

Last Line of Defence - Seawalls

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Kim Bowra¹, Shannon Hunt¹, John McGrath¹ and Donna Pistol¹

¹. Gold Coast City Council PO Box 5042 QLD 9729

INTRODUCTION

The city of Gold Coast has a very dynamic coastline. It is shaped by a well-studied predominant south-easterly wave climate with an average of 500,000 cubic metres of sand moving in a net northerly direction annually (GCCC 2008). The Gold Coast also has a long record of intense beach erosion during major cyclonic storms (Smith 1989). The erosion has nearly always been temporary, with the erosion zones refilling naturally during the period of fine weather that have followed the cyclones. However, this long-term cycle of erosion and accretion has long been proven to be incompatible with beachfront development, and a beach-based economy. It may take years or even decades for nature to restore the beach to the pre-storm profile, leaving the erosion scarp vulnerable to future erosion events.

To address these concerns, the Gold Coast has an A-line Boulder wall that serves as the 'last line of defence' during cyclonic conditions. This paper presents an overview of Gold Coast City Council's current approach to the management of the A-line seawall, in light of its history, and shares some issues faced in its implementation.

HISTORY

In hindsight, we can reflect that our city's coastline was subdivided and developed during a relatively calm period, during the 1920s and 1930s. What followed was a series of large cyclones and east coast lows that eroded the beaches and damaged properties to a degree that was unprecedented in the Gold Coast's short history. In particular, during the storms of 1954 and 1967, a conglomeration of car bodies, logs, old car tyres, sand bags, masonry and rock or concrete aggregates were literally dumped on the erosion scarp in a desperate attempt to prevent beachfront homes from toppling into the sea (Smith 1976).

In 1965, the Queensland Coordinator General's Department (C.O.G.) released a standard design for a boulder wall that would prevent storm-induced erosion. It adopted the approach used at the time in the U.S.A of having three layers of soil and rock protection, a layer of face armour, a layer of secondary armour and a layer of clay-shale sand erosion protection at the rear of the wall (Smith 1997). Council and many of the residents who owned beachfront property adjacent to the beach constructed protective walls along the beachfront. In the majority of cases, these walls were constructed directly on the existing cyclonic or storm erosion scarp. Due to the variable nature of the cyclonic wave action within the coastal zone, the resultant influences on beach were heavily localised. Consequently, the boulder walls were constructed on contradistinctive alignments, and at varying distances landward of the fine weather beach line. They were constructed to different standards using a

variety of materials, and gaps in the wall existed where property owners elected not to build a wall in front of their property. It was clear that a more coordinated approach was required.

In 1964, the Queensland C.O.G. commissioned a detailed investigation into the erosion problem on the Gold Coast. In 1970 Delft Hydraulics Laboratory in the Netherlands released the resultant report that served as the catalyst for a major overhaul of coastal management systems and practices along the Gold Coast. The strategic construction of seawalls was one of the Delft report's key recommendations.

In the years following, an extensive surveying program funded by Council's Beach Replenishment Programme was undertaken to establish a boulder wall line that could attain the best compromise between costs, property damage, erosion concentrations and the protection of beachfront land. This line defines where the wall is to be constructed. It also defines the usable area of beachfront land, and the beachfront building line or setback. In 1976, this line was officially adopted as the 'A-line' and was accompanied by a series of standards and policies including:

- all boulder walls were to be of C.O.G minimum standard;
- all Council esplanades in direct hazard of erosion as of 1974 were protected with a landwards C.O.G. wall;
- a total continuous beachfront boulder wall smooth plan alignment was adopted;
- in addition to a boulder wall for new building development on the beachfront, erosion resistant building foundations were required; and
- any new beachfront building would not be permitted until the property was protected by a full C.O.G. wall, on the adopted alignment (Smith 1989).

CURRENT PRACTICE

Today, the A-line seawall has been adopted as a continuous line and is generally parallel to the long-term primary dune alignment. It includes as many quality boulder walls that existed prior to 1976 as possible but as the beachfront land within the City has been progressively redeveloped Council has been actively supporting and encouraging the rebuilding of sub-standard boulder walls in accordance with the adopted standard design on the nominated alignment. This is evidenced in The Gold Coast Planning Scheme Planning Policy 7 (2003), which is described briefly below.

It is also important to note that the A-line seawall is but one beach protection measure adopted in Gold Coast City Council's shoreline management planning. It is the last-line of defence and is complemented by a suite of other measures. The role that the A-line plays in the Gold Coast's Shoreline Management Plan is detailed below.

Planning Policy 7: Foreshore Rock Wall — Design and Construction

The purpose of this Policy is to protect the integrity of the foreshore seawall by ensuring that walls are constructed or restored in accordance with the adopted standard design. This design is detailed in Standard Drawing No. 59402 – Foreshore seawall (Figure 1).

