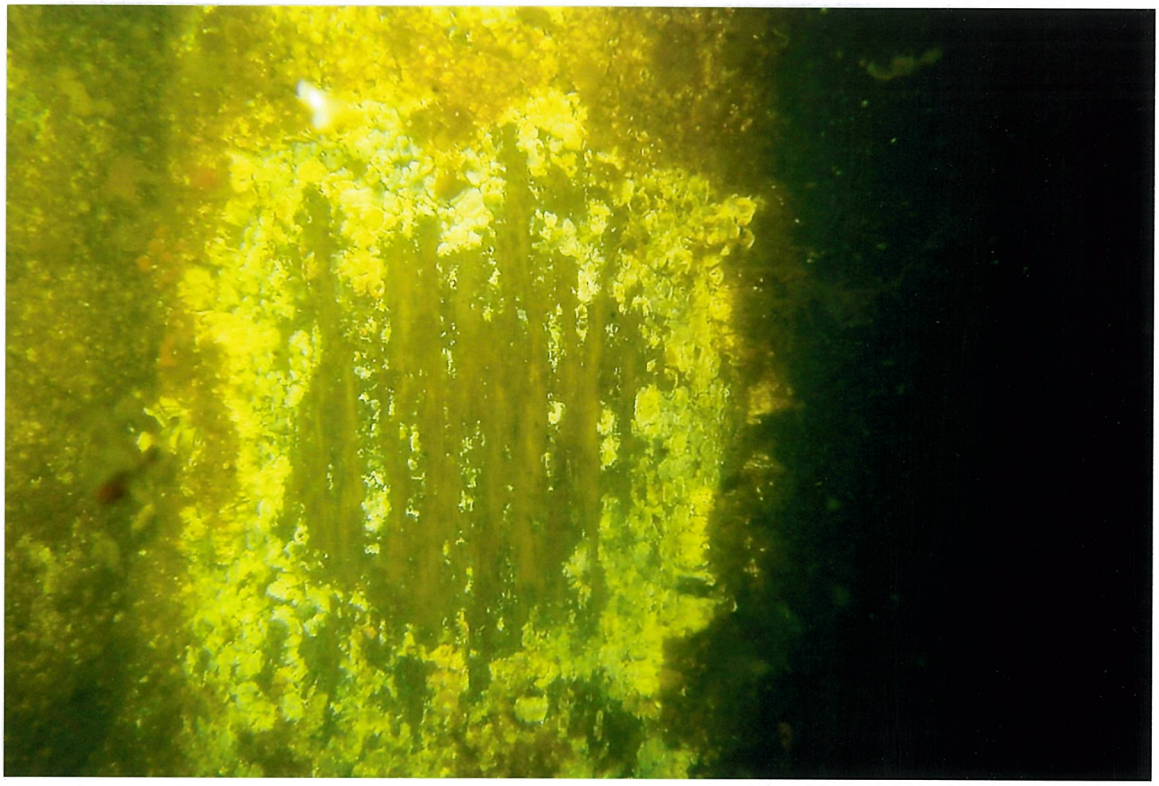


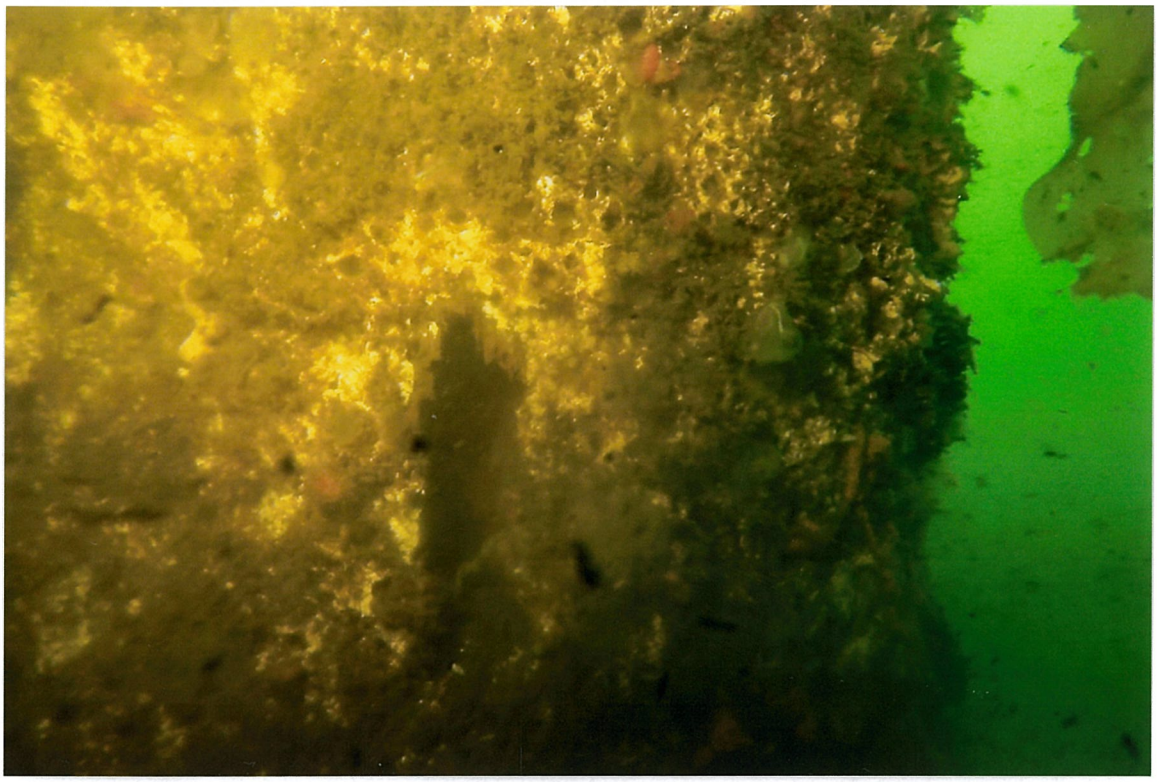
GENERAL PILE MARINE GROWTH OBSERVED