THE BAY OF STORMS AND TAVERN OF THE SEAS

RISK IN THE MARITIME CULTURAL LANDSCAPE OF THE HARBOR AT CAPE TOWN, SOUTH AFRICA

By

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South Africa's connection with the sea is most prevalent in its founding harbor at Cape Town. Until the opening of the Suez Canal, the passage around the Cape of Good Hope via Table Bay represented the most important oceanic trading route to the East. The passage, however, became known for its characteristic storms that devastated shipping at Table Bay and developed the area's reputation as the Bay of Storms. This thesis examines the way the British government at the Cape managed the risks associated with using Table Bay and demonstrates how risk is reflected in the historical and archaeological record of Cape Town. Specifically, research will focus on the initial development of the harbor during the Second British occupation at the Cape from 1806 to 1910.

This thesis will utilize an amalgamation of social theories pioneered by Anthony Giddens and approaches of risk analysis to examine how risk is incorporated in and reflected by the remains of past societies. A combination of statistical and geo-spatial analyses will be used to reflect the maritime risks of using Table Bay during the selected timeframe. Through the use of these theoretical and methodological foundations, it is

possible to assess risk as a measureable entity in the cultural landscape of the harbor. It is ultimately argued that the harbor's historical development was intrinsically linked to the concept of risk and risk management.

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RISK IN THE MARITIME CULTURAL LANDSCAPE OF THE HARBOR AT CAPE TOWN, SOUTH AFRICA

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Risk in the Maritime Cultural Landscape of the Harbor at Cape Town, South Africa

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CHAPTER ONE: INTRODUCTION

The Cape of Good Hope is situated at one of the most important and strategic locations in the world. Since the beginning of the 17th century until the opening of the Suez Canal, this area located along the Southern African coastline has acted as the sole maritime shipping route between the Western and Eastern markets in the Atlantic and Indian Oceans. With the rise in maritime traffic passing through the Cape, the establishment of landing sites along the coastline became essential to the replenishment of stocks for vessels making the voyage to the East and back. Table Bay, located above the Cape Peninsula along the Western Cape, became the most visited landing site since the first Europeans arrived at the foot of Table Mountain in 1503.

Previously the home to generations of indigenous Khoisan people, Table Bay became a permanent port of call for European colonizers with the establishment of the *Vereenigde Oostindische Compagnie*, or Dutch East India Company (VOC) victualing station by Jan van Riebeeck in 1652. This outpost would later be integrated into the British Empire and develop into one of the most visited harbors in the world with hundreds of vessels from various nationalities calling in the bay annually. The frequent amount of ships and people that called at the Cape intrinsically linked the development of the city and harbor with maritime activity. From the time of original Dutch settlement through its eventual occupation by the British, Cape Town would become a thriving port city and resting stop on the voyage east, which led to the adoption of its symbolic role as the Tavern of the Seas.

Despite the preeminence of the Cape route in world maritime commerce, the turbulent geographical nature of the southern Cape coastline has caused major problems for shipping throughout the centuries and generally hindered the development of harbors and ports. It was because of this turbulent environment that Vasco de Gama originally deemed the passage around the southern tip of Africa '*Cabo Tormentoso*,' or 'the Stormy Cape'. It was not until the mid-19th century, which was over 150 years since the establishment of the outpost at Cape Town, that the beginnings of a sufficient harbor of refuge were begun. During these early years, the lack of sufficient harbor facilities made maritime commerce within the bay inefficient, costly and dangerous.

It is estimated that over 2,700 ships of various nationalities have perished along the South African coastline (Sharfman et al 2012:90). Over any other region, Table Bay boasts the largest concentration of wreck material. Approximately 450 shipwrecks have been reported lost in and around Table Bay since its first recorded wreck in 1619 (Werz 2003:48-120). This collection of shipwreck material is composed of more than 28 ship types, representing over 21 different nationalities. Both the VOC and particularly the British government, who oversaw the greatest percentage of these shipping losses at Cape Town, needed to find ways of managing the conflicting notions of the increasing importance of the Cape Colony and the dangers or risks associated with its primary port city. How the colonial Cape government responded to these issues is reflected in the archaeological record of Table Bay.

The variety and scale of the archaeological resources associated with maritime activity within a relatively small geographical area illustrates the staggering maritime archaeological potential of Table Bay. Due to a combination of cultural, political, legal,

and economic factors, archaeological work on maritime sites in South Africa has been limited (Deacon 1988; Werz 1993a; Gribble 1998, 2002; Sharfman et al 2012). Compounding these issues, 20th century foreshore reclamation projects in Cape Town buried the historic shoreline with dredge spoil, which consequentially covered up the majority of archaeological material (Figures 1.1, 1.2). As a result, much of the maritime archaeological reports have been in response to urban development projects consisting primarily of cultural impact assessments (Lightley 1976; Cox 2000; Hart 2001, 2002, 2003; Werz 2003; Halkett 2012).

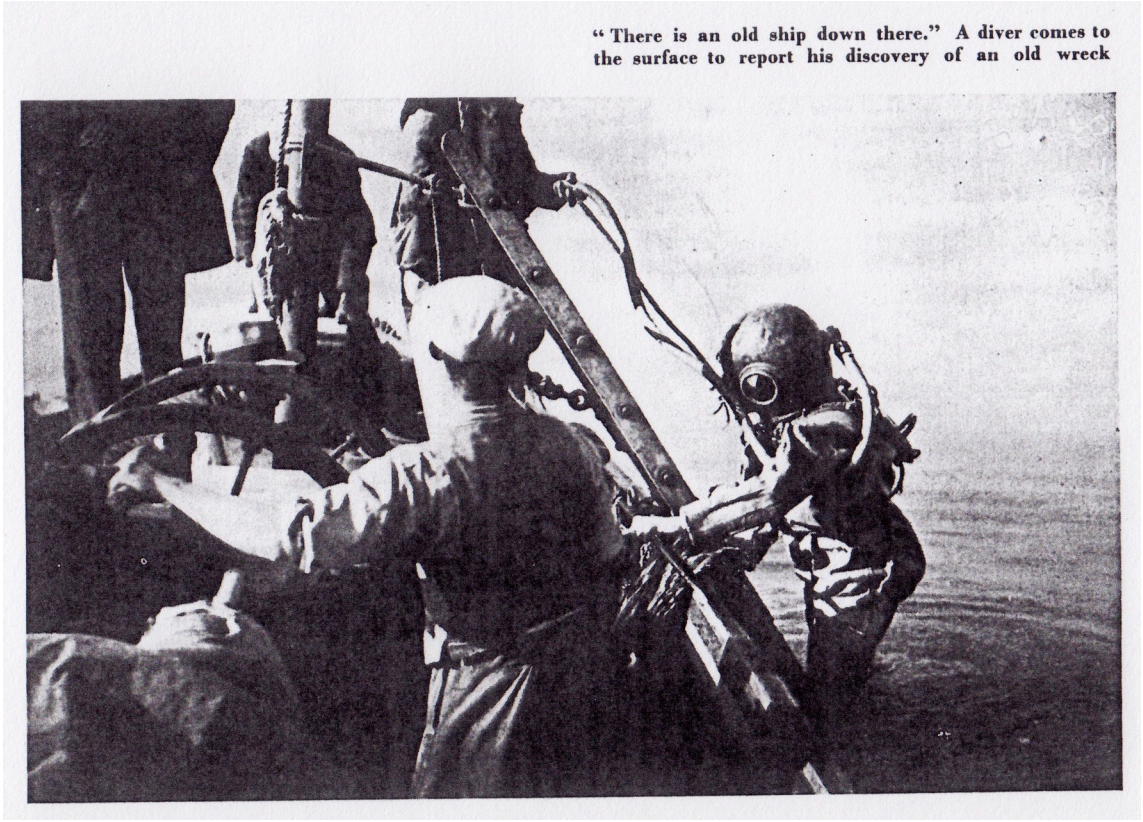


FIGURE 3.1. Photograph of diver returning from a survey of the harbor during twentieth century harbor reclamation (Photo courtesy of the National Library of South Africa, PHA 4921).

Despite this, fieldwork in Table Bay has generated a wealth of information. With the exception of sparse compilations of shipping incidents in Table Bay, the most extensive being one published in the *South African Shipping News and Fishing Industry Review* (1982), no comprehensive list of shipwrecks in South Africa existed until the National Monuments Council began a formal register in 1993. This database is now administrated by the South African Heritage Resources Agency (SAHRA).

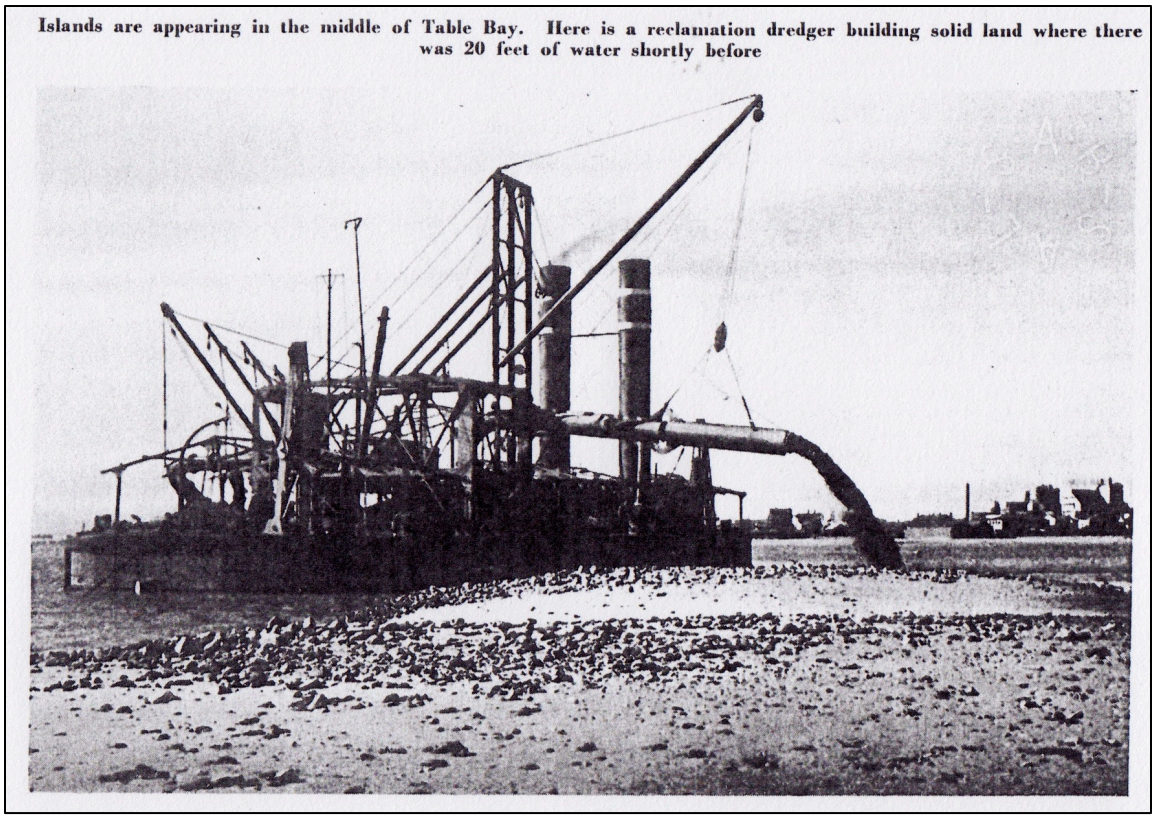


FIGURE 1.4. 20th century dredging activity in Table Bay harbor covered the majority of archaeological remains located on the old shoreline of the bay including shipwrecks as well as older harbor works (Photo courtesy of the National Library of South Africa, PHA 4932).

Remote sensing and diver surveys in the bay area have located wreck material near the current shoreline, along with the others around the rocky shores of Robben Island (Werz 1990, 1993b-c, 1999; Harris 1993; Maitland and Winton 2010). New

methods of recording sites with different theoretical and methodological frameworks such as the use Geographical Information Systems (GIS) have also been applied to a wreck near the old mouth of the Salt River (Sharfman 1998). Further use of GIS identified its potential application to the study of archaeological artifact distributions (Breitenmoser 1991). As development on the foreshore increased, exposed original harbor works and facilities have also been investigated (Saitowitz et al 1993). The overall maritime archaeological potential of Cape Town, particularly for shipwreck material, has also been reviewed (Durden 1992; Mavrodinov 1999).

The historiography of the harbor is equally limited. In 1972, David Rush studied the history of the colony and harbor in terms of maritime trade relative to other ports in South Africa. The development of the harbor until 1860 was also examined through an economic perspective, gleaned by compiling the various letters, correspondence, and reports of the Cape Officials and Imperial Government (Soonike 1974). Peterson (1978) provided a detailed examination of the construction of the Breakwater and Alfred Basin, the first attempt at establishing a harbor of refuge in Table Bay. These studies and resources have produced invaluable statistics and details concerning the maritime cultural material of Cape Town. What is lacking is the application of a broader theoretical framework for synthesizing the existing information, which is underutilized for interpreting the heritage resource on a regional basis.

Theoretical Approach

Maritime archeology as a discipline has branched out from analyzing solely shipwreck material viewed as isolated sites to include a diverse range of maritime activities and material. The maritime cultural landscape approach within archaeology,

originally devised by Westerdahl (1992), is a proven way of synthesizing and analyzing existing sources of information on a regional basis to integrate both social behavior and cultural practices as well as the linkages between underwater and terrestrial sites within a single generalist theoretical framework (McErlean et al 2002; Ruppé and Barstad 2002; Duncan 2006; Ford 2009, 2011). One potential avenue of research within this broader framework is the analysis of landing sites and harbors, which exist at the confluence of the land and the sea and facilitate the interaction between the two (Ilves 2009, 2011, 2012; Harris 2010). Therefore, examination into the development and use of harbors and ports has the potential to significantly contribute to the understanding of past maritime activity of an area.

It is argued that the concept of risk is integral to the establishment of any harbor. To define what is meant by risk and risk management, contemporary theories of the concept derived from the research of Ulrich Beck and Charles Perrow will be utilized. By complementing these theories with Giddens' Structuration Theory as a basis for explaining how people can enact change within society and the cultural landscape along with Crook's concepts of risk management strategies it is possible to examine the element of risk as a measurable entity that was the driving force in the construction of a harbor at Cape Town.

Past Studies

This approach originated with Bradley Duncan's honor's thesis *Signposts in the Sea: An investigation of the shipwreck patterning and cultural seascapes of the Gippsland region, Victoria* (2000). In this work, Duncan pioneered a method for identifying cultural seascapes and how risk affected the development of seascapes by

analyzing merchant shipwreck patterning in southeastern Australia. Duncan extended the range of evidence to not only include shipwrecks, but also the cognitive perceptions and behavioral responses to risks through a predominantly economic lens. This was the first attempt to establish a methodology for examining risk in the cultural landscape and identified risk as a major factor influencing maritime activity throughout the study area.

A second study by Joshua Marano titled, *Ship Ashore! The role of risk in the development of the United States Life-Saving Service* [USLSS] *and its effects on local wrecking patterns along the North Carolina coast* modified Duncan's scheme to examine how the USLSS developed on North Carolina's Outer Banks and its relationship to perceptions of risk in the coastal community. The analysis employed by Marano was made possible through the investigation of a series of annual reports distributed by the USLSS that helped to mold the community's concept of risk and its impact on local wrecking patterns. Marano used an assortment of data sources to collate historical and geospatial information that was analyzed at the national and local level to determine how the development of the USLSS related to risks of shipping along the east coast of the United States. By examining individual shipwreck reports supplied by the USLSS, Marano was also able to create a GIS database to examine the patterning of shipwrecks along a stretch of the North Carolina coastline and how these shipwreck incidents related to the development of USLSS stations for the study area.

This past research has demonstrated through an examination of the cultural landscape one can collate all of the existing historical and archaeological material for a region and examine the relationship between these data sources within a single framework. The application of risk theory to the study of cultural landscapes is

particularly useful when analyzing the maritime cultural landscape that includes shipwrecks and the effects of shipwreck patterning on risk in a given area. This thesis will employ different aspects of these past studies to determine and analyze how the behavioral responses to risk affected the development of Cape Town's harbor and harbor facilities.

Research Objectives

Maritime archaeologist Bruno Werz (2003:39) remarks that because Table Bay has played a focal role in international maritime traffic during the last 500 years, the current South African nation has some of its more important roots there. Therefore, the efforts of maritime archaeologists are of the utmost importance from both a national and international perspective. With the recent revitalization of Cape Town's harbor and focus on the cultural heritage of the waterfront, studies into the past usage of South Africa's capital port are essential to further understanding of the historical significance of the harbor (Worden 1994:33).

This research represents a compilation of primary and secondary sources that document the development of the harbor and associated shipping activity in 19th century Cape Town. Investigation into the historic maritime activity and associated infrastructure in Table Bay create a picture of the past landscape that ultimately set the stage for the contemporary status of the modern waterfront. Given the abundance and temporal range of maritime archaeological material within Table Bay, this analysis will focus on a snapshot of the cultural landscape during the second British occupation at the Cape from 1806 to 1910 when the initial effort of constructing a harbor in Table Bay was begun.

Collected information was used to create a data set that is potentially indicative of

risk in the history of Cape Town's harbor. The role that risk played in the development and use of the harbor facilities at Cape Town will be quantifiably measured through the application of statistical and geo-spatial analyses. With the suppression of the old shoreline by modern harbor developments, these analyses will aid in the re-creation of the historic landscape of Table Bay and examine how it developed through the lens of risk assessment and management. Furthermore, by identifying past landscape usage that is currently concealed underneath the modern harbor, this study will provide a potential benchmark for future monitoring of known shipwreck sites as well as contribute to the relocation of unidentified sites potentially impacted by further development on the Cape foreshore area. Specific research questions for this project include:

Primary

- What role has risk and risk management played in shaping the cultural landscape of the harbor in Table Bay between 1806 and 1910?

Secondary

- What features on the landscape represent the management of risk such as jetties, wharves, quays, breakwaters, lighthouses, and natural landmarks?
- What factors influenced behavioral responses of both Cape Officials and the wider maritime community to determine the development of the harbor?
- What natural and cultural variables influenced shipping losses in Table Bay?
- What is the correlation between the natural and cultural factors affecting shipping in Table Bay and the spatial distribution of shipwrecks and harbor facilities?
- How did the lack of harbor infrastructure or the addition of harbor infrastructure influence shipwreck events and shipping statistics in Table Bay?

Tertiary

- How is the temporal development of the harbor and factors that influenced harbor construction demonstrated by the wrecking of *Fame* (1822), RMS *Athens* (1865), and SS *Hermes* (1901)?
- Can historic maps, photos, and artwork yield pertinent locational and chronological information about the development of harbor facilities?

Research Methodology

In order to study how risk is evident in the cultural landscape of Table Bay and the effect that risk had on the development of the harbor at Cape Town, this study utilized three tiered approach. First, historical research was conducted to identify the historical development of harbor works in Cape Town and how these harbor works affected shipping in the bay. This line of inquiry focused on the specific chronology of harbor constructions along with the extent of harbor operations in the given timeframe. Research utilized a range of data sources to obtain a holistic interpretation of the historic landscape of Table Bay. This included extensive research into the life history of three shipwrecks of *Fame*, RMS *Athens*, SS *Hermes*, that were used as case studies that exemplify certain risks that predominantly influenced harbor development.

Next, statistical analyses were employed using Microsoft Excel and IBM's SPSS statistical toolkit to determine any trends in shipping activity in Table Bay throughout the development of the harbor. This statistical analysis temporally distributed general shipping data as well as the number and dispersal of archaeological shipwreck sites identified during historical research. Both shipwreck data as well as historical information pertaining to the historic locations of harbor works were also entered into a GIS database to facilitate geo-spatial analysis. The combination of these analytical methods allowed for the delineation of any existing relationships between shipping, shipwrecks, the extent of harbor operations and identifiable risks in the historic landscape of Table Bay.

Thesis Structure

The approach used in this study requires the research design to be conducted in a way that accurately reflects the range of information concerning the role of risk in shaping the cultural landscape of Table Bay and the development of the harbor. Chapter Two, *Theoretical Foundation for Risk Analysis*, discusses the correlation between cultural landscape theory and socio-cultural theories that relate human action to the dynamic structuring or formation of the landscape. Furthermore, the concept of risk and risk analysis is outlined. Discussion of these paradigms in conjunction with one another lays the foundation for this study and describes how risk can be imbued into the cultural remains of past societies.

Chapter Three, *A Methodology for Measuring Risk*, outlines the specific methodological approach enacted in this study to quantify and measure the effects of risk in the development of the harbor at Cape Town. This chapter will outline the reasoning for choosing 19th century Table Bay as a viable snapshot of the cultural landscape of risk. Furthermore, specific reference will be made to the various archival collections, publications and databases utilized for this research, which allowed for an assessment of the history of the harbor through a combination of various data sources. The chapter will also outline the integration of statistical and geo-spatial analyses with historic data. GIS creation and application for historic analyses of shipwreck and harbor spatial patterning will be discussed in detail.

Chapter Four, *Risk and the History of Cape Town's Harbor*, documents the relative chronological development of the harbor in Table Bay from original Dutch settlement through the formation of the Union of South Africa in 1910. In order to

examine how risk is evident in the cultural landscape of Table Bay, this chapter will also serve to delineate the different aspects that comprise cultural landscape in the historical record of Cape Town.

Chapter Five, *The Bay That Shaped the Harbor and the Harbor That Shaped the Bay*, describes the physical landscape of Table Bay. In addition to outlining the environmental characteristics that potentially had an effect on perceptions of risk in the maritime community, the manner by which the physical layout of the bay influenced alterations to the historic shoreline to accommodate the growing harbor will be discussed. How these modifications had a corresponding influence on shaping the natural dynamics of the bay and cultural material located along the shore will also be explained.

Chapter Six, *Analyzing Risk in the Bay of Storms and Tavern of the Seas*, introduces the archaeological remains of shipping activity in Table Bay and collates the historical and environmental data to analyze how risk is evident in the cultural landscape of Cape Town. This chapter uses shipwreck incidents as potential indicators of risk and provides a statistical breakdown of shipping activity in the harbor along with the geo-spatial distributions of harbor works and shipwrecks. The analysis will offer evidence of the effects of risk in historical trends of maritime activity in Table Bay. Furthermore, two prevailing themes of how this risk was managed in the history of the harbor will be discussed. It is argued that these themes were the guiding force in defining the cultural landscape of risk for the development of the harbor. The concluding chapter will provide general observations and conclusions presented through this research. Recommendations for future study and application of the methodologies used will also be discussed.

CHAPTER TWO: THEORETICAL FOUNDATION FOR RISK ANALYSIS

Introduction

Recently there was a fundamental shift in maritime archaeology to move away from purely descriptive approaches to material culture and instead focus on examining the social implications of cultural remains (Muckelroy 1978; Babits and Van Tilberg 1998; Gould 2000; Catsambis et al 2011). Port and harbor archaeology was largely neglected within such works, which suggests that this area of study has received a paucity of the same theoretical and methodological developments seen in other areas of the discipline. Any inclusion of this subject matter instead typically only refers to a description of the technological developments and structures rather than a more theoretical or all-encompassing analysis (Rogers 2013:183-4). In order to come to a more informed interpretation of ports and harbors within archaeology it is equally important to focus on meanings as it is descriptions. One method of accomplishing this goal is through the application of approaches grounded in social theory.

A social approach to the archaeology of ports and harbors will allow archaeologists to develop more critical perspectives of the remaining cultural material through the study of the cultural remains, their use, and how they were experienced in order to place them within a wider social and historical context. These locations have played an integral role in many of the key themes that resonate throughout history including travel and exploration, social interaction, trade, imperialism, resource exploitation, slavery, war and peace, environmental manipulation and technological development. Through contextual studies of ports and harbors it is possible to emphasize

local values as well as the importance of human experience, ideology, and human action in creating cultural meanings associated with a harbor (Rogers 2013:182-3). The wide range of potential influences for the creation of meaning includes both the physical or tangible features and intangible or abstract values of an area, and therefore a generalized theoretical approach is necessary to incorporate the range of data included in contextual analyses.

It is argued in this chapter that a holistic approach is needed to investigate the role of risk in the creation of a harbor in Table Bay. Previous studies by Brad Duncan (2000; 2006) and Josh Marano (2012) will be drawn upon to create a framework for analyzing the relationship between risk and the creation, development, and evolution of the harbor in Table Bay. By combining the notion of cultural landscapes and Giddens' Theory of Structuration, it is possible to look beyond the features of the harbor in isolation and instead examine how the wider cultural landscape is related to human behavior and action, namely through the assessment and management of risk. Both of the aforementioned theories will be described in detail followed by a discussion of risk analysis and why it can be a useful method for examining ports and harbors.

A Cultural Landscape Approach

The cultural landscape approach was recently widely integrated into archaeological discourse and cultural heritage management. A cultural landscape is the idea that cultural identities and collective histories are anchored to the physical landscape features as well as contained within the cognitive perceptions of a given area. This notion provides a mechanism to amalgamate a variety of different approaches to compare and contrast different perspectives regarding the complexity of people's social interactions

and relationships with their environment over space and time (Duncan 2006:7). The study of cultural landscapes has been used archaeologically to investigate the physical signatures of cultural presence on the landscape and the generation of cognitive meaning associated with them in the archaeological record.

Tilley (1994:25) defines a landscape as, "the physical and visual form of the earth as an environment and also as a setting in which locales occur and in dialectical relation to whom meanings are created, reproduced and transformed." Landscapes exist at the intersection of space, culture, and time. Space is a medium for human activity and does not have significance apart from that activity. Until humans utilize a space and make it a place, it does not exist culturally (Ford 2009:9). In addition, space provides a context or arena for culture to take shape within; both culture and space are inextricably interwoven with one another and form the foundation for cultural landscapes.

Carl Sauer first established the term cultural landscape. Sauer used it as a way to interpret regional settlement patterns associated with cultural and social organization. According to Sauer (1925:46), culture acts as the agent, the natural area serves as the medium, and the cultural landscape is the result of the interaction between the two. Sauer's progression is significant for the study of cultural landscapes as it stresses the agency, or ability, of culture and society to act as a compelling force in shaping the visible elements of the physical environment. This has particular relevance to the central principles of Giddens' Structuration Theory, outlined below.

There is a further duality between cultural landscapes and human behaviors in that landscapes are constantly being constructed and altered because neither the people nor the environment within a landscape is passive, and both function to construct and

reconstruct the other (Ford 2009:11; 2011:2). In other words, human action or culture creates or modifies the landscape, and the landscape influences or shapes human action. Over time, culturally determined landscapes shift and change to form distinct and frequently overlapping landscapes within a single geographic region. Therefore, landscapes can be viewed as culturally dynamic, continuing forces of cultural construction that are influenced by the natural features of an area and evolve over time alongside culture or society.

Cultural landscape studies that traversed the land/sea divide began with the introduction of the maritime cultural landscape by Christer Westerdahl in the early 1990s. Westerdahl (1991) used the term to describe the connection between maritime-related terrestrial and underwater material culture during a regional survey along the north Swedish coast. He advocated that a maritime cultural landscape approach can be used to analyze the past maritime cultural remains located on both land and underwater that have resulted from the human utilization of maritime space (Westerdahl 1992:5-6). His theory argued that within the total topography of an area, maritime features located in the vicinity of a waterfront are as significant as submerged features because the entire range of maritime activities can yield information on past maritime activity including tangible, intangible, cognitive and social activities or aspects of a study area (Westerdahl 1994:266).

This groundbreaking theoretical framework disregarded traditional notions of a land/sea divide and instead sought to view the two as seamless components within the cultural landscape as a whole. This idea of the totality of the cultural landscape to include both the land and the sea has been researched extensively within the study of indigenous

landscapes and seascapes (Irwin 1992; Lewis 1994; Hviding 1996; McKinnon et al 2014), but was applied to Western society/culture through Westerdahl's application of the maritime cultural landscape. He argued that the boundary of one environment was also the beginning of another and despite being opposite in nature – on land or submerged underwater – one could not be understood without reference to the other (Westerdahl 2000:3). Both the sea and the land are cognitively perceived as a singular landscape, and cultural remains located within each are complementary to one another.

This allowed for data sources derived from either terrestrial or maritime environments to be opened to the researcher because they were perceived by their users as collective components of the same landscape (Duncan 2006:16). The line of archaeological evidence can then be extended to not only include shipwrecks, but also serve to integrate the data set into the maritime history and physical residue of past maritime systems (Ford 2009:16; 2011:4). All of the features in the landscape are analyzed to explore how people perceived and understood the sea and used this knowledge and understanding to order and constitute their society and landscape (O'Sullivan and Breen 2007:15).

In his doctoral dissertation titled, *The Maritime Archaeology and Maritime Cultural Landscapes of Queenscliffe: A nineteenth century Australian coastal community*, Brad Duncan (2006:8-35) compared a range of different studies to identify the key features of maritime cultural landscape analysis and provided a succinct summation of the concept to date. Duncan noted that cultural landscapes tie in the history of an area through a combination of written and oral histories, toponymy or the study of place names, as well as archaeological sites. Ford (2009:13) groups these into two main

categories: 1) living knowledge, including place names, myths/folklore, beliefs, and practices; and 2) reconstructed knowledge, based on archaeological remains, historical documentation, and environmental studies. Several other factors that could have significant bearing on the constitution of a maritime cultural landscape are the study of empty space, authoritarian structures, technological changes, actions and events themselves in addition to their archaeological signatures, sailing or shipping routes and the landscape of movement, ancestral knowledge, environmental change, social hierarchy, gender studies, and rituals or symbolism within the landscape (Duncan 2006:36).

For archaeologists, the landscape is "the richest historical record we possess," and can be viewed as a part of the material culture of a society (Hoskins 1955:14; Anschuetz et al 2001:190). It is only through the examination of all of the potential aspects of a cultural landscape that a truly holistic representation can be achieved. What makes achieving this representation difficult is due to the vagueness of the concept. This makes the definition of a singular methodology for identifying cultural landscapes incredibly challenging. Given the breadth of information and lack of data that is often available, it is less pertinent to attempt to define an all-encompassing approach, but rather to identify *the* methodology that will be utilized for any given study (Duncan 2006:37).

Since the formation of the maritime cultural landscape concept, it has since been developed further by Westerdahl (1995, 1998a, 1998b, 1999, 2000, 2002a, 2002b, 2006, 2011) and many others (Jasinski 1994; Hviding 1996; Parker 1999, 2001; McErlean et al 2002; Flatman 2003; O'Sullivan 2004; Ash 2005; Busch 2006; O'Sullivan and Breen 2007; Ford 2009, 2011). Its application on the African continent, however, is much more

limited. The push for a cultural landscape approach has been focused along the East African coast mainly in association with the 'Swahili' archaeology that prevails throughout the region (Breen and Lane 2003). Pollard (2008) took this a step further by examining the coastal landscapes of local fishing sites in Kilwa Kisiwani, Tanzania. Pollard's analysis looked at the role of the environment in shaping the economic and religious systems of the harbor through excavations into the historic shoreline as well as ethnographic study of the continued use of fishing techniques and locations.

In Western Africa, Harris and others (2013) defined a maritime cultural landscape associated with the enduring legacy and memory of an early twentieth century shipwreck, locally used surfboats and an abandoned diamond mining community along Namibia's Skeleton Coast. Other work by Martin Hall (2006) in Cape Town looked at how the urban landscape served to express different stages of identity associated with the city's past and how this is currently being redefined and used by contemporary society to celebrate or oppose certain memories. Coastal Ghana has received some maritime archaeological attention suggesting the potential for a cultural landscape approach associated with the slave trade and West African diaspora (Gijanto and Horlings 2012; Horlings 2012).

It is important to note that this thesis is not a maritime cultural landscape study in the traditional sense, but rather an analysis of risk in the development of Cape Town's harbor. The cultural landscape approach is used as a backdrop for analyzing the cognitive perception of and behavioral responses to risk in Table Bay. A comprehensive examination of the cultural landscape from the founding of the harbor to the present day is beyond the scope of this work, but the aim will instead be to provide a snapshot of the

cultural landscape of risk for the port city during the time that efforts to build a harbor were initiated. Harbors represent the physical and cognitive linkage of land/sea and are integral within any maritime cultural landscape. Risk is a fundamental component in the formation of all harbors and therefore should be reflected in the cultural landscape of any given port city. Furthermore, a landscape approach in this study will allow for the examination of a variety of different data sources that might otherwise not be considered. To examine how risk and risk management is linked to the cultural landscape of harbors it is necessary to turn to another approach based on social theory.

Giddens' Theory of Structuration

Sociologist Anthony Giddens formulated his Theory of Structuration in his 1984 book *The Constitution of Society*. Giddens' work was largely a response to the increasing influence of environmental determinism, functionalism, structuralism, and world systems theories in the shaping of human cognition and societal structures (Kilminster 1991:74-77). He argued that these theories reduced human ability to think for themselves to a mechanistic level without the capacity for individualistic decision making. Instead, his theory of structuration proposes a new rationale for how humans make decisions despite being constrained by societal, economic, and environmental conditions within society.

Structuration theory is an attempt to explain how human beings make decisions within the structured nature of their society, while at the same time emphasizing the reflexive or circular relationships that exist between the individual actors or agents and the various structures within a given society. The key point of this sociological paradigm is the emphasis on the recursive relation between social structure and agency. Giddens argues that there is a duality of structure in that social structures are both constituted by

human agency and yet at the same time is the very medium of this constitution (Bryant and Jary 1991:7).

To clarify this idea, it is necessary to define some of the key components of structuration theory. The term, agent, denotes someone, or an actor, who exerts power or produces effect, while agency concerns the *capability* of the agent to act independently and make their own choices. Within structuration theory, agency dictates that there are numerous human reactions to any given situation. At any point in an individual's decision-making process, that individual made a conscious decision and could have acted differently (Giddens 1984:9). Linked to this is the notion of knowlegability, which refers to everything that the actor knows about the circumstances of his or her action and that of others (Giddens 1984:375). What an actor knows or does not know, which includes implicit as well as broadly available knowledge, has an effect on the production and reproduction of an individual's actions.

How individuals come to make a decision, the subsequent effects of that decision, and how the actor uses the consequences in future decision-making processes are addressed through varying forms of consciousness modeled within Giddens' theory. He defines discursive consciousness as what actors are able to say regarding their social conditions and actions, and practical consciousness as what actors know about social conditions, but cannot express verbally (Giddens 1984:375). The difference between the two is the ability to verbally articulate one's own actions. Subsequently, the capability to recognize or examine one's own actions as well as those of others is termed reflexive monitoring, and is a chronic feature of everyday action (Giddens 1984:5).

Agency refers not to the intentions behind human action, but rather the ability to act itself. Therefore, both the intended and unintended consequences of action are of equally importance. The flow of action continually produces intended and unintentional consequences, which may form unacknowledged circumstances that are brought into consciousness through the reflexive monitoring of daily social activity (Giddens 1984:27). Thus, reflexive monitoring represents the agent's recognition of both the intended and unintended consequences of a given situation, which continuously affects the decision-making process in an evolving process. Ultimately, reflexive monitoring provides a mechanism by which information, such as a perception of risk, can be evaluated and reintroduced as a component in future decision-making processes.

To summarize, Giddens provides several different factors that influence the decision-making process for actors within society along with identifying the agent's function in society. The role of social structures and how agents can reproduce structural properties must now be ascertained. Structures are defined by Giddens (1984:377) as the rules and resources of society that are recursively implicated in the reproduction of social systems and instantiated in action. In other words, structure describes the rules that govern social conduct within society (Marano 2012:24). Social systems are then the patterning of reproduced social relations between actors or groups, organized as regular social practices (Giddens 1984:25). For Giddens, systems are viewed as surficial patterns of interaction, while structures give *form* and shape to social life but do not *constitute* that form or shape.

Societal structures do not only influence human action, as implicated in structuralist and functionalist thought, but are also formed by human action. Structures

exist in and through the activities of human agents (Giddens 1989:256). In other words, structures represent the implicit or explicit standards or rules within a society that are replicated through human action; they not only restrict behavior, but also create possibilities for human behavior. Rules are viewed as the practices that can be seen in normal everyday conduct that is performed by individuals on a routine basis that create a structure or norm within society. Resources are the bases of power that the agent has the ability to manipulate or influence to alter or transform social events (Giddens 1984:258). Agents utilize resources within the structured nature of society, the enactment and reincorporation of behavior through reflexive monitoring enables them to alter those structures, thusly becoming both the mechanism and the product of social behavior (Marano 2012:24).

Referred to above as the duality of structure, this central tenet of Giddens' theory suggests that although people go through a socialization process and become dependent upon existing social structures, those social structures are also being altered by their activities. Despite the constraints of the established norms or rules of society, individual reaction and response to any given situation contains a certain degree of personal choice, or agency (Cohen 1987:283). Therefore, the agent has the ability to act freely within these rules and enact change in them. As a result, society structures human action, and human action structures society in an on-going process.

Social structuring is further determined by the historical, economic and ecological boundaries in which the society exists. Giddens accounts for this by defining *social praxis*, which states that the nature, conditions, and consequences of historically and spatio-temporally situated activities and interactions are produced through the agency of

social actors (Cohen 1989:1-2; Marano 2012:26). Social praxis is essentially the creation and evolution of social life. It is the means of transforming an agent's actions into an external reality.

Cohen (1987:288) elaborates on this, stating that it is necessary to examine the historical, economic trends, cultural behaviors, and ecological factors of the *locale* that was extant when the society was being structured. Giddens defines a locale as the physical region involved as part of the setting of interaction, which help concentrate that interaction in one way or another (Giddens 1976:106-107; 1984:375). This includes not only the physical aspects and human artifacts associated with institutionalized activities but also the way that these are used in the course of normal social routines. The inclusion of this concept is important as it identifies material culture remains as an active medium of social reproduction rather than as a passive backdrop that merely reflects the abstract process (Firth 1993:2).

This thesis will center around one form of social structure: risk. Structuration theory is applicable to the analysis of risk by addressing the manner in which both individuals and systems have the ability to identify, assess, and manage risk in daily life, while also identifying the reflexive mechanisms whereby information regarding risk can be evaluated and reintroduced as component in future decision-making processes (Marano 2012:29). Structuration theory underpins the notion of maritime cultural landscapes and provides a theoretical framework against which to interpret cultural behavior on a broader scale by defining the continuing nature of society along with the role of past cultural and associative aspects of the landscape (Duncan 2000:28). Risk mitigation and behavioral responses to risk can therefore be viewed as one form of

cognitive reactive framework that actively shapes and reshapes societal structure, and therefore the cultural landscape.

Defining Risk and Risk Management

At this point it is necessary to define the meaning of the term "risk" and why the study of risk and risk management is useful for examining past maritime society, particularly as it pertains to the construction of harbors. The etymological origins of the concept can be found in the Arabic word *risq*, which meant the acquisition of wealth or good fortune, or the Latin *risco*, which was used as a navigational term by sailors entering uncharted waters (Mythen 2004:13). Combined, these terms express themes of uncertainty and monetary value, which translated within the ancient medieval application of the concept for laws regarding maritime insurance and navigation. Bolstered by mathematicians as well as an increase economic development during the 18th and 19th centuries, the concept of risk cemented itself to calculation and the quantifiable measure of the primarily economic considerations of society (Mythen 2004:13-14). Under this banner, risk became recognized as the balance between some form of potential danger and acquisitive opportunity.

Throughout its history, risk is continually linked with the quantification of dangers that are either extant or unknown within a society versus the probability of those dangers causing some form of loss to an individual or group. For most people, risk is typically synonymous with a hazard or danger (Fox 1999:12). Another definition posits that a hazard represents a potential threat to people and what they value, while risk is the measure of hazards. More precisely, risk can be seen as the likelihood or probability of some adverse effect of a hazard, while a more neutral definition specifies risk as simply

the probability of some future event (Lowrance 1976; Kates and Kasperson 1983:7027). This definition is useful for this study as it concentrates any analysis of risk onto the range of things that people value. These may include people's health (both mental and physical), their lives and lifestyles, the quality of their lives or economic well-being and environment, along with the social values placed on a physical location (Short 1984:711).