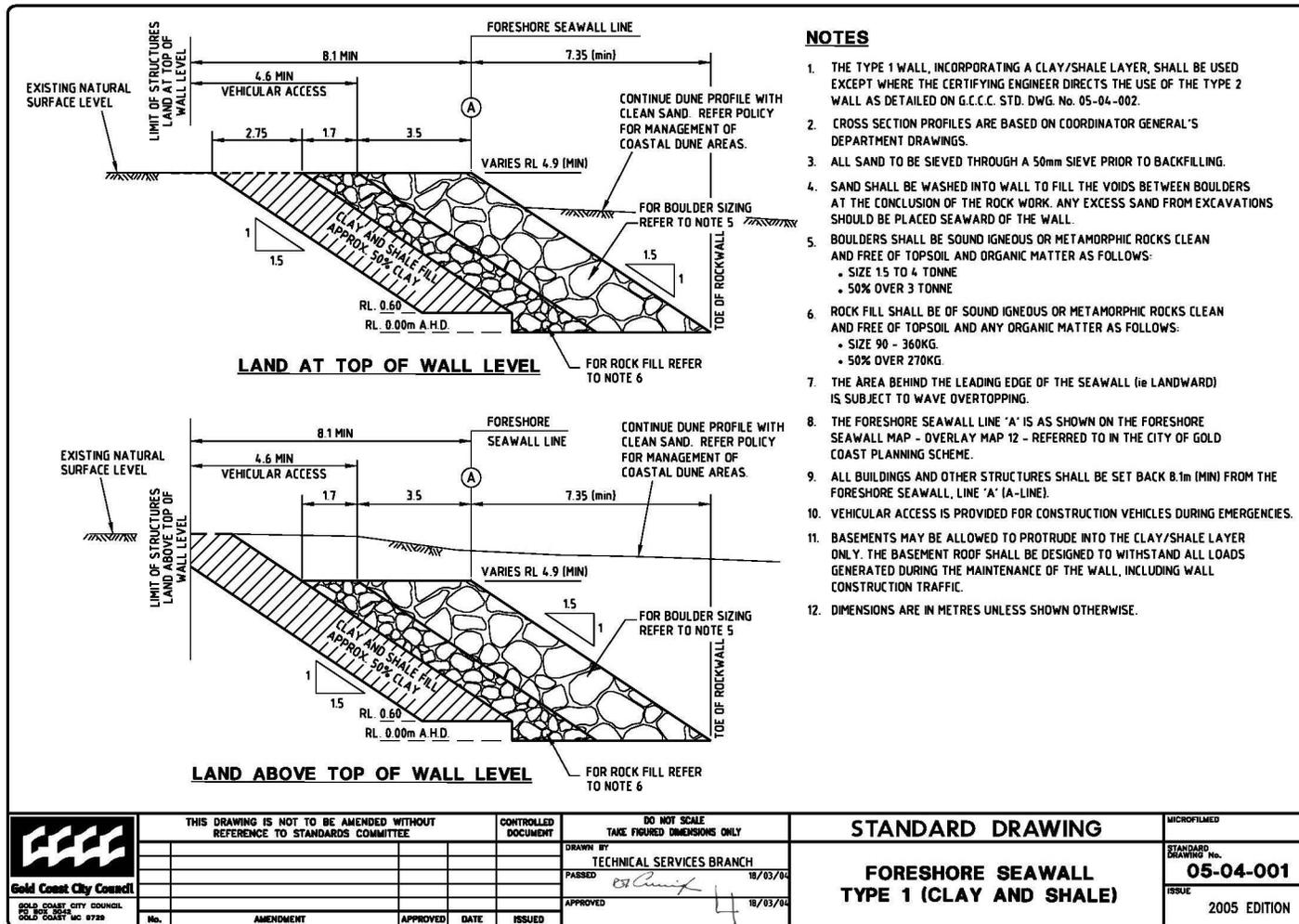


Figure 1. Standard Drawing 05-04-001: Foreshore Seawall Type 1 (Clay and Shale)

The Gold Coast Shoreline Management Plan

One of the central tenets of the Gold Coast Shoreline Management Plan (2008) is that a seawall, built to standard, in conjunction with adequate control structures and a significant sand buffer seaward of the boulder wall, are expected to be able to provide the level of safety that is predicted to be required to protect public and private property. As such, the key recommendations include

- *Adopt the preferred option for beach management of nourishment in combination with a continuous seawall at the A-line, with coastal control structures utilised where needed (recommendation 7.6);*
- *Continue to implement the BPA Design Profile for beach nourishment, based on a default value for storm cut of 414m³/m above RL -3m AHD until more sophisticated storm erosion modelling is developed (Recommendation 7.9); and*
- *Retain and maintain existing coastal control structures (Recommendation 7.15).*

Investment into constructing and maintaining the A-line seawall are recommended as essential capital and operational works for future coastal management on the Gold Coast. Through implementing the Gold Coast Shoreline Management Plan, it is anticipated that Council will achieve a continuous seawall spanning the entire length of the Gold Coast foreshore along the a-line. The following section discusses some of the challenges associated with this.

DISCUSSION

Implementation of the A-line seawall on the Gold Coast has not been without challenges. With large tracts of foreshore areas being occupied by private property owners, voluntary construction of the seawall (at an estimated cost of \$2000 per lineal metre) is not readily accepted. This presents legal implications for Local Government in ensuring such areas are protected and the future of adjacent coastal assets is maintained. Another issue that arises is one of maintaining access to the seawalls for maintenance. Finally, it has been essential to educate the community on the importance of adhering to the standard form of the seawall. In the past, Council has had a difficult time with residents who do additional 'tidy-up' work on the wall, and alter its structural integrity (Smith 1979). These issues remain ongoing concerns for Gold Coast City Council.

TAKE HOME MESSAGES

- After thirty-five years of being officially adopted as a policy for coastal management on the Gold Coast, the boulder wall remains one of the important components of shoreline management in this city.
- There continue to be challenges associated with the implementation of this vital coastal management structure.

REFERENCES

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