



# Waitaki

DISTRICT COUNCIL

TE KAUNIHERA Ā ROHE O WAITAKI

## Notice of Meeting

and

## AGENDA

### *Harbour Area Committee*

in the

Council Chamber, Third Floor, Waitaki District Council Headquarters,  
20 Thames Street, Oamaru

**Tuesday 8 May 2017 at 3.00pm**

#### **MEMBERSHIP:**

Mayor Gary Kircher (Chair)  
Cr Jeremy Holding  
Cr Jim Hopkins

Deputy Mayor Melanie Tavendale  
Cr Guy Percival  
Cr Colin Wollstein

# Harbour Area Committee Meeting

## Agenda

**Tuesday 8 May 2018**

**Council Chamber, Third Floor  
Waitaki District Council Headquarters  
20 Thames Street, Oamaru**

	Page/s
1. <b>Apologies</b> – Cr Colin Wollstein (overseas)	
2. <b>Declarations of Interest</b>	
3. <b>Confirmation of Previous Meeting Minutes</b>	
• <b>3 May 2017</b>	4 – 5
4. <b>Harbour Projects</b>	
• <b>Memorandum and Recommendation</b>	6 – 19
5. <b>Resolution to Exclude the Public</b>	–

That the public be excluded from the following parts of the proceedings of this meeting, namely items 6, 7, and 8.

The general subject of each matter to be considered while the public is excluded; the reasons for passing this resolution in relation to each matter, and the specific grounds under Section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are as follows:

General subject of each matter to be considered	Reason for passing this resolution in relation to each matter – Section 48(1)
<b>Public Excluded:</b>	
6. Harbour Proposals PE	To protect the privacy of natural persons. Section 48(1) (a).
7. Lease of Land PE	(The disclosure of the information would cause unnecessary personal embarrassment to the persons concerned.)
8. Visitor Accommodation Update PE	To enable the Council to carry out commercial negotiations without prejudice or disadvantage. Section 48(1)(a) (Premature disclosure of the information would detrimentally affect the Council's position in the negotiations.)

These resolutions are made in reliance on Section 48(1) of the Local Government Official Information and Meetings Act 1987 and the particular interest or interests protected by Section 6 or Section 7 of the Act or Section 6 or Section 7 or Section 9 of the Official Information Act 1982, as the case may require, which would be prejudiced by holding of the whole or the relevant part of the proceedings of the meeting in public are as shown above (in brackets) with respect to each item.

- |    |  |         |
|----|--|---------|
| 6. | <b>Harbour Proposals PE</b>            | 20 – 23 |
|    | • Report and Recommendations           |         |
| 7. | <b>Lease of Land PE</b>                | 24 – 28 |
|    | • Report and Recommendation            |         |
| 8. | <b>Visitor Accommodation Update PE</b> | 29 – 31 |
|    | • Memorandum and Recommendation        |         |

### **Resolution to Return to Public Session**

That the Harbour Area Committee resumes in open meeting and decisions made in public excluded session are confirmed and made public as and when required and considered.

9. **Release of Public Excluded Information**  
 Public excluded information that is approved for release during the Public Excluded session of this meeting will be included in the public minutes of this meeting, under Agenda Item 9.

### **Harbour Area Committee:**

Mayor Gary Kircher (Chair)	Deputy Mayor Melanie Tavendale
Cr Jeremy Holding	Cr Guy Percival
Cr Jim Hopkins	Cr Colin Wollstein

**Waitaki District Council****Harbour Area Committee**

**Minutes of the Harbour Area Committee Meeting  
held in the Council Chamber, Third Floor, Waitaki District Council  
Headquarters, 20 Thames Street, Oamaru  
at 2.00pm on Wednesday 3 May 2017**

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**Present** Mayor Kircher (Chair), Crs Holding, Hopkins, Percival, Tavendale, and Wollstein (from 2.05pm)

**In Attendance** Cr Garvan  
Cr Wheeler  
Mr Jorgensen (Assets Group Manager)  
Ms McNeill (Property Officer)  
Mrs Tanner (Policy Officer – Governance)

**Declarations of Interest**

There were no declarations of interest.