Social theorist Ulrich Beck elaborates upon this notion of risk, deeming it the systematic way of dealing with hazards and insecurities induced and introduced by modern society (Beck 1992:21). This definition suggests that risk has a position or purpose within society. As society evolves, humans utilize risk and risk calculation for decision-making at both the individual and institutional level of society. As modernity changes society through either technological, economic, social, cultural, or ecological means, people continue to make decisions based on their perception of and willingness to accept certain risks. Therefore, risk functions as a form of societal structure. At the individual level, these decisions are made throughout the course of people's daily lives whereby the cognitive perception of potential hazards and the ability to recognize these hazards dictates certain reactions over others. As shown by Giddens' theory, these reactions have the ability to make risk an influential driving force not only in individual's daily lives, but also within the larger systems of culture such as the development and evolution of cultural landscapes (Marano 2012:18). Therefore, managing and mitigating for conceivable dangers or risks are not only a psychological issue, but also above all a social problem.

Corresponding with this idea, Luhmann (1993:3) explains that risk managers are likely to act in a fashion that coincide with a pertinent reference group, either in

conformity to or in breach of prevailing opinion, in terms of one's socialization. This brings to the foreground further questions of who or what takes responsibility for the consequences of action or non-action and decides whether, and within which material or temporal contexts, the measures of precaution and controlling manufactured uncertainty in the dimensions of space, time, money, or knowledge are appropriate (Luhmann 1993:4; Beck 2000:xii). The action ultimately taken is informed not only by an overall understanding of the extent of the problems facing the society, or the knowledgeability of an agent(s), but also the technological and ecological issues associated with each concern.

The assessment of risk can be viewed as the cognitive identification of a hazard within a society. Risk management is then defined as the practices and methods by which the future consequences of individual and institutional decisions based on potential hazards are controlled in the present (Beck 2000:xii). This definition alludes to a society's ability to control and predict the future: "To calculate risk is to master time, to discipline the future. To provide for the future does not just mean living from day to day and arming oneself against ill-fortune, but also mathematizing one's commitment" (Ewald 1991:207).

Both risk assessment and risk management form the heart of risk analysis. As evidenced in Perrow's (1984:63) investigation of "Normal Accidents," any risk analysis must first begin with the social and cultural context of hazards and attendant risks. This includes first the determination of what is at risk, followed by the investigation of the perception of those risks within society, leading finally to the acceptability of risk and a behavioral response in the form of risk mitigation strategies (Short 1984:712). This

progression will have particular significance for the methodology used in this thesis to determine how risk impacted the landscape usage in Table Bay.

In addition, Duncan (2000:29) and Marano (2012:27) have identified Stephen Crook's (1999) article titled, "Ordering Risks," as particularly relevant when discussing risk in society. Crook (1999:163) advocated that societies identify, assess, and manage risks through a series of orderings and management strategies. Orderings are viewed in this sense as the framework upon which models of order are projected and contested (Crook 1999:163). He argues that social dimensions of risk are at least partially revealed through *regimes* of identification, assessment, and management. Crook (1999:170) defines regimes as extremely broad, historically contingent networks for the ordering of risk. Complimentary to Giddens, Crook's regimes can be seen as one form of structuring agent. He identified three primary, but not comprehensive, regimes of risk management: ritualized, ordered, and neo-liberal. The latter two will be discussed briefly.

Risks are often either proactively managed or passively managed. Ordered risk management seeks to control the type of risk that is extant in society and further limit social exposure to it through regulation or prohibition of access to the hazard (Crook 1999:170). In this case societal hierarchy controls risks, and minimal freedom of choice to decide the level of risk exposure is granted to the individual or group. The activities of scientific and technical experts, inspectors, legislators and enforcement are not only used to process observed risk but through surveillance and discipline routinely identify, assess and manage the risk, another example of reflexive monitoring (Crook 1999:171).

In contrast, neo-liberal risk management strategies provide the individual or group with the means to assess the available risk, but ultimately leave the decision of acceptable

level of risk exposure and susceptibility to them. While ordered management operates through certain regulatory bodies, these are still present, but their function changes to focus on the dissemination of information regarding risk rather than preventing exposure to it (Crook 1999:171). Duncan (2000:29) argues that the greater freedom of choice allowed in this management period may oftentimes result in increased risk-taking behavior due to capitalism and the pursuit of economic gain.

The analysis of risk is complimentary to Giddens' theory of structuration and the notion of maritime cultural landscapes. As agents respond to risks within society, risk mitigation through risk assessment and risk management can be conceived as a type of reflexive monitoring scheme that actively reshapes societal structure, specifically the conception of risk. This, in turn, affects the decision-making processes of those people or groups interacting with a given area and results in a unique cultural landscape for that locale.

The combination of these concepts provides a useful theoretical framework for the analysis of risk in past landing sites and harbors. Risk, as a concept, has been a factor in the theoretical and methodological study of shipwreck events and patterns within several maritime archaeological studies (Souza 1998; Gibbs 2006). The explicit application of risk to the cultural landscape approach, however, has only recently been outlined (Duncan 2000; Marano 2012). Since risk management is expressed in cognitive behavior through the use of the landscape and its physical elements, it creates a distinct cultural assemblage of tangible (i.e. harbor facilities, lighthouses, shipwrecks, environmental modifications, etc.) and intangible (i.e. place names, cultural traditions, myths, folklore, spiritual associations) material culture imbued within any harbor.

Conclusion

This chapter has demonstrated the close theoretical ties between the cultural landscape approach, Anthony Giddens' Theory of Stucturation, and the concept of risk. Giddens, Beck, Perrow, and Crook all contributed to an understanding of the way that individuals and groups identify, assess, and manage risk in daily life. Giddens further provides a means for the reincorporation of information regarding risk through reflexive mechanisms in society. The manner by which the colonial government and local maritime community at Cape Town identified and responded to the risks of using Table Bay imbued the landscape with implicit and explicit signs or features that reflect the cultural landscape of risk in Table Bay. The following chapter will discuss the methodology utilized for identifying these characteristics within the landscape of Table Bay.

CHAPTER THREE: A METHODOLOGY FOR MEASURING RISK

Introduction

In order to examine the role that risk played in the development of the harbor at Cape Town, a research methodology was needed that allowed for a comprehensive investigation of the diversified data sources that inform a cultural landscape approach. This chapter will discuss the specific methodology used for this survey. It is first necessary to outline the parameters and limitations of the study. Next, each data source utilized will be discussed individually and the potential for the application of each towards the determination of risk in the cultural landscape of 19th century Table Bay will be outlined. The final section of this chapter will describe the statistical and geospatial analysis of the harbor and associated features in the cultural landscape. The benefit of GIS spatial and temporal data representation for identifying trends or patterns that reflect risk or the management of risk in the cultural landscape of Table Bay will be demonstrated.

Defining the Study Area

The primary aim of this thesis is to define and examine the cultural of landscape of risk in relation to harbor development. Table Bay has historically been a locus of maritime activity since the original passage of 15th and 16th century explorers and traders around the Cape of Good Hope. Therefore, the timeframe and extent of the survey needed to encompass the study area's unique culture, history and variety of resources while fitting in the scope of a Master's thesis. It was not until 1652 that a permanent

outpost and the beginnings of a harbor were actually initiated in Table Bay, which allocates over 350 years for potential research. To accomplish research goals given the breadth of potential research, focus needed to be scaled in order to make the data set more manageable.

One issue with scaling the temporal focus of a cultural landscape study is that it can potentially lead to biases imposed by the researcher and neglect of certain aspects of past landscape usage that could reveal landscape values and inter-relationships associated with the chosen area (Duncan 2006:38). As stated in the previous chapter, the aim of this study is to define how the cognitive perception of and behavioral response to risk is evident *within* the cultural landscape. The decision to build and utilize a harbor represents the acknowledgment of risk and the subsequent responses are the attempt to mitigate that risk manifested in diverse ways. Therefore, the ideal timeframe to study risk in Table Bay's cultural landscape should begin with the initial concerted efforts of mitigating risk through the construction of a harbor of refuge.

The British Empire inherited a singular dilapidated jetty from the previous Dutch government at the Cape when the colony was taken in 1806 and officially ceded in 1814. During the ensuing century, the intensification of maritime activity coupled with the rise of the British to global supremacy necessitated the modification of its harbor at Table Bay, which was situated at the oceanic crossroads of the Empire. It was during this second British occupation at the Cape beginning in 1806 that a harbor at Cape Town came to fruition. In 1910, four separate British colonies, the Cape Colony, Natal Colony, Transvaal Colony, and Orange River Colony amalgamated into the Union of South Africa. What had been an imperial colony became a sovereign nation and historic

predecessor of the modern Republic of South Africa. After this event, the harbor at Cape Town underwent extensive alterations to bring it into the modern age, which submerged the historic shoreline and harbor beneath the contemporary city. Therefore, the time period between 1806 and 1910 represents an ideal snapshot of the cultural landscape that was defined by risk and risk management for Cape Town's harbor.

Data Acquisition

This section will discuss each source of data that was used for this thesis. With limitations in fieldwork and necessary access to relevant material and subjects, certain ethnographic and folkloric information were excluded from the study. This information could have potentially provided invaluable insight into how risks were perceived and dealt with at a local level within Cape Town. The following resources were used in a complementary manner to one another and the order they are presented does not necessarily reflect the way that they were used in the process of analyzing risk in the landscape.

Historical/Documentary Sources

Historical research performed for this study was carried out with three primary objectives. First, research was conducted to determine the overall extent of harbor development by investigating the construction, development and evolution of harbor works and infrastructure throughout the 19th century. In order to create a relative chronological history of the harbor, regional heritage syntheses and broad thematic histories relating to the harbor were initially consulted. It was found that relatively few overview histories discuss the progression of the harbor in its entirety (Newall 1993; Veitch 1994). Other secondary sources were dedicated to a specific timeframe of the

harbor's history (Rush 1972; Soonike 1974; Peterson 1978; Dimond 2009) and several had short synopses as part of a larger analysis of shipping in South Africa (Murray 1933; Burman 1976; Wiese 1981; Worden 1994; Worden et al 1998; Newall 1999b).

Several of the secondary source materials were particularly useful for establishing the perceptions and responses to risk in the foundational period of British governance at the Cape. In particular, Hans Erik Soonike's (1974) master's thesis titled, *The Development of the Port and Harbor of Table Bay with Special Reference to the Period 1825-1860* was vital in establishing the history and economic difficulties in forming the harbor during early stages of development. Soonike's thorough coverage of archival material including personal correspondence between Cape Officials and Parliament along with requests from the local mercantile community made identifying local as well as official attitudes towards the potential risks and benefits of a harbor abundantly clear.

Official historical records provide insights into world, national and statewide views as well as governmental attitudes that present official views towards risk. Local government and regulatory authority records often provide better insights into regional official mercantile and thematic issues as well as the occasional glimpse of local ideologies, practices and behaviors, specifically as it pertains to risk mitigation strategies and the potential for risk-taking behaviors (Duncan 2006:42-43). In Cape Town, the local agents in charge of the oversight and construction of the harbor were the various Harbour Boards for Table Bay.

In 1836 the original Harbour Board for Table Bay was authorized to raise money and administer the construction of several works in the bay (Table Bay Harbour Board 1895:8). As Governor of the Cape in 1847, Sir Henry Pottinger first introduced the Table

Bay Improvement Bill and set forth legislation for the overall port and harbor improvement in the colony. Ordinance 11, passed in 1848, provided further administrative backing for the establishment of multiple Boards of Commissioners for the Improvement of the Ports and Harbors in the colony, which was established in Table Bay later that same year (Soonike 1974:105).

Each of these regulatory entities provided *Annual Harbour Board Reports* on the state of the harbor with updates and recommendations for further works to the Houses of Parliament in London. These sources were found in the Cape Town Archives Repository inventory of Reports of the Select Committees of the Legislative Council and House of Assembly (CCP). To find each report, a list of potential reports was compiled from the aforementioned secondary sources and by searching the National Automated Archival Information Retrieval System (NAAIRS) database for the archives. During two months of field research in Cape Town, 32 volumes from the CCP collection with dates ranging from 1854-1904 were consulted and the reports scanned for future reference.

Submitted each fiscal year, the *Annual Harbour Board Reports* also contained detailed statistics on the expenditure and revenue for each individual harbor work, the labor used, and measure of progress for every change to the shoreline. Aside from merely listing data, the Harbour Board gave explanations for why modifications or additions were pursued or not. These reports provided the necessary clarification on the inaccuracies or inconsistent data in the secondary source material. Furthermore, these reports presented the views of the people that were actively pursuing the construction of the harbor. The Harbour Board represented the core of risk assessors and managers for Table Bay and largely dictated the course of harbor evolution throughout the 19th

century. Therefore, they were essential in establishing the disposition of local risk management and official perceptions of risk in Table Bay. One supplemental history from the Harbour Board in 1895 was also found that outlined the history of harbor works up to that point (Table Bay Harbour Board 1895).

The second line of inquiry sought to determine the impact of the harbor on the colony and extent of harbor activity. This was assessed through general shipping statistics such as the tonnage of vessels entering and leaving, import and export values, etc. in Table Bay for the given time period. These statistics were compiled into a singular document annually within the *Cape Annual Bluebook and Statistical Registers* submitted by the colonial government to the Houses of Parliament. The earliest *Annual Bluebook* found during research was within the Colonial Office (CO) records dated to 1821 and continued to 1849. The volumes changed from the CO to the CCP collection from 1850 to 1885, and then to the Cape Archives (CA) collection from 1886 to 1906. Due to time constraints statistical information from 1806 to 1814 and 1906 to 1910 were not recorded. The information gathered, however, allows for a reliable dataset of 85 years during which the main development of the harbor took place for the study timeframe. All figures were recorded in Microsoft Excel for further analysis.

Lastly, the wrecking events associated with three chronologically distributed shipwrecks were investigated to demonstrate how the maritime landscape of risk is represented temporally by specific shipwreck incidents in the archaeological record of Table Bay. While shipwrecks represent a single component within the cultural landscape, they are an essential component and the wrecking events are intimately linked with other factors in the landscape. The wrecks of *Fame* (1822), RMS *Athens* (1865) and SS *Hermes*

(1901) were chosen as they all wrecked under unique circumstances that reflect the state of the harbor at the time of wrecking and the potential risks associated with its chronological development.

Historical information on these shipwrecks was collected in a variety of locations. The National Library of South Africa (NLSA) housed microfilm collections of local newspapers that were present at the time each vessel foundered in the Bay. Papers researched included the *Cape Argus*, the *Cape of Good Hope and Port Natal Shipping and Mercantile Gazette*, and the *Cape Town Gazette and African Advertiser*. This research centered on the wrecks themselves and the circumstances of their wrecking. Additional sources on each shipwreck were gathered at the Iziko Museum's John H. Marsh Maritime Research Center and the Iziko Museum Social History collections.

Several photographic and artistic image collections were also critically analyzed to ascertain past attitudes towards risk in the harbor. Photographs have the ability to demonstrate not only physical landscape components, but also display the symbolism as well as perceptions of the landscape at the time they were taken through their respective composition. Photographs were particularly useful for bringing a sense of reality to the descriptions of the harbor. Furthermore, created images, which include paintings, lithographs and drawings, represent a stylized reality of the landscape and the inclusion of certain features over others reflects upon the creator's underlying perceptions of the landscape (Duncan 2006:45). This imagery, particularly artistic images of the harbor at Table Bay enabled the interpretation of elements of risk and risk management imbued within the iconography of the landscape.

Ethno-Historical Sources

The analysis of historical events through selective observer interpretation (i.e. personal accounts or testimonies) represents an inherent bias when researching historical accounts. Duncan (2006:45) argues that if these biases are recognized by the observer, these accounts can still offer valuable insights into the behavior, practices, and social structures of historical maritime communities. Newspaper accounts were specifically used in this study to provide local viewpoints on potential hazards and risks in Table Bay that are not necessarily recorded in official historical records. The three Cape Town newspapers listed in the previous section were examined for indications of these local insights. These papers represented valuable sources for understanding the perceptions of and beliefs regarding maritime risk in the local community.

Cartographic Sources

Cartographic material in the form of maps and charts provide a diagrammatic portrayal of the historic landscape. Maps, similar to other created imagery, produce a reality that was chosen by the mapmaker during the particular historical period it was made (Wood 1992:20). Like other historical documents, maps contain inherent biases, but have the ability to provide insight into past landscape usage, archaeological site re-location, changes in the shoreline along with the values and ideologies of the surveyor/mapmaker (Duncan 2006:47-48; Fontana 2013:280). Therefore, maps and charts allowed for the interpretation of the physical natural and cultural features of Table Bay as well as intangible values associated with those perceptible elements.

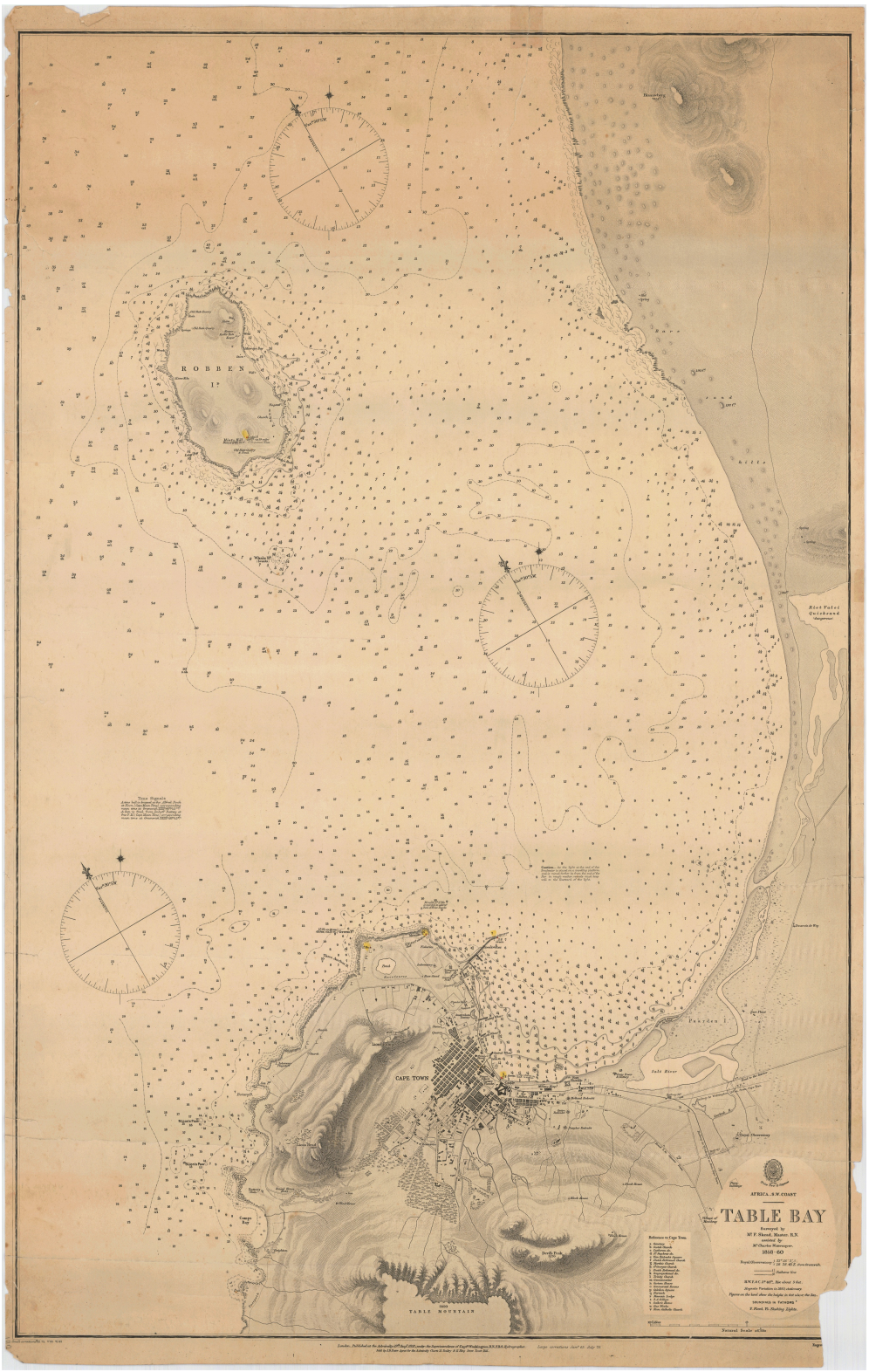


FIGURE 3.1. Historical chart detailing the extent of Table Bay and Cape Town as surveyed by British hydrographer Francis Skead from 1858-1860 (Chart courtesy of the City of Cape Town Environmental and Heritage Management).

Furthermore, maps and charts provide official names for landscape features, which have connotations for how the past landscape was viewed. Toponymy, or the study of place names, assists in defining the cultural landscape by delineating the encoded values of cultural agents within the tangible landscape. Place names act as reminders of cultural identity through the preservation of famous persons, events and history, operate as navigational signs, detail historical events, associate cultural activity with geographic features, and serve as a perceptible reminder of the community's distant past (Barber 1994:18). Toponymic data cross-cuts a variety of data sources and was therefore gathered through a combination of cartographic analysis and an examination of the historical record with special attention to the way different areas around Table Bay were described or labeled.

Historic geospatial information relating to harbor works were not included in the *Annual Harbour Board Reports*, making it difficult to determine where these sites were located. Contemporary maps and charts aided in the delineation of Table Bay's historic landscape and subsequently for the recreation a visual representation of the landscape's chronological development on a modern GIS system (ESRI ArcGIS 10). To facilitate a geospatial analysis of the historic shoreline and harbor in Table Bay, 30 maps and charts were collected and either downloaded or digitized into .JPG or .TIFF files (Figure 3.1). Maps were principally selected based on the date they were created, but other factors included the potential for georeferencing, a process outlined below, on ArcGIS.

The collected maps ranged in date from 1786 up to the present. The majority of maps (16) were provided by the City of Cape Town (CCT) Environmental and Heritage Management Office in Cape Town. In 2001 the CCT set in motion a plan to "identify,

assess, conserve, manage and enhance the heritage resources, structures and landscapes of all the people of Cape Town" (CCT Environmental and Heritage Management Branch 2005:21). A significant section of this plan outlines the creation of a GIS database for historic heritage resources that can be updated as new sites are identified or researched. The management approach resulted in the collection of many historical maps of Cape Town to identify potential resource locations and the maps obtained for this study were included in that assemblage.

Several other maps and charts (7) were collected from the African Studies Department's digital map collection accessed at the University of Cape Town (UCT) Chancellor Oppenheimer Library. Some relevant maps spanning the temporal range of this study and beyond could not be downloaded from the library due to access limitations, but were viewed for substantive analysis online (uctscholar.uct.ac.za). Another key resource for cartographic data was located at the Chief Directorate of Mapping and Surveys in Cape Town, which contains the national mapping agency of South Africa, the National Geo-Spatial Information Agency (NGI). While the NGI contains the largest collection of aerial images of South Africa, it also holds a large repository of historic and modern topographical, aeronautical, and administrative maps. An additional 7 maps were identified and digitized by the NGI for use in this survey.

Several modern maps that were digitized from the NGI already contained geospatial data and were particularly useful for relocating certain shipwreck sites (Figure 3.2). All of the maps and charts collected for analysis varied in scale and differed in the manner of representing features in the landscape, which is problematic for establishing an *exact* estimate of site locations. The goals of this thesis, however, do not entail exact site

re-location, but rather an assessment of the general location of sites in relation to one another and what this reflects upon risk in the past utilization of the landscape. The potential error is therefore negligible for the analyses employed in this study.

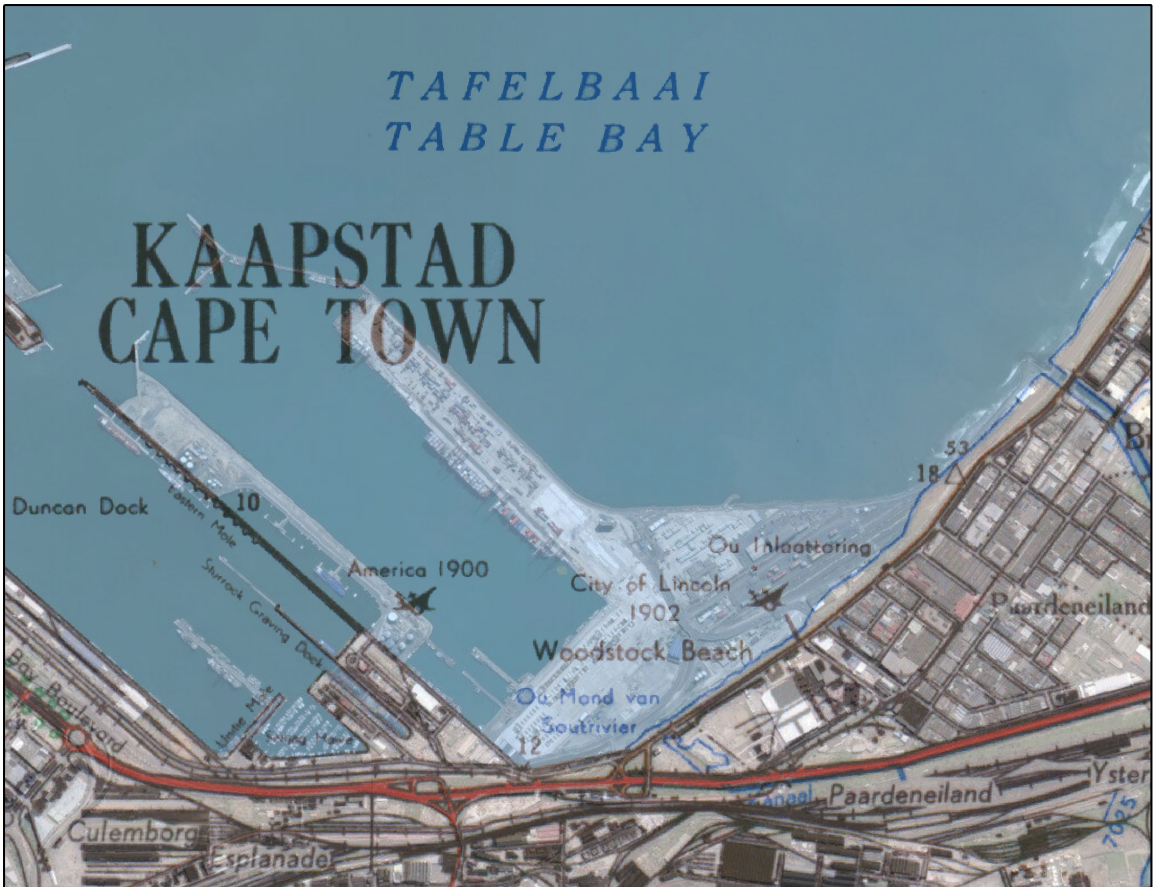


FIGURE 3.2. GIS overlay of a modern map of Table Bay, surveyed in 1961 and drawn in 1962 by the Trigonometrical Survey Office of South Africa. The map contained locations of shipwrecks in the bay that could be used for site relocation (Map courtesy of the Chief Directorate of Surveys and Mapping).

Environmental Data

As previously indicated, the environment represents an essential component of any maritime cultural landscape. The topographic, hydrologic, geologic, meteorological, and climactic conditions of an area have a significant impact on the construction of a

cultural landscape. The natural or physical characteristics of Southern Africa and Table Bay had a direct influence on the perception of risk in Cape Town and subsequent management of that risk. For example, it is impossible to discuss the history of shipping in Table Bay without mentioning the influence of major storm systems distinctive to Africa's southern coastline. Therefore, it was necessary to collect historical data pertaining to the physical landscape of Table Bay.

The oldest continuously existing scientific institution in South Africa, the Royal Observatory, was built in 1820 and recorded meteorological and astronomical data for the Cape during the 19th century. Unfortunately there is a paucity of research that collates historical environmental statistics obtained from these observations. This was identified as one area of potential future research that will be discussed later in this thesis. Information pertaining to a select number of years, however, was recorded from observations made chiefly by astronomer Thomas Maclear (Stone 1871). For the purposes of this study the majority of the historic environmental data was determined from contemporary studies outlined above.

To supplement this information, current statistics and research were surveyed and compared with past descriptions in historical sources to determine the range of natural factors that may have influenced the creation of a cultural landscape of risk. Modern environmental geospatial data was chiefly contributed by the South African Navy Hydrographic Office (SANHO). This information was part of an agreement between the SANHO and the author whereby digital vector data including soundings and depth contours for Table Bay were provided for analysis (Appendix 1). Other data was found in several theses and reports that contained past descriptions of the ecological and climatic

traits of Table Bay (Van Iperen 1971; Woodborne 1982, 1983; McLachlan 1991; Mavrodinov 1999).

Archaeological Data

The historical and archaeological potential for 19th century Cape Town was previously recognized by Toby Durden (1992) in his honor's thesis aptly titled, *The Maritime Archaeological Potential of Table Bay, 1806-1900*. Durden's research concentrated on the relative temporal and spatial patterning of shipwrecks in Table Bay during the specified time period. While it did not address the concept of risk or the cultural landscape, the results of Durden's survey provided an essential base upon which this thesis could expand into the range of potential data included in a cultural landscape study.

Duncan (2000:50; 2006:60) notes the benefit of using shipwreck databases and existing archaeological site documentation in the form of books, reports, and journal articles for the examination of large-scale data. In the 1990s the National Monuments Council of South Africa collated all of the historical records for shipwrecks along the South African coastline into a single shipwreck database. This database, now administered by the South African Heritage Resources Agency (SAHRA), provided historical information and general spatial data for shipwrecks in Table Bay. This data was essential for the statistical and spatial analyses outlined below. Further review of the archaeological literature helped to determine the extent of archaeological documentation of maritime sites in Table Bay.

Data Analysis

Using prior studies by Duncan (2000) and Marano (2012) as a point of departure, analysis of the complete data set collected throughout this survey was directed into three main sections. The first phase of analysis involved the historical and statistical examination of shipping in Table Bay with a focus on the measurement of potential risks in Table Bay and the range of values at risk within the maritime community. The next step in data analysis entailed the construction of a GIS database that outlined the chronological development of the harbor as well as the plotting and visual representation of landscape features relating to risk and risk management. The final analytic component of the study compared the geospatial data with the temporal and statistical trends to determine perceptions of risk and its effect on cultural and natural landscape features that reflect the management of risk in the historical and archaeological records.

Statistical Analysis

The official colonial records sent annually back to London in the *Annual Bluebooks* and *Harbour Board Reports* provided detailed information on harbor operations. These statistics contained specific elements that can be examined to determine the potential effects of risk on the development of the harbor during this time period. The statistical analysis portion of this thesis involved two main components. The first part involved the compilation and examination of the statistics concerning the extent and effectiveness of harbor operations housed in both the historical documents. The second portion involved the investigation of shipwreck events in Table Bay for evidence of potential hazards and trends in risk taking behaviors as recorded in the SAHRA shipwreck database.

As an imperial society within the British Empire, the Cape Colony was required to record annual statistics regarding all aspects of life within the colony. These *Cape Annual Bluebook and Statistical Registers* were submitted in annual reports to the Houses of Parliament that allowed London officials to assess the contemporary status of the colony and effect changes when as needed. These records collated various assortments of information that were partitioned according to several different aspects of society. Examples of sections within the *Bluebooks* included population data, financial statistics, and production outputs. Due to limitations mentioned above, and to fit these statistics best within the parameters of the research questions, statistics that would best reflect risk in the development of the harbor were selected. The most pertinent set of statistics contained within the *Bluebooks* was therefore information relating to imports, exports and general shipping for the colony.

Cape Colony	Cape Town Harbor
• Total Tonnage Inwards • Total Tonnage Cleared • Total Revenue • Total Expenditure	• Vessel Tonnage Entering Table Bay • Vessel Tonnage Clearing Table Bay • Value of Goods Entering Table Bay • Value of Goods Clearing Table Bay • Men Imported • Men Exported • Duty Collected on Imports • Customs Revenue • Expenditure on Harbor Works • Wharfage Revenue

TABLE 3.1. Cape Town and Cape Colony statistics recorded from Annual Bluebook Statistical Registers, 1806-1910.

The *Bluebook* statistics on shipping contained both aggregate data for the whole Cape Colony as well as localized information for each major port, such as Cape Town. To better assess potential risks of past utilization of Cape Town's harbor, baseline data

for the extent and effectiveness of the harbor provided an estimation of the value Cape Town had within the colony. This information was then used to quantify *what* was at risk for the maritime community in Table Bay. The categories of data collected from these statistical registers are outlined in Table 3.1. For each year data was entered into an Excel spreadsheet for further analysis and to create graphs and charts to visually represent any observable trend. By examining the extent of shipping and the value that shipping had to the colony as a whole, it was possible to determine trends that would have affected the decision-making of Harbour Board officials to pursue different measures of risk management over time.

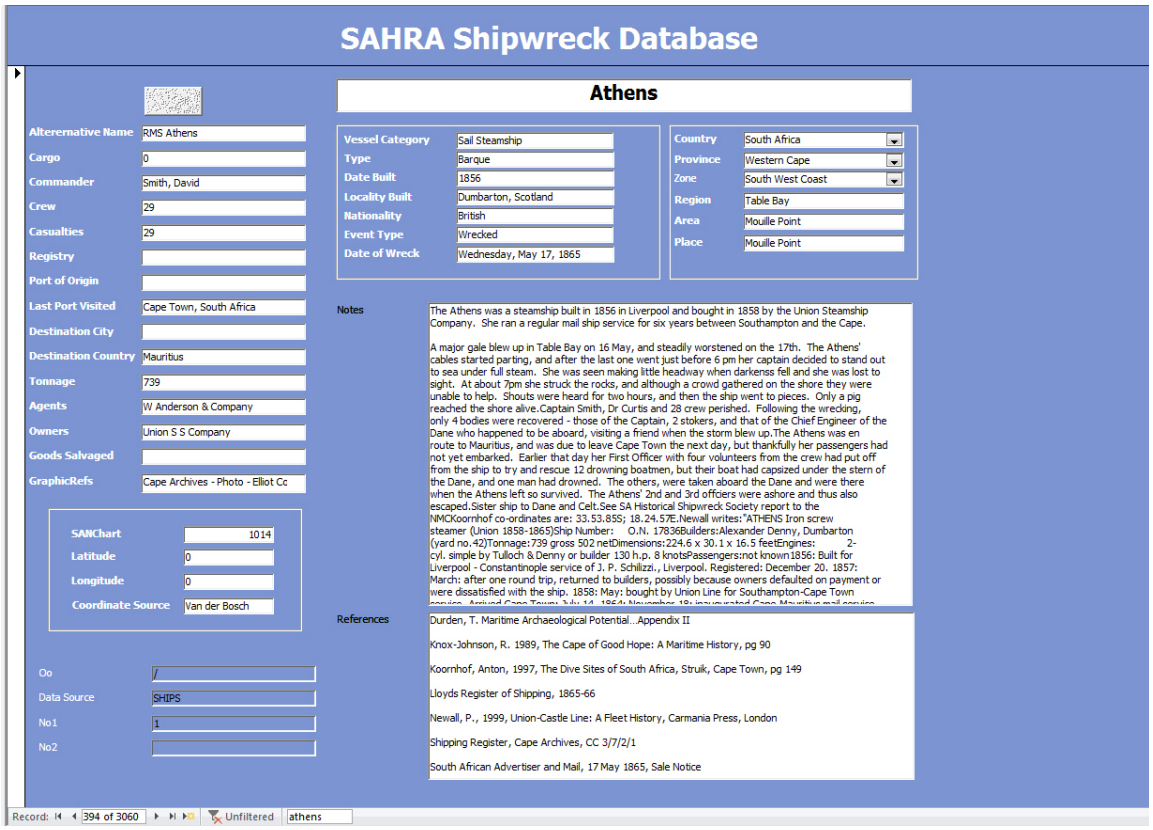


FIGURE 3.3. Example of a shipwreck file for South African shipwrecks containing all known information for the vessel within the SAHRA shipwreck database (Image by author, 2015. Shipwreck database provided by SAHRA, 2014).

In addition to the compilation of data related to harbor development in Table Bay, statistics for shipwreck incidents were recorded based on information contained within SAHRA's shipwreck database for South Africa. The database, housed in Microsoft Access format, is the product of an extensive survey of South Africa's historical and archaeological records to determine all possible shipwrecks reported along the nation's coastline. For the purposes of this study, the database was queried for all shipwrecks wrecked in Table Bay between 1806 and 1910. The file for each shipwreck provided information relative to the history of the vessel as well as data concerning its loss as shown in Figure 3.3.

Circumstance of Loss	Definition	Other Terms Included
Beached	*Intentional* process by which a ship is laid ashore or grounded	
Grounded	*Unintentional* impact of a ship on a seabed or beach due to natural factors	Stranded
Navigational Error	Unintentional grounding or wrecking due to apparent *human error* in navigation	
Gale/Storm	Severe storm system that produced a dangerous sea state and resulted in a wreck	
Abandoned	Purposeful abandonment or wrecking of a vessel in a non-catastrophic manner	Condemned
Collision	Impact of a ship with another ship or obstruction to navigation	
Repurposed	Intentional wrecking or salvage of a ship to serve a different function	Broken Up
Fire	Wrecking of a vessel due to incendiary causes	Explosion
Wrecked	Unknown circumstance of loss	Unknown

TABLE 3.2. Classification of the terminology used for wrecking events in Table Bay.

Data related to the wrecking event for each shipwreck identified in the SAHRA database was then logged into an Excel spreadsheet. Specifically, the circumstances of the vessel's loss, date of loss, general location of the wreck, and type of vessel were recorded. This information was imported into IBM's predictive statistical analysis

software SPSS to determine any chronological or thematic trends in the wrecking events that could be indicative of risks and risk-taking behaviors for shipping in Table Bay.

One issue that occurred during this analysis was that the circumstances of loss for some vessels were described using inconsistent or confusing terms. It was important to clarify this data as the circumstances surrounding the loss of a vessel could have different connotations for how risk was perceived following the wrecking event. To make the classifications used in this study clear, the supporting notes and history for each vessel were reviewed and a new terminology for classing the circumstance in which the vessels were lost was created. The new definitions are listed in Table 2. Vessels that were refloated after wrecking were included within the study since the wrecking event itself would have contributed to the perceptions of risk amongst the maritime community.

GIS Creation and Spatial Analysis

GIS technology enables the linkage of spatial representations of reality, such as maps, with related information that is stored in database and feature attribute tables. The use of GIS for analyzing shipwreck spatial patterning as well as for the plotting of multiple layers of different types of data representing cultural landscape features is a proven methodological tactic (Boyd et al 1996:58; Murphy 1998:167; Duncan 2000:31, 2006:70; Kimura 2006:43; Kammerans et al 2009; Marano 2012:46). To analyze risk in the cultural landscape of Table Bay, a systematic process of relocating historic sites and structures for analysis of spatial patterning within the historic landscape was needed. GIS analysis was completed with two objectives. The first was to visually demonstrate the chronological development of the harbor and landscape of Table Bay. The second

objective was to determine any correlation between risk and the spatial distribution of shipwrecks and harbor facilities in the area.

The first step in the creation of this GIS involved the digitization of historical cartographic source material. A base map consisting of modern satellite imagery of Table Bay within ArcMap was first inserted into the database and set to the WGS 1984 projection to provide spatial reference for the modern landscape. Collected maps and charts were then overlaid onto the modern map coverage using a common GIS process called geo-referencing, which allowed the modern geographical coordinate system to be applied to the historic sources (Figure 3.4).



FIGURE 3.4. Example of the geo-referencing process, where a historic map (*left*) is assigned spatial control points based on similar features in the modern satellite imagery (*right*) and overlaid onto the modern image (Image by author, 2015).

In order to complete the geo-referencing process, a series of control points were selected using permanent structures with known spatial locations that could be identified on both images. A total of 10 maps were georectified within the GIS database. Each map

was selected based on the availability of detail within the image for matching control points onto the modern landscape, as well as for its temporal date of creation. This was an issue with past studies in Table Bay using earlier forms of GIS, whereby the lack of scale and detail resulted in distortions that would have negatively affected any interpretation of the cultural features (Mavrodinov 1999:112). The control points utilized varied according to each map, but generally included the Mouille Point and Green Point Lighthouses, Lion's Head, Robinson Graving Dock, Cape Castle, and Diep River entrance. The amount of relative distortion between the control points on the two images could be assessed on a link table in the ArcMap geo-referencing toolbar with each remaining within acceptable levels.

