P7984 Cottesloe Beach Pylon Conservation Management Plan

Prepared for

The Town of Cottesloe

By

HOCKING HERITAGE STUDIO

MEnD

April 2019

Cover Photograph:

HHS Job No. 2018-65

Rev No	Author	Date	Reviewer	Date
	Hocking Heritage Studio MeND	Feb 2019	Town of Cottesloe WGA Engineers	
	Hocking Heritage Studio MeND	April 2019	Town of Cottesloe WGA Engineers	

Executive Summary

The Cottesloe Beach Pylon was constructed in 1936 as part of a shark proof enclosure scheme for the Cottesloe Beach area. The enclosure was never completed and the pylon remained as an iconic element in the Cottesloe Beach land and seascape. Its significance to the Western Australian community was recognised by its inclusion on the State Register of Heritage Places (Place 7984) and the Town of Cottesloe Heritage List. Cottesloe Beach Pylon is also included in the State Registered Place 16637 Cottesloe Beach Precinct which was included on the State Register in 2004. The Town of Cottesloe are committed to retaining the pylon and Cottesloe Beach for the Cottesloe and Western Australian community.

After a storm damaged the original mast in 1995, a replacement was installed in 1996. Since that time the pylon has suffered further damage and undergone repairs. In January 2019, the Town of Cottesloe undertook significant repairs to the pylon below the waterline, the community contributed to the funding for these works. During these works specialist materials engineers, MeND, assessed the condition of the pylon above the waterline.

The Town of Cottesloe engaged Hocking Heritage Studio and MeND to prepare a conservation management plan to guide the future management of the pylon. This conservation management plan includes options for the management of the pylon into the future to enable the Town of Cottesloe to make the most appropriate decisions in regard to maintaining the heritage values of the pylon.

Statement of Significance

The following statement was prepared in 2003 for its permanent inclusion on the State Register of Heritage Places.

Cottesloe Beach Pylon, a concrete pylon constructed in 1936 with a reconstructed top and situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach, has cultural heritage significance for the following reasons:

> the place is an element of Cottesloe Beach, one of Perth's most popular recreation and swimming beaches from the 1880s through to the present;
>
> the place is rare as the only remaining element of what was to have been a shark proof enclosure, a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach; and,
>
> the place is a well-known icon for visitors to Cottesloe Beach, and contributes to the beach as a distinctive landmark.

Conservation Policy

The following conservation policies have been developed on the basis of the assessment of the cultural heritage significance, zones and elements of heritage significance and the statement of heritage significance for Cottesloe Beach Pylon.

The policies have been drafted with awareness of the context of the site, sufficiently flexible to recognise constraints and requirements on the site and of its owners, managers and users, and to enable the heritage significance of the place to be retained and enhanced alongside future development. In this context the conservation policy aims:

- to provide guidance to the owners of the place, regarding significance of the place;
- to provide advice to ensure retention of significance of Cottesloe Beach Pylon;
- to provide practical recommendations for conservation of significant fabric and policies for restoration, reconstruction and maintenance of the existing significant structure;
- to provide criteria for assessing the appropriateness of adaptation of the fabric;
- to illustrate practical means by which the significance of the place can be presented through appropriate interpretation; and
- to provide advice on the approval process for any proposed development.

The policies recommended for Cottesloe Beach Pylon are based on the need to conserve it as a place of aesthetic, historic and social significance. The conservation of the built structures assessed as being of cultural significance should take account of the physical changes that have occurred over time and which reflect the historical development of the structure.

Key Policy Statements

Policy 1.1 The assessed significance of Cottesloe Beach Pylon and the recommendations of the Conservation Management Plan should be adopted by the owners and managers of the place, as well as relevant authorities, as a guiding document for decisions about management, maintenance and future use.

Policy 1.2 The conservation of significant elements should be carried out in accordance with the principles outlined in the Australia ICOMOS charter for the conservation of places of cultural significance (the Burra charter). These principles are fundamental to the Conservation Management Plan.

Policy 1.3 The Conservation Management Plan should be reviewed periodically to consider the continued applicability of the conservation policies and to assess the manner in which they have been implemented.

Policy 1.4 All work undertaken to conserve or adapt the structure should be appropriate to the assessed significance of the place and should be guided and supervised by experienced conservation practitioners.

Policies Arising from the Cultural Heritage Significance of the Place

Policy 2.1 The future conservation and use of Cottesloe Beach Pylon should take account of the assessed significance of the place.

Policy 2.2 All the elements assessed as being of cultural heritage significance of the Cottesloe Beach Pylon site should be retained and conserved in their original locations.

Requirements Arising out of the Burra Charter

Policy 3.1 The definitions and principles of the Burra Charter should be used to guide all considerations for the future conservation, development and use of the Cottesloe Beach Pylon and any associated requirements for physical works. (Refer 8.10 Policies Arising from the Physical Condition of the Place)

Policies Arising out of Graded Zones and Elements of Significance

Policy 4.1 The significant fabric of structures or elements of considerable significance should be preserved, restored or reconstructed as appropriate.

Key Policies Arising from the Physical Condition of the Place

Policy 5.1 All original fabric should be retained wherever practicable. Where this is not possible due to condition, new fabric can be introduced to match the original.

Conservation of Cottesloe Beach Pylon

Policy 6.1 All fabric to the Cottesloe Beach Pylon should be inspected on a routine basis for structural adequacy and cracking, spalling and deterioration of materials. Where issues are known to exist, these should be remediated by appropriate professionals and/or monitored for further deterioration.

Policy 6.2 Where replacement of original fabric is required, new fabric may be introduced to match the originals.

Policy 6.3 All identified conservation works should be undertaken to help maintain and conserve Cottesloe Beach Pylon as per the "Recommended Conservation Works Schedule" set out in Section 9.5 – Implementation, of this report.

Policy 6.4 Any works identified in the 'Urgent Works' section of this report should be undertaken within one year of the completion of this report.

Policy 6.5 Regular maintenance is an essential part of conserving built fabric and retaining the significance of a place. Lack of maintenance can lead to the loss of significant fabric and the need for more extensive conservation work. See "Maintenance Schedule" set out in Section 9 – Implementation, of this report.

Requirements for Interpretation

Policy 7.1 Copies of the conservation plan should be available through the Town of Cottesloe and the Grove Library for information of visitors and for research purposes.

Policy 7.2 Ensure the conservation of Cottesloe Beach Pylon as the fundamental component of its interpretation.

Policy 7.3 Encourage the development of interpretive material on the history and significance of the Cottesloe Beach Pylon within the context of the history of Cottesloe Beach Precinct and its continued use by the Western Australian community.

Policies Arising from External Requirements

Policy 8.1 Generally, any development of the place should comply with statutory constraints including building and health requirements administered by the local authority.

Policy 8.2 A copy of this conservation management plan should be provided to the following agencies for their information and guidance.

- Town of Cottesloe
- Heritage Council of WA
- Battye Library of WA

Policy 8.3 Due to being entered on the State Register of Heritage Places any works requiring a development application will be forwarded to the Heritage Council of Western Australia for their comment.

Requirements of Statutory Authorities

Policy 9.1 Where elements have been assessed as having significance, any works arising from requirements to comply with statutory regulations should be evaluated against this conservation policy to ensure minimum impact on significant fabric. Professional advice should be sought to ensure that both safety and conservation issues are fully assessed.

Requirements of Owners and User of the Place

Policy 10.1 Any adaptation of Cottesloe Beach Pylon must ensure that significant fabric of the place is retained, maintained and interpreted. The owners of the site have a duty to maintain the structures and to share the stories with the public, informing them of the part that Cottesloe Beach Pylon played in the development of the Town of Cottesloe.

Future Site Development

Policy 11.1 Any further development on Cottesloe Beach should not restrict or impede views of Cottesloe Beach Pylon from Cottesloe Beach. The landmark status of Cottesloe Beach Pylon should be retained in any new potential development.

Contents

Table of Figures

1.0 Introduction

Cottesloe Beach Pylon is a concrete pylon constructed by the Municipality of Cottesloe in 1936 as the north-west corner support for netting to create a shark proof enclosure, a project that was never completed. The only remaining evidence of this unsuccessful venture, the pylon, is situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach (High Water Mark) in line with John Street.

After a storm damaged the original mast in 1995, a replacement was installed in 1996. Since that time the pylon has suffered further damage and undergone repairs. In January 2019, the Town of Cottesloe undertook significant repairs to the pylon below the waterline, the community contributed to the funding for these works. During these works specialist materials engineers, MeND, assessed the condition of the pylon above the waterline.

1.1 Location

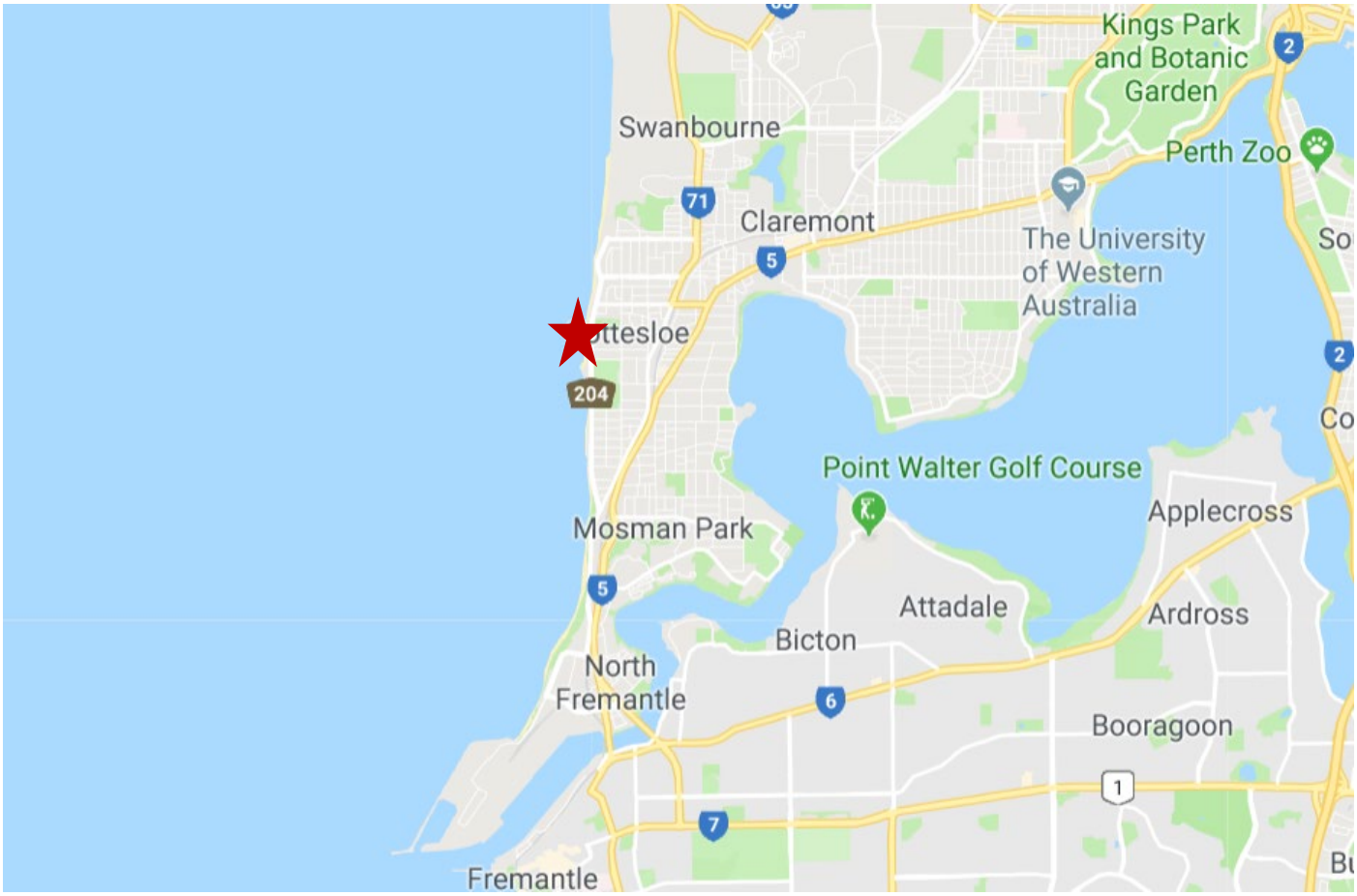


Figure 1: Location of Cottesloe Beach in Perth Metropolitan area
Courtesy Google Maps

Figure 2: Aerial photograph showing location of Cottesloe Beach Pylon
Courtesy Landgate, 2018

1.2 Heritage Listings

P7984 Cottesloe Beach Pylon has the following heritage listings:

Register of Heritage Places	Interim Listing	17/04/2003
	Permanent Listing	15/08/2003
Classified by the National Trust		----------
Municipal Heritage Inventory	Adopted	30/09/1995
Heritage List		----------

P16637 Cottesloe Beach Precinct

Register of Heritage Places	Interim Listing	23/11/2004
Classified by the National Trust		----------
Municipal Heritage Inventory		----------
Heritage List		----------

1.3 Statement of Significance

The following statement was prepared in 2003 for the permanent inclusion of Cottesloe Beach Pylon on the State Register of Heritage Places.

Cottesloe Beach Pylon, a concrete pylon constructed in 1936 with a reconstructed top and situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach, has cultural heritage significance for the following reasons:

the place is an element of Cottesloe Beach, one of Perth's most popular recreation and swimming beaches from the 1880s through to the present;

the place is rare as the only remaining element of what was to have been a shark proof enclosure, a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach; and,

the place is a well-known icon for visitors to Cottesloe Beach, and contributes to the beach as a distinctive landmark.

1.4 Acknowledgements

The authors of this conservation management plan would like to acknowledge the assistance of the following individuals in the preparation of this report:

- Kevin Truscott, Project Manager, Town of Cottesloe
- Staff of the State Heritage Office who prepared the Assessment Documentation for the place in 2003

1.5 Methodology

This conservation management plan has been prepared in accordance with the standard brief of the State Heritage Office of Western Australia.[1]

The report follows the approach recommended by Australia ICOMOS (International Council on Monuments and Sites. It applies the principles set out in *The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (The Burra Charter); Guidelines to the Burra Charter: Cultural Significance; Guidelines to the Burra Charter: Conservation Policy; and Guidelines to the Burra Charter: Procedures for Undertaking Studies and Reports.*[2]

The report has also been prepared in accordance with principles of *The Conservation Plan*[3] and Criteria of Cultural Heritage Significance for Assessment of Places for Entry on to the State Register of Heritage Places.

The documentary research included the use of primary and secondary sources and is largely drawn from the assessment documentation prepared in 2003 by officers of the State Heritage Office. Acknowledgment is extended to those officers for their original work.

The documentary evidence covers both the concise history of the Cottesloe Beach Pylon as well as the social and contextual history that relates to the use and development of the site. A complete bibliography of all sources is provided at 10.0.

Physical evidence has been prepared with reference the 2003 documentation prepared by officers of the State Heritage Office. The structural components of the Cottesloe Beach Pylon have not been described in this document as other documentation has been prepared for the Town of Cottesloe and included in the Appendices. The condition of the upper level of the structure, specifically the concrete has been addressed by engineers from MeND.

The conservation and management policy has been formulated to assist with the retention and enhancement of the identified and documented cultural heritage significance as determined in 2003, with reference to the current condition of the pylon.

Site visits were undertaken by the team in January 2019 when works were being undertaken by the Town of Cottesloe.

1.6 Ownership

Cottesloe Beach Pylon is owned by the State of Western Australia and managed by the Town of Cottesloe. A copy of the Reserve Enquiry Form and Survey are included at Appendix A.

The place is designated as part of the Reserve 47618 as shown on Lot 15530 on Plan 041103, land ID 3356364.

---

1 State Heritage Office, An Information Guide to Conservation Management Plans and Standard Brief, January 2013 http://stateheritage.wa.gov.au/docs/conservation-and-development/guide-to-conservation-management-plans0CE0050FE47C.pdf?sfvrsn=2

2 Peter Marquis-Kyle & Meredith Walker *The Illustrated Burra Charter: Making Good Decisions About the Care of Important Places*, Australia ICOMOS, Sydney 1994. The Burra Charter and Guidelines are available from www.icomos.org/australia

3 James Semple Kerr, The Conservation Plan: A Guide to the Preparation of Conservation Plans for Places of European Cultural Significance, National Trust NSW, Sydney, 1990, 5th Edition

1.7 Previous Studies/Research

- *Assessment Documentation for Place 7984 Cottesloe Beach Pylon, prepared in 2003 by the State Heritage Office.*
- Adamson, P. (1995, March). Story of the Solitary Pylon at Cottesloe, originally part of a plan for a shark-proof swimming pool. *Cottesloe Society Newsletter*, pp. 4-10.

1.8 Study Team

The conservation management plan was prepared by:

- Gemma Dewar, MSc Hist Cons, BSc Hons Est Man, M.ICOMOS
- Prue Griffin, BA Hist, Post Grad Dip Pub Hist, M App Cult Heritage Studies, M.PHA (WA), M.ICOMOS
- Garon Deutsch, Consulting Engineer, Duratech Australian
- Liam Holloway, Consulting Engineer, MeND

1.9 Terminology

The terms used in this Conservation Management Plan are those employed in the ICOMOS Burra Charter.

Adaptation means modifying a place to suit the existing use, or a proposed use

Association means the special connections that exist between people and a place

Burra Charter The Australia ICOMOS charter for places of cultural significance

Compatible Use means a use which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance

Conservation means all the processes of looking after a place, so as to retain its cultural significance

Cultural significance means aesthetic, historic, scientific/research, social or spiritual values, for past, present and future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects

Fabric means all the physical material of the place including components, fixtures, contents and objects

HCWA the Heritage Council of Western Australia

ICOMOS International Charter for the Conservation and Restoration of Monuments and Sites

Interpretation means all the ways of presenting the cultural significance of a place

Maintenance means the continuous protective care of the fabric and setting of a place and should be distinguished from repair.

Meanings denotes a place significances, indicates, evokes or expresses

Place means the site, area, land, landscape, building or other work, group of buildings or other works, and may include components, contents, spaces and views

Preservation means maintaining the fabric of a place, in its existing state, and retarding deterioration

Reconstruction means returning a place to a known earlier state and is distinguished from *restoration* by the introduction of new materials into the fabric

Repair involves the restoration or reconstruction of a place

RHP Register of Heritage Places administered by HCWA

Related Objects means an object that contributes to the cultural significance of a place but is not actually at that place

Related Place means a place that contributes to the cultural significance of another place

Restoration means returning the existing fabric of a place to a known earlier state by removing accretions, or by reassembling existing components, without the introduction of new material

Setting means the area around a place which many include the visual catchments

Use means the function of a place, as well as the activities and practices that may occur at such a place

2.0 Documentary Evidence

The following Documentary Evidence has been largely drawn from the assessment documentation prepared in 2003 for the inclusion of the Cottesloe Beach Pylon on the State Register of Heritage Places. Acknowledgment is extended to the staff of the State Heritage Office who prepared the Documentary Evidence in that assessment. Additional information has been included where required and identifies any significant changes and events since 2003 to the present day [2018].

2.1 Introduction

The following documentation has been prepared using primary and secondary source material. Acknowledgment is extended to the authors of all secondary source material. Whilst all efforts have been made to check original sources no responsibility is taken for the conclusions made in the secondary source material.

2.2 Chronology

1895	Establishment of the Cottesloe Road District
1904	Construction of a jetty at Cottesloe Beach
1906	Rebuilding of Cottesloe Jetty
1907	Creation of the Cottesloe Municipality
1925	Death of Simon Ettleson in a shark attack at Cottesloe Beach
1929	Construction of the Cottesloe Bathing Pavilion
1933	Application to build a shark proof swimming enclosure south of the Cottesloe Jetty by private company 'Cottesloe Shark-Proof Swimming Pool Co Ltd'
1934	• August - The Town of Cottesloe accept the proposal of Town Clerk/Engineer John Foreman to build a shark proof enclosure adjoining the jetty and raise a loan to build the enclosure. • October – work began on construction of the pylons but detained while work was undertaken to strengthen the jetty.
1935	• March – works begin on construction of the pylons for the shark enclosure • December – works completed on strengthening the jetty
1936	• 1 April – works completed on the Cottesloe Beach Pylon • 29 May – heavy storm damages the enclosure removing one pylon and timber piles
1937	Report prepared by Mr. H. Bennett, retired engineer of the Harbours and Rivers Branch of the PWD into the validity of the remaining enclosure structures concluded that Cottesloe Beach Pylon would be dislodged 'sooner or later'.
1952	Cottesloe Jetty removed
1956	Cottesloe groyne built
1961	Formation of the Town of Cottesloe
1964-68	Upper section of the pylon mast removed
1995	7 June Mast damaged and removed in a severe storm
1996	New mast with stainless steel cone fitted on the base
2009	Storm damage again removes the mast from the base and the Town of Cottesloe rebuilt the mast
2018	Fundraising campaign to repair the pylon above and below the water line
2018-19	Works undertaken to create a new sheath of concrete around the existing concrete base
2019	Conservation Management Plan prepared

2.3 Cottesloe Beach 1886-1934

Cottesloe was named in 1886 and soon became a gathering point for the population of Perth during the warmer months due to its excellent beach situated conveniently close to a railway station. The wealthy purchased land and built imposing residences there, while boarding houses and tearooms catered for the summer visitors. Over the ensuing four decades, it became one of the best known and most popular of Perth's coastal resort towns.

The lavish beach facilities that attracted crowds included a jetty first constructed by Aitken and Law in 1904, then rebuilt in 1906 after storm damage. Extending out in line with Forrest Street, the jetty featured a wide promenade with a rotunda out over the water where a band played on Sundays and other evenings. The pleasure steamer, *Zephyr*, used to berth at the jetty on its way to Rottnest from Fremantle. North of the jetty and central to the main beach, a magnificent bathing pavilion was constructed in 1929. In the 1930s, tourist posters proclaimed, 'Cottesloe never palls whether you come for a day, a year or a life.'[4]

Figure 3: Cottesloe Beach, New Pavilion c1930
Courtesy SLWA online image b2940514_1

A tragedy occurred at Cottesloe in November 1925, when local man Simeon Ettleson was attacked and killed by a shark. This incident is likely to have influenced proposals to construct a shark proof enclosure. Comments in the local press at the time support this conclusion. *The Truth* stated in 1926 that, 'the shark tragedy at Cottesloe last season had a far-reaching influence, and timid people now resolutely refuse to bathe except in either baths or a shark-proof netting enclosure'.[5]

In January 1933, the Cottesloe Municipal Council received an application from the 'Cottesloe Shark-Proof Swimming Pool Co. Ltd.' for the lease of an area south of the jetty for this purpose. Other metropolitan beaches were vying for patronage and there was recognition amongst councillors that Cottesloe needed to stay competitive and safe to ensure the profitable running of the pavilion.[6]

In August 1934, John Foreman, Cottesloe's town clerk/engineer, submitted a special report with four recommendations designed to increase the popularity of Cottesloe Beach. These included repairs and an extension to the jetty, the provision of changing sheds, building a promenade from the main beach to the Eric Street beach, and the construction of a shark proof enclosure.[7]

John Godsell Foreman (1904-1945) was to play a prominent part in the construction of the shark proof enclosure, to the extent that the venture would become known locally as 'Foreman's Folly'. Born in Kalgoorlie in 1904 and educated at Perth Modern School, Foreman spent some time in the RAAF and RAF before returning to WA in 1927. With qualifications in engineering and accountancy and experience in both the Fremantle and Perth Roads Boards, he accepted the position at Cottesloe in January 1932 aged 28, and was noted in the local press as the youngest town clerk in WA.[8]

---

4 Erickson & Taylor with Philip Griffiths 'Town of Cottesloe Municipal Heritage Inventory', Record No 248.
5 *The Truth,* 2 October 1926, p. 5.
6 Adamson, Pat 'Cottesloe's Solitary Pylon' in *The Cottesloe Society Newsletter*, Vol. 4, No. 1, March 1995, pp.4&5.
7 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
8 *The West Australian,* 18 December 1931, p. 16; *The Kalgoorlie Miner,* 18 September 1945, p. 2; and *Daily News,* 27 January 1934, p. 17.

2.4 Cottesloe Beach Shark Enclosure – 1934 to1939

In 1934, the Cottesloe Municipal Council accepted Foreman's specifications and estimates, and a loan was raised to allow the works to proceed.[9] Foreman's specifications took into consideration that the shark proof enclosure would have to be of 'sufficient strength in the netting supports to overcome wave action'.[10] The existing jetty was to form the southern boundary of the enclosure with its piles acting as the support for the cables and netting. The cables holding the netting on the west and north sides of the enclosure were to be supported by a number of concrete pylons: one located at the north-western corner 80 yards from the mean high water mark; two midway along the western boundary; and, one midway along the northern boundary.[11]

Each concrete pylon was to be a height of 15 feet from bedrock level, thereby ensuring a height of 8 feet at low tide. The base of the pylon was specified as 8 feet in diameter, moving up to a diameter of 5 feet at the top.[12] Foreman proposed that each of the pylons would have steps and a springboard for the enjoyment of beachgoers, and that floodlights would also be erected to allow night swimming.[13] It was estimated that the total cost of the shark proof enclosure would be £1,600.[14]

At the meeting of the Cottesloe Council on 12 September 1934 it was announced that the loan for the cost of the entire beach improvements had been arranged. It was decided that the tender for the construction of the shark proof enclosure would be offered immediately to allow work to begin should weather permit.[15]

The timber moulds for the concrete towers or pylons are said to have taken approximately one month to build. Each individual mould incorporated steel reinforcement so that when they were placed into position on the seabed the concrete could be poured directly into the mould.[16] Prior to their placement, cofferdams (water tight enclosures of inter-locking sheeting) were to be constructed in the ocean and then dredged of water and sand down to the bedrock level.[17] Work began on the installation of the first cofferdams near the jetty in October 1934. However, as had been foreseen by Council, weather conditions impacted on the work schedule, as did the fragile condition of the jetty itself. Work was suspended on the enclosure project until February 1935, and attention turned to the reconstruction of the jetty, which was completed in December 1935.[18]

Figure 4: Cottesloe Jetty, March 1935
Courtesy The Grove Library, image CPM00966

9 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934 and 12 September 1934, Item 11, cons 6187, SROWA.
10 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
11 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
12 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
13 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
14 Municipality of Cottesloe Minutes of Council Meeting, 8 August 1934, Item 11, cons 6187, SROWA.
15 Municipality of Cottesloe Minutes of Council Meeting, 12 September 1935, Item 11, cons 6187, SROWA.
16 'Cottesloe's Solitary Pylon', op. cit., p. 6.
17 'Cottesloe's Solitary Pylon', op. cit., p. 6.
18 Ibid, pp. 6 – 7, 'Cottesloe Shark Proof Pool' in Municipality of Cottesloe, Civic Centre News, 1989, p. 10.