**Apologies**

RESOLVED  
HAC17/001

Cr Hopkins / Cr Garvan  
That an apology for lateness be received from Cr Wollstein.

CARRIED

**1. Harbour Land**

To formally request ideas from interested parties in Harbour accommodation development as indicated in the Harbour Strategy 2011.

RESOLVED  
HAC17/002

Cr Tavendale / Cr Hopkins  
The Harbour Area Committee recommends that Council:  
1. Proceeds with releasing an Expression of Interest (EOI) document seeking interest from parties in the Harbour Land, while keeping the community informed of progress.

CARRIED

**2. Harbour Strategy 2017**

The purpose of this memorandum is to let people know that the Harbour Area Committee has started the process to update the Harbour Strategy 2011.

RESOLVED  
HAC17/003

Cr Wollstein / Cr Hopkins  
The Harbour Area Committee receives the information.

CARRIED

There being no further business, the Chairman declared the meeting closed at 2.25pm.

Confirmed on this 8<sup>th</sup> day of May 2018 in the Council Chamber of the Waitaki District Council Headquarters, 20 Thames Street, Oamaru.

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Chairman

UNCONFIRMED

# Harbour Area Committee Report

**From** Property Officer

**Date** 8 May 2018

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## Harbour Projects

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### Recommendations

The Harbour Area Committee recommends:

That Council:

1. Approves the removal, relocation and reinstatement of the hut and mast with a \$20,000 budget funded from the Harbour Project fund.
2. Approves the replacement of Holmes Wharf entrance fencing with Oamaru stone block and signage with a \$1,500 budget funded from the Harbour Project fund.
3. Approves the installation of globe lights on the lampposts adjacent to the Esplanade with a \$20,000 budget funded from the Harbour Project fund.
4. Approves the construction of a viewing area on Sumpters Wharf with a \$35,000 budget allocated as part of the Holmes Wharf re-decking project.
5. Receives and notes the information on the other projects.

### Objective of the Decision

To approve and allocate funding to a number of projects in the Harbour area.

### Summary

To provide the Harbor Area Committee with a formal overview of the current projects underway in the Harbour area.

### Summary of Decision Making Criteria

	No/Moderate/Key		No/Moderate/Key
Policy/Plan	No	Environmental Considerations	No
Legal	No	Cultural Considerations	No
Significance	No	Social Considerations	Key
Financial Criteria	Key	Economic Considerations	Key
Community Views	No	Community Board Views	No
Consultation	No	Publicity and Communication	No

### Background

The Harbour Area Committee has been working for some time on a number of projects in the Harbour area. This report provides a formal update on the status of the projects, with a number now at a stage where funding is required to progress them. There is also other work underway that impacts some of the Harbour proposals. In particular, a key project is the development of a collaborative Heritage Precinct, Harbour and Surrounds Strategy. This is being led as part of the District Plan review and provides an important foundation for future work in the Harbour. For example, the Urban Park project will be guided somewhat by the Strategy. The Strategy is not included as part of the project in this report, as it is currently included in the District Plan process. It is expected that the Harbour Area Committee will have a key role in the development of the Strategy as it progresses.

The report now focuses on the various projects, with ones requiring a decision near the beginning of the report and the list where work is still required before bringing to the Committee for formal discussion and decision making.



## Relocation of Hut and Flagpole

### Summary

Leading marks for the harbour entrance channel have been installed near the boat launching ramps. The Harbour Master has identified that there is significant visual clutter around the lead marks due to several structures, all of which are painted white. These structures include a hut and flagpole.

The flagpole is owned and used by the North Otago Yacht and Power Boat Club. Council officers are in receipt of a letter dated 12 April 2018 advising that the Club would like to see the flagpole moved to the west of the Club rooms.

Historically, the hut has had a flagpole close by, and therefore it would be ideal to keep them together.

A price to remove, relocate and reinstate has been requested from a contractor. This is estimated to be \$20,000.

### Option 1 – Do nothing

Do nothing is not considered as an option as changes are required to improve navigational safety.