To recreate the chronological evolution of the harbor, the geo-rectified maps were traced and made into shapefile layers on ArcMap. Supplemental features in the landscape were also made into point, polyline, and polygon features. Of the 10 maps that were selected, four different sections of harbor development could be determined. The first was at the beginning of harbor construction in 1860, the next at the second stage of major harbor modification in 1884, the third at the turn of the century in 1900, and the last with the formation of the Union of South Africa in 1910. These representations of the historic harbor could then be coupled with the statistical information to examine the extent of harbor operations over time, and assess the cultural and natural features in the landscape that demonstrate the management of certain risks to maritime activity in the bay.

To facilitate the spatial analysis of the harbor and its effect on shipwreck patterning in Table Bay, the shipwreck data obtained from the SAHRA database was transferred to the GIS. Using the layers for the historic shoreline at each time period as

well as the geo-rectified maps as references, the general shipwreck location for each wreck was plotted onto the map in a point layer. Few shipwrecks are archaeologically known with exact latitude and longitude data. Only the coordinates for the three shipwrecks mentioned above were collected since they are known archaeological sites. These points were recorded using a Garmin GPS Map 78s unit. Each shipwreck point was then given attributes specific to the vessel that it represented, which allowed for the analysis of the wrecks according to certain characteristics of the vessel or wrecking event. These points could then be analyzed using different functions on the GIS to display patterns of risk within the archaeological record.

Conclusion

This chapter outlined the methodological approach utilized in this thesis. In an effort to stay true to this generalist type of analysis, care was taken to account for a variety of different data sources and analytical techniques. To successfully analyze the role of risk in the development of Cape Town's harbor during the 19th century, it is first necessary to determine what is at risk, how risks are perceived by the maritime community, and finally how those risks were mitigated. It is argued that because the nature of risk is related to the quantification of potential hazards, the application of relevant historical statistical information is particularly useful for determining trends that may have affected decisions to enact certain measures of risk management over others. Coupled with the use of a GIS, this decision-making process of risk assessment and management can be analyzed further and visually represented on the cultural landscape.

CHAPTER FOUR: RISK AND THE HISTORY OF CAPE TOWN'S HARBOR

"The value of a secure and ample harbor at Cape Town cannot be overlooked…"
- Captain James Vetch, R.E., Harbor Surveyor to the Admiralty
(Table Bay Harbour Board 1895:11)

Introduction

The historical development and process behind the construction of the harbor at Cape Town is exceedingly important to this study. After control of the Cape Colony permanently shifted to the British in 1806, Cape Town continued to act as a crossroads of trade and 'Gateway to the East' for imperial expansion between Britain and Her Majesty's interests worldwide. With the growth of the British Empire and exponential rise of vessels making the trip around the Cape in the years that followed, maritime activity became intrinsically linked to the city of Cape Town and to the maturity of the colony as a whole. The need to protect and facilitate this linkage would eventually necessitate a sufficient harbor befitting the most prominent port of call in southern Africa.

The primary goal of this chapter will be to outline the chronological history of the harbor at Cape Town, with particular reference to the second British occupation of the Cape. This period prompted the initial expansion of the harbor. The calculation of risk is one of the most important considerations when deciding upon building a harbor of refuge. The decision to create certain harbor constructions over others, along with choosing which will be the most effective and where they should fit spatially within the landscape all reflect the cognitive perception of risk. Therefore, historical analysis of the decisions made to begin harbor development in Table Bay can shed light on what risks were most

prevalent in Table Bay and what measures were taken or not taken to mitigate these dangers.

To fully understand and delineate the cultural landscape of risk, a more holistic understanding of the broader cultural landscape in Cape Town must first also be explored. In addition to analyzing the development of the harbor, this chapter will also function to describe the broader cultural landscape of risk as it appears in the historical record. To accomplish this, different features of the harbor will be discussed as they appear chronologically in the historical record. The expansion of the harbor was eventually the result of an outcropping of different social, political, economic, and environmental variables extant within the maritime economy of South Africa during the 19th century.

Table Bay and the VOC

To begin, it is important to discuss the cultural landscape as it existed prior to the British reign at the Cape. Within the period of 150 years of Dutch administration at the Cape, the efforts towards constructing a port of call were likely to affect the potential decision making processes under the forthcoming British government. As the number of ships rounding the Cape of Good Hope increased following the establishment of the Dutch East India Company, the need for a sufficient anchorage amplified. Although Saldanha Bay to the north provided greater natural shelter, the supply of fresh water in Table Bay made it more suitable for a refreshment station along the southern African coastline (Liebbrandt 1898a:26-31).

The initial 1649 blueprints for a settlement in the bay called for a means of getting the necessary supplies to the ships at anchor in the roadstead by means of a wooden jetty

immediately off the northwestern bastion of the established *Fort de Goede Hoop*, and later Cape Castle (Figure 4.1; Liebbrandt 1898a:3-16). In 1664, work on the wooden jetty was initiated and was eventually completed in 1658 with the structure stretching 300 feet into the bay. The jetty was built using timber felled from Newlands Forest and casks of water could be filled at a nearby reservoir, rolled onto the jetty and either handed or craned down to lighters waiting to take the cargo to the anchored ships (Leibbrandt 1900:30). The purpose of the work was to ensure the better health of sailors who were previously required to wade through the surf to replenish their ship's water supplies.

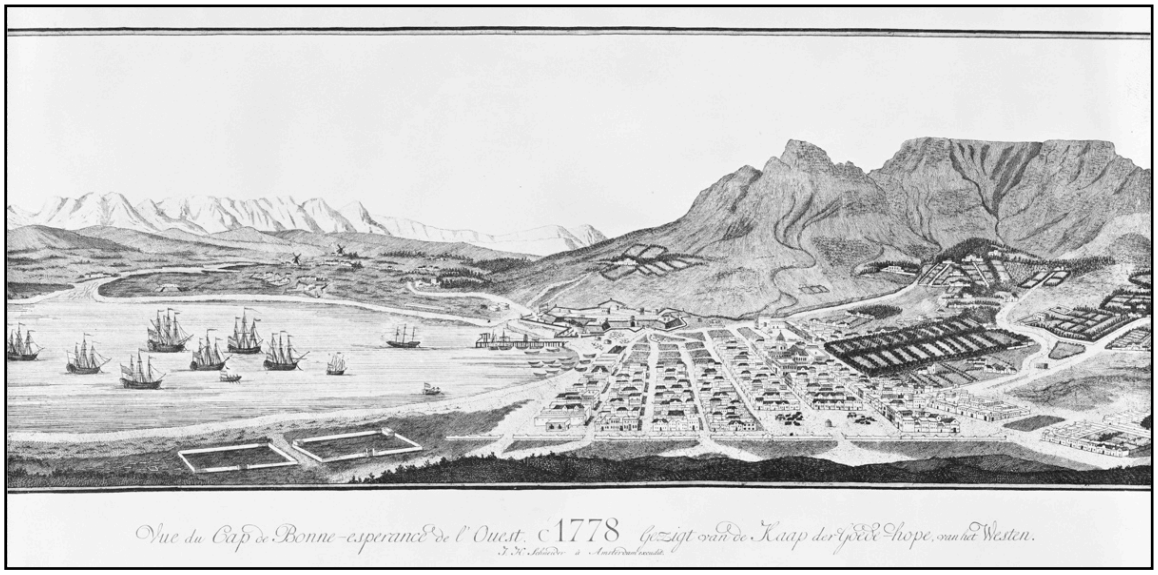


FIGURE 4.1. Engraving by J.H. Schneider depicting early Cape Town in 1778 with the Old South Jetty and Castle, ships at anchor in the roadstead and surfboats waiting on the beach (Courtesy of the City of Cape Town Environmental and Heritage Management).

Since Table Bay was more of a convenient provision depot to the VOC, there was little aspiration to establish a commercial port to supplement the relatively low volume of trade conducted. Therefore, focus was placed on the landing and loading of cargo for people making the voyage east and supplying a break in the long voyage, hence the establishment of hospitals, inns, and taverns that lead to the formation of Cape Town's

symbolic role as the 'Tavern of the Seas.' By 1673, the wooden jetty had already been damaged from several storms and during repairs was lengthened to enable smaller craft to come aside it at low water (Soonike 1974:3).

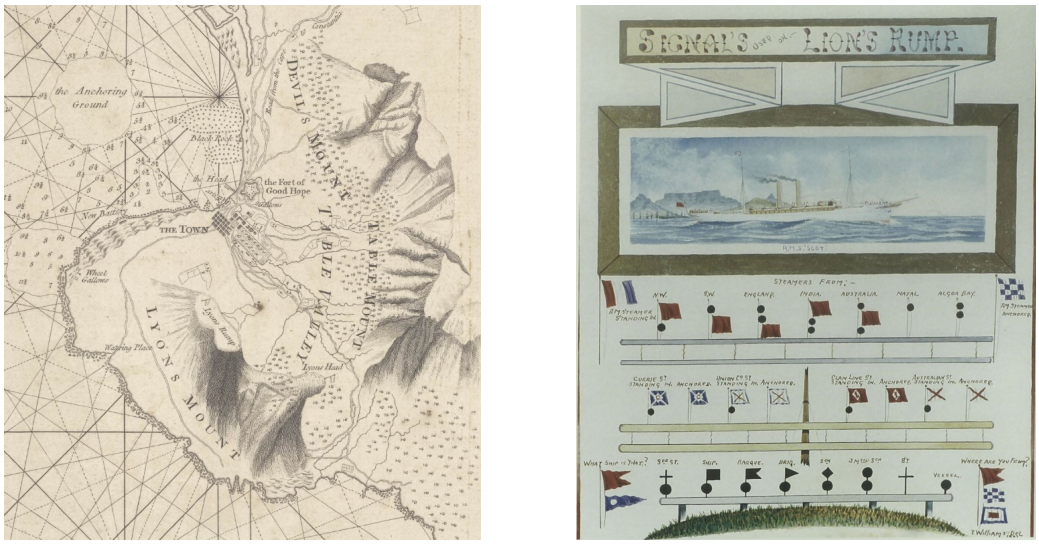


FIGURE 4.2. Section of 1794 map (*left*) highlighting the "Lion Mountain" with signal flag on the Lion's Rump and Head that overlooked the roadstead, the main entrance and southerly approach to the bay. Painting by T. Williams (*right*) illustrating the signals used on the Lion's Rump for communicating the arrival of mail steamships to the Port Offices (Map courtesy of the University of Cape Town African Studies Department; Veitch 1994:69).

In order to secure the expanding trade with the East Indies, the Dutch needed to make sure that they could maintain freedom of the seas to ensure safe and profitable shipping. The Cape route was the only sea-route that led to the Indian Ocean, therefore all ships passed by the Cape on the way to Asia and the majority of them anchored in Table Bay to re-provision. By holding this anchorage the Dutch and later on the British both successfully secured its shipping access to the East Indies. Both nations were very much aware of the vulnerability of the Cape and its strategic importance, so a series of secret signals were used to warn unsuspecting captains should an enemy overrun the town (Leibbrandt 1898b:200).

The Dutch originally utilized the landscape in these efforts and established outposts on Robben Island near the entrance of the bay as well as upon the Lion's Rump or Signal Hill, which was a part of a larger mountain that resembles a lion overlooking the sea (Figure 4.2). These signals were changed annually and allowed vessels to choose to either anchor in Table Bay or St. Helena Bay when safe. With the development of mail steam lines these signals later facilitated communication with the Port Captain upon the arrival of mail steamships (Figure 4.2; 1898b:166; Veitch 1994:69). The mountains also served as aids to navigation in the bay and both the Dutch and the British usefulness of these points of reference to determine the best locations to weigh anchor at any given time of year (Stanier and McArthur 2010:482).

To further defend the city against attack from the sea, a series of batteries were constructed including the original Castle under Jan van Riebeeck, the Chavonnes Battery built in 1726, Fort de Knokke and Imhoff batteries built in 1744, and the Amsterdam Battery in 1787 (Thunberg 1986:39). These coastal fortifications played a vital role in Britain's second successful attempt at gaining control of the Cape during the Napoleonic Wars in 1805. When General Baird's fleet entered Table Bay on 6 January, 1806 the forts along the bay's rocky shoreline warded off any landing attempt made by the invading fleet, forcing them to anchor farther to the north and march over the mountains, which eventually led to the Battle of Blaauwberg and the full cessation of the Colony in 1814 (Wilmot 1869:234).

In the 17th century, Cape Town became a desirable port of call but the severe northwesterly storms frequently caused entire flotillas and their precious cargoes to be lost in a single storm (Leibbrandt 1900:289-291). In 1729 a special levy, or *Mouljegeld*,

was imposed to finance the construction of a breakwater (Soonike 1974:8). Farmers were obligated under the *Mouljegeld* to take stones from a quarry at the base of Signal Hill to the site of the mole, or breakwater, whenever they brought their produce to the city markets. After a plague of locusts decimated crops in 1745 however, fewer farmers made the trip into the city and work on the breakwater languished until ultimately the project was abandoned in 1746 and the breakwater tax abolished. The remains of the incomplete mole could still be seen at low tide in 1904 and is reflected in the name of the surrounding neighborhood, "Mouille Point" (Table Bay Harbour Board 1904). With lack of funds and labor, the VOC never tried to reinvest efforts into building a larger harbor for the remainder of the Company's time at the Cape.

The Jetty Phase

Following British takeover of the Cape in 1795, General J.H. Craig remarked upon the poor state of the old VOC jetty whose piles had been eaten through by worms to such an extent that an inch of breadth was all that retained the structural integrity of the work in certain places (Theal 1897:275). This jetty represented the sole commercial artery of the Colony and the growth of trade made it increasingly difficult to handle cargo at the lone landing site in the bay (Figure 4.3). By 1815, the annual trade tonnage doubled from 8,892 tons in 1813 to 15,291 tons. Three years later in 1818, this number doubled once more to 30,775 tons of trade goods entering the bay, necessitating further repairs to the heavily used jetty and instigating further requests for an improved harbor (Soonike 1974:14).

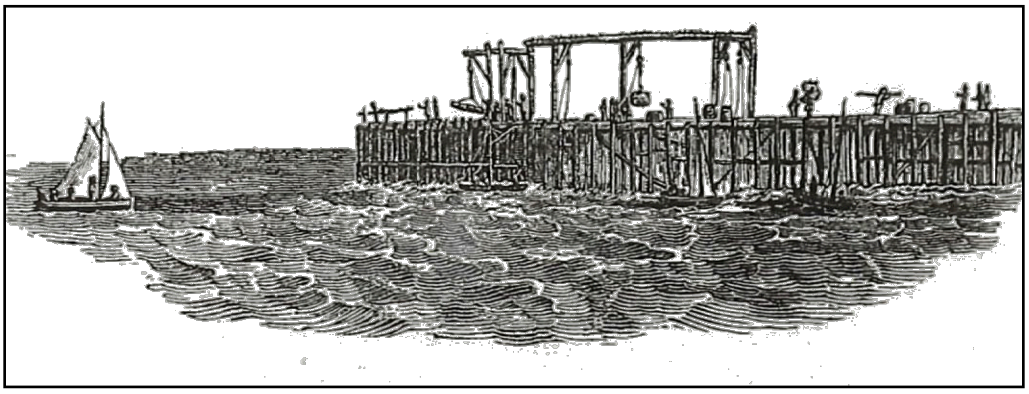


FIGURE 4.3. The Old South Jetty, with cranes to load supplies for boats to take to larger vessels waiting in Table Bay (Cape Town Archives Repository J5173).

During this time, vessels continued to anchor some distance from shore while passengers and goods remained to be ferried using lighters and surfboats. The bulk of goods were conveyed by porters through the surf to the lighters waiting alongside the decaying jetty, but beyond the breakers, to take supplies to the ships anchored in the roadstead. Depending on the time of year, this process proved exceedingly difficult as southeasterly wind and wave conditions often pushed the empty lighters into the shore while heavy winter seas caused goods to be lost or damaged in transit, resulting in recurring losses for investors and traders. Ships typically spent an average of 30 days to load and unload cargo at Cape Town and 2 to 3 days a week were commonly lost due to adverse weather (Soonike 1974:44; Durden 1992:22).

Table Bay boatmen, whose skills at traversing rough seas were utilized on a daily basis, enjoyed the reputation of being among the best in the world (Theal 1964:199; Hattersley 1969:76). The flagstaff on Lion Mountain would be raised when a ship approached the harbor from the south and immediately it would be surrounded by a crowd of small boats (Simmonds 1847:214). These boats ranged in size from small canoes to launches of fifty to sixty feet and were operated by not only Europeans, but

also Cape Malays and native Africans. Since boatmen were the only people adept at navigating the surf, and their use was necessary to conduct trading operations at the port, there were no fixed rates of hire and so they were able to charge increased rates to receive higher wages than they could inland (Simmonds 1847:214-215). What resulted from this system was the creation of a class of people whose livelihood on the waterfront began during the Dutch rule at the Cape and continued up through the construction of the Alfred Docks in the 1860s.

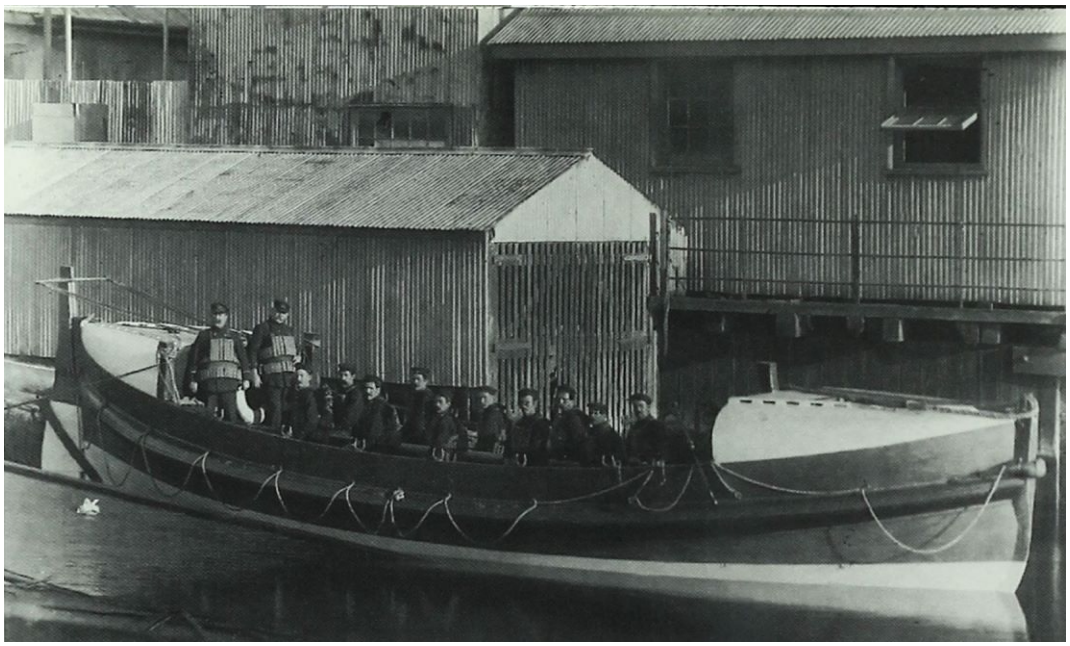


FIGURE 4.4. The Cape Town Lifeboat Rescue Crew, circa 1910 (Veitch 1994:84).

Boatmen in Table Bay could also find work with numerous private firms that were formed at the waterfront as well as with the Colonial Port Offices. After a succession of wrecking events where ships were grounded on the shore in 1828, a group of individuals including the Port-Captain, Lieutenant James Bance, accumulated a significant sum of money to commission the James Lowe shipwright firm to build a launch from which spare hawsers and emergency anchors could be delivered to ships in

danger on running aground. Appropriately named the 'Northwester,' the business was led by boatman James Buckley and commenced in October 1828 (Soonike 1974:42). In November 1838, the Cape Town Commercial Wharf Company was formed for the purpose of further regulating the work of the boatmen in the bay, who remained the only means of conveying cargo at the time. The independent or privately owned operations of boatmen were amalgamated into the construction of the harbor by 1870 and placed under the auspices of the Port Offices and Harbour Board (Figure 4.4).

A further outcome of the prolonged and inefficient harbor system was the promulgation of the Cape as the "Tavern of the Seas." Ilves (2011:7) remarks that due to the nature of ports where a multitude of different people come together temporarily or seasonally, this liminal or fleeting connection between people has the potential to create a tension around social rules and thus facilitate more violent or deviant social behaviors. While the crews of vessels that called at the port were responsible for their cargo operations, sailors and seamen took advantage of their time in the harbor by frequenting the many taverns and inns when the opportunity presented itself.

This explains the rise in the hospitality industry at the Cape, and also resulted in many sailors appearing in court documents linking them to excessive drinking, instigating fights with soldiers or other sailors, and generally engaging in socially aberrant behavior (Worden 2007:73). In some cases, these acts were a conscious decision made by sailors wishing to leave their ship permanently, as many sailors who were arrested on outbound voyages cared little about their punishment if it meant living at the Cape for the duration of their typical three month sentence, as opposed to the much more difficult life at sea (Table Bay Harbour Board 1860). This made the prolonged stay at the Cape even more

risky as captains needed to account for the potential of desertion with the interests of the sailors needing a respite from their vessel.

By August 1822, the Cape had become notorious among the international shipping community not only for its cargo operations, but also for its lack of suitable ship-repair facilities. For a port serving as a halfway house for the refreshment of ships, it was reasoned that there needed to be an ability to fix damage done to those vessels during long voyages. To this end, Messrs. Nisbet & Dickson, Lloyd's agents and representatives of British shipping interests in the East asked the Cape Government for permission to build such a yard at Rogge Bay. While their request was denied, following a severe 1822 storm in the bay the firm of Aken & Monteith was granted the right to build a small repair yard between Rogge Bay and Muntingh's whale fishery at the end of Bree Street (Soonike 1974:16).

At this time, the small port at Cape Town was not especially linked with the interior of the Colony. In 1819, Governor of the Cape Lord Charles Somerset advocated for the emigration of British settlers to the newly formed and burgeoning colony. The Colonial Office in London supported this notion and in 1820 4,000 settlers (36% male, 20% female, 44% children) were chosen to relocate to the Cape Colony and participate in expansion into the interior to displace the existing Boer and African populations along the Eastern Cape (Bryer and Hunt 1984:17-20). This mass immigration prompted an influx of shipping into the main port of call for the Colony at Cape Town.

As more commerce centered on the old jetty, the storage space available at this location became intolerably congested. After another heavy storm in 1831 that wrecked six ships with a loss of £40,000 of cargo, shipping agents, merchants, and boatmen

recognized the lack of government interest in funding a harbor project and set forth in raising £3,300 to pay for a separate stone landing place near the Whalefishery (Table Bay Harbour Board 1895:6). Under the supervision of Col. Charles C. Mitchell, work on the stone pier commenced that year at the bottom of Bree Street. In anticipation of the pier being completed, stores and warehouses began to be constructed at the expected site of the work. When estimates for the completion of the project proved to be too much for the finances of the colony, the colonial authorities suspended all work by the end of 1833 (Table Bay Harbour Board 1895:6).

Given the cluttered state of the Old South Jetty, shippers and merchants began to move to the site of the less clustered, but incomplete stone pier at the end of Bree Street. The new commercial quarter beginning to take shape at this location near the Amsterdam Battery made conducting trade that much more difficult, as goods now needed to be transferred from the Old South Jetty to sheds located over a mile away. In their own subtle way the Cape mercantile community was placing pressure on the government to resume work on the stone pier, which would greatly expedite business at the waterfront. Therefore, in December 1836, Colonial Secretary Lord Glenelg attained authorization to establish a commission for the first Harbour Board in Table Bay with the power to collect wharfage money, borrow money on security of charges, and most importantly, complete the stone pier (Table Bay Harbour Board 1895:6).

Col. Mitchell was placed in charge of the construction of the pier, but upon further examination of the remaining structure after three years of exposure to the elements in Table Bay instead opted for the construction of two wooden dwarf jetties, estimated at a cost of £900; work began on these new jetties in 1838. In October, 1839

the first of the dwarf jetties, the South Jetty also referred to as the South Wharf, was completed at the end of Buitenkant Street immediately to the west of the Old South Jetty.

With the promise of a new landing site at government expense, a group of private individuals raised £2,900 to purchase a tract of land and associated buildings near the whale fishery and transferred the property to the government as the site for a new wharf made of stone and timber (Soonike 1974:74). On 11 November, 1839 orders were given to begin work building the North Wharf at the end of Bree Street. The buildings purchased by the local shipping community were to be converted to Customs and Wharf Offices to augment the new commercial quarter already established in that area. A total of £2,331 10s 7d was raised for the new work, which was eventually completed in 1842 (Saitowitz et al 1993:99-100).

In the historical record the terms jetty and wharf are used interchangeably to refer to the initial works in Table Bay. A jetty can be defined as a port-related structure to get passengers and goods on and off a boat and built perpendicular to the waterline, whereas a wharf represents a similar structure built parallel or at an angle to the shore (Khan 2006:xiii-xiv). The structures built in Table Bay were primarily wooden built, which is characteristic of jetties, while stone is typically incorporated into the building of wharves. Given the curve of the bay, the North Wharf will be considered such because it was built at an angle to the shore and utilized the remnants of the stone pier abandoned in 1833 as well as timber. The Old South Jetty, South Jetty, and Central Jetty explained below, were all wooden structures and extended directly into the bay and are therefore termed jetties.

As the number of steamers making the trip to the East rose, the need for coal bunkering and storage at ports along the South African coastline became abundantly

clear. To address this situation Col. Mitchell commenced with the building of a stone pier at the eastern end of the Amsterdam Battery completed in 1844. This would eventually serve as the Coaling Pier for steamships entering the port (Table Bay Harbour Board 1895:7). Additionally, a large corrugated iron building for the storage of coal was erected near the Central Jetty, which was utilized to a greater extent than the other Coaling Jetty for the victualing of steamers in 1854 (Table Bay Harbour Board 1855:3).

With the appointment of John Montagu as Government Secretary in 1843, a new era began for the Cape Colony's public works efforts. Montagu utilized methods he adopted in Australia by improving the efficiency of convict labor and removed all obstacles to implement the program into the construction of roads and bridges (Soonike 1974:86). With the emancipation of slave labor in Britain's colonies in 1834, Montagu created a system whereby convict labor would become the staple labor force for public works in the colony. The precedent established by Montagu's Central Road Board, which was legitimized by the Legislative Council in 1843, inevitably set the stage for later use of prison labor on the future breakwater in Table Bay.

In 1844, the steady improvement of the Cape's finances led to the eventual liquidation of two decades of debt, allowing for a substantial surplus of revenue available for use within the colony. With the upsurge of roads, bridges, and tunnels through this new Central Road Board, a rising influx of agricultural produce was transported to the coast. The volume of wool shipped from Table Bay, for example, doubled from £534,377 in 1843 to £936,269 in 1844 (House of Assembly 1843, 1844). After his arrival to the Cape as the new Governor, Sir Henry Pottinger recognized that the improvement of roads

would bring no benefit to the colony if the ports of the colony remained small and under-developed.



FIGURE 4.5. Section of an 1854 map showing the locations of the South Jetty, Central Jetty, and North Wharf in Table Bay. Note the presence of boatmen in the foreground of the image at the bottom of the map (Map courtesy of City of Cape Town Environmental and Heritage Management).

Spurred by requests to develop the foreshore area between the North Wharf and the South Jetty, an 1847 survey was conducted. This resulted in another proposal set forth by Col. Mitchell for a sea wall running parallel to shore and a second wharf, which ran perpendicular to it, built in between the two existing wharves. Fishermen in the harbor would then be moved to the space between the Old South Jetty and the sea wall (Soonike 1974:103). Since the opening of the North Wharf, the site had been the main place of landing goods and because of the commercial quarter located nearby, the steady rise in commerce and the growth of the town caused high strain on the worn out wharf. Given the status of the North Wharf and with suggestions from boatmen in the bay, work on the

Central Causeway and Jetty at the bottom of Adderley Street was commenced immediately and was opened on 11 March 1850 (Figure 4.5; Soonike 1974:109).

In an effort to see this work through, Pottinger first introduced the Table Bay Improvement Bill designed to build two additional wharves at Rogge Bay. Next, he set forth the legislation for the overall port and harbor improvement in the colony, which abolished Cape Town market dues and passed Ordinance 21 for Improving the Ports, Harbors, and Roadsteads of the Colony. This was meant to encourage the export industry as well as coastal trade. Additionally, a second piece of legislation, Ordinance 11 in 1848 provided for the administrative backing for the construction of the harbor through the establishment of Boards of Commissioners for the Improvement of the Ports and Harbors in the colony. The same year, Sir Harry Smith nominated the Board for Improving the Port and Harbor of Table Bay that was given the ability to sell reclaimed land and raise money for harbor works through the collection of wharfage dues (Soonike 1974:105; Table Bay Harbour Board 1895:8). The Board provided annual reports, but due to a lack of funds focused on repairing and modifying the existing works.

Seen as temporary remedies for the pending construction of the sea wall, the jetties were not constructed in a permanent fashion. The sea wall was never built and therefore the jetties, which were not built to sustain the volume of shipping flowing through the port, were constantly in need of repair and modification to keep up with the growing demands for effective commerce. The fundamental problem facing the Harbour Board was that the colony had become a one of the largest international ports of call, but the harbor could not keep up with the rise in the number of vessels conducting trade. Furthermore, the lack of protection for vessels resulted in the continual loss of goods,

lives, and generally hindered trade within the bay. Northwesterly storms caused enough consistent damage to the wooden structures until eventually in 1853 the Old South Jetty built by Van Riebeeck was removed entirely (Table Bay Harbour Board 1895:9).

The Lighthouses

To stem the number of shipwrecks in Table Bay, Sir Rufane Donkin, who was acting as Governor for the Cape in the absence of Lord Charles Somerset, initiated a 13,400 rix-dollar lighthouse project at Green Point on the western shore of the bay facing the ocean. Upon Somerset's return, he continued with building Donkin's structure and in April 1824 the twin light was completed (Burman 1967). Designed by Col. Mitchell and built by Herman Schutte, the twin lights were housed in a 68-foot square tower. The lights were visible for thirteen miles and only used two gallons of oil per night. The beacon would eventually be replaced by a dioptric flashing light and raised to its present height of 65 feet in 1865 (*Cape Times* 1974).

During the course of the construction for the North Wharf, a further succession of shipwrecks including *Singapore*, *Mulgrave Castle*, and *Royal William* on Mouille Point indicated the ineffectiveness of the Green Point light as well as the need for another lighthouse to guide vessels away from the rocky headland of the bay (Figure 4.6). The poor construction and ineffective reflectors of the lights cast a relatively weak beam that was not visible to ships in dense weather or to those farther out to sea. Many captains could not accurately judge the distance from the Green Point light to the rocks at Mouille Point due to the weaknesses of the dual beams.



FIGURE 4.6. Image showing the wreck of the steamship *Thermopylae* (1899) on the rocks in front of the Green Point lighthouse (Cape Town Archives Repository DRJ75).

To avert further shipwrecks, the port instructions were altered to steer clear away from the rocky headland at night, which was the primary cause for wrecking on these western shores of the bay. Further efforts by Governor Sir George Napier resulted in the erection of another light at Mouille Point in July 1842 just 1,215 yards away from the one at Green Point. The new lighthouse was a pyramidal structure rising forty feet above sea level, possessing a single clear white light (Burman 1967:1). In 1908 the Mouille Point Light was decommissioned due to its redundancy after the erection of a light at the end of the breakwater.

Storms and Shipwrecks

Known to occur predominantly during the winter months, gales in Table Bay have historically been the most disastrous for shipping and were a primary concern in the creation of a harbor of refuge. The British first experienced the impact of these storm systems on 9 November 1799 when the warship HMS *Sceptre* was among fourteen vessels caught at anchor during an unexpected summer storm. After parting all cables despite using cannons to help weight the anchors down, *Sceptre* was driven broadside onto a rocky reef on the southern shore of the bay. Heavy wave action broke the ship apart and by the end of the night *Sceptre* had become a total wreck. All 349 sailors and soldiers perished in the event, their bodies found lying amongst the wreckage (Wilmot 1869:217).

Another uncharacteristic summer storm in 1842, deemed a hurricane, further decimated shipping in the bay. Four vessels were wrecked along with numerous commercial boats, such as whale boats and surfboats, which had been employed to take extra cables to the distressed ships (*Cape of Good Hope & Port of Natal Shipping and Mercantile Gazette* 1846). This event also incurred the catastrophic loss of the convict vessel *Waterloo* whereby 143 convicts, 15 soldiers, 14 sailors, 4 women, and 14 children all perished within sight of the shore (*South African Commercial Advertiser* 1842). Fishing boats and boatmen provided 90 of the *Waterloo*'s passengers with enough line to make it to safety. One common factor in all accounts of storms in the bay was the presence and fortitude of the boatmen who braved the storms to rescue crews and bring aid to vessels in need. Many newspapers lamented the lack of a suitable launch for these small craft, which primarily set out from the overcrowded North Wharf, but argued that

without the boatmen there would be a much greater risk to shipping in the bay (*Cape Argus* 1857a; 1857b; 1857c; 1857d).

The utilization of boatmen during severe storms has two ramifications for the perception of risk in the historical record. First, there would be an increase in the number of vessels grounded or wrecked if no cables or anchors could be brought out when their cables parted in the high seas. While the boatmen not only served to transfer cargo to the port, they also were on call and rendered aid when needed and acted as a kind of unofficial life-saving service for the harbor. The boatmen were known to get alongside grounded vessels and take crews to safety during storms, which accounts for the generally low average loss of life attributed to wrecking events in the bay. Cape historian George Theal (1964:199) describes how the "boatmen of Table bay, whose skills were utilized on a daily basis, enjoyed the reputation of being among the best in the world due to their feats in conveying anchors and cables to distressed ships in winter storms." The *Argus* stated that during violent gales the boatmen are "a fine set of fellows and deserve every penny they get," likely not knowing that the many volunteered their services (*Argus* 1857b). Further examination of the Port Office records will shed more detail on the boatmen who played such a vital role to the safety of Cape Town's early harbor.

Despite these efforts, from 1853 to 1859, the Table Bay Harbour Board (1895:10) reported an estimated loss of £138,000 with an average of £23,000 annually in Table Bay. The wrecking of six ships in an 1822 northerly storm had prompted a survey of the harbor by William W. Bird and a flurry of proposals for a harbor of refuge, none of which would ultimately be adopted (Bird 1822; Knox 1830; Soonike 1974:37). A report submitted to the Table Bay Harbour Board and Municipality of Cape Town by Mr. Scott

Tucker in 1854, highlighted the contemporary state of affairs at the port of Cape Town (Table Bay Harbour Board 1854). Mr. Tucker emphasized that:

> The present evils attending the exposed condition of the Bay are so great, and glaringly at variance with the demands of the age, that security was to be gained at all hazards, in order that the growing trade of the Colony should be effectually protected; as also that that which daily passes its threshold, from between Europe and the East, should be invited *at all seasons*, by the offer of certain security, for the purpose of receiving Repairs or Supplies, instead of being driven, as at present, for nearly four months in the year, by the terror and inhospitability of its coasts, to more distant and inferior Ports (CCP 1/2/1/1 A10:1).

Another major storm struck in 1857 where one-third of the total shipping in the bay was beached with a loss of £25,000, most of which derived from the Port Offices. The same year Lloyd's of London blacklisted the harbor by refusing to insure any vessels wintering in Table Bay (*Cape Argus* 1857a). The editors of the *Cape Argus* (1857a) noted, "this great misfortune falls annually upon us, and that although we may easily calculate upon each occasion the direct loss inflicted, that which we can sustain indirectly by the large amount of shipping, which passes by without calling, in the winter, is quite incalculable, and certainly far exceeds the other amount." The damage referred to is that of the area's negative reputation as the 'Bay of Storms' where the perception of the international shipping community was that at any moment a major storm could occur in

Table Bay and cause significant harm to any vessel in the unprotected harbor. This harmful perception caused much of the potential trade opportunities to be lost by the port.



FIGURE 4.7. Photograph of the destructive force to shipping in Table Bay caused by the historic Great Gale in 1865 (Cape Town Archives Repository E3411).

The greatest and most devastating storm in the maritime history of Cape Town began on the 16 May, 1865. After a long, hot dry spell typical of late summer months, the weather began to drastically shift as winds and rains fell on the bay. By the morning of 17 May, the system had transformed into a tremendous gale with fierce winds blowing across the bay making the water like a sheet of foam tossing ships around their moorings. In the course of the day 18 of the 28 ocean-going vessels along with 30 cutters and small boats were wrecked or stranded on the beach (*Argus* 1865a; *Cape Town Gazette and Mercantile Advisor* 1865). Included in the wrecking were the Royal Mail Steamship

Athens and the barque *City of Peterborough*, both of which were completely destroyed with all hands lost (Figure 4.7; *Argus* 1865a, 1865b, 1865c; 1865e). Surfboats began running anchors to the distressed vessels, but eventually the trips became too dangerous. In total only sixty lives were lost, but the damage to the vessels, their cargoes and the perception of the harbor's safety was insurmountable.

Coal, Mail and the Rise of Steam

A new sense of urgency for the construction of suitable harbor facilities was placed upon the shipping community in Table Bay with the arrival of SS *Enterprise* in 1825, the first steamship to enter Table Bay. This marked the beginning of the steamship era at the Cape, which heralded the arrival of vessels with increased tonnage and deeper draught (Murray 1933:4). Cape Town's role as the primary port of call for these steamships necessitated the construction of coal bunkering and storage to replenish vessels making voyages past the Cape. This was of primary concern for the Cape government, and therfore a corrugated iron warehouse was constructed near the Central Jetty in 1854 (Veitch 1994:44). The provision of coal would have major impacts on the development and selection of harbor works as the harbor developed in the latter half of the 19th century.

As steamers became increasingly common, the British used them for the expedited communication with the far corners of the Empire. In the Cape Colony from as early as 1836 coasting steamships belonging to the Cape of Good Hope Steam Navigation Company and later Phoenix Navigation Company operated a mail service between Cape Town and Port Elizabeth (Murray 1933:11-13). By 1851 the arrival of *Bosphorus* inaugurated the new international mail service from London to Cape Town,

which was facilitated by steamships belonging to the General Screw Steam Shipping Company. This service collapsed after four years but was quickly picked up by the Union Steam Collier Company or Union Line in 1853 (Murray 1933:16).

Competition with the Union Line for its monopoly on the passenger-mail service began ten years after its inception with the establishment of Donald Currie's Castle Line. In the hopes of gaining the sole mail contract with the Cape, the Union and Castle Lines engaged in a fierce rivalry to progressively build larger and faster steamships. These vessels were pushed to the limit, which caused excessive wear and tear on the men and machinery, resulting in increased risks for both after several voyages. In 1900 the renewal of the British-South African mail contract called for a single carrier and rather than continue the decades-long rivalry, the Union and Castle Lines merged into a single fleet of 39 vessels under the Union-Castle Line (Murray 1953:178; Newell 1963:91). The mail service to the Cape was an essential factor in the construction of the harbor. While Port Elizabeth, Durban, and East London harbors lagged behind, Cape Town's harbor faced the responsibility for accommodating the rise in larger ocean-going steamships (Newall 1999b:21). This unsatisfactory situation placed a constraint on the passenger-mail lines and put substantial pressure on the Harbour Board in Table Bay by the end of the century.

The Breakwater and Alfred Basin

Harbor surveyor, J. Scott Tucker argued that any serious proposal for construction of a harbor in Table Bay had to satisfy at least three primary requirements. The first requirement called for the facilitation of protection for shipping from ocean swells and an uninterrupted communication with the shore. Since Table Bay was the chief port of the

colony, the lack of protection from northwesterly seas as well as southeasterly winds not only caused the frequent destruction of ships at anchor but also on the small boats that were compulsory to the trade of the port. These smaller craft were much more susceptible to the dangerous seas. Even the southeasterly offshore winds experienced during the relatively benign summer months oftentimes escalated and caused adverse conditions for shipping operations between the shore and the roadstead, which needed to be mitigated.