ON THE EAST BERTH



PILE GROUP 17A PILE #1 SEVERED PILE

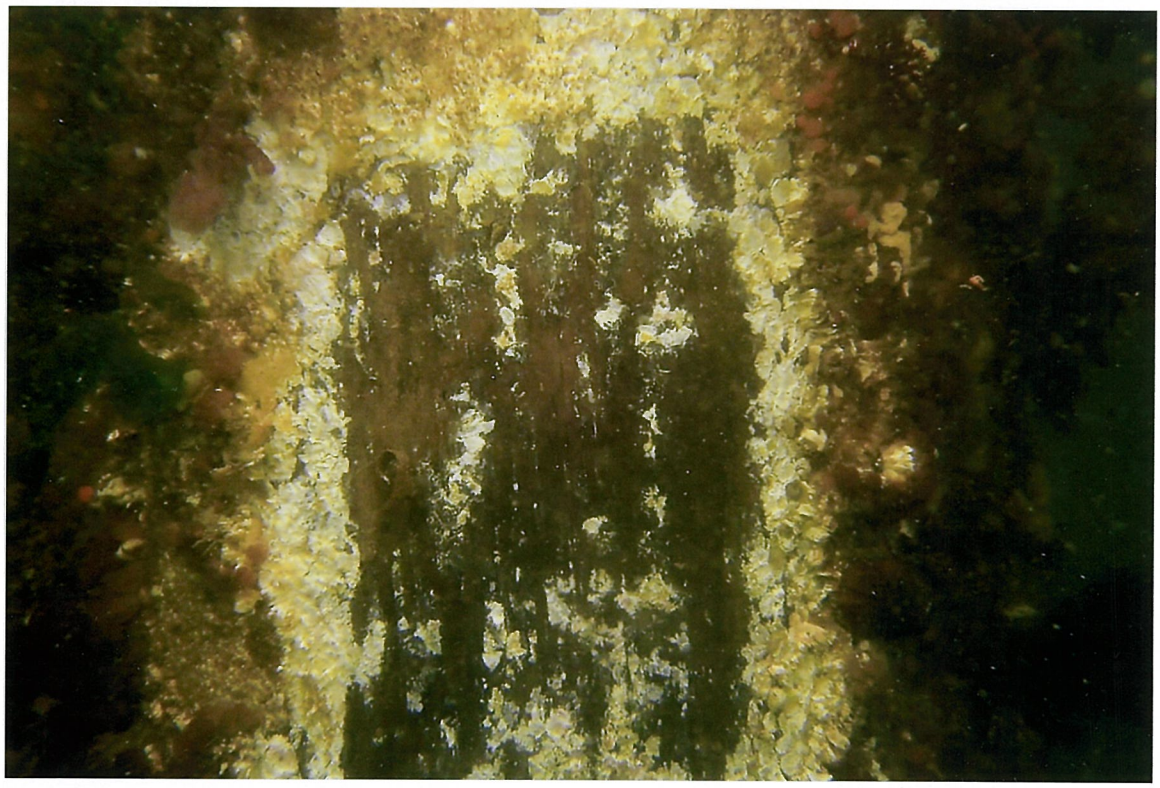
PILE GROUP 19A PILE SPOT CLEANING