### Option 2 – Relocation (recommended)

This option ensures that the hut and flagpole continue to be part of the harbour area.

### Assessment of preferred option

Option 2 is the preferred option as it meets navigational requirements and keeps the assets in the harbour area.



Image 1 – Hut situated next to a flagpole



Image 2 – Current location and proposed

## Gateway to Holmes Wharf

### Summary

The entrance to Holmes Wharf is dated and in need of replacement. The existing fencing and netting has been removed from the left side of the entrance. However, the entrance needs to be addressed. Materials currently used in and around the harbour area include Oamaru stone blocks and Corten steel. It is suggested that, to ensure continuity within the area, these materials are used again. This theme could be continued on for the naming of the other wharves in the future. Based on the proposal in image 2, the project is estimated to cost \$1,415 + GST.

Stone Blocks	\$80 + GST per block	\$480
Signage	2000 x 500 steel sign	\$335
Freight and ground levelling	Estimate	\$600
Total		\$1,415

### Option 1 – Do nothing

Do nothing is not considered as an option as the entrance is run down and in need of replacement.

### Option 2 – Approve replacement of the wharf entrance (recommended)

This option provides a welcome visual boost to the area at a reasonable cost.

### Assessment of preferred option

Option 2 is the preferred option as it addresses the run-down fencing and is in keeping with the area.



Image 1 - Existing fencing



Image 2 - Proposed concept for the entrance to Holmes Wharf



## Globe Lights on Esplanade

### Summary

The stone wall along the Esplanade has 25 lampposts. The lampposts have no power, and their lamps were removed some time ago.

As part of tidying up the Harbour area, the 25 lampposts could be painted in rust-effect paint in keeping with the Steampunk theme in the area and 3D printed solar -powered lithospheres could be placed on the lampposts.

The lithospheres would have etched imagery to tell a story about the harbour and would light up in the evening (powered by a solar panel).

The estimated cost is \$19,265 + GST, broken down as follows:

25 x globes	\$13,765
Electrical - Estimated	\$500
Rust Paint - Estimated	\$1,000
Painting - Estimated	\$4,000
Total	\$19,265

### Option 1 – Do nothing

The area would continue to look as it does now.

### Option 2 – Conduct a Trial

One globe could be constructed and feedback sought. The estimated cost is \$2,000.

### Option 3 – Install all of the lights (recommended)

This option provides more efficiency overall, with economies of scale achieved and provision of a complete visual experience.

### Assessment of preferred option

Option 3 is the recommended option as it improves the look of the entire area and has good economies of scale.

## Sumpter Wharf Viewing Area

### Summary

Work has been underway to assess the work required to make viewing the Sumpter Wharf easier and for the area to look more attractive than the existing barriers. The proposal has been reviewed by Council's coastal engineer, and the inspection report is attached.

### Option 1 – Do nothing

The area would continue to look as it does now.

### Option 2 – Construct a viewing area on Sumpters Wharf (recommended)

Sumpter Wharf is an important piece of the Oamaru Harbour history and improving access and visibility will help locals and visitors take a better look at it as well as improving the visible look of the area. A viewing area could extend to Pile 3 with a \$15k investment in piles and bracing. It is anticipated that another \$20k would be needed for rock work, professional fees, Heritage New Zealand approval, decking, fencing and contingency.

### Option 3 – Reconstruct more viewing-friendly fencing

This option would remove the existing fencing and replace it with a more viewing-friendly version. The fencing would not encroach onto the wharf, meaning that the additional works in option 2 would not be required. The estimated budget required would be around \$8,000.

### **Assessment of preferred option**

Option 2 is the recommended option as extending the viewing area onto Sumpters Wharf would significantly enhance the attractiveness of the historic wharf. The work is relatively feasible (for this type of project) and could be funded as part of the budget set aside for the Holmes Wharf re-decking project.

### **Slipway Options**

In November 2016, the Oamaru Slipway was reviewed and graded with a limiting factor of 7 tonne.

The booking form and operation was legally reviewed, to ensure Council was not exposed to risk associated with the slipway operation. The solicitor engaged a Marine Architect to provide vessel tonnage guidelines.