An attempt was made by three Councillors to put a stop to the project altogether, but the motion was defeated 11 votes to 2 at the Council's meeting on 30 January 1935.[19]

On 27 March 1935, the first of the cofferdams for the shark proof enclosure was successfully positioned adjoining the jetty, into a 6 feet deep hole that had been blasted into the bedrock.[20] The concrete was poured into the mould by 10 April, in an operation that took just over 24 hours. The mould was later removed leaving the concrete pylon in place.[21] The project was of interest to many in the community and was reported in the local press.

> ***SHARK-PROOF POOL***
> ***Work Commenced at Cottesloe***
> *Thirteen feet long, 12 feet in diameter, and weighing over three tons, a steel cylinder was floated from the Cottesloe beach early on Monday morning and placed in position to act as a coffer dam for making the first concrete pylon of the Cottesloe shark-proof swimming pool. The construction of the pool, which presents some interesting engineering problems, has been awaited with interest, and throughout Monday a constant stream of visitors flowed along the pier to inspect the first stage of the work.*
> *The site of the first pylon is underneath the jetty, and while favourable weather conditions for the erection of the coffer dam were awaited, a hole about six feet deep was blasted in the rock of the sea bed. On Monday morning the big steel cylinder, packed with empty drums to give buoyancy, was rolled into the water from the beach and towed into position with a winch from the jetty. The three tons of iron required careful handling as the drums were removed from one end and the cylinder was lowered into the water by a derrick in an upright position. When the lower rim of the cylinder came to rest on the rock of the sea bed, the cylinder was secured at four points to piles of the jetty with huge turnbuckles and braced to withstand the movement of the waves. A wooden breakwater was also erected to reduce the force of the waves.*
>
> ***Concrete Pylon***
> *Work, which started at 6 o'clock on Monday morning, was continued till nightfall, and the coffer dam was securely anchored in position and the work of making it water tight at the bottom commenced. The bottom of the cylinder is to be sealed with clay and the clay held in position with sandbags. When the sealing is complete, and the foundation of the pylon cleared of rock and debris, the water will be pumped from the cylinder. A wooden mould for the pylon, 10 feet 6 inches wide at the bottom and five feet wide at the top, will be lowered into the cylinder and concrete poured into the mould, in which steel reinforcement is already in position. After the concrete has been left to set for a few days the mould will be removed, the water allowed the return to the cylinder, and the coffer dam will be lifted for use in the construction of the five pylons required for the pool.*
> *An interesting feature of the work will be the fact that when the first pylon is constructed it will not be possible to lift the coffer dam clear without dismantling the pier. The dam has accordingly been made in two halves, bolted together over timber to make the joint watertight, so that the two halves can be taken away separately. The work is being carried out under the supervision of the town clerk of Cottesloe (Mr. J. Foreman), who is also the engineer. It is estimated that when the water is exhausted from the dam, the latter will exert an upward lift of 28 tons, as it stands in about 10 feet of water. This strain will be taken by the bracing to the piles of the jetty, so that to rise from the sea bed the dam must lift the jetty bodily.*
>
> ***Simple Diver's Helmet***
> *A curious contrivance which proved its usefulness on Monday was a home-made diving outfit. A four-gallon drum was converted into a diver's helmet by fitting a glass pane to the front and fashioning chest and backplates of metal weighted with lead. To the top of the drum an ordinary garden hose was connected, while the other end of the hose was attached to an ordinary double action motor car air pump. Several times during the day workmen in bathers donned the curious helmet to descend a ladder to the bottom of the*

19 'Cottesloe's Solitary Pylon', op. cit., p. 7.
20 *The West Australian,* 27 March 1935, p. 10.
21 'Cottesloe's Solitary Pylon', op. cit., p. 7.

> *dam, while another many worked the pump. The pressure of the air inside the helmet prevented the water entering, while the weight of lead held the contrivance in the position on the diver's head.*[22]

The Cottesloe Council was informed that the cost of completion of this pylon had been twice that of the estimation, being £260. This meant the total cost of the enclosure would be much higher than had been anticipated, but that some of additional funding needed would be found from the surplus associated with the jetty works.[23]

Following completion of the first pylon, it was proposed that work being immediately on the northern pylon. Initial plans were deferred due to bad weather.[24]

In August 1935, Foreman put forward plans for a variation to the specifications of the enclosure's construction. He recommended that, in the place of the concrete pylons planned at midway points along the western boundary, an African hard wood called 'turpentine' could be used to construct three dolphins as cable supports. (Foreman had been advised by the Queensland Forestry Department that the timber would be immune from termite attacks.)[25] Given that the use of timber would expedite the timeframe for the project, the Council agreed to the variation.[26]

Weather continued to cause delays up to December 1935. In the intervening period, the two shore anchors for the cables were installed at the John Street and Forrest Street ramps. By January 1936, the first timber pile had been put into position and a working platform was extended to the site of the northern pylon.[27]

Figure 5: Aerial view of Cottesloe Beach, 1936. Courtesy The Grove Library, image CPM00444

Although it was stated that the second concrete pylon (Cottesloe Beach Pylon) would be completed in two weeks, work progressed steadily during the months of February and March. Construction of Cottesloe Beach Pylon was finished by 1 April 1936.[28] At its base in the bedrock, the pylon was said to have been approximately 12 foot 6 inches in diameter and estimated to weigh 60 tons. The cofferdam and mould were left in place until the end of April to allow the proper curing of the concrete. By this time, the third timber pile had been erected and all that was required to finish the project was the installation of the cables and netting.[29]

However, the Cottesloe Beach shark proof enclosure was never completed. On the night of 29 May 1936 a storm caused substantial damaged to the built structures. The first pylon under the jetty was dislodged and was removed by Council, and the timber piles were swept away by heavy seas. Foreman suggested that

---

22 *The West Australian,* 27 March 1935, p. 10.
23 'Cottesloe's Solitary Pylon', op. cit., p. 7.
24 'Cottesloe's Solitary Pylon', op. cit., pp. 7-8.
25 'Cottesloe's Solitary Pylon', op. cit., p. 8. A dolphin is the name of a pile or bollard used to moor boats.
26 'Cottesloe's Solitary Pylon', op. cit., p. 8.
27 'Cottesloe's Solitary Pylon', op. cit., p. 8.
28 'Cottesloe's Solitary Pylon', op. cit., pp. 8-9.
29 'Cottesloe's Solitary Pylon', op. cit., p. 9.

the matter of the enclosure's reconstruction be deferred until it was determined what affect the winter storms would have on the remaining pylon.[30]

Foreman sought advice from consultant Mr. H. Bennett, a retired engineer of the Harbours and Rivers Branch of the Public Works Department, with regard to the project. In his report of 1937, Bennett recommended three different schemes for the enclosure's reconstruction and, further to this, believed that the remaining pylon would be dislodged sooner or later.[31]

The Council's decision on the matter of the shark proof enclosure was deferred in January and February 1937, before being referred to the Beach and Works Committee for its consideration. However, there is no evidence to indicate that the matter was ever dealt with again and it appears to have disappeared from formal Cottesloe Council discussions.[32]

The two timber piles erected for the scheme remained for some years but it is not known when they were removed. Photographic evidence shows them in place in 1939. These photographs also show that the original mast was much taller than the extant mast. This was likely to enable the lighting, which was planned for each of the pylons.

Figure 6: View of Cottesloe Jetty, pylon and piles, 1937
Courtesy The Grove Library, image CPM00122

Note the two remaining piles

Figure 7: View of Cottesloe Jetty, pylon and piles, 1938
Courtesy The Grove Library, image CPM00662

Note: the two piles are still in evidence

30 'Cottesloe's Solitary Pylon', op. cit., p. 9.
31 'Cottesloe's Solitary Pylon', op. cit., pp. 9-10.
32 'Cottesloe's Solitary Pylon', op. cit., p. 10.

Figure 8: View of pylon and jetty, 1939. Courtesy State Library of WA, online image b3348177_6.

Figure 9: View of pylon and jetty, 1939. Courtesy State Library of WA, online image b3348177_7.

2.5 An icon of Cottesloe Beach - 1939 to 1995

Cottesloe Beach was considered to be the most popular beach in Western Australia in the first half of the twentieth century: 'the mini Brighton of the West'.[33] The jetty (1904/1906; 1935) and the pavilion (1929) were an integral part of life at the beach during this period, not only for beachgoers but they, together with the Cottesloe foreshore strip, were part of the nightlife for local residents of the western suburbs.[34] Although the jetty and the pavilion as well as other entertainment venues along the foreshore fell into disuse and disrepair from the 1950s to the 1970s, Cottesloe Beach continued to be one of Perth's and the State's most popular swimming areas. As a feature of the beach, Cottesloe Beach Pylon became a popular diving platform for beachgoers.

The jetty was removed in 1952 and the new groyne built in 1956 to prevent erosion of the beach. It is probable that if the piles were still in evidence in 1952 they were removed during this program of works. As the pylon was a popular element for beach goers it was retained, or least difficult to remove and was left in situ.

Photographic information indicates that the upper portion of the mast was lost in the period between 1964 and 1968. (See Figure 14 and Figure 15)

33 Marchant James, R. *The Heritage of Pines: A History of Cottesloe,* Town of Cottesloe, 1977, p. 24.
34 Erickson & Taylor with Philip Griffiths, Town of Cottesloe Municipal Inventory, 1995, p. 248.

Figure 10: Demolition of jetty, 1952.
Courtesy The Grove Library, CPM01964.

Figure 11: View of beach and pylon, 1957
Courtesy Westpix, online imageWAN0005531.

Figure 12: View of beach and pylon, 1962
Courtesy State Library of WA, online image b3760463_4.

Figure 13: View of beach and pylon, 1964
Courtesy Westpix, online imageWAN0005237.

Figure 14: View of Pylon and surf boat, 1964
Courtesy Westpix, online imageWAN0005283.

Figure 15: *Cottesloe Beach 1968.*
Courtesy SLWA online *image b3379952_3.*

2.6 Repairs and Maintenance - 1995 to 2018

Despite the harsh conditions the Cottesloe Beach Pylon remained resolutely in place although the mast gradually reduced in size over the years. The image at Figure 16 shows the broken masthead and how swimmers placed tyres over the mast to enable climbing to the top. Amongst some members of the community, climbing the pylon and diving off it is was a 'rite of passage' that led to the continued popularity of the pylon.

Figure 16: View of Pylon, 1990
Courtesy Westpix, online image TWA 0061445.

A severe storm on the night of 7 June 1995 broke off the top section of the northern pylon. A new mast was fitted to Cottesloe Beach Pylon on 10 December 1996[35] with a stainless steel cone attached to the mast to prevent access to the peak and stop the addition of car tyres as elevated diving platforms. Council has also removed protruding metal lugs, which provided an anchor point for climbing ropes, and staff regularly removed new ropes as they appeared.

The mast that was lost in 1995 remained on the sea floor until retrieved during the night by members of the Swanbourne Surf Club. The mast was eventually retrieved by the Cottesloe Surf Club members is believed to be on display in their clubrooms.[36]

Figure 17: Cottesloe Beach Pylon, 1995 after a severe storm removed the mast.
Courtesy The Grove Library, image CPM02344.

35 Marchant James, R. *Cottesloe A Town of Distinction,* Town of Cottesloe, 2007, p. 301.
36 Information from blog posted 11 April 2013, The History Diaries, http://thehistorydiaries.blogspot.com/2013/04/ol-buoy.html

These strategies were put in place because the Town of Cottesloe was unable to secure public liability insurance for any injury sustained by this activity and diving was made illegal from the pylon. Despite these precautions and the illegality of the activity, determined individuals still manage to scale the pylon and use it as a diving platform as seen at Figure 18.

Figure 18: Cottesloe Beach Pylon, c2009
Courtesy Sydney Morning Herald.

Note the diving prohibited sign.

Figure 19: View of Pylon, 2009 showing the mast toppled after a storm.
Courtesy *Sydney Morning Herald*, 22 May 2009.

The mast was again toppled in May 2009 following storm damage. The community concern over the popular landmark saw the Town of Cottesloe undertake reconstruction of the mast. Funding for the project was assisted by a contribution of $122,000 from the Federal Government and $50,000 from Lotterywest. These works also rebuilt the eroded shoulders of the base, which provided the opportunity build a stronger base for the mast. These works did not include significant works for the structure below the water line.

In 2017, the Town of Cottesloe began planning for additional works to the pylon below the water level, which were completed in January 2019.

One of the features associated with the pylon is that it has been traditionally painted in the colours of the Cottesloe Surf Life Saving Club, yellow, black and white. However it has been a common practice for rival clubs to paint the pylon during the night to achieve bragging rights over the local club. It is also been stated that the winning colours of the WAFL club have been painted on the pylon. The regular painting of the pylon has been a beneficial practice for delaying the deterioration of the concrete.

Figure 20: Cottesloe Beach Pylon, 2017.
Courtesy Flickr

2.7 Associations

John Godsell Foreman (1904-1945)

Figure 21: John Godsell Foreman, 1944
Courtesy Australian War Museum, image P07820.001

John Godsell Foreman was born in Kalgoorlie in 1904, one of three children of Henry Edgar John Foreman and Elizabeth Foreman, nee Scott. As an able student he secured a position at Perth Modern School for his secondary education. On leaving school he obtained a position with the Commonwealth Bank and subsequently undertook training with the RAAF and later the RAF in England. He returned to Australia in 1927 and took up a position at the Fremantle Municipal Council as chief clerk and auditor and later the Deputy Secretary of the Perth Road Board. Foreman had qualifications in accounting and engineering

which made him well qualified for his appointment in January 1932, as Town Clerk of Cottesloe, a position he held until 1941.

John Foreman married Jean Weir Williamson (c1905-1988) in 1930 and the couple had two girls. During the period in which Foreman was Town Clerk the family livid at Chamberlain Street Cottesloe, and later in Princess Road Claremont. In 1934, a newspaper report stated that since Foreman took up the position as Town Clerk, 'the district has made excellent progress, particularly on the beach, where he has carried out big improvements to his own plans and specifications ... [he] has the confidence of his council and his staff'.[37] The confidence of the council and the community was diminished by the failure of the shark pool scheme which was promoted and designed by Foreman. When heavy storms washed away the majority of the structures the scheme lapsed and was later referred to as 'Foreman's Folly'. The episode did not seem to hinder the career of John Foreman at Cottesloe.

In 1941, at the age of 37 he enlisted with the Australian Army and served with the AIF in Italy. As an engineer, he achieved the rank of Major in the 2/13th Field Squadron and served with distinction in Salerno Italy in 1944. He received a military cross for his 'great courage, fine example, excellent organisation and personal devotion to duty during the day he enabled his Squadron to complete successfully a very hazardous operation.'[38] He next served in Tarakan Borneo where his knowledge of bridges gained in Italy was valued for training the landing force. He became ill in Borneo and died whilst waiting for transport back to Australia in September 1945.

37 *The Daily News,* 27 January 1934, p. 17.
38 Citation, WX11141 Major John Godsell Foreman, in Service Record File, NAA: B883 WX11141

3.0 Physical Evidence

MeND consulting, specialists' materials engineers have prepared this portion of the documentation.

3.1 Introduction

MEnD Consulting was engaged by Hocking Heritage Studio (HHS) to undertake a visual inspection of the upper section of the heritage listed Cottesloe Pylon and provide general advice on the remediation and preservation of the structure.

3.2 Physical Description

Cottesloe Beach Pylon is a concrete pylon constructed in 1936 as the northwest corner support for a shark proof enclosure, a project that was never completed. The only remaining evidence of the project, the pylon, is situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach (High Water Mark) in line with John Street.

Prior to the works in January 2019 the pylon took the form of a 2.5 metre (8 ft) diameter concrete base with an estimated weight of some 63 tonnes, keyed into the bedrock. Where it protrudes from the ocean the base is stepped down to about 2 metres diameter and rises approximately 2 metres above mean sea level. This base supports a concrete mast about 3 metres in height, which is not the original but a later replacement.

Stabilisation works in 2019 encased the existing structure in a new reinforced concrete structure up to a level just above the water line.

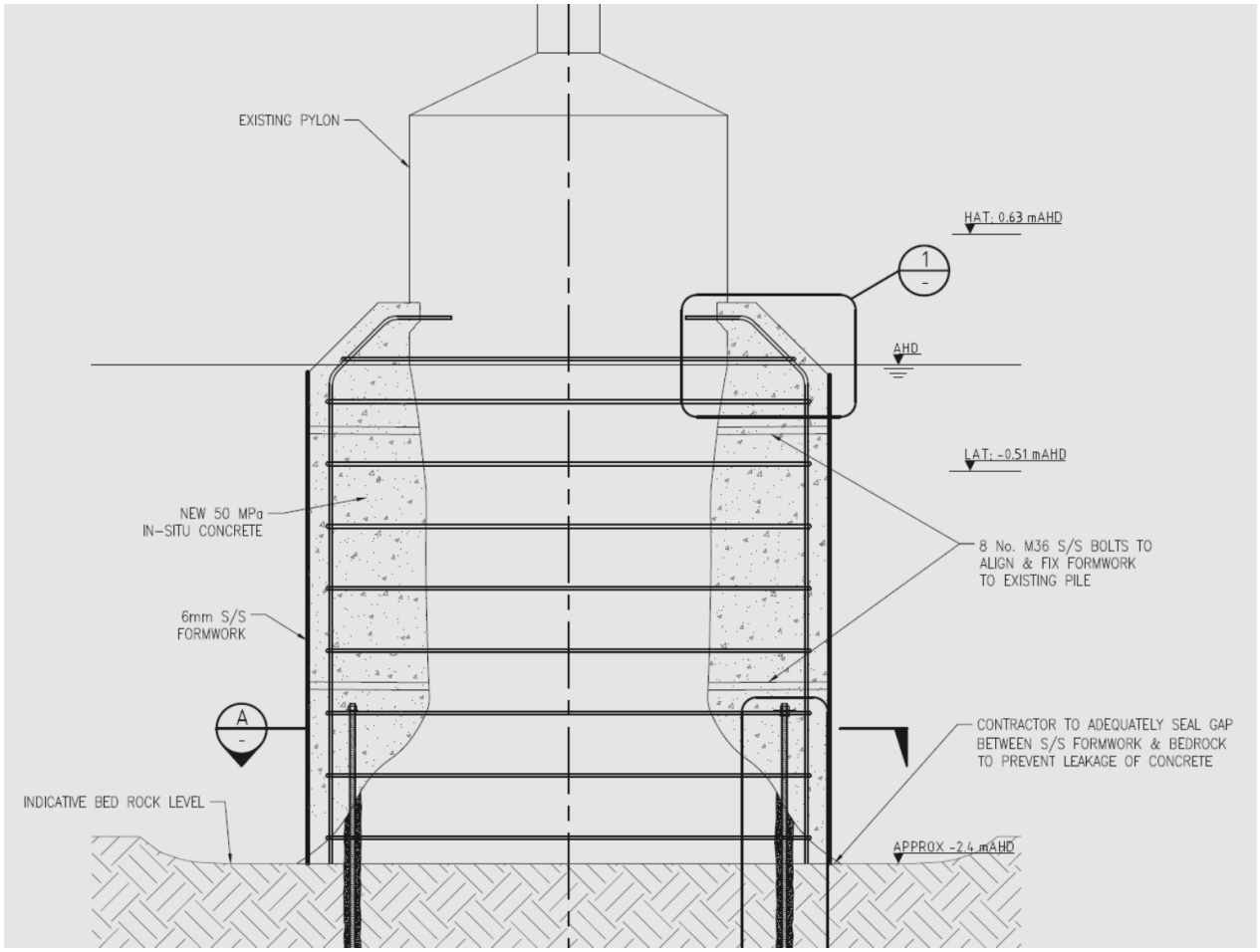


Figure 22: Typical section of stabilisation design.
Courtesy of MeND

3.3 Condition

The following points summarise the findings form the visual inspection by MeND of the upper section and mast:

1. The precast concrete mast appeared to be in a reasonable condition with no visible signs of concrete deterioration Figure 23. The mast had a coating on the surface, which appeared to have been coated multiple times. At the top of the mast there also appeared to be a metal cap that was in good condition fabricated from stainless steel. While the coating on the mast (and upper sections of the pylon) does not appear to be an engineered system suitable for protecting concrete in marine environments, it will still be providing a level of protection to the ingress of moisture and chlorides. This will subsequently slow deterioration.
2. The interface between the mast and upper section of the pylon appeared to be in good condition. There was no evidence of significant cracking or deterioration along the construction joint between the 2 concrete elements. However, significant cracking was identified radiating away from the mast in the upper section of the original Pylon as shown in Figure 24. Like the mast, the upper section of the concrete was coated. It was apparent that the coating does not have any crack bridging ability and the cracking was clearly reflected through the paint.
3. Figure 25 was provided by the Town of Cottesloe as a record of the extent of deterioration to the west elevation. Extensive cracking and spalling to the upper section of the concrete was identified. Most of the defects were on the west elevation including exposed reinforcement and corrosion staining. The cover to the reinforcement was very deep in the spalled locations. Vertical cracking radiated out from the mast and down the face of the concrete. There was also evidence of circumferential cracking around the sloped section of the concrete and at an apparent construction joint between the two separate pours. It is understood that the upper most section was a more recent addition to the Pylon.
4. Figure 26 shows an area of white mortar that was identified on the western aspect of the pylon, near some of the exposed reinforcement. This may have been an embedded sacrificial anode that was installed within a repair area or into the original concrete, as part of previous remediation works.
5. The stainless-steel formwork and reinforcement installed during the stabilisation works are shown in Figure 27. This photo was taken prior to the concrete pour. The original concrete as seen in the left of the image showed signs of erosion with significant sectional loss at the tide level.

Figure 23: Painted precast concrete mast

Figure 24: Upper section of the concrete pylon and bottom of the concrete mast

Figure 25: Standoff of the west elevation

Figure 26: Possible evidence of embedded sacrificial anodes near exposed reinforcement.

Figure 27: Stainless steel reinforcement prior to concrete pour

It was apparent that large areas from the upper section of the Pylon had spalled, exposing the reinforcement. Significant cracking was also observed on all elevations of the sloped surface and the upper part of the vertical face. The lack of reinforcement within the upper most section of the pylon indicates that most of the cracking was due to thermal expansion and contraction of the concrete repair at the time of construction and not due to the corrosion of the reinforcement. Subsequently, these large cracks provided a rapid route for oxygen, water, and chlorides to reach the reinforcement leading to the eventual corrosion and spalling. The lack of suitable reinforcing or pinning into the original pylon may have also resulted in the concrete being unstable, and subject to physical damaged from the wind and wave action.

The precast concrete mast was found to be in a reasonable condition with no obvious signs of deterioration. The connection to the upper section appeared well adhered and stable. Nevertheless, ongoing deterioration to the upper sections of the pylon may eventually compromise the connection detail with the mast.

4.0 Comparative Evidence

Shark proof enclosures were constructed off a number of coastal and swan river jetties in the Perth metropolitan area in the early twentieth century. Others known examples include shark proof enclosures in South Fremantle, Busselton and Fremantle.

The shark proof enclosure in South Fremantle was constructed by 1928 at South Beach. The netting was strung between two jetties and was supported by approximately ten poles upon which a promenade deck was constructed. A diving platform extended from the promenade. The enclosure is believed to have been extant until the 1950s.

A shark proof enclosure was attached to the Busselton Jetty early in the twentieth century. Sea baths were added to the jetty in 1911, which were deemed 'the finest bathing area in the State', as they were 'secure against the intrusion of sharks and other sea monsters'. The length of the baths along the original jetty frontage was 100m with the piling between the two jetties 4m deep and measuring 150m wide. The baths also included a platform (16.6m in length and 4.3m in width) on the jetty that accommodated a number of spacious dressing compartments. It is not known when the sea bath was removed.

Shark-proof Municipal Sea Baths were constructed at Fremantle in the 1890s, between Long Jetty and South Jetty. These were demolished in 1917, and the site is now Fishing Boat Harbour's northern sea wall.

There are heritage listed sea baths in other States, particularly New South Wales, although they appear to be structures more like tidal swimming pools than net-enclosed ocean areas. Shark-proofing was provided by means of timber, metal, or more recently plastic bars and rods. Sea baths of this nature are located at Bondi Beach, Sydney (constructed in the 1920s; Register of National Estate - RNE), Manly Beach, Sydney (date not given; RNE) Middle Brighton Municipal Baths, Vic (1936; RNE), Northbridge Pool, NSW (1924; RNE) and Merthon, Sorrento, Victoria (date not given; RNE).

Eastern Beach Bathing Complex, Geelong (1928-1939; Victorian Heritage Register), includes a bathing complex, constructed to the design of I. McDonald in 1937, featuring a landmark semi-circular shark-proof enclosure and promenade. The promenade is formed by a two level braced pier structure supported on 10in diameter yellow stringy bark piles, with blue gum superstructure, red gum decking, handrails and underneath, a fence of bronze shark proofing bars.

At Little Sirius Cove Enclosure Remnants, Mosman NSW, (date unknown; RNE) a sweeping sandstone sea wall, which retains the fill material used to form the park, and sandstone steps into the water, are the only remaining elements of a shark-proof enclosure that until the late 1960s retained its 150m of shark-proof netting.

Neilsen Park Pool, Vaucluse, NSW (1930; RNE) is an almost semi-circular crescent shaped shark proof enclosure. Timber and concrete encased timber poles support a braided stainless steel cable from which a shark proof mesh is suspended. Originally, rope netting was kept at surface level by means of glass buoys rather than a cable. The enclosure remains intact.

Parsley Bay Swimming Enclosure, Vaucluse, NSW (1930, 1985, 1995; RNE) uses natural features, with the enclosure formed by the installation of a nylon net mesh stretching from shore to shore, effectively enclosing half of Parsley Bay.

5.0 Assessment of Significance

The criteria adopted by the Heritage Council in November 1996 have been used to determine the cultural heritage significance of the place.

The following statements have been reproduced from the documentation prepared in 2003 for the inclusion of Cottesloe Beach Pylon in the State Register of Heritage Places. The statements on condition have been modified through recent [2019] observations.

5.1 Aesthetic Value

Cottesloe Beach Pylon contributes to the beach setting by its landmark quality.