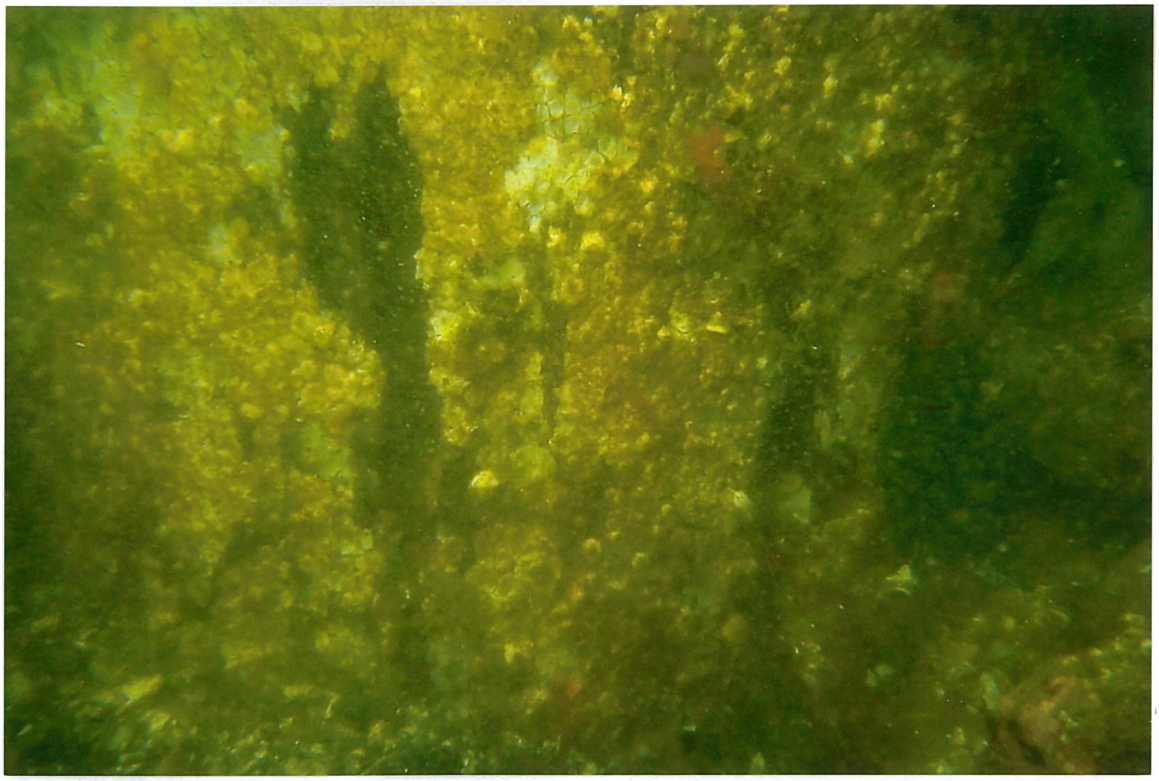




PILE GROUP 21A PILE #2 HOLE

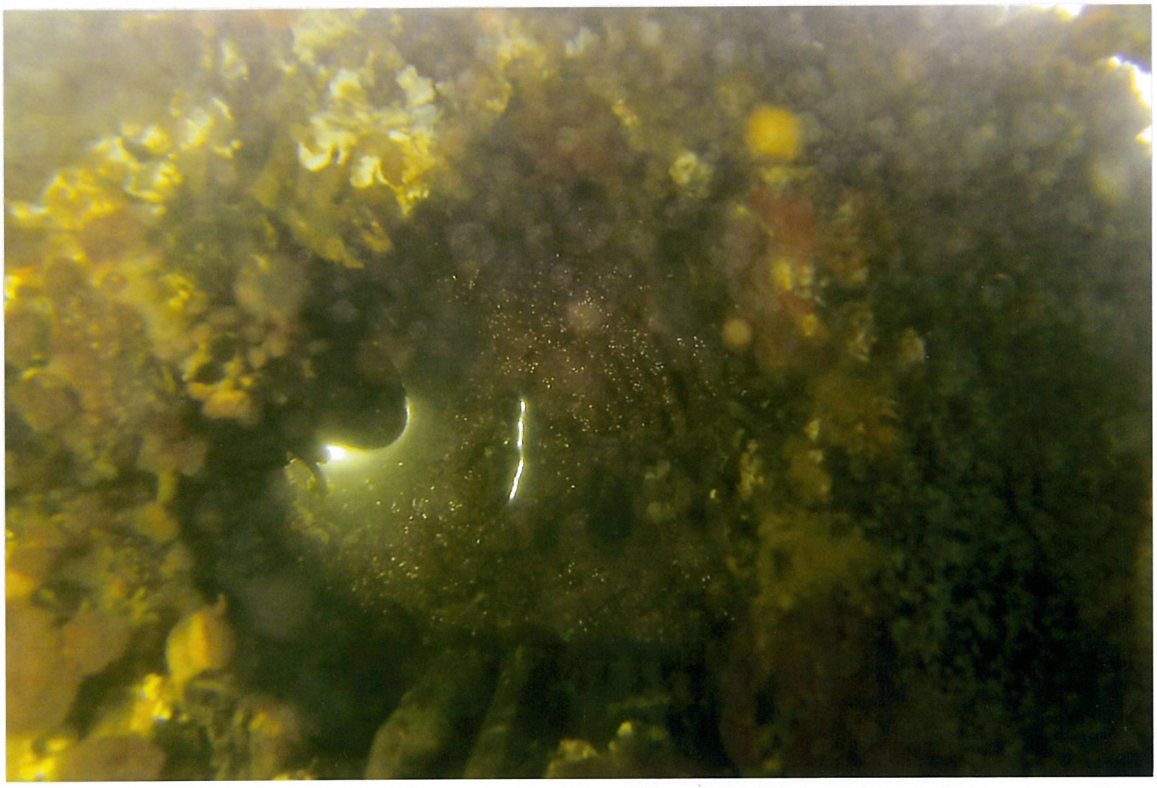