Council officers are investigating ways to enable the slipway to be suitable for vessels which are larger than 7 tonne. The slipway was extensively used during November and December 2017. Before the Christmas break, one of the side-arms broke and the operation of the slipway was stopped. The Marine Architect was engaged to review the slipway and advise the most practical way to increase the hauling tonnage at the same time.

The Marine Architect's report has now passed to a Marine Engineer with a request for a proposal on the process, cost estimates and timeframes. Once this information is received, a report will be provided to the Committee.

### **Navigational Signage**

The navigational signage will be jointly completed with the Otago Regional Council (ORC). ORC officers had wanted to hold off until the bylaws were in place and dredging had been completed, but they are now working to complete sooner. They will provide the content for Council to install signage which will be funded out of existing harbour budgets.

### **Otago Regional Council Harbour Bylaw**

Otago Regional Council is in the process of drafting a new navigational safety bylaw that will include the Oamaru Harbour. Otago Regional Council signed off the bylaw on 11 April 2018 and it will soon go out for public consultation.

### **Road Construction**

The road construction is well underway and still on track for completion on 7 May. The footpath and landscaping will be completed in the weeks following that date.

### **Dredging**

Officers have met with Port Otago and are currently developing dredging options and costings for further discussion with the Harbour Area Committee.

### **Holmes Wharf decking and utility renewal**

There is more deterioration of the Holmes Wharf piles than originally envisaged and further design work is required before the decking project can proceed. The team is currently waiting on information from the engineer regarding upgrade requirements of a 3 tonne loading area proposed adjacent to the 2015 upgrade, and potentially a heavy load area leading out to the wharf edge near the existing buildings. Information is also being gathered regarding power and sewer upgrades.

### List of Other Harbour Projects

This is a list of other harbour projects that are in various states of progress. Some may require allocation of funds and will come to a future Harbour Area Committee Meeting.

- Boat ramps
- Moorings
- Red Sheds leasing
- Interpretive signage regarding shags on Sumpter Wharf and liaison with Forest and Bird
- Urban Park
- Penguin Colony Carpark – Improvements to carpark.
- Harbour Street beautification
- Renovation of interpretive signage (rusty pipe signs)
- Sleepers at entrance to Holmes Wharf
- Bollards on Tyne Street, Harbour Street and Wansbeck Street
- Oamaru Steam and Rail matters, including Bridge Trusses use and incorporation with rail
- Suspension bridge decoration options – Decoration to the suspension bridge including lighting will be decided after the completion of construction. The suspension bridge is expected to be completed by the end of June.
- Possible steam crane relocation.

### Harbour Budget

The Separate Rate Reserve Balance as at 30 June 2017 was \$194,800. Assuming the 2018 financial year goes to budget, as well as allowing for the 2017 carry forward funds, the available Separate Rate Reserve Balance reduces to \$24,188.

The 2017 carry forward projects are:

Project Description	Carry Forward Total	Funding Separate Rate Reserve	Funded from other sources	Other sources of funding
Freezer Building Investigation	35,000	35,000	n/a	n/a
Harbour Projects	48,000	28,000	n/a	n/a
Holmes Wharf Deck Replacement	787,612	87,612	700,000	Internal Loan
Breakwater Maintenance	200,000	n/a	200,000	Depreciation Reserves
<b>Total</b>	<b>1,070,612</b>	<b>170,612</b>	<b>900,000</b>	

Special Fund Reserve Balances:

Special Fund Reserve Description	Balance as at 31 December 2017	Restrictions
Harbour Sale of Land	482,248.46	If not in cash earning interest for the harbour endowment activity. Should be invested in land and building assets. Note: since interest on cash deposits are applied to the harbour endowment activity, this balance does not grow.

Depreciation Reserves Balances:

Depreciation Fund Reserve Description	Balance as at 30 June 2017	Comments including any restrictions
Breakwater (Coastal Protection)	(72,480.40)	Currently in deficit, but is only available for the breakwater. Of the annual \$237,137 depreciation charge, only \$100,000 is funded.