The second condition was that a means of landing and shipping goods at all times without the intervention of the costly cargo boats and boatmen were needed. The necessity of lighters and other small boats limited the trading potential of the harbor by causing frequent delays due to the time necessary to convey all cargo to and from the three jetties. The jetties themselves were too small and ineffective at loading and unloading the cargo with limited crane capacity and strength. Lastly, an independent shelter was needed for the local fishing and other small craft that were not in immediate service to the port or ships in the anchorage, but still contributed to the economy of the city (Table Bay Harbour Board 1854:2).

In May 1855, the Committee of the House of Assembly decided to take a new direction for the harbor and consulted with Captain James Vetch, the Royal Ensign and Harbor Surveyor to the Admiralty. Vetch suggested that more elaborate docks should be constructed comprising of an inner and outer harbor with a breakwater near the site of the Chavonnes Battery. In 1858, Act 20 was passed that awarded the Cape Government an Imperial grant amounting to £200,000 for expenditure on a new breakwater. Vetch's plan was estimated to be too costly to the Cape Government, so a second opinion was sought from Mr. John Coode, regarded as the foremost harbor engineer in England. Coode was

consulted and eventually selected as the engineer-in-chief to revise Vetch's expensive plans (Table Bay Harbour Board 1859). Accordingly, in 1860 Coode submitted a revised harbor scheme at an estimated cost of £396,475. This plan would be built under the auspices of the Table Bay Dock and Breakwater Management Commission formed that same year (Figure 4.8; Table Bay Harbour Board 1860a).

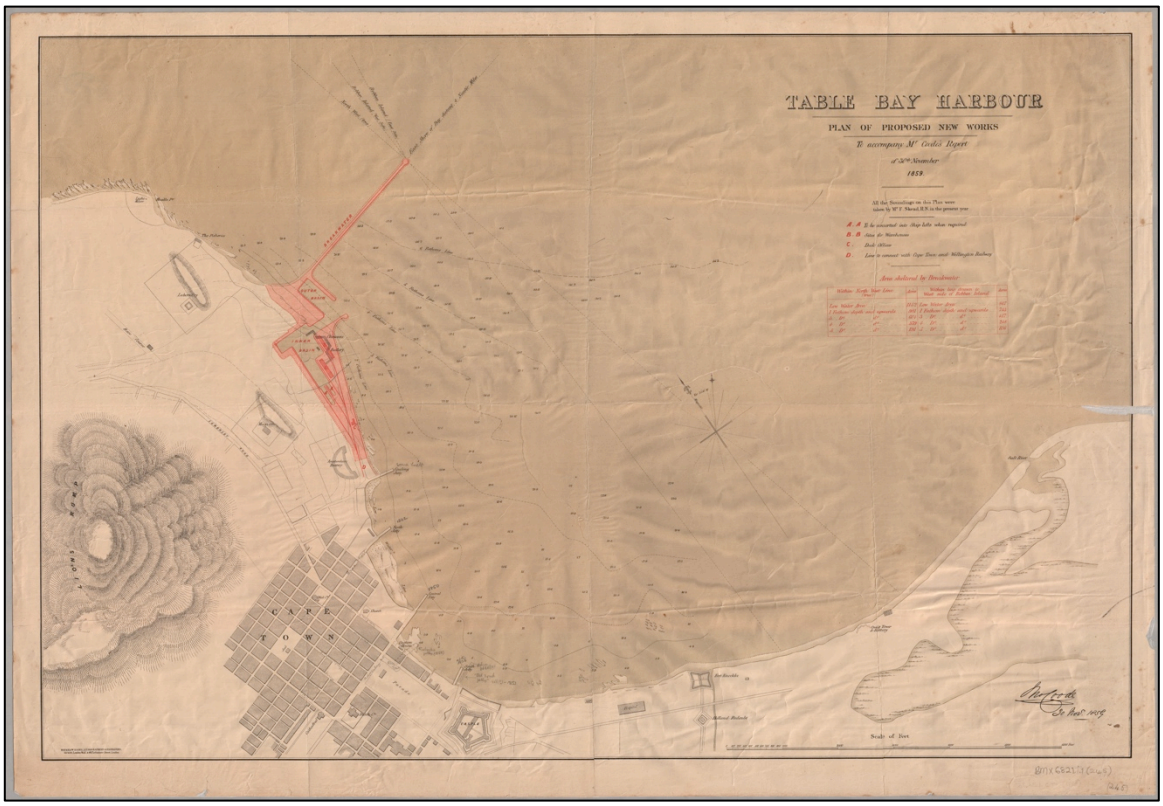


FIGURE 4.8. Plan submitted by Sir John Coode in 1859 for the proposed harbor of refuge in Table Bay (Map courtesy of the University of Cape Town African Studies Department).

The cost for the work was defrayed through the use of convict labor, which had shown its effectiveness in Montagu's schemes of road and bridges construction throughout the colony. With previous suggestions for the use of convicts from Britain and Australia for the potential construction of harbor schemes and other public works projects, the populace at Cape Town expressed their vehement reservations about

introducing large numbers of foreign convicts to the Cape. These sentiments resulted in the public boycott and protest of the convict ship *Neptune* from landing in Cape Town, forcing the vessel to wait in the roadstead rather than calling to shore (Veitch 1994:40). The colonists did not want the Cape turned into a penal colony. Therefore, for the construction of Coode's proposed harbor of refuge, local Cape convicts and native labor were exploited instead.

In 1859 the Breakwater Prison was built to house the convicts that would work on the harbor in Table Bay. With the later introduction of a larger number of natives to the labor force, such as workers from Delagoa Bay, separate barracks were also used (Table Bay Harbour Board 1881). A study by Deacon (1989:16) demonstrated how the British legal structure incorporated the indigenous African and Khoisan populations in a way that coerced these people into a system of state-controlled labor that formed a wage-dependent working class. The prison system sanctioned this control, and with the rise in the capitalist economy associated with increases in merchant mining capital further contributed to production and control of a division between the white and black population at the Cape (Deacon 1989:48 Worger 2004:71).

While the majority of prisoners at the Breakwater Prison throughout the construction of the harbor were black, the number of white convicts generally increased between 1881 and 1886 with the rise in illegal diamond buying in the interior. The workload for these convicts was strict and they were required to work in the quarry from 0600 to 1700 every day, except Sundays (Newall 1993:11). For those who misbehaved, the use of a never-ending staircase or treadmill was used as a form of punishment, which currently remains on display at its original location.

On 17 September 1860 H.R.H. Prince Alfred inaugurated construction of the breakwater by tipping the first load of stones into the water (Peterson 1980:34). Over 400 Cape convicts were put to work excavating the rocky shores near the Chavonnes Battery to create an enclosed basin of almost ten and a half acres, the sides of which would form quays amounting to 4,075 acres in landing space equipped with cranes and railways to facilitate the improved movement of goods from the wharves. The shape of this basin followed the natural line of the shore, which explains the narrowing of the basin's southern extremity (Peterson 1980:37).

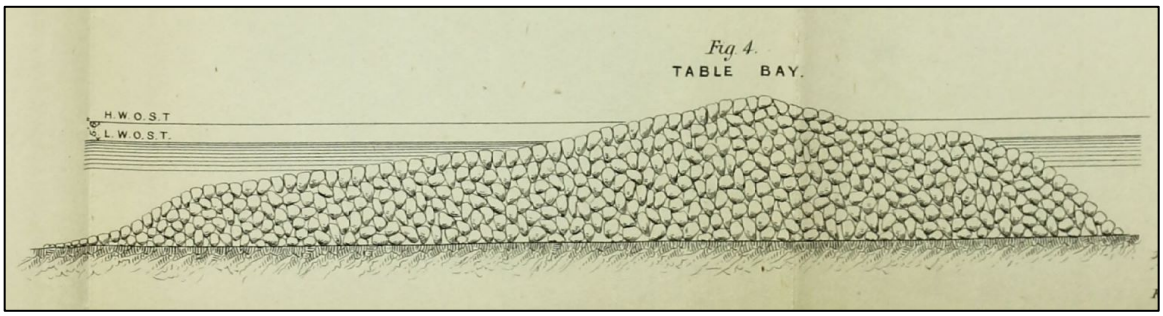


FIGURE 4.9. Cross-section of the Table Bay rubble mound breakwater with high and low water tidal ranges shown (Vernon-Harcourt 1885:Plate 6).

The breakwater itself constituted a rubble mound originally formed from the stone excavated in the basin, which was supplemented by the stone obtained from a quarry at the bottom of Signal Hill and from further excavations on Harbour Board property (Figure 4.9). It was begun 1,100 feet northwest of the Chavonnes Battery and was planned to run 3,250 feet in a northeasterly direction into the bay, which would protect 867 acres of water from the northwest winds (Table Bay Harbour Board 1860). A shortage of rubble from the basin excavations temporarily halted the work at 1900 feet at five fathoms of water.

By 1865, the onset of one of the worst storms in the history of the colony reiterated the necessity of completing the harbor breakwater. Seven staging bays were swept from the work and several more were significantly damaged. Furthermore, 270 feet of the breakwater bank was levelled and 60,000 tons of stone had shifted from the heavy swells. Repairs from this single storm cost £3,000 and took six months to complete (Vernon-Harcourt 1885:204). Despite the damage dealt to it, this storm as well as others in 1870 and 1878 actually revealed some positive effects on the constitution of the breakwater as the rubble compacted and a natural slope was formed on the seaward side from the wave-driven accumulation of sediment (Table Bay Harbour Board 1865; 1871; 1879).

While the effect of the gales reinforced the decision for a rubble mound breakwater, the length originally proposed did not adequately protect a large enough area. In 1878 Sir John Coode once again proposed a plan for extending the breakwater at a northeasterly bend to shield the southeastern shores from northwesterly and northerly winds (Vernon-Harcourt 1885:204). Excavations in the Harbour Board quarry provided stone for the harbor works and sediment used in land reclamation for quay space along the breakwater. As the Outer Harbor docks developed, the breakwater extension was continued until after 1903 with the addition of a capping wall. This wall provided a backbone to further protect the breakwater against the higher seas experienced in the bay and lessened the amount of material needed for maintenance (Table Bay Harbour Board 1904).

The cofferdam holding the water from entering the enclosed Alfred Basin was removed in 1869 and the harbor was officially opened for world shipping on 17 May

1870. Dubbed the Alfred Basin, the harbor was formally inaugurated by H.R.H. Duke of Edinburgh on 11 July. The total amount of rock and soil moved for the works was approximately 1,082,782 cubic yards, with 115, 580 tons supplied to ships as ballast, while the total capital for the harbor expended amounted to about £389,736 (Table Bay Harbour Board 1871). The finished harbor at this point consisted of an Outer Harbor with the main Breakwater and attached East Jetty; an Inner Harbor with warehouses, and Alfred Basin composed of an East, North and West Quay. Furthermore, a road was built that connected the docks with the sheds and approaches to the North Wharf and Central Jetty and the South Jetty (Table Bay Harbour Board 1871).

Fishing and Whaling

Fishing was a staple occupation for many people within the maritime community of Table Bay. The Cape Malay population developed as the preeminent fishermen during the 18th and early 19th centuries and would launch small fishing craft from the fishing grounds to local catchment areas in Milnerton, Hout Bay around the Peninsula, and along the rocky shores of Robben Island (Veitch 1994:52). In small watercraft measuring 5 to 8 meters in length, and 2 meters in beam, fishermen would typically stick close to the coast and employ techniques known as Trek fishing, where nets would be used from the beach along with some line and stake net fishing. Fish such as snoek and yellowtail were commonly found, providing as essential part of the diet for many living along the coast.

While Cape Town was the fishing center at the Cape, it remained a small operation limited to small businesses that employed other men's slaves as crews. Similar to the business of boatmen in the early part of the century, fishing provided an opportunity for the marginalized classes of society to make a living on the waterfront. In

the early 19th century there were approximately 40 boats utilized for fishing purposes, with this number increasing to over 400 boats and 2,500 fishermen by 1900 (Figure 4.10; Veitch 1994:52). Sealing and whaling activities were also carried out in the bay as early as 1604. By 1822 there were seven whale fisheries along the Cape, two of which were located in Table Bay.



FIGURE 4.10. Postcard dating to 1912 with a depiction of the locally utilized fishing harbor (Kerham 2005).

Traditionally, the fish market at Rogge Bay was the center of fishing activity. In his report to the Harbour Board, Tucker noted the need for protecting these fishing activities that were a major component of maritime culture in Cape Town (Table Bay Harbour Board 1854:2). The fishing beach at Rogge Bay underwent several modifications with the development of the harbor, but was eventually covered up with

land reclamation projects by the end of harbor construction. Nevertheless, the fishing industry in Cape Town was an important part of the cultural landscape of the city and characterized the local utilization of the harbor during the 19th century.

Repair Facilities

As a port of call for outward and homeward bound ships making the arduous voyage to the Indies, Cape Town was a constant stop for disabled vessels along with vessels awaiting instructions from home. Cape Town's role as a refreshment outpost naturally obliged any new harbor to also contain ship repair facilities. Coode's original plans for a harbor called for a Patent Slipway for ship repairs as well as a separate dry dock for larger vessels. By 1867 a slip was completed by De Pass, Spence & Co. outside of the harbor, likely near the spot of the previous repair yard by Muntingh's whale fishery, but was later moved to the narrower southeastern end of the Alfred Basin in 1870. The Patent Slip was in continuous use throughout the year and a cradle was added to it in 1875 to facilitate easier repairs (Table Bay Harbour Board 1876).

Evidenced by the number of vessels using the Slip, in 1875 work began excavating land on the southwestern corner of the Alfred Basin for a dry dock capable of housing vessels with deeper draught. The excavations for dry dock provided much of the stone used in the Breakwater extension as well as land reclamation for the Outer Harbor. Granite from a Paarl quarry was used to step the sides of the 530 foot-long work with a width of 90 feet at its coping, and 38 feet at the bottom (Table Bay Harbour Board 1883). Officially opened on 20 October 1882, and named after Governor of the Cape, Sir Hercules Robinson, the Dry Dock demonstrated the improved opportunity for carrying

out repairs by inaugurating its completion with the repair of the 3877 ton RMS *Athenian* of the Union Steamship Company.

Both works were continuously used throughout the course of the year with the Graving Dock filled 109 days by 15 vessels totaling 18,568 tons in its first year (Table Bay Harbour Board 1883). In some years the Graving Dock saw upwards of 40 different vessels. The Patent Slip was then used for smaller tonnage vessels, but ranged from 16 to over 20 vessels repaired annually. With Cape Town situated at a crossroads of trade, the risks of long voyages were at least partially alleviated by the presence of these facilities to outfit any necessary repairs or modifications when necessary.

Diamonds and Gold

The Alfred Basin was completed just prior to a major transformation in South Africa's economy due to the 1866 discovery of diamonds along the Orange and Vaal Rivers in Griqualand (Table Bay Harbour Board 1873). In the early half of the 19th century, products such as wine, wheat, barley and oats had led the Cape's export industry. After the arrival of the 1820 Settlers, the growth of the pastoral herding of woolen sheep in the Eastern Province had grown to such an extent that the volume of wool traded at Rogge Bay vastly increased between 1832 and 1839 (Soonike 1974:55). By 1850 wool had increased from 0.7% of the total exports from the colony to 44.8%.

The discovery of diamonds, however, prompted an influx of international and local interest. Soon, mining towns were installed away from the rivers and established at Vooruitzigt, a farm owned by Johannes Nicholaas De Beers. The mining locations on the farm were assumed by the British and by 1873 the newly established town of Kimberley was the second largest in southern Africa (Meredith 2008:34). In April of 1880 Cecil

John Rhodes consolidated several joint-stock companies controlling the mining industry that would later develop into the De Beers Consolidated Mining Company. Nearly ten years later De Beers oversaw a monopoly over the Kimberley mines, nearly 90 percent of the world's diamond production, making it one of the most powerful companies in the world located in Southern Africa (Meredith 2008:162).

In 1884 the first discovery of gold was made on a barren stretch of Highveld in the Transvaal named Witwatersrand, or Ridge of White Waters. Similar to the diamond rush, a flood of prospectors and small joint-investment companies were initially established, but were later supplanted by larger magnates such as Rhodes and J.B. Robinson. South Africa continued to produce gold throughout the century with the exports eclipsing that of diamonds by the turn of the century with over £15 million worth of gold produced in 1898 (Union-Castle 1903:6).

Diamond and gold mining stimulated new markets in the interior and the mining industry created new opportunities for employment as well as the prospect of riches for many travelers and fortune hunters from across the globe (Muller 1969:204). The Union-Castle Steamship Company advertised for travelers to the 'Sunny Cape' stating that "this 'Cinderella' of the Empire stood by its 'Stormy Cape' neglected and almost ignored…[but through the discovery of diamonds and gold] was uplifted, in a day, from obscurity into universal notice, while its destiny was advanced hundreds of years at a bound" (Union-Castle 1903:5). The mining industry provided the assurance of a continuous influx of ships entering Table Bay, and fuelled industrial expansion within the colony despite the opening of the Suez Canal the same year gold was discovered in 1886.

Victoria Basin

As evidenced from several gales rivaling the intensity of the historic Gale of 1865 the Breakwater afforded the necessary protection for vessels in the bay, but the risks associated with the harbor shifted to concerns of the exponentially rising maritime commerce. The existing works in the harbor were consistently inadequate for the extent of shipping in the harbor. During this time, material excavated at the site of the Chavonnes Battery along with excavations at the Graving Dock were used for the first extensive land reclamation projects along the breakwater to make room for additional quay space. To compensate for the number of steamships entering the bay, a new Breakwater Jetty was completed above the East Jetty in 1880 equipped with a shed capable of storing 2,000 tons of coal (Table Bay Harbour Board 1879). The new jetty was built specifically for the provisioning of coal and therefore the locus of steam traffic shifted from the site of the old Coaling Jetty near the Amsterdam Battery to the current Breakwater Jetty within the confines of the Outer Harbor.

With the reclamation of land along the East Jetty, moorings were then laid within the breakwater to enable vessels to be moored stem to stern along the southern end of the work, further increasing the ability to conduct trade (Table Bay Harbour Board 1881). This new quay between East and Breakwater Jetties allowed for accommodation of large steamers. In 1877 a new coal store was placed on the East Jetty capable of housing 1350 tons while alterations were made to the Coaling Jetty along the breakwater to accommodate vessels with side coaling ports (Table Bay Harbour Board 1878; 1885). By 1883 plans were made to further augment the coaling of steamers by constructing a jetty

for the provision of colliers, or bulk cargo ships designed to carry coal. This jetty would not be completed until 1903 (Table Bay Harbour Board 1904).

Supplemental improvements to the harbor at this time included an 1881 contract with the South African Dynamo-Electric Light and Brush Company, which illuminated the harbor with 22 electric lamps to minimize the number of accidents occurring with vessels working at night. Furthermore, a Clock Tower was built and synced with the Royal Observatory. This allowed for a more regulated workday and for dock workers to utilize the tower's self-recording tide gauge to more accurately record tidal change throughout the day (Table Bay Harbour Board 1883; 1883). The land between the Amsterdam Battery and the North Wharf, which had been ultimately abandoned commercially, was covered up during additional reclamation deposits. The old Fishing Jetty at Rogge Bay was displaced by the land filling, and so a retaining wall was placed along the shore and a fish landing for salting and drying fish was established in 1884. The beach alongside the jetty was allocated for fishermen and local boating purposes (Table Bay Harbour Board 1885).

In 1880 Coode conceived plans to widen the Outer Harbor by enclosing it with a new South Pier parallel to the Breakwater increasing the area of the harbor from 44 to 62 acres (Figure 4.11; Table Bay Harbour Board 1883). An East Pier with quay space on its inner face and rubble mound on its seaward face was commenced in 1889 perpendicular to the breakwater. This new work was completed in 1902 and sheltered the innermost jetties of the Outer Harbor (Table Bay Harbour Board 1903). To further compensate for vessels of deeper draught that were visiting the harbor on a frequent basis, a jetty was also built 220 feet between the Breakwater Jetty and the East Pier. Due to the activity of

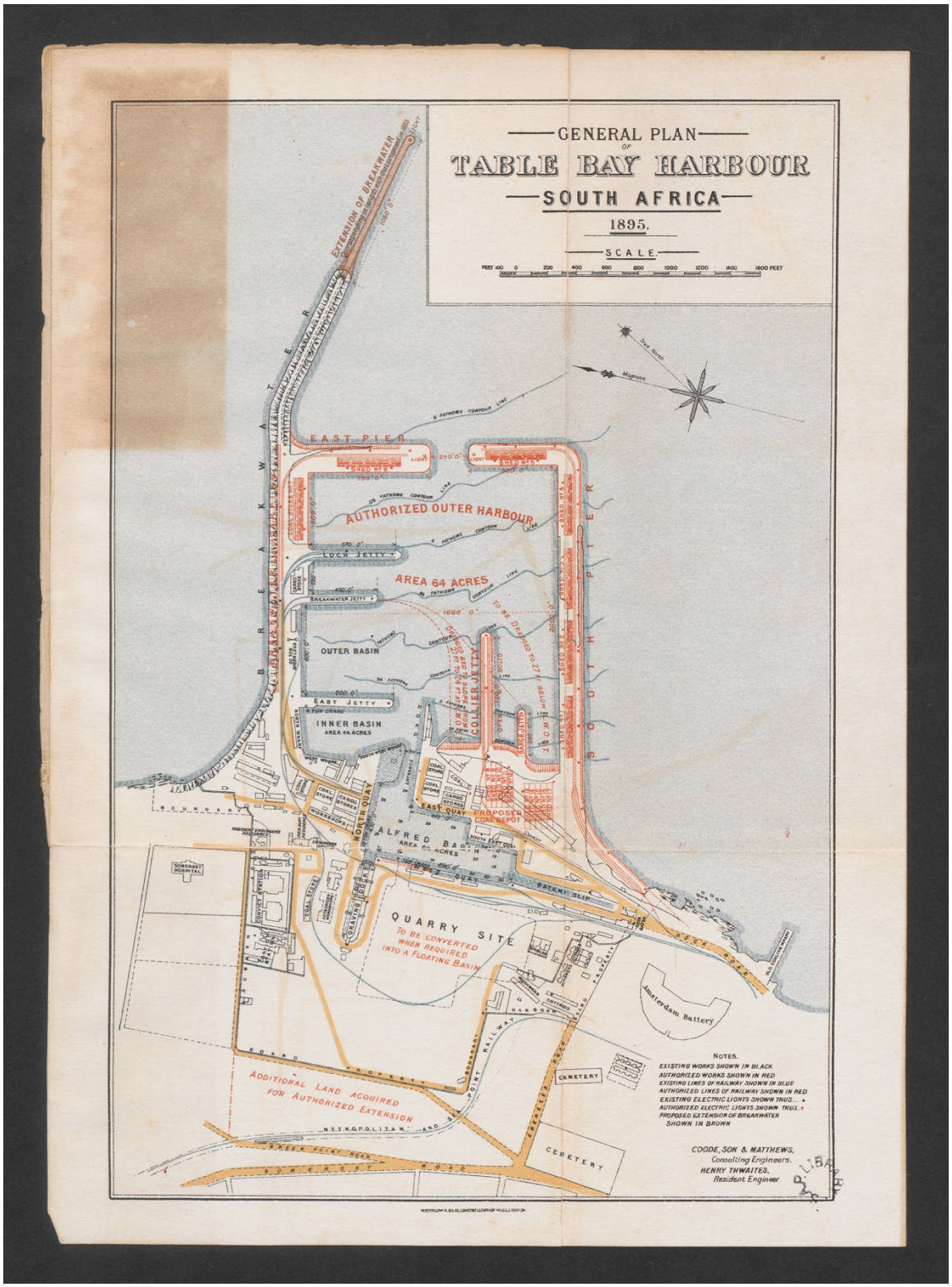


FIGURE 4.11. Detailed map showing the existing Outer Harbor, Inner Harbor and Alfred Basin with the proposed new works to enclose the Outer Harbor outlined in red (Map courtesy of the National Library of South Africa, AZ1984-10).

marine worms and the danger of fire with wooden structures, the Loch Jetty, named after Sir Henry Loch, was made of iron (CCP 1/2/1/77 G30 1890). The South Pier was extended from its original proposed length and included a western facing elbow that faced the East Pier. It was completed just prior to the onset of the Second Anglo-Boer War in 1899.

Hostilities between the British the Dutch settlers, who had formed independent republics in the interior of the colony, rose throughout the course of the 19th century. These tensions mounted following the discovery of gold in the independent Republic of Transvaal, which had begun to make the Vaal an economic hub of the colony (Nasson 2010:25). The imperial eye of Britain was never far from these developments and following events such as the failed attempt at usurping the independence of the Transvaal of President Kruger by Leander Starr Jameson in 1895, the spark had ignited and one of Britain's most extensive wars ensued. With the possibility of war looming over the head of the British colony, shipping traffic in Table Bay once again took a significant leap.

During the two-and-half year war ships moored along the newly built South Pier were at times double or triple banked with more than 50 vessels anchored in the bay at any given time (Figure 4.12). Cape Town was the only harbor in Southern Africa that was capable of landing troops and equipment directly onto the quayside and with over 609,000 troops, 1.4 million horses, and over 1,000 mules shipped, the harbor was incessantly congested (Newall 1999a:2). For locals the effects of the war were further augmented by the Royal Navy and Army seizing control of the sheds and warehouse, which further hindered trade within the harbor (Table Bay Harbour Board 1904).

By the turn of the century, the town's tramway was extending into the docks in an attempt to better facilitate the transport of passengers and cargoes with the large numbers of people entering the bay due to the wartime activity (Table Bay Harbour Board 1898). Any additional developments within the harbor had to be forestalled until the cessation of hostilities in 1902. In the meantime the harbor continued to be distinguished by its congested moorings and crowded roadstead.



FIGURE 4.12. Photograph showing the crowded state of the harbor during the Second Anglo-Boer War (Photo courtesy of the National Library of South Africa, PHA 5058).

Following the war, work on the harbor was able to resume as the number of vessels entering the anchorage dropped slightly. Additional warehouses were built in 1904 and 1905 as the number of vessels conducting trade and the bulk cargoes now being shipped necessitated additional storage space. A cold storage warehouse for the stowing of fruit bound for Australia was built in 1902 (Table Bay Harbour Board 1903). The

facilitation of produce transport had become a rising industry at the Cape Town harbor, but it would not be until the formation of the Union of South Africa and the South African Railways and Harbor Administration in 1910 that any further improvements to the harbor took place (Figure 4.13).

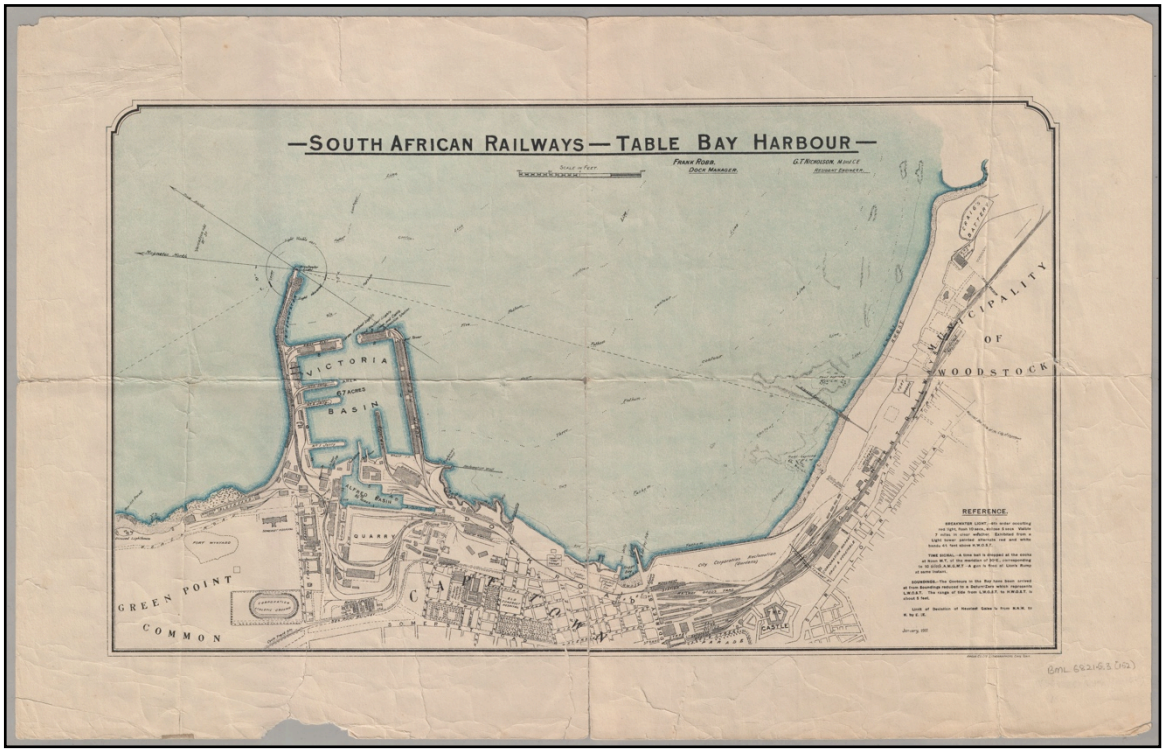


FIGURE 4.13. Map designed by the South African Railways and Harbor Administration showing the state of Table Bay's harbor in 1911 following the formation of the Union of South Africa (Map courtesy of the University of Cape Town African Studies Department).

Conclusion

This chapter outlined the development of Cape Town's harbor and demonstrated how risk is evident in the historical record of the harbor. The various elements of Cape Town's history that influenced the decision-making process of Cape Officials to carry out harbor modification schemes were outlined. Two underlying themes permeate the historical record of Table Bay: 1) the protection of ships at anchor in the bay, and 2) the

safe and effective loading and unloading of cargo and passengers. Early developments were largely influenced by the economic status of the colony and the overbearing influence placed upon the Cape's finances by the Imperial Government. As a result, harbor works were minimal and the trade carried out in the bay was hindered by the corresponding lack of infrastructure.

This resulted in the frequent loss of ships and goods to severe storms in addition to the ineffective transaction between vessels calling at the port and Cape Town's shipping community. Later developments alleviated the risks of using the bay by affording adequate protection, but the harbor never fully achieved the ability to keep up with the demands of shipping carried out in the Bay. Therefore, harbor developments in the latter half of the 1800s were characterized by increasing the commercial infrastructure of the port over the risk associated with shipwrecks and the loss of cargoes in the bay.

Using data and themes derived from the historical record, a better picture of the maritime cultural landscape of risk can be understood. By combining this information with archaeological, natural and environmental data a holistic conception of risk in Table Bay is revealed. The following chapter will outline the environmental influences of the bay and discuss how these natural processes may affect cultural material and how the cultural material influences the natural features of the bay.

CHAPTER FIVE: THE BAY THAT SHAPED THE HARBOR AND THE HARBOR THAT SHAPED THE BAY

Introduction

Despite the preeminence of the Cape route in world maritime commerce, the turbulent geographical nature of the Southern Cape coastline has caused major problems for shipping throughout the centuries and has hindered the overall development of harbors and ports in South Africa. It has been suggested that a landscape approach is particularly relevant to archaeology through its ability to facilitate the recognition and evaluation of the dynamic, interdependent relationships that people maintain with the physical, social, and cultural dimensions of their environments across space and time (Anschuetz et al 2001:159). While the landscape is not necessarily synonymous with environment, the natural features of an area have a distinct impact on how people use and perceive the space that they occupy, and is therefore a key determining variable in the construction of a cultural landscape.

This chapter will examine the relationship between the environment of Table Bay and the construction of the maritime cultural landscape of risk in Cape Town. It is ultimately argued that the development of the harbor was a cognitive reaction or behavioral response influenced primarily by the natural environment of Table Bay. These responses have actively shaped the cultural and physical landscape of the harbor, and are reflected within the natural and archaeological record of Cape Town. The natural environment of the Cape of Good Hope has had a profound influence on how people have utilized Table Bay as a landing site, port of call, and harbor of refuge while

correspondingly, that interaction has had a significant impact on the physical environment of the Bay itself.



FIGURE 5.1. Satellite imagery of Table Bay with the major areas of development labeled (Image by author, 2014).

General Landscape of Table Bay

Table Bay is a shallow bay located just north of the Cape Peninsula in South Africa's Western Cape Province. The longitudinal boundaries of the bay run from approximately 33°45'S at the rocky headlands to the north of Blaauwbergstrand to 33°55'S off Mouille Point. The bay is bounded laterally by the Atlantic Ocean to the west

at 18°21'E and by the sandy beaches of Milnerton, Blaauwberg and Paarden Eiland to the east at 18°29'E (Figure 5.1). Robben Island marks the northwestern perimeter of Table Bay and is located at approximately 33°48'S and 18°22E, which is 9.5 km north of Mouille Point and 7 km west of Blaauwbergstrand. The island takes up about 6.8sq km, while the total surface area of the bay encompasses approximately 100sq km (Werz 2003:13). Approximately 2 km south of Robben Island there is a rock formation known as Whale Rock, which has historically been marked on navigational charts as a major shipping hazard.

Along the eastern shores of Table Bay, numerous industrial and population centers form the present-day greater Cape Town area. Starting north and running south these include Blaauwberg, Rietvlei, Milnerton and the industrial center at Paarden Eiland. From Paarden Eiland the bay runs in a westerly direction along the modern harbor, the central business district, turning northwards at the current Victoria & Alfred Waterfront, through Granger Bay, and ending at Mouille Point and Green Point. Overall, the planimetric shape of the bay resembles a negative or anticlockwise log-spiral curve (McLachlan 1991:8).

The most significant rivers that empty out into Table Bay are the Diep and Salt Rivers. At the time of Van Riebeeck's 1651 landing at the Cape, the Diep River entered the sea through two mouths. The first was approximately 3 km south of its present location and the other even farther south near the site of the current Salt River mouth. These two openings effectively cut off Paarden Eiland from the shoreline and created a marshland that separated the eastern shoreline from the city of Cape Town (Figure 5.2). The contemporary Salt River also enters the bay approximately 3km north of its old

natural mouth (Grindley and Dudley 1988:2-4). Since 1786 both rivers have undergone extensive silting. The total sediment yield into the bay for the Diep has been estimated to be about 41,000 cubic meters annually (Smith et al 2001:2826). At present, the discharge from the Salt River is negligible compared to the Diep River. This, in combination with effects of 20th century harbor construction has led to the degradation of the two rivers whereby Paarden Eiland is no longer separate from the mainland.



FIGURE 5.2. Lithograph by Thomas Bowler showing a view looking north towards Blaauwberg through the Salt River marshland in the nineteenth century (Brown 1955:Plate 34).

Originally, the Diep River flowed through an estuary called Rietvlei. The latter name is still used, but currently describes an area that was artificially created through the dredging of a wetland for construction of the Ben Schoeman Dock in the 1970s (Durden 1992:4). The river now enters the bay through the Milnerton Lagoon. Both the Salt and

Diep Rivers underwent significant changes throughout the history of Table Bay, chiefly due to the 19th and 20th century harbor developments. These artificial constructions in combination with other natural variables such as the dominant wave action and sediment distribution patterns discussed below, makes this section of the coast susceptible to an increased amount of erosion, which affects the physical landscape of the eastern sections of the bay significantly (Smith et al 2001:2828).

Geomorphology

The onshore and offshore bedrock of Table Bay consists of two prominent rock types. The first is Malmesbury Group pelitic (very fine-grained) and semi-pelitic rocks mainly including shales (mudstone), hornfels (metamorphosized mudstone), and greywackes (sandstone rich rock fragments). These Malmesbury rocks are thought to be the dominant source of clay materials found in the Milnerton Lagoon area. Southwest of the Sea Point contact at latitude 33°54.5'S, Cape Granite intrudes into the Malmesbury formation and is predominant from this position southwards. Pedogenic or calcite rich materials like calcrete also occur within the bay (Woodborne 1982:8; McLachlan 1991:8; Durden 1992:7).

Sediment Movement and Distribution

Table Bay has large areas of exposed bedrock and the distribution of sediment in the bay appears to be controlled by a combination of these bedrock features and wind-driven currents. As evidenced by the integration of Paarden Eiland to the shoreline since the mid-19th century, the beaches in the bay are in a constant state of dynamic flux. Therefore, the movement of sediment within the bay is incredibly important to the physical landscape of Cape Town. In general, sediment transportation cycles in a

northerly direction as a result of the predominant wind-induced southwesterly swells. Originating on the littoral drift, these waves strike the shore at an oblique angle and are responsible for the increased generation of longshore currents. This causes the net movement of about 19,000 cubic meters of sediment annually (Woodborne 1983:272).

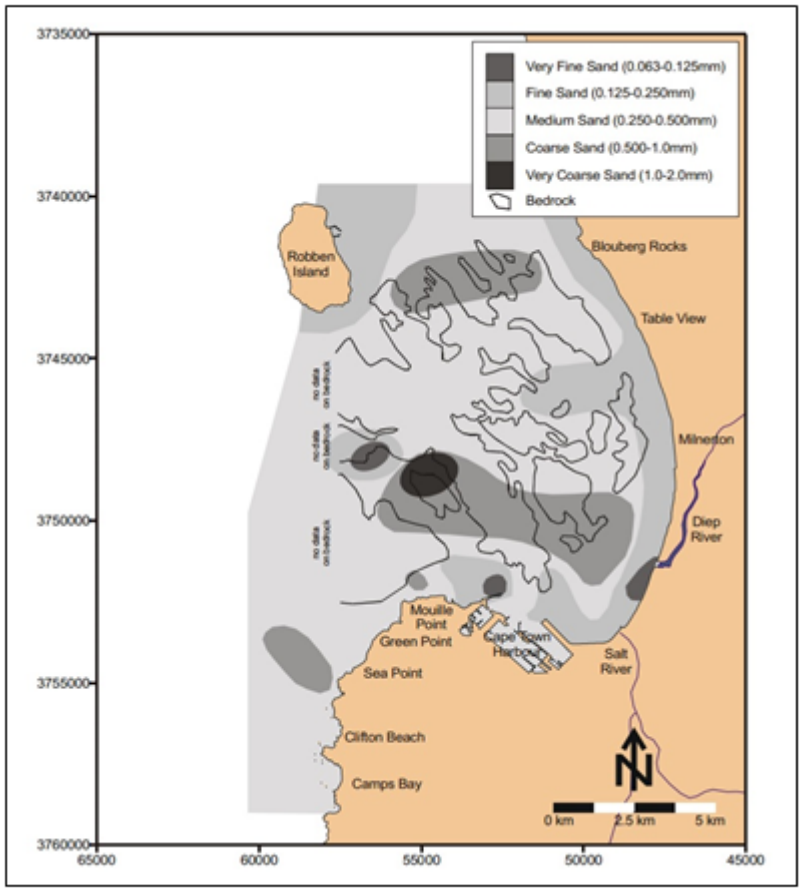


FIGURE 5.3. Sediment and bedrock distribution in Table Bay (Van Ballegooyen 2007:34, adapted from Woodborne 1983:Fig.8).

A summary of the distribution of sediment types is provided in Figure 5.3. In most areas, the bedrock has only a surficial covering of sand with varying proportions along with gravel and mud (Woodborne 1983:268). Fine sand is generally confined to the near-shore region along the eastern perimeter of the bay. The sediment size in this area

can be ascribed to the beach gradient and wave action of the area. Milnerton is moderately protected by Mouille Point and Robben Island, and is characterized by a gentle beach gradient resulting in the deposition of medium to fine sands (McLachlan 1991:55).

A concentration of fine sand extends into the bay along the seaward side of the harbor breakwater in the embayment of the Ben Schoeman Dock and Milnerton Beach to a depth of about 25 meters in the northeastern part of the bay. The reasons for the formation of this tongue of fine sand are potentially due to discharge from the nearby rivers as well as recent harbor extensions. In 1940, the building of the Duncan Dock created a "dead corner" near Woodstock along the southern shore of the bay (McLachlan 1991:6). This allows for the accumulation of finely textured sand due to a general weakening of wave action in this area. In contrast to this section of the shoreline, the beaches to the north at Rietvlei and Blaauwbergstrand are characterized by a steeper beach gradient and consist of coarser textured sand. Coarse and very coarse sand (0.5-2 millimeters) deposits also occur in the center of the bay, and for the most part are separated from the finer sands by deposits of medium sand (250-500 microns). Gravel (>2 millimeters) follows the pattern of the coarse sand, but tends to be found chiefly towards the center of the bay (Woodborne 1983:269-271; McLachlan 1991:6).