PILE GROUP 51A SPOT CLEANING VIEW

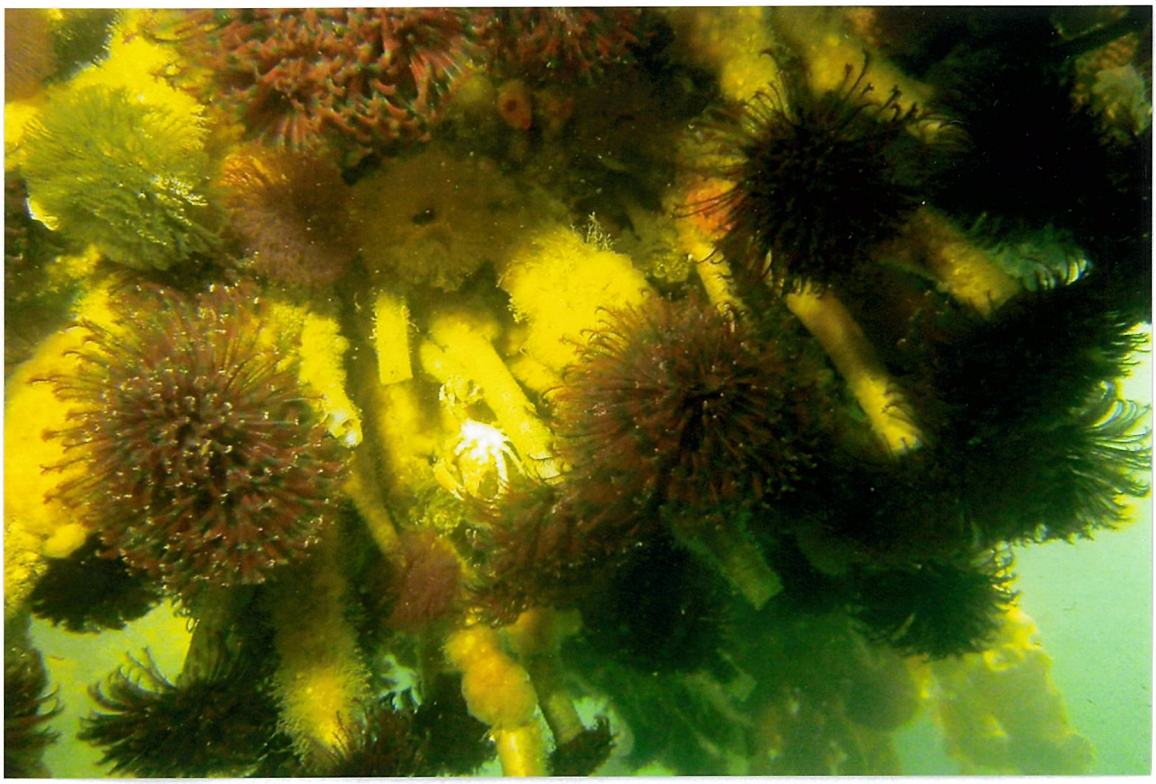




PILE GROUP 55A PILE 25 HOLLOWED