Wharves, Slipway and Waterways	4,383.29	Currently do not fund the wharves and slipway rails and cradle depreciation. Do fund \$2,947 for the Slipway building; slipway waste pump station; Holmes Wharf chip-seal surface from asphalt to 6m past the gate; and Holmes Wharf area CCTV.
Buildings and Miscellaneous Assets	86,573.85	Currently do not fund the following buildings: Freezer Building; Harbour House (2 Test Street); and Scotts Brewery. Do fund the following buildings: Holmes Wharf Sheds; Steam Café; Fair Ground Signalman's Hut; Penguins Nest Café. Other assets funded: Friendly Bay Sewer Pump Station; Marine Parade Wall and Other Miscellaneous Fencing/Barriers; Oamaru Harbour Mast; and Friendly Bay Power Supply/Meter Box.

Rachel McNeill  
**Property Officer**



Neil Jorgensen  
**Assets Group Manager**

**Attachments**

Additional decision making considerations  
Inspection report: Sumpter Wharf, Oamaru Harbour

**Additional Decision Making Considerations**

The following matters have been considered in making the decisions.

**Outcomes**

We provide and enable services and facilities so people want to move here and stay here.  
We enable opportunities for new and existing services.



## OFFSHORE & COASTAL ENGINEERING LIMITED

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New Zealand  
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27 March 2018

Waitaki District Council  
PO Box 50058  
OAMARU 9444

Attention Rachel McNeill

Dear Madam

### **INSPECTION REPORT: SUMPTER WHARF, OAMARU HARBOUR**

#### **1.0 INTRODUCTION**

Offshore & Coastal Engineering Limited (OCEL) was engaged by Waitaki District Council (WDC) to undertake a below deck inspection along an inshore portion of the Sumpter Wharf, Oamaru. The inspection was restricted in scope to the first three inshore pile bents closest to the shore abutment. It is understood WDC are considering relocating the existing barrier fence to allow pedestrian access onto a confined area of the wharf deck. This would involve shifting the barrier a maximum two pile bents offshore of its current position. The inspection which was undertaken on 13 February 2018 was limited to visual assessment of the timber structural elements below deck and above low water. It did not include below water dive inspection since the structure inspected is above low tide water level over a rock armour slope other than for the third pile bent.

#### **2.0 WHARF DESCRIPTION**

Sumpter Wharf was constructed during 1883 to 1884 specifically for the frozen meat trade. The wharf is constructed using Australian hardwood timber piles to provide a 300 ft (92 m) long berth either side. The wharf has a curved transition at the inshore end both to align it with the direction of the incoming refracted and diffracted swell waves entering the port to reduce vessel movement alongside the wharf, and allow a curved railway transition onto the wharf.

#### **3.0 PREVIOUS REPORTING**

OCEL undertook an inspection of Sumpter Wharf along its entire length in 2011, the principle focus of that inspection was the condition of the piles supporting the wharf. All of the piles were found to be waisted, ie to have a reduced cross section and diameter at the low water level. 67% of the piles were found to be no longer effective in taking any significant load (80% reduction in cross section area) with partial and progressive collapse to be expected. The hour glass type erosion centred on the low water mark was a result of marine borer attack. Cross bracing across the length of the wharf was also found to be in generally poor condition with the majority of the deterioration caused by marine borer attack concentrated around the bolted connections. The wharf deck support timbers – capping and deck beams as well as the deck timbers were found to be in deteriorated condition but much of it considered salvageable on an element by element basis. The pile replacement and repair was seen as the

largest cost proportion in the reinstatement of the wharf, relying on specialist plant and equipment, thus affecting the economic viability of full reinstatement.

#### **4.0 CURRENT CONDITION**

The wharf is over 130 years old, well beyond its original design life estimated in the order of 50 years. Based on the historic noted damage the wharf has been fenced off to public access, its structure only subject to self weight and imposed loading from the local shag population. The 2018 inspection was limited to the three pile bents formed within the sloping rock armour at the inshore end – Photograph No 1. We understand the WDC wish to extend pedestrian access beyond its existing location.