Oceanography

Bathymetry

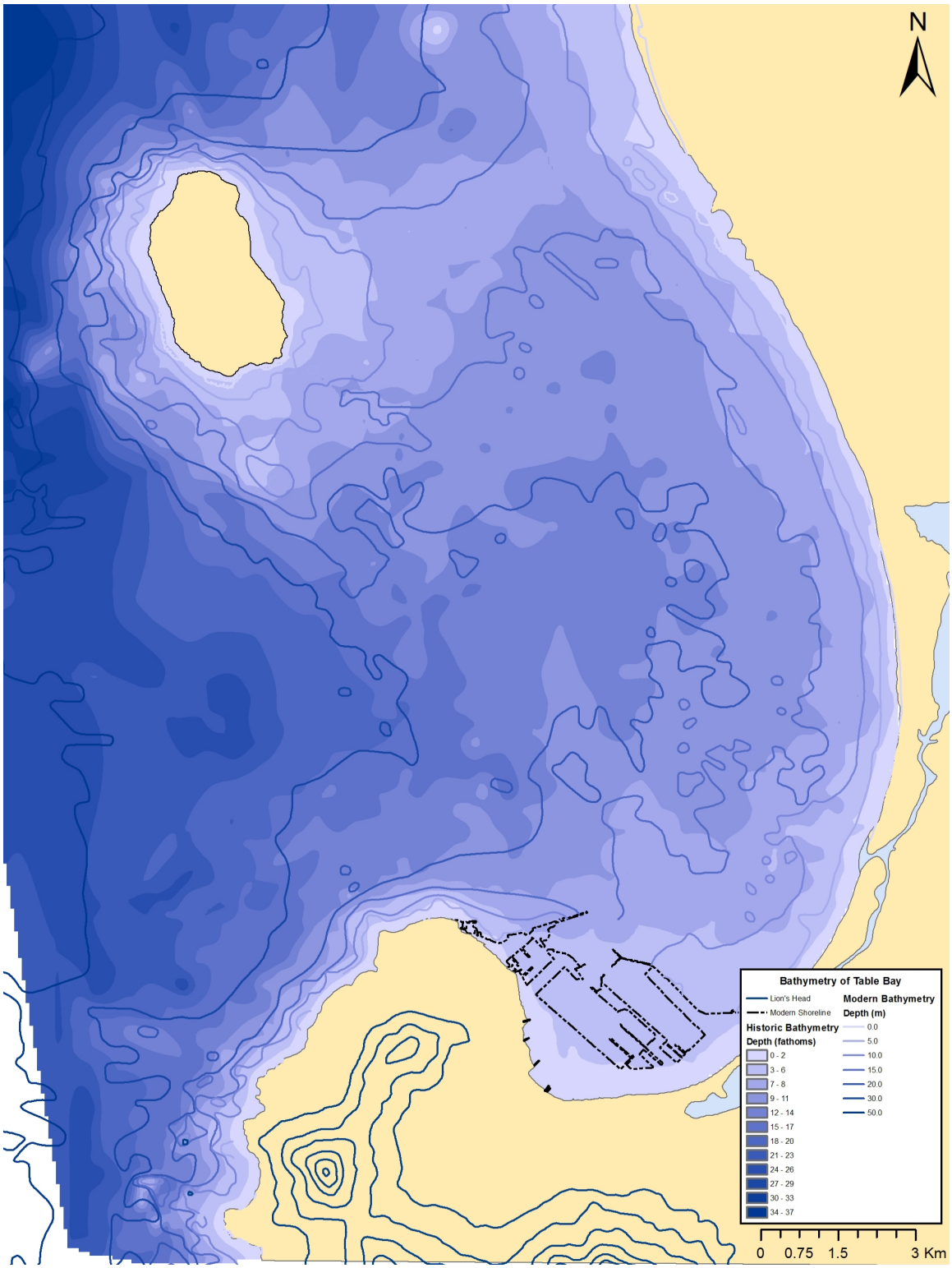


FIGURE 5.4. Image by the author depicting the bathymetry of Table Bay. Shaded areas represent the bathymetry from 1858-1860 obtained from historic soundings originally assessed by British hydrographer Francis Skead. The accompanying lines and curves signify modern bathymetric profiles provided by the South African Navy Hydrographic Office.

North-south bathymetric profiles suggest that the bay slopes gently from both the historic shoreline and Robben Island to form a relatively deep central channel with a maximum sounding of about 35 meters (Figure 5.4). Recorded east-west profiles indicate that there are a number of wave-cut terraces in the topography of the bay, which may be indicative of previous sea levels (Woodborne 1982:5-16). Side scan sonar surveys have identified a number of features on the sea floor itself. One feature is a prominent ridge, known as the Green Point Ridge that is situated 4 km to the west of what is considered the entrance channel between Robben Island and Mouille Point. This ridge begins about 1km west of Green Point and runs 8 km in a northwesterly direction, culminating in a rocky shoal 2 km southwest of Robben Island (Woodborne 1983:267-268).

Another feature consists of smooth, regularly spaced isobaths, or contours of equal depth, between Robben Island and Blaauwbergstrand. This suggests that the unconsolidated sediment is indicative of a submerged tombolo, or a submerged spit of sand caused by current actions that is protruding from the mainland and connecting with the island. The crest of the tombolo appears at a depth of 14 meters, not making it a significant danger to shipping in the bay. Regularly spaced sea bed contours also appear along the entire eastern and southern near-shore margin (Woodborne 1982:5; 1983:267).

Winds, Currents, and Waves

Table Bay is situated within the southern Benguela upwelling and while its circulation and water properties are characteristic of this region, the Benguela Current itself has relatively little impact on the currents in the bay. There are little to no strong tidal currents, and the mean tidal range is roughly one meter or 1.8 meters maximum during spring tides. Therefore, tidal changes are also insignificant in the movement of

currents in the bay. Rather, water movement is primarily wind-driven with minor impacts from inner-shelf currents and with waves or swells influencing the flow of water closer to shore. The speed of these currents generally decrease as the depth of the bay increases while the center of the bay experiences little to no subsurface current activity, which results in poor water circulation (Van Ieperen 1971:13; Quick and Roberts 1993:279).

Due to the fact that currents are predominantly wind-driven, the directions of the currents shift with the prevailing wind patterns. In the summer the winds typically enter the bay from the southeast and the water entering the bay between Robben Island and Mouille Point is pushed in a northerly direction. In the winter, winds come from the northwest, creating a southerly flow (Van Ieperen 1971:4-14). Swells in the bay are also influenced by the wind velocity, but due to the geographic location of the Cape Peninsula, generally over 80% of swells enter the bay from the southwest while only about 5% enter from the northwest (Smith et al 2001:2824).

Typically, the southeasterly winds occur most frequently and at the highest velocities during the spring and summer months from October to March. During winter this trend is reversed and winds dominate from the northwesterly quarter (Van Ieperen 1971:21). This change is due to passing depressions between seasons, where low-pressure systems often move to higher latitudes in April and May high causing velocity winds to blow across southern Africa, with particular ferocity at the Cape. These winds have the potential to form severe storms within Table Bay, mainly in the period between April and September. The depressions that form severe storms are associated with cold fronts to the southwest of the Cape Peninsula and influence waves generated in the bay

when the oceanic swells come into contact with the front, which increases the height and force of the swell (McLachlan 1991:12).

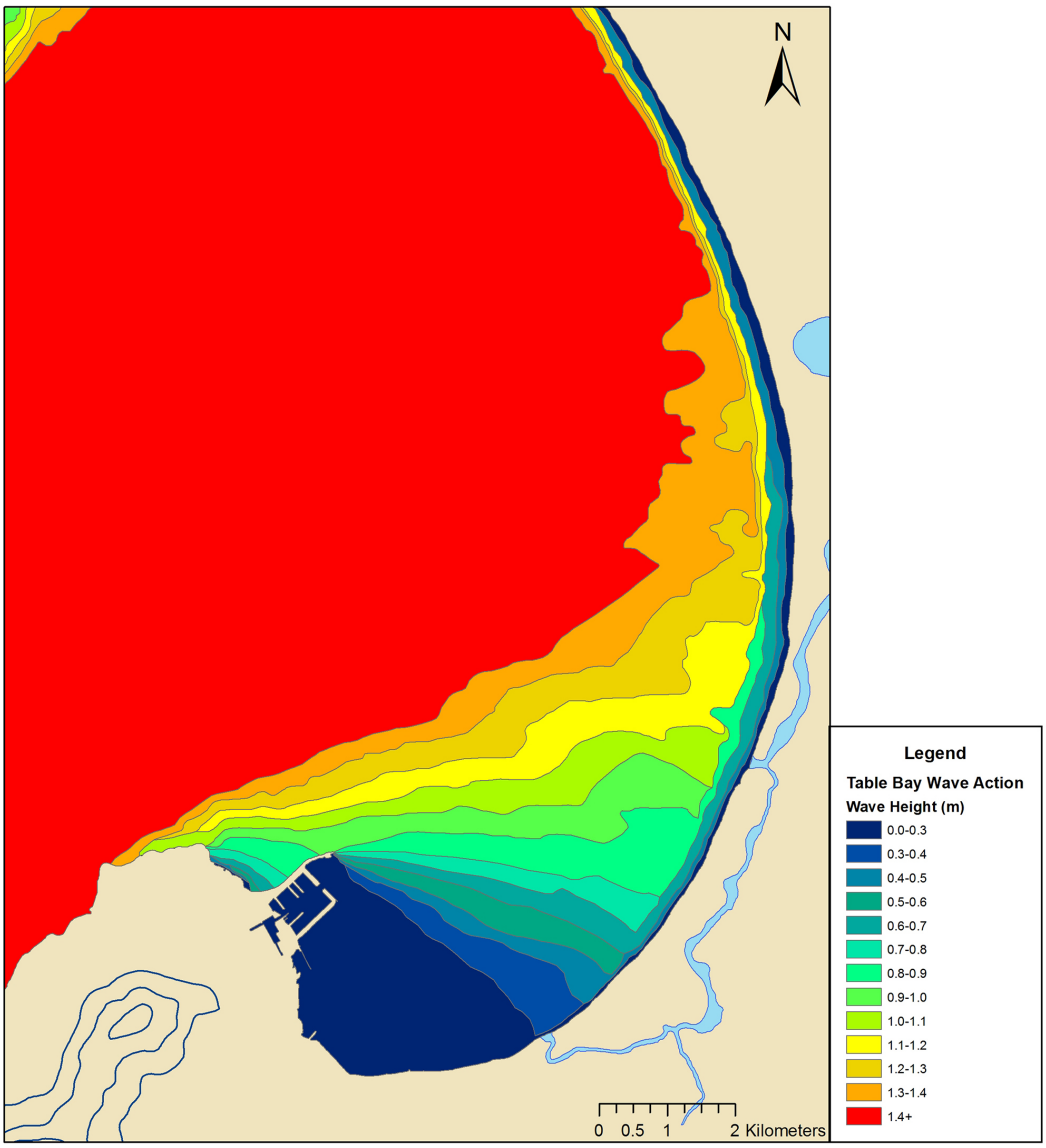


Figure 5.5. Image depicting the estimated wave height and strength in Table Bay following construction of the harbor. Note the exposure of the eastern shoreline to increased wave action in addition to the lessening of wave height on the southern shoreline in the lee of the breakwater (Map adapted from Seifart 2012:83).

Wave refraction is the bending of waves due to changes in the depth of an area. As a bay shallows, wave shape must alter itself accordingly. This results in the diffusion of waves to the center of a bay and the subsequent convergence of wave activity onto the

headlands. Geological formations such as the rocky headlands at Mouille Point and the entrance to the Salt and Diep Rivers typically form areas of highly concentrated wave energy (Durden 1992:15). During the summer in Table Bay, the southwesterly swell is refracted by the shoaling bottom of the bay and waves approach the eastern beaches from the west and perpendicular to the shore. In the wintertime the northwesterly and southwesterly swells are also refracted by shoaling and then locally refracted by near shore bars, resulting in waves approaching the beach from the northwest (McLachlan 1991:22). In all cases, the eastern shore receives relatively little protection while the southern sector is slightly more sheltered (Figure 5.5). Construction of the Table Bay Harbor has played a role in the changing effects of waves on the shores of Table Bay, particularly in the southeastern section.

Month	Average Wind Velocity (mph)
January	14.15
February	13.87
March	12.29
April	9.44
May	7.62
June	7.78
July	7.80
August	8.92
September	9.94
October	11.72
November	12.75
December	13.54

TABLE 5.3. Historical observations regarding average wind velocity for Table Bay made by Maclear from 1860 to 1870. Yellow highlighted numbers indicate summer months.

Northwesterly gales during the winter months have historically been the most disastrous for shipping in Table Bay (Werz 2003:15). As shown above, the climatic conditions that affect these storms as well as the oceanic conditions of the bay are

primarily influenced by wind direction and velocity, which changes with the season. Observations made at the Royal Observatory in Cape Town from 1860 to 1870, however, demonstrate that the mean wind velocity for Table Bay during the winter months was actually less than that of the summer (Table 5.1). This indicates the relative rarity and cultural significance of northwesterly storms for people living in Table Bay. These storms were not a predictable occurrence and when one materialized, the shape of the bay, coupled with the dominant wave dynamics created an optimal environment for shipwreck incidents. Furthermore, as demonstrated by the meteorological findings of the observatory, the high velocity winds of the summer months would have greatly affected the landing and loading of goods in the early stages of harbor development when the use of cargo boats was necessary. It is clearly evident that the climate of the Cape would have played a major role in the shaping the landscape of risk in Cape Town.

How the Bay Shaped the Harbor

Cape Town is bordered on its landward side by Devil's Peak, Table Mountain and Lion Mountain along with the Atlantic Ocean to the seaward edge. The city was therefore inherently limited in the way it could expand. During the first half of the 19th century, a number of jetties were placed along the southern shoreline of the bay. The water along this shoreline was at a depth of only a few meters, which was not conducive to the deep draught of the vessels frequenting the harbor in the latter half of the century, which led to additional harbor expansion. From the onset of the construction of a harbor in Table Bay, excavated rock and soil were used to aid in the seaward expansion of the city (Durden 1992:43). It was reasoned that the shallow space along the southern shore could be filled in with this material and reclaimed from the sea. This decision opened valuable space to

compensate for the sprawling growth of Cape Town in addition to placing the harbor facilities closer to the deeper water (Halkett 2012:12).



FIGURE 5.6. Map of major land reclamation areas in Table Bay by 1910. Note the change in the shoreline as a result of reclamation processes as well as sediment accumulation mentioned above.

In the early stages of harbor excavations soil from the Alfred Basin and in the Harbor Quarry was primarily used to reclaim land. The higher quality stones were deposited onto the end of the breakwater and later onto the South Pier expansion, while lesser quality stones were supplied as ballast. The remaining stone and soil was used to create the ground upon which additional harbor infrastructure could be placed (Figure 5.6). Sediment accumulation had already occurred on the lee side of the breakwater and Outer Basin when in the 1870s an embankment was constructed on the southeastern

shore to prevent land from being eroded by wave action. Five years later in 1875 the first major reclamation scheme took place with the removal of 16,500 cubic yards of material from the excavation of the Graving Dock, which was deposited between the Central Jetty and the Castle. This reclamation covered about five acres of valuable land and effectively buried the South Jetty (Table Bay Harbour Board 1876).

The practice of reclaiming land became firmly established in Table Bay with each succeeding construction in the harbor. More stone and soil from the Graving Dock excavations were used to extend the ground to the east of the Alfred Basin, near the Amsterdam Battery in 1879. The Graving Dock excavation supplied additional material for constructing land in front of the Somerset Hospital in 1881 and between the North Wharf and Central Jetty (Table Bay Harbour Board 1881; 1883; 1883). During 1890, 8,476 cubic yards of excavated stone were used for the reclamation of land on the East Quay of the Outer Basin and 862 cubic yards were deposited behind the breakwater wall. By 1895 a sea wall was constructed at the edge of the newly reclaimed land which ran from the North Wharf to the fishing harbor at Rogge Bay and formed a promenade from the Central Jetty to an intercepting pipe jetty. This area became known as Combrink's Concession and an expanded causeway was then built to replace the Central Jetty, which had fallen into a state of relative disrepair (Table Bay Harbour Board 1898).

The Department of the Conservator of Woods and Forests oversaw the planting of vegetation on the filled in land in an effort to stabilize the loose sand as well as reduce the time that developers would have to wait in order to construct foundationally sound buildings (Table Bay Harbour Board 1885). One of the first constructions on the reclaimed foreshore area was a coal store in 1877, and later a Cold Storage administration

building and warehouse were built on the land reclaimed during Combrink's Concession (Halkett 2012:12). It is likely that these early buildings required substantial foundations due to the infancy of the soil that they were placed upon. These foundations and plant material would likely have an impact on any shipwreck material along the older shoreline, which was covered up during these early reclamation projects.

Even the earliest harbor schemes called for the use of dredging due to the relative shallow depth of the bay (Table Bay Harbour Board 1855). As shown by the bathymetric profile above, the shallow water close to the shoreline needed to be deepened to accommodate the increasing draught of vessels entering the harbor. The use of divers, cranes and dredges to excavate the sea bottom was an essential, evolving process throughout the construction of the harbor. These techniques were first utilized at the mouth of the Alfred Basin, which needed to be widened and deepened from its original measurements (Table Bay Harbour Board 1867). Additional work was needed along the Outer Harbor jetties that received the majority of bulk cargo and deep draught shipping traffic.

In 1907, Mr. C.E. McLeod proposed a scheme for developing the foreshore of Table Bay due to the overcrowding of the shoreline as a result of railways and harbor development (Veitch 1994:85). Later 20th century harbor works implemented this plan with additional extensive reclamation of land on Cape Town's foreshore (Clark 1947). In 1926, the constructed mole at Rogge Bay and Municipal Pier at the old Central Causeway built in 1913 were removed and the land filled to make room for the Duncan Dock for the express purpose of sheltering larger, deep draught vessels and tankers. By this time the South Arm had been widened to accommodate the amount of goods passing through the

port, but once again ancillary space was needed for the ever-increasing size of vessels entering the harbor. The Duncan Dock was completed in 1945 and by 1976 the Ben Schoeman Dock reclaimed an extra 180 hectares seaward of the existing foreshore and industrial area of Paarden Eiland. These historic and recent improvements of the harbor have significantly altered the coastline and coastal process affecting the physical landscape of Table Bay.

How the Harbor Shaped the Bay

The construction of the harbor in Cape Town had profound impacts on the natural landscape of the bay. Two of the major impacts of harbor development on the natural landscape of the bay are the result of the anthropogenic modification of the shoreline in the form of land reclamation, and the shifting equilibrium of the natural state of the harbor as a result of the locations of the harbor works. In each case, the construction of the harbor has changed or influenced the natural conditions within Table Bay and consequentially, the landscape of the harbor in general.

As described previously, large tracts of land were reclaimed during the development of the breakwater and Victoria and Alfred Basins. The dredging operations required for the deepening of each basin for larger draught vessels and the excavations for quay extensions produced thousands of tons of rocks and rubble. With the extensive growth of the city at the time, the expansion of the foreshore and waterfront area can be seen as a reasonable risk mitigation measure to compensate for the lack of space for the extent of business carried out within the harbor. Older, unused features of the landscape such as the North Wharf, Coaling Jetty and South Jetty could be covered up and new infrastructure for the current harbor constructed in their place.



FIGURE 5.7. Aerial photograph showing the beginning of twentieth century harbor expansion and the covering up of the 1910 shoreline to make room for a new foreshore section of the city (Photo courtesy of the City of Cape Town Environmental and Heritage Management).

By 1913, the Victoria and Alfred Basins and additional quay space were once again deemed inadequate. Further harbor installments required the reclamation of at least 480 acres of land over the Central Causeway and Promenade for the construction of the Duncan Dock begun in 1937 and completed in 1945, as well as an additional 180 hectares on the existing coastal road, foreshore and industrial area near Paarden Eiland during the building of the Ben Schoeman Dock in the 1970s (Figure 5.7). All of the future works reflect an evolving landscape of modernity and citywide expansion that continued throughout the twentieth century.

These harbor works and reclamation projects represent a blatant altering of the physical landscape to fulfill the growing needs of the city and harbor. These changes also had severe impacts on the stability of the bay. Based on a parabolic equation for determining historic sediment transportation and distribution methodology devised by Hsu et al. (1989), Smith et al. (2001:2827) were able to state that the 1870 coastline configuration in Table Bay was close to that of complete equilibrium. With the addition of harbor works into the bay, several changes in the natural environmental conditions of the harbor ensued. One such change was the breakwater structure, which shifted the position of the headland, or diffraction point of the bay, from Mouille Point to a more easterly position at the tip of the breakwater. The new equilibrium configuration calculated with the new diffraction point indicates that to achieve a state of balance, the flow of energy must shift shoreward to the location between the Salt River Mouth and the wreck of MV *Winton* near the Milnerton Lighthouse, signifying an increased likelihood of erosion in this area (2001:2828).

Reports on the state of the shoreline indicate that from the harbor to the mouth of the Diep River, approximately 30 to 45 meters of erosion has taken place at a rate of about 1 meter per year (Seifart 2012:67). Estimates for the total amount of erosion for sections of this coast suggest that it has retreated up to 60m just above the Salt River, and upwards of 75m between the Diep River and the 1934 shipwreck of MV *Winton*. Due to the increased amount of erosion, the sediment transport in the bay has also been amplified whereby a maximum coastal recession of 30m is possible during a severe storm (Grindley and Dudley 1988:21). Grindley and Dudley (1988:21) suggest that this shoreline had historically been in a state of accretion between at least 1780 and 1900.

Therefore, this shift in the rate of erosion can be directly correlated with the construction of the Victoria Basin, completed in 1905. Further harbor expansion has only served to augment these processes.



FIGURE 5.8. Photo of the Milnerton Wreck thought to be the remains of *Commodore II* exposed on the beach in Milnerton, Table Bay (Photo by bernd68, http://www.panoramio.com/photo/16542891).

The processes outlined above have affected cultural material greatly. With additional harbor and urban development in Table Bay there are little to no permanent historic structures remaining along the shoreline, but rather the bulk of cultural material consist of more dynamic sites such as shipwrecks, especially on the eastern shoreline of the bay (Mavrodinov 1999:64). As the effects of the harbor change the natural landscape of the bay, cultural material becomes exposed and in some cases can be indicative of shoreline changes (Harris et al 2013:129). This is evidenced along the eastern shoreline

of Table Bay by the discovery of skeletal remains dating to the late 18th or early 19th century on the shore in Milnerton as well as the exposure of a shipwreck believed to be *Commodore II*, which ran aground in 1945 (Figure 5.8; Abrahams 1983:33; Gribble 2004:7). Furthermore, as shown by Seifart's (2012:156-157) research into the 2009 wrecking of *Seli One* shipwreck in Blaauwberg, the presence of shipwrecks along the shore have the potential to actively shape and affect shoreline sediment accumulation and wave distribution. The combination of natural and cultural processes outlined above influence the maritime cultural landscape of Table Bay and will be used to analyze risk within the cultural landscape.

Conclusion

The environmental and natural conditions of a space play a major role in constructing the way that meaning and culture are created in a landscape as much as the culture determines how the landscape is both perceived and utilized. This chapter highlighted the various ways that the Cape society in Table Bay actively shaped the physical landscape of the harbor through their cognitive perceptions of and behavioral responses to the natural conditions of the region. These conditions played a significant role in determining how the development of the port of Cape Town took place and the meaning placed on the physical landscape. The harbor works that were built since Prince Alfred tipped the first load of stones for the Breakwater in 1860 have since functioned to reform and change the physical landscape of the bay itself.

At this point, the overall maritime cultural landscape of risk in Cape Town has been investigated in the natural or physical record in addition to the historical record of the region. The next chapter will sum up the previous sections to analyze how risk is

evident in the cultural landscape of Table Bay. Each natural and cultural variable outlined previously will be examined along with the archaeological features in the landscape of Table Bay.

CHAPTER SIX: ANALYZING RISK IN THE BAY OF STORMS AND TAVERN OF THE SEAS

Introduction

Thus far, various natural and historical elements comprising the cultural landscape of risk within Table Bay have been discussed. This chapter will synthesize all of the information obtained from the various data sources listed throughout this thesis to ascertain how characteristics of risk are implicated in the construction of Cape Town's harbor. The associated risks to maritime activity in Table Bay will first be outlined. This line of inquiry will focus on the assessment of risk using shipwrecks as indicators of potential hazards in the bay prior to harbor development. Furthermore, shipping statistics will be utilized to determine the range of values that were potentially affected by risk to harbor operations for the local and international maritime community of Cape Town. Coinciding with this analysis, it is necessary to discuss the perceptions of identified risks and how these perceptions are manifested in the cultural landscape of Table Bay. Lastly, how the management of risk and risk mitigation measures are imbued within the cultural landscape will be explained. This discussion will be defined by two dominant themes that exemplify the development of the harbor during the study time period.

In order to complete these assessments of risk a combination of statistical and geo-spatial analyses will be utilized interchangeably throughout the chapter. Due to the availability of certain data included in historical sources for some years and omitted in others, some of the statistics will vary in time coverage, but all data spans the relevant construction phases of the harbor. To supplement these figures, a multitude of data

sources will be drawn upon whereby each builds upon another in a complementary manner.

Identifying Risk in Table Bay

Table Bay has historically been a locus of shipping activity in the southern African continent. As the Mother City to the Cape Colony and original port of call for vessels making the voyage to the East Indies, Cape Town was an essential crossroads of trade for not only the British Empire but also for all seafaring nations due to its favorable position along major international shipping routes. Over 29 different nationalities are listed on Port Office records for vessels calling at Cape Town. Of these countries, the number of British vessels calling at Table Bay far outweighs that of foreign shipping (Figure 6.1). The variation between the numbers of British and foreign vessels is indicative of Britain's dominance in world maritime commerce during the 19th century and the importance of Cape Town for Britain's worldwide shipping interests.

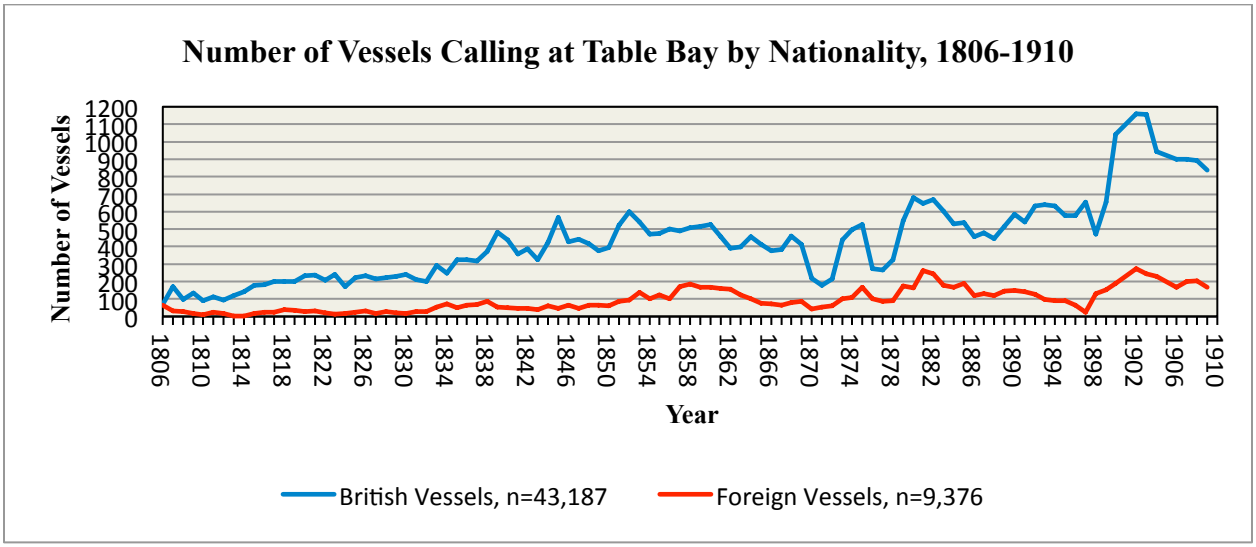


FIGURE 6.1. Extent of British and foreign shipping in Table Bay for each year between 1806 and 1910 (Data obtained from the Cape Town Archives Repository, 2014).

Since the British occupied the Cape Colony and were in control of trade within the Colony's ports, the gap between total numbers of British and foreign vessels logged at Cape Town are to be expected. The historic Table Bay study region contains 320 historically and archaeologically known shipwrecks during the selected timeframe from 1806-1910. The number of British wrecks during this period amounts to 161, while the next closest number is 20 American vessels lost. Figures 6.2 and 6.3 demonstrate the general wreck distributions in the bay. What this meant for the maritime community in Table Bay was that any potential risk to shipping would have a direct impact on primarily British global maritime interests. One of the chief aims of this study is to examine the risks of using the port at Cape Town and how these risks impacted the development of the harbor. To accomplish this goal, shipwrecks will be used as indicators of risk in the cultural landscape.

Shipwrecks were plotted according to the availability of general locational and temporal data in the SAHRA shipwreck database. Some entries were listed as unknown or as wrecking in Table Bay, and were therefore not included in the distributions presented below. For analytical purposes the distribution of shipwrecks were divided into two temporal periods and four zones. The time periods are divided into shipwrecks prior to initial harbor completion in 1870 and those occurring after 1870. These wrecks were further divided into historically and archaeologically known sites determined by the availability of GPS coordinates in the SAHRA database. Some archaeologically known sites may be represented as historically known due to the paucity of available spatial data.

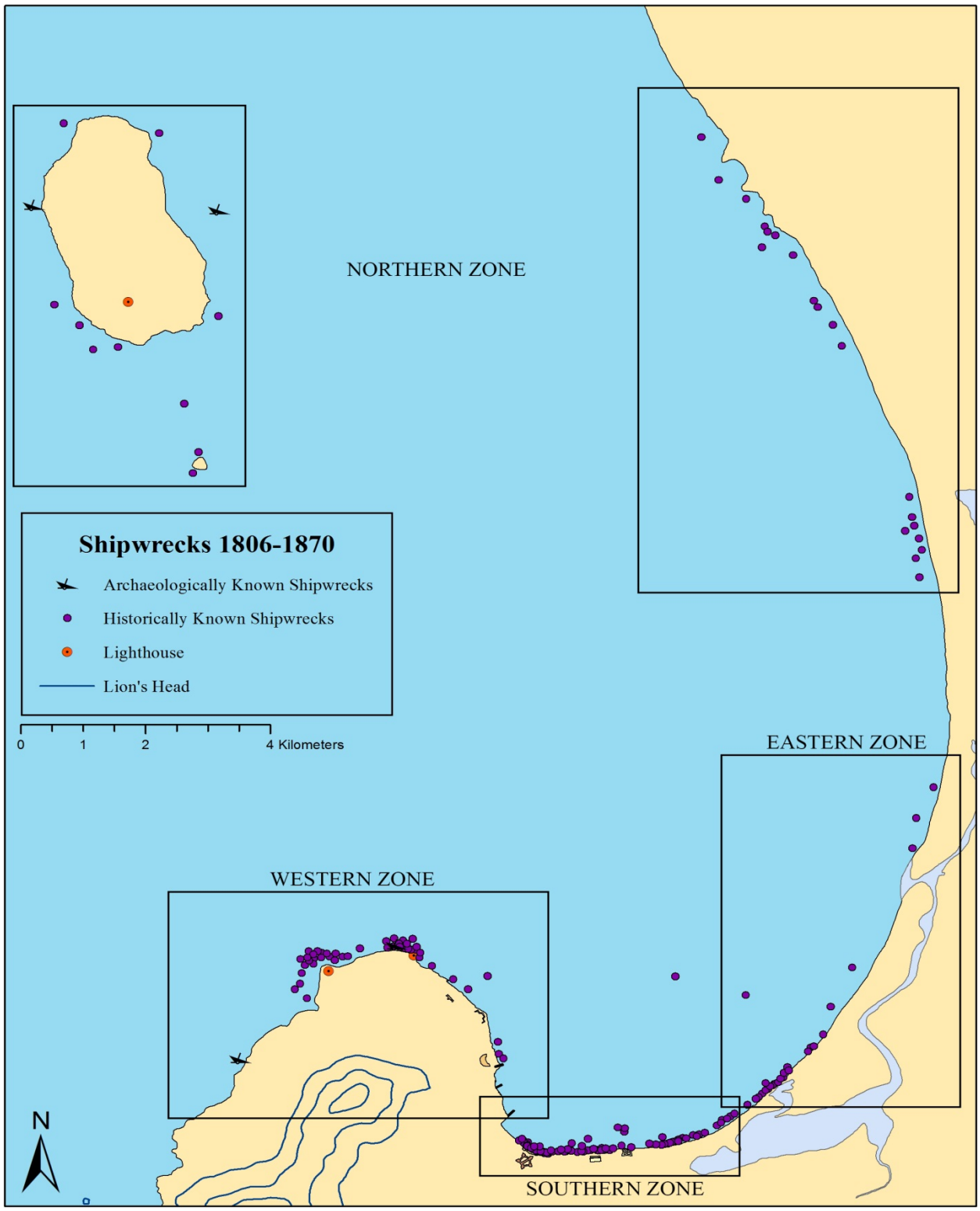


FIGURE 6.2. Distribution of historically and archaeologically known shipwrecks in SAHRA's shipwreck database along the historic shoreline prior to harbor development in Table Bay. Locations were plotted according to general spatial data and in actuality may be further from the depicted shoreline than indicated.

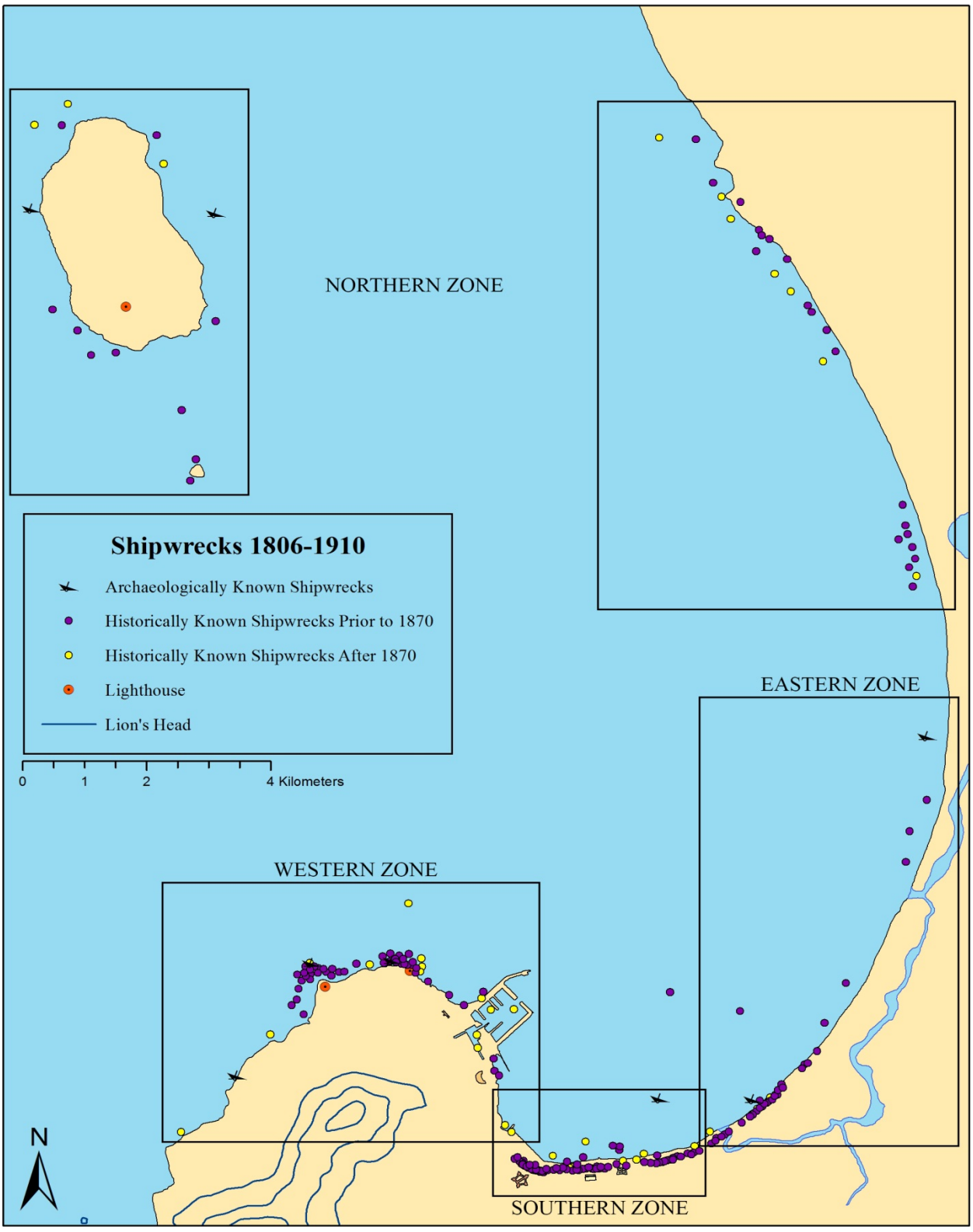


FIGURE 6.3. Distribution of all historically and archaeologically known shipwrecks within SAHRA's shipwreck database at the completion of 19th century harbor development. Shipwrecks after 1870 are colored in yellow.

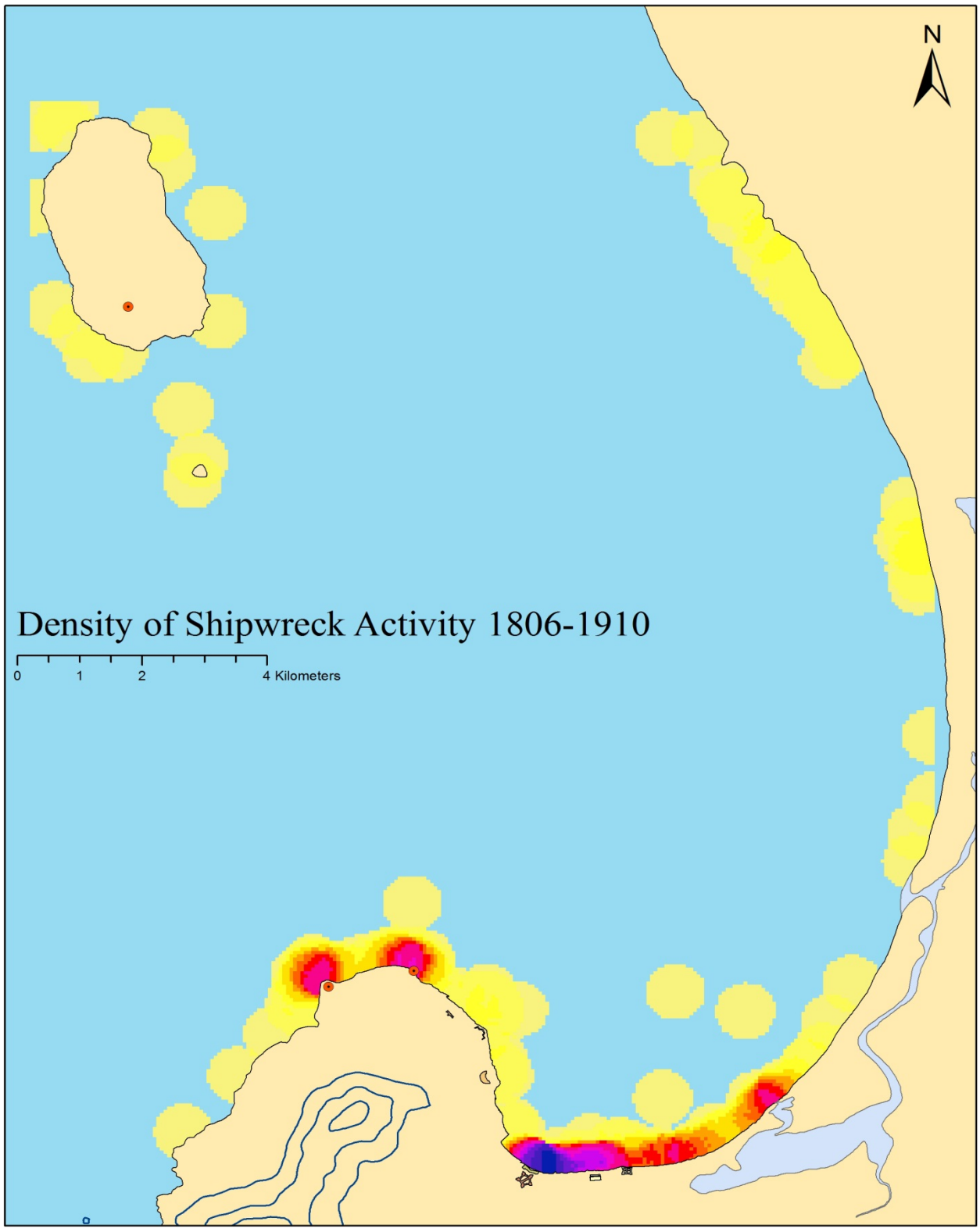


FIGURE 6.4. General densities of shipwreck activity occurring in Table Bay between 1806 and 1910 with the SAHRA shipwreck database. Darker blues and reds indicate a higher wreck density.