AT GROUND LEVEL

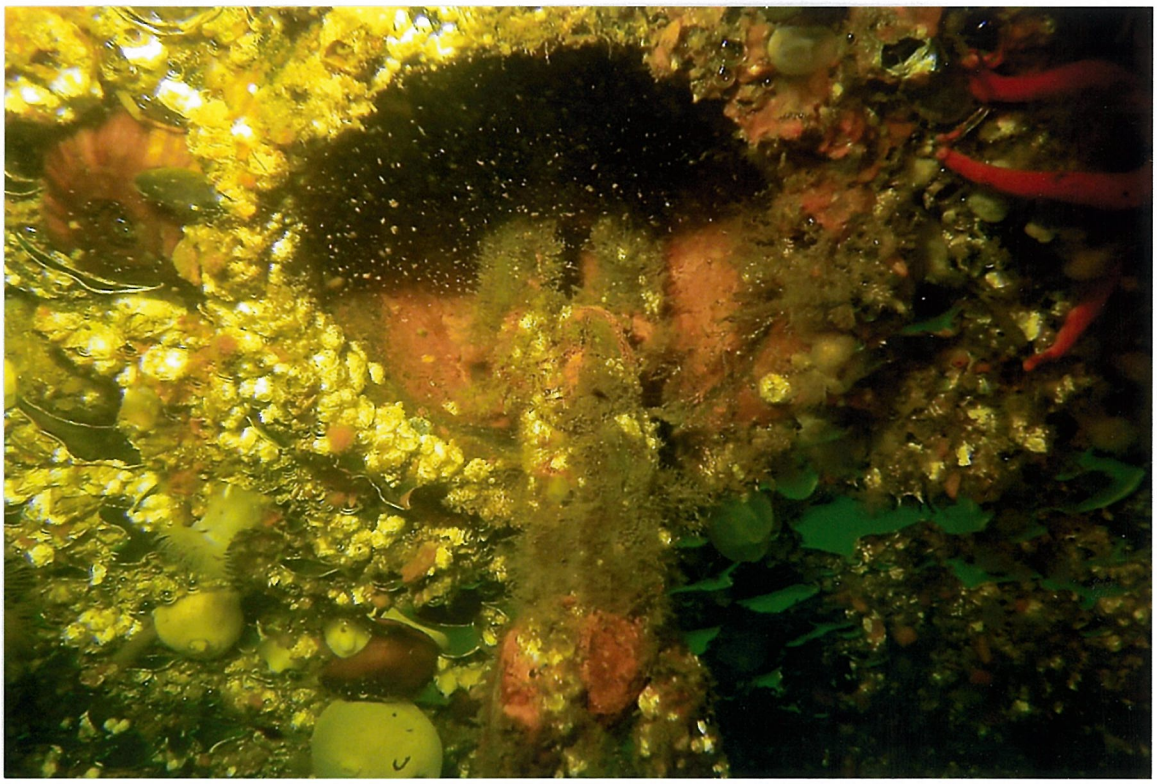
PILE GROUP 55A RUBBING POLE HOLLOWED OUT HOLE