5.2 Historic Value

Cottesloe Beach Pylon is associated with the use of Cottesloe Beach as one of the most popular recreation and swimming beaches in Perth and in Western Australia as a whole from the 1880s and 1890s through to the present day (in 2018). (Criterion 2.1)

Cottesloe Beach Pylon formed part of the construction undertaken for a shark proof enclosure at Cottesloe, although this was never completed. This enclosure, together with the jetty (1904/1906; 1935) and the beach pavilion (1935), was part of a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach. (Criterion 2.2)

Cottesloe Beach Pylon has associations with John Godsell Foreman, who, as the Town of Claremont town clerk/engineer, was responsible for the development of the scheme for the shark proof enclosure. His role in the saga of the construction of the enclosure led to the venture becoming locally known as 'Foreman's Folly'. (Criterion 2.3)

5.3 Scientific Value

Cottesloe Beach Pylon has the potential to yield information in regard to the design and construction techniques for shark proof enclosures.

5.4 Social Value

Cottesloe Beach Pylon is valued by the local community as a reminder of past infrastructure, including the jetty and the original bathing pavilion, located at Cottesloe Beach and for its contribution to the beach as a distinctive landmark and for its use as a diving platform. (Criterion 4.1)

As a well-known icon for visitors to Cottesloe Beach, who travel from across the state and Australia, Cottesloe Beach Pylon contributes to the community's sense of place. (Criterion 4.2)

Degree of Significance

5.5 Rarity

Cottesloe Beach Pylon is the only remaining element of what was to have been a shark proof enclosure off a Western Australian beach. (Criterion 5.1)

5.6 Representativeness

Cottesloe Beach Pylon is representative of measures taken against shark attack in the metropolitan area in the early twentieth century. (Criterion 6.2)

5.7 Condition

The base of the Cottesloe Beach Pylon below the water line is in good condition following recent [2019] works. The mast and the junction between the mast and base are in good condition. The upper level of the base is in poor condition. (See 3.3)

5.8 Integrity

As a remnant of attempts to construct a shark proof area, Cottesloe Beach Pylon has a high degree of integrity.

5.9 Authenticity

Cottesloe Beach Pylon has a low degree of authenticity as the original mast has been replaced and the original base is encased in a new layer of concrete.

6.0 Statement of Significance

The following statement was prepared in 2003 for the permanent inclusion of Cottesloe Beach Pylon on the State Register of Heritage Places.

Cottesloe Beach Pylon, a concrete pylon constructed in 1936 with a reconstructed top and situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach, has cultural heritage significance for the following reasons:

the place is an element of Cottesloe Beach, one of Perth's most popular recreation and swimming beaches from the 1880s through to the present;

the place is rare as the only remaining element of what was to have been a shark proof enclosure, a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach; and,

the place is a well-known icon for visitors to Cottesloe Beach, and contributes to the beach as a distinctive landmark.

7.0 Zones and Elements of Significance

Based on the analysis of the documentary and physical evidence a hierarchy has been developed to broadly categorise the significance of the zones and elements that make up Cottesloe Beach Pylon.

Relative degrees of significance within the place determine the appropriateness of conservation actions. Generally, a five tier grading system is used to identify those parts of the place that area of:

- Exceptional significance
- Considerable significance
- Some/Moderate significance
- Little/no significance (neither contributes nor detracts from the significance of the place)
- Intrusive (detracts from or has an adverse effect on the significance of the place)

The five tiers of significance are to be considered on a state context and all five tiers may not be applicable to each place.

All of the Cottesloe Pylon structure is of considerable significance. The landmark, historic and social values of the structure are still intact although the remaining original fabric is now encased in concrete below the waterline and the area above the waterline has been extensively altered.

8.0 Conservation Policy

8.1 Introduction

The following conservation policies have been developed on the basis of the preceding assessment of the cultural heritage significance, zone of heritage significance and the statement of heritage significance for Cottesloe Beach Pylon.

The policies have been drafted with awareness of the physical environment of the site, sufficiently flexible to recognise constraints and requirements on the site and of its owners, managers and users, and to enable the heritage significance of the place to be retained and enhanced.

In this context the conservation policy aims:

- to provide guidance to the owners of the place, regarding significance of the structure;
- to provide advice to ensure retention of the significance of Cottesloe Beach Pylon;
- to provide practical recommendations for conservation of significant fabric;
- to illustrate practical means by which the significance of the place can be presented through appropriate interpretation; and,
- to provide advice on the approval process for any proposed development,.

The assessment of significance and recommendations for conservation should be viewed not only as constraints but also, more importantly, as opportunities. Conservation of the Cottesloe Beach Pylon should be balanced against the opportunities associated with the conservation of this unique heritage structure in Cottesloe Beach Precinct.

8.2 Guide to Conservation Policy

The policies recommended for Cottesloe Beach Pylon are based on the need to conserve it as a place of aesthetic, historic and social significance. The conservation of this culturally significant structure should take account of the physical changes that has occurred over time and which reflect the historical development of the place.

The Conservation Management Plan recommends the conservation of the place be carried out in accordance with the principles established in the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (Burra Charter).

8.3 Key Policy Statements

Policy 1.1 The assessed significance of Cottesloe Beach Pylon and the recommendations of the Conservation Management Plan should be adopted by the owners and managers of the place, as well as relevant authorities, as a guiding document for decisions about management, maintenance and future use.

Policy 1.2 The conservation of significant elements should be carried out in accordance with the principles outlined in the Australia ICOMOS charter for the conservation of places of cultural significance (the Burra charter). These principles are fundamental to the Conservation Management Plan.

Policy 1.3 The Conservation Management Plan should be reviewed periodically to consider the continued applicability of the conservation policies and to assess the manner in which they have been implemented.

Policy 1.4 All work undertaken to conserve or adapt the structure should be appropriate to the assessed significance of the place and should be guided and supervised by experienced conservation practitioners.

8.4 Policies Arising from the Cultural Heritage Significance of the Place

The Assessment of Significance (Section 5.0) and Statement of Significance (Section 6.0) define the cultural significance of Cottesloe Beach Pylon in terms of aesthetic, historic, scientific and social significance, and in terms of its condition, rarity and representativeness.

The significance of a place must be capable of being observed in the fabric of the structure and other elements of physical evidence in order that the conservation of these preserves the documented cultural heritage significance.

Policy 2.1 The future conservation and use of Cottesloe Beach Pylon should take account of the assessed significance of the place.

Policy 2.2 All the elements assessed as being of cultural heritage significance of the Cottesloe Beach Pylon site should be retained and conserved in their original locations.

8.5 Requirements Arising out of the Burra Charter

The conservation policy for Cottesloe Beach Pylon recommends the conservation and interpretation of the existing structure in accordance with the principles of the Burra Charter. (Policy 1.2)

The Burra Charter indicates certain principles, which should guide conservation. Generally, original fabric is considered to be of greatest significance and the principles of the Burra Charter focus on the means of conserving this in order to preserve the authenticity of the heritage place. Where fabric has deteriorated to the point where it is no longer viable, reconstruction should be carried out using replacement material that matches the original as closely as possible. However, since the greatest value is placed on authentic material dating from the period of construction, conservation of this is of the highest priority and replacement should only be carried out when all means of conserving the original fabric have been investigated.

Conservation of existing fabric does not require that the fabric appear as new. Part of the understanding of a place of heritage significance includes the patina of age resulting from minimum interference with original fabric. Generally, conservation practice requires owners and users to maintain places of cultural heritage significance as part of their day-to-day use.

All the principles of the Burra Charter are relevant to the conservation of Cottesloe Beach Pylon.

The following Articles 8, 9 and 16 are relevant. (Refer to the text of the Burra Charter for exact definitions and explanatory notes for each article 2)

ARTICLE 8: Conservation requires the maintenance of an appropriate visual setting: eg form, scale, colour, texture and materials. New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate.

ARTICLE 9: A building or work should remain in its historical location. The moving of all or part of a building or work is unacceptable unless this is the sole means of ensuring its survival.

ARTICLE 16: The contributions of all periods to the place must be respected. If a place includes fabric of different periods, revealing the fabric of one period at the expense of another can only be justified when what is removed is of slight cultural significance and the fabric which is to be revealed is of much greater cultural significance.

8.6 Policies Arising out of the Burra Charter

Policy 3.1 The definitions and principles of the Burra Charter should be used to guide all considerations for the future conservation, development and use of the Cottesloe Beach Pylon and any associated requirements for physical works. (Refer 1.17 Policies Arising from the Physical Condition of the Place)

8.7 Policies Arising out of Graded Zones and Elements of Significance

The following recommendations for the different graded zones of significance are based on those outlined in the Heritage Council of Western Australia's '*Conservation Plan Study Brief*,' but have been adapted to suit the specific requirements of the Cottesloe Beach Pylon. (Refer Section 7.0 Zones and Elements of Significance).

Policy 4.1 The significant fabric of structures or elements of considerable significance should be preserved, restored or reconstructed as appropriate.

Reconstruction of any lost element is desirable provided sufficient detailed information is available to allow for an accurate reconstruction.

There should be no new works, which will adversely affect the setting of the structures or obscure important views to and from the site or its individual elements.

The visibility of Cottesloe Beach Pylon from Cottesloe Beach and its resultant landmark status is part of its cultural heritage significance and contributes to the understanding of the place. Any new development should not obscure the prominence, or legibility, of the original structure.

All works should be undertaken with the assistance of a qualified and experienced heritage practitioner.

Detailed conservation policies for the Cottesloe Beach Pylon are outlined in Section 8.9 (Policies 6.1 — 6.5). These policies have been prepared in accordance with the assessed levels of significance of the structure.

Responsibility for implementation is outlined in Section 9.0. Generally, the owner of a place is responsible for the conservation works.

8.8 Key Policies Arising from the Physical Condition of the Place

The conservation policy must address the issues related to the conservation of significant fabric of the structure and site elements.

Policy 5.1 All original fabric should be retained wherever practicable. Where this is not possible due to condition, new fabric can be introduced to match the original.

8.9 Conservation of Cottesloe Beach Pylon

Policy 6.1 All fabric to the Cottesloe Beach Pylon should be inspected on a routine basis for structural adequacy and cracking, spalling and deterioration of materials. Where issues are known to exist, these should be remediated by appropriate professionals and/or monitored for further deterioration.

Policy 6.2 Where replacement of original fabric is required, new fabric may be introduced to match the originals.

8.10 Policies Arising from the Physical Condition of the Place

Policy 6.3 All identified conservation works should be undertaken to help maintain and conserve Cottesloe Beach Pylon as per the "Recommended Conservation Works Schedule" set out in Section 9.5 – Implementation, of this report.

Policy 6.4 Any works identified in the 'Urgent Works' section of this report should be undertaken within one year of the completion of this report.

Policy 6.5 Regular maintenance is an essential part of conserving built fabric and retaining the significance of a place. Lack of maintenance can lead to the loss of significant fabric and the need for more extensive conservation work. See "Maintenance Schedule" set out in Section 9 – Implementation, of this report.

8.11 Requirements for Interpretation

The interpretation of a place of assessed cultural heritage significance involves the way in which the significance is conveyed to the users of the place including visitors and the general public. Interpretive material may include signs, plaques, displays and other material as a means of explaining the history or reflecting the era of significance of the structure. Interpretive material is used to integrate the story of the history of the place with ongoing practical use.

Cottesloe Beach Pylon has been recognised as a place of cultural heritage significance and has been entered on the State Register of Heritage Places. The history of the place in the context of the development of the Cottesloe Beach forms an important component of the Cottesloe Beach Pylon interpretation.

One of the most important components of the interpretation of Cottesloe Beach Pylon is the conservation of the structure which contributes to its significance.

Policy 7.1 Copies of the conservation plan should be available through the Town of Cottesloe and the Grove Library for information of visitors and for research purposes.

Policy 7.2 Ensure the conservation of Cottesloe Beach Pylon as the fundamental component of its interpretation.

Policy 7.3 Encourage the development of interpretive material on the history and significance of the Cottesloe Beach Pylon within the context of the history of Cottesloe Beach Precinct and its continued use by the Western Australian community.

8.12 Policies Arising from External Requirements

The conservation policy should take account of external requirements. The Cottesloe Beach Pylon site falls under the jurisdiction of the Town of Cottesloe. As the pylon and Cottesloe Beach are on the State Register of Heritage Places, all development applications will be referred to State Heritage Office for their comment.

These requirements may affect the requirements of current and future users of the place.

Policy 8.1 Generally, any development of the place should comply with statutory constraints including building and health requirements administered by the local authority.

Policy 8.2 A copy of this conservation management plan should be provided to the following agencies for their information and guidance.

- Town of Cottesloe
- Heritage Council of WA
- Battye Library of WA

CURRENT HERITAGE LISTINGS

All current heritage listings are noted in section 1.2 of this conservation management plan. Policies relating to the implications of these listings are discussed below.

Heritage Council of Western Australia:

Cottesloe Beach Pylon is included on the State Register of Heritage Places. All development on Cottesloe Beach Pylon will be referred to State Heritage Office for their comment.

Policy 8.3 Due to being entered on the State Register of Heritage Places any works requiring a development application will be forwarded to the Heritage Council of Western Australia for their comment.

8.13 Requirements of Statutory Authorities

Fire safety regulations, Health Acts, the Australian Building Code regulations and other constraints operating on any property apply and the future use of the structure may be influenced by these requirements. Appropriate procedures for approval should be followed for any proposed or future use of the site, however all applications should be accompanied by a statement indicating the heritage significance of the place. All applications should involve a process of negotiation in order to ensure that requirements are met with minimum interference to significant fabric and other heritage values.

Policy 9.1 Where elements have been assessed as having significance, any works arising from requirements to comply with statutory regulations should be evaluated against this conservation policy to ensure minimum impact on significant fabric. Professional advice should be sought to ensure that both safety and conservation issues are fully assessed.

8.14 Requirements of Owners and User of the Place

The requirements of the owners and users of the place will depend upon issues of practical use.

Policy 10.1 Any adaptation of Cottesloe Beach Pylon must ensure that significant fabric of the place is retained, maintained and interpreted. The owners of the site have a duty to maintain the structures and to share the stories with the public, informing them of the part that Cottesloe Beach Pylon played in the development of the Town of Cottesloe.

8.15 Future Site Development

Opportunities for development on or near the Cottesloe Beach Pylon are limited. The only foreseeable adjacent developments that would affect the pylon are development on the adjacent shoreline. Such a proposal would need to go through the Heritage Planning Process as Cottesloe Beach is also included on the State Register/

Policy 11.1 Any further development on Cottesloe Beach should not restrict or impede views of Cottesloe Beach Pylon from Cottesloe Beach. The landmark status of Cottesloe Beach Pylon should be retained in any new potential development.

9.0 Policy Implementation

9.1 Introduction

This section is concerned with implementation of the conservation policies set out in Section 8. It is intended to identify those who should be responsible for the implementation of the various policies, when the policies should be implemented and also suggest how these policies might best be implemented. The aim is to ensure the maintenance, and where applicable, the improvement of the cultural significance of the place. This includes ensuring that the fabric of the structure is properly cared for, that adequate financial provision is made for its care and maintenance, and that adequate interpretation for the understanding of the place is put in place and then maintained.

9.2 Implementation and Future Management

Primary responsibility for the implementation of the conservation policy for Cottesloe Beach Pylon lies with the current owners/managers of the place. Any further development of the adjacent beach and structure should take account of the recommendations established in the conservation policy section of this conservation management plan.

It is the responsibility of the owners/managers of the site to provide copies of the conservation plan to the Town of Cottesloe Grove Library, Heritage Council of Western Australia and to any future owners of the place, for their use as a guide to the future management of the place.

The present owners are responsible for ensuring that any future owners of the place are fully briefed regarding their responsibilities for the implementation of the conservation management plan and any Heritage Agreements that may exist. The current owners should provide any future owners or leaseholders with a copy of the conservation management plan for their information and guidance.

9.3 Management Guidelines

All works to Cottesloe Beach Pylon should be undertaken in accordance with this Conservation Management Plan which is to be adopted by the owners of Cottesloe Beach Pylon. Long term management of the cultural heritage significance of this structure should commence with the adoption of this Conservation Management Plan.

The owners of Cottesloe Beach Pylon are primarily responsible for the implementation of the policies within the Conservation Management Plan. It is recommended that any existing management and maintenance programs that may be in existence for the place be reviewed by the current owners with reference to the policies, Condition Assessment and schedule of works.

Any future management for the place should seek to address all the issues raised in this document and any other pertinent issues that may arise. It should also seek to establish protocols for decision making in order to achieve the objectives and strategies established in this Conservation Management Plan.

9.4 Maintenance Plans

An appropriate maintenance and security plan should be established and implemented for the place to ensure minimisation of any deterioration of the significant built fabric. This should be developed by owners and managers of the site.

Future maintenance work should be undertaken by tradespeople with suitable expertise and skills in heritage and conservation work, who will understand and respect the significance of the place. Overseers of the work should be familiar with good conservation practice and should have demonstrated expertise in this field.

The following maintenance schedule is a guide to relevant issues association with the maintenance of heritage buildings.

In preparing maintenance plans, tasks are allocated a frequency of occurrence varying from weekly tasks to annual inspections.

Monthly or Quarterly Schedule

The purpose of the monthly or quarterly inspections is to ensure the structure remains in a safe condition and that any signs of vandalism or deterioration are dealt with in an efficient manner, additional checks should be taken following bad storms.

When boat access is not possible a regular visual inspection from the shore should be undertaken with binoculars or similar.

- Inspect for defects including cracking
- Check for graffiti and remove as soon as possible
- Investigate the installation of a sacrificial anode cathodic protection system to help minimise the risk of corrosion to the reinforcement in the unrepaired areas. Given the apparent depth of the original reinforcement this may not be practicable.

Annual Schedule

- Paint annually to protect the concrete from deterioration.
  Note: Painting the Pylon with colours of the winning WAFL team or a local surf club is a practice that has practical benefits as well as reinforcing the historic and social values of the pylon.

Long Term

- Review the conservation plan every 5 years or sooner if circumstances change considerably.
- Implement a periodic inspection and maintenance schedule such as performing a visual and delamination survey every 5 years to assess the condition of the Pylon above and just below the tide level. If any deterioration is identified, undertake localised maintenance works.

9.5 Recommended Conservation Works - Options

Given the recent works to the pylon below the high water mark there is little requirement for future works in the short or medium term. The area above the high water mark is more problematic and the following recommendations have been prepared by MeND to provide guidance for the owners and managers of the structure.

Decisions on the future works to the pylon should be guided by the following practical considerations in addition to the consideration of the heritage values.

- To preserve as much of the existing structure as possible, remediation is the preferred.
- If cost and durability are the main considerations then replacement is the more durable option, and from a whole of life cost perspective the cheaper option as a new structure with a relatively low maintenance regime would last for 50-100 years.
- Based on historical costs it is proposed that initial remediation and reconstruction costs may be equivalent although with careful planning and design these could be reduced considerably.
- Lifespan of a repair is approximately 15 years if properly designed. However other unrepaired sections will fail within that timeframe. **To be more accurate with the life span estimate a detailed investigation would be essential**.

OPTION A

The budget estimate **(April 2019)** for reconstructing the top of the pylon and the mast is:

Item	**Cost**
Preliminaries	$8,920.00
Equipment and Materials	$63,000.00
Labour and supervision	$19,600.00
Sub Total	$91,520.00
Contingency	$27,900.00
Total	$119,420.00

This price is based on a nominal 7 day works program with a contingency of 3 additional days for stand down due to weather or sea state.

The proposed method would be as follows:

1. Design new precast RC pylon top and mast that can be fixed to existing structure with suitable epoxy fixed SS anchors.
2. Design and fabricate suitable temporary work platform to the mounted to existing Pylon base.
3. Mobilise barge with crane to site and install temporary work platform.
4. Install suitable lifting points to mast and pylon.
5. Using ring saw cut off mast and remove using crane barge.
6. Using wire saw cut of upper section of pylon and remove using crane barge.
7. Prepare pylon base to receive new pylon top and mast including installing new epoxy set fixings.
8. Lift and grout in new pylon top.
9. Lift and grout in new mast.
10. Coating and finishing works.
11. Demobilise from site.

.

OPTION B

The budget estimate **(April 2019)** for the repairs of the pylon and mast is:

Item	**Cost**
Preliminaries	$7,880.00
Equipment and Materials	$51,500.00
Labour and supervision	$22,400.00
Sub Total	$81,780.00
Contingency	$24,900.00
Total	**$106,680.00**

This price is based on a nominal 8 day works program with a contingency of 3 additional days for stand down due to weather or sea state.

The proposed method would be as follows:

1. Complete detailed defect survey and prepare repair methods.
2. Design and fabricate suitable temporary work platform to the mounted to existing Pylon base.
3. Mobilise barge with crane to site and install temporary work platform.
4. Complete breakout and demolition of defective concrete.
5. Prepare substrate and install new reinforcement and temporary form work.
6. Place new micro concrete repair mortar and complete crack injection repairs.
7. Allow to cure
8. Remove forms and complete coating and finishing works.
9. Demobilise from site.

In addition to the remedial options presented above, further preservation measures should also be considered within the conservation management plan, these may include:

1. It is understood that historically the Pylon was painted annually with the colours of the winning WAFL team. This tradition could be reinstated as an annual maintenance scheme going forward, which would both help to protect the concrete and maintain a cultural heritage aspect of the Pylon.

Note: All costs are estimates only and are only a guide to future costs.

9.6 Implementation of Interpretation Policy

The implementation of the interpretation policy for Cottesloe Beach Pylon is the responsibility of the current and future owners of the place. The main component of interpretation of the place is however the continued conservation of the place in accordance with the recommendations of this Conservation Management Plan.

9.7 Adoption of the Policy

The Town of Cottesloe should adopt the Conservation Management Plan for Cottesloe Beach Pylon. The policy should become one of the basic documents for future and on-going management and conservation of the place.

9.8 Review

This Conservation Management Plan should be reviewed every five years by appropriately qualified heritage consultants. It is the responsibility of the Town of Cottesloe to commission the review of the plan.

10.0 Bibliography

(1833-2018). *The West Australian*.

(1882-1990). *The Daily News*.

(1885-1955). *The Western Mail*.

(1902-2014). *The Sunday Times*.

(1905-1910, 1921-1956). *The Mirror*.

Adamson, P. (1995, March). Story of the Solitary Pylon at Cottesloe, originally part of a plan for a shark-proof swimming pool. *Cottesloe Society Newsletter*, pp. 4-10.

Erickson & Taylor; Griffiths, Phil. (1995). *Town of Cottesloe Municipal Heritage Inventory*. Cottesloe: Town of Cottesloe.

Kerr, J. S. (1990). *The Consevation Plan: A guide to the preparation of conservation plans for places of European cultural significance*. Sydney, NSW, Australia: National Trust of Australia.

Laverack, D. (2006, September 13). David Laverack 1917-2013. (B. Davidson, Interviewer) Cottesloe, WA: The Grove Oral History Program. Retrieved January 9, 2018, from https://thegrovelibrary.spydus.com

Marchant James, R. (1977). *The Heritage of Pines: A History of Cottesloe*. Cottesloe: Town of Cottesloe.

Marchant James, R. (2007). *Cottesloe A Town of Distinction*. Cottesloe: Town of Cottesloe.

Marquis-Kyle, P., & Walker, M. (1994). *The Illustrated Burra Charter: Making Good Decisions About the Care of Important Places,*. Sydney: ICOMOS. Retrieved from www.icomos.org/australia

Municipality of Cottesloe. (1897 - 1959). AU WA S2436 - cons 6187. *Minutes of Council Meetings*. SROWA.

Municipality of Cottesloe. (1989). Cottesloe Shark Proof Pool. *Civic Centre News*, p. 10.

State Heritage Office. (2003, August 15). *Place 7984 Cottesloe Beach Pylon*. Retrieved from inHerit Database: http://inherit.stateheritage.wa.gov.au

State Heritage Office of Western Australia. (2012). *Basic Principles for Local Government Inventories*. Perth WA: State Government of Western Australia.

State Heritage Office of Western Australia. (2012). *Criteria for the Assessment of Local Heritage Places and Areas*. Perth, WA: Government of Western Australia.

State Library of Western Australia. (n.d.). *Images Collection*. Perth, WA, Australia: State Library of WA.

Sydney Morning Herald. (2009, May 22). *Cottesloe beach pylon toppled*. Retrieved from Sydney Morning Herald: https://www.smh.com.au/national/cottesloe-beach-pylon-toppled-20090522-bhxu.html

The Grove Library. (n.d.). *Images Collection*. Perth, WA, Australia: Town of Cottesloe, Shire of Peppermint Grove. Town of Mosman Park.

West Australian Newspapers. (1833-2018). *The West Australian*.

Westpix. (n.d.). *Print and Digital News Photography*. WA, Australia: West Australian Newspapers.

Appendices

Appendix A – Land Information

VR 595

FORM LAA-1023

DUPLICATE

SECTION 46

WESTERN AUSTRALIA
LAND ADMINISTRATION ACT 1997
TRANSFER OF LAND ACT 1893 AS AMENDED

MANAGEMENT ORDER (XE)

RESERVE DESCRIPTION (NOTE 1)	EXTENT	VOLUME	FOLIO
47618	Whole	3134	363

MANAGEMENT BODY (NOTE 2)

Town of Cottesloe, PO Box 606, COTTESLOE WA 6911

CONDITIONS (NOTE 3)

To be utilised for the designated purpose of "Cottesloe Beach Pylon" only.

THE MINISTER FOR LANDS (IN THE NAME OF AND ON BEHALF OF THE STATE OF WESTERN AUSTRALIA) ORDERS THAT THE CARE, CONTROL AND MANAGEMENT OF THE ABOVE RESERVE BE PLACED WITH THE ABOVE DESCRIBED MANAGEMENT BODY FOR THE PURPOSE FOR WHICH THE LAND IS RESERVED UNDER SECTION 41 OF THE LAND ADMINISTRATION ACT 1997, AND FOR PURPOSES ANCILLARY OR BENEFICIAL TO THAT PURPOSE SUBJECT TO THE CONDITIONS STATED ABOVE

Dated this 30TH day of MARCH in the year 2004

ATTESTATION

PROJECT OFFICER
METROPOLITAN
LAND ASSET MANAGEMENT SERVICES

DUPLICATE

INSTRUCTIONS

1. If insufficient space in any section, Additional Sheet Form B1 should be used with appropriate headings. The boxed sections should only contain the words "See Annexure".

2. Additional Sheets shall be numbered consecutively and bound to this document by staples along the left margin prior to execution by parties.

3. No alteration should be made by erasure. The words rejected should be scored through and those substituted typed or written above them, the alteration being initialled by the person signing this document and their witnesses.

NOTES

1. RESERVE DESCRIPTION
Reserve number and details to be stated. The Volume and Folio numbers to be stated.

2. MANAGEMENT BODY
State the full name and address of the management body.

3. CONDITIONS
Specify all conditions to be observed by the lessee in the operation of the area affected by this permit.

4. EXECUTION
A separate attestation is required for every person signing this document. Each signature should be separately witnessed by an Adult Person. The address and occupation of the witness must be stated.