The Western Shipwreck Zone encompasses the area from Sea Point around the southern entrance of the bay to the historic location of the Central Jetty when the shoreline turns eastward. The Southern Zone is the southernmost section of the bay from the South Jetty to historic Fort Knokke. The Eastern Zone is comprised of the area around the entrance to the Salt River through Milnerton. The Northern Zone runs from Rietvlei to Blaauwbergstrand and includes shipwrecks around Robben Island in the middle of the bay. These zones were selected according to prevailing clusters of shipwrecks in the area that could be analyzed to determine spatial and temporal trends of risk in the harbor (Figure 6.4).

Risk of the Bay of Storms

Safety of ships while at anchor was of primary concern to British officials at the Cape, who recognized the danger inherent to the storm systems and high winds that often blew throughout the region. These early perceptions were drawn from prior experiences as well as from the initial discovery of the sea route around the southern tip of Africa when Portuguese navigator Vasco de Gama labelled the region as the '*Cabo Tormentoso'*, or 'Stormy Cape' (Theal 1896:85). De Gama's descriptions led to the conception of the supernatural figure Adamastor, the spirit of the Cape of Storms, who would open the sky and unleash tempests that threatened every vessel rounding southern Africa (De Camoens 1877:146). Further stories told of a Dutch East Indiaman that was the only vessel of its consort wrecked in a storm off the Cape. When the remaining fleet set sail some sailors saw their lost comrades sailing in a ghost ship that later became known as 'The Flying Dutchman' (Barrington 1800:45). This notion of the Cape of

Storms played a major role in shaping the perceptions of the risk for all mariners sailing in the region, especially at the main port of call in Table Bay.

Of the total number of wrecks in Table Bay, the circumstances of loss for 220 could be determined, representing 68.8% of the total sample of 320 vessels. The general zone of wrecking was entered into SPSS along with the circumstances of loss for each vessel and controlled by the time period of harbor development. The statistical results are presented in their entirety in Appendix 1. One of the most noticeable trends among the wrecking events in Table Bay is the number of vessels lost to severe storms prior to harbor construction. Within this sample, 44.1%, or almost half of total numbers of shipwrecks were lost in severe storms. Of the 183 shipwrecks prior to the decision to create a harbor, 47.0% of the total wrecks were caused by severe storms. This clearly demonstrates that the natural conditions of the bay had a significant impact on the risks to shipping for Cape Town.

In Table Bay, the seasonal variation in wind velocities and direction causes dramatic changes in wave and current dynamics. Due to the presence of low pressure systems along the southern African latitudes, the shift in winds coming from the southeast to the northwest during winter month brings about a southerly flowing current and increased wave activity through the natural entrances of the bay. An unsuccessful attempt to suppress this wave activity at the southern entrance to the bay through the construction of a rudimentary breakwater at Mouille Point, which is named for the abandoned construct, shows that these conditions were recognized by the maritime community of Table Bay as potentially hazardous.

While these weather patterns are characteristic to the region, it is during these winter months that the low pressure systems had a greater potential of turning into a severe storm or gale. Gales were typically preceded by a spike in temperature and a gradually falling barometer as the winds shifted to the north. The danger associated with these storms was that the wind oftentimes changed direction suddenly and with little indication to mariners (United States Hydrographic Office 1908:56, 510).

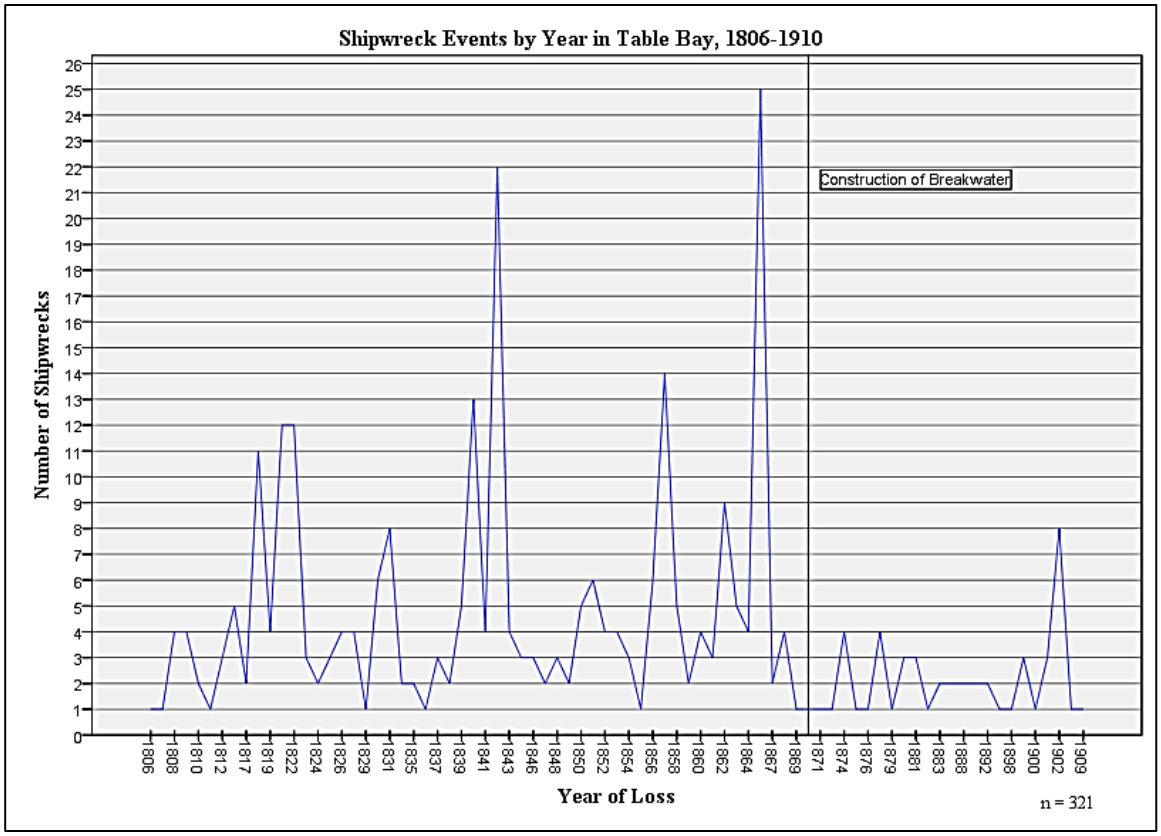


FIGURE 6.**5**. Chronological distribution of shipwrecks in Table Bay.

The chronological spread of shipwrecks in Table Bay reveals a pattern of spikes in wrecking events associated with major storms in 1822, 1831, 1842, 1857 and 1865 (Figure 6.5). The average of 10 years between events is indicative of a cyclic nature to these major storms, with less severe storms occurring on a more regular basis. Once a

gale formed in the bay, winds entered from the northwest causing heavy swells and the currents pushed the waves southwards. As a result, the natural confines of the bay, the curvature of the landscape and associated oceanic influences had a distinct effect on where vessels were wrecked during these storms (Figure 6.6).

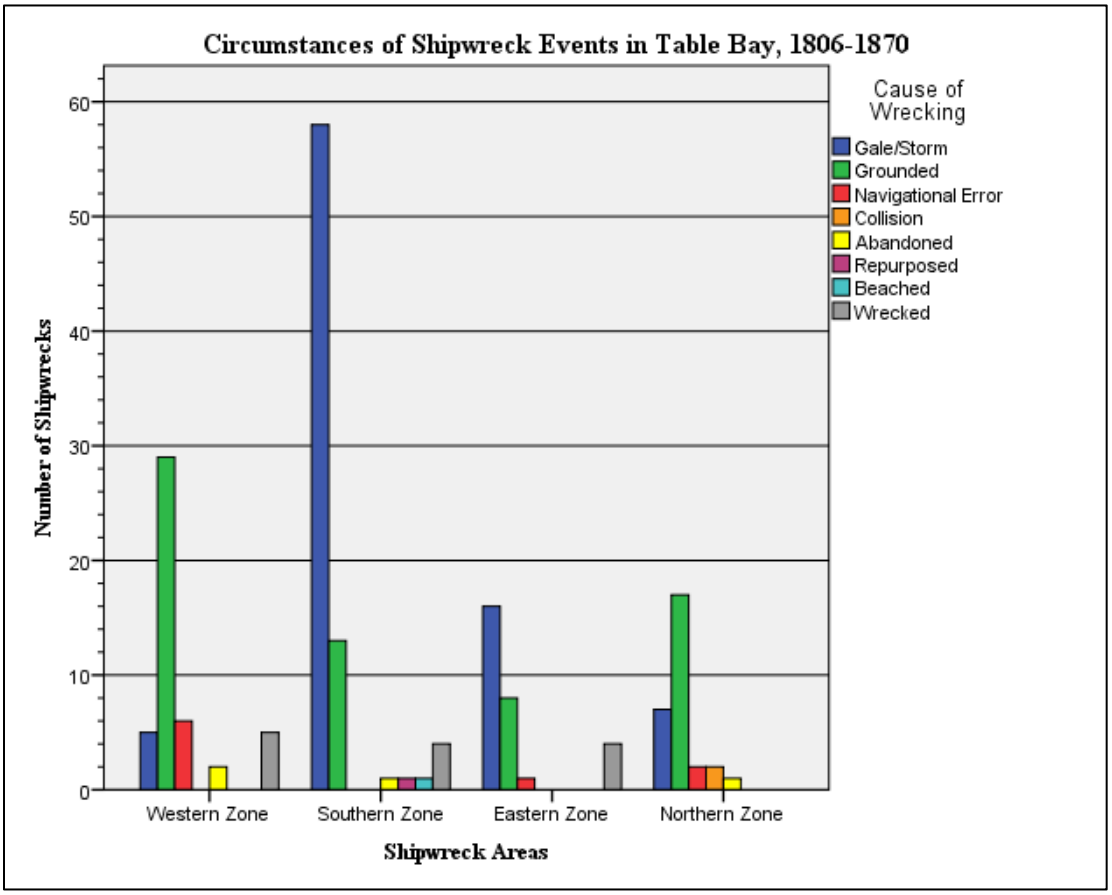


FIGURE 6.6. Distribution of shipwreck events according to spatial location and the causes of wrecking prior to breakwater construction.

Given the above data, the number of shipwrecks caused by storm systems along the southern shores of the bay is far greater than any other area. Forty-nine vessels during this time period were wrecked in the Southern Zone, whereas the next greatest amount is 16 vessels in the eastern Zone. The spatial clustering of these wrecks is shown in Figure 6.3. A number of paintings, drawings and photographs show the city and primary

anchorage tucked into the southwestern shoreline between the Castle and Chavonnes Battery. This meant that the beaches between the Castle and Milnerton were in a direct line with the prevailing wind during storms. There is increased shipwreck density particularly in the area from the Cape Castle to the historic mouth of the Salt River, which was the point in the bay where the land begins to curve from a vertical north-south orientation to an east-west alignment. This pattern of wrecking demonstrates how the overall shape of Table Bay created a natural ship trap for vessels that broke loose from their anchor cables during severe weather. The exception for this trend was the wrecking of RMS *Athens* off Mouille Point during the historic Great Gale of 1865, explained below.

During these storms, the risks for shipping during winter months were exponentially greater. As shown by the number of vessels calling at Cape Town by season, a greater amount of shipping entered Table Bay during the summer months when storms were less frequent (Figure 6.7). When the British inherited the Cape from the Dutch, the practice of wintering vessels at the Simon's Town anchorage in False Bay was common. The seasonal numbers of British vessels entering Table Bay demonstrates that the British continued to exercise this caution throughout most of the 19th century. Furthermore, Lloyd's of London recognized the risks of using Table Bay during the stormy winter season and decided against granting insurance claims to vessels wintering in Table Bay. Despite the natural benefits of using False Bay, however, Simon's Town harbor was unsuited for the majority of shipping that called to the Cape. As a result many vessels were forced to anchor in Table Bay where the potential risks of wrecking were much higher.

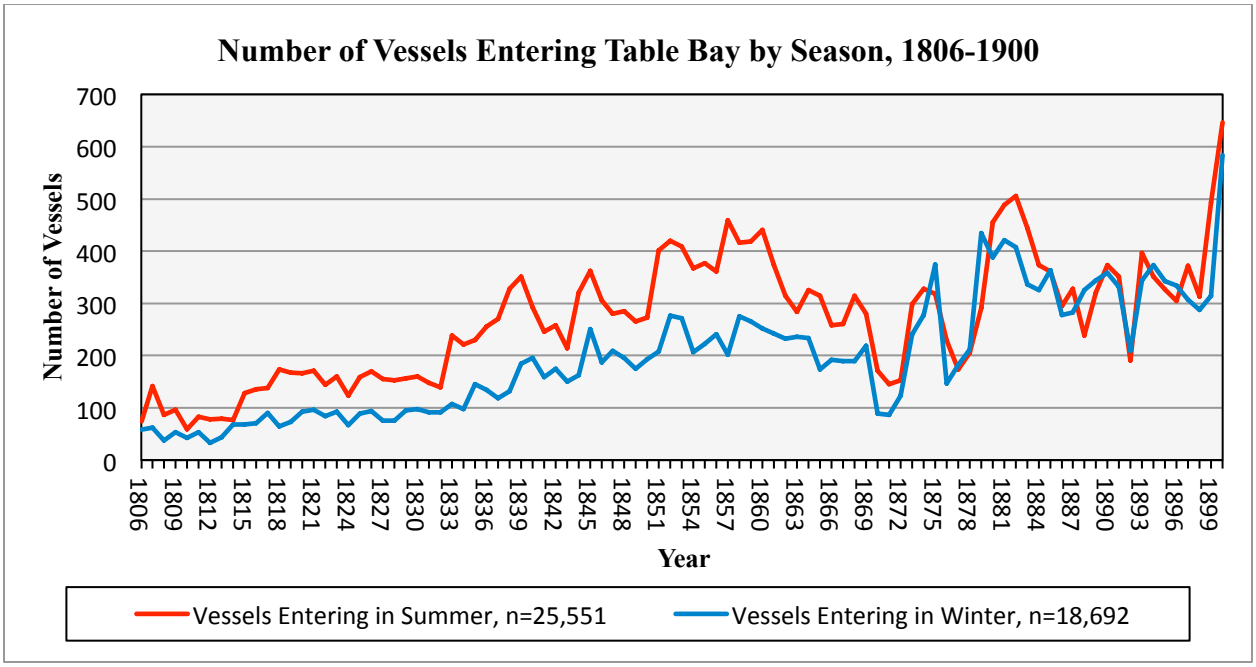


FIGURE 6.7. Seasonal variation in the number of vessels entering Table Bay during the 19th century (Durden 1992:Appendix 2).

Case Study: RMS *Athens* (1865)

RMS *Athens* built in 1856 by Alexander Denny in Dumbarton, Scotland. The vessel was a 750-ton iron steamship. While it had a barque rig, the ship was propelled by a simple 130 horsepower, two-cylinder engine attached to a screw propeller built by Tulloch and Denny and capable of 8-10 knots. This compound engine was simple compared to later 19th century advances in steam navigation, but it represented the height of technology for the time. *Athens* was part of the first wave of new screw steamships introduced to augment paddle-wheel steamers already in use. It originally ran a service from Liverpool to Constantinople for J.P. Schilizzi and spent the first years of its use running the line between Britain and the Mediterranean (Murray 1933:265). In May 1858, the vessel was bought by the Union Steamship Company, known for its mail service at the Cape, and after six years running the western route *Athens* started the Mauritius Mail Service in November 1864.

It was during this service that *Athens* was anchored in Table Bay on May 16 for the onset of one of the greatest storms to ever strike Table Bay. A Parliamentary inspection was due for the pending construction of the harbor breakwater when the storm system brought waves rolling in with "immense volume" that caused vessels at anchor to "pitch and grind with violent force" (*Cape Argus* 1865a). When the wind originally began to shift to the northwest, *Athens* Captain Smith made a call to the Port Office to enter the safety of the Alfred Dock, but the not yet completed work could not accommodate the vessel. Boat crew's surfboats were deployed to render assistance to vessels, but the efforts of the boatmen could not address every ship. By seven o'clock that evening, seventeen vessels had been run ashore and *Athens* had parted its last anchor cable. A signal was made that the steamship would attempt to drive out to sea to avoid getting pushed onto the beach.

Two hours later the engines of *Athens* had either been put out by the waves or had broken down when the vessel was pushed broadside against the rocks at Mouille Point within sixty or eighty yards from shore (*Cape Argus* 1865a). Life buoys, ropes, lights, and the rocket apparatus to deploy a cable to the distressed vessel were sent to the shoreline, but the torrential rain and darkness prevented any rescue attempt. Screams were heard by on-lookers unable to render any aid when the vessel broke apart in the ensuing wave activity, killing all 22 passengers and crew onboard. By morning only the top of the steam engine could be seen when bodies began washing up on shore (Figure 6.8; *Cape Argus* 1865b). The only survivor of the wreck was a pig who managed to reach the rocky beach despite the heavy seas. In total, 60 lives were lost in the storm along with 18 of the 28 ocean-going vessels and 30 cutters or small boats (*Cape Town Gazette and*

Mercantile Advisor 1865). *City of Peterborough* and *Athens* were the only steamships lost.



FIGURE 6.8. Wreck of the RMS *Athens* on the rocks at Mouille Point in the 1930s. The wreck serves as a marker in the cultural landscape of Table Bay's reputation as the Bay of Storms (Photo courtesy of the Iziko Museum of South Africa).

The Great Gale of 1865 is a milestone in the cultural landscape of risk for the development of Cape Town's harbor. A poem published in the *Cape Argus* (1865d) commemorated the storm remarking that, "the wind came down o'er the bay and town, with rain and icy sleet, and dashed before its might, the sea upon the fleet." The breakwater had not yet been completed and therefore vessels that required assistance relied upon boatmen coming from the shore to provide supplementary anchors and cables as the wave activity pushed ship's moorings to the point of breaking loose. For the

perceptions of risk in Table Bay, the gale reinforced the necessity of protecting vessels during winter months when the potential hazard of storms was at its greatest.

The attempt made by Captain Smith to steam out to sea was a decision that reflected either overconfidence in the power of steam technology or an underestimation of the influence of risk posed by Table Bay storms. Instead of passing out of danger's reach, *Athens* entered a location where the higher power waves converged on the rocky headland of the bay, which would have naturally increased the risks for the steamship. The remains of the vessel currently serve as a cultural marker in the landscape of risk for historic gales characteristic to Table Bay.

Wind Patterns

The wrecking of *Athens* demonstrates another trend of risk for shipping in Table Bay. Whether during the winter or the summer, Cape Town is known for high winds that blow along the southern Cape. As shown in the previous chapter, the primary seasonal change in winds is the direction while the velocity remains relatively constant, with the summer months sometimes averaging greater wind speeds than winter. The risk of southeasterly storms during the summer was less than winter but still affected shipping. Since all harbor operations were carried out by lighters and porters who conveyed cargo to and from the shore to vessels in the bay, these southeasterly summer winds would have pushed these small sailing craft away from the shoreline. This would have made getting to the small jetties to unload the cargo an especially slow and difficult process. These characteristics made early 19th century harbor operation in Table Bay incredibly inefficient.

The wind patterns in the bay also had an effect on the types of vessels lost in the bay. Only two steamships, including *Athens*, were among the eighteen vessels wrecked during the Great Gale. This is indicative that there was a greater risk to sailing vessels than steamships during severe storms. Given the prevalence of high velocity winds at the Cape, the reliance of sailing vessels upon wind energy for navigation and propulsion was potentially hazardous. The distribution of shipwreck types lost in the bay during the study time period confirms this assumption (Figure 6.9).

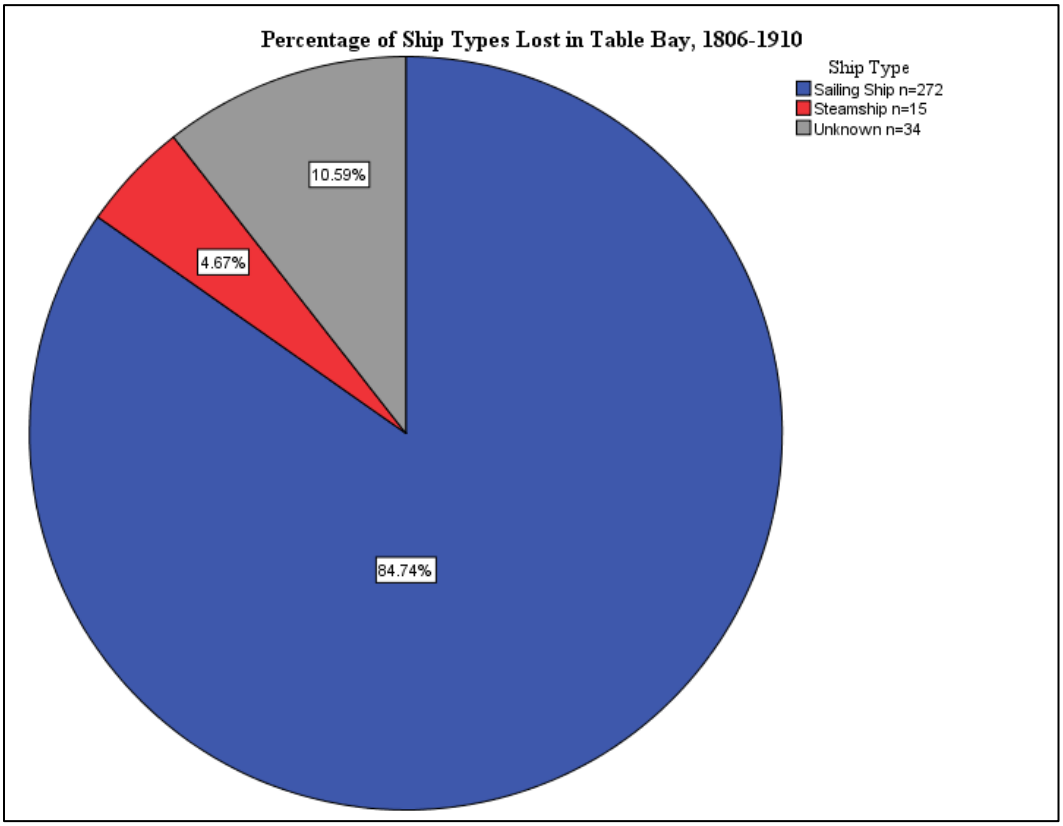


FIGURE 6.9. Percentage of sail and steam powered vessels wrecked in Table Bay as included in the SAHRA shipwreck database.

The data presented in Figure 6.9 demonstrates that the amount of sailing ships wrecked in Table Bay significantly outnumbered that of steamships. During the 18th century, as technology progressed the engine-driven steamships that frequented the

harbor were easier to maneuver and had a more powerful propulsion that was not reliant on wind. For sailing vessels, the contrary winds in Table Bay, especially in the winter, oftentimes trapped these vessels as they attempted to leave the harbor and pushed them onto the shallows (Werz 2003:20). The numbers of vessels grounded along the western and northeastern shoreline further demonstrate this effect (Figure 6.5). The advanced technology afforded by steam engines allowed these vessels to better counter the risks posed by these adverse weather conditions, resulting in less frequent groundings. Therefore, the risks to sailing ships were much greater than that of steamships. In the case of *Athens*, the extreme force of the winter storm system made the steamer the exception to the norm.

The Western Zone in particular had a large number of wrecks associated with the grounding of vessels along the rocky shore (29). As ships either departed the bay heading south around the Cape to the East Indies or entered the bay from this direction, these ships were exposed to the full force of the winds and swells coming from the open ocean. As a result, ships under sail were particularly susceptible to grounding on the shore especially if stays were missed, which was commonly noted in many of the wrecking events along this western shore. Similarly, the Northern Zone comprising Rietvlei and Blaauwberg had an increased amount of groundings (17) associated with sailing vessels either missing stays or running ashore due to foggy conditions, discussed below.

Toponymic evidence suggests that certain areas cautioned of these inherent risks. The shallow bay immediately south of Green Point, Three Anchor Bay, is named for the common procedure of using at least three anchors when vessels were moored in the roadstead (Raper 2005:432). The naming of this area was a cultural indicator of risk in

the landscape for mariners that warned of the danger posed by the prevailing weather patterns in the bay. Furthermore this particular name served as a way of suggesting a possible solution to these risks for sailors entering the harbor.

Case Study: *Fame* (1822)

The five-decked East Indiaman *Fame* was a chartered sailing brig for the English East India Company in India. Built in Calcutta in 1818, the vessel was 629 tons and made of teak, sheathed in copper. *Fame* was sailing from Madras bound for London when the vessel left Table Bay on 14 June, 1822. Upon leaving the confines of the bay a heavy northwest wind began blowing with big swells rolling into the shore. When the ship began rolling in the seas, anchors were put down to ride out the gusts when it lost the moorings and was driven onto the rockiest part of Sea Point. The vessel soon became a total wreck in the subsequent wave activity. Boatmen were sent from Table Bay to assist the stranded vessel and succeeded in rescuing the majority of passengers with minimal loss of life (*Cape Town Gazette and Mercantile Advertiser* 1822; Rawe and Crabtree 1978:616).

The wrecking of *Fame* demonstrates the potential risks of wind patterns in the bay. According to the historical record, *Fame* was headed to London, which would have meant that the vessel should have been sailing north from Cape Town. Instead, the northwest winds pushed the sailing vessel to the south and into a dangerous area subject to higher winds and stronger waves. Much like *Athens* that wrecked just to the north of *Fame*, once the vessel was on the rocks the strong winds, which were not described as a gale, caused the total loss of the vessel. Therefore, even when storms did not hit, there were potent risks created by the strong wind patterns in the bay.

Hazards to Navigation

After grounding events and shipwrecks caused by storm systems, the next greatest number were wrecked due to navigational errors. Nine vessels were lost because of errors in navigation prior to 1870 and one more in the period after. The two areas that these circumstances were prevalent were within the Northern and Western Zones. These two areas represented the approaches of the bay. From the south, vessels would typically round Green Point and Mouille Point while ships coming from or heading to the north passed by Robben Island or Blaauwberg. These areas were known to experience thick fog at times, chiefly during summer months with southeasterly winds, and later navigational instructions would caution of this for sailors entering the bay (United States Hydrographic Office 1908:507). The fog would typically sit low enough to obscure the shoreline and while masts could be seen at the western location from the foot of Lion Mountain, these vessels could not make out the rocks and were at risk of running aground.

Even after construction of two lighthouses along the western shoreline, indicated by red dots in the above maps, at least two instances in the SAHRA database include notes that describe how captains mistook the placement of the lights while entering the bay at night and subsequently wrecked their vessel. This was caused by the earlier Green Point light built in 1824 at a place that was too far from the rocks at Mouille Point so captains who did not know the bay would attempt to round the bend before the actual entrance of the bay and run into the rocky shoreline. Furthermore, it is important to note that early navigational charts for the Cape surveyed by Dutch hydrographers oftentimes misrepresented the placement of the shoreline. This led to an increased risk of captains

sailing closer to the actual shore than was planned for. These hazards were prevalent throughout the 19th century, as evidenced by the wrecking of such vessels as the *Thermopylae* in 1899 pictured in Chapter Four, and help explain why there is a significant cluster of shipwrecks around the western location in the bay.

Furthermore, features in the landscape were marked within navigational charts as potentially dangerous areas. The most prominent of these was Whale Rock just offshore of Robben Island. Located in the Northern Zone of wrecking, Whale Rock was the cause of two shipwrecks that were wrecked by colliding with the submerged rock. Another area that was marked on maps was the mouth of the Salt River that was known to contain dangerous quicksand that would make it difficult to refloat any vessel pushed close to the shore.

Shipping Risks

The earliest notion of the Cape of Storms originated by de Gama was altered by Portuguese King John II who looked to the newfound access to Asian markets and deemed the recently discovered passage as the 'Cape of Good Hope.' The actual Cape that King John was referring to was the location where vessels would make the turn eastward around the African continent, located along the Cape Peninsula south of Table Bay. The Cape of Good Hope was also the common way to refer to the British-owned Cape Colony in the reports sent back to London. With the rise of ocean-going steamships in the latter half of the 19th century, more sailors and passengers began to make the voyage to the Cape. The discovery of diamonds and gold further instigated travel to the growing Cape Colony. Advertisements to passengers created an ideal image of potential opportunity and wonder to be experienced if one was to venture to South Africa:

> Passing a few rocky islands, we enter Table Bay, along the curving shores of which extends the metropolis of all South Africa – its main avenues running straight from the sea to the pine and silver-tree plantations, which clothe the base of a titanic wall of rock, the flat-topped Tafel berg or Table Mountain, that, with the picturesque Devil's Peak and the grotesque Lion's Head on either flank, enclose the city and its immediate environs, forming an amphitheatre comparable in scenic effect to Naples or Rio (Union-Castle Steamship Company 1903:9).

This made Cape Town, situated just prior to the actual Cape of Good Hope, the main commercial and passenger center in South Africa. For many, Cape Town was the gateway to the east. As the original halfway stop on this voyage, Cape Town's urban character had earned it a reputation during the 18th century Dutch period as *de Indische Zeeherberg*, or tavern of the Indian Ocean (Ward 2007:140). Up to the mid-19th century sailors would typically only stop in Table Bay as part of a much longer voyage. By the time that the Union and Castle Lines had merged at the turn of the 19th century, the amount of people making Cape Town their final destination prompted the creation of popular perceptions of the city as no longer the gateway to the east, but rather the gateway to South Africa. Therefore, shipping in Table Bay underwent significant changes during this transformative period of Cape Town's identity in the 19th century. The risks associated with these changes are demonstrated by relevant shipping statistics for the harbor at Cape Town.

The total number of vessels calling annually in Table Bay was previously demonstrated in Figure 6.1. From this data it is clear that there was a steady rise in the

number of vessels entering Table Bay during the study period. Two low points during the 1870s are indicative of an uncertain economic climate in Britain that would have caused the number of ships travelling to the Cape to decrease. The year 1806 represented the lowest number (133) of total vessels in Table Bay while 1902 witnessed the inundation of the harbor with vessels (1431) during the year. The latter figure can be attributed to the Second Anglo-Boer War, which caused a significant influx of primarily British vessels through Cape Town to supply Britain's wartime efforts in the interior.

Another influence for this rise in shipping traffic was the competition between the Union Steamship Company and the Currie-owned Castle Packets Company that increased the risk taking behaviors of sailors entering Table Bay. The granting of a joint-mail contract for each company to run an individual mail service to the Cape in 1876 resulted in a fierce rivalry between both lines. With the growth of steamships, the voyage to the Cape was growing significantly shorter. Awards were given to mail ships that made a speedy passage and these vessels were known to be seen racing one another, with the date of arrival becoming more conjecture in London papers (Murray 1933:65). In Cape Town, vessels were arriving weekly with mail from around the globe, which would have swelled the numbers of ships recorded by the Port Offices in Table Bay during the latter half of the century. In the pursuit of economic gain, these vessels were pushed to the limit and led to an increase in risk-taking behaviors during these voyages.

While the large number of ships entering Table Bay benefitted the colony, it also posed certain risks for the harbor. As previously explained, the harbor operations were continually lagging behind in granting sufficient accommodation for vessels. The transfer of cargo and passengers was done in the early half of the century by individual boats and

boatmen that charged increased rates despite the inefficiency of the exchange. This forced vessels to wait long periods just to engage in trade with the port, which would have affected total voyage time if the vessel was only stopping in the bay and increasing the danger of exposure to natural risks outlined above. Furthermore, even as additional harbor expansion projects increased the amount of space in the harbor, long periods of waiting due to the chronic congestion at the port also caused some vessels to anchor in the roadstead, which further exposed them to the natural dangers of the bay. This situation is exemplified by the wrecking of SS *Hermes*, explained below.

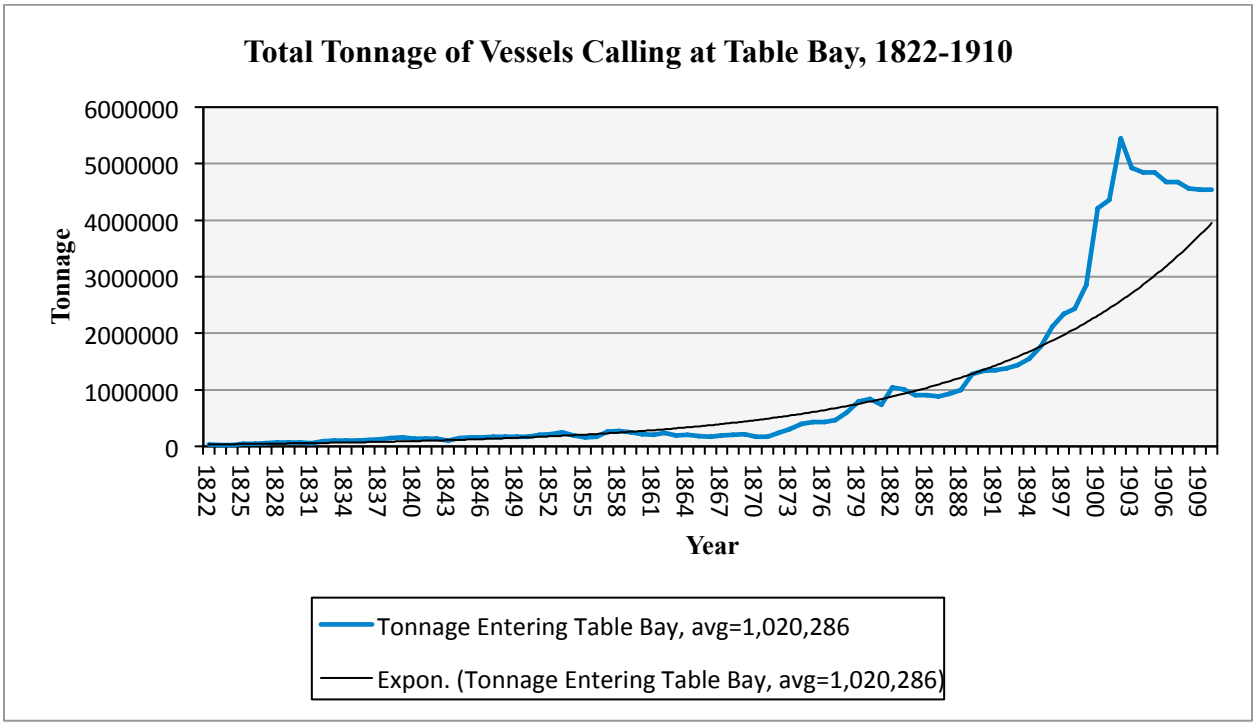


FIGURE 6.10. Compiled annual tonnage of all vessels entering Table Bay for each year between 1806 and 1910.

In a similar fashion, the tonnage of ships making their way to Table Bay also increased during the 19th century. The total annual tonnage of all vessels in the harbor is depicted in Figure 6.10. Each year not only brought about more ships into the bay, but

also vessels of increasing size. By the time the decision was made to expand Cape Town's Outer Harbor in 1889 with the addition of the East Pier perpendicular to the breakwater, the average tonnage of vessels entering the bay numbered in the thousands per vessel. In November 1881 the Union Line had received a "tempting offer" to build a ship of 5,000 tons, but the bar afforded by the Cape Town dock obliged the company to decline it (Newall 1999b:21). By 1897 the Union line built the first ever 10,000-ton mail ship *Briton*, which was closely followed by the *Kinfauns Castle* of 9,664 tons and later the Union Line *Saxon* boasting 12,000 gross tons (Murray 1933:69). These vessels pushed the limit of even the newly constructed, but not yet completed Outer Harbor in Table Bay.

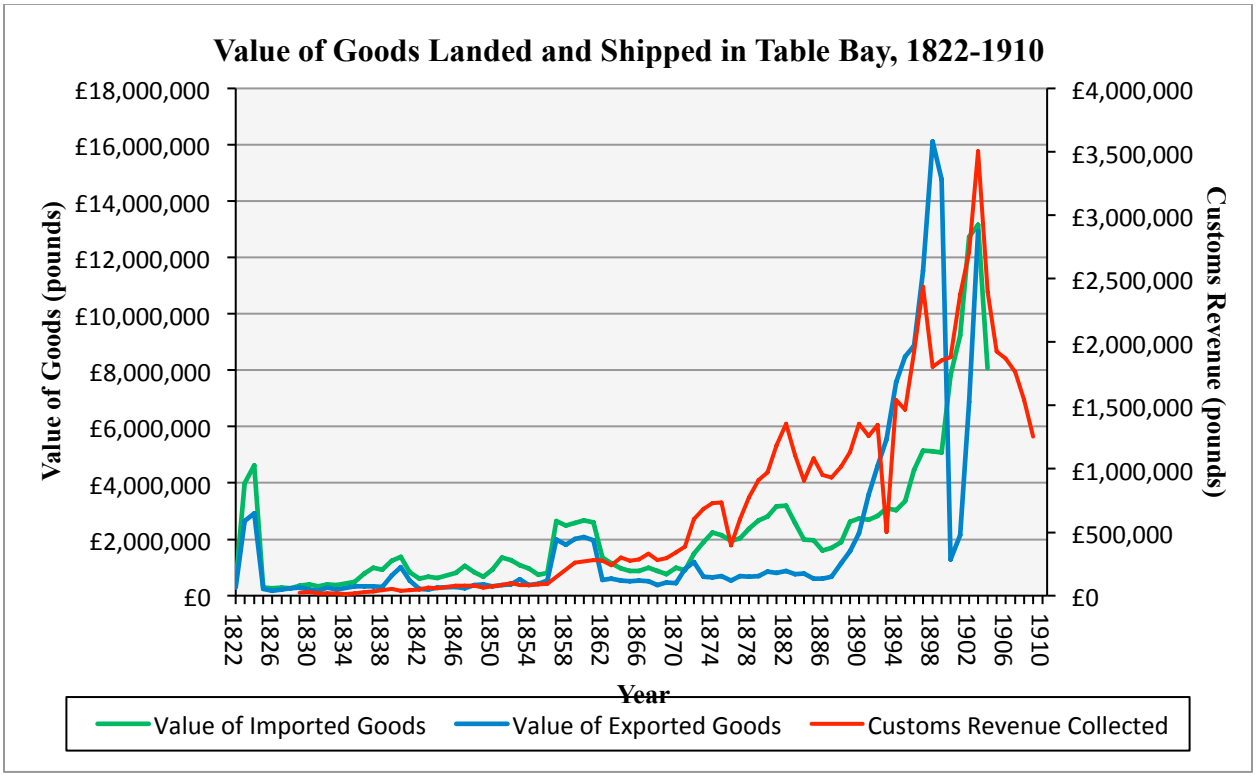


FIGURE 6.11. Total monetary value of imports and exports in Table Bay along with the revenue collected by Customs Officials in the Cape Town harbor.