EXTENT OF MARINE GROWTH ON CAMEL FENDERS

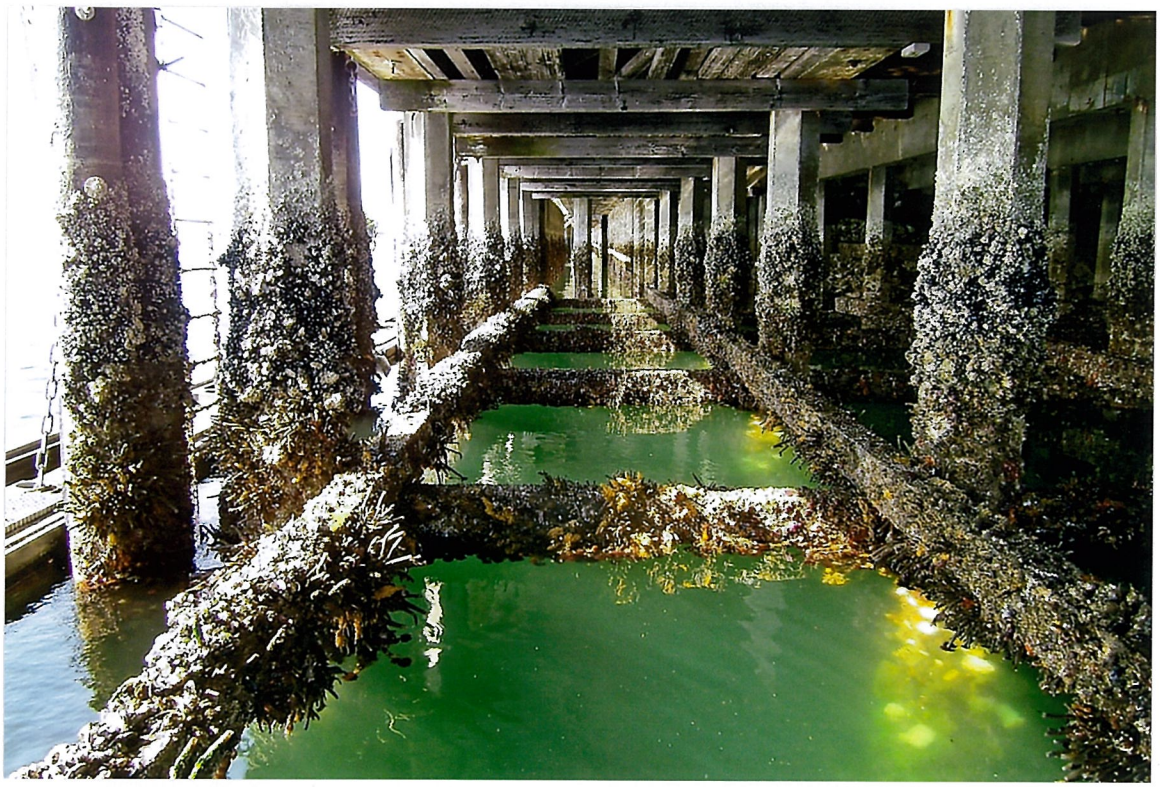
MOORING CHAIN SLEEVE THROUGH CAMEL FENDERS