EXAMINED

DUPLICATE

I 838006 XE
31 Mar, 2004 13:58:48 Midland

MANAGEMENT ORDER (XE)

LODGED BY **Land Asset Management Services**

ADDRESS **DPI-LAMS Metro Region Box M98**

PHONE No.
FAX No.

REFERENCE No. **Ruth de Ridder 50433-2003-01RO**

ISSUING BOX No.

PREPARED BY **Land Asset Management Services**

ADDRESS **DPI-LAMS Metro Region Box M98**

PHONE No. FAX No.

INSTRUCT IF ANY DOCUMENTS ARE TO ISSUE TO OTHER THAN LODGING PARTY

TITLES, LEASES, DECLARATIONS ETC LODGED HEREWITH

1._____ Received Items
2._____ Nos.
3._____
4._____ Receiving Clerk
5._____
6._____

040650-004

Registered pursuant to the provisions of the TRANSFER OF LAND ACT 1893 as amended on the day and time shown above and particulars entered in the Register.

1192

APPLICATION I838004

WESTERN AUSTRALIA

REGISTER NUMBER
N/A

VOLUME FOLIO
LR 3134 363

QUALIFIED CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

NO DUPLICATE CREATED

The undermentioned land is Crown land in the name of the STATE of WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

DATED 31 MARCH 2004

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 15530 ON DEPOSITED PLAN 41103

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE continued overleaf)

STATUS ORDER/INTEREST: RESERVE UNDER MANAGEMENT ORDER

PRIMARY INTEREST HOLDER: TOWN OF COTTESLOE OF PO BOX 606, COTTESLOE
(XE I838006) REGISTERED 31 MARCH 2004

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE continued overleaf)

1. I838005 RESERVE 47618 FOR THE PURPOSE OF COTTESLOE BEACH PYLON. REGISTERED 31.3.2004.
   I838006 MANAGEMENT ORDER. CONTAINS CONDITIONS TO BE OBSERVED. REGISTERED 31.3.2004.
2. I856680 MEMORIAL. HERITAGE OF WESTERN AUSTRALIA ACT 1990. REGISTERED 19.4.2004.

Warning: (1) A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.
(2) The land and interests etc. shown hereon may be affected by interests etc. that can be, but are not, shown on the register.
(3) The interests etc. shown hereon may have a different priority than shown.

----------END OF CERTIFICATE OF CROWN LAND TITLE----------

STATEMENTS:

The statement set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF THE LAND: DP41103
PREVIOUS TITLE: THIS TITLE
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: NO LOCAL GOVERNMENT AUTHORITY INFORMATION AVAILABLE.

NOTE 1: A000001A CORRESPONDENCE FILE 50433-2003-01RO
NOTE 2: SUBJECT TO SURVEY - NOT FOR ALIENATION PURPOSES

END OF PAGE 1 – CONTINUED OVER

```
ers1 -----------------   CROWN RESERVES SYSTEM  ---------------------- RESCERS1
10:13:15                 RESERVES INDEX ENQUIRY                        27 APR 04
COMMAND ==>
                                                NO CAL RECORD
Reserve  : 47618      (Status : 1 )     Class : C ( 31/03/2004 pp       )
Orig Gaz :       of 31/03/2004          Area  :          0.0144
Coded Information : (to translate VESTING, RESP AGENCY and LGA = Press PF05 )
Vesting  : 1L116 :          Resp. Agency : SLSD
Usage    : 6295 :      :      :      :      :
L.G. Auth: 116 :      :      :      :      :         (Last Change: 22/04/2004 )
Gaz-Page and  Date.          Text Details
        31/03/2004   1  CA  0.0144 HA (I838005)
        31/03/2004   1  CP  COTTESLOE BEACH PYLON (I838005)
        31/03/2004   1  CV  VEST: TOWN OF COTTESLOE (I838006)
        22/04/2004   1  FN  50433-2003-01RO
        31/03/2004   1  LT  LOT 15530 ON DP41103 (I838005)
        31/03/2004   1  ST  IN THE INDIAN OCEAN OFF MARINE PARADE,COTTESLOE.
        31/03/2004   1  SV  LOT 15530 ON DP41103 (I838005)


PFkeys: 1 = Help  3 = End  4 = Main Menu  5 = Translate Codes  6 = Map Details
7 = Bkwd  8 = Fwd  9 = Print  10 = Cal List            12 = Command Line
```

Reserve 47618

Scale : 1:1000 (MGA)
MGA : SW=381905.985,6459286.865 Zone 50 / NE=382107.422,6459549.815 Zone 50
Lat/Long : 115°44'59.390",-31°59'46.837" / 115°45'07.181",-31°59'38.374" 263* 201

Printed : 10:24 Tue 27/Apr/2004

Appendix B – State Heritage Office Documentation

HERITAGE COUNCIL OF WESTERN AUSTRALIA

REGISTER OF HERITAGE PLACES

Permanent Entry

1. DATA BASE No. 07984

2. NAME *Cottesloe Beach Pylon* (1936; 1996)
FORMER NAME Cottesloe Beach Shark Proof Pool; 'Foreman's Folly'

3. LOCATION offshore at Cottesloe Beach in line with John Street, Cottesloe

4. DESCRIPTION OF PLACE INCLUDED IN THIS ENTRY
Portion of Sea bed, being unallocated Crown land as is defined in Heritage Council of Western Australia survey drawing No. 7984 as prepared by Warren King & Company and Midland Survey Services.

5. LOCAL GOVERNMENT AREA Outside Town of Cottesloe boundary

6. OWNER State of Western Australia

(under control of Department of Land Administration and the Town of Cottesloe)

7. HERITAGE LISTINGS

• Register of Heritage Places:	Interim Entry	17/04/2003
	Permanent Entry	15/08/2003
• National Trust Classification:		----------
• Town Planning Scheme:		----------
• Municipal Inventory:	Adopted	30/09/1995
• Register of the National Estate:		----------

8. CONSERVATION ORDER

---

9. HERITAGE AGREEMENT

---

10. STATEMENT OF SIGNIFICANCE

Cottesloe Beach Pylon, a concrete pylon constructed in 1936 with a reconstructed top and situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach, has cultural heritage significance for the following reasons:

the place is an element of Cottesloe Beach, one of Perth's most popular recreation and swimming beaches from the 1880s through to the present;

the place is rare as the only remaining element of what was to have been a shark proof enclosure, a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach; and,

the place is a well known icon for visitors to Cottesloe Beach, and contributes to the beach as a distinctive landmark.

HERITAGE COUNCIL OF WESTERN AUSTRALIA

REGISTER OF HERITAGE PLACES - ASSESSMENT DOCUMENTATION

11. ASSESSMENT OF CULTURAL HERITAGE SIGNIFICANCE

The criteria adopted by the Heritage Council in November 1996 have been used to determine the cultural heritage significance of the place.

PRINCIPAL AUSTRALIAN HISTORIC THEME(S)

- 8.1 Organising recreation
- 8.2 Going to the beach

HERITAGE COUNCIL OF WESTERN AUSTRALIA THEME(S)

- 405 Sport, recreation and entertainment

11. 1 AESTHETIC VALUE*

Cottesloe Beach Pylon contributes to the beach setting by its landmark quality. (Criterion 1.3)

11. 2. HISTORIC VALUE

Cottesloe Beach Pylon is associated with the use of Cottesloe Beach as one of the most popular recreation and swimming beaches in Perth and in Western Australia as a whole from the 1880s and 1890s through to the present day (in 2002). (Criterion 2.1)

Cottesloe Beach Pylon formed part of the construction undertaken for a shark proof enclosure at Cottesloe, although this was never completed. This enclosure, together with the jetty (1904/1906; 1935) and the beach pavillion (1935), was part of a scheme developed in the late 1920s and 1930s to ensure the continuing popularity of Cottesloe Beach. (Criterion 2.2)

Cottesloe Beach Pylon has associations with John Godsell Foreman, who, as the Town of Claremont town clerk/engineer, was responsible for the development of the scheme for the shark proof enclosure. His role in the saga of the construction of the enclosure led to the venture becoming locally known as 'Foreman's Folly'. (Criterion 2.3)

11. 3. SCIENTIFIC VALUE

Cottesloe Beach Pylon has the potential to yield information in regard to the design and construction techniques for shark proof enclosures.

---

* For consistency, all references to architectural style are taken from Apperly, Richard; Irving, Robert and Reynolds, Peter, *A Pictorial Guide to Identifying Australian Architecture: Styles and Terms from 1788 to the Present* , Angus & Robertson, North Ryde, 1989.

11. 4. SOCIAL VALUE

Cottesloe Beach Pylon is valued by the local community as a reminder of past infrastructure, including the jetty and the original bathing pavillion, located at Cottesloe Beach and for its contribution to the beach as a distinctive landmark and for its use as a diving platform. (Criterion 4.1)

As a well-known icon for visitors to Cottesloe Beach, who travel from across the state and Australia, *Cottesloe Beach Pylon* contributes to the community's sense of place. (Criterion 4.2)

12. DEGREE OF SIGNIFICANCE

12. 1. RARITY

Cottesloe Beach Pylon is the only remaining element of what was to have been a shark proof enclosure off a Western Australian beach. (Criterion 5.1)

12. 2 REPRESENTATIVENESS

Cottesloe Beach Pylon is representative of measures taken against shark attack in the metropolitan area in the early twentieth century. (Criterion 6.2)

12. 3 CONDITION

Cottesloe Beach Pylon appears to be in fair to poor condition.

12. 4 INTEGRITY

As a remnant of attempts to construct a shark proof area, *Cottesloe Beach Pylon* has a high degree of integrity.

12. 5 AUTHENTICITY

Cottesloe Beach Pylon has a moderate degree of authenticity. The concrete mast section was replaced in 1996 after storm damage washed away the original mast.

13. SUPPORTING EVIDENCE

The documentary and physical evidence has been compiled by Heritage Council staff from data supplied by the Town of Cottesloe.

13. 1 DOCUMENTARY EVIDENCE

Cottesloe Beach Pylon is a concrete pylon constructed by the Municipality of Cottesloe in 1936 as the north-west corner support for netting to create a shark proof enclosure, a project that was never completed. The only remaining evidence of this unsuccessful venture, the pylon, is situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach (High Water Mark) in line with John Street.

Cottesloe was named in 1886 and soon became a gathering point for the population of Perth during the warmer months due to its excellent beach situated conveniently close to a railway station. The wealthy purchased land and built imposing residences there, while boarding houses and tearooms catered for the summer visitors. Over the ensuing four decades, it became one of the best known and most popular of Perth's coastal resort towns.

The lavish beach facilities that attracted crowds included a jetty first constructed by Aitken and Law in 1904, then rebuilt in 1906 after storm damage. Extending out in line with Forrest Street, the jetty featured a wide promenade with a rotunda out over the water where a band played on Sundays and various other evenings. The pleasure steamer, *Zephyr*, used to berth at the jetty on its way to Rottnest from Fremantle. North of the jetty and central to the main beach, a magnificent bathing pavillion was constructed in 1929. In the 1930s, tourist posters proclaimed, 'Cottesloe never palls whether you come for a day, a year or a life.'[1]

A tragedy at Cottesloe in 1925, when Simeon Ettleson was attacked and killed by a shark, may have influenced proposals to construct a shark proof enclosure. In January 1933, the Cottesloe Municipal Council received an application from the 'Cottesloe Shark-Proof Swimming Pool Co. Ltd.' for the lease of an area south of the jetty for this purpose. Other metropolitan beaches were vying for patronage and there was recognition amongst councillors that Cottesloe needed to stay competitive and safe to ensure the profitable running of the pavillion. Nevertheless, the council had to reply that it had no authority to grant such a lease.[2] Subsequently, in August 1934, John Foreman, Cottesloe's town clerk/engineer, submitted a special report with four recommendations designed to increase the popularity of Cottesloe Beach. These included repairs and an extension to the jetty, the provision of changing sheds, building a promenade from the main beach to the Eric Street beach, and the construction of a shark proof enclosure.[3]

John Godsell Foreman was to play a prominent part in the saga of the construction of the shark proof enclosure, to the extent that the venture would become known locally as 'Foreman's Folly'. Born in Kalgoorlie in 1904 and educated at Modern School, Foreman spent some years in the RAAF and the RAF before returning to WA in 1927. After experience in both the Fremantle and Perth Roads Boards, he had accepted the position at Cottesloe in January 1932 aged 28, and was probably the youngest town clerk in WA.[4]

The Cottesloe Council accepted Foreman's specifications and estimates, and a loan was raised to allow the works to proceed.[5] Foreman's specifications took into consideration that the shark proof enclosure would have to be of 'sufficient strength in the netting supports to overcome wave action'.[6] The existing jetty was to form the southern boundary of the enclosure with its piles acting as the support for the cables and netting. The cables holding the netting on the west and north sides of the enclosure were to be supported by a number of concrete pylons: one located at the north-western corner 80

---

1 Erickson & Taylor with Philip Griffiths 'Town of Cottesloe Municipal Heritage Inventory', Record no. 248.

2 Adamson, Pat 'Cottesloe's Solitary Pylon' in 'The Cottesloe Society Newsletter', Vol. 4, No. 1, March 1995, pp.4 & 5. For example: By the 1910s, the sea baths at Busselton Jetty were reported to be 'secure against the intrusion of sharks and other sea monsters.' (RICH Students, K. Blair, N. Edgecombe, S. Keane, A. Nancarrow, J. Roberts, & L. Waker, 'Busselton Jetty', draft heritage assessment, May 2002, p. 14.)

3 Municipality of Cottesloe, Minutes of Meeting 8 August 1934.

4 *Daily News* 27 January 1934.

5 Municipality of Cottesloe, Minutes of Meeting 8 August 1934; Municipality of Cottesloe, Minutes of Meeting 16 August 1934; Municipality of Cottesloe, Minutes of Meeting, 12 September 1934.

6 Municipality of Cottesloe, Minutes of Meeting 8 August 1934.

yards from the mean high water mark; two midway along the western boundary; and, one midway along the northern boundary.[7]

Each concrete pylon was to be a height of 15 feet from bedrock level, thereby ensuring a height of 8 feet at low tide. The base of the pylon was specified as 8 feet in diameter, moving up to a diameter of 5 feet at the top.[8] Foreman proposed that each of the pylons would have steps and a springboard for the enjoyment of beachgoers, and that floodlights would also be erected to allow night swimming.[9] It was estimated that the total cost of the shark proof enclosure would be £1,600.[10]

At the meeting of the Cottesloe Council on 12 September 1934 it was announced that the loan for the cost of the entire beach improvements had been arranged. It was decided that the tender for the construction of the shark proof enclosure would be offered immediately to allow work to begin should weather permit.[11]

The timber moulds for the concrete towers or pylons are said to have taken approximately one month to build. Each individual mould incorporated steel reinforcement so that when they were placed into position on the seabed the concrete could be poured directly into the mould.[12] Prior to their placement, cofferdams (water tight enclosures of inter-locking sheeting) were to be constructed in the ocean and then dredged of water and sand down to the bedrock level.[13] Work began on the installation of the first cofferdams near the jetty in October 1934. However, as had been foreseen by Council, weather conditions impacted on the work schedule, as did the fragile condition of the jetty itself. Work was suspended on the enclosure project until February 1935, and attention turned to the reconstruction of the jetty, which was later completed in December 1935.[14]

An attempt was made by three Councillors to put a stop to the project altogether, but the motion was defeated 11 votes to 2 at the Council's meeting on 30 January 1935.[15]

On 27 March 1935, the first of the cofferdams for the shark proof enclosure was successfully positioned adjoining the jetty, into a 6 feet deep hole that had been blasted into the bedrock.[16] The concrete was poured into the mould by 10 April, in an operation that took just over 24 hours. The mould was later removed leaving the concrete pylon in place.[17]

---

7 Ibid. It was planned cables and nets would be detached during the winter storms, but of a strength to be able to withstand the summer season. (Ibid.)

8 Municipality of Cottesloe, Minutes of Meeting 8 August 1934. For detailed information on the specifications for the construction of the towers (pylons) and netting see Municipality of Cottesloe, proposed Loan No. 13 for £5,250, Specifications for Proposed Works & Estimates of Costs Thereof.

9 Ibid.

10 Ibid.

11 Municipality of Cottesloe, Minutes of Meeting 12 September 1934.

12 'Cottesloe's Solitary Pylon', op. cit., p. 6.

13 Ibid, p. 6.

14 Ibid, pp. 6 – 7; 'Cottesloe Shark Proof Pool' in Municipality of Cottesloe, *Civic Centre News*, 1989, p. 10.

15 'Cottesloe's Solitary Pylon', op. cit., p. 7.

16 *The West Australian*, 2/3/1935, in 'Cottesloe's Solitary Pylon', op. cit., p. 7.

17 'Cottesloe's Solitary Pylon', op. cit., p. 7. It is interesting to note that it was eventually found that this pylon had been erected 20 feet further along the jetty than specified, which, had the enclosure been completed, would have resulted in an odd shape.

The Cottesloe Council was informed that the cost of completion of this pylon had been twice that of the estimation, being £260. This meant that the total cost of the enclosure would be much higher than had been anticipated, but that some of additional funding needed would be found from the surplus associated with the work to the jetty.[18]

Following completion of the first pylon, it was proposed that work being immediately on the northern pylon. Initial plans were deferred however due to bad weather.[19]

In August 1935, Foreman put forward plans for a variation to the specifications of the enclosure's construction. He recommended that, in the place of the concrete pylons planned at midway points along the western boundary, an African hard wood called 'turpentine' could be used to construct three dolphins as cable supports. (Foreman had been advised by the Queensland Forestry Department that the timber would be immune from termite attacks.)[20] Given that the use of timber would expedite the timeframe for the project, the Council agreed to the variation.[21]

Weather continued to cause delays up to December 1935. In the intervening period, the two shore anchors for the cables were installed at the John Street and Forrest Street ramps. By January 1936, the first timber pile had been put into position and a working platform was extended to the site of the northern pylon.[22]

Although it was stated that the second concrete pylon (*Cottesloe Beach Pylon*) would be completed in two weeks, work progressed steadily during the months of February and March. Construction of *Cottesloe Beach Pylon* was finished by 1 April 1936.[23] At its base in the bedrock, the pylon was said to have been approximately 12 foot 6 inches in diameter and estimated to weigh 60 tons. The cofferdam and mould were left in place until the end of April to allow the proper curing of the concrete. By this time, the third timber pile had been erected and all that was required to finish the project was the installation of the cables and netting.[24]

However, the Cottesloe Beach shark proof enclosure was never completed. On the night of 29 May 1936 a storm caused substantial damaged to the built structures. The first pylon was dislodged and had to be removed by Council, and the timber piles were swept away by heavy seas. Foreman suggested that the matter of the enclosure's reconstruction be deferred until it was determined what affect the winter storms would have on the remaining pylon.[25]

Foreman sought advice from consultant Mr. H. Bennett, a retired engineer of the Harbours and Rivers Branch of the Public Works Department, with regard to the project. In his report of 1937, Bennett recommended three different schemes for the enclosure's reconstruction and, further to this, believed that the remaining pylon would be dislodged sooner or later.[26]

---

18 Ibid, p. 7.

19 Ibid, pp. 7 – 8.

20 Ibid, p. 8. A dolphin is the name of a pile used to moor boats.

21 Ibid, p. 8.

22 Ibid, p. 8.

23 Ibid, pp. 8 – 9.

24 Ibid, p. 9.

25 Ibid, p. 9.

26 Ibid, pp. 9 – 10.

The Council's decision on the matter of the shark proof enclosure was deferred in January and February 1937, before being referred to the Beach and Works Committee for its consideration. However, there is no evidence to indicate that the matter was ever dealt with again and it appears to have disappeared into obscurity.[27]

Cottesloe Beach was considered to be the most popular beach in Western Australia in the first half of the twentieth century: 'the mini Brighton of the West'.[28] The jetty (1904/1906; 1935) and the pavillion (1929) were an integral part of life at the beach during this period, not only for beachgoers but they, together with the Cottesloe foreshore strip, were part of the nightlife for local residents of the western suburbs.[29] Although the jetty and the pavillion as well as other entertainment venues along the foreshore fell into disuse and disrepair from the 1950s to the 1970s, Cottesloe Beach continued to be one of Perth's and the State's most popular swimming areas. As a feature of the beach, *Cottesloe Beach Pylon* became a popular diving platform for beachgoers.[30]

A severe storm on the night of 7 June 1995 broke off the top section of the northern pylon. A new spire was fitted to *Cottesloe Beach Pylon* on 10 December 1996.[31]

Diving from *Cottesloe Beach Pylon* is now illegal, as the Town of Cottesloe was unable to secure public liability insurance for any injury sustained by this activity. A stainless steel cone has been attached to the spire to prevent access to the peak and to prevent the addition of car tyres as elevated diving platforms. Council has also removed protruding metal lugs, which provided an anchor point for climbing ropes, and staff regularly remove new ropes as they appear.[32]

In 2002, *Cottesloe Beach Pylon* is a distinctive landmark on Cottesloe Beach and is used by swimmers as a diving platform.

13. 2 PHYSICAL EVIDENCE

Cottesloe Beach Pylon is a concrete pylon constructed in 1936 as the north-west corner support for shark proof netting, a project that was never completed. The only remaining evidence of the project, the pylon, is situated in the Indian Ocean about 80 metres offshore from Cottesloe Beach (High Water Mark) in line with John Street.

The pylon takes the form of a 2.5 metre (8 ft) diameter concrete base with an estimated weight of some 63 tonnes, keyed into the bedrock. Where it protrudes from the ocean the base is stepped down to about 2 metres diameter and rises approximately 2 metres above mean sea level. This base supports a concrete mast about 3 metres in height, the latter a recent replacement after storms in June 1995 washed away the original.

---

27 Ibid, p. 10.

28 Marchant James, R., *The Heritage of Pines: A History of Cottesloe*, Town of Cottesloe, 1977, p. 24.

29 Erickson & Taylor with Philip Griffiths, Town of Cottesloe Municipal Inventory, 1995, Record No. 248.

30 Marchant James, op. cit., pp. 28 – 29; Information provided by the Town of Cottesloe, in HCWA File: P7984.

31 Information provided by the Town of Cottesloe, in HCWA File: P7984.

32 Malcolm Doig, A/ Chief Executive Officer, Town of Cottesloe, in a letter to HCWA, 15 January 2003, in HCWA File P7984

The structure appears to be in fair condition. However, the condition of the point of attachment to the underlying reef is unknown. Also, the structure is constructed of concrete of uncertain standard, which was mixed on site, and the diameter of the base has been significantly eroded by the sea. Recent examinations have revealed substantial exfoliation of concrete due to corrosion and the failure of the original reinforcement. The extent and adequacy of the steel reinforcement is unknown.[33]

13. 3 COMPARATIVE INFORMATION

Shark proof enclosures were constructed off a number of coastal and swan river jetties in the Perth metropolitan area in the early twentieth century. Others known to have been constructed include shark proof enclosures South Fremantle, Busselton and Fremantle.

The shark proof enclosure in South Fremantle was constructed by 1928 at South Beach. The netting was strung between two jetties and was supported by approximately ten poles upon which a promenade deck was constructed. A diving platform extended from the promenade. The enclosure is believed to have been extant until the 1950s.[34]

A shark proof enclosure was attached to the Busselton Jetty early in the twentieth century. Sea baths were added to the jetty in 1911, which were deemed 'the finest bathing area in the State', as they were 'secure against the intrusion of sharks and other sea monsters'. The length of the baths along the original jetty frontage was 100m with the piling between the two jetties 4m deep and measuring 150m wide. The baths also included a platform (16.6m in length and 4.3m in width) on the jetty that accommodated a number of spacious dressing compartments. It is not known when the sea bath was removed.[35]

Shark-proof Municipal Sea Baths were constructed at Fremantle in the 1890s, between Long Jetty and South Jetty. These were demolished in 1917, and the site is now Fishing Boat Harbour's northern sea wall.[36]

There are heritage listed sea baths in other States, particularly New South Wales, although they appear to be structures more like tidal swimming pools than net-enclosed ocean areas. Shark-proofing was provided by means of timber, metal, or more recently plastic bars and rods. Sea baths of this nature are located at Bondi Beach, Sydney (constructed in the 1920s; Register of National Estate - RNE), Manly Beach, Sydney (date not given; RNE) Middle Brighton Municipal Baths, Vic (1936; RNE), Northbridge Pool, NSW (1924; RNE) and Merthon, Sorrento, Victoria (date not given; RNE).

Eastern Beach Bathing Complex, Geelong (1928-1939; Victorian Heritage Register), includes a bathing complex, constructed to the design of I. McDonald in 1937, featuring a landmark semi-circular shark-proof enclosure and promenade. The promenade is formed by a two level braced pier structure supported on 10in diameter yellow stringy bark piles, with blue gum superstructure, red gum decking, handrails and underneath, a fence of bronze shark proofing bars.

---

33 ibid.

34 Conversation with City of Fremantle Local Studies Librarian 20/2/2003

35 HCWA draft assessment for P0423 *Busselton Jetty*, 2002.

36 Cummings D.A., Garrat D., & McCarthy, M., *Port Related Structures in Western Australia: Appendix 2A: Archaeological Excavation Report: Fremantle Long Jetty/*, 1995, p.4.

At Little Sirius Cove Enclosure Remnants, Mosman NSW, (date unknown; RNE) a sweeping sandstone sea wall, which retains the fill material used to form the park, and sandstone steps into the water, are the only remaining elements of a shark-proof enclosure that until the late 1960s retained its 150m of shark-proof netting.

Neilsen Park Pool, Vaucluse, NSW (1930; RNE) is an almost semi-circular crescent shaped shark proof enclosure. Timber and concrete encased timber poles support a braided stainless steel cable from which a shark proof mesh is suspended. Originally, rope netting was kept at surface level by means of glass buoys rather than a cable. The enclosure remains intact.

Parsley Bay Swimming Enclosure, Vaucluse, NSW (1930, 1985, 1995; RNE) uses natural features, with the enclosure formed by the installation of a nylon net mesh stretching from shore to shore, effectively enclosing half of Parsley Bay.[37]

13. 4 KEY REFERENCES

No key references.

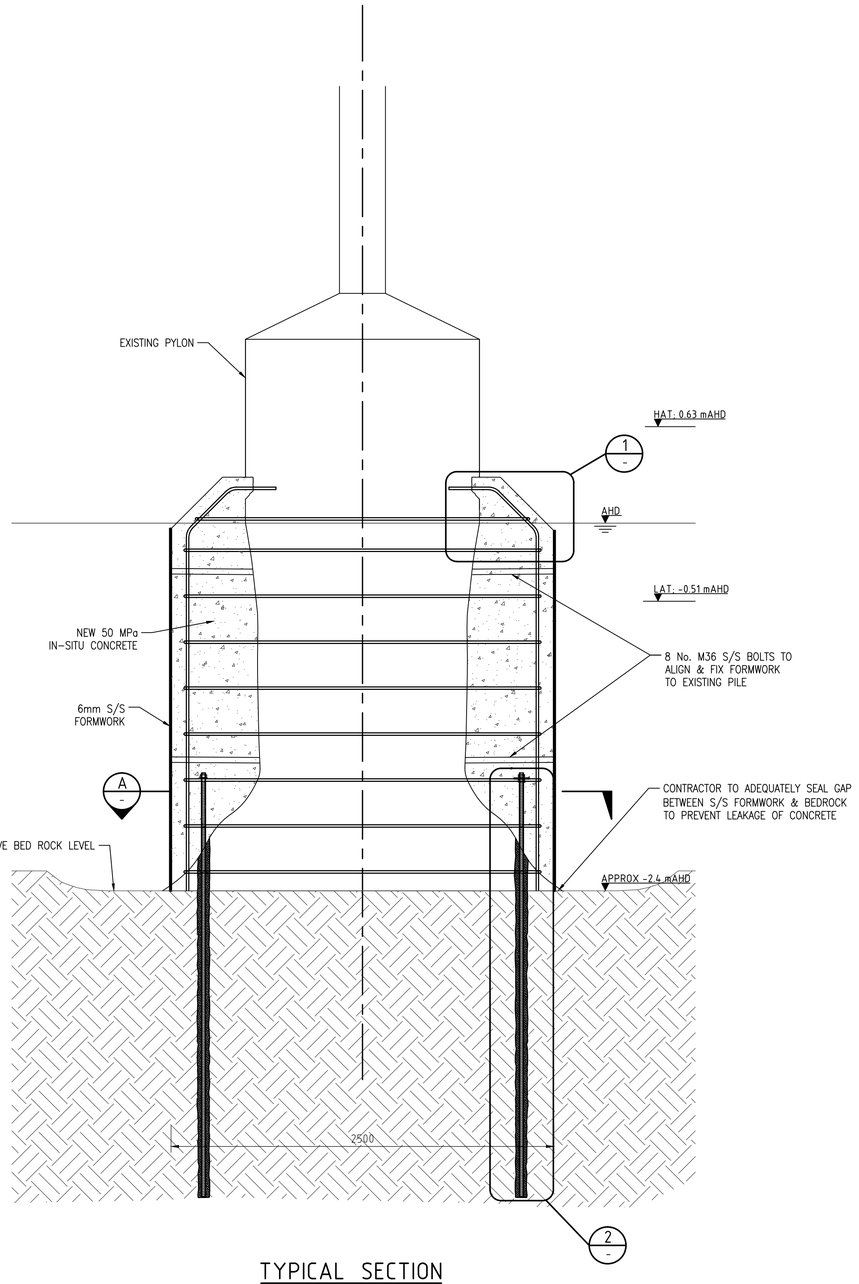
13. 5 FURTHER RESEARCH

---

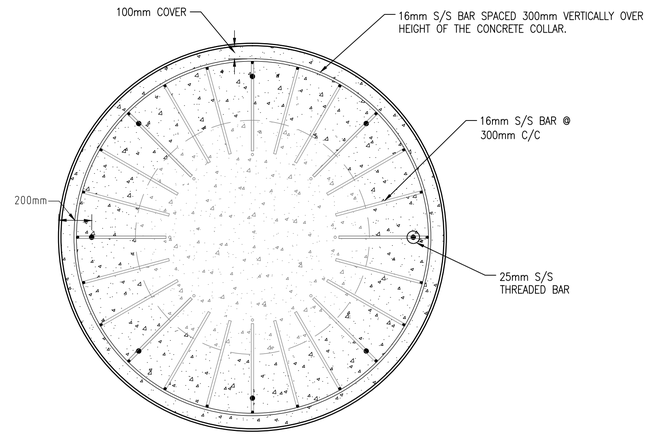
[37] Information from searches of the online Australian Heritage Places Inventory at <http://www.heritage.gov.au/ahpi/index.html>

Appendix C – Design Drawings January 2018, M P Rogers & Associates

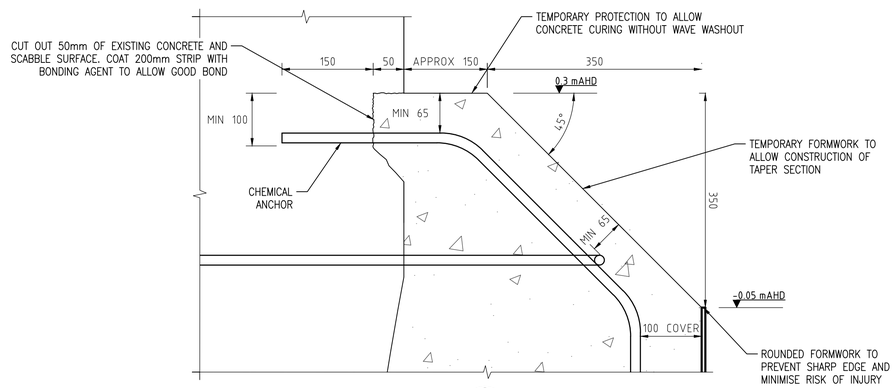
AT CORRECT SCALE THIS IS 100 mm



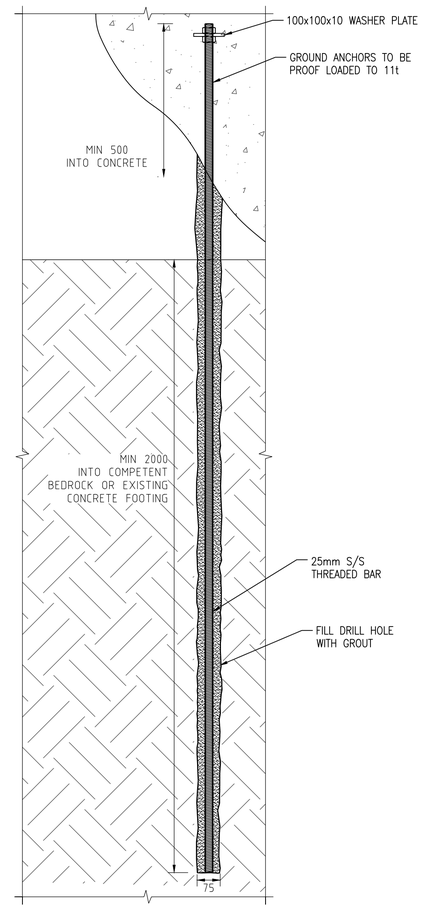
TYPICAL SECTION
1:20



SECTION A
1:20



DETAIL 1
1:5



DETAIL 2
1:10

NOTES:

1. CONTRACTOR TO CONFIRM LEVEL OF BEDROCK AND PYLON DIMENSIONS PRIOR TO FABRICATION OF REINFORCEMENT CAGE AND FORMWORK.

AT CORRECT SCALE THIS IS 100 mm

CAD:D14870101A

REV	DATE	APPROVED	AMENDMENT
A	24.01.18	PMD	ISSUE FOR APPROVAL

This plan is not to be used for construction unless issued as Rev 0 and signed below

CLIENT: SMC MARINE / TOWN OF COTTESLOE

DESIGNED	CHECKED	APPROVED
J. CHEN	P. DOUST	
DRAWN	CHECKED	
R. BORJA	J. CHEN	

m p rogers & associates pl
coastal and port engineers

Suite 1, 128 Main Street
Osborne Park 6017
Western Australia

t: +61 8 9254 6600
f: +61 8 9254 6699
admin@coastsandports.com.au

PROJECT: COTTESLOE PYLON REFURBISHMENT

TITLE: REFURBISHMENT DETAILS

SCALE AT A1	DRAWING NUMBER	REV
AS SHOWN	D1487-01-01	A

Appendix D – Cottesloe Pylon Refurbishment Design Report, January 2018, M P Rogers & Ass

m p rogers & associates pl ABN 14 062 681 252
creating better coasts and ports

R973 Rev 0

January 2018

SMC Marine

Cottesloe Pylon Refurbishment Design Report

marinas
boat harbours
canals
breakwaters
jetties
seawalls
dredging
reclamation
climate change
waves
currents
tides
flood levels
water quality
siltation
erosion
rivers
beaches
estuaries

www.coastsandports.com.au

m p rogers & associates pl
creating better coasts and ports

Suite 1, 128 Main Street, Osborne Park, WA 6017
p: +618 9254 6600
e: admin@coastsandports.com.au
w: www.coastsandports.com.au

K1487, Report R973 Rev 0
Record of Document Revisions

Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft for MRA review	J Chen	P Doust	P Doust	18/01/18
0	Issued for Client use	J Chen	P Doust	P Doust	23/01/19

Form 035 18/06/2013

Limitations of this Document

This document has been prepared for use by the Client in accordance with the agreement between the Client and M P Rogers & Associates Pty Ltd. This agreement includes constraints on the scope, budget and time available for the services. The consulting services and this document have been completed with the degree of skill, care and diligence normally exercised by members of the engineering profession performing services of a similar nature. No other warranty, expressed or implied, is made as to the accuracy of the data and professional advice included. This document has not been prepared for use by parties other than the Client and its consulting advisers. It may not contain sufficient information for the purposes of other parties or for other uses.

M P Rogers & Associates takes no responsibility for the completeness or form of any subsequent copies of this document. Copying this document without the permission of the Client or M P Rogers & Associates Pty Ltd is not permitted.

Table of Contents

Table of Figures

Table of Tables

1. Introduction

The Cottesloe Beach Pylon (referred to as the Pylon in this report) was constructed in 1936 to form part of a shark proof enclosure. The enclosure was not completed due to damage caused by severe storm in May 1936. The pylon is the only remaining part of the structure and is now a Perth landmark that is heritage listed. In recent times the structure has deteriorated making it at risk of collapsing and also a concern for the safety of swimmers. The location of the Pylon is shown in Figure 1.1.

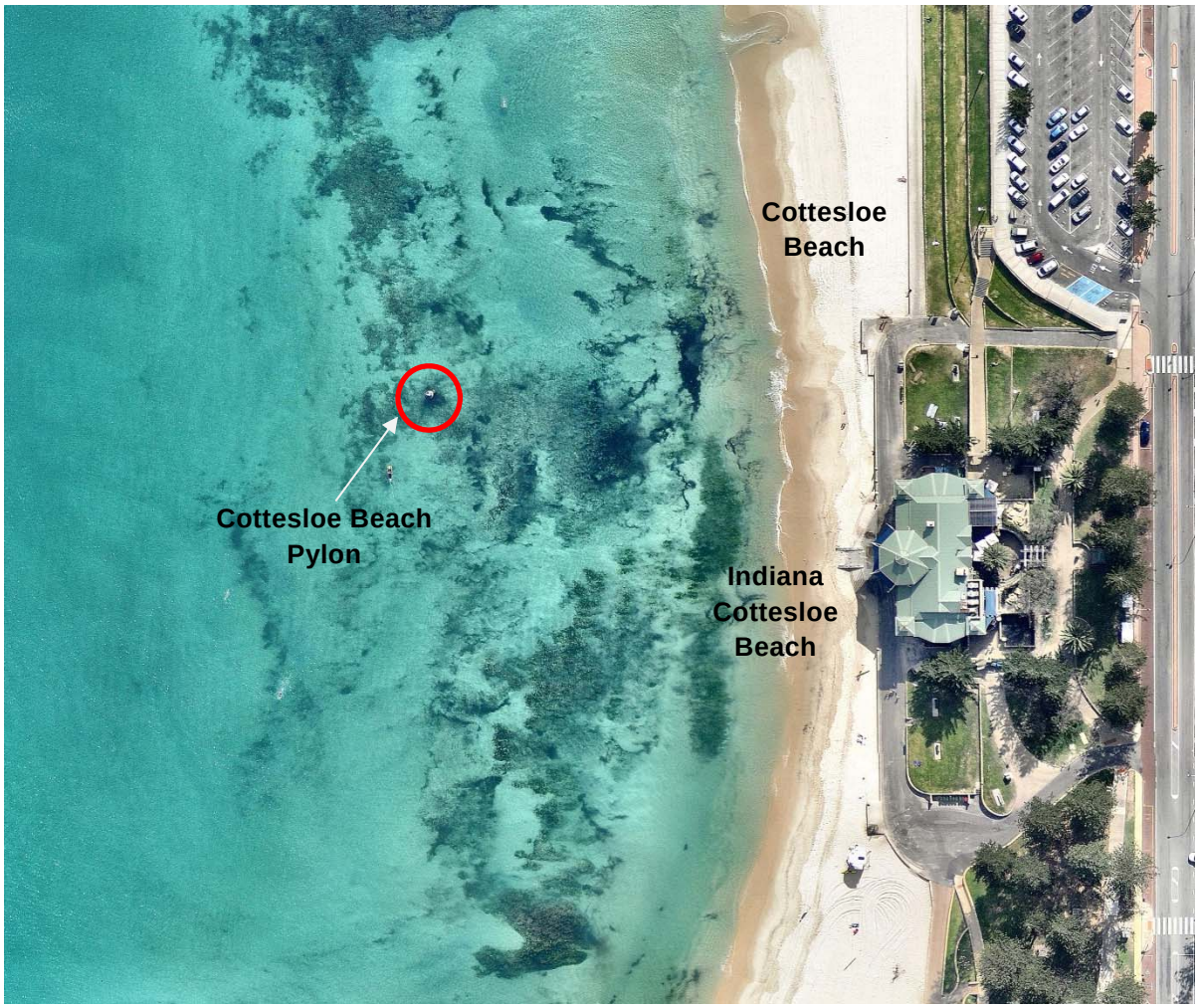


Figure 1.1 Location Diagram

To ensure public safety and preserve the Pylon, the Town of Cottesloe (The Town) called tenders for the remediation works on the Pylon. Two remediation options were provided to the tenderers and consisted of the following.

- Option 1 - Design and construction of the refurbishment of the submerged component of the Pylon. A performance specification developed by Wood & Grieve Engineers (WGE) has been provided for this option.
- Option 2 – Replacement of the Pylon as per the drawings and structural engineering specification developed by WGE.

SMC Marine Pty Ltd (SMC) were awarded the contract for the design and construction of their alternative option for the refurbishment of the Pylon. The alternative proposal consists of the use of a permanent stainless steel formwork and stainless steel reinforcement to provide additional protection to the Pylon over the design life of the refurbishment works.

SMC engaged specialist coastal engineers, M P Rogers & Associates Pty Ltd (MRA), to complete the detailed design of the refurbishment works. The scope of the works includes the following:

- Review of background information and performance specification for the works.
- Complete wave assessment to determine the loadings on the Pylon.
- Complete detailed design and documentation of the refurbishment works.

This design report presents a summary of the design conditions, criteria, methods, basis of design and considerations for construction and maintenance.

2. Existing Condition

The Pylon was constructed from concrete in 1936 and is now listed in the Register of Heritage Places. The assessment documentation prepared by the Heritage Council (Heritage Council 2003) provides the following information on the Pylon.

- The Pylon section below the water line is about 2.5 m in diameter (circumference of about 7.9 m) and keyed into the bedrock.
- The Pylon protrudes about 2 m above the mean sea level, over which the dimeter reduce to 2 m (circumference of about 6.3 m).
- The 2 m diameter base supports a concrete mast about 3 m in height.

The grade and quality of the concrete used for the Pylon construction is unknown. In recent times, observations showed that the Pylon has been significantly eroded, exposing the original reinforcement.

2.1 Diver Inspection

To ascertain the existing condition of the Pylon, a condition survey of the Pylon was carried out by Fremantle Commercial Diving (FCD 2016). To allow inspection of the Pylon, it was initially cleaned to remove marine growth and its base was exposed using a small water pump. The outcome of the inspection is summarised by the following.

- Apparent losses of concrete from the Pylon. In general the concrete losses are not uniform and on the whole the concrete has eroded down to a layer of steel reinforcement, which was originally embedded about 200 to 250 mm below the concrete surface. The concrete above the water line has a circumference of approximately 4.8 m. Below the waterline, significant loss of material is identified and the circumference of the Pylon varies between 4.2 and 8.2 m.
- Exposure of steel reinforcement throughout the structure. The exposed reinforcement showed signs of failure in some sections.
- The Pylon appears to be seated in a seabed surrounded by bedrock.
- Some areas of the Pylon have been subjected to heavy degradation.

2.2 Beach Survey

BMT Oceanica and Cardno have completed coastal monitoring for the Town for the period between 2014 and 2016 (BMT 2015, Cardno 2016). Beach survey transects were completed for these studies. Based on the survey transects taken between November 2014 and March 2016, the bed depth at the Pylon location is estimated to be approximately -2.4 mAHD. This is consistent with the 2009 Lidar survey undertaken by Fugro LADS Corporation for the Department of Transport (DoT).

2.3 Geotechnical Conditions

Geotechnical information is limited at the Pylon location and has been based on the diver's inspection (FCD 2016). From the report, it appears that the Pylon base sits in a roughly defined depression that is cut into the limestone bedrock.

Heritage Council (2003) also suggests that the concrete pylon was installed into a 6 feet deep hole that had been blasted into the bedrock.

3. Design Criteria

3.1 Performance Criteria

The performance criteria for the design of the Pylon refurbishment are outlined in the Structural Engineering Performance Brief (WGE 2017) and are summarised by the following table.

Table 3.1 Performance Criteria

Item	Criteria
Finished collar diameter	2.5m (+25mm,-0mm)
Design life for repaired pylon	25 years
Concrete exposure environment	C2
Collar verticality	90º (+/-1º)
Concrete type/strength	50MPa min, special class
Cementitious content	>400kg/m^3
Maximum shrinkage strain	600x10^{-6} mm/mm
Maximum w/c ratio	0.4
Minimum concrete cover	65mm
Curing	Min 14 days water cured
Reinforcement grade	500MPa
Minimum bar diameter	16mm
Reinforcement finish	Hot dip galvanised to 600gsm
Concrete finish	Crack free, Class 2

3.2 General Performance Outcomes

The Performance Brief also requires the finished concrete collar to meet the following general performance outcomes in addition to the above performance criteria.

- Have a smooth finish, free from protrusion and sharp edges.
- Crack free.
- Remain sound and intact for the design life.
- Be neatly cut into the existing Pylon (at the top) and sealed to ensure water cannot readily transverse between old and new concrete.

3.3 Alternative Design Criteria

SMC proposed the following alterative design criteria which was accepted by the Town.

- Permanent stainless steel formwork.
- Stainless steel reinforcement.

These items were proposed to improve the durability of the structure.

4. Design Considerations

4.1 Design Water Level Conditions

Tidal levels at the Pylon are expected to be similar with those measured in around 5 m of water at Fremantle Fishing Boat Harbour (FFBH), 8 km south of the Pylon location. This is one of the longest tidal records in the state. DoT measures water levels at FFBH and has prepared a submergence curve, included in Appendix A. The key tidal levels are presented in Table 4.1 below.

Table 4.1 FFBH Tidal Levels

Tidal Plane	Prefix	Still Water Level (mAHD)
Highest Astronomical Tide	HAT	+0.63
Mean High High Water	MHHW	+0.38
Mean Sea Level	MSL	+0.04
Mean Low Low Water	MLLW	-0.30
Lowest Astronomical Tide	LAT	-0.51

Note: 1. Levels taken from DoT Submergence Curve (DOT 1615-13-02, October 2016)

4.1.1 Extreme Water Levels

Whilst astronomical tides can be accurately predicted there is the potential for these levels to be exceeded due to meteorological or hydrological effects.

An analysis of extreme water levels experienced at FFBH has been conducted by MRA based on 65 years of water level records at FFBH from 1950 to 2015. The highest 66 water level events were identified and fitted to an extreme distribution. A Weibull distribution with k=1.25 had the best fit for the data, with the resultant extreme water level values shown in Table 4.2.

Table 4.2 Estimated Storm Surge Induced Water Levels at the Pylon

ARI (years)	Still Water Level (mAHD)
1	0.96
10	1.17
50	1.29
100	1.33

4.1.2 Sea Level Rise

Extreme and ambient water levels are both expected to increase in the future with sea level rise as a result of climate change. The DoT (2010) released recommendations on the appropriate

allowances for sea level rise to be used in coastal planning and development in Western Australia. The allowances are presented in Figure 4.1.

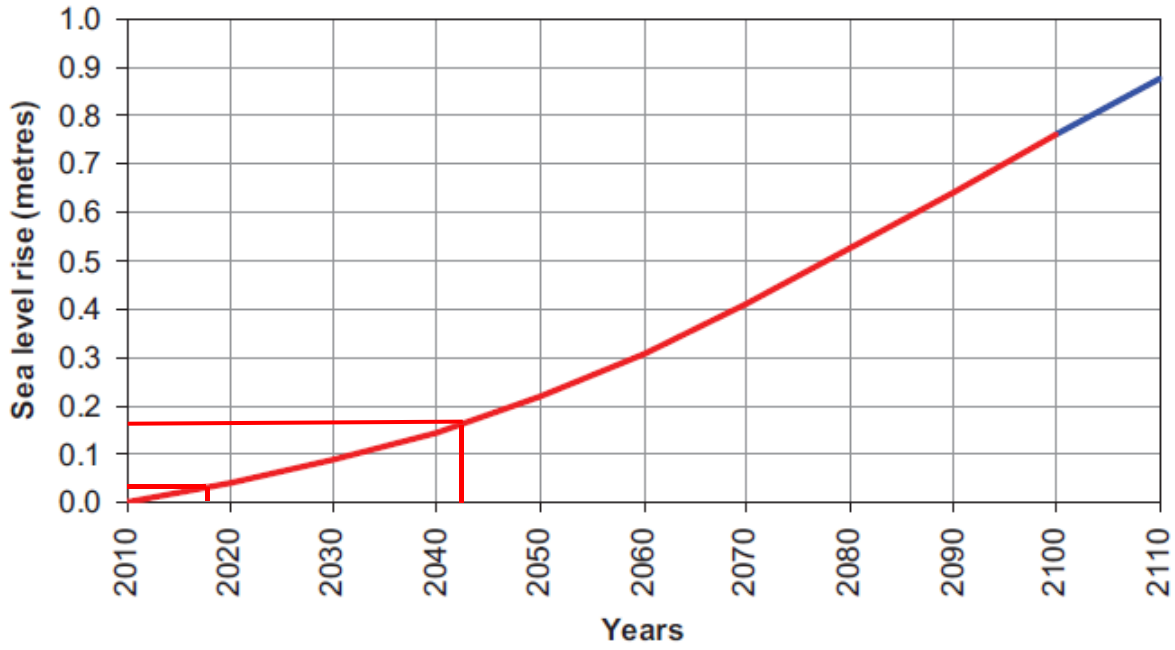


Figure 4.1 Recommended Sea Level Rise Allowances (DoT 2010)

For a design life of 25 years, the recommended climate change allowance is therefore approximately 0.13 m. This has been adopted in the design.

4.2 Design Wind Conditions

The design wind speeds are calculated in accordance with *AS1170.2-2011 Structural design actions – Wind actions*.

For the critical design case only a small portion of the structure will experience wind loading as most of the structure will be submerged by the wave.

4.3 Design Wave Conditions

The wave climate at the site can be a result of swell generated far from the site or seas generated by local winds.

As there was little wave data close to the Pylon site, an analysis of offshore wave data together with detailed wave modelling was used to determine the wave conditions at the site.

4.3.1 Extreme Offshore Waves

To determine the design wave conditions, an extreme analysis was required to determine the wave heights for various return periods. The extreme wave analysis was completed using Rottnest buoy records for the highest 50 events over the period 1994 to 2015. To ensure that only individual events were identified, a 48 hour separation was applied between wave events. The extreme distribution for the 50 event analysis is presented in Figure 4.2 and summarised in Table 4.3. This analysis is for all directions.

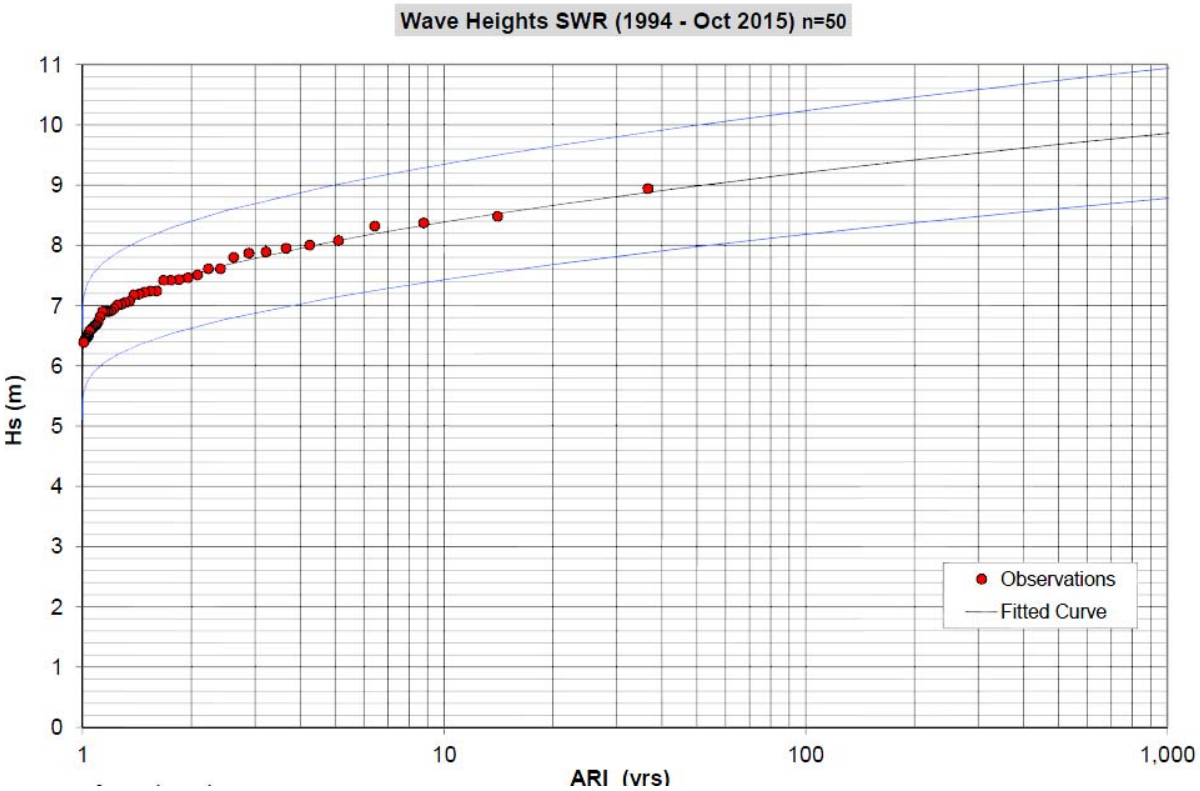


Figure 4.2 Extreme Wave Height Distribution Curve

Table 4.3 Design Wave Condition Offshore from Pylon

Average Recurrence Interval (ARI)	Significant Wave Height (m)
1	6.4
50	9.0

4.3.2 Design Wave Conditions at Pylon

MRA has previously competed numerical wave modelling for the region. This model was used to transform the offshore wave conditions to obtain the wave conditions at the Pylon.

Table 4.4 provides a summary of the design wave conditions expected at the Pylon.

Table 4.4 Design Wave Conditions at the Pylon

Average Recurrence Interval (ARI)	Design Waves		
	H_s (m)	H_{max} (m)	T_p (s)
1	2.3	3.9	13
50	3.2	4.3	13

4.4 Design Current Conditions

At the Pylon location, during design events, large currents are generated by waves. These wave induced currents are included in the assessment of the design loads on the Pylon.

5. Detailed Design

The following section outlines the key design features, assumptions and methods for the various aspects of the works. The design drawings for the works are included in Appendix B, and a specification for the works is provided in MRA (2017).

5.1 Design Loads on the Pylon

5.1.1 Wave Loads

The critical horizontal wave & current load for the Pylon design was estimated to be a combination of a quasi-static wave force and the slamming wave load.

These wave loads were estimated based on the following assumptions.

- 25 year design life.
- As per AS4997-2005, the Pylon was assumed to be Functional Category 1 – Structure presenting a low degree of hazard to life or property. For this type of structure and a 25 year design life, a 50 year ARI design wave event was used.
- The load impact areas were estimated based on the Pylon dimensions for the proposed refurbished structure.
- The quasi-static wave force is assumed to act over the height of the Pylon (-2.4 mAHD to 5 mAHD).
- The slamming load is assumed to act only above -0.51 mAHD, which is the Lowest Astronomical Tide (LAT).

It is noted that the above assumption on the impact area will give a conservative estimate of the total horizontal wave load, as the slamming load only acts over a short duration and the peak slamming load does not occur simultaneously with the peak non-breaking wave load.

5.1.2 Construction Loads

It is anticipated that no load shall be applied to the existing Pylon during construction.

5.2 Pylon Stability

The Pylon refurbishment works proposed to restore the heavily eroded submerged portion of the Pylon back to its original dimension (2.5 m in diameter). The Pylon base was originally keyed into the bedrock, and therefore expected to still provide some resistance to overturning during severe storm events. However, given the limited information on the current condition of the Pylon, the stability of the proposed Pylon refurbishment works was completed without the residual overturning resistance from the existing Pylon.

Based on the stability check, the self-weight of the proposed Pylon refurbishment works will not be able withstand the design load. Therefore, ground anchors will be required to provide the additional overturning resistance.

5.3 Formwork Design

6 mm stainless steel formwork was proposed by SMC. It is noted that this formwork will remain in place after the concrete pour to provide additional protection to the Pylon.

The formwork was designed in accordance with the requirements of AS3610.

5.3.1 Lateral Concrete Pressure

The pouring of concrete will exert lateral pressure on the formwork. It is anticipated that this pressure would be mostly offset by the hydrostatic pressure on the external face of the formwork. However, to minimise the lateral concrete pressure the height of the pour should be minimised. It is intended that concrete pour will commence at the base of the formwork and progressively rise.

5.3.2 Strength

The formwork was designed in accordance with the strength requirements of AS3610.

5.3.3 Restraint Systems

The stainless steel formwork is proposed to be restrained by two rows of four stainless steel M36 bolts before and during concrete pouring. The bolts configuration is shown in Figure 5.1.

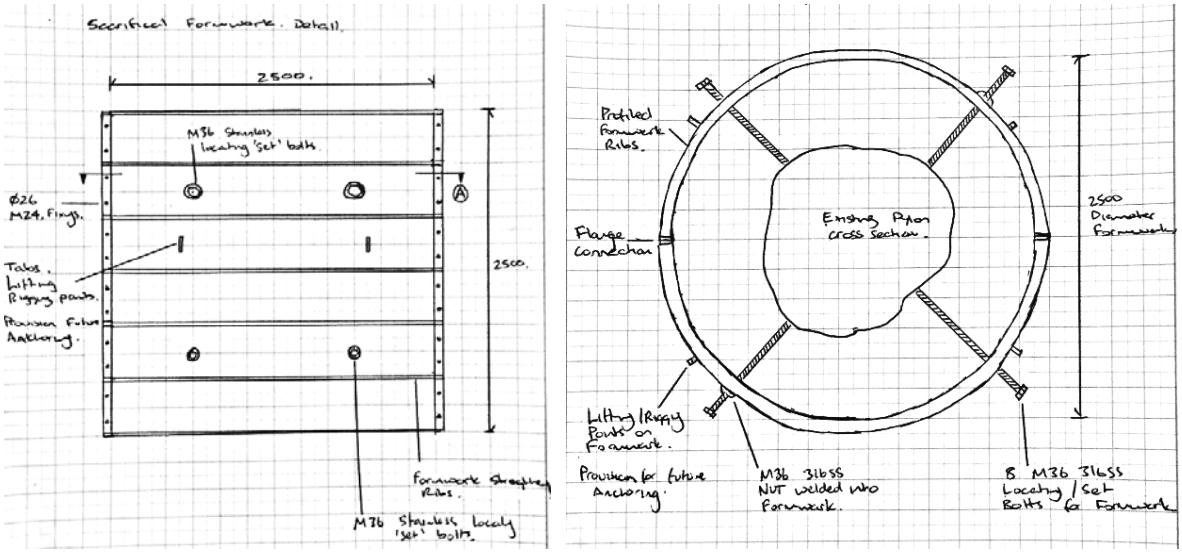


Figure 5.1 Formwork Holding Bolts Arrangement

5.4 Concrete Collar Design

The concrete collar is a critical component of the refurbishment works and must be able to withstand the design wave actions and be durable over the design life with minimal maintenance. Therefore it has been designed in accordance with the strength and durability requirements in the following Australian Standards:

- AS4997 - 2005: Guideline for the design of maritime structures.
- AS3600 – 2009: Concrete structures.

5.4.1 Strength

The concrete collar has been designed to withstand the wave actions and in accordance with the strength requirements in AS4997 and AS3600.

5.4.2 Durability

The following durability requirements were adopted in the concrete design:

- 50 MPa marine grade concrete.

- 14 days of water curing.
- Limit stress in steel reinforcements to minimise crack width.

5.4.3 Reinforcement

Stainless steel reinforcements will be used for this works.

5.4.4 Crack control

Longitudinal stainless steel reinforcements were used to limit crack development.

Limiting Stress

The stress in the reinforcements were limited in accordance with the requirements of the AS4997 and AS3600.

5.5 Ground Anchors

To provide the required capacity to resist the design wave actions, ground anchors in the form of threaded stainless steel rebar embedded into straight shaft boreholes were adopted. It is anticipated that the boreholes would be tremie-grouted after insertion of the threaded rebar.

The anchors have been designed against the principal failure modes of the ground anchors to ensure that the required stabilising forces can be achieved. The following four modes of failure were considered:

- Tension failure of the steel anchor.
- Grout to steel bond or interface failure.
- Rock to grout bond or interface failure.
- Shear or uplift failure within the surrounding rock mass.

Based on considerations of the above failure modes, to achieve stability, an anchor penetration of 2.0 m into competent rock is required.

To ascertain the geotechnical assumptions adopted in the design and ensure the required pull out resistance is achieved, proof load testing shall be completed after installation of the ground anchors. Should the tests show that the geotechnical conditions are poorer than expected then deeper anchors will be required.

6. Construction Considerations

6.1 Surface Preparation

The following general methodology is proposed for the surface preparation of the existing pylon prior to the commencement of the refurbishment works:

- Identify and cut exposed reinforcements that may obstruct the works.
- Apply epoxy resin primer to areas where old concrete are required to bond to new concrete.

6.2 Ground Anchors

The following general construction methodology is proposed for the ground anchors.

- Survey location of the ground anchors.
- Drill bore holes to the required penetration into competent bed rock.
- Pump grout into boreholes. A “non-shrink” grout should be used to minimise formation of voids as a result of shrinkage.
- Install ground anchors.

6.3 Formwork & Reinforcement Installation

The following general construction methodology is proposed for the formwork.

- Place stainless steel reinforcement.
- Align formwork with the surveyed location of the fixing anchors and place formwork into position.
- Install fixing bolts to hold the formwork in position.
- Install temporary formwork to allow concrete placement to complete the taper section of the Pylon.

6.4 Concrete Collar

The following general construction methodology is proposed for the concrete collar.

- Insert and lower tremie pipe to the bottom of the formwork.
- Discharge concrete into pipe and slowly raise the pipe in stages throughout placement of the concrete.
- Temporary protection to top surface of new concrete to prevent wave washout.

7. Maintenance

The design life of the refurbishment works has been set at 25 years. The use of stainless steel reinforcement and permanent stainless formwork ensured that this design life can be achieved with minimal maintenance effort. However, it should noted that the portion of the Pylon above AHD is not part of the refurbishment works and is therefore not protected by the stainless steel formwork.

It is recommended that the degradation of this portion of the Pylon be monitored to determine any maintenance activities required. Inspections should be completed on an annual basis and following any severe storm events.

8. Approvals

From previous experience with similar projects, MRA have identified the key authorities from whom approvals for the repair works may have to be sought. These are listed below:

- Department of Planning, Lands & Heritage.
- Town of Cottesloe.
- Department of Transport (Notice to Mariners).

It should be noted that the approval process can take a considerable period of time and it is therefore recommended discussions are commenced with the relevant authorities as soon as possible to reduce the risk of delays.

9. References

BMT Oceanica, 2015. Cottesloe Coastal Monitoring –Summary Report – Summer 2014/2015, R987 Rev 0. Prepared for Town of Cottesloe.

Cardno, 2016. Cottesloe Coastal Monitoring – Annual Summary Report April 2015 to March 2016, R987 Rev 0. Prepared for Town of Cottesloe.

DoT, 2010. *Sea Level Change in Western Australia - Application to Coastal Planning*. Coastal Infrastructure, Fremantle.

Fremantle Commercial Diving (FCD), 2016. *Cottesloe Pylon Survey, FCD_TOCL 16027_IR_CottesloePylonSurvey_V01*. Prepared for Town of Cottesloe.

MRA, 2017. *Cottesloe Pylon Refurbishment – Technical Specification, R987 Rev 0*. Prepared for SMC Marine Pty Ltd.

Standards Australia 1995. *Australian Standard 3610-1995: Formwork for concrete*. Standards Australia, Sydney, NSW.

Standards Australia 2002. *Australian Standard 1170.2-2002: Structural Design Actions – Part 2: Wind Actions*. Standards Australia, Sydney, NSW.

Standards Australia 2002. *Australian Standard 4678-2002: Earth-retaining structures*. Standards Australia, Sydney, NSW.

Standards Australia 2005. *Australian Standard 4997-2005: Guidelines for the design of maritime structures*. Standards Australia, Sydney, NSW.

Standards Australia 2009. *Australian Standard 3600-2009: Concrete structures*. Standards Australia, Sydney, NSW.

Wood & Grieve Engineers (WGE), 2017. *Request for Tender Part Two: Specification*. Prepared for Town of Cottesloe.

10. Appendices

Appendix A **Submergence Curve**

Appendix B **Design Drawings**

Appendix A Submergence Curve

Department of
Transport

DATUM

Fremantle Fishing Boat Harbour,
(Fremantle, Low Water Mark 1949).
2.752m below benchmark DMH 098.
0.77m below AHD (2012). **[a]**

RANGE - Recorded

HIGHEST ● 2.12 m, 5/11/2005
LOWEST ■ -0.15 m, 13/01/1986

DATA

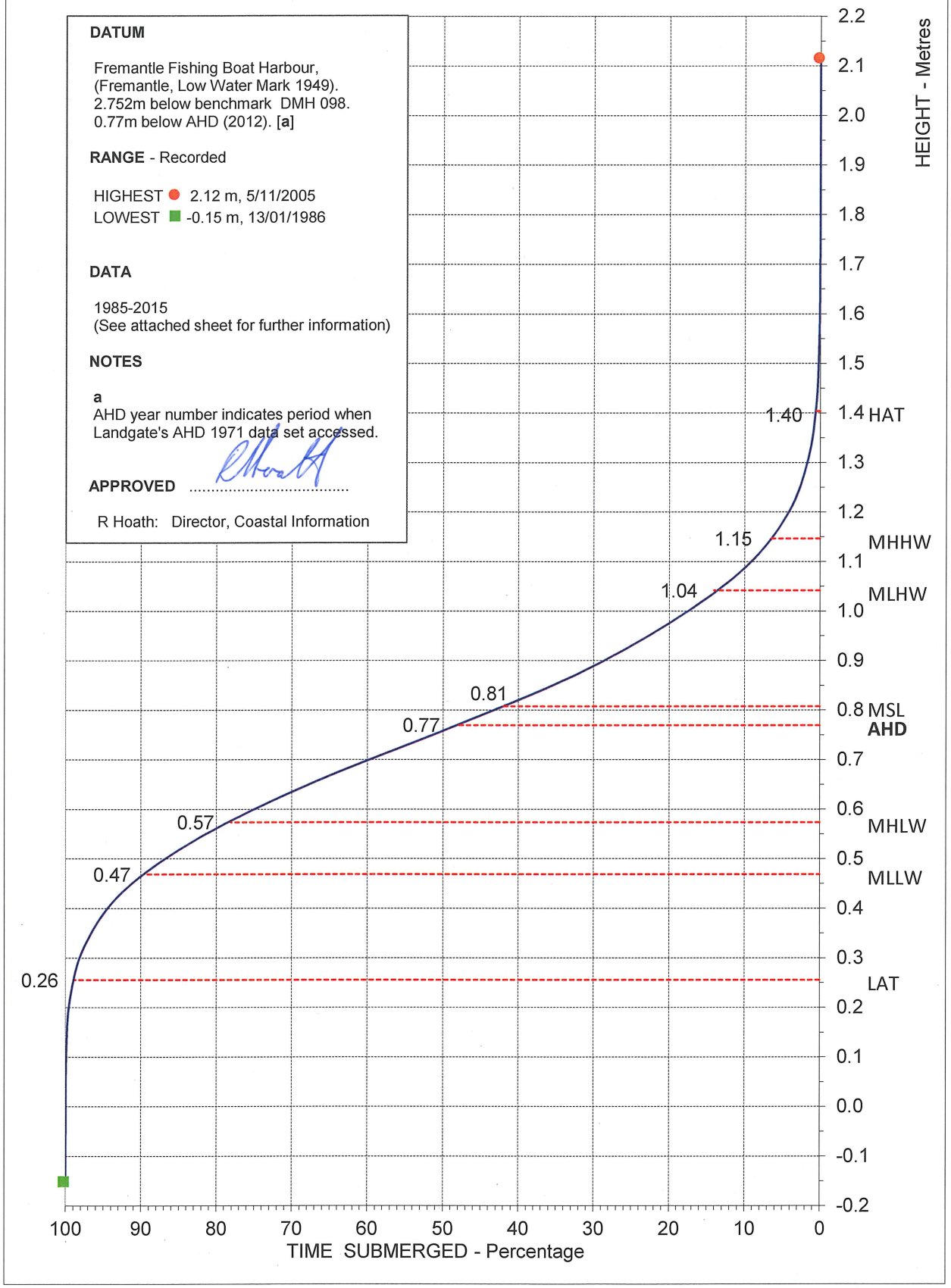
1985-2015
(See attached sheet for further information)

NOTES

a
AHD year number indicates period when Landgate's AHD 1971 data set accessed.

APPROVED .....

R Hoath: Director, Coastal Information



Compilation:
31 October 2016, L Tian

SUBMERGENCE CURVE

LAT 32° 04' S LONG 115° 45' E

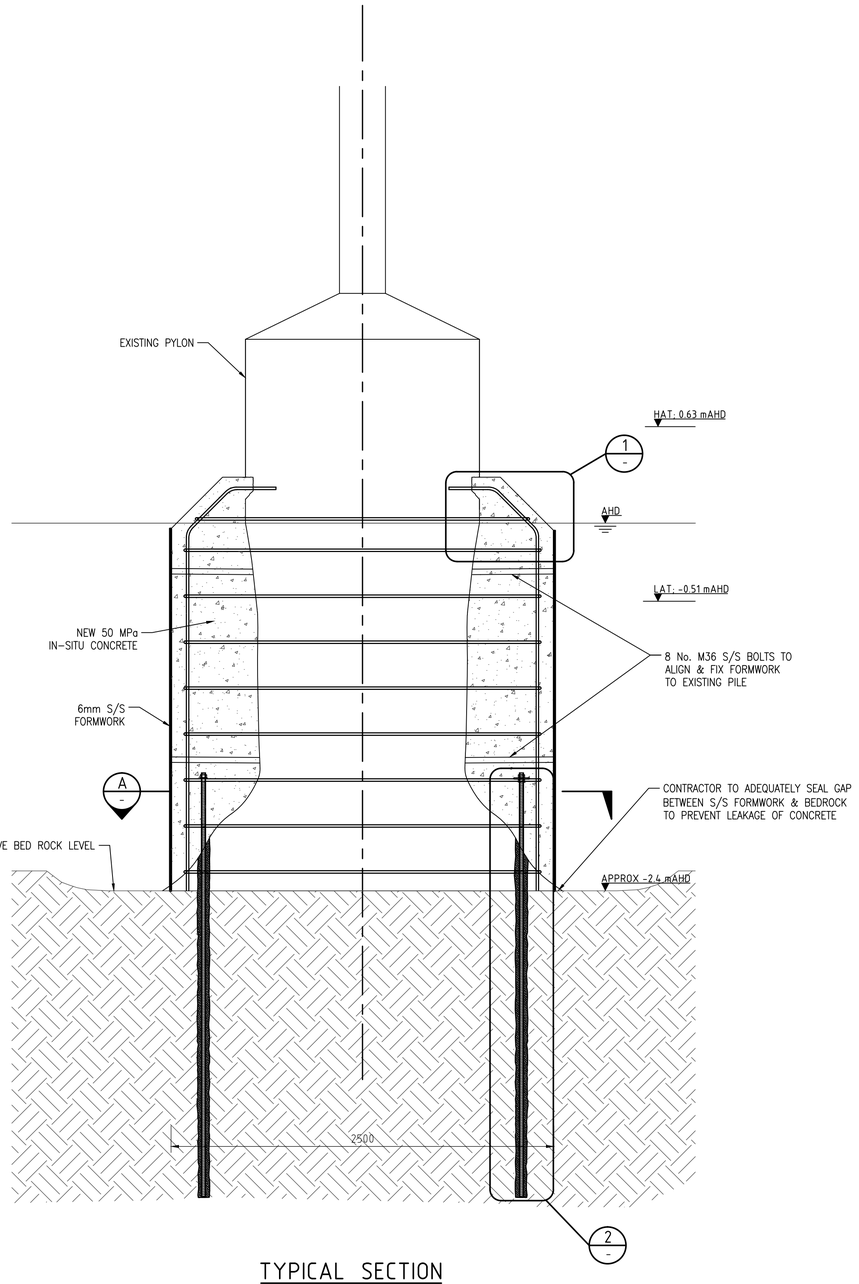
FREMANTLE FISHING BOAT HARBOUR

Fremantle - Western Australia

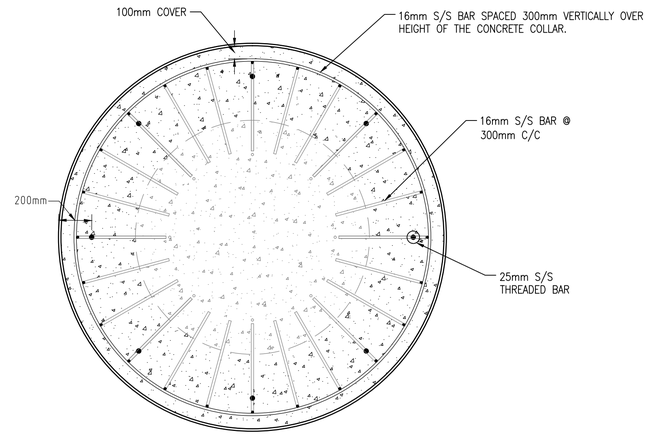
Plan: 1615-13-02 **ANTT port:** -----

Appendix B Design Drawings

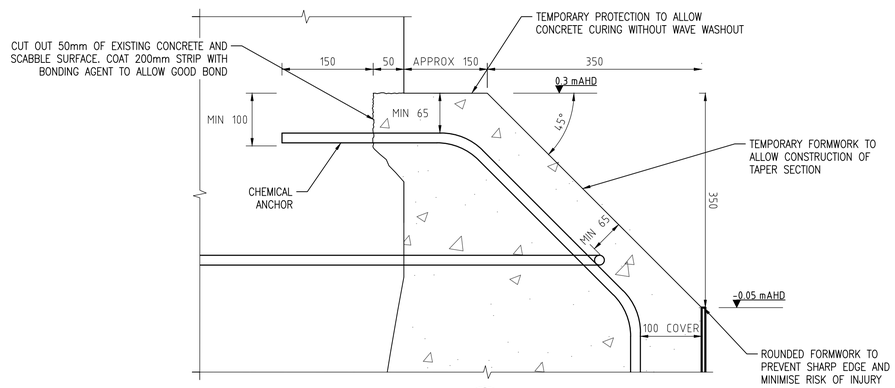
AT CORRECT SCALE THIS IS 100 mm



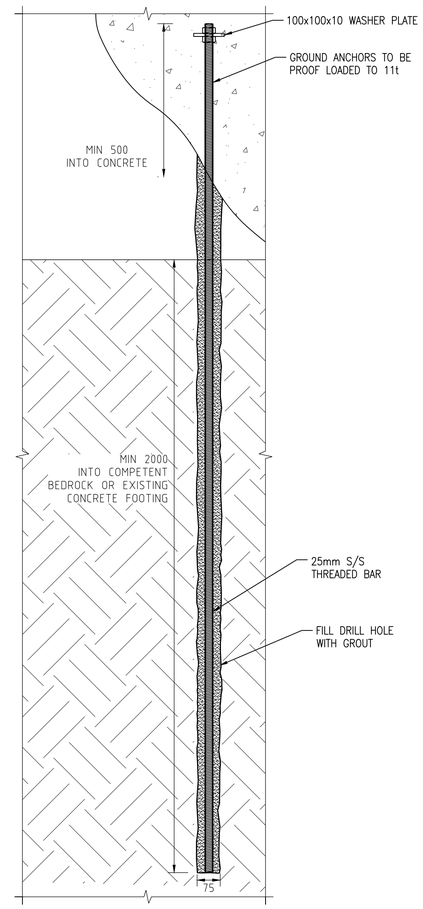
TYPICAL SECTION
1:20



SECTION A
1:20



DETAIL 1
1:5



DETAIL 2
1:10

NOTES:

1. CONTRACTOR TO CONFIRM LEVEL OF BEDROCK AND PYLON DIMENSIONS PRIOR TO FABRICATION OF REINFORCEMENT CAGE AND FORMWORK.

AT CORRECT SCALE THIS IS 100 mm

CAD:D14870101A

REV	DATE	APPROVED	AMENDMENT
A	24.01.18	PMD	ISSUE FOR APPROVAL

This plan is not to be used for construction unless issued as Rev 0 and signed below

CLIENT: SMC MARINE / TOWN OF COTTESLOE

DESIGNED	CHECKED	APPROVED
J. CHEN	P. DOUST	
DRAWN	CHECKED	
R. BORJA	J. CHEN	

m p rogers & associates pl
coastal and port engineers

Suite 1, 128 Main Street
Osborne Park 6017
Western Australia

t: +61 8 9254 6600
f: +61 8 9254 6699
admin@coastsandports.com.au

PROJECT: COTTESLOE PYLON REFURBISHMENT

TITLE: REFURBISHMENT DETAILS

SCALE AT A1	DRAWING NUMBER	REV
AS SHOWN	D1487-01-01	A

m p rogers & associates pl

www.coastsandports.com.au

Appendix E – Cottesloe Pylon Refurbishment Technical Specification, January 2018, M P Rogers & Ass

m p rogers & associates pl ABN 14 062 681 252
creating better coasts and ports

R987 Rev 0

January 2018

SMC Marine

Cottesloe Pylon Refurbishment Technical Specification

marinas
boat harbours
canals
breakwaters
jetties
seawalls
dredging
reclamation
climate change
waves
currents
tides
flood levels
water quality
siltation
erosion
rivers
beaches
estuaries

www.coastsandports.com.au

m p rogers & associates pl
creating better coasts and ports

Suite 1, 128 Main Street, Osborne Park, WA 6017
p: +618 9254 6600
e: admin@coastsandports.com.au
w: www.coastsandports.com.au

K1487, Report R987 Rev 0
Record of Document Revisions

Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft for MRA review	J Chen	P Doust	P Doust	18/01/18
0	Issued for Client use	J Chen	P Doust	P Doust	23/01/18

Form 035 18/06/2013

Limitations of this Document

This document has been prepared for use by the Client in accordance with the agreement between the Client and M P Rogers & Associates Pty Ltd. This agreement includes constraints on the scope, budget and time available for the services. The consulting services and this document have been completed with the degree of skill, care and diligence normally exercised by members of the engineering profession performing services of a similar nature. No other warranty, expressed or implied, is made as to the accuracy of the data and professional advice included. This document has not been prepared for use by parties other than the Client and its consulting advisers. It may not contain sufficient information for the purposes of other parties or for other uses.

Table of Contents

Table of Tables

1. Preliminaries

1.1 Description of Works

The works will be located offshore of Cottesloe Beach. The works shall comprise of the supply and placement of reinforced concrete collar to refurbish the existing Pylon. The works will consist of the following.

- Supply and installation of ground anchors, including proof load testing.
- Supply and installation of permanent stainless steel formwork.
- Supply and placement of in-situ reinforced concrete collar.

1.2 Documents

1.2.1 Drawings

The Drawings referred to in this Specification, and attached to this document in Appendix A, consist of those listed in the following table.

Table 1.1 Design Drawings

Drawing No.	Drawing Title
D1487-01-01	Refurbishment Details

1.3 Dimensions, Interpretations & Method of Measurement of Works

Unless otherwise stated, all measurements of all parts of the Works are to be performed in accordance with Australian Standard 1181 - 1982, Method of Measurement of Civil Engineering Works and Associated Building Works.

Figured dimensions on drawings shall be used in preference to measurement by scale. Larger scale drawings shall be read in preference to smaller scale drawings.

The Contractor shall check all dimensions on site prior to commencement of construction. The Contractor shall make good at their own expense any defect due to a discrepancy which has not been brought to the notice of the Superintendent for clarification.

1.4 Specifications, Codes & Test Methods

In general, all materials, manufactured articles and workmanship must conform to the relevant standards of the Standards Association of Australia except where the provisions conflict with this Specification then this Specification will take precedence.

1.5 Geotechnical Conditions

No site specific geotechnical investigation has been undertaken for the project. The geotechnical conditions have been estimated based on the condition report completed by Fremantle Commercial Diving (FCD) for the Pylon and historical details provided by the Heritage Council.

From this information it is expected that the geotechnical conditions at the site are likely to comprise of limestone bedrock. The diver condition report is presented in Appendix B. Should the conditions differ then the Contractor should immediately notify the Design Engineer.

2. Ground Anchors

2.1 Grouting Around Ground Anchors

2.1.1 General

The ground anchors shall be installed to the locations and dimensions as shown on the Drawings.

2.1.2 Materials

The grout shall be specified “non-shrink”. The grout shall be Conbextra UW, or equivalent approved. The use of metallic non-shrink grout in areas exposed to wet conditions shall not be permitted.

2.1.3 Preparation & Placement of Grout

The grout shall be mixed, placed and cured strictly in accordance with the manufacturer’s specification. All grout shall be mixed by an approved paddle type mixer to a uniform constancy. Mixed grout shall be transported so segregation is prevented.

The substrate surface shall be free from any debris or loose material. The surface of the drilled hole shall be cleaned with a high pressure water jet to remove any debris from drilling.

2.1.4 Curing

Curing shall be carried out in accordance with the manufacturer’s specification and recommended best practices.

2.2 Proof Load Testing

Proof load testing shall be carried out to confirm the geotechnical strength of the anchors. The load testing shall not commence until the grout has achieved adequate strength. The Contractor shall allow minimum 14 days from the placement of grout before commencement of load testing.

All ground anchors shall be subjected to pull out test prior to acceptance. Pull out tests shall be carried out to a maximum proof load of 11 tonnes. The load shall be held for 15 minutes and the deflection of the anchor measured.

The construction shall maintain access and have the ability to conduct pull out test at all ground anchor locations.

The Contractor shall provide their proposed testing methodology to the Design Engineer for approval prior to testing.

2.2.1 Acceptance Criteria

The acceptance criteria shall be the permanent displacement of the fixed anchor, and shall not exceed 5 mm for grouted fixed anchors.

3. Surface Preparation

Where concrete has to be cut to make way for the new works, the following measures shall be undertaken to ensure the continued durability of the existing pylon.

Where old concrete is required to bond to new concrete an epoxy resin primer shall be applied in accordance with the manufacturer's recommendations in the locations as shown on the Drawings. An example product is Nitobond EP.

4. Concrete

4.1 General

The scope for the concrete work associated with the Cottesloe Pylon Refurbishment Works includes:

- the supply and placement of in-situ reinforced concrete collar, and
- any other concrete works as shown on the Drawings.

4.1.1 Referenced Document

All concrete work shall be carried out in accordance with the requirements of the latest editions, at the time of Proposal closing, of the following Australian and International Standards:

Table 4.1 Concrete – Reference Documents

a) Australian Standards

Designation	Title
AS 1012	Methods of testing concrete
AS 1141	Methos for sampling aggregates
AS 1379	Specification and supply of concrete
AS 1478.1	Chemical admixtures for concrete mortar and grout – Admixtures for concrete
AS/NZS 1554.3	Structural steel welding – Part 3: Welding of reinforcing steel
AS/NZS 1554.6	Structural steel welding – Part 6: Welding stainless steels for structural purposes
AS/NZS 2350	Methods of testing portland and blended cements
AS 2758.1	Aggregates and rock for engineering purposes – Concrete aggregates
AS 3582.1	Supplementary cementitious materials for use with portland and blended cement – Fly ash
AS 3582.2	Supplementary cementitious materials for use with portland and blended cement – Slag, Ground granulated iron blast furnace
AS/NZS 3582.3	Supplementary cementitious materials for use with portland and blended cement – Amorphous silica
AS 3600	Concrete structures
AS 3610	Formwork for concrete
AS 3672	Portland and blended cements
AS/NZS 4673	Cold – formed stainless steel structures

AS 4997	Guidelines for the design of maritime structures
SAA HB 64	Guide to concrete construction

b) International Standards

BS 6744	Stainless steel bars for the reinforcement of and use in concrete - Requirements and test methods
ISO 3506	Mechanical properties of corrosion-resistant stainless steel fasteners

4.2 Materials

4.2.1 Concrete

The concrete for the various elements of the Works shall contain the specific types of materials listed in the following table and in the following clauses. Chemical admixtures may be used only if listed below or approved by the Superintendent.

The concrete shall be designed and produced so that the properties listed in Table 4.2 are achieved. The concrete shall have suitable durability so that it will last more than 25 years in the marine environment.

The selection, proportioning and mixing of the concrete materials shall be such as to produce a mix which Works readily into corners and angles of the forms and around reinforcement with the method of placement employed on the work, but without permitting the material to segregate or excess free water to collect on the surface. The resultant concrete shall be sound and have the other qualities specified.

Premixed concrete shall be manufactured and supplied in accordance with the requirements of AS 1379.

Table 4.2 Concrete Materials

Grade (f'_c, MPa at 28 Days)	SC50
Maximum Nominal Coarse Aggregate Size	20 mm
Slump	220 mm
Cement Type	GB
Minimum Cement Content	> 420 kg/m^3
Maximum Water / Cement Ratio	0.4
Drying shrinkage at 56 days (AS 1012.13)	600x10^{-6} mm/mm
Admixtures – Mandatory	Catalytic Crystalline Additive
Admixtures – Permitted	WR-Re, SP

Cement
Cement used in the Works shall be blended cement (Type GB) and shall comply with the requirements of AS 3972.

Supplementary cementitious materials (SCMs) comprising either or both fly ash and slag at combined levels above 7.5% and amorphous silica at a level not exceeding 10% may be used. The Contractor shall submit the proposed mix details to the Superintendent for approval prior to commencing concrete production.

Aggregates
Concrete aggregates shall comply with the requirements of AS 2758.1. Aggregates shall be crushed rock with maximum water absorption of 2.5% suitable for exposure classification C in accordance with AS 2758.1.

Water
Water used in concrete shall be of potable quality, free from all impurities, which may have a harmful effect on the concrete. Total dissolved solids shall not exceed 1000 mg/L and sulphate or chloride salts shall not exceed 500 mg/L. Water shall meet the requirements of AS 1379.

Admixtures
Chemical admixtures, where specified in Table 4.2, or if approved for use, shall comply with the requirements of AS 1478.1, and shall be used in accordance with the practices detailed in Appendix B of AS 1478.1.

The water reducing-retarding (WR-Re) and superplasticising (SP) admixtures shall be approved by the Superintendent.

The catalytic crystalline admixture shall be XYPEX ADMIX C5000 or approved equivalent and shall conform to the requirements of AS 1478.1, type Special Purpose and be of dry, cementitious powder type. The catalytic additive shall remain reactive whenever moisture is available within the concrete and shall cause the permanent filling of capillaries, bleed tracts and small voids within the concrete with a multiplicative, non-soluble crystalline growth. The catalytic additive shall not detract from normal plastic and hardened concrete characteristics.

Fly Ash, Slag & Amorphous Silica
Fly ash, slag, and amorphous silica shall comply with the requirements of AS 3582.1, AS 3582.2 and AS/NZS 3582.3 respectively.

Other Materials
Curing compounds shall not be used on maritime concrete. The use of penetrating chemicals for chloride inhibitors, such as silanes, siloxanes or other surface coatings, precludes the use of chemical curing compounds on maritime concrete.

4.2.2 Reinforcing Steel
Steel reinforcement for in-situ concrete collar shall be Class 316 stainless steel in accordance with BS 6744 Grade 500.

General
Reinforcement (immediately prior to concrete placing) shall be free from loose mill scale, loose rust, mud, oil, grease, and other non-metallic coatings that would reduce the bond between the concrete and the reinforcement.

All steel reinforcement shall have the following properties:

- Strength Grade 500
- Ductility Class N
- Shape D (deformed)

The size of the reinforcing bar shall be to the dimensions indicated on the Drawings.

All reinforcing bars shall be cut and bent in accordance with AS 3600.

Acceptable manufacturers and processors of steel reinforcement must hold a valid certificate of approval, issued by the Australian Certification Authority for Reinforcing Steels Ltd (ACRS), or to an equivalent certification system as may be approved in writing by the Superintendent.

Evidence of compliance with this clause must be obtained when contract bids are received.

Certificates from a NATA laboratory of chemical composition and physical properties of all reinforcing steel will be required. All testing will be in compliance with BS 6744, including frequency of sampling and testing.

Reinforcing steel shall be stacked clear from the ground and labelled for positive identification.

Any welding of the steel reinforcement shall be in accordance with AS/NZS 1554.3 and AS/NZS 1554.6.

Splicing of reinforcement shall only be done in accordance with AS 3600 and where approved by the Superintendent. Where approved, any splicing shall be completed to develop 100% of the yield strength.

4.2.3 Accessory Items

Anchor bolts, nuts and washers shall be as specified on the Drawings and shall be grade A4-50 (316) stainless steel in accordance with AS/NZS 4673 or ISO 3506, unless shown otherwise.

The surfaces of items to be embedded in concrete shall be cleaned, but left unpainted.

4.3 Formwork

All formwork shall be to the requirements of AS 3610.

4.4 Form Removal

It is intended that the stainless steel formwork would remain in place over the design life of the Pylon refurbishment works.

Temporary formwork at the top of the collar shall remain in place until the concrete has reached a strength of 32MPa.

4.5 Placing & Fixing Reinforcement

4.5.1 Placing

Reinforcement shall be placed in the locations shown in the Drawings. Laps and other details shall comply with AS 3600.

4.5.2 Fixing

Reinforcement shall be placed and securely held in its correct position by the use of approved supports.

Chairs, spacers, and stools used as supports for reinforcement shall be purpose made of concrete. Plastic or metal chairs are not permitted. Cementitious chairs shall be thoroughly wetted down before pouring concrete.

The supports shall be adequate to withstand construction traffic and shall be sufficient in number and spacing to maintain the reinforcement in its correct position during the concrete placing, compaction and finishing operations.

4.5.3 Chemical Anchoring into Existing Pylon

Chemical anchors shall be Chemset Reo 502, or equivalent approved, installed as per the best practices and recommendation from the manufacturer.

4.5.4 Placing Tolerances

Unless otherwise shown on the Drawings, the reinforcement shall be fixed and maintained in its correct position within the tolerances specified in AS 3600.

4.6 Placing, Compacting & Finishing

4.6.1 Delivery

The concrete shall be transported from the delivery vehicle to its final position as rapidly as possible by a means which will prevent segregation or loss of materials or contamination, and in such a way that proper placing and compaction of the concrete will not be adversely affected.

The concrete manufacturer shall be notified when a concrete mix is required to be placed by pumping. Transporting the concrete by pumping shall be completed in accordance with the requirements for the concrete as set out in this Specification.

4.6.2 Placing Restrictions

Concrete shall be placed within 60 minutes from the time of batching, or before the consistency of the concrete is such that it cannot be properly placed and compacted without the addition or excess water to the mix. The time limitation may be waived by agreement if the concrete can still be satisfactorily placed, compacted and finished.

The temperature of the concrete as delivered shall be not less than 5°C nor more than 35°C. For ambient temperatures below 10°C or above 30°C special precautions shall be taken in accordance with Clause 4.8.

The concrete shall not be placed if the slump is outside the specified limits in Section 4.2.1.

Concrete shall not be placed when heat, wind, rain, low humidity, or plant and equipment defects will prevent the requirements of the specification being met.

4.6.3 Concrete Placement Underwater

Concrete shall be deposited in such a manner as to require a minimum of rehandling and shall be distributed so that when consolidated and finished, the thickness, surface shape and level shown in the Drawings will be obtained.

Prior to placing any concrete underwater, the water level inside the formwork shall be equal to the external water level or to a stable level such that no further inflow or outflow. The base of the formwork shall be free from loose debris. The bottom of the formwork shall be sealed to ensure no leach out of concrete during concrete placement.

The placement of concrete underwater shall be completed via a tremie in accordance with the following requirements:

- A tremie pipe with watertight joints long enough to rest on the bottom of the formwork shall be used.
- At commencement of concrete placement the tremie pipe shall be lowered down to the base of the formwork. Concrete is discharged into the pipe until the tremie pipe is completely filled. The pipe is then lifted 200 to 300 mm to allow concrete placement.
- The tremie pipe shall be raised in stages throughout the placement of concrete and shall remain submerged below the surface of concrete until completion of the concrete pour.

The concrete shall be placed uniformly over the width of the works and in such a manner as to minimise segregation.

4.6.4 Compacting

The tremie concrete shall be sufficiently workable to enable it to be self-levelling and consolidating. No vibrator should be used for underwater concrete placement.

4.7 Curing

Concrete shall be water-cured by protection against loss of moisture and rapid temperature changes for a period of not less than 14 days from completion of the finishing operations. Curing shall comprise initial curing followed by moist curing.

No curing compounds shall be used as these preclude the use of penetrating chemicals for chloride inhibitors which may be required in the future.

Before concrete placing commences, all equipment needed for adequate curing of the concrete shall be on hand and checked ready for use.

Curing shall commence as soon as practicable, but no more than 3 hours after completion of the finishing operations or stripping of formwork.

Failure to comply with the specified curing requirements shall be cause for immediate suspension of the concreting operations.

The use of covering material that contains or becomes contaminated with sugar in any form, tannic acid, or any other substance considered detrimental to portland cement concrete shall not be permitted.

4.7.1 Initial Curing

Immediately after the finishing operations have been completed and until the moist curing has been applied, the surface of the concrete shall be kept continuously damp by means of a water fog or mist applied with approved equipment.

4.7.2 Unhardened Concrete

Unhardened concrete shall be protected from rain, wave actions and flowing water.

4.8 Adverse Weather Conditions

4.8.1 Concreting in Hot Weather

When the shade temperature is likely to exceed 30°C, or climatic or other conditions are likely to result in the temperature of the concrete exceeding 35°C when placed, some or all of the following precautions shall be taken in placing, curing, and protecting the concrete as necessary and as directed.

The forms and reinforcement shall be sprinkled with water immediately before placing the concrete.

Concrete shall be placed at the lowest temperature practicable, and in no case exceeding 35°C by adopting one or more of the following measures as required:

- Aggregates shall be shaded from the sun.
- Mixing water shall be cooled.
- Mixing and placing of the concrete shall be done during the coolest period of the day.

Concrete shall be transported, placed and finished continuously, and as rapidly as possible.

During the placement and finishing operations, an approved aliphatic alcohol shall be sprayed over the exposed surfaces in accordance with the manufacturer's specifications to limit evaporation of water. This procedure may be carried out whenever there is a break in the sequence of placing and finishing operations.

As soon as possible after finishing operations have been completed, curing operations shall be commenced. Initial curing shall be provided if the final moist curing method cannot be commenced immediately after finishing operations have been completed.

4.8.2 Concreting in Cold Weather

If it is necessary to place concrete when the ambient temperature of the air is below 10°C, or climatic or other conditions are likely to result in the concrete temperature falling below 5°C when delivered, or when the concrete is likely to be subjected to freezing conditions before the expiration of the specified curing period, placing shall only proceed upon full compliance with the following provisions.

The forms shall not be frozen and shall be entirely free of frost when the concrete is deposited.

The temperature of the concrete when placed shall not be less than 5°C. Heating of the mixing water and/or aggregates shall be undertaken as necessary to ensure the minimum temperature of 5°C at the point of discharge. All methods of equipment for heating shall be subject to approval.

The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer.

An approved method of curing shall be commenced as soon as possible after finishing.

Suitable covering and/or other means shall be provided for maintaining the concrete at a temperature of at least 10°C, for not less than 72 hours after placing, and at a temperature above

freezing for the remainder of the curing period. At the end of the curing period, concrete temperature shall be allowed to fall gradually.

Salt, chemicals, additives of other foreign material shall not be mixed with the concrete to prevent freezing.

Any concrete damaged by freezing shall be removed to the full depth and replaced.

4.8.3 Protection Against Rain & Wave Actions

No concrete shall be placed during rain, and unhardened concrete shall be protected from rain and wave actions.

A temporary protection shall be provided for any unhardened concrete exposed to the action of waves.

When rain appears imminent, concreting operations shall cease and all concrete less than 24 hours old shall be protected. Waterproof covers for the protection of the surface of all concrete less than 24 hours old shall be available on Site at all times, and concreting should not commence until this provision is complied with.

4.9 Testing & Acceptance of Concrete

4.9.1 Testing Requirements

The concrete shall be sampled and tested for strength in accordance with the requirements of AS 1379 and AS 3600. All test results shall be forwarded to the Superintendent for approval as soon as they become available.

2 Strength and 2 slump tests shall be completed.

Test cylinders shall be taken during the Works for determining the time for form stripping. These test cylinders shall be field cured and shall be in addition to the tests required in accordance with AS 3600.

4.9.2 Acceptance Criteria

Strength

The criteria for compliance with any of the characteristic strength requirements of this Specification shall be in accordance with AS 1379.

Slump

The slump shall be deemed-to-comply if the appropriate requirements of AS 1379 are satisfied.

4.9.3 Rejection Criteria

Hardened concrete shall be liable to rejection if:

- it is porous, segregated, or honeycombed;
- the reinforcing steel has been displaced from its correct location;
- inserts or other items embedded in the concrete have been displaced from their specified position; or
- work can be shown to be otherwise defective or non-compliant with this Specification.

Concrete that is liable to rejection may be permitted to be retained on the basis of satisfactory results being obtained from one or more of the following:

- An appraisal of the statistical information related to the concrete strength;
- A structural investigation;
- Additional tests (such as outlined in AS 1379); or
- Approved remedial work is undertaken.

Where concrete work has been finally rejected it shall be removed to the extent determined, and replaced.

4.10 Construction Tolerances

Following completion, the finished surfaces of the various concrete elements shall be tested for conformance to the grades, lines and levels shown on the Drawings, and for surface flatness.

Construction with intent to use the maximum tolerances shall not be permitted.

4.10.1 Poured In-Situ Concrete

For the poured in-situ slab, the following tolerances shall be achieved:

- Surface levels – the finished surface shall conform to the levels, grades and cross-sections shown on the Drawings to the extent that any point on the finished surface shall not vary by more than 10 mm above or below the level indicated.
- Surface flatness – the finished surfaces of the various sections of the slab shall not deviate from the testing edge of an approved 3 m straightedge by more than 6 mm.
- The finished surface must marry up to the adjacent works to the satisfaction of the Superintendent.

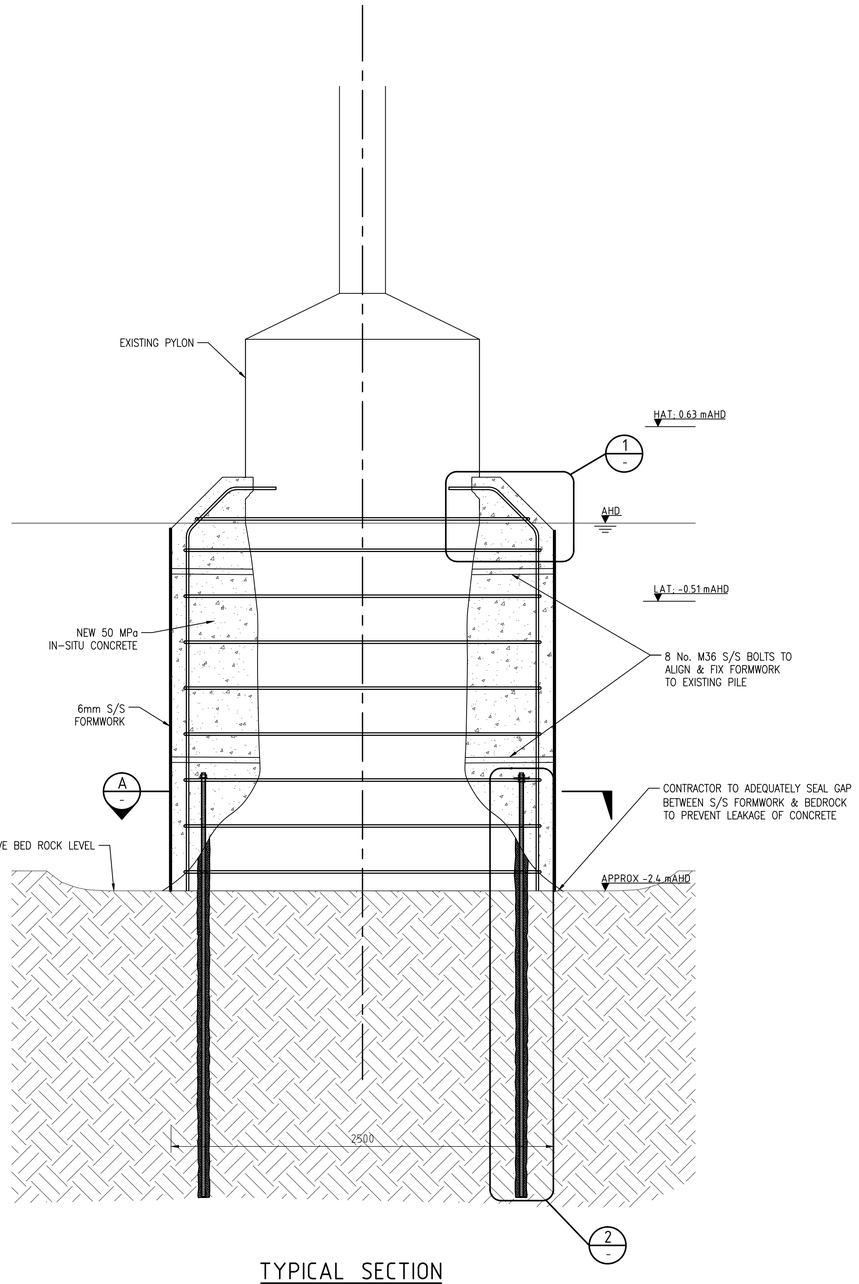
5. Appendices

Appendix A **Design Drawings**

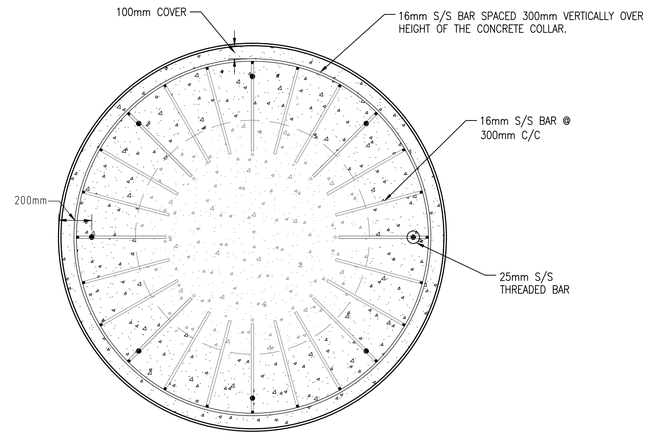
Appendix B **Pylon Condition Inspection Report**

Appendix A Design Drawings

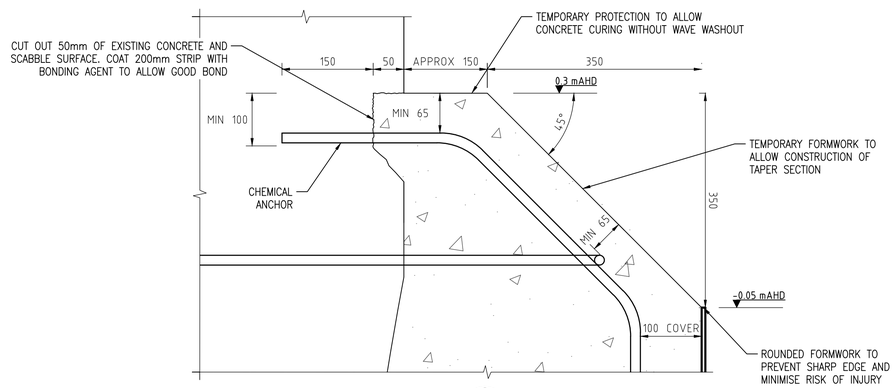
AT CORRECT SCALE THIS IS 100 mm



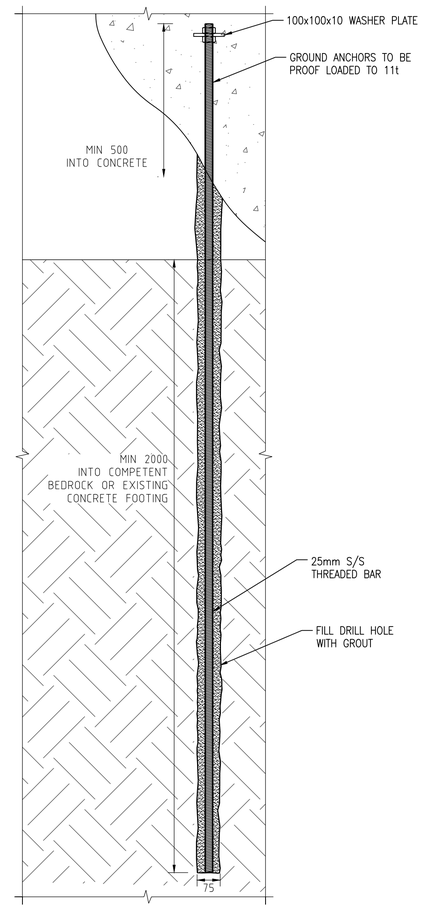
TYPICAL SECTION
1:20



SECTION A
1:20



DETAIL 1
1:5



DETAIL 2
1:10

NOTES:

1. CONTRACTOR TO CONFIRM LEVEL OF BEDROCK AND PYLON DIMENSIONS PRIOR TO FABRICATION OF REINFORCEMENT CAGE AND FORMWORK.

AT CORRECT SCALE THIS IS 100 mm

CAD:D14870101A

REV	DATE	APPROVED	AMENDMENT
A	24.01.18	PMD	ISSUE FOR APPROVAL

This plan is not to be used for construction unless issued as Rev 0 and signed below

CLIENT: SMC MARINE / TOWN OF COTTESLOE

DESIGNED	CHECKED	APPROVED
J. CHEN	P. DOUST	
DRAWN	CHECKED	
R. BORJA	J. CHEN	

m p rogers & associates pl
coastal and port engineers

Suite 1, 128 Main Street
Osborne Park 6017
Western Australia

t: +61 8 9254 6600
f: +61 8 9254 6699
admin@coastsandports.com.au

PROJECT: COTTESLOE PYLON REFURBISHMENT

TITLE: REFURBISHMENT DETAILS

SCALE AT A1	DRAWING NUMBER	REV
AS SHOWN	D1487-01-01	A

Appendix B Pylon Condition Inspection Report

FREMANTLE commercial diving

Cottesloe Pylon Survey

22nd April 2016

Revision 1

For all enquiries relating to this report, please contact Antony Old at Fremantle Commercial Diving, 2/14 Renewable Chase, Bibra Lake, WA 6163
Tel: 08 9418 5753, Mob: 0418 904 262

TABLE OF CONTENTS

LIST OF FIGURES

1 Introduction

On the 22nd of April 2016, Fremantle Commercial Diving (FCD) undertook a condition survey of the concrete pylon located at Cottesloe Beach. The inspection was undertaken at the request of the Town of Cottesloe and the aim was to provide a general overview of the construction and condition of the pylon. A five (5) person AS 2299.1:2007 compliant dive team was used to execute the works from a 24 ft. dive support vessel. Winds were Easterly all day at between 10 and 15 knots and swell was between 1.2 to 1.5 metres. Underwater visibility was between 3 and 4 metres.

The divers initially cleaned the pylon to remove the bulk of marine growth and then used a small water pump to expose the base of the pylon. Measurements were taken to document the dimensions of the pylon and surrounding features. Two underwater videos were taken by the divers and are referred to as “Video 1” and “Video 2” respectively. Video 1 gives an overview of the general condition of the pylon and outlines the observable features after the base of the pylon had been exposed, while Video 2 focuses on how the pylon was likely to have been constructed originally and what evidence of construction still remains. Still photographs were also obtained and are used to provide explanation throughout this report.

2 Results of survey

After the divers had cleaned the pylon and removed the sand from the base they focused on documenting five (5) areas of significance, these are:

- Apparent concrete losses from the pylon (Section 2.1);
- Concrete re-enforcement bar throughout the structure (Section 2.2);
- Seating of the pylon on the seabed and surrounding bedrock (Section 2.3);
- Evidence of original construction methods used (Section 2.4); and
- Soft concrete areas subject to heavy degradation (Section 2.5).

The following sections summarise the diver's observations during the survey and provide representative photographs. Further information on all findings can be found in the accompanying videos to this report.

2.1 Apparent concrete losses from pylon

The top section of the pylon that typically sits above the height of the water is relatively uniform as a cylindrical shape with a circumference of 4.8 m (Figure 2-1). There is some cracking though this top section however there are no areas of significant concrete loss. It appears that a repair to the upper part of this section may have been previously undertaken. Where the pylon meets the waterline there are significant apparent losses of concrete resulting in a scalloped appearance to the pylon through this section. The losses are not uniform, but it appears that on the whole the concrete has cracked away down to a layer of re-enforcing bar (rebar) that was originally embedded around 200 to 250 mm below the surface of the concrete. Although not entirely uniform, the result is that the pylon roughly tapers from a circumference of 4.8 m above the waterline, to a circumference of 4.3 m 600 mm below the waterline. Please note that for ease of reference in this report the area where the pylon transitions from sectional concrete loss to no sectional loss has been referred to as "the surface". The following photographs (Figure 2-2 through Figure 2-4) illustrate these concrete losses at the waterline and resulting scalloping of the pylon.

Figure 2-1 Pylon above waterline

Figure 2-2 Concrete loss at waterline

Figure 2-3 Concrete loss at waterline

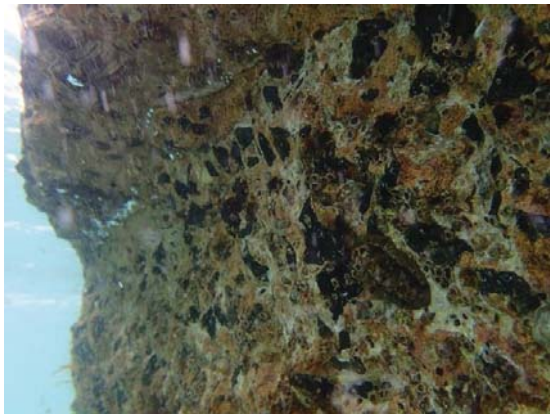


Figure 2-4 Concrete loss at waterline

Below the waterline, the pylon has a relatively uniform circumference of between 4.2 to 4.3 m which continues down to 1.6 m below the surface. At this point the pylon tapers outwards but also has significant losses of material, making the structure very uneven. At 1.8 m below the surface, the outside circumference of the pylon is 4.75 m, 2 m below the surface it is 6.05 m, 2.2 m below the surface it is 6.8 m and 2.4 m below the surface it is 8.2 m. Note that these measurements are subject to variation, depending on which parts of the structure are included or excluded. There appears to be a rebar framework throughout the top of the tapered section, but in some areas the rebar sits out from the concrete. All measurements were taken on the outside of the rebar to better determine the original measurements of the pylon. The following photographs (Figure 2-5 through Figure 2-10 below) illustrate the loss of concrete material and exposed rebar throughout the top of the tapered section.

Figure 2-5 Rebar through top of tapered section

Figure 2-6 Rebar through top of tapered section

Figure 2-7 Rebar through top of tapered section

Figure 2-8 Rebar through top of tapered section

Figure 2-9 Rebar through top of tapered section

Figure 2-10 Rebar through top of tapered section

The rebar taper ends 2 m below the surface with the vertical steel pieces originally tying into a circular horizontal piece. There are only a couple of small sections where this horizontal piece still remains. Below this horizontal rebar the foundation of the pylon continues to taper outwards unevenly, and appears to be composed of discrete types of concrete and aggregate mixes. Much of the concrete and aggregate below the rebar taper is soft and crumbly, and the pylon is very uneven at this point due to loss of original concrete material. No rebar was found in this section and the divers were able to remove material from several areas of this section by hand (refer to the videos). The following photographs (Figure 2-11 through Figure 2-14 below) illustrate the condition of the pylon below the tapered rebar section.

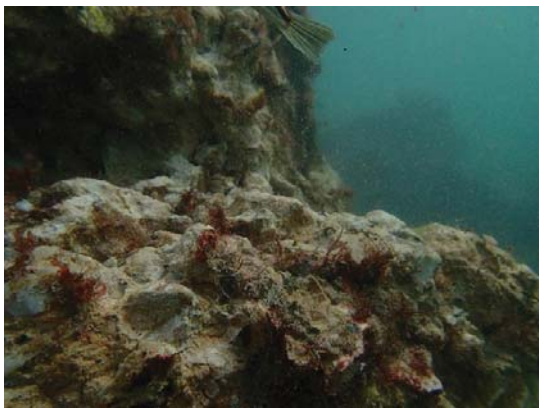


Figure 2-11 Crumbling concrete on taper

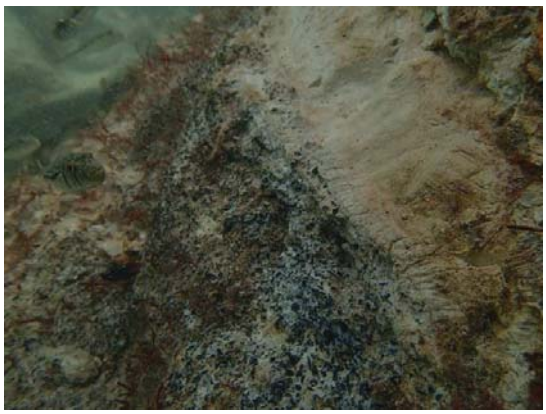


Figure 2-12 Soft concrete on lower taper

Figure 2-13 Lower section of taper

Figure 2-14 Lower section of taper

2.2 Concrete re-enforcement bar throughout the structure

As previously mentioned, there is concrete rebar throughout the structure down to 2 m below the surface. It appears that the rebar has been originally made as a cylindrical framework with a taper at the bottom. There is evidence of circular steel hoops tied together with vertical pieces that extend uniformly from the surface down to the start of the taper at 1.6 m. From this point larger vertical pieces continue

downwards but also taper out on an angle. These tapered pieces originally terminated in a steel ring and pieces of this ring are still visible. With the exception of the tapered section, it appears that the concrete has predominantly cracked away down to the rebar but not further (in some areas the rebar is slightly proud). The following photographs (Figure 2-15 through Figure 2-20 below) illustrate the rebar still evident in the structure.

Figure 2-15 Part of ring visible at base of taper

Figure 2-16 Part of ring visible at top of taper

Figure 2-17 Ring visible in cylindrical section

Figure 2-18 Ring visible in cylindrical section

Figure 2-19 Vertical bar in cylindrical section

Figure 2-20 Broken ring cylindrical section

2.3 Seating of the pylon on the seabed and surrounding bedrock

The divers excavated sand away from the base of the pylon to expose the foundations. It appears that the pylon sits in a roughly defined depression that is cut

into the limestone bedrock. The presence of the pylon sitting in the centre of the depression creates a loosely defined trench between the outside of the pylon foundations and the outside of the depression. The uneven nature of the bedrock visible in the trench suggests that the depression may have been formed by blasting. The trench is well defined on the Southern and Western sides through to the centre of the Northern side. From the centre of the Northern side around to the South-Eastern side the trench is less defined and has a more gentle slope further away from the pylon. There are two large rocks sitting in the trench on the South-Eastern side, one of which leans up against the foundations of the pylon. There is also a large rock on the Northern side that sits on the outside edge of the trench. As an average, the trench measures 900 mm wide and 400 mm deep on the Southern side, 400 mm wide and 500 mm deep on the Western side and 400 mm wide and 400 mm deep on the North-Western side. The Eastern side sits hard against a large rock and the Northern side is less defined. The following figures illustrate the composition of the trench and adjacent rocks.

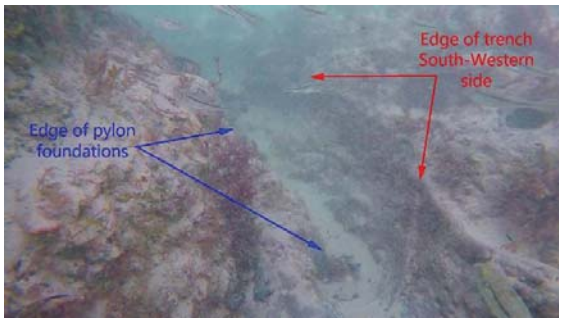


Figure 2-21 Trench South-Western side

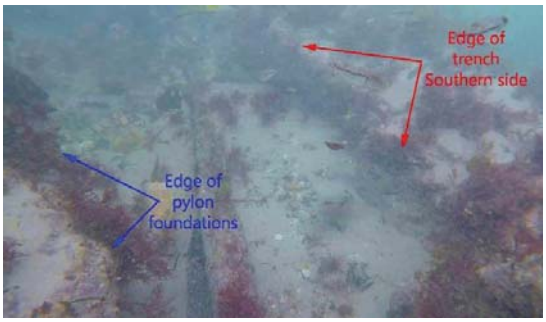


Figure 2-22 Trench Southern side

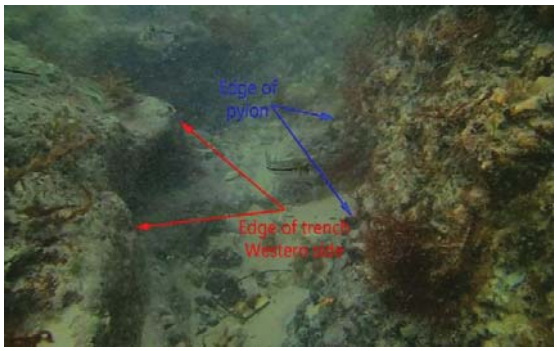


Figure 2-23 Trench Western side

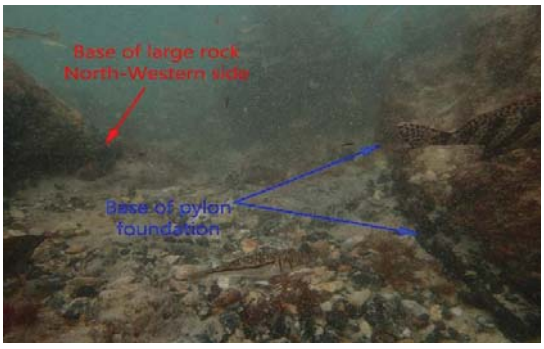


Figure 2-24 Trench North-Western side

Figure 2-25 Trench poorly defined Northern side

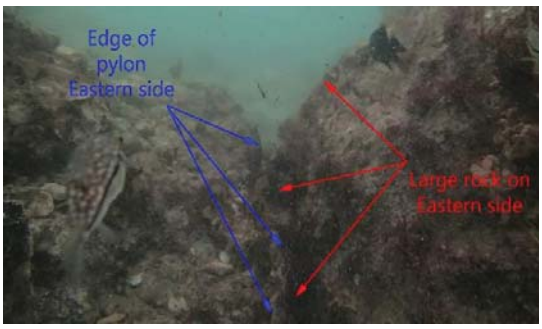


Figure 2-26 Large rock on Eastern side

2.4 Evidence of original construction methods

After removing sand from the trench that surrounds the pylon, the divers looked for evidence of how the pylon was originally constructed. Sitting in the base of the trench and at the base of the pylon in certain areas are blue metal stones of approximately 40 mm diameter. The stones in the trench are loose, however there are areas of blue metal at the very base of the pylon structure that are bound together, suggesting that the entire pylon structure may have been built on a base of blue metal rock. There is an area on the South-Western side of the pylon with clearly defined blue metal stones at the base of the structure (refer to Video 2).

On top of the blue metal stones there are what appear to be two types of concrete mix. The first type is a creamy coloured mortar with very small stones (or possibly crushed shell) of only a few millimetres in diameter. The second type is a creamy coloured mortar with large white aggregate rock of variable diameter from 20 to 50 mm average. The second type of concrete mix is far more prevalent than the first around the entire structure, and appears to have been used as the primary building material from the top of the blue metal layer up to the top of the rebar taper. There is significant degradation of this material as can be seen by the rebar protruding out from the structure in the tapered section. There is significant cracking throughout the material and divers were able to remove this material by hand with moderate effort. There is an old chain that runs around the entire structure, roughly at the base of the cream mortar and large aggregate section. It is unclear what the intended purpose of the chain was, but it is now heavily degraded in sections. The following photographs (Figure 2-27 through Figure 2-34) illustrate the various materials used in this section of the pylon.

Figure 2-27 Bound blue metal South-Western side

Figure 2-28 Loose blue metal Northern side

Figure 2-29 Cream mortar small stones South-Western side

Figure 2-30 Cream mortar large stones showing cracking South-Eastern side

Figure 2-31 Cream mortar large stones diver removes aggregate by hand

Figure 2-32 Cream mortar large stones degraded through rebar taper section

Figure 2-33 Cream mortar large stones degraded through rebar taper section

Figure 2-34 Chain running around base of structure

Above the rebar taper, the pylon appears to be homogenous in construction. It is constructed from a creamy coloured mortar with large (25 to 40 mm) blue metal aggregate. As previously mentioned, the concrete has cracked away underwater to form a roughly cylindrical section bounded on all sides by the original internal rebar cage. The concrete through this section appeared relatively solid, although significant force was not applied. There is a small section just below the waterline on the North-Western side where the concrete appears to stick out to its original width. Above the surface the concrete has some cracking but appears to be at its original diameter. There is some minor erosion on all sides above the waterline showing exposed aggregate. The divers could not find any soft sections of concrete above the rebar taper, suggesting that this section may have been constructed as a single pour, or the method of tying in the cold joints in the concrete together was different to those employed lower down on the pylon.

Figure 2-35 Pylon above rebar taper

Figure 2-36 Pylon below scalloping at waterline

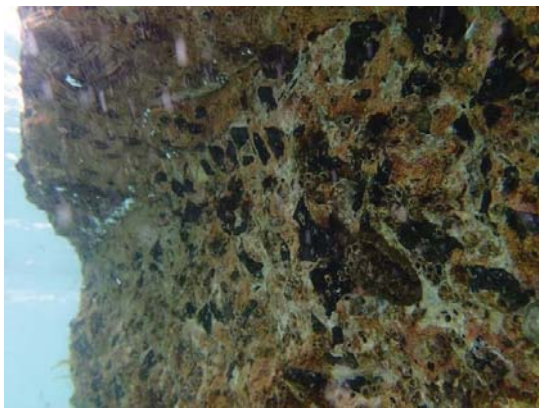


Figure 2-37 Cream mortar with blue metal aggregate at waterline

Figure 2-38 Cream mortar with blue metal aggregate above waterline

Figure 2-39 Exposed blue metal aggregate above waterline

Figure 2-40 Pylon above waterline

2.5 Soft concrete areas subject to heavy degradation

From the base of the pylon's foundations to the top of the tapered rebar section there are several areas where horizontal sections of the structure appear to be degrading more rapidly than others. There are up to three horizontal sections on some parts of the pylon that are significantly more degraded than the areas above and below them. The tapered rebar itself defines one of these sections, and then there are up to two similar sections below it. These areas are characterised by soft creamy grout with little or no aggregate that can be easily removed by hand. The absence of aggregate and the clay-like nature of these sections suggest they may have been cold-joints from the original construction. These joints were by far the weakest areas of concrete encountered during the survey. It should be highlighted that due to the degradation of the tapered rebar and foundations below it, there is increasingly less rebar tying the cylindrical section to the foundation. If the clay-like concrete runs all the way through the structure horizontally, the solid cylindrical section is sitting on

soft foundations that are already heavily eroded with minimal rebar to reinforce it. The following photographs (Figure 2-41 through Figure 2-46 below) illustrate the nature and extent of these areas of soft concrete.

Figure 2-41 Soft clay-like material above blue metal section

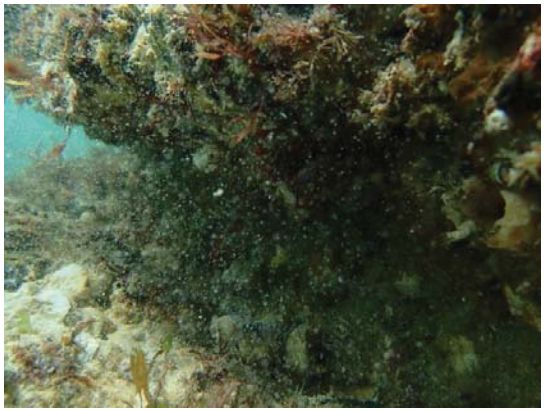


Figure 2-42 Sectional loss through rebar tapered section

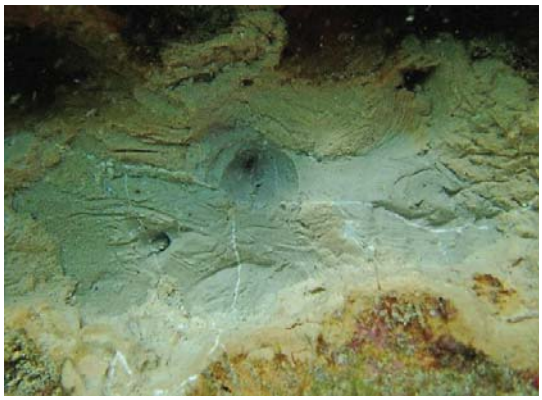


Figure 2-43 Soft clay-like material through rebar tapered section

Figure 2-44 Soft clay-like material through rebar tapered section

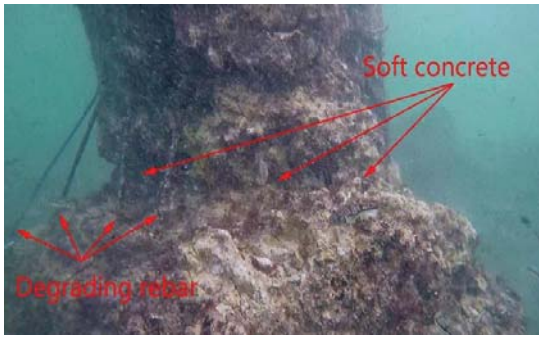


Figure 2-45 Soft clay-like material through rebar tapered section and degraded rebar

Figure 2-46 Soft clay-like material through rebar tapered section and broken rebar

2.6 Explanation of appendices

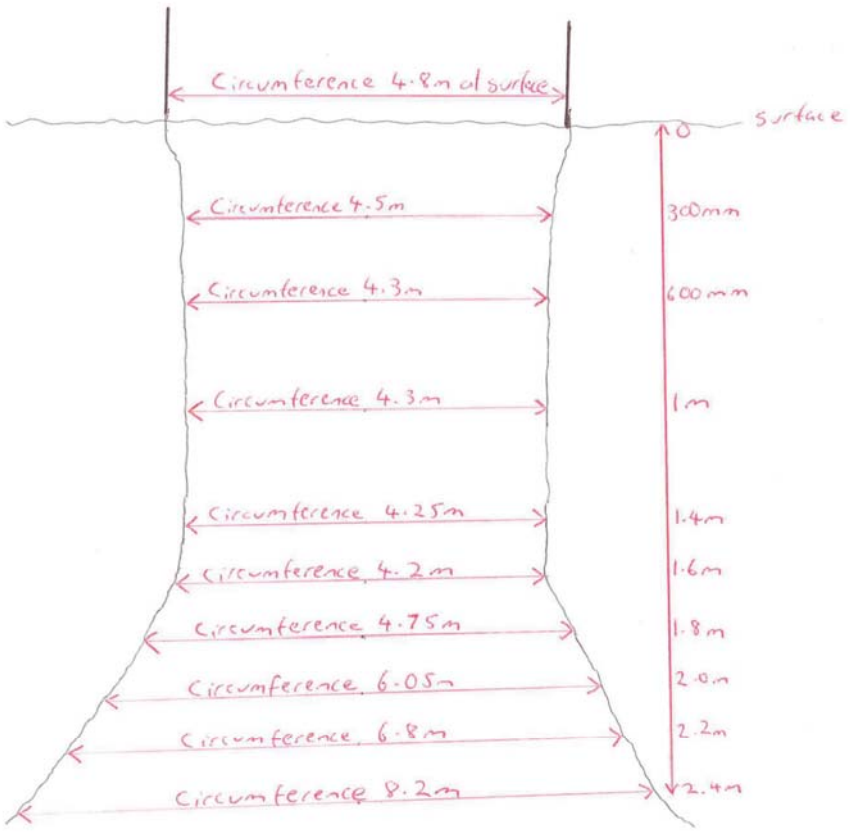
Two field diagrams (not to scale) have been provided as appendices to this report, however caution should be exercised in interpreting the diagram that gives circumferences of the pylon and foundations. Circumferential measurements were obtained by running a tape measure around the pylon at set heights and obtaining an overall measurement. The surface of the pylon and foundations is very variable and this simplistic method of measurement does not appropriately convey the level of degradation on the pylon or uneven nature of the surfaces. The following photographs (Figure 2-47 and Figure 2-48 below) illustrate the variable nature of the pylon and foundations.

Figure 2-47 Uneven nature of foundations Eastern side

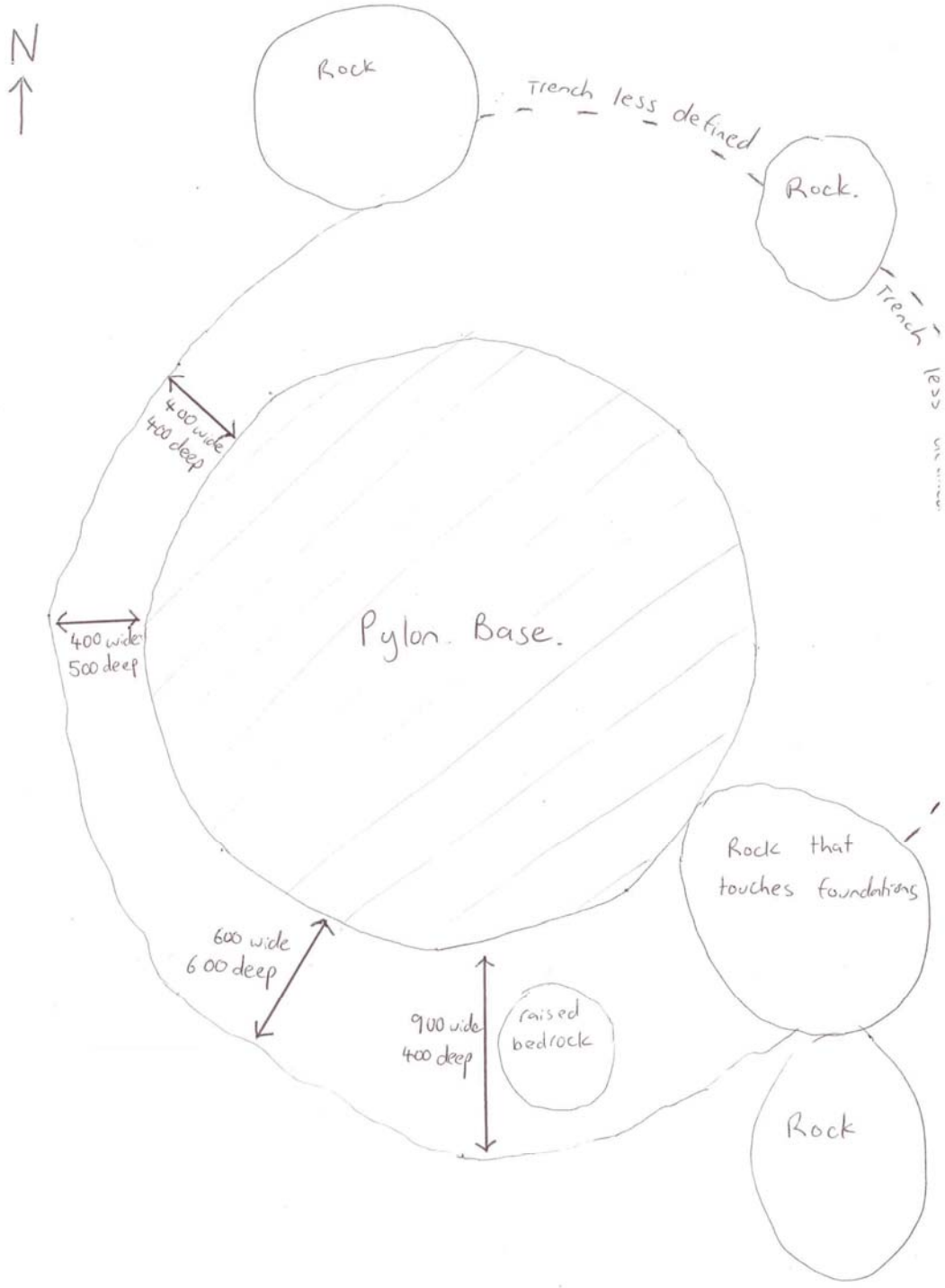
Figure 2-48 Uneven nature of foundations North-Eastern side

Appendix A. Field drawings

A. 1. Average circumferences of pylon (not to scale)



A. 2. Configuration of trench (not to scale)



m p rogers & associates pl

www.coastsandports.com.au