report

Condition Report

Balls Head Coal Loader

Waverton, NSW

Date of Issue:	5th March, 2018
Issue No:	5
Status:	Final - Amended
Project No:	17204

Taylor Lauder Bersten Pty Ltd ABN 94 074 717 892
Level 6, 1 James Place North Sydney NSW 2060
p. 02 9409 3300 **f.** 02 9929 6667 **e.** info@tlbengineers.com

Phone 02 9409 3300

Issue Status

Issue No:	Status:	Date:	Prepared by:	Director:	
1	DRAFT for Client Review	01/08/2017	R. Howell	Name: M. Baker	Signature:
2	Amended Draft	14/08/17	R. Howell	M. Baker	
3	Final Draft	14/08/17	R. Howell	M. Baker	
4	Final	22/08/17	R. Howell	M. Baker	
5	Estimate of steel pile service life clarified	05/03/18	R. Howell	M. Baker	Mark Baker

Contents

Attachments

1. Introduction

This report has been prepared at the request of Ms Nhu Doan of NSW Roads and Maritime Services (RMS). The purpose of the report is to provide advice regarding the structural condition of the Balls Head Coal Loader, located in Balls Head Bay, Waverton.

The structure was reviewed by Mr Russell Howell of TLB Engineers from 2:00pm to 4:00pm on 24 July 2017 for the preparation of this condition report. The review included an inspection from a vessel provided by RMS, during which personnel from RMS were in attendance. The structure was also inspected from the Coal Loader viewing platform located on the land abutting the wharf.

Due to the condition of the structure, access onto and beneath the structure is considered unsafe. As such the structure was reviewed from a vessel positioned alongside the structure, and from the land.

TLB has previously undertaken inspections of the Balls Head Coal Loader in 2006, 2009, 2013 and 2015. The condition assessments made in this report have been made with consideration of the observations made during the previous inspections, as well as reports by others that have been obtained by TLB since 2005. Photos taken for earlier reports have been included in this report.

The condition of the wharf will be described, and based on the condition the opportunity to preserve the timber structure will be discussed. Advice will be provided regarding current maintenance options and preventative maintenance that could have been carried out to reduce the rate of deterioration of the structure.

Figure 1: The Coal Loader Wharf in December 2006 (left) and 2017 (right).

2. Description of Structure

The Coal Loader Wharf is approximately 170m in length and 19m in width. It extends west from a sandstone block seawall on the western side of Balls Head, Waverton.

The coal loader structure was constructed around 1920 and originally comprised a timber wharf - timber piles, capwales, girders, bracing and decking. In 1976 additional steel bracing frames were installed within the substructure to provide additional support for the deck, support a new coal loading system, and to resist mooring and berthing loads. The timber elements of the structure are now in a state of disrepair, and localised collapse of members occurs regularly.

The wharf deck supports a separate set of steel portal frames constructed above the timber deck which supported part of the coal loading system.

A pump room is located below the wharf deck at the landward end of the wharf. It is constructed on a concrete slab and seawall which extends out from the sandstone seawall abutting the wharf.

The wharf was constructed to load coal into large vessels and as such required an elevated deck. The deck level is RL +6.7m AHD. AHD approximates to Mean Sea Level and as such the deck level is typically 6.7m above water level.

The wharf also required sufficient water depth for large vessels and as such the southern berth bed level is typically RL -12.4m AHD. The bed level for the northern berths varies from RL -6.9m to RL -8.9m AHD.

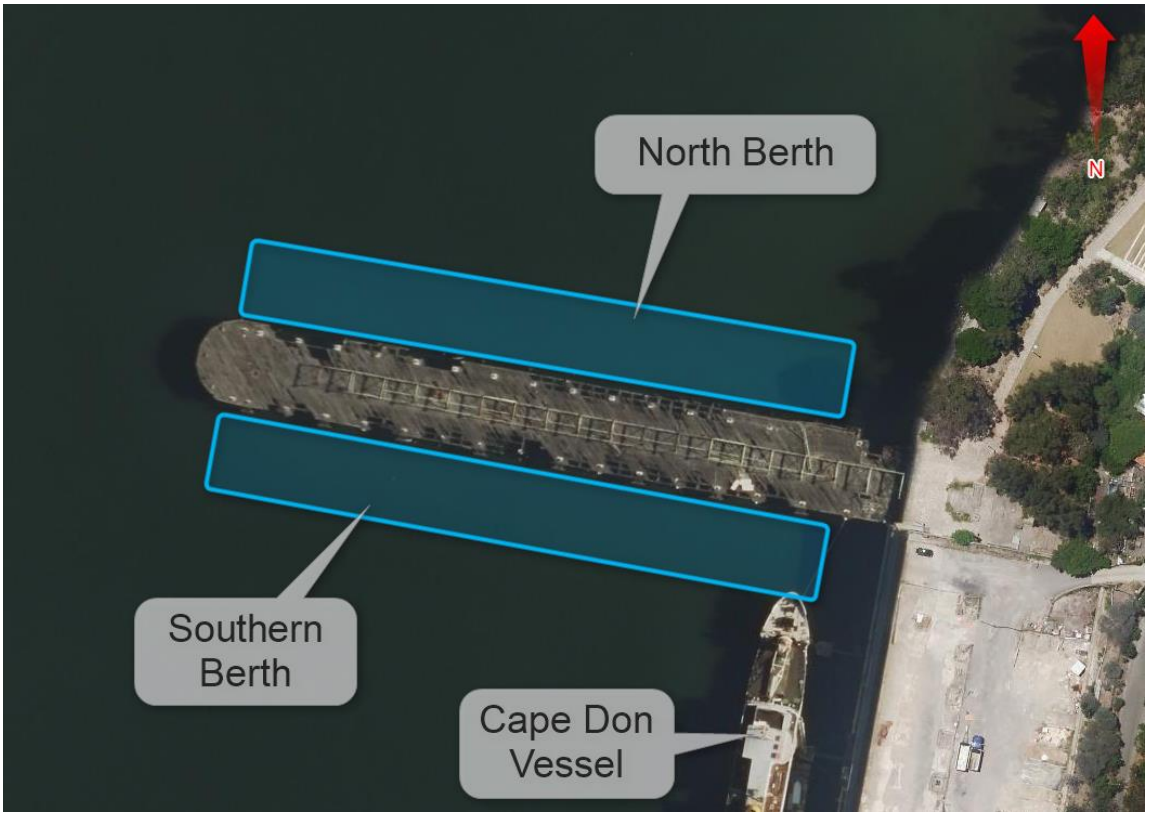


Figure 2: Aerial photo obtained from Sixmaps showing berths.

3. Condition of Structure

Piles

Approximately 95% of the timber piles supporting the wharf have failed or are missing. The remaining 5% are in very poor condition and display significant necking in the tidal zone. The remaining timber piles are likely to have little or no load capacity. We understand that unstable parts of a number of failed piles have been removed by a marine contractor.

A mark-up of a wharf plan is included in Attachment 1, which indicates the piles that were observed to have failed or were missing during a visual inspection undertaken in July 2017.

The length above the water line of timber piles that have failed in the tidal zone, are left hanging from the deck. When the connecting bolts fail these pile lengths fall into the water and float. A steel mesh has been installed in the tidal zone and surrounds the structure to prevent collapsed timbers from floating away. However timber elements are regularly found floating outside the structure.

Headstocks and Girders

It is not possible to closely inspect the girders and headstocks due to the access restrictions. The wharf deck level is RL +7.6m ZFDTG, so when viewing from a vessel at low tide (RL+0.3m to RL+0.6m), the viewing distance is approximately 6m to the closest members. This distance makes it difficult to confirm the extent and severity of deterioration, and prevents checking for some types of damage, e.g. termite damage. As such it is difficult to provide an accurate assessment of the condition of these members.

Nonetheless, the condition of the girders and headstocks is considered to be very poor. All girders and headstocks were heavily weathered, and a number of headstocks had large splits at the end. Typically the top of these members deteriorates more quickly than the other sides. The tops of most members were not visible however significant deterioration of the top of some members could be seen in a number of locations.

Given the high likelihood of unseen deterioration and the inability to undertake a close inspection of the members, we consider the overall condition of the members to be very poor.

As most of the timber piles have failed or are structurally insufficient, in the majority of locations the headstocks can no longer support the girders. As such it is only the girders' ability to span between steel frames that supports the timber deck.

The timber girders in the longitudinal direction of the wharf are spanning between the steel bracing frames. The spans between steel frames are approximately 9500mm which is three times the original span between timber headstocks and piles.

The deteriorated girders are not structurally sufficient over the increased span to safely support the self weight of the timber decking structure.

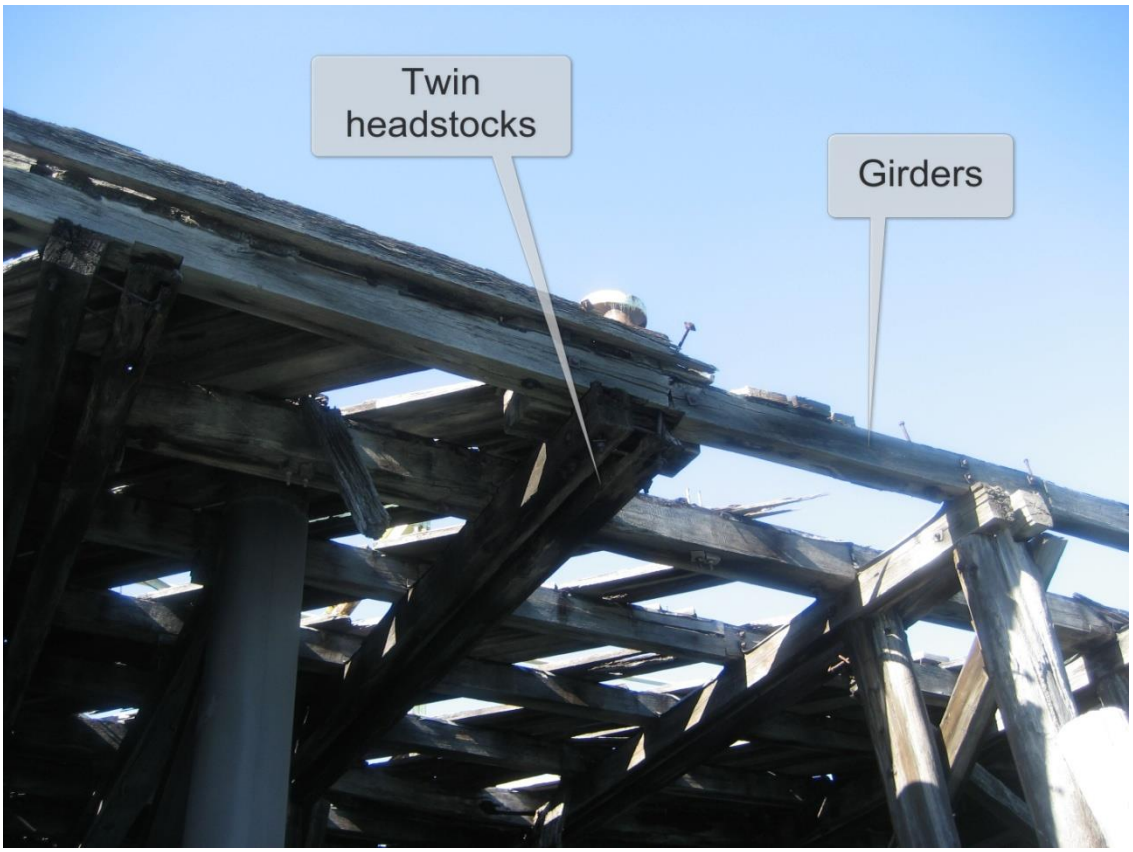


Figure 3: North side of Grid 11. Note that piles are missing from the headstocks in the middle and left of the photograph.