GENERAL CONDITION OF MOORING CHAINS AND COUNTER WEIGHT FOR CAMEL FENDERS

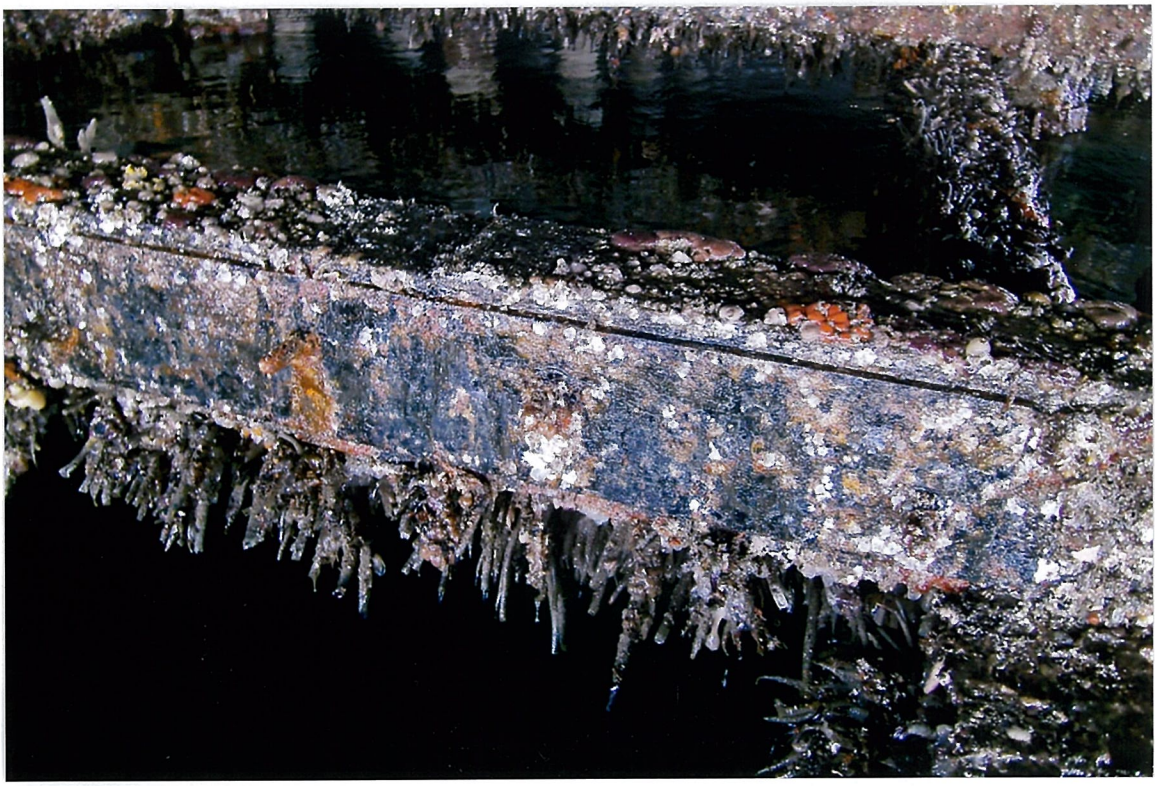
VIEW OF EXPOSED CROSS BRACING LOOKING EAST ON NORTH BERTH

VIEW OF EXPOSED CROSS BRACING LOOKING SOUTH ON EAST BERTH



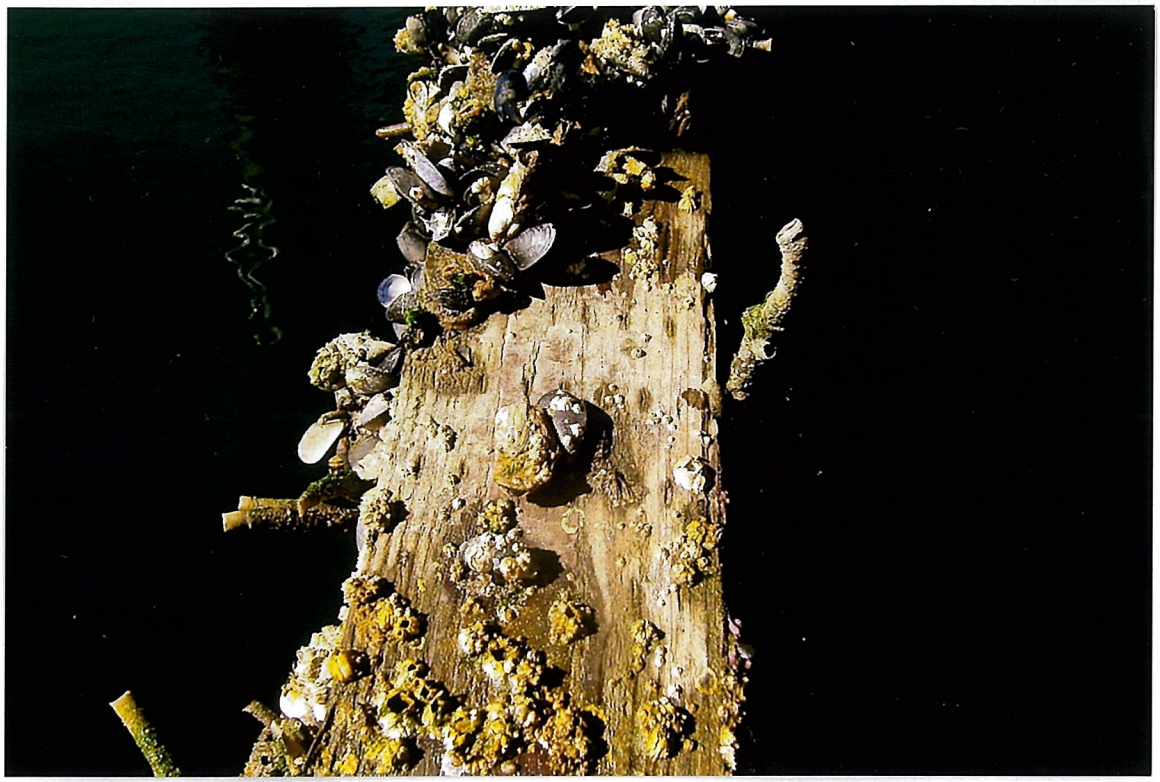
CROSS BRACE TIMBER BEAM JOINTS

CROSS BRACE TIMBER BEAM SPLICE PLATES



VIEW OF CROSS SECTION END OF UPPER NUMBERED BEAMS

VIEW OF PILE CLAMPS FOR LOWER LETTERED BEAMS



VIEW OF TIMBER CONDITION FOR UPPER NUMBERED BEAMS

VIEW OF TIMBER CONDITION FOR LOWER LETTERED BEAMS