##### **4.1 Piles**

The condition of the piles on bent 3 – Photograph No 2, was representative of the results from previous inspections, the majority of pile deterioration principally due to marine borer, either *Limnoria* or *Bankia*, attack. One of the load bearing piles was assessed as nonviable having effective 100% waisting – Photograph No 3. The two other load bearing piles had approximately 20% and 50% waisting. Furthermore, the raker pile on the eastern side had sustained 50% waisting, while the mooring pile on the western side had 100% waisting.

Piles on bents 1 and 2 visible above the rock armour slope were deemed in generally acceptable condition – Photograph No 5. Although the full extent of their condition could not be determined below the rock line it is unlikely any marine borer attack would have deteriorated the concealed pile lengths to the same scale as the exposed piles at low water. Notwithstanding this it is recommended a selection of piles driven within the rock armour, and also on bent 3 are load tested to prove their capacity to take imposed loads. This could be carried by placing concentrated loads over a selected pile representative of pedestrian surcharge over the area of the pile load catchment.

##### **4.2 Cross Bracing**

The cross bracing along bent 3 – Photograph No 2, was found to be nonviable, the timbers having deteriorated around the bolt holes through marine borer attack. The ability of the cross bracing to distribute load from a badly deteriorated or discontinuous pile to other piles through truss action developed by the cross bracing is therefore non-existent.

##### **4.3 Capping Beam and Deck Stringers**

The capping beams and stringers – Photograph No 4, appear structurally sound in general with localised deterioration occurred at the connections through moisture or water ingress. However the timbers in their current state would be considered capable of taking pedestrian access loads. A further assessment would have to be made of each element following removal of deteriorated decking timbers. The decking timber was assessed from the previous inspection to be badly weathered and affected by fungal attack.

##### **4.4 Repair/Reinstatement**

Pedestrian access could be extended out to pile bent 3 subject to replacement or repair of one of the three load bearing piles, and full reinstatement of cross bracing utilising new timber braces and bolt fixings. The heavily deteriorated mooring pile on the western side can be disregarded as it serves no purpose as a load bearing pile. Furthermore the eastern side raker pile's purpose to provide capacity against vessel berthing impact is irrelevant to pedestrian loading on the wharf deck and can also be ignored.

The affected load bearing pile could be repaired by bolting a steel jacket around the pile and the space between the pile and inside of the jacket grouted. The steel casing forms a structural component. This method has been applied for repairs to council wharves in Banks Peninsula, Christchurch, and on commercial wharves. Based on the degree of necking and slender tapered profile of the pile above low water it may be beneficial to cut out the pile at the capping beam connection and install a new pile section spliced to the existing pile stub below low water

using a grouted steel jacket. The cost for a pile jacket repair in consultation with an experienced marine contractor is in the order of \$10k ex GST. The viability of this repair depends on the quality of the timber below the waisting and ability to excavate material where required to expose a sufficient length of pile stub. Removal of rock armour around the pile is anticipated although the extent of this would be confirmed at the time of the work. Alternatively a new timber pile could be driven through the existing deck although this would need to be offset from the original pile location unless the original pile could be removed entirely. To achieve this would require floating plant with heavy driving gear, and is not the preferred solution. Shore based plant would require access to the deck which would likely require complete restoration of the wharf deck structure to allow the piling rig to progress.

The diagonal cross bracing along bent 3 would require complete removal and replacement with new timber sections and bolted connections. The estimated cost for this is in the order of \$5k ex GST.

Relocation of the barrier fence further along the wharf to pile bent 4 could be considered subject to a detailed below water inspection of the piles. The extent of deterioration below low water however is unknown although it is expected to be consistent with that found across the 2011 pile inspection.