The following areas of girders and headstocks appear to be in distress based on deflection of the members and as such we consider these areas to be an immediate risk of collapse:

- Grids 2-E;
- Grid 4, C-D;
- Grid 28, C-D;
- Grid B, 28-30;
- Edge beam on Grid A, 41-42;
- Edge beam on Grid A, 13-16.

Decking

All wharf decking is heavily weathered. The decking appears to have collapsed in a number of locations. We understand that some heavily deteriorated or unstable areas of the deck have been removed by a marine contractor.

The assessment of the decking is also hindered by the viewing distance. As some areas appear to have collapsed, and based on previous inspections of the wharf, we consider the decking generally to be in poor condition.

Timber Bracing

The original timber wharf structure contained vertical timber bracing members at each pile bent. Most of the original bracing members are missing, and the remaining members are unable to perform their intended function due to the failure of a connection at one end, or the failure of the connecting members. As such we consider that the timber bracing has failed.

Steel Structure

Piles

The steel piles forming the bracing frames are in satisfactory condition (expected to be sufficient for the load based on current usage). There was no significant damage or corrosion above the tidal zone. However it was noted that for the bracing frame between grids 33 and 34, the connection of the central pile to the bracing frame had failed.

Figure 4: Example of pile corrosion in tidal zone. Photo taken December 2013.

The protective coating applied to the piles has failed in the tidal zone and as such the piles are corroding in this area. The loss of section due to corrosion is expected to increase over time.

Inspection of original structural drawings of the steel frames indicates that the piles are likely to be concrete-filled from the seabed to the lowest horizontal steel bracing member.

Bracing

The bracing is considered to be in satisfactory condition and no damage was visible. Corrosion was visible to some members – particularly to the underside of the lowest members. The extent of corrosion is not yet structurally significant but will increase over time.

Central Beam

The original steelwork drawings show a large steel beam running longitudinally down the centreline of the wharf, connecting each of the steel bracing frames. This beam is missing from the shoreline to the frame between grids 39 and 40. There is no indication of damage or failure; therefore we have concluded that the beams have been removed. The remaining members appear to be in satisfactory condition.

We note that the removal of this beam has reduced the overall stability of the wharf in the longitudinal direction.

Figure 5: Typical steel bracing frame. Note majority of timber piles are missing, as is the central steel beam between the frames. Photo taken December 2013.

Conveyor Frames

The steel conveyor frames above the deck are supported by the deck and are in poor condition. The frames are corroding in a number of locations and are likely to have suffered damage as a result of deterioration of the timber deck. Deterioration of the deck has resulted in deformations of the deck, which in turn has caused settlement of the conveyor frames and likely yielding or deformation of the connections between the portal frames and the connecting beams.

A collapse of the timber deck will result in either the conveyor frames hanging from the steel pile bracing frames, or a collapse of the conveyor frames into the water.

The conveyor frames do not contribute to the load carrying capacity or stability of the wharf.

Fender Panels

The fender panels are located on the south side of the wharf and are in-line with every second steel bracing frame. The panels consist of timber planks affixed to two steel “H” piles. The panels are directly connected to the steel bracing frames through rubber arch fenders just below the deck level. It is likely that the fender panels were added during the construction of the steel bracing frames in 1976.

The panels are generally in satisfactory condition however significant corrosion is occurring to the piles in the tidal zone. The panel closest to the seaward end of the wharf appears to be leaning and should be investigated further.

Pump House

The pump house structure appears to be in very poor condition. The corrugated cladding is corroding and has disintegrated in a number of places. The corrosion appears to be much more significant on the south side, and at the base of the structure. This is likely to be due to the longer wave fetch from the south, leading to larger waves and more severe environmental exposure.

While the cladding is in poor condition the timber framing may be in reasonable condition if it has been kept dry. However the loss of cladding has allowed the framing to become exposed and as such we consider this to be unlikely.

There appears to be a timber wharf pile inside the pump house located on the centreline of the wharf. The pile passes through the pump house roof and may or may not be supporting the roof. If the timber components of the wharf were removed the pile could be trimmed to be level with the pump house roof.

Figure 6: Photo taken December 2014 showing condition of southwest corner of pump house.

A pipe appears to run the length of the wharf from the pump house and was originally used to pump fuel oil to the ships moored at the wharf. The supporting brackets appear to have failed as the pipe now hangs level with the floor of the pump house.

The pump house is constructed on a concrete slab and seawall, probably founded on a rock outcrop or shelf. The slab appears to be of cemented rock rubble construction and no steel reinforcement is visible.

The southwest corner of the slab and seawall appears to have disintegrated and the remaining slab has been undermined - there is a large void below the slab. The size of the void is uncertain and therefore the stability of the slab supporting the pump house is unclear. We note that this type of slab construction has a very limited ability to cantilever over the void due to the lack of steel reinforcement.

The pump house can no longer be easily accessed from either land or water due to the condition of the wharf. This currently prevents a detailed inspection of the pump house.

The pump house structure appears to be independent of the steel wharf frames therefore removing the steel frames would appear to have no impact on the pump house. However the wharf does provide a sheltering effect by obstructing the wind and waves at the site. As such removal of the wharf it likely to increase the wind loads on the pump house and the wave loads on the supporting seawall.

4. Safety Concerns

The condition of the wharf structure poses a number of safety concerns detailed below.

Unauthorised Access

While a fence has been erected at the land access to the structure, and steel mesh installed at the water level, persons may still seek to access the structure for purposes of vandalism or thrill-seeking.

Persons accessing the deck of the Coal Loader Wharf may overestimate the condition of the deck and could cause a collapse, possibly resulting in serious injury. We note that the timber pile stumps remain submerged just below the low water level, and a fall into the water may impact a stump or other submerged debris.

Persons may also seek to access the structure from a vessel, possibly to climb onto the deck. The steel mesh prevents vessels from passing below the deck but may not prevent access onto the steel frames.

Figure 7: Photo taken May 2017 showing a collapse of a deck area in progress.

Floating Debris

Failed timber elements have been found floating away from the structure for more than 20 years. Most of these elements in the past are likely to have been timber piles as only 30-40 pile heads remain. The remaining pile heads can still fall from the structure and may fall outside the steel mesh, particularly the remaining piles on the perimeter of the structure.

Figure 8: Photo taken July 2017 showing a floating pile head retrieved from outside structure.

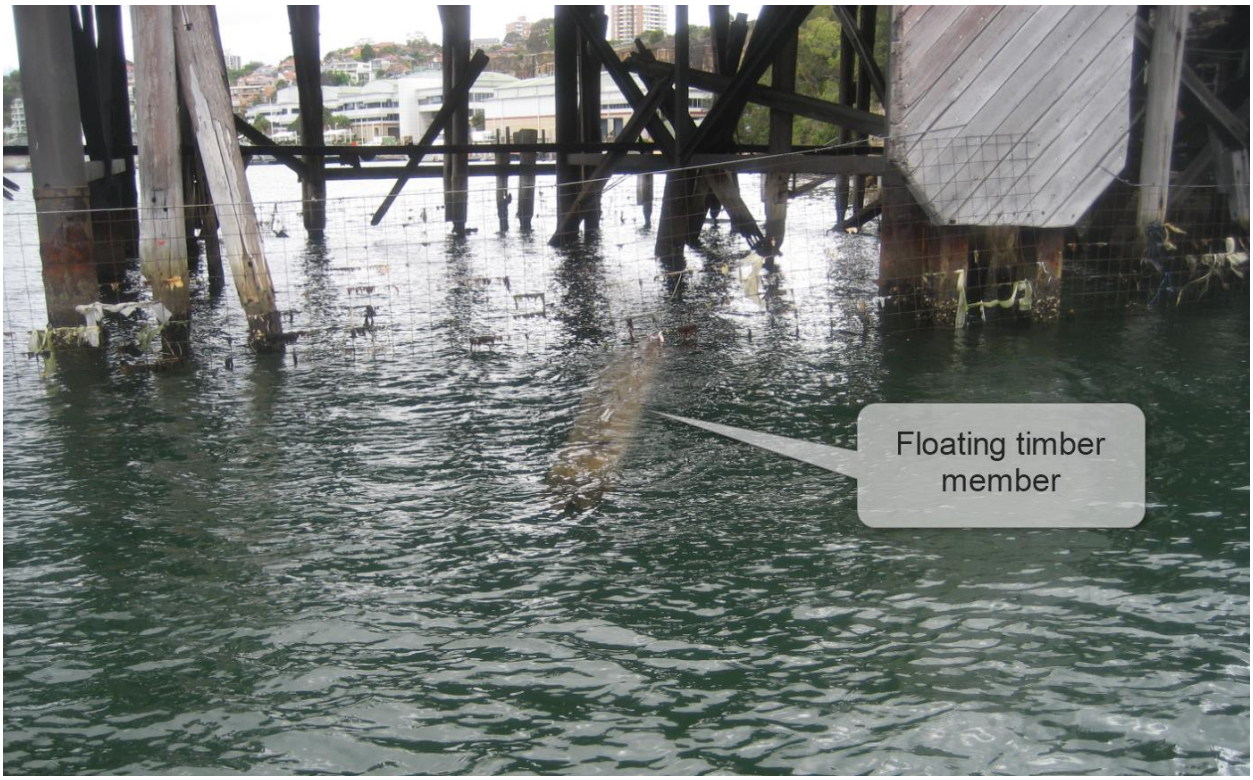


Figure 9: Photo taken October 2014 showing a large timber member found floating outside of containment mesh.

Should a pile fall onto the steel mesh, the mesh could be damaged and may allow other members to float away. Other timber members have been found floating outside the mesh, including decking planks and lengths of capwales.

Large floating members pose a significant hazard to passing vessels due to the risk of collision and the resulting damage. As shown in Figure 9 even large members can be difficult to see as most of the member is submerged.

We note that parts of the containment mesh appear to be hung from the deck structure, and a failure of the deck may therefore cause a failure of the containment mesh.

Should a significant collapse of the deck occur, large number of timber elements may float away from the structure. This could result in a serious hazard to navigation if a collapse occurs at night or goes un-noticed.

Hazard to Navigation

Should the timber deck collapse the remaining steel frames and submerged elements will remain a hazard to navigation, particularly at night. The removal or collapse of the deck will reduce the visibility of the dark-coloured steel frames during day and night.

The removal of the deck is also likely to make the structure and spacing of frames appear “open” which could encourage vessels to pass between the frames, and persons to climb on the frames. If the submerged timber pile stumps have not been removed there is a significant risk of damage to a vessel.

Figure 10: Photo taken May 2015. Note "open" bays at west end due to loss of pile heads. Submerged pile stumps remain and are not visible at high tide.

5. Expected Life of Structure

A comparison of photos taken for this report and photos taken in 2006 indicates that all areas of apparent collapse and demolition of the deck have occurred since 2006. Photographic records indicate that the majority of timber piles had failed or were near failure by 2006.

Based on the current condition of the deck, we consider that the majority of the deck is likely to collapse within 3 years. However we note that collapse could occur at any time.

The steel bracing frames are in satisfactory condition for retention and to support the structure if it were to be repaired. Based on the condition of the frames and the fact that vessels no-longer berth alongside the wharf, we consider that the steel frames are likely to be sufficient to continue carrying the current loads for at least 10 years. If the piles are indeed concrete filled in the tidal zone, the piles are likely to remain sufficient for a longer period.

If the existing deck structure is removed leaving the steel frames only, it is estimated the steel piles would be structurally sufficient for 15 years without maintenance. During this time the steel piles will continue to corrode in the vicinity of the tidal zone. Beyond 15 years the corrosion of the piles may have progressed to an extent such that the structural sufficiency of the piles is brought into question. The steel piles may therefore require significant repairs in 15-25 years to ensure the stability of the steel frames. Without significant repairs or protective works the steel piles may become unstable within 25 years.

Figure 11: Photograph taken December 2006.

Figure 12: Photo taken December 2013.

Figure 13: Photo taken July 2017.

Figure 14: Photo taken July 2017. Note deformations of conveyor frames.

Figure 15: Photo of pump house taken in 2015. Note sag in deck structure above.

Figure 16: Photo taken July 2017 above pump house.

Based on the current condition of the pump house we consider that the pump house structure is likely to be fragile and may remain intact for 5 to 10 years. The southwest corner of the pump house is not expected to last beyond 5 years. In addition the slab supporting the southwest corner is disintegrating and is not expected to last beyond 5 years.

The pump house is partially sheltered by the wharf and wharf deck. Collapse of the wharf deck would damage the pump house, while removal of the wharf and wharf deck would increase the exposure of the pump house to wind, wave and rain, increasing the rate of deterioration.

6. Current Maintenance Options

We consider that the timber deck structure is beyond repair or stabilisation. Based on the apparent condition of the members we consider that few (say 0 - 10%) of the existing members could be salvaged. It is more likely that parts of some members may be salvaged, rather than complete members.

As a result we consider the current maintenance works can be summarised into two categories:

1. Make Safe Works
2. Maintenance of Steel Frames

If a timber deck accessible to the public is required at the site, complete removal and reconstruction of the existing timber structure is required. Reconstruction is discussed briefly at the end of this section.

Make Safe Works

Section 4 of this report discussed the risks of unauthorised access and floating debris. These risks are a direct result of the ongoing collapse of the deteriorated timber structure and could result in consequences ranging from minor effects to significant damage to vessels and serious injury. The risks can be reduced by removal of areas that are most likely to collapse.

We consider that areas of decking that display excessive sag are considered to be in distress and are likely to collapse before other areas. Due to the risks posed by floating debris leaving the structure (which already occurs on a regular basis) we recommend immediate removal of the following deck areas:

1. 27-29, C-D;
2. 3-5, C-D;
3. 1-3, D-F

The first two areas above provide support for conveyor frames and therefore cannot be removed without removing the conveyor frames. Areas 1 and 2 cannot be safely accessed without removal of adjacent deck areas. Access to the third area is obstructed by the Cape Don vessel moored just to the south.

We note that as areas 1 and 2 above support the conveyor frames the failure of these deck areas would cause an increase in load applied to the adjacent conveyor frames and supporting deck areas. If the adjacent deck areas cannot support the increase in load a progressive collapse of the deck could occur which may result in the collapse of a majority of the remaining deck area.

The deck is supported by the girders spanning between steel frames. Failure of a girder will apply loads to the connected headstocks and decking, which in turn apply load to adjacent girders, headstocks and decking elements, potentially causing a collapse of the adjacent elements which are also in poor condition.

As such the risks of unauthorised access and floating debris discussed in Section 4 can only be resolved by complete removal of the remaining deteriorated timber structure. It is likely that the timber deck structure is fragile to the extent that any works to stabilise or remove areas in distress have the potential to cause further collapse of adjacent areas.

Maintenance of Steel Frames

Should the steel bracing frames be retained, maintenance will be required to ensure the frames are protected from corrosion. The extent of maintenance will depend on the length of time for which the frames are to be retained, however the works will involve the following:

- Repair of protective coating to piles in tidal zone, or;
- Replacement of protective coating in tidal zone;
- Localised repair of paintwork to bracing frames;
- Installation and/or replacement of sacrificial anodes to piles.

These works are discussed briefly below. The works can only be undertaken if safe access is provided by removal of the timber structure. We note that retaining the steel frames will result in a hazard to navigation discussed in Section 4.

Repair of Paint Coating In Tidal Zone:

Repairing the existing protective coating in the tidal zone is difficult and generally does not achieve satisfactory long term results, requiring ongoing repairs for the life of the structure.

A repair of the paint coating in the tidal zone requires work to be undertaken only at low tide, and is likely to require 3 or 4 tidal cycles to complete the work. Not all tides will be sufficiently low to provide access.

A brief description of the work is as follows:

- 1st Low Tide: Remove corrosion product with a needle gun and abrasive grit blast;
- 2nd Low Tide: Water blast, dry steel with flame torch, then apply primer coat;
- 3rd Low Tide: Water blast, dry (possibly with compressed air) then apply 2nd coat of paint system;
- 4th Low Tide: Water blast, dry, then apply 3rd coat.

Due to the less than ideal environment the coating is applied in, paint coating suppliers may not warrant their product for longer than 18 months. Each coat should typically be allowed to cure for 2 hours or more as a minimum, however this is generally not achievable in the tidal zone.

If a coating is applied using the sequence above the coating is expected to start breaking down in approximately 2 years, allowing holes in the coating and localised corrosion of the steel. The coating is likely to fail within 5 years after which it will offer little or no protection and would need to be re-applied.

We note that the piles cannot reasonably be encapsulated in the tidal zone and therefore corrosion product and failed coating removed by the needle gun and grit blast will fall into the waterway.

For reference, a report prepared by GHD in 1993 stated that the last known repair of the paint in the tidal zone was undertaken in 1981 and used a product called Luxatar 5, believed to be produced by Berger Paints. This paint is likely to be a tar epoxy coating and may include micaceous iron oxide.

Replacement of Protective Coating in the Tidal Zone:

The piles can be protected from corrosion in the tidal zone by applying a new protective wrap. The wrap would extend up to the bulge visible on the piles, and roughly 2m below the low-water line. Ideally the wrap would extend above the bulge to protect this splash zone, however this is difficult to achieve with a wrap.

The wrap consists of grease tape wrapped around the piles, and a black polyethylene plastic wrap to hold and protect the tape. The plastic is secured with black plastic straps.

Figure 17: Example of plastic polyethylene wrapping of piles. Photo from Google images.

Wrapping the piles involves the following works:

- Needle gun to remove any loose material on surface of pile;

- Wrapping pile in grease tape, ensuring no water or air bubbles are trapped between the tape and the steel surface;

- Apply plastic polyethylene wrap over grease tape and secure with plastic straps.

The wraps are applied by divers and the work is not tide dependent so can be applied relatively easily. The wraps can be expected to last 20 years or more, but should be inspected on a yearly basis to confirm the wraps remain secure.

Localised Paint Repair of Bracing Frames:

The coating on the frames generally appears to be in satisfactory condition considering the frames were installed 40 years ago. Paint coatings in this environment typically last a maximum of 30 years, so it is expected that ongoing localised paint repairs will be required.

The repair of the coating not difficult but is complicated by the height of the frames, and provision of safe access to the heights. Access equipment such as boom-lifts can be placed on a barge, however movement of the barge due to waves will be amplified at the level of the work platform, potentially making access unsafe or at least more difficult.

Sacrifical Anodes:

It is not known by TLB as to whether sacrificial anodes have been installed to the steel piles.

Sacrifical anodes can be attached to the piles a few metres below the water line to slow the rate of corrosion. This allows the submerged length of pile to be installed unpainted, however the anodes only protect the length of pile below the water line. The splash zone and tidal zone above the water line are not protected.

Sacrifical anodes typically require replacement every 10-20 years. If anodes were applied to the piles at installation the anodes are expected to have been depleted. If the steel frames are to be retained this should be investigated and replacement anodes installed.

Reconstruction

If reconstruction of the deck is to be considered, the following points should be noted:

- The existing wharf deck level is too high to access vessels other than large cargo vessels. Significant modifications will be required to provide access to private vessels or ferries.

- Timber beams and girders used for wharf construction are difficult to obtain in spans longer than 6m. The spans between steel frames are 9.5m. As such reconstructing the deck will require the installation of new pile bents between the steel frames to reduce the span.

- Timber piles have become more difficult to procure in long lengths. Based on the height of the deck, depth of the water, and required embedment into the seabed, it may be quite difficult to obtain timber piles of sufficient length. Items that are difficult to obtain are typically expensive.

7. Condition Assessment for Preservation Opportunity

We understand that the Coal Loader Wharf and more specifically the timber deck structure is considered to have significant heritage value. TLB has undertaken an assessment of whether the remaining timber elements can be preserved for heritage purposes. This assessment is described below.

7.1 - Past Maintenance

Knowledge of the past maintenance and repairs, and earlier assessments of the structure are critical for determining the current condition of the timber elements. As such TLB has reviewed previous reports prepared by TLB and reports by others to inform this condition report.

TLB understands that the site was decommissioned in 1992. Reports were prepared that assessed the potential for re-use and redevelopment of the entire site (wharf, seawall, storage tunnels and stockpile area). These reports are listed as follows:

- Report prepared by EJE Group dated June 1993 entitled Site Options Document – Balls Head Coal Loader Site, Waverton NSW;
- Report by Godden Mackay Logan dated May 2000 entitled Waverton Peninsula Industrial Sites – Conservation Management Plan by Godden Mackay Logan;
- Report by State Forests NSW dated 19 February 2007, prepared by Mr Richard Forrester.

We understand that ownership of the structure was in dispute beginning1999 and court proceedings continued until 2005 at which point RMS took ownership of the structure.

During the period of 2006 to 2012 RMS considered a number of proposals to re-purpose the structure and engaged TLB to prepare concept designs. None of the proposals were ultimately successful.

As such it is likely that no maintenance or repairs (with the exception of removal of unstable elements) have occurred in the 25 years that have passed since the decommissioning of the site.

It should be noted that repair and maintenance of a structure of this type is relatively expensive, and becomes more expensive and more complicated as the structure deteriorates. If the future use of the structure is unclear, an additional layer of complexity is added to the decisions required to undertake and justify the costs of repair.

7.2 - Condition Assessment

While TLB was not able to closely inspect the individual elements for safety reasons, observations from a distance provided sufficient indication to conclude that the elements are generally in poor or very poor condition.

In order to confirm our condition assessment, TLB has reviewed documents used to prepare previous condition reports in order to gain an indication of the condition of the structural elements at various points in time, and present a timeline of the deterioration of the structure.

7.3 - Timeline

1992 – Site decommissioned. Condition of wharf structure is unclear, however it is possible that as the decommissioning was planned the wharf owner expected to remove the wharf as a requirement of the lease. As such it is likely that no significant maintenance had been undertaken for some time. It is unlikely that the wharf was in good condition, and more likely that the wharf was in satisfactory or poor condition.

1993 - Report is prepared entitled "Site Options Document – Balls Head Coal Loader Site, Waverton NSW" prepared by The EJE Group (Eckford Johnson Enviroplan) in Association with Peter Fenwick. The report includes an evaluation of the physical condition based on a report by GHD Engineering.

"The Site Options Document aims to investigate and assess the significance of the Balls Head Coal loader Site... and to determine guidelines and directions for the conservation and future development (redevelopment) of the site."

The report states that the condition of the wharf deck surface is relatively good, however the condition of the components below the deck level is considered to be poor, and that "a complete collapse probably would occur without the structural steel component" (pg81).

The report also comments: "Having identified the structural and configuration constraints of the wharf it is considered that uses for the wharf are limited" (pg 81).

"The extent of the repairs necessary to the timber work to bring the wharf back to a stage where its structural integrity is reinstated and considered safe, would effectively result in the intrinsic heritage value of the wharf being lost" (pg 82).

The report by GHD provided more specific comments regarding the condition of timber decking and piles.

"A very broad assessment of the age and condition of planks is as follows:

- Very old and very poor condition: say 15-30%;
- Old and medium to poor condition: say 55-75%;
- Fairly new and good to medium condition: say 10-15%."

"A visual survey of three pile bents (18 piles) resulted in the following results:

- Good condition: nil;
- Moderate to bad condition: 2 piles;
- Bad to very bad condition: 10 piles;
- Failed and broken piles: 6 piles;"

2000 – Report prepared entitled Waverton Peninsula Industrial Sites – Conservation Management Plan by Godden Mackay Logan.

Expert advice on the condition of the wharf was sought from Patterson Britton and Partners Pty Ltd, who commented;

"The underside of the timber deck appeared to be in fair to poor condition. It is expected that closer inspection of the timber deck, particularly the top surface of girders and headstocks, will find the deck to be in poor condition. Given the poor condition of the timber structure, it is expected that partial collapse from self-weight alone will continue."(pg 168)

The report comments further:

"The timber wharf elements are not (in good condition), and present major hazards to both visitors to the site who are brave enough to venture onto the wharf and to nearby uses of the Harbour, as timber elements from the structure are now in the habit of coming adrift". (pg 183)

The report discusses options for the structure including stabilisation of loose timbers and reconstruction of the wharf.

"Repair is not considered here as a separate alternative, as the severely degraded nature of the timber structural elements and decking (as well as their corroded steel hardware attachments) effectively prevent any meaningful form of repairs. If the wharf is to be conserved as a historic relic, it will be necessary to rebuild its timber substructure and superstructure."

2005 – RMS confirmed as owner of structure after finalisation of court proceedings.

2006 - TLB Engineers is engaged by RMS to prepare options for re-use of site, and condition report for wharf structure. For purpose of condition report TLB arranges for State Forests NSW to undertake an inspection of a sample area of timber elements. The report by State Forests notes the following:

"Only general observations of the decking have been made. They were:

- Several lengths of decking had been replaced within approximately 10-15 years. This decking was in good condition.

- Older decking planks ranged from being in good condition to poor condition. Many of these were decayed in their entirety or on their ends to such an extent that they could not be relied upon to support a person's weight.

- Some decking boards were missing."

Approximately 20% of the girders and headstocks inspected were rejected. A further 20% were found to have some level of section loss due to rot or termite damage. The report noted that access to the members was limited and tested by test drilling from above the deck level. The report noted that the number of members rejected could increase (up to 30% for headstocks, up to 50% for girders) if a more thorough inspection were undertaken.

2007 - Options for redevelopment considered.

2012 - All proposed options for redevelopment are unsuccessful.

2013 – At the request of RMS TLB prepared new condition report for structure. The report found that 80-90% of the timber piles had failed or were missing and most of the original timber cross bracing had been lost.

7.4 - Confirmation of Condition Assessment

Based on the comments in the previous reports, it is clear that the condition of the wharf was considered to be poor prior to 2000, and that no significant maintenance has been undertaken in the following 17 years. Allowing for the additional deterioration expected to occur over this period, we consider that our assessment is likely to be accurate.

We also note that none of the earlier reports considered repair of the wharf to be a viable option for re-use or redevelopment, primarily based on the condition of the timber elements.

As RMS ownership was confirmed during 2005 it seems that no viable options were available to RMS for preservation of the timber structure.

7.5 – General Comments Regarding Preservation Works

The timber deck structure is only part of the original timber wharf structure. As of 2017 many of the original wharf elements have been lost, as shown in Figure 5 below.

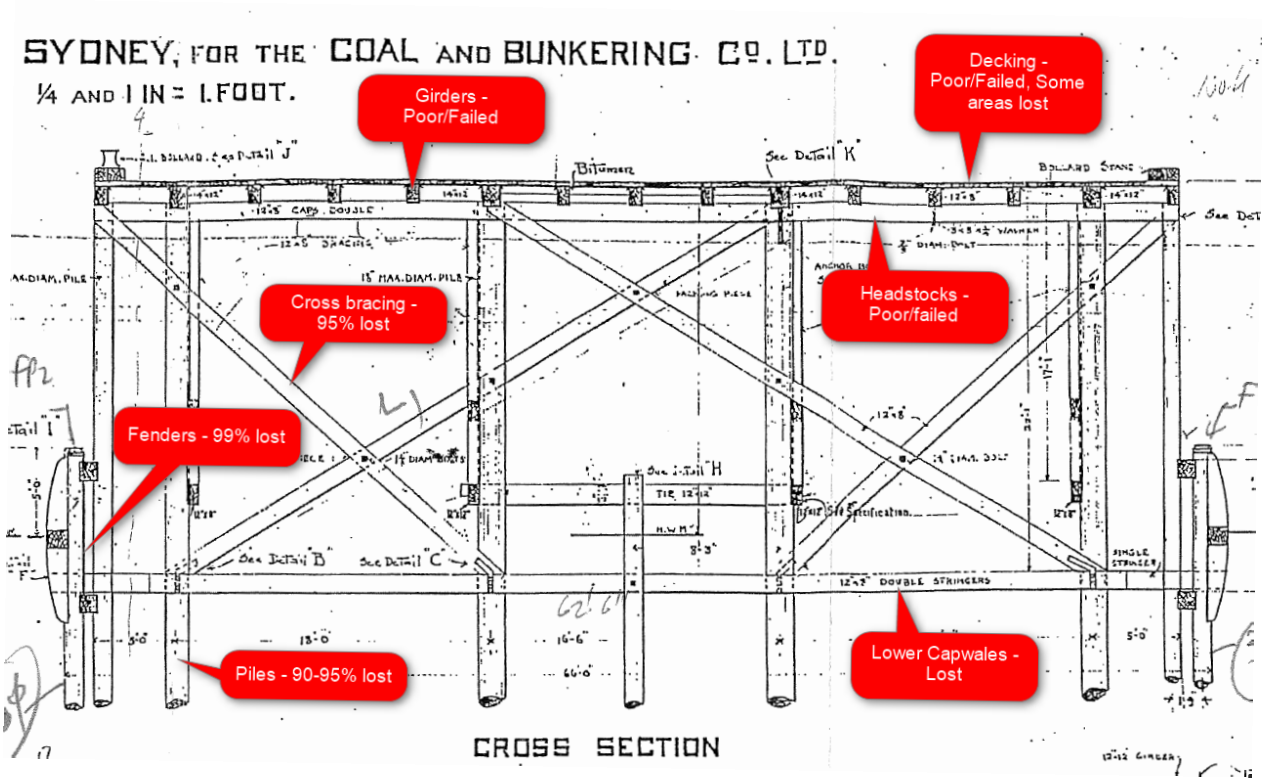


Figure 18: Cross section of original timber wharf structure with mark-up of condition and loss of elements, as of 2017.

Figure 19: Photo taken July 2017 provided by RMS. Only one timber cross brace remains connected at left edge of photo. This length of the wharf originally utilised more than 70 timber cross-braces.

The cross bracing and lower capwale elements shown in Figure 5 are difficult to access and maintain. As a result preservation of these elements would have been difficult even if the wharf was in good condition.

Timber piles in Sydney Harbour typically require replacement after 30 years. Methods to repair timber piles in the tidal zone have been developed in the last 10-15 years, however almost all of the original piles have now been lost.

As such only the upper deck structure had the potential for longer term preservation. Works that are likely to have been required to maintain the deck structure in satisfactory condition for limited use, are as follows:

7.5.1 Timber piles in Sydney Harbour have an average life of 34 years. The current piles are likely to have been installed during the steel bracing frame installation works during 1976 and are therefore 40 years old or more. It is unreasonable to expect any of the original piles to have lasted 95 years. Photos indicate that most of the piles had failed by 2006. As such many of the timber piles would have required replacement prior to 2000.

7.5.2 Timber wharves should be inspected for termites on a yearly basis. It is likely the deterioration of the wharf has prevented safe access for inspectors and as a result the timber elements are likely to have suffered significant ongoing termite damage.

7.5.3 Installation of additional steel beams spanning between the bracing frames could have provided an alternative to the replacement of the timber piles, with less ongoing maintenance. The steel frames would not prevent failure of the existing timber elements, and the existing timber elements would need to be removed to provide a safe work environment for installation of the new members.

7.5.4 Protective treatments can be applied to prolong the life of timber but not extend indefinitely. The existing timber has decayed to the extent that protective treatments would have no effect. Treatments need to be applied by brush or roller, however there is no safe access to do so.

7.5.5 A shelter structure could have been installed on the wharf deck to protect the timber elements from exposure. Based on the previous condition assessments a shelter structure would need to have been installed no later than 1993 to be considered effective for the preservation of the deck. However it should be noted that by 1993 some deck timbers already required repair. It should also be noted that such a structure would not preserve the deck indefinitely.

If supported off the steel bracing frames and designed to fully protect the timber deck, this could have increased the life of the timber elements (decking, girders, capwales). It should be noted that this would also require the beams mentioned in item (3) above, as well as the termite inspections in item (2) above, to successfully provide longer term protection for the deck, yet even these works would not protect the original timber elements indefinitely.

As numerous options for redevelopment were being considered and a number of elements were already in poor condition this would not have been considered a reasonable option at the time.

7.5.6 High-density polyethylene wraps could be applied to the steel piles in the tidal zone to prevent or slow corrosion of the piles within the tidal zone. Application of the wraps would require removal of any unstable timber elements above the pile, in order to provide a safe work environment for the divers.

7.5.7 The steel piles may have been protected from corrosion below the waterline by sacrificial anodes. The anodes are consumed by corrosion over time to the point where they no longer provide sufficient protection, at which point replacement of the anode is required.

Installation or replacement of the anodes would require removal of any unstable timber elements above the pile, for safety. Divers would need a survey to confirm safe underwater access to the piles, noting that all of the timber pile stumps below water are likely to still be in place.

7.6 – Assessment of Potential for Preservation

We consider that the remaining timber deck structure is beyond repair or preservation due to the poor condition of the individual timber elements. A summary of our findings is as follows:

7.6.1 Concerns regarding the condition of the timber elements were raised as early as 1993, indicating that at the time of decommissioning the structure already required significant repairs to remain in service.

7.6.2 Structures of this type require ongoing inspection and maintenance on a yearly basis in order to remain in service.

7.6.3 Options for redevelopment of the site were considered but none were ultimately successful.

7.6.4 The relatively high cost of repairs, combined with uncertainty of future use, and change of ownership, appear to have delayed the decision to undertake works that would preserve the structure. The further deterioration allowed by this delay has resulted in the structure becoming unsafe to repair, dramatically increasing the cost of repair.

7.6.5 The timber piles supporting the original timber structure could not be preserved beyond 30-40 years in service and would have required replacement regardless of any preventative or preservative works available at the time.

7.6.6 Failure of the timber piles has resulted in the cross-bracing, headstocks and girders becoming overstressed. The timber structure can no longer support itself and relies on structural steel frames to prevent collapse.

7.6.7 Overstress of the elements combined with ongoing deterioration has resulted in the remaining timber elements becoming unstable, leading to the loss of many elements. Many lost elements float away from the structure becoming a hazard to navigation.

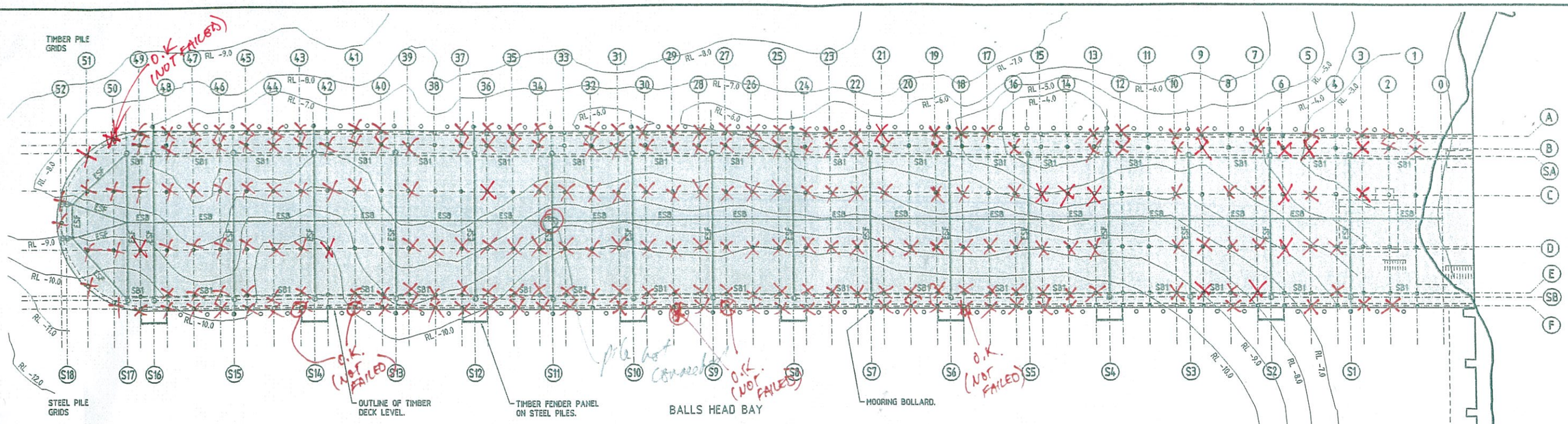
7.6.8 In order to have prevented the overstress and provided safe access to repair or strengthen the structure, at least half of the original timber piles needed to be in satisfactory condition to provide support for the structure.

7.6.9 Based on the sample of piles inspected during 1993 by GHD Engineering, 30% of the piles had failed and a further 50% were in poor or very poor condition.

7.6.10 Therefore in order to retain the original timber deck elements, significant structural repairs (pile replacement) and preventative maintenance needed to be undertaken during 1993, and preventative maintenance needed to continue indefinitely on a yearly basis to slow deterioration.

7.6.11 No known repairs or preventative works have been undertaken in the following 24 years. It is likely that very little can be salvaged from the timber structure.

Attachment No. 1
Drawing Mark-Up - Deterioration of Structure



(52) : TIMBER PILE GRIDS.

(S18) : STEEL FRAME GRIDS.

SCALE 1:200

PLAN ON EXISTING STEEL STRUCTURES UNDER WHARF BEING RETAINED

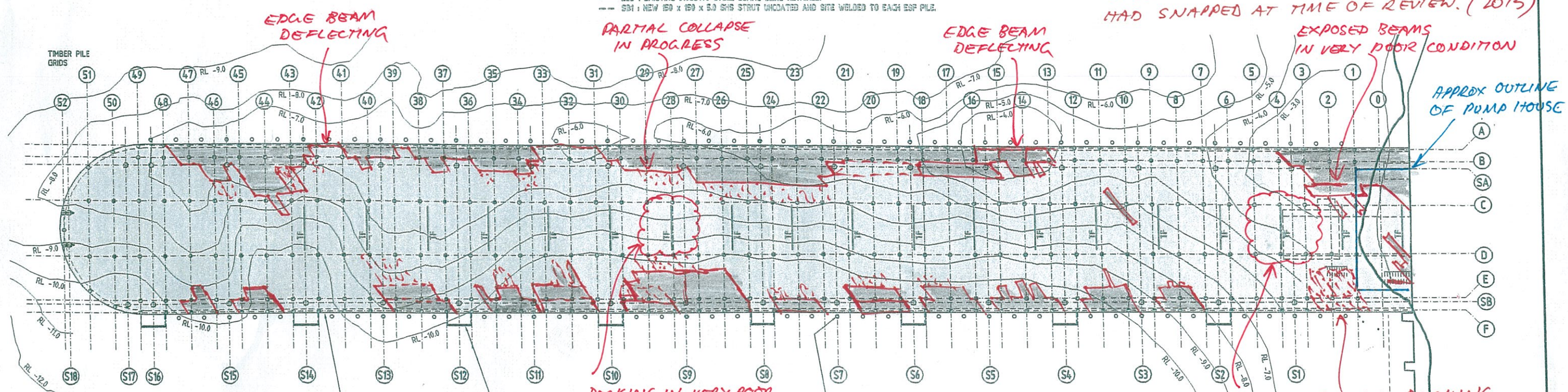
: TIMBER STRUCTURE

ESF : EXISTING STEEL FRAMES BEING RETAINED.

ESB : EXISTING 610UB140 STEEL BEAMS BEING RETAINED.

SB1 : NEW 150 x 150 x 5.0 SHS STRUT UNCOATED AND SITE WELDED TO EACH ESF PILE.

X – PILES MARKED AS SUCH WERE NOT PRESENT OR HAD SNAPPED AT TIME OF REVIEW. (2013)



(52) : TIMBER PILE GRIDS.

(S18) : STEEL FRAME GRIDS.

SCALE 1:200

PLAN ON EXISTING STEEL TRESTLES AT RL +7.6 (ZFDTG)

: TIMBER STRUCTURE

TF : EXISTING STEEL TRESTLE FRAMES TO BE RETAINED (NOTE : TEMPORARILY REMOVE AND STORE AT A LOCATION NOMINATED BY NSW ROADS & MARITIME SERVICES). SEE DEMOLITION NOTES ON DWG. No. S1.

DETERIORATION OF STRUCTURE

17204 01/08/17 RH

REVISION A – 11/08/17

FOR TENDER

REFER TO DWG. No. S1 FOR CONSTRUCTION NOTES.