These statistics for shipping in Table Bay reflect the risks of running successful and efficient harbor operations. Whether or not there was a harbor in Cape Town, the city would become the chief commercial and passenger port in South Africa. While early harbor development was stagnated by a lack of financial infrastructure, the rise in shipping caused the risks of not having sufficient harbor facilities to outweigh the risk of increased colonial expenditure. Especially as the industrial and productive output of the colony increased and Cape Town was linked to places such as the gold reefs and diamond fields through the construction of several rail lines, the trade flowing from the colony through its main port increased the value of adding harbor facilities to expedite maritime commerce. This value is demonstrated by the overall monetary value of goods imported and exported from Cape Town (Figure 6.11).

The initial spike in the value of goods is likely due to the mass emigration of settlers in 1820. Following the first stage of harbor construction in 1870 there is a rise in the value of goods brought into the bay, which demonstrates an increase of commercial capability within the port. The large drop off at the turn of the century can be explained by the Second Anglo-Boer War. The most substantial aspect of this data, however, coincides with the discovery of gold in 1886 when the value of exported goods skyrockets. What this meant for the harbor was that Cape Town could no longer be perceived only as the Tavern of the Seas on the voyage to the east, but was now a productive participant in global maritime trade. Therefore, shipping in Table Bay during the second half of the 19th century was marked by the large mail steamships frequently bringing passengers and merchandise to the Cape, while cargo vessels worked to

facilitate the exchange of goods between nations. Once again, the risks to the harbor were the availability of infrastructure to cope with these dramatic changes to maritime activity.

It is also important to note Table Bay's role as the primary repair station for vessels making the voyage around the Cape. Coinciding with Cape Town's symbolic role as Tavern of the Seas, the port was also the place where vessels would stop in to make the necessary modifications and repairs to the hulls of vessels that were damaged on route to London or ports in the Indian Ocean. The construction of the Robinson Graving Dock and Patent Slip as part of the harbor scheme reinforced this ideal, and both facilities were consistently used throughout the year (Table Bay Harbour Board 1873; Table Bay Harbour Board 1883). Marano (2012:165) notes how shipwrecks tend to cluster around areas with potential opportunity for rescue or aid. Similarly, the presence of these repair facilities would have increased the amount of wounded vessels attempting to get to Table Bay, and was also a factor in the potential risks of an increased number of ships calling in the bay.

Case Study: SS *Hermes*

SS *Hermes* was registered in Liverpool, Scotland in 1899 and belonged to Robert Houston's British and South American Steam Navigation Co. Ltd. *Hermes* was one of a series of cargo ships built for the line in the late 1890's. On 12 May 1901, a windy afternoon in Table Bay, the steam-driven cargo ship let go of its starboard anchor in 10 fathoms of water (Board of Trade 1901:76). The vessel had arrived following a voyage from Rosario, Argentina with a large consignment of forage. The vessel had arrived in the middle of the Second Anglo-Boer War and the dry conditions in the South African interior coupled with the vast numbers of horses and mules requiring fodder as a result of

the war necessitated the importation of fodder. A further result of the war was the crowded state of Cape Town's harbor, where in some places vessels were triple-banked on the docks (Murray 1933:77; Newall 1999a). Given the overwhelmed status of the docks, and with the prospects of berthing in the immediate future seeming remote, *Hermes* banked its engine fires and made preparations for the long wait in the roadstead.

That night, the wind had picked up and a strong northwesterly gale had come upon the bay. The captain of the vessel was called by the second officer for permission to let go the second anchor as the seas were swiftly becoming dangerous, but the captain did not come on deck. The second officer remained on watch, but in the commotion of the storm lost sight of his bearing lights. An hour after the storm had begun the second officer noticed a white streak on the starboard quarter of the vessel and once again called for the captain. Realizing that the ship was likely in danger, the captain came above deck. Ten minutes later SS *Hermes* ran aground on Blaauwberg Beach, over a kilometer from its anchorage (Board of Trade 1901:76).

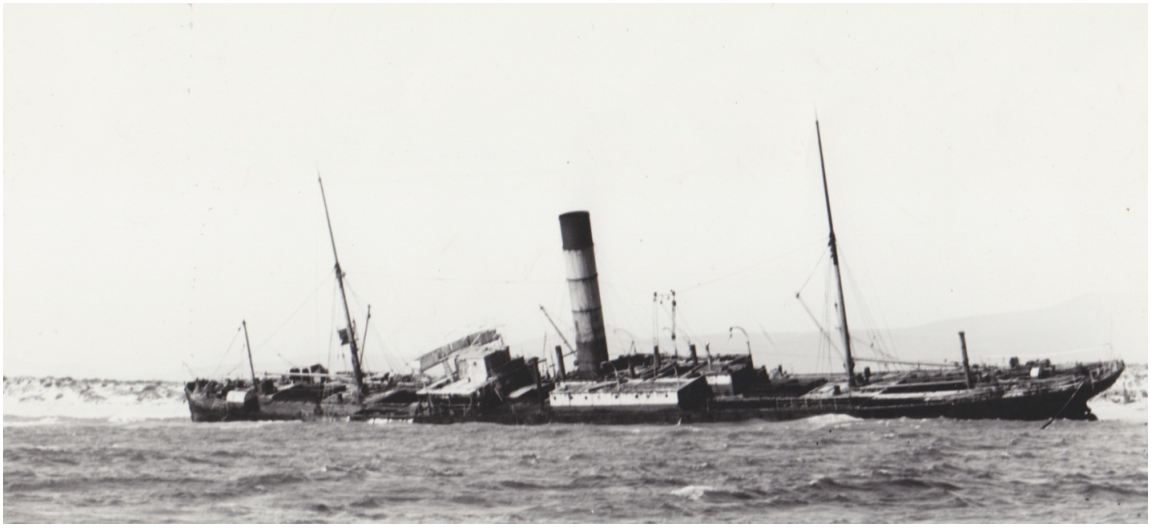


FIGURE 6.12. SS *Hermes* on the beach one kilometer north the present-day Milnerton lighthouse (Cape Town Archives Repository, E 8855).

Soon after wrecking, lifeboats were deployed and in the heavy seas, two women were drowned after the small craft capsized in the heavy wave activity (*Cape Argus* 1901a:5). The remainder of the crew stayed aboard and were got off when the rocket apparatus secured a cable to the ship and a breeches buoy could relay the passengers and crew to the shore (*Cape Argus* 1901b:5). Several days after the *Hermes* was lost, the vessel had become firmly embedded in the sand and became a total wreck (Figure 6.12)

The wrecking of the *Hermes* displays a chronic feature of Cape Town's harbor – the lack of suitable accommodations for ships in the bay. The Second Anglo-Boer War at the turn of the century had resulted in the overburden of vessels on the docks engaging in activity related to the wartime effort. This caused a heavy strain on the already encumbered and barely completed harbor works that were not yet in a position to afford the most efficient loading and unloading of people and goods. This caused the delay of vessels at the docks and recently arrived ships, like the *Hermes*, to wait in the unprotected roadstead, which made them susceptible to the natural risks of the bay. The story of the Hermes embodies the risks of unsuitable harbor facilities for the extent of shipping in the harbor, and the wreck is a prime archaeological feature in Table Bay's cultural landscape of risk.

Mitigating Risk in the Cultural Landscape

The cultural landscape of Cape Town is distinguished by the dialectical relationship between that of the Cape of Storms and the Cape of Good Hope. This relationship has played a vital role in shaping the general perceptions of risk for shipping around southern Africa, and specifically Table Bay. Similarly, notions of inherent natural danger and the prospect of potential trading opportunity are reflected in the development

of the harbor at Cape Town. Based on data obtained throughout the course of this research, two prevailing themes have historically characterized the risks associated with shipping and the growth of the harbor. These themes are 1) the protection of vessels entering and using the bay, and 2) the safe and effective loading and unloading of cargo and passengers. Both themes highlight the cognitive perceptions of risk in the bay outlined in the above sections as well as the behavioral responses of the maritime community to these risks in the form of risk management. The decisions to modify the harbor and mitigate these risks directly relate to the creation of a cultural landscape of risk in Table Bay and will therefore be expanded upon in the following sections.

Protection of Ships in the Bay

There are several factors that influenced the decision-making process to provide adequate protection for ships in Table Bay. The most influential of these was the natural environment. The combination of wind, wave, and current patterns in the bay naturally created a potentially hazardous area for ships anchored offshore in the typical roadstead of the port. With the cyclical occurrence of major northwesterly storms that historically devastated shipping in the bay and the symbolic notion of Cape Town as the Tavern of the Seas or main stop on the voyage east, the dominant perceptions of the harbor were that it was a dangerous but necessary port of call, especially in the wintertime.

An attempt to mitigate this risk was demonstrated through the decision of Lloyds not to insure any vessel that used the anchorage during this dangerous season. This reflects an attempt of Crook's neo-liberal risk management strategies whereby the colonial authorities attempted to minimize potential risk exposure through the provision of incentives for avoiding the natural risks of the harbor (Duncan 2000:43). The

alternative to Cape Town's port, however, was in Simon's Town, which had a much lesser amount of harbor space or facilities to handle the amount of shipping calling by the Cape during this period. This initial attempt to mitigate risks through regulatory suggestion was ultimately unsuccessful.

Duncan (2000:113) notes how periods of neo-liberal risk mitigation will correspond with increased numbers of wrecking events. The construction of harbor facilities to protect shipping in the bay represent the governmental control of risk in an area and are classified as ordered risk management which should coincide with a decrease in the number of shipwrecks. The breakwater in Table Bay represents the attempt by the Harbour Board regulatory body to control natural risks in the landscape. Figure 6.2 demonstrates the effect that the breakwater had on the risks of storms and weather in the bay.

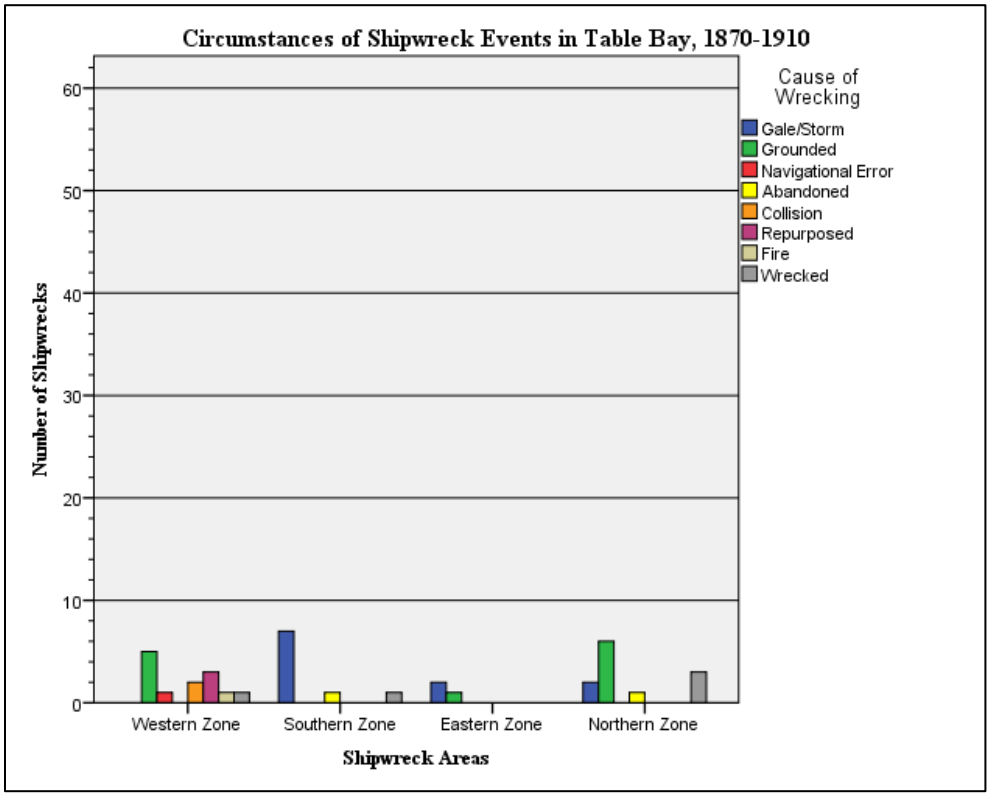


FIGURE 6.13. Distribution of shipwreck events according to spatial location and the causes of wrecking after breakwater construction.

Following construction of the breakwater, there is a significant decrease in the number of vessels wrecked in the bay. In the period after its construction there are several years with major storm systems, one of which rivaled the ferocity of the historic Great Gale. Each was noted with a corresponding lower consequence to shipping (Figure 6.13; Table Bay Harbour Board 1879). Instead, these events prompted the extension of the work with a bend to cover a larger area that would further negate the effects of the prevailing winds to the northwest and protect the southern shoreline. Five of the seven vessels wrecked along this stretch of coast were wrecked in this single 1878 storm.

Instructions for sailing into Table Bay in this period after harbor construction describe the work as "the most important maritime works south of the equator…to remove the evil reputation that Table Bay has had for its turbulent sea in S.E. or N.W. gales" (Findlay 1876:210). Throughout the early history of harbor development in Table Bay, improvements to the harbor were driven by a sense of risk incited by large-scale natural disasters to shipping caused by storms. Despite numerous surveys, plans prepared, estimates provided, and statistical registers compiled demonstrating the benefits of a harbor of refuge, these potential improvements were continually "pigeon-holed and set aside for later consideration" (Hammersley-Heenan 1904:208). A severe storm in 1857 prompted the final consideration of a plan that was approved in 1860 and the 1865 Great Gale further reinforced the execution of the breakwater. Therefore, the breakwater is a significant feature of the cultural landscape for changing the perceptions of risk in Table Bay and symbolizes the taming of the Bay of Storms.

Another important element under the theme of the protection of vessels in the bay is demonstrated by the acts of Table Bay boatmen. From the earliest mention of the

severe storm systems in Cape Town, reports mention the valor of these boatmen in relaying cables and anchors to distressed vessels as well as rowing out to rescue passengers and sailors that were stranded on sinking vessels (Bird 1822:131; *Cape of Good Hope and Port of Natal Shipping Gazette* 1846; *Cape Argus* 1865a). Many early images of Cape Town depict the spare anchors and cables along the shoreline ready to be deployed in case of severe weather (Figure 6.14). Prior to the construction of the breakwater these boatmen were the sole means of affording protection for shipping in the bay. The ability of boatmen to assemble quickly and directly address any shipwreck incident significantly decreased the number of lives lost in the bay and played a vital role in mitigating risk in Table Bay.



FIGURE 6.14. Section of a landscape drawing by Robert Gordon in 1778 that incorporated anchors on the beach along with a shipwreck to the left of the jetty. Inclusion of these images in the illustration is telling of their importance to the cultural landscape of early Cape Town (Image courtesy of the City of Cape Town Environmental and Heritage Management).

The construction of the two lighthouses along the western entrance of the bay further represents risk mitigation through cultural construction. Research demonstrated, however, that the poor placement of the original Green Point light was too far from the

actual entrance to the bay and instead caused many of the wrecking events in the area. The lighthouse at Mouille Point alleviated some of these risks, but the weakness of the lights continually resulted in the wrecking of vessels along the shore, and the risks to shipping continued throughout the time period (Figure 6.13). With the completion of the breakwater and light placed at its head, the Mouille Point Light was no longer necessary and abolished soon after the turn of the century.

Additional hazards to navigation were marked through the cultural naming of the landscape. Whale Rock, named for the historic whaling activity around Robben Island is noted as the prime hazard to ships entering around the island (Findlay 1876:206). Furthermore, the Lion Mountain was used as a cultural means to convey avoiding the area at the base of the Lion's Head. Two rock features that were potentially hazardous were named the North and South Paw of the Lion and aided in the identification of a potentially risky area for shipping.

The elements expressed in the cultural landscape of Table Bay that reflect the theme of protecting vessels entering and using the harbor changed the perceptions of Cape Town as a potentially dangerous port to be utilized with caution, to that of a safe harbor able to conduct secure operations during the entire year. This active shaping of the landscape resulted in the dramatic increase of maritime activity in Table Bay and contributed to the success of the colony as a whole. It also led to the creation of a new set of risks associated with keeping up with the rising tide of shipping that would emerge in the ensuing years.

Safe and Effective Loading and Unloading of Passengers and Cargo

The fundamental function of any harbor is to facilitate the linkage of land and sea. During the initial phases of harbor use in Table Bay during the study period, all cargo and passenger operations were carried out on the North Wharf, Central Jetty, and South Jetty. When a vessel entered the bay, cannons would be fired from the Imhoff Battery and later the signal station on the Lion's Rump would send word to the port offices. This instigated a swarm of boatmen and vendors to surround the vessel offering to relay people or cargo as well as to promote different lodgings or activities in the town (Veitch 1994:49). The significance of these boatmen is reflected artistically by the presence of small watercraft and boatmen in the majority of historical representations of Table Bay (Bradlow and Bradlow 1955:210-244).

Since there was no place for vessels to come alongside the jetties due to their location in the shallow water near the shoreline, use of these boatmen was obligatory. This enabled these early entrepreneurs to charge increased fares for their services. Therefore, this period from 1806-1870 effectively forced the bay itself to serve as an extension of the waterfront whereby the line between the water and the shore was blurred. The factors surrounding use of the harbor during this time created a cultural landscape of risk for shipping that was guided by the lack of sufficient facilities and the agency of boatmen who used the system as a means of extending the waterfront to make a living in the maritime community.

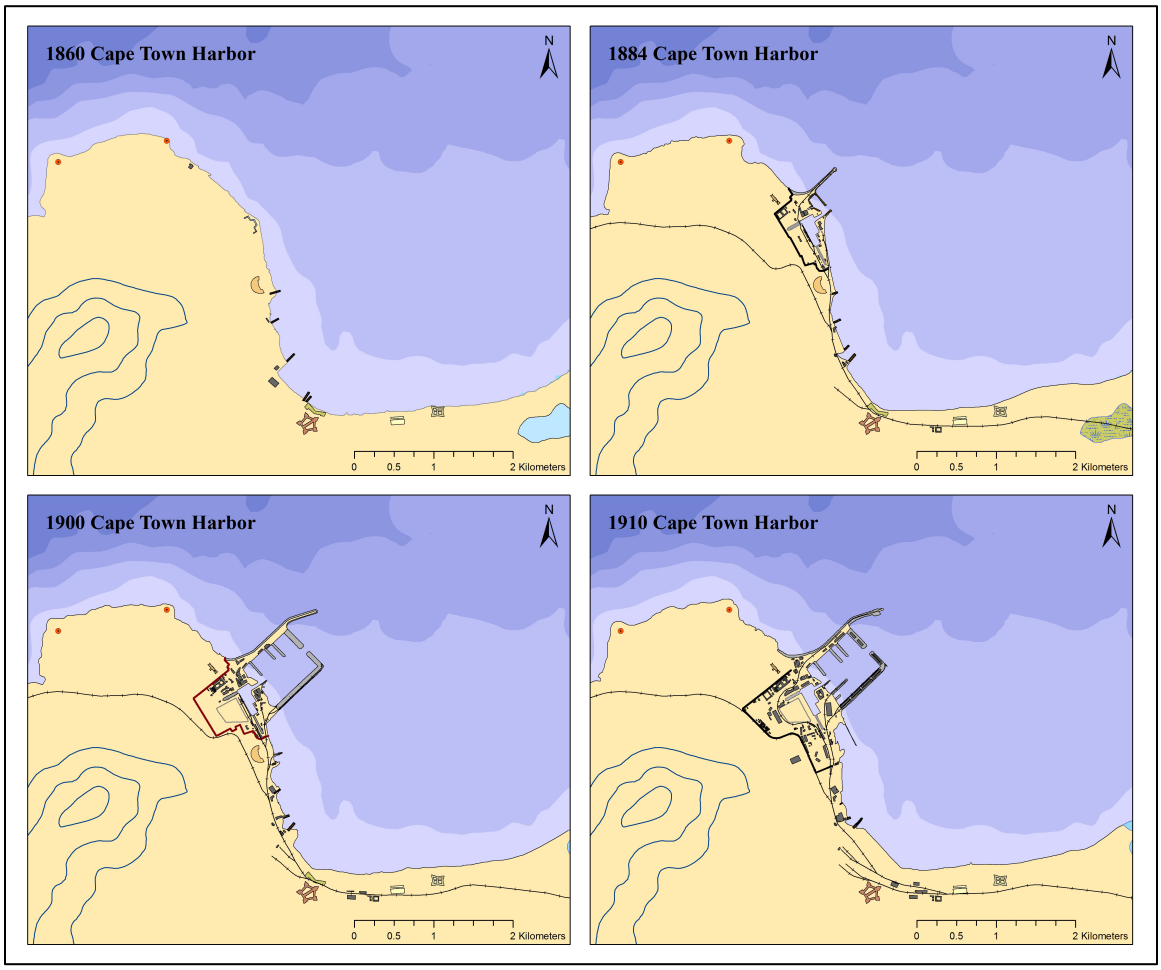


FIGURE 6.15. Spatial and temporal development in Cape Town's harbor with relevant harbor works, extent of harbor property and supplementary infrastructure utilized by the maritime community. Topographical curves signify the base of the Lion's Rump and shaded areas represent bathymetric differentiations in the bay (Image by author, 2015).

The creation of a harbor by 1870 ensured the effective removal of ships from the anchorage in the roadstead to a contact with the shore via the docks, which would have eliminated the need for the boatmen in the capacity of exchanging people and goods from vessels to the shore. Boatmen employed under the auspices of the Port Office were still utilized as a life-saving service, and many of these men still maintained their status in the fishing community at Rogge Bay. Further research is needed to determine the extent to which these workers were incorporated into the general dock labor force. As shown in

previous sections, the exponential rise in shipping continuously created the need for additional facilities and infrastructure to accommodate the growing trade at the port. A list of all of the relevant works and their chronological dates of construction is included in Appendix 1. The spatial distribution of these works is demonstrated in Figure 6.15.

The spatial patterning of harbor works reflects the management of the risks of shipping in the bay. The beginning of the harbor via the construction of the breakwater, Alfred Docks and Inner Basin enclosed by the East Jetty ensured the protection of vessels and accommodated the number and size of vessels calling at that time. As evidenced by the above shipping statistics, these works were begun during a period when they were sufficient to manage the extent of shipping calling in the bay. Given the shift in the 1870s to the use of vessels with deeper draughts and more vessels requiring the provision of coal, the recently completed works and infrastructure were not in a position to handle the coinciding changes in necessary harbor operations. Therefore, the Outer Harbor was a necessary addition and supplementary jetties were constructed to mitigate the bathymetric risks to these larger vessels. Figure 6.14 shows how the Outer Harbor was placed in a deeper location and enclosed by the South Pier, which also eliminated the risk of southeasterly winds and allowed for even more dock space.

To facilitate the effective supply of coal to steamships, a Collier Jetty (depicted in the 1910 section next to the South Pier) was extended to a deeper location and a coal delivery system equipped with eight electrical cranes and an elevator built on the work. A Loch Jetty built perpendicular to the breakwater on the deeper end of the Outer Basin augmented this service and further addressed the needs of deeper, steam-driven vessels. Supplementary warehouses were built that stored this fuel source and supplied the

increasing number of steam vessels making their way to the Cape. The Outer Harbor, or Victoria Basin, is consequently a response to the requirements of a modern harbor by the effective management of larger, deep draught steamships through the provision of a primary fuel source for these ships (Weise 1981:84). In this sense, Cape Town continued in its original function as the halfway house on the voyage around the Cape and became the primary fuel bunkering facility for the new era of vessels plying the seas.

The Table Bay Harbour Board created a cultural landscape in the latter half of the 19th century characterized by the ordered management of shipping activity in the bay. Not only were the risks posed by the type of vessels calling at the port mitigated, but the work of the harbor itself was also managed. This was regulated by additional infrastructure in the harbor, such as the construction of a Clock Tower at the entrance to the Alfred Basin, which regulated the workday while a Time Ball Tower linked to Greenwich Time and signaled the shift in tides (Table Bay Harbour Board 1883). The signal station at the Lion's Rump was made even more operational by the linkage of a telegraph system connected to the docks as well as the railways. These rails were extended onto the docks and cranes put in place, which allowed for the direct transfer of goods from ships to a transport system that further connected Cape Town with the rest of the colony (Hammersley-Heenan 1904:222). These constructions within the landscape of Table Bay were a response by the colonial authorities to mitigate the risks posed by the evolution of Cape Town from a mere halfway house and refreshment outpost to the Mother Port for all of South Africa.

The decision to begin construction of the harbor in 1860 marks the beginning of a shift in risk for shipping in Table Bay. Harbor operations and facilities were meticulously

managed and controlled through the actions of the Table Bay Harbour Board. Whereas the former half of the century was an un-mitigated period of shipping management that fostered the rise of individual agents and small businesses to dictate the extent and efficiency of the harbor, the new docks were an attempt by the colonial government to take control over the risks posed by the exponential rise of shipping in the bay. By constructing the harbor in Table Bay, the Harbour Board not only took action to create an ordered risk landscape, their actions also facilitated more shipping to call into the bay and encouraged perceptions of Cape Town as a safe and effective harbor. This in turn created even further risks of increased shipping activity.

The actions of the Harbour Board reflected by the development of the harbor were structured by the risk of shipping in the bay and the subsequent creation of harbor works structured the risk of amplified shipping in an on-going process throughout the 19th century. Therefore, the creation of the docks mirrors Gidden's duality of structure whereby the mitigation of risk in the landscape was driven by the perception of Table Bay as an ineffective harbor, and led to the creation of the modern harbor facilities. This action changed the societal structure of risk in Table Bay, which evoked an increase of shipping and led to the need for even further harbor development.

Conclusion

This chapter outlined the prominent risks to maritime activity and harbor operations in the cultural landscape of Table Bay. Analysis was conducted through an examination of shipwreck events and statistics for the extent of shipping in Cape Town. It has been shown that examining the spatial location of shipwrecks in the bay reveals patterns of risk that show the dominant presence of natural hazards to shipping in Table

Bay. Furthermore, the characteristics of shipping throughout the 19th century created a situation in Cape Town where harbor development continually lagged behind the prevailing trends of maritime transportation. The successful mitigation of these factors caused perceptions of risk in the bay to change during the course of the 19th century.

Two themes of risk management were identified, which counter the identified risks of the bay. These were the protection of vessels in the harbor and the effective operation of harbor functions. Each theme corresponded with the responses of the Harbour Board in Table Bay to the prevailing risks within the harbor. As a result, the cultural landscape of risk during the 19th century in Table Bay was characterized by the duality between the notion of a Bay of Storms and the maritime culture of Cape Town as Tavern of the Seas or Gateway to the East. The development of the harbor can be seen as a behavioral response to risks in the cultural landscape that evolved alongside the dominant perceptions of the harbor to eventually bring the port city into the modern era.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

General Observations

The first and most significant pattern found in this study was the effect of the natural environment on the determination of the harbor in Table Bay. Perceptions of risk along the Cape of Good Hope and the main port of call for the passage at Cape Town were formed by the prevailing patterns of weather that historically caused significant hazards to shipping. Past studies have suggested that the beaches at Woodstock and the Salt River in the southern sections of the bay were likely hotspots for shipwrecks (Durden 1992:87; Werz 2003:22). Evidence obtained from the spatial and temporal analysis of shipwreck events and harbor evolution confirms how the predominant weather systems resulted in a patterning of shipwrecks along this southern shoreline of the bay. Therefore, the looming presence of severe storms prompted the colonial government at the Cape to take action and enact changes in the harbor to mitigate the dangers posed by these natural risks. These reactive responses resulted in the formation of a unique cultural landscape of risk that is reflected in the material remains of the historic maritime community and development of harbor works.

In addition to this, statistical analyses of shipping trends in relation to the growth of importance of Cape Town as a terminus have shown how the natural limitations in the way the city could expand created the need to extend the waterfront into the bay. As a result, the alterations made to the harbor during this time have had a significant effect on the natural dynamics of the bay. Furthermore, the reclamation of land even by the turn of the century effectively covered up the majority of shipwreck material along the area of

the bay that contained the greatest density of shipwreck activity. These natural changes to the shoreline over the years have consequences for the deposition of material culture remains for this historic period as well as the way that contemporary archaeological impact assessments are performed.

A second observation involves the extent of harbor facilities in relation to general trends in maritime activity at the Cape Town waterfront. The early stages of harbor usage during the 19th century were generally governed by small businesses and locally operated boats since vessels were forced to anchor due to the lack of accommodation along the several wooden jetties that comprised the port. Historical statistical analysis showed that with the rise of passenger and mail steamships, along with the amplification of industrial expansion within the colony through the mining of mineral resources in the interior, the value of goods passing through the Cape Town increased and the number of ships entering the bay intensified. The culmination of these factors resulted in the need for the ordered mitigation of shipping risks in the harbor. The Table Bay Harbour Board therefore functioned as a regulatory entity within the local society that produced an ordered landscape of risk management through additional public works projects and the effective administration of harbor activities.

One final observation made throughout the course of this research was the effect of boatmen on the cultural landscape of risk in Table Bay. These Table Bay boatmen were identified as a distinctive maritime culture within the local maritime community and played an active role in shaping the perceptions of risk as well as the effectiveness of operations in the harbor. Historical research into the accounts of severe storms described how the loss of life associated with the high number of wrecking events in Table Bay was

significantly low and offset by the efforts of these intrepid navigators of the surf. Due to limitations in time for data collection and availability of information pertaining to each wrecking event, these statistics could not be assessed in this thesis, but would allow for the measure of effectiveness of the boatmen in mitigating the risks associated with lives lost in shipwreck incidents.

In addition to their role as an ad hoc lifesaving service, boatmen provided the essential assistance of relaying people and goods from the boats to the shore prior to the establishment of an efficient dock system in the harbor. Composed of both European and other marginalized members of society such as native African and Cape Malay people, the local boatmen functioned as an extension of the shoreline into the roadstead and merged the line between the city waterfront and the bay. The culture of boatmen formed an integral component of the maritime cultural landscape and these men played a vital role in the development of Cape Town's harbor.

Limitations and Implications for Future Research

As shown in the methodological approach used in this study, a full investigation into the maritime cultural landscape and how risk influenced the evolution of that landscape requires the extensive examination into numerous sources of information. These data sources built upon one another to relate the concept of risk with how the people of Cape Town perceived, understood, and used the sea as well as the sea's relationship to the landscape. Certain features of the maritime cultural landscape that are relevant, but due to short duration of fieldwork and the availability of data collection could not be investigated include:

1. Oral histories/ethnographic accounts of identifying trends of risk or risk management for maritime activity in the bay.
2. Indigenous or native perceptions of the sea as potential influences on the cultural landscape.

Each of these data sources were not consulted in detail and could potentially yield invaluable information that would add to a more holistic understanding of how risk was perceived in 19th century Cape Town. While some ethnographic accounts were added to supplement analysis of certain shipwreck events as case studies reflecting the development of the harbor, a survey of the historical newspaper accounts for a range of different wrecking events could add to local conceptions of risk for shipping in the bay. Additionally, the inclusion of indigenous or native perceptions of risk was omitted. Since the decision to construct the harbor was a task set forth by the colonial government, the perceptions of risk according to these primary risk assessors and managers was focused upon. Perceptions of Capetonians largely outside the economic and political structures of power, while a valid component of the cultural landscape, could not be covered in adequate detail.

Ultimately, this thesis provides multiple avenues for additional research. Further studies are needed to determine the full extent of how risk shaped the development of the port and harbor, especially during the Dutch period when the conception of Table Bay as the Bay of Storms was initially formed. Likewise, analysis into the succeeding landscape of risk should focus on the evolution of the harbor in relation to the storage of goods, effective repair of vessels and supply of fuel for the bigger class of modern container-cargo vessels that began to frequent the Cape route by the early half of the twentieth

century. The advances made during this modern time period shifted away from the Alfred (1860-1870) and Victoria (1886-1905) Basins and moved to the newly constructed Duncan Docks (1939-1945) and later Ben Schoeman Dock (1969-1977). Therefore, the locus of shipping activity was moved away from the historic harbor core created during the preceding century. This progression paved the way for the modern harbor and historic waterfront area that has seen a recent revival of cultural heritage that promotes the historical aspects of shipping activity and Cape Town's fundamental link with the sea.

The Cultural Landscape and the Modern Waterfront

This study revealed how the cultural landscape of risk in Table Bay by 1910 was characterized by the dialectical relationship between the symbolic role of Cape Town as the Tavern of the Seas along the international shipping route for the Cape of Good Hope, and the notion of natural danger from the Cape of Storms. This relationship created a unique cultural landscape defined by risk and risk management. Shipwreck material, the dock facilities, quays, warehouses, port offices, etc., all formed part of the cultural landscape of risk in Table Bay.

This landscape has undergone a recent revitalization within the last 20 years. During 20th century harbor development, the historic harbor outlined in this study was functionally cut off from the city and Cape Town's historic link with the sea along with the maritime heritage of the old harbor was severed. In the foreshore area further tracts of land were reclaimed as the modern harbor expanded along the southern shoreline. These reclamation projects submerged the cultural material associated with the Bay of Storms, containing the densest accumulation of shipwrecks in the bay, underneath the growing city. The vacant Victoria and Alfred Dockland then became an area utilized by the local

fishing industry, with the Graving Dock fitting nicely as a dry dock for the smaller vessels used by the fishing community (Killian and Dodson 1996:497-498). Aside from the immediate dock space, the harbor infrastructure fell into relative disrepair during South Africa's economic isolation during the apartheid era, was forgotten, and the cultural landscape defined in this study became a relict landscape of past maritime activity.

In November of 1988 the Victoria and Alfred Waterfront (Pty) Ltd. (V&AW) was established as a subsidiary of the state-owned transport corporation Transet Ltd. The objectives for this newfound company were to restore the historic links of the harbor with the city (Worden 1996:61). A plan was established for a staged process of redevelopment to include the restoration of historic harbor buildings, the creation of restaurants, a fish market, exhibition center, souvenir shops, office accommodation, berths for harbor tours, plus a boat marina, parking lots, and hotel accommodation (Van Zyl 2005:6). Ultimately, the existing fishing culture was allowed to remain, but a combination of new facilities and modified harbor infrastructure were added to the landscape, which had changed from one of risk mitigation for contemporary shipping activity, to one characterized by the promotion of tourism, commercial, residential, and business development.

The V&AW promoted the area as the romanticized essence of Cape Town's symbolic role as the Tavern of the Seas and the overall success of the historic harbor's revival for the economy of the city is unquestionable (Breen and Rigby 1996:57). Despite the economic success of this changing landscape, it has been criticized as an untrue reflection of Capetonian identity, and instead promotes the heritage of British maritime colonialism that leads to nostalgic feelings reminiscent of the apartheid ideals of white

dominance (Worden 1994:43). The waterfront distinctively lacked a presence of the African migrant laborers that came to the city to work the docks, the convicts that built the breakwater, the fishermen that made a living on the coast, or even the boatmen that were identified in this study as an essential component of the cultural landscape (Worden 1996:62). Therefore, the history presented by the historical revival of the docks has been highly selective and alienating to some.

Other criticisms have discussed the functional conflicts between the development of a commercially based tourist industry, and the maintenance of the harbor as an operational port for tug and fishing boats (Killian and Dodson 1996:500). Since the writing of these critiques, the V&AW has made strides to rectify their representation of the harbor by, for example, linking the Clock Tower Precinct with ferries to Robben Island (Van Zyl 2005:7). The island became a World Heritage Site in 1999 and provides tours of the island where Nelson Mandela spent 18 years of incarceration during the apartheid era. Through the facilitation of tourist access to the island, the V&AW guaranteed a synergistic relationship between two of Cape Town's most important visitor attractions while recursively emphasizing the struggles of South Africa's profound history of racial struggle.

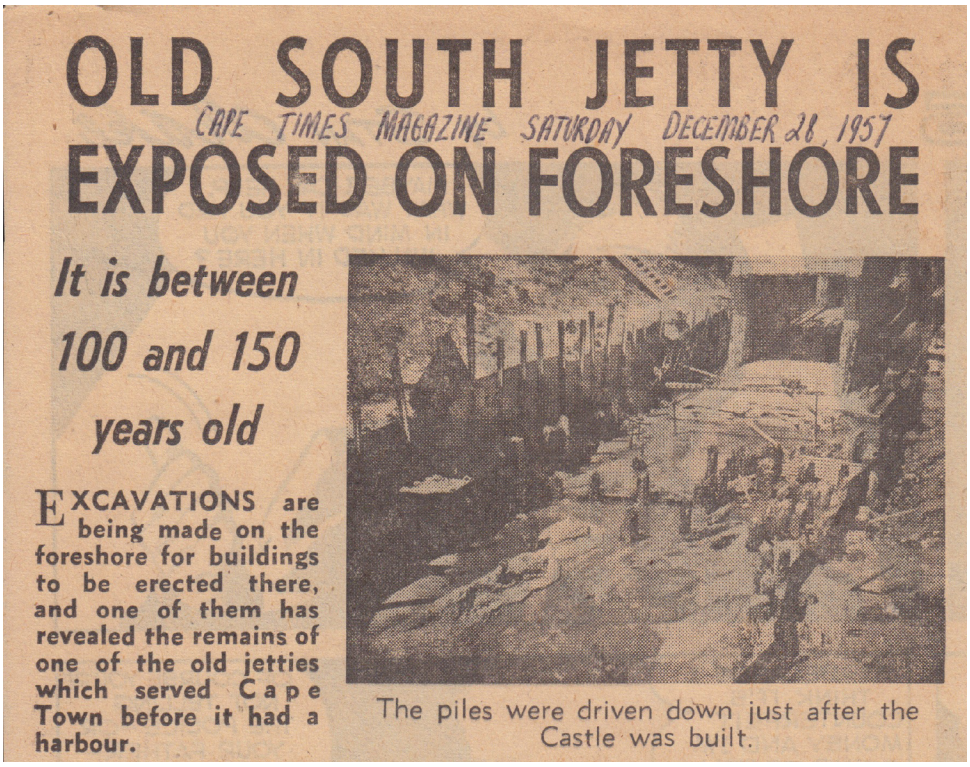
What comes to the fore when examining the present utilization of the Victoria and Alfred Docks compared to the historical beginnings of the harbor is the notion of a continuing or evolving cultural landscape. It has been demonstrated in this study that a cultural landscape theme is able to account for the range of material and associations that form the heart of Cape Town's historic links to the sea. Further research into the modern waterfront and the links to past cultural remains in the form of shipwrecks buried beneath

the current harbor and the marginalized cultures within the historic local maritime community is beyond the scope of this thesis. This, however, would be a useful line of future inquiry to aid in the creation of inclusive management plans for the waterfront area under a landscape theme.

Geographical Information Systems and Cultural Heritage Management

The analyses employed in this study relied heavily upon the spatial locations of shipwrecks and harbor works in addition to the analysis of geo-spatial trends in wrecking activity as potential indications of risk in the cultural landscape. To facilitate this examination, the use of a GIS was essential. The GIS allowed for the relocation of these historic sites and rendered an effective spatial representation of these landscape features. Given the expansion of the modern harbor over the historic foreshore area, the bulk of this cultural material is currently located below the city.

As development projects on the Cape Town foreshore area proceeded, the work had an impact on the cultural material located along the historic shoreline of Table Bay (Figure 7.1). Since contemporary methods of archaeological surveying were not available at the time and the laws regarding the management of cultural resources did not address maritime heritage specifically or preclude any development to take on cultural impact assessments, these sites went largely undocumented. There were few instances where archaeological practices documented these cultural remains as they appeared (Lightley 1976; Saitowitz et al 1993). With the progress of heritage laws regarding cultural resource management in South Africa, developers are now required to have archaeological assessments carried out prior to building anything on the reclaimed foreshore.



OLD SOUTH JETTY IS EXPOSED ON FORESHORE

CAPE TIMES MAGAZINE SATURDAY DECEMBER 28, 1957

It is between 100 and 150 years old

EXCAVATIONS are being made on the foreshore for buildings to be erected there, and one of them has revealed the remains of one of the old jetties which served Cape Town before it had a harbour.

The piles were driven down just after the Castle was built.

FIGURE 7.1. Newspaper article showing the impact of twentieth century foreshore development on historic harbor remains (*Cape Times* 1957).