## 5.0 CONCLUSION

An area of the Sumpter Wharf deck could be opened to pedestrian access limited to pile bent 3 subject to repair of minimum one load bearing pile on bent 3 and reinstatement of new cross bracing, in addition to replacement of the decking timbers where required. The pile repair forms the largest portion of the remedial cost due to requiring specialist equipment and marine contractor experience. It is recommended a selection of piles across bents 1 to 3 are load tested to confirm their load capacity – test loads would approximate pedestrian loading. The cost associated with deck repairs is anticipated to be low since recycled timber planks from Holmes Wharf could be used for Sumpter Wharf, replaced on a plank by plank basis, and could rely on volunteer input. The condition of the deck stringers and capping beams could be confirmed during removal of deteriorated timber planks and affected sections replaced where necessary. To extend the barrier beyond pile bent 3 to pile bent 4 would entail repair to a number of load bearing piles and reinstatement of the cross bracing, full extent of which would require below water investigation.

## 6.0 LIMITATION

This report has been prepared for the use of our client, Waitaki District Council. No liability is accepted for the use of any part of the report for any other purpose of by any other person or entity.

The observations made in this report are based on that encountered through visual inspection only. Destructive testing or removal of elements was not carried out and it must be appreciated that the condition of some connection details and elements having been concealed at the time of inspection may vary from the general assessed condition.

## 7.0 ATTACHMENTS

Photographs

Yours faithfully  
Offshore & Coastal Engineering Limited



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Photograph No 1: Pile bents 1 – 3 (from right to left). White barrier fence above bent 2



Photograph No 2: Pile bent 3

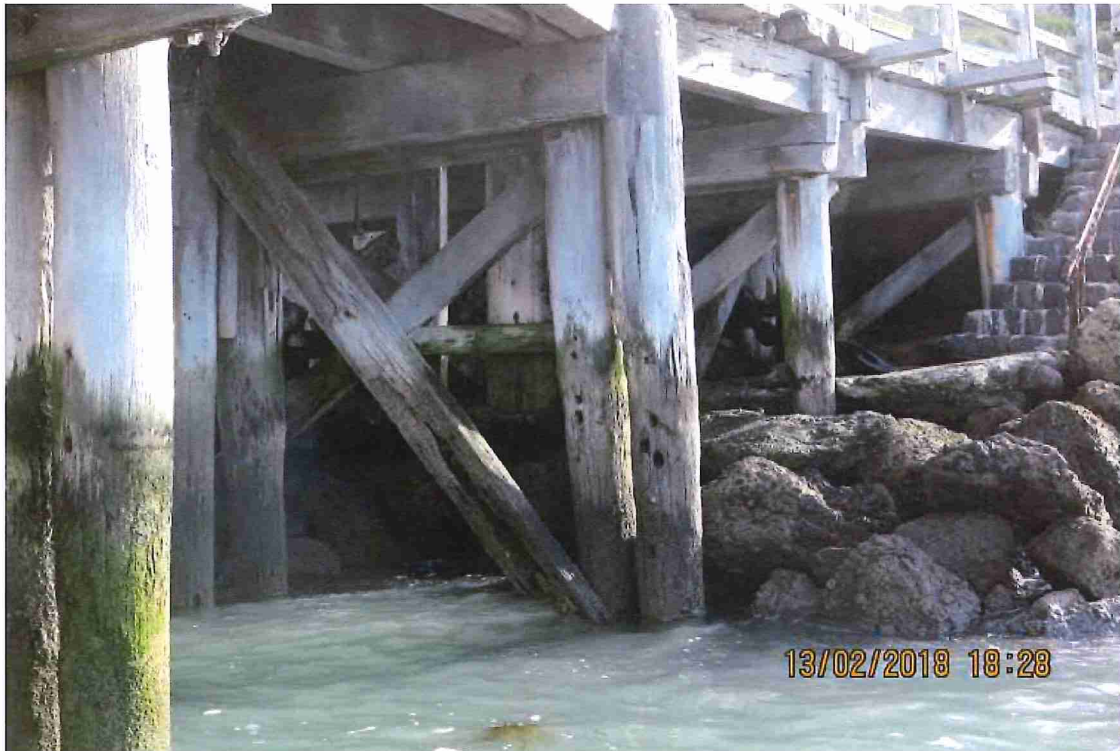


Photograph No 3: Heavily waisted load bearing pile second from left - pile bent 3



Photograph No 4: Bent 4 (foreground), bent 3 (background)





Photograph No 5: Timber piles appear generally sound above water