TLB Quality Control : Project Level 1

0 20mm 40mm 60mm 80mm 100mm

REV.	DATE	DESCRIPTION	Drawn	Design
A	20.11.12	BUDGET PRICING ISSUE	W.O'B.	H.B.
01	11.12.12	TENDER ISSUE	W.O'B.	H.B.

tlb
TAYLOR LAUDER BERSTEN PTY. LTD.
CONSULTING STRUCTURAL, CIVIL & MARITIME ENGINEERS
514 MILLER STREET CAMMERAY
(PO BOX 110) NSW 2062
TEL. (02) 9409 3300
FAX. (02) 9929 6667
info@tlbengineers.com
www.tlbengineers.com
ABN 94 074 717 892

BALLS HEAD LOADING FACILITY
WAVERTON
DEMOLITION WORKS

STEEL REMOVAL & STABILISATION PLAN

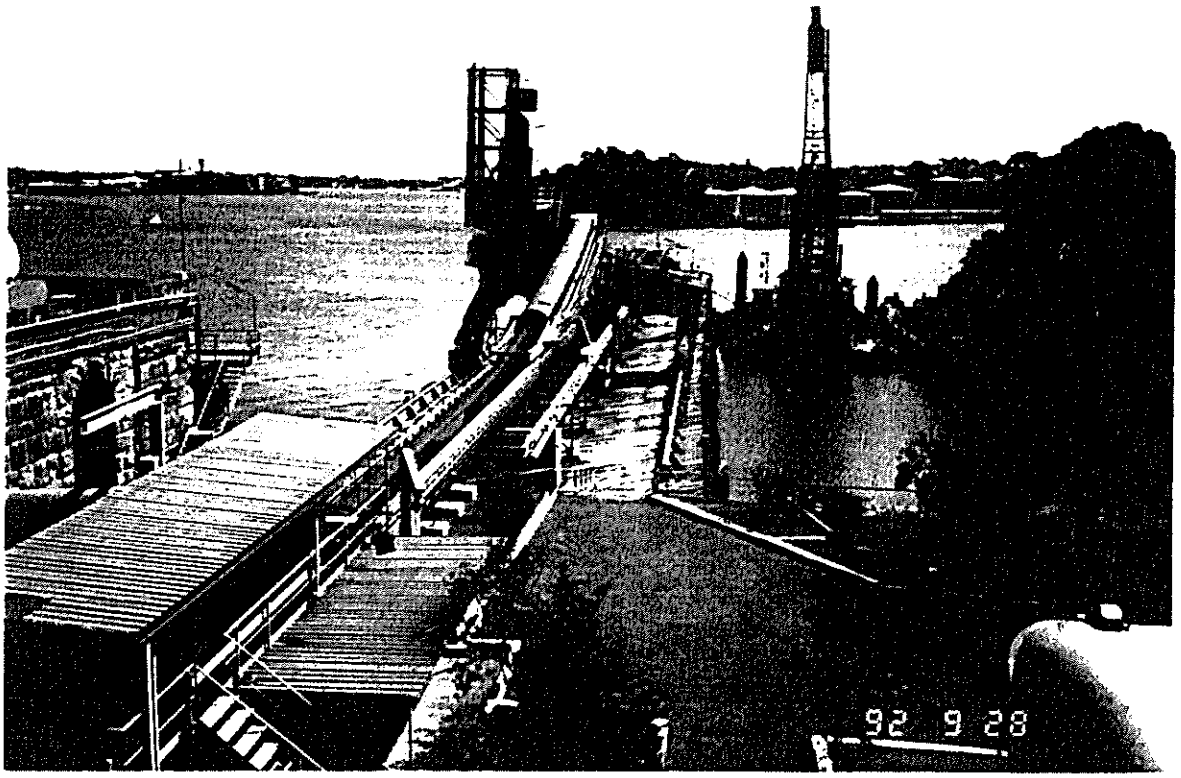
Director	Howard Bersten	Project No.	06233
Sheet Size	B1	Dwg. No.	S11
Scales	1:200	Rev. No.	01

Attachment No. 2
Part Scan of Report prepared by EJE Group dated June 1993

THE PROPERTY SERVICES GROUP

SITE OPTIONS DOCUMENT

BALLS HEAD COAL LOADER SITE, WAVERTON NSW



PREPARED BY

THE EJE GROUP
IN ASSOCIATION WITH
PETER FENWICK

NEWCASTLE

412 King Street
Newcastle NSW 2300
Tel: (049) 29 2353
Fax: (049) 26 3069

SYDNEY
4th Flr, 270 Pacific Hwy
Crows Nest NSW 2065
Tel: (02) 438 4775
Fax: (02) 437 4447

JUNE 1993

EJE Group
ECKFORD JOHNSON ENVIROPLAN

ITEM NAME:- Wharf **(REF No.BHCL-10)**

LOCATION OF THE ITEM:- The wharf is located at the western periphery of the site, adjoining the northern end of the coal stockpile tunnel and the main seawall. The wharf extends west into Balls Head Bay for some 160 metres.

SIGNIFICANCE:- The wharf is a significant reminder of the coal loading activity of the site. It is also a fine example of wharf building craftsmanship still remnant within Sydney Harbour.

The wharf structure was purpose designed to accommodate the activity of ship bunkering, to achieve this the industrial wharf was constructed at a height which facilitated this process. The height of the wharf is some 6 metres above the high water mark compared to more common 2-3 metre height.

This additional height of the purpose designed industrial wharf necessitated specialised lateral cross bracing supports.

CONDITION OF ITEM:- The condition of the wharf surface (timber decking) is relatively good and has been the subject of an ongoing maintenance program to ensure a suitable standard of surface prevails.

The general condition of the wharf below the deck level and thus in part below the water's surface is poor. The life expectancy for timber piers submerged in Sydney Harbour is about 5 to 10 years though the subject jetty structure's longevity may have been enhanced by water pollution from the nearby gasworks.

A engineering report investigated the structural integrity of the wharf and assessed the extent of the deterioration of the piles and a series of pile bents. The report concludes that the timber structural components of this element have been compromised and have failed, a complete collapse probably would occur without the structural steel component.

CONSERVATION POLICY:- That consideration be given to adaptive reuse, continued use or retention of all or part of this item. However, if an adaptive reuse, continued use or retention of this item cannot fulfil the dynamic and evolving, operational and functional requirements compatible with the safe, economic and efficient use of the site then the owner can either :-

a) Sell the item to a third party, who will remove the item from the Site, for further use in a manner which continues to interpret its significance. The obligation for heritage conservation of this item is then passed to the purchaser,

b) offer the item to a third party who will remove the item from the Balls Head site, and take over whole or an identifiable part of the item for purposes of conversation,

c) relocate the whole, or an identifiable part of the item to an appropriate location on the Balls Head site for purposes of conservation,

d) if none of the options detailed in (a) (b) or (c) are achieved, then the owner will proceed with demolition and removal of the item from its present location after fully documenting and recording relevant details of the item so as to maintain a record of its heritage significance.

OPTIONS FOR REUSE / LIKELY USES:- Having identified structural and configuration constraints of the wharf it is considered that uses for the wharf are limited.

HERITAGE IMPLICATIONS:- The extent of the repairs necessary to the timber work to bring the wharf back to a stage where its structural integrity is reinstated and considered safe, would effectively result in the intrinsic heritage value of the wharf being lost.

OTHER ISSUES:- It could be expected that the ongoing reinstatement of the original jetty timber will become progressively more expensive due to the extreme difficulty and high labour costs associated with the removal of old timber and reinstatement of bolted joints etc. New timber under the influence of the tidal zone would be subject to marine borer infestation and the subsequent replacement/maintenance programme on a continual basis.

RECOMMENDATION:- That the conservation policy for this item be initiated.

PROPERTY SERVICES GROUP

BALLS HEAD COAL LOADING FACILITY AT WAVERTON, SYDNEY NSW

REPORTS ON EXISTING WHARF, STOCKPILE PLATFORM AND SEA WALLS, AND GANTRY UNLOADER

GUTTERIDGE HASKINS & DAVEY PTY LTD
(Incorporated in ACT)
Consulting Engineers • Environmental Scientists & Planners • Project Managers
39 Regent Street, RAILWAY SQUARE NSW 2000
Telephone: (02) 690 7070 Facsimile: (02) 698 1780

May 1993
216/026279/00
R2786

3 CONDITION OF STRUCTURES

3.1 TIMBER WHARF

Coal & Allied correspondence dating back to the 1950s indicates extensive repairs to fenders, piles and deck have been carried out following ship berthing collisions, fire damage and maintenance repiling therefore the condition of all timberwork is extremely varied.

The deck planks have in general been replaced as they fail so that the deck consists of planks of varying age and condition, from very new to very old and close to failure. A very broad assessment of the age and condition of planks is as follows:

- Very old and very poor condition: say 15–30%
- Old and medium to poor condition: say 55–75%
- Fairly new and good to medium condition: say 10–15%

The longitudinal bearers appeared to be generally in medium to good condition, although it is noted that because of access limitations there could be some bearers in bad condition which were not detected.

The cross heads are in varying condition, but the pile bents are in extremely bad condition, with whole sections of the support system for the timber wharf having already failed. In particular most piles and diagonal braces have either failed or are close to failure in the tidal zone. A visual survey of three pile bents (18 piles) resulted in the following results:

- Good condition (>50% cross section left) nil
- Moderate to bad condition (25%–50% left) 2 piles
- Bad to very bad condition (<25% left) 10 piles
- Failed and broken piles 6 piles

As these bents were at the landward end it is possible that the above underestimates the severity of the deterioration of the pile bents. It is clear that was it not for the support provided by the steel wharf where timber bearers have been packed off the steel beams, either all or part of the wharf would have been subject to overall collapse by now.

3.2 STEEL WHARF

The steel wharf is generally in good condition. Pile bents and cross frames are painted with what appears to be a coal tar epoxy system as commonly used for steel piles. There is some corrosion evident at random locations above high tide mark, and more consistently below high tide mark. However, this does not at this stage appear to be sufficient to endanger the structural integrity of the system, although maintenance is required.

Inspection of Coal & Allied records indicates that blasting off rust and marine growth in tidal areas and then painting with Luxatar Nº 5 was last carried out in 1981.

From previous involvement with the facility we were aware that one pile near the south west corner of the wharf had been damaged by a ship collision during the last 5 years but had been repaired. This pile was difficult to locate, but the repair was eventually identified.

It is noted that the top flanges of the runway girders are restrained against lateral buckling by bracing back to the timber deck. This is an unsatisfactory arrangement, because of the extremely poor condition of the timber wharf. If the runway beams were to be used for continued support of the shiploader, then it would be necessary to stiffen the top flanges and brace these back to the steel cross frames.

3.3 CONVEYOR GANTRY STRUCTURE

The base structure, which is the remnant of the original structure, has a significant amount of rust, but this did not appear to be sufficient to threaten the integrity of the structure. The new structure above this was generally in good condition.

The major concern with this structure is the fact that it is supported by the timber planking and original wharf structure, which is not considered structurally competent.

Attachment No. 3
Part Scan of report by Godden Mackay Logan dated May 2000

- generally intact steel stairs and gantry – requiring some maintenance and repair;
- modified former tank sites;
- extant underground fuel tanks;
- buildings in fair to good condition, adapted for current use;
- intact pumping equipment inside pump room, below wharf;
- tracks and paths remaining on original alignment;
- extant (but mostly inoperable) service elements including transport and substation; and
- timber and steel Coal Loader wharf in fair to poor condition (see below).

9.10.5 Coal Loader Wharf

In view of the significance of the former Coal Loader wharf and the apparent poor condition of its timber superstructure, specialist advice was sought from Patterson Britton and Partners Pty Ltd, Consulting Engineers. Their report, which is based on an external inspection, is included in full as Appendix B. They conclude:

The coal loader wharf consists of two integrated structures: a closely spaced timber structure and a more largely spaced steel framed structure. The timber structure appears to be the original construction and was built perhaps 50 or more years ago. The steel framed structure was installed about 25 years ago to provide support for a number of berthing dolphins used to cater for small coal ships.

The timber structure of the Coal Loader Wharf is in extremely poor condition. A large majority of the timber piles have been severely necked in the tidal zone as a result of marine borer attack. Deterioration is so advanced that localised sections of the sub-structure have dropped away from the deck girders and fallen into the sea. At these locations where sub-structure collapse has occurred, the steel framed structure is preventing sections of the timber deck from falling into the sea. The vast majority of the timber piles will require remedial work if the structure is to be made safe. The underside of the timber deck appeared to be in fair to poor condition. It is expected that closer inspection of the timber deck, particularly the top surface of girders and headstocks, will find the deck to be in poor condition. Given the poor condition of the timber structure, it is expected that partial collapse from self-weight alone will continue.

The steel framed structure appears to be in fair to good condition throughout but is undergoing localised corrosion mostly in or slightly above the tidal zone. The steel framed structure at the western end of the wharf appears quite stable and is providing good longitudinal and lateral stability for the rest of the timber and steel wharf. The steel-framed structure back to shore appears to have been partly dismantled (longitudinal beams removed) but is still quite stable. It is expected that the steel-framed structure would have a remaining life of many years.

- *It is not considered viable to repair the timber structure of the Coal Loader Wharf due to its advanced deterioration. If a wharf type timber structure is required at the site, it should be built from new materials – modern construction techniques even with timber can imitate the techniques employed in the original construction.*

- *It may be beneficial to retain the steel-framed structure as this is in far better condition that the timber. Part of the steel-framed structure could be used to support a new wharf and this has the potential to save large sums on construction. If large vessels are to be moored at the wharf, it is likely that a steel structure would be required in any case. It is expected that the piles would be re-useable but that the steel beams would need to be modified.*

- *The existing wharf is positioned very high out of the water. This has the potential for good views but makes vessel usage difficult. Access to vessels moored at the wharf would require the deck to be much lower or a low-level platform introduced.*

9.10.6 Remediation Requirements

The BP site contains areas that are contaminated as the result of fuel leaks and other activities undertaken at the site. As part of the decommissioning process BP Australia is undertaking site remediation.

The proposed site Remediation involves the removal of soil from the foreshore near the wide timber wharf and the soil within the sandstone block wall. This Remediation work will impinge upon areas of archaeological potential and will require archaeological assessment and supervision. Remediation works in the southeast lower terrace and east of the office building are also in the vicinity of areas of archaeological potential, and will require archaeological assessment and supervision. Additional remediation activity at the upper level, within fill areas, is unlikely to affect subsurface archaeological features.

9.11 Associated Places and Records

The significance of the three industrial sites on the Waverton Peninsula derives in large part from their layered history and the survival or potential survival of evidence from each occupational phase. However, this significance and factors that contribute to it extend beyond the place itself to associated places and records.

The adjacent Woodley's Boat Yard includes the sandstone sea wall and boat ramp dating to the Berry occupation phase. The stone steps and potentially the foundations of the house built for Berry's overseer, Mathews, survive west of Balls Head Road, adjacent to the BP site.

Adjoining the BP site to the north are two residences that were purchased by COR to house the site manager and other staff.

10.3 The Coal Loader Wharf

The wharf on the Coal Loader site is an item of outstanding significance, not only in the context of the Coal Loader and the Waverton Peninsula, but also as an important industrial icon within Sydney Harbour. Built as a utilitarian feature, the timber structure of the wharf is now supported by an inserted steel frame. The frame itself, though requiring some remedial work, is in generally good condition. The timber wharf elements are not, and present major hazards both to visitors to the site who are brave enough to venture onto the wharf and to nearby uses of the Harbour, as timber elements from the structure are now in the habit of coming adrift.

10.3.1 Options

Potential options for the future treatment of the Coal Loader wharf include:

- no action;
- stabilisation of the existing structure;
- reconstruction;
- partial reconstruction;
- retention of the steel frame;
- adaptation; or
- demolition.

The 'no action' option is impractical, given the self-evident public safety and liability issues that would arise.

Stabilisation of the existing structure would be a good short-term conservation option. Although this work has not been costed, it would be physically feasible to secure loose timbers, to erect suitable barrier fencing and signage and to 'mothball' the structure for the time being. However, this is not a permanent solution, given that the timber elements will continue to deteriorate and eventually fall apart of their own accord, with potentially serious consequences.

The next option involves reconstruction of the wharf. (Repair is not considered here as a separate alternative, as the severely degraded nature of the timber structural elements and decking (as well as their corroded steel hardware attachments) effectively prevent any meaningful form of repairs.) If the wharf is to be conserved as a historic relic, it will be necessary to rebuild its timber substructure and superstructure. This would provide a good conservation outcome, in that historic timber structures have a tradition of replacement of defective members, so that over time it is the form and design, rather than original fabric, which is retained. However, this approach would be extraordinarily expensive, to the point of being prohibitive. There are no current firm cost estimates available, but earlier reports put the cost of effective repair in the order of $3 million.

Partial reconstruction of the timber wharf elements, attached to and supported by the existing steel frame, could be considered and would provide a reasonable compromise that has regard to the heritage value of the element and the practical realities of its condition and costs involved in repair. For example, the existing steel structure, which is largely in good condition, could be retained, with defective timber elements removed and an indicative reconstructed section of the timber substructure and superstructure installed, by way of demonstration and to provide visitor amenity. The precise section to be so treated would be a matter for detailed design.

A lesser option, which retains the general form of the wharf, but not its distinctive timber appearance, is removal of the timber structure and retention of the existing steel frame. From a physical and practical point of view this should be achievable but does not result in a good heritage outcome in that the significance of the wharf rests in the design, appearance and rarity of its massive timber structure, rather than in the more recent steel support. It would also be feasible to undertake detailed archival recording of the timber structure, removal of timber and retention of the steel, with a view to future reconstruction of all or part of the timber elements.

Adaptation would involve changes to the wharf design, fabric or use, so as to accommodate new uses and activities. There are a broad range of possibilities. Some or all of the timber and steel structure may be retained. The level of the decking may be adjusted, so as to make the wharf itself more accessible to visiting vessels. New elements, such as walkways or fishing platforms may be attached to the steel structure. Whatever the design solution that were to be chosen, it is highly likely that the existing timber elements would require removal, whether or not they were replaced in whole or part. The advantage of a robust adaptation is that it would create an opportunity for some form of economically viable future use, such as mooring of larger vessels or waterside commercial activities. However, adaptation which alters the distinctive visual characteristics, bold form and scale of the wharf would strike at the heart of its heritage significance and would not be good conservation outcome.

Demolition would not achieve a good outcome as the wharf is an integral part of the significance of the site and is a major heritage item in its own right. While demolition may be physically feasible and economical, it is not consistent with the conservation values or key planning objectives for the site.

10.3.2 Policy Direction

While the practical and financial difficulties associated with the conservation of the Coal Loader wharf are recognised, it is simply not possible to achieve a good heritage outcome for this site if the wharf is not retained and conserved. Future planning and management for this site should therefore focus on how this can best be achieved, with maximum retention of heritage values. The policy direction adopted in this Conservation Management Plan is therefore predicated on retention of the wharf, but formulated in a way that would allow for wide ranging consideration of options including partial reconstruction, retention of the steel frame or adaptation. In the short term, it is clearly preferable that the wharf be stabilised, and that public access be prevented/discouraged. Final resolution will

- upper retaining wall – this structure is a highly visible reminder of the industrial history of the site and the way in which the natural landform has been manipulated over time to meet the requirements of the former occupants; and
- concrete foundations and remnant plant – although much of the industrial equipment and infrastructure has been removed, the remaining elements such as steps, footings, railings and plant can assist in conveying the story of the site to visitors. They are mostly robust and can be adapted to a range of interpretive and recreational uses.

- Coal Loader site:
  - wharf (or remnant wharf structure) and pump house – these offer major opportunities for interpretation of the coal loading operation. The timber structure has high aesthetic qualities as well as the ability to demonstrate a particular technology. However, its poor condition and consequent public safety concerns may preclude its long-term conservation and possible reuse for recreation as a viewing or fishing platform;
  - Coal Loader platform, including tunnels – the platform is a large open space with considerable potential for community uses, including markets, fairs and heritage activities. The tunnels are interesting spaces with interpretive potential but they support a population of bats. Future use of the tunnels will depend on the outcome of a fauna study. Some of the coal chutes could be reopened and converted to light wells to illuminate one or more of the tunnels. Provided safety and conservation issues can be satisfactorily addressed, the public should have access to one or more of the tunnels, particularly that containing remnant coal skips and track. A possible interpretive program would be to have visitors walk south through one tunnel and return via another;
  - Site of former oil storage tank – this has been landscaped as a 'mini wetland' and supprts populations of frogs. Future use will depend on the outcome of a fauna study.
  - operating relics – if one of the remaining coal skips could be made to operate again within the tunnel, the public would be able to obtain a better appreciation of the operation of the coal loader. The tunnels may also be an appropriate point at which to use an audio presentation of the oral history of the site, including commentaries by former employees, sounds of the coal loader in operation, etc; and
  - historic buildings – the ancillary buildings have been adapted for new uses but there is potential to interpret their previous uses by signs or other means.

- a walking track, incorporating associated brochures and signage (so as to be self-guided), linking Waverton Park, the BP site and Balls Head along the eastern side of the Peninsula and the Caltex site, Coal Loader site and Balls Head along the western side of the Peninsula;

Attachment No. 4
Report by State Forests NSW dated 19 February 2007

06233

FORESTS NSW
ABN 43 141 857 613
121-131 Oratava Ave West Pennant Hills NSW 2125 (PO Box 100 Beecroft NSW 2119)
www.forest.nsw.gov.au T 02 9872 0111 F 02 9871 6941
(Direct: T 9872 0179 F 9872 9093)

Our ref: 4360-36800
R Forrester:mf

19 February 2007

The Manager
Taylor Lauder Bersten Pty Limited
PO Box 110
CAMMERAY NSW 2062

Attn: Mr Howard Bersten

Fax: 9929 6667

Dear Sir

Preliminary Timber Inspection
Balls Head Coal Loader

As requested Mr R Forrester, Mr B Roach and Mr Peter Sykes, Timber Inspectors, carried out a preliminary inspection of the wharf known as the Balls Head Coal Loader on 9 February 2007.

The Inspectors met Mr Howard Bersten on site prior to the inspection being carried out.

It was agreed that the inspection would be carried out of sample areas.

The purpose of the Inspection was to:
1. Determine the timber stress grade for decking, beams and capwales.
2. Detail the remaining structural section of a representative selection of decking, beams and capwales.
3. Carry out an assessment of the presence of termites.

Plans were provided by Mr Bersten. Two sample areas were inspected. The sample areas were taken over the width or the wharf with the exception of the last 1.5 m approximately from each side for safety reasons. Part plans were used for each sample area. The plans were used to indicate the location at which the bearers and capwales were test drilled and the results of that test drill. These locations and results were also marked *in-situ* with orange spray paint.

Note:
The orange spray paint will fade and will be unreadable after approximately 3 months.

Capwales and bearers were drilled from above either through the decking or between gaps between the decking. In most instances the capwales and bearers could not be visually inspected or physically sounded.

The decking could only be inspected on the top surface.

Inspection

The capwales were mostly Ironbark with some other in-ground durability class 1 timbers. From the small sections that could be seen the timber was identified as a minimum of strength group 2 timbers (S2) and, other than the defects noted in the plans as well as access restrictions for a thorough inspection, was likely to meet the requirements of structural grade 2. The stress grade that could be allocated was F17 to AS 2082.

The bearers were mostly Ironbark with some other in-ground durability class 1 timbers. From the small sections that could be seen the timber was identified as a minimum of strength group 2 timbers (S2) and, other than the defects noted in the plans as well as access restrictions for a thorough inspection, was likely to meet the requirements of structural grade 2. The stress grade that could be allocated was F17 to AS 2082.

The decking was mixed hardwood. Brush box, Blackbutt and Ironbark were some of the species identified. The species ranged from in-ground durability class 1 to in-ground durability class 3 timbers. The species ranged from strength group 3 species to strength group 1 species. The newer decking that was sound is likely to meet structural grade 2 therefore the stress grade that could be allocated was F14 to AS 2082.

Only general observations of the decking have been made. They were:

- Several lengths of decking had been replaced within approximately 10 to 15 years. This decking was in good condition.
- Older decking planks ranged from being in good condition to poor condition. Many of these were decayed in their entirety or on their ends to such an extent that they could not be relied upon to support a person's weight.
- Some decking boards were missing.

Plans

Legend:

X	Reject.
B	Bearer that the test drill indicated was essentially sound.
H	Capwale that the test drill indicated was essentially sound.
T 200	Size of defect (diameter approximately); **T** indicating that the defect was towards the top of the cross section.
100	Size of defect (diameter approximately).The defect towards the middle of the cross section.

The markings have been placed where the bearer is drawn on the plans. A dotted line indicates the position of the capwales. Markings have either been placed on the dotted line or an arrow indicating the position on the dotted line to which the markings belong.

Termites

No active termites were found at the time of the inspection however there were indications of minor to extensive termite damage in approximately 20% of the timber tested.

Comments

Inspections of the bearers and joists were only carried out by test drilling. It is Mr Forrester's opinion that should a more thorough inspection take place rejection of:

- capwales may increase by 30%;
- bearers may increase by 50% due to moisture being trapped between the decking and the bearer for extended periods.

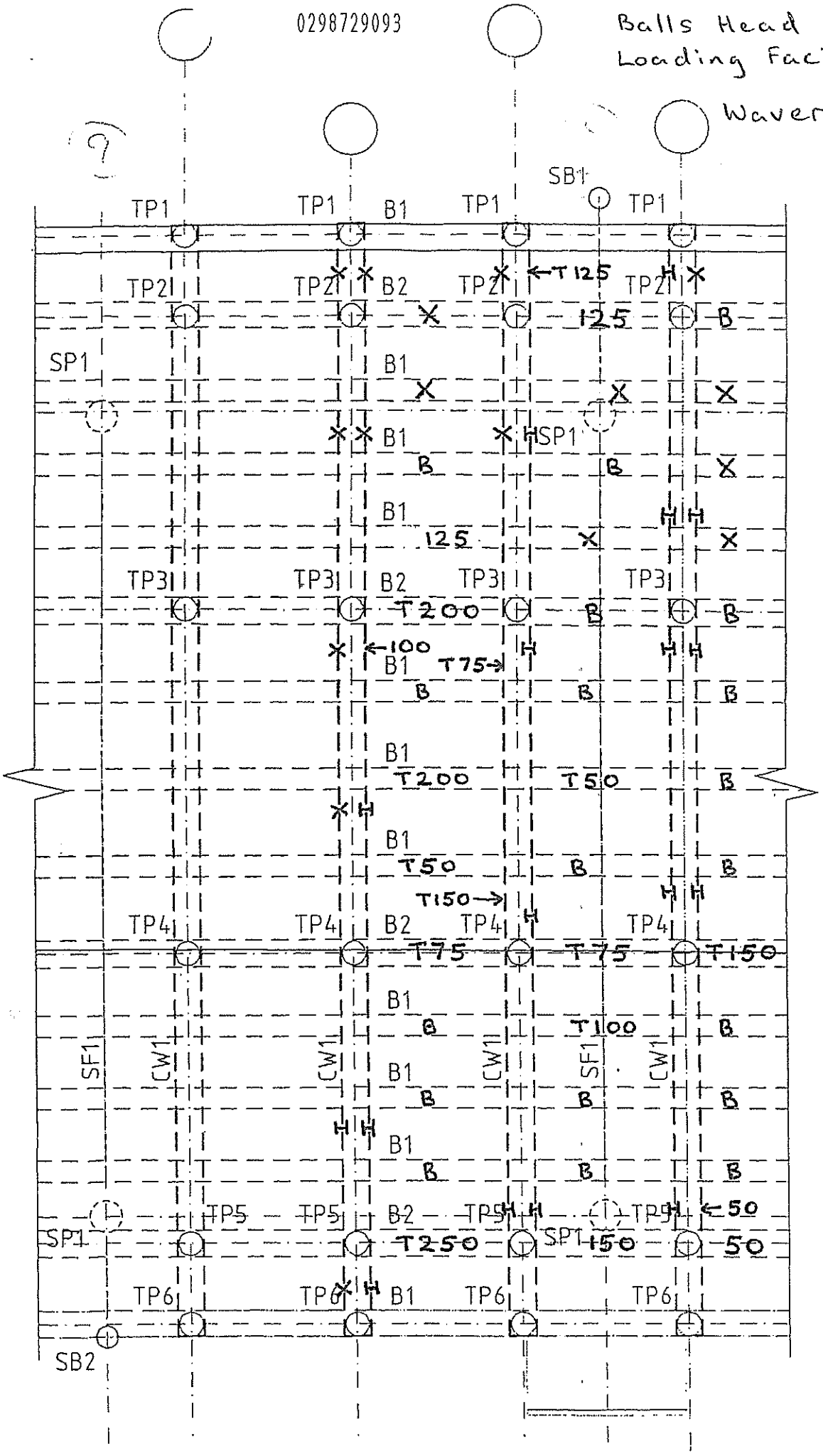
Yours sincerely

R Forrester

R FORRESTER
ACTING CHIEF TIMBER INSPECTOR

0298729093

Balls Head
Loading Facility
Waverton



steel pile → S9

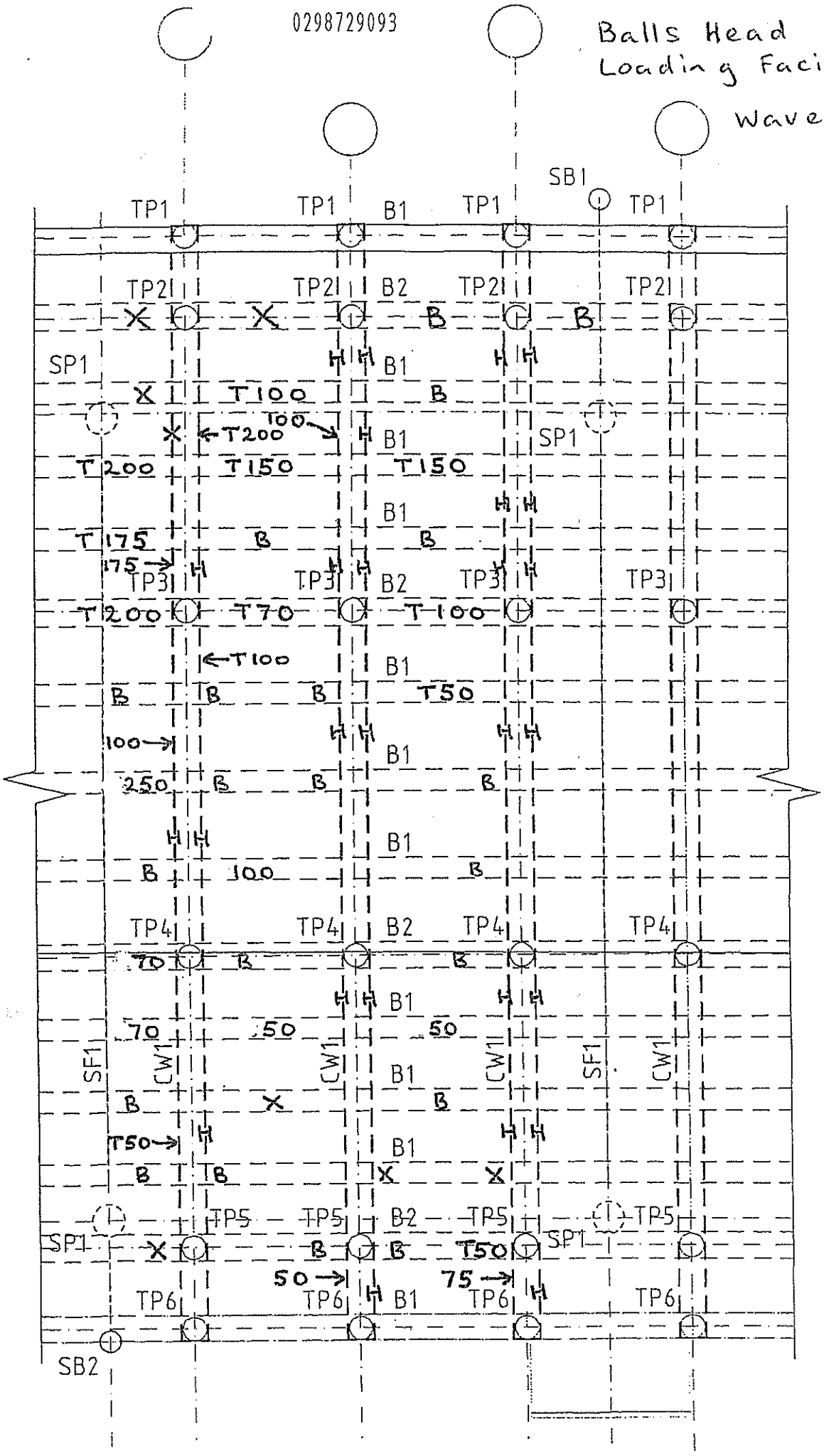
SCALE 1:100

PART PLAN OF DECK

S8 ← steel pile

0298729093

Balls Head
Loading Facility
Waverton



SCALE 1:100

PART PLAN OF DECK

Steel pile → S6

S5 ← Steel pile