Several of these cultural impact assessments have utilized GIS as a means of predictive analysis to determine potential areas that might contain cultural remains within the contemporary waterfront (e.g. Durden 1992; Halkett 2012). This research further demonstrated the benefit of GIS in this capacity. Through the re-creation of the historic shoreline facilitated by geo-referectifying historic maps in relation to the modern expanse of the city, general shipwreck locations could be plotted in along the old shoreline (Figure 7.2). From the creation of this GIS database, future impact assessments would be able to query the data set to evaluate the range of cultural material that would be expected in a given area of potential development. This would expedite the assessment of impact for developers and allow for a more reliable interpretation of potential cultural material located along the historic shoreline.



FIGURE 7.2. Image depicting the modern shoreline of Cape Town in relation to the density of shipwreck material in the bay from 1806 to 1910 (Map by author, 2015).

Application of the Research Design

One final implication of this research for future studies is the application of the general research design for use in the analysis of past harbor usage. A special issue of the *Journal of Maritime Archaeology*, published in 2013, presented a range of different articles that explore the role of archaeological theory and interpretation in port and harbor studies with a special emphasis on social themes (Rogers 2013:181). These articles demonstrated a shift away from describing ports and harbors in purely technical terms,

but instead promoted the investigation of these crucial areas of maritime interaction as they fit within a wider social and historical context.

This study investigated the development of Cape Town's harbor during the 19th century through a lens of risk analysis and risk management. It was argued that risk is intrinsically linked to the construction of and use of ports and harbors. Findings presented in this thesis support this notion for the development of a harbor in Cape Town. According to Giddens' duality of structure, while people are inherently limited in their responses to risk through their physical environment and the prevailing societal structures, such as the perception of risk, the actions taken to manage identified risk in the cultural landscape function to reshape those structures. The actions taken by the maritime community in Table Bay to improve the harbor were driven by the prevailing perceptions of risk and as these actions changed the landscape, the perceptions of risk changed in an on-going process. Therefore, risk and the perception of risk as a form of societal structure, in Table Bay, can be seen as the main influence for harbor development.

The theoretical and methodological foundation for the analysis of risk in the cultural landscape was grounded in social theory that describes the manner by which individuals and systems identify, assess and manage risk in everyday life. By examining a diverse range of data sources included in a landscape study, the generalist approach to analyzing risk in the landscape used in this study allowed for a holistic understanding of how risk in the harbor changed over time, through the actions of the maritime community in Cape Town. Ash (2007:11) notes, however, that to facilitate this wider interpretation of harbor development in relation to human behavior, such a study must be based on

existing historical and archaeological knowledge. The rich databases of potential archaeological sites and several historical sources documenting the development the harbor in Cape Town allowed for this research to happen. The application of this approach to other similar locations with a range of existing cultural material could potentially yield interesting insights into the past usage of different harbors and synthesize the existing data for a broader interpretation of how past maritime activity in these locations was impacted by human behavior.

Conclusion

The primary objectives in this thesis were to identify the role of risk in shaping the development of the harbor in Table Bay, while identifying features in the cultural landscape that reflect prevailing trends of risk and the management of identified risks in the archaeological record. By utilizing an all-encompassing approach grounded in several social theories, the cultural and historical remains associated with the harbor could be analyzed from an alternate perspective. Furthermore, the benefits of statistical and geo-spatial analysis for easy visualization and representation of collected data and analysis were demonstrated. It is hoped that future studies will utilize the approaches presented here, and further the social interpretation of harbors and ports that represent the quintessential linkage between the land and the sea.

REFERENCES

Abrahams, Gabebah
1983 Report on Human Skeletal Remains and Associated Artefacts from Milnerton Beach, Cape Province. *The South African Archaeological Bulletin* 38(137):33-35.

Anschuetz, Kurt, Wilshusen Richard, and Cherie Scheick.
2001 An Archaeology of Landscape: Perspective and Directions. *Journal of Archaeological Research* 9(2):157-211.

Ash, Aidan
2005 A Nice Place for a Harbour Or Is It? Investigating a Maritime Cultural Landscape: Port Willunga, South Australia. Maritime Archaeology Monograph and Report Series, No. 4. Flinders University, Adelaide, South Australia.

Babits, Lawrence and Hans Van Tilberg (editors)
1998 *Maritime Archaeology: A Reader of Substantive and Theoretical Contributions*. Plenum Press, New York.

Barber, R.J.
1994 *Doing Historical Archaeology: Exercises Using Documentary, Oral, and Material Evidence*. Prentice-Hall, New Jersey.

Barrington, George
1800 *A voyage to Botany Bay with a description of the country, manners, customs, religion, &c. of the natives by the celebrated George Barrington.* C. Lowndes, London.

Beck, Ulrich
1992 *Risk Society: Towards a New Modernity*. Sage Publications, London.
2000 Foreward. In *Environmental Risks and the Media*, Stuart Allan, Barbara Adam, and Cynthia Carter, editors, pp.xii-xiii, Routledge, New York.

Bird, William Wilberforce
1822 *State of the Cape of Good Hope in 1822*. John Murray, London.

Board of Trade
1901 Wreck Report: “Hermes” (S.S.). Board of Trade Shipwreck Reports, No. 6230, London, Board of Trade Wreck Reports, PortCities Southampton. <http://www.plimsoll.org/images/72076_tcm4-307248.pdf>.

Boyd W.E., S. Pathirana and G. Bell
1996 A contribution to the management of the buried historical shipwreck heritage: A GIS risk assessment model for the River Richmond mouth, northern New South Wales. *Bulletin of the Australian Institute for Maritime Archaeology* 20(2):57-69.

Bradlow, Edna and Frank Bradlow
1955 *Thomas Bowler of the Cape of Good Hope: His life and works with a catalogue of extant paintings*. A.A. Balkema, Cape Town.

Breen, Ann and Dick Rigby
1996 *The New Waterfront*. McGraw-Hill, New York.

Breen, Colin and Paul J. Lane
2003 Archaeological Approaches to East Africa's Changing Seascapes. *World Archaeology* 35(3):469-489.

Breitenmoser, Emile
1991 Surveying of Archaeological Artifacts in Table Bay with Geographical Information Systems Support. Honor's thesis, Department of Surveying and Geodetic Engineering, University of Cape Town, Cape Town.

Bryant, Christopher G.A., and David Jary
1991 *Giddens' Theory of Structuration: A Critical Appreciation*. Routledge, New York.

Bryer, Lynne and Keith S. Hunt
1984 *The 1820 Settlers*. Don Nelson, Albany, ZA.

Burman, Jose
1967 This Lighthouse Ruined the Man Who Built It. *Cape Argus* Saturday 5 August, 1967, Cape Town.
1976 *The Bay of Storms: Table Bay, 1503-1860*. Human and Rousseau, Cape Town.

Busch, Mette.
2006 The Danish Coastal Landscape, Fishery and Transport, 1050-1700. In *Fishery, Trade and Piracy: Fisherman and Fisherman's Settlements in and Around the North Sea Area in the Middle Ages and Later*, Marnix Pieters, Frans Verhaeghe and Glen Gevaert, editors, pp. 195-206. Flemish Heritage Institute, Brussel, BE.

Cape Argus
1857a The Gale of Sunday – Shipping Disasters. *Cape Argus* 10 June, 1(46), Cape Town, Cape of Good Hope.
1857b More Wrecks in Table Bay. *Cape Argus* 13 June, 1(47), Cape Town, Cape of Good Hope.
1857c More Wrecks in Table Bay. *Cape Argus* 17 June, 1(48), Cape Town, Cape of Good Hope.
1857d The Wrecks Ashore in Table Bay. *Cape Argus* 20 June, 1(49), Cape Town, Cape of Good Hope.
1857e The Jetties; The Wrecks. *Cape Argus* 27 June, 1(51), Cape Town, Cape of Good Hope.

1865a Terrific Gale in Table Bay. *Cape Argus* 18 May, 11(1264), Cape Town, Cape of Good Hope.
1865b Wrecked Steamer 'Athens.' *Cape Argus* 20 May, 9(1265), Cape Town, Cape of Good Hope.
1865c The Loss of the Athens. *Cape Argus* 1 June, 9(1260), Cape Town, Cape of Good Hope.
1865d Table Bay, May 17 and 18, 1865. *Cape Argus* 30 May, 9(1269), Cape Town, Cape of Good Hope.
1865e Terrific Gale in Table Bay: Seventeen Ocean-going Vessels Wrecked: Nine Men Drowned: Great Destruction of Cutters and Boats. *Cape Argus* 18 May, 6(1264) Cape Town, Cape of Good Hope.

House of Assembly
1822 Cape Annual Bluebook and Statistical Registers. CO 5964, Colonial Office Collection, Cape Town Archives Repository, Cape Town, ZA.
1843 Cape Annual Bluebook and Statistical Registers. CO 5985, Colonial Office Collection, Cape Town Archives Repository, Cape Town, ZA.
1844 Cape Annual Bluebook and Statistical Registers. CO 5986, Colonial Office Collection, Cape Town Archives Repository, Cape Town, ZA.

Cape of Good Hope & Port of Natal Shipping and Mercantile Gazette
1846 The Late Gale. *Cape of Good Hope & Port of Natal Shipping and Mercantile Gazette* 9 January, 3(106). Cape Town, Cape of Good Hope.

Cape Town Gazette and Mercantile Advisor
1822 Arrivals and Departures: Sailed out of Table Bay. *Cape Town Gazette and Mercantile Advisor* 14 June, XVII(858).
1865 The Great Table Bay Gale. *Cape Town Gazette and Mercantile Advisor* 20 May, Cape Town, Cape of Good Hope.

Cape Times
1974 Green Point Light 150 Years Old. *Cape Times* 13 April, Cape Town, ZA.

Catsambis, Alexis, Ben Ford, Donny L. Hamilton (editors)
2011 *The Oxford Handbook of Maritime Archaeology*. Oxford University Press, Oxford.

City of Cape Town Environmental and Heritage Management Branch
2005 Cultural Heritage Strategy for the City of Cape Town. Environmental Resource Management Heritage Resources Section, Economic, Environmental and Spatial Planning, Integrated Metropolitan Environmental Policy (IMEP), Cape Town.

Cohen, Ira J.
1987 Structuration Theory and Social Praxis. In *Social Theory Today*, Anthony Giddens and Jonathan Turner, editors, pp. 273-308. Stanford University Press, Stanford.

Cox, Glenda.
2000 Assessment of the Impact on Potential Archaeological Sites as a Result of the Construction of the "Cape Town International Conference Center". Unpublished report prepared for CHAND Environmental Consultants, Cape Town.

Clark, W. Marshall.
1947 The Gateway to South Africa: Description of the Cape Town Foreshore Plan. Cape Town Foreshore Joint Technical Committee, South African Railways and Harbor Administration. Stewart Printing Co., Cape Town.

Deacon, Harriet
1989 A History of the Breakwater Prison from 1859 to 1905. Honor's thesis, Department of African Studies, University of Cape Town, Cape Town.

Deacon, Hilary J.
1988 Practice and Policy in Maritime Archaeology. *South African Archaeological Bulletin* 43(148):123-125.

De Camoens, Luis
1877 *The Lusiad; or The Discovery of India: An Epic Poem*, William Julius Mickle, translator, 5th edition. George Bell and Sons, London.

Duncan, Bradley G.
2000 Signposts in the Sea: Shipwreck patterning and cultural seascapes of the Gippsland region, Victoria. Honor's thesis, School of Anthropology, Archaeology, and Sociology, James Cook University, Australia.
2006 *The Maritime Archaeology and maritime Cultural Landscapes of Queenscliffe: A Nineteenth Century Australian Coastal Community*. Doctoral dissertation, School of Anthropology, Archaeology, and Sociology, James Cook University.

Durden, Toby A.S.
1992 An Assessment of the Maritime Archaeological Potential of Table Bay, 1806-1900. Honor's thesis, Department of Archaeology, University of Cape Town, Cape Town.

Ewald, F.
1991 Insurance and Risk. In *The Foucault Effect: Studies in Governmentality*, G. Burchell, C. Gordon, and P. Miller, editors, pp. 197-210. Harvester/Wheatsheaf, London.

Firth, Antony.
1993 Three Facets of Maritime Archaeology: Society, Landscape and Critique. Theoretical Advances in Maritime Archaeology Seminar, Durham. <http://www.arch.soton.ac.uk/Research/Firth/>.

Findlay, Alexander G.

1876 *A Directory for the Navigation of the Indian Ocean*, 3rd edition. Richard Holmes Lourie, London.

Flatman, Joe.
2003 Cultural Biographies, Cognitive Landscapes and Dirty Old Bits of Boat: 'Theory' in Maritime Archaeology. *IJNA* 32(2):143-157.

Fontana, Dominic
2013 Charting the Development of Portsmouth Harbour, Dockyard and Town in the Tudor Period. *Journal of Maritime Archaeology* 8:263-282.

Ford, Benjamin L.
2009 Lake Ontario Maritime Cultural Landscape. Doctoral dissertation, Department of Philosophy, Texas A&M University, College Station, TX.

Ford, Benjamin L. (editor)
2011 *The Archaeology of Maritime Landscapes*. Springer, New York.

Fox, Nick.
1999 Post-Modern Reflections on 'Risk', 'Hazards', and Life Choices. In *Risk and Sociocultural Theory: New Directions and Perspectives*, Deborah Lupton, editor, pp.12-33. Cambridge University Press, Cambridge, UK.

Gibbs, Martin
2006 Cultural Site Formation Processes in Maritime Archaeology: Disaster response, salvage and Muckelroy 30 years on. *IJNA* 35(1):1-16.

Giddens, Anthony.
1976 *Central Problems in Social Theory: Action, Structure, and Contradiction in Social Analysis*. Macmillan Press, London.
1984 *The Constitution of Society: Introduction of the Theory of Structuration*. University of California Press, Berkeley.
1989 A Reply to My Critics. In *Social Theory of Modern Societies: Anthony Giddens and His Critics*, D. Held and J. B. Thompson, editors, pp. 249-301. Cambridge University Press, Cambridge.
1993 *New Rules of Sociological Method*, 2nd edition. Polity Press, Cambridge, UK.

Gijanto, Liza A, and Rachel L. Horlings
2012 Connecting African Diaspora and West African Historical Archaeologies. *Historical Archaeology* 46(2):134-156.

Gould, Richard
2010 *Archaeology and the Social History of Ships*. Cambridge University Press, New York.

Gribble, John

1998 Keeping our heads above water: The development of shipwreck management strategies in South Africa. *The Bulletin of the Australian Institute for Maritime Archaeology* 22:119-124.
2002 The Past, Present and Future of Maritime Archaeology in South Africa. In *The International Handbook of Underwater Archaeology*, Carol V. Ruppe and JF Barstad, editors, pp.553-567. Kluwer Academic/Plenum Press, New York, NY.

Grindley, J.R., and S. Dudley
1988 Estuaries of the Cape: Part II: Synopses of available information on individual systems. CSIR Research Report 427, Report No. 28 Rietvlei/Diep CW24/25, Division of Earth, Marine, and Atmospheric Science and technology Council for Scientific and Industrial Research, Stellenbosch.

Hall, Martin
2006 Identity, Memory and Countermemory: The Archaeology of an Urban Landscape. *Journal of Material Culture* 11(1-2):189-209.

Halkett, D.J.
2012 Archaeological Assessment of the Proposed Cape Town International Convention Centre 2 on ERWEN 192, 245, 246 and the Remainder of ERF 192, "Salazar Square", Roggebaai, Cape Town Foreshore. Archaeological Contracts Office Associates, Vidamemoria, Cape Town International Convention Centre Company.

Hammersley-Heenan, R.H.
1904 Cape Town Harbour Works. In *Public Works*, Vol. IV. The St. Brides Press, London.

Harris, Lynn
1993 A Preliminary Investigation of the Seaport, Table Bay and Shipwrecks in the Vicinity of Cape Town, South Africa. Master's thesis, Department of History, East Carolina University, Greenville, NC.
2010 South Carolina Shipyards: Labor, Logistics, Lumber, and Ladies. *Journal of Maritime Archaeology* 5:17-35.

Harris, Lynn, Jennifer Jones, and Kate Schnitzer
2013 Monuments in the Desert: A Maritime Landscape in Namibia. *Journal of Maritime Archaeology* 7(1):111-140.

Hart, Timothy
2001 Foreshore Freeway Completion Project: Archaeological assessment of potential heritage impacts. Archaeological Contracts Office, Foreshore Project Managers, University of Cape Town, Cape Town.
2002 Phase 1 Heritage Impact Assessment of a Portion of ERF 10256, Culemborg, Cape Town. Archaeological Contracts Office, SRK Consulting, University of Cape Town, Cape Town.

2003 Heritage Scoping Assessment of the Roggebbai Canal Precinct, Foreshore, Cape Town. Archaeological Contracts Office, The Environmental Partnership, University of Cape Town, Cape Town.

Hattersley, Alan F.
1969 *An Illustrated Social History of South Africa*. AA Balkema: Cape Town.

Horlings, Rachel L.
2012 Maritime Cultural Resource Investigation, Management, and Mitigation in Coastal Ghana. *Journal of Maritime Archaeology* 7:141-164.

Hoskins, W. G.
1955 *The Making of the English Landscape*. Hodder and Staughton, London.

Hsu, J.R.C., R. Silvester and Y.M. Zia
1989 Generalities on static equilibrium bays. *Coastal Engineer* 12:353-369.

Hviding, E.
1996 *Guardians of Marovo Lagoon: Practice, Place and Politics in Maritime Melanesia, Pacific Islands Monograph Series 14*. University of Hawaii Press, Honolulu.

Ilves, Kristen
2011 Is There an Archaeological Potential for a Sociology of Landing Sites? *Journal of Archaeology and Ancient History* 2:1-31.

Irwin, Geoffrey
1992 *The Prehistoric Exploration and Colonization of the Pacific*. The University of Cambridge Press, Cambridge.

Jasinski, M.E.
1994 The Maritime Cultural Landscape: An Archaeological Perspective. *Archaeologia Polski* 38(1):7-21.

Lewis, David
1994 *We, the Navigators: The Ancient Art of Landfinding in the Pacific*. University of Hawaii Press, Honolulu.

Lightley, Robert A.
1976 An 18th Century Dutch East Indiaman, Found at Cape Town, 1971. *IJNA* 5(4):305-316.

Lowrance, William W.
1976 *Of Acceptable Risk: Science and the Determination of Safety*. William Kaufmann, Los Altos.

Luhmann, Niklas

1993 *Risk: A Sociological Theory*, R. Barnet, translator. Walter de Gruyter, Berlin.

Kammermans, Hans, Martijn van Leusen, and Philip Verhagen (editors)
2009 *Archaeological Prediction and Risk Management: Alternatives to current practice*. Leiden University Press, Netherlands.

Kates Robert and Jeanne Kasperson
1983 Comparative Risk Analysis of Technological Hazards (A Review). *Proceedings of the National Academy of Sciences* 80:7027-7038.

Khan, Amer
2006 Pier Reviewed: A study of Port-related structures in South Australia. Master's thesis, Department of Maritime Archaeology, Flinders University, South Australia.

Killian, Darryll and Belinda Dodson
1996 Between the Devil and the Deep Blue Sea: Functional conflicts in Cape Town's Victoria and Alfred Waterfront. *Geoforum* 27(4):495-507.

Kilminster, R.
1991 Structuration Theory as a World View. In *Giddens' Theory of Structuration: A critical appreciation*, Bryant, Christopher G.A. and David Jary, editors, pp.74-115. Routledge, New York.

Kimura, Jun
2006 *Interpreting Maritime Cultural Space Through the Utilization of GIS: A Case Study of the Spatial Meaning of Shipwrecks in the Coastal Waters of South Australia.* Master's thesis, Department of Archaeology, Flinders University, South Australia.

Knox, Robert
1830 An Examination of a Variety of Plans for Reducing the Danger to which Human Life, Shipping and Merchandise are exposed to in Table Bay Harbor and of Opinions Promulgated Upon this Important Question: Intended to promote the construction of a secure and convenient harbour at the port of Cape Town. London.

Leibbrandt, Hendrik Carel Vos
1898a *Precis of the Archives of the Cape of Good Hope: Letters and Documents Received 1649-1662*, Vol. 8. W.A. Richards & Sons: Cape Town.
1898b *Precis of the Archives of the Cape of Good Hope: Letters and Documents Received 1649-1662*, Vol. 9. W.A. Richards & Sons: Cape Town.
1900 *Precis of the Archives of the Cape of Good Hope: Letters Dispatched from the Cape, 1652-1662*. W.A. Richards and Sons, Cape Town.

Marano, Joshua L.

2012 Ship Ashore! The Role of Risk in the Development of the United States Life-Saving Service and its Effects on Local Wrecking Patterns Along the North Carolina Coast. Master's thesis, Department of History, East Carolina University, Greenville.

Mavrodinov, Nikolay S.
1999 An assessment of the maritime archaeological potential of the eastern coastline of Table Bay, between the old Salt River Mouth and Blouberg. Master's thesis, Department of African Studies, University of Cape Town, Cape Town.

McErlean, Thomas, Rosemary McConkey, and Wes Forsythe.
2002 *Strangford Lough: An Archaeological Survey of the Maritime Cultural Landscape*. Northern Ireland Archaeological Monographs No. 6. Environment and Heritage Service, Built Heritage. Blackstaff Press, Belfast, IE.

McKinnon, Jennifer, Julie Mushynsky, and Genevieve Cabrera
2014 A Fluid Sea in the Mariana Islands: Communicty Archaeology and Mapping the Seascape of Saipan. *Journal of Maritime Archaeology* 9(1):59-79.

McLachlan, A.J.
1991 Seasonal Beach Morphology Variations and Sediment Transport Around the Wreck of the *Oosterland* in Table Bay Between the Estuaries of the Diep and Salt Rivers. Honor's thesis, Department of Geology, University of Cape Town.

Meredith, Martin
2008 *Diamonds, Gold, and War: The British, the Boers, and the Making of South Africa.* Public Affairs, New York.

Muckelroy
1978 *Maritime Archaeology*. Cambridge University Press, New York.

Muller, C.F. (editor)
1969 *Five Hundred Years: A History of South Africa*. Academia, Cape Town.

Murphy, Larry
1998 Geographic Information Systems. In *The Encyclopedia of underwater and Maritime Archaeology*, James P. Delgado, editor, pp. 166-168. Yale University Press, New Haven.

Murray, Marischal
1933 *Ships and South Africa*. Oxford University Press, London.
1953 *Union-Castle Chronicle: 1853-1953*. Longmans-Green, London.

Mythen, Gabe
2004 *Ulrich Beck: A Critical Introduction to the Risk Society*. Pluto Press, New York.

Nasson, Bill

2010 *The War for South Africa: The Anglo-Boer War 1899-1902*. Tafelberg, Cape Town.

Newall, Peter
1993 *Cape Town Harbour: 1652 to the present*. Portnet, Cape Town.
1999a Boer War Transports. *Ships in Focus* 7:1-3.
1999b *Union-Castle Line: A Fleet History*. Carmania Press, London.

Newell, Gordon
1963 *Ocean Liners of the 20th Century*. Bonanza Books, New York.

O'Sullivan, Aidan.
2004 Place, Memory and Identity Among Estuarine Communities: Interpreting the Archaeology of Early Medieval Fish Weirs. *World Archaeology* 35(3):449-468.

O'Sullivan, Aidan, and Colin Breen.
2007 *Maritime Ireland: An Archaeology of Coastal Communities*. Tempus, Gloucestershire, UK.

Quick, A.J.R., and M.J. Roberts
1993 Table Bay, Cape Town, South Africa: Synthesis of available information and management implications. *South African Journal of Science* 89:276-287.

Parker A.J.
1999 A Maritime Cultural Landscape: The Port of Bristol in the Middle Ages. *IJNA* 28(4):323-342.
2001 Maritime Landscapes. *Landscapes* 1:22-41.

Perrow, Charles
1984 *Normal Accidents: Living with High Risk Technologies*. Princeton University Press, Princeton.

Peterson, Sydney T.
1978 The development of the Table Bay harbour, 1860-1870: Being a study of the construction of the breakwater and the inner and outer basins of the Alfred Docks. Honor's thesis, Department of History, University of Cape Town, Cape Town.

Pollard, Edward J.
2008 The Maritime Landscape of Kilwa Kisiwani and its Region, Tanzania, 11th to 15th Century AD. *Journal of Anthropological Archaeology* 27:265-280.

Quick A.J.R. and M.J. Roberts
1993 Table bay, Cape Town, South Africa: Synthesis of available information and management implications. *South African Journal of Science* 89:276-287.

Raper, Peter,

2005 *New Dictionary of South African Place Names*, 3rd edition. Jonathan Ball Publishers, Johannesburg.

Rawe, Jim and Anne Crabtree
1978 *Shipwrecks of the Southern Cape: A guide to the wrecks and their references for the coastline and islands between Lamberts Bay and Cape Agulhas*. Atlantic Underwater Club, Cape Town.

Rogers, Adam
2013 Social Archaeological Approaches in Port and Harbour Studies. *Journal of Maritime Archaeology* 8:181-196.

Ruppe, Carol V., and Jane E. Barstad (editors)
2002 *International Handbook of Underwater Archaeology*. Springer, Kluwer Academic Publishing, New York.

Rush, David W.
1972 Aspects of the growth of trade and the development of ports in the Cape Colony 1795-1882. Master's thesis, Department of History, University of Cape Town, Cape Town.

Saitowitz, Sharma, Ute Seemann, and Martin Hall.
1993 The Development of Cape Town's Waterfront in the Earlier Nineteenth Century: History and Archaeology of the North Wharf. *South African Archaeology Society Goodwin Series* 7:98-103.

Sauer, Carl O.
1925 *The Morphology of Landscape*. University of California Press, Berkley.

Seifart, Christian
2012 The Long-Term Impact of the *Seli One* Shipwreck on the Table Bay Beaches. Master's thesis, Department of Civil Engineering, Stellenbosch University, Stellenbosch.

Short, James F.
1984 The Social Fabric at Risk: Toward the Social Transformation of Risk Analysis. *American Sociological Review* 49(6):711-725.

Sharfman, Jonathan
1998 The *Oosterland* GIS: Applying Aspects of Geographical Information Systems to a Maritime Archaeological Project. Master's thesis, Department of Archaeology, University of Cape Town, Cape Town.

Sharfman, Jonathan, Jaco Boshoff, and Robert Parthesius.
2012 Maritime and Underwater Cultural Heritage in South Africa: The Development of Relevant Management Strategies in the Historical Maritime Context of the Southern tip of Africa. *Journal of Maritime Archaeology* 7:87-109.

Simmonds, Peter L.
1847 *Simmonds's Colonial Magazine and Foreign Miscellany*. Simmonds and Ward, Foreign and Colonial Office, Bucklesbury.

Smith, G.G., E. Dunkley, and C. Soltau
2001 Shoreline Response to Harbour Developments in Table Bay. *Coastal Engineering* 2000:2822-2835.

Soonike, Hans E.
1974 The development of the harbour of Table Bay with special reference to the period 1825-1860. Master's thesis, Department of African Studies, University of Cape Town.

South African Commercial Advertiser
1842 Cape Town, September 3 1842. South African Commerical Advertiser 1842-4 – October to December. Sue Mackay < http://www.eggsa.org/newspapers/index.php/south-african-commercial-advertiser/55-sac-1842-oct-dec>. Accessed 20 March 2015.

South African Shipping News.
1982 Marine Casualties Southern African Waters 1552 to 1913. *South African Shipping News and Fishing Industry Review* 37(6):18-50.

Souza, Donna J.
1998 *The Persistence of Sail in the Age of Steam: Underwater Archaeological Evidence from the Dry Tortugas*. New York, Plenum Press.

Stanier-Clarke, James and John McArthur
2010 *The Naval Chronicle: July-December, 1812*. Cambridge University Press, Cambridge.

Stone, Edward James
1871 *Results of Meteorological Observations Made at the Royal Observatory, Cape of Good Hope*. Saul Solomon & Co, Cape Town.

Table Bay Harbour Board
1854 Report of Mr. Scott Tucker upon the Port of Table Bay. CCP 1/2/1/1 A10, Cape Town Archives Repository, Cape Town.
1855 Seventh Annual Report on the Harbour Board. CCP 1/2/1/2 G2, Cape Town Archives Repository, Cape Town.
1859a Message, with Enclosures, from His Excellency the Governor, relative to Harbor of Refuge in Table Bay. CCP 1/2/1/6 A55, Cape Town Archives Repository, Cape Town.
1859b Report and Proceedings of the Select Committee on His Excellency the Governor's Message relative to Cost of Constructing a Harbor of Refuge in Table Bay. CCP 1/2/1/6 A78, Cape Town Archives Repository, Cape Town.
1860a Report of Mr. Coode on the proposed Harbour of Refuge in Table Bay. CCP 1/2/1/8 G12, Cape Town Archives Repository, Cape Town, Republic of South Africa.

1860b Report on the Operations of the Shipping Office, Cape Town, during the Year 1859. CCP 1/2/1/8 G28, Cape Town Archives Repository, Cape Town.
1865 Statement of the Expenditure incurred in the Construction of the Breakwater and Harbour Works in Table Bay for the Half-year ending 31st December, 1864, with a Report on the Progress of the Works. CCP 1/2/1/14 G34, Cape Town Archives Repository, Cape Town.
1871a Statement of the Expenditure incurred in the Construction of the Breakwater and Harbour Works in Table Bay for the Half-year ending 30th June, 1870, with a report on the Progress of the Works. CCP 1/2/1/23 G24, Cape Town Archives Repository, Cape Town.
1871b Statement of the Expenditure incurred in the Construction of the Breakwater and Harbour Works in Table Bay for the Half-year ending 31st December, 1870. CCP 1/2/1/23 G25, Cape Town Archives Repository, Cape Town, Republic of South Africa.
1873 Report of the Shipping Office, Cape Town, for 1872. CCP 1/2/1/25 G26, Cape Town Archives Repository, Cape Town.
1878 Report of the Table Bay Dock and Breakwater Management Commission with Statement of the Revenue and Expenditure and Report of the Resident Engineer, for the Year 1877. CCP 1/2/1/36 G54, Cape Town Archives Repository, Cape Town.
1879 Report of the Table Bay Dock and Breakwater Management Commission with Statement of the Revenue and Expenditure and Report of the Resident Engineer for the Year 1878. CCP 1/2/1/40 G48, Cape Town Archives Repository, Cape Town.
1881 Reports of the Harbour Boards of Table Bay, Mossel Bay, and Algoa Bay, with Statements of Revenue and Expenditure for the Year 1880. CCP 1/2/1/46 G48, Cape Town Archives Repository, Cape Town.
1883 Report of the Harbour Board of Table Bay, with Statements of Revenue and Expenditure, for the Year 1882. CCP 1/2/1/57 G81, Cape Town Archives Repository, Cape Town.
1884 Reports of the Harbour Boards Boards of Table Bay, Mossel Bay, and Algoa Bay, with Statements of Revenue and Expenditure for the Year 1883. CCP 1/2/1/63 G60, Cape Town Archives Repository, Cape Town.
1885 Reports of the Harbour Boards Boards of Table Bay, Mossel Bay, and Algoa Bay, with Statements of Revenue and Expenditure for the Year 1884. CCP 1/2/1/66 G40, Cape Town Archives Repository, Cape Town.
1890 Reports of the Harbour Boards Boards of Table Bay, Mossel Bay, and Algoa Bay, with Statements of Revenue and Expenditure for the Year 1889. CCP 1/2/1/77 G30, Cape Town Archives Repository, Cape Town.
1895 A short account of the construction of harbour works in Table Bay from 1656 to 1895. Manuscript, Table Bay Harbour Board, Cape Town.
1898 Reports of the Harbour Boards – Table Bay, Algoa Bay, East London, Mossel Bay, Simon's Town, for the year 1897. CCP 1/2/1/105 G60, Cape Town Archives Repository, Cape Town.
1903 Reports of the Harbour Boards – Table Bay, Algoa Bay, East London, Mossel Bay, Simon's Town, for the year 1902. CCP 1/2/1/128 G38, Cape Town Archives Repository, Cape Town.

1904 Reports of the Harbour Boards – Table Bay, Algoa Bay, East London, Mossel Bay, Simon's Town, for the year 1903. CCP 1/2/1/127 G51, Cape Town Archives Repository, Cape Town.
1904 Report of the Commission appointed by the Honourable the Treasurer on the 16th July, 1904, to Enquire into the Financial Position of the Table Bay Harbour Board and the General Working of the Same. CCP 1/2/1/128 G89, Cape Town Archives Repository, Cape Town.

Theal, George McCall
1896 *The Portuguese in South Africa*. T. Fisher Unwin, London.
1897 *Records of the Cape Colony from February 1793 to December 1796,* Vol. V. William Clowes and Sons Ltd., London.
1902 *The Beginning of South African History*. T. Fisher Unwin, London.
1908 *History of South Africa since 1795, Volume III*. George Allen & Unwin, Ltd., London. Reprinted 2010 by Cambridge University Press, New York.
1964 *History of South Africa since 1795*, Vol. VI. C. Struik, Cape Town.

Thunberg, Carl P.
1986 *Travels at the Cape of Good Hope 1772-1775. 1793*. Reprint. The Van Riebeeck Society, Cape Province.

Tilley, Christopher.
1994 *A Phenomenology of Landscape: Places, Paths and Monuments*. Bloomsbury Academic, Oxford, UK.

Turner, Malcolm.
1988 *Shipwrecks and Salvage in South Africa, 1505 to the Present*. C. Struik, Cape Town.

Union-Castle Steamship Company
1903 *The Union-Castle Atlas of South Africa*. J.C. Juta and Company, Cape Town.

United States Hydrographic Office
1908 *West Coast of Africa: Cape Palmas to the Cape of Good Hope and the adjacent islands*, 3rd edition. US Government Printing Office, Washington D.C.

Van Ballegooyen, R.C.
2007 Ben Schoeman Dock Berth Deepening Project: Integrated Marine Impact Assessment Study. CSIR Report No. CSIR/NRE/ECO/ER/2007/0014/C, Cape Town.

Van Ieperen, M.P.
1971 Final Report on the Hydrology of Table Bay. Institute of Oceanography, University of Cape Town, Cape Town.

Van Zyl, Pieter

2005 The Story of the Victoria and Alfred Waterfront Development. Manuscript, Victoria & Alfred Waterfront Ltd., Cape Town, ZA.

Veitch, Neil.
1994 *Waterfront and Harbour: Cape Town's Link with the Sea*. Human and Rousseau, Cape Town.

Vernon-Harcourt, Leveson Francis
1885 *Harbours and Docks: Their physical features, history, construction, equipment, and maintenance, with statistics as to their commercial development*, Vol. 1. Clarendon Press Series, Oxford.

Ward, Kerry
2007 "Tavern of the Seas?" The Cape of Good Hope as an Oceanic Crossroads during the Seventeenth and Eighteenth Centuries. In *Seascapes: Maritime Histories, Littoral Cultures, and Transoceanic Exchanges*, Jerry H. Bentley, Renate Iridenthal and Karen Wigen, editors, pp.137-152. University of Hawaii Press, Honolulu.

Wiese, Bernd
1981 *Seaports and Port Cities of Southern Africa*. Franz Steiner Verlag GMBH Wiesbaden.

Werz, Bruno E.J.S.
1990 A Maritime Archaeological Project in Table Bay. *South African Archaeological Bulletin* 45:121.
1993a South African shipwrecks and salvage: The need for improved management. *IJNA* 22(3):237-244.
1993b Shipwrecks of Robben Island, South Africa: An exercise in cultural resource management in the underwater environment. *IJNA* 22(3):245-256.
1993c Maritime Archaeological Project Table Bay: Aspects of the First Field Season. *South African Archaeological Society Goodwin Series* 7:33-39.
1999 *Diving Up the Human Past: Perspectives of Maritime Archaeology, With Specific Reference to Developments in South Africa Until 1996*. British Archaeological Reports S749. Oxford: Archaeopress.
2003 Strategic Environmental Assessment (SEA) for the Port of Cape Town and Environmental Impact Assessment (EIA) for the Expansion of the Container Terminal Stacking Area: Specialist Study on Maritime Archaeology. National Ports Authority, Port of Cape Town, Cape Town.

Westerdahl, Christer
1991 Norrlandsleden: The Maritime Cultural Landscape of the Norrland Sailing Route. In *Aspects of Maritime Scandinavia, AD 200-1200*, Ole Crumlin-Pedersen, editor, pp. 105-119, The Viking Museum, Roskilde.
1992 The Maritime Cultural Landscape. *IJNA* 21(1):5-14.
1994 Maritime Cultures and Ship Types: Brief Comments on the Significance of Maritime Archaeology. *IJNA* 23(4):265-270.

1995 Traditional Zones of Transport Geography in Relation to Ship Types. In *Shipshape: Essays for Ole Crumlin-Pedersen, On the Occaision of His 60th Anniversary, February 24th 1995*, Olaf Olsen, Jan Skamby Madsen, Flemming Reick, editors, The Viking Museum, Roskilde.
1999 The Norrland Survey and Its Aftermath. In *The Marine Archaeology of the Baltic Sea Area. Research Reports No. 1*, M. Lindstrom, editor, pp. 101-104, Sodertorns Hogskola, Department of Archaeology, Stockholm.
2000 From Land to Sea, From Sea to land. On Transport Zones, Borders and Human Space. In *Down the River to the Sea: Proceedings of the Eighth International Symposium on Boat and Ship Archaeology*, Gdansk 1997, Jerzy Litwin, editor, pp. 11-20, Polish Maritime Museum, Gdansk.
2002a The Cognitive Landscape of Naval Warfare and Defense: Toponymic and Archaeological Aspects. In *Maritime Warfare in Northern Europe: Technology, Organization, Logistics and Administration 500 BC-1500 AD. Papers From an International Seminar at the Danish National Museum, Copenhagen, 3-5 May 2000, Publications from The National Museum, Studies in Archaeology and History Vol. 6*, Anne Norgard Jorgensen, John pind, Lars Jorgensen, and Birthe Clausen, editors, pp. 169-190. PNM, Copenhagen.
2011 The Maritime Cultural Landscape. In *The Oxford Handbook of Maritime Archaeology*, Alexis Catsambis, Ben Ford, and Donny Hamilton, editors, pp. 733-762. Oxford University Press, Oxford.

Wilmot, Alexander
1869 *History of the Colony of the Cape of Good Hope*. J.C. Juta, Cape Town.

Wood, Denis
1992 *The Power of Maps*. The Guilford Press, New York.

Woodborne, M.W.
1982 Sediment distribution and the correlation between lithofacies and associated seismic reflection signatures in Table Bay. Honor's thesis, Department of Geology, University of Cape Town, Cape Town.
1983 Bathymetry, solid geology and Quaternary sedimentology of Table Bay. Joint Geological Survey Office/University of Cape Town Marine Geoscience Unit Technical Report No. 14, Geology Department, University of Cape Town, Cape Town.

Worden, Nigel
1994 Unwrapping History at the Cape Town Waterfront. *The Public Historian* 16(2):33-50.
1996 Contested Heritage at the Cape Town Waterfront. *International Journal of Heritage Studies* 2(1-2):59-75.
2007 Strangers Ashore: Sailor Identity and Social Conflict in Mid-18th Century Cape Town. *Kronos* 33:72-83.

Worden, Nigel, Elizabeth van Heyningen, and Vivian Bickford-Smith.

1998 *Cape Town: The Making of a City: An Illustrated Social History*. David Philip Publishers, Claremont, SA.

Worger, William H.
2004 Convict labour, industrialists and the state in the US South and South Africa, 1870-1930. *Journal of Southern African Studies* 30(1):63-86.

APPENDIX 1: HARBOR TIMELINE & CHRONOLOGY OF WORKS

1806 British Empire begins occupation of the Cape Colony following Battle of Blaauwberg on January 8, 1806.

1814 Dutch government formally cedes Cape Colony to Britain.

1821 Sir Rufane Donkin begins construction of a lighthouse project at Green Point under the supervision of the head engineer, Herman Schutte.

1822 Severe gale in Table Bay that lasted from 18-21 July and caused the wrecking of 9 vessels anchored at Cape Town. The storm also caused significant damage to structures in the town.

1822 William Wilberforce Bird proposes new breakwater closer to the present Victoria and Alfred Basins, but this proposal is set aside due to the cost of the project.

Small repair yard for vessels built likely near the existing yard at the site of Muntingh's whale fishery. This location is depicted in Plate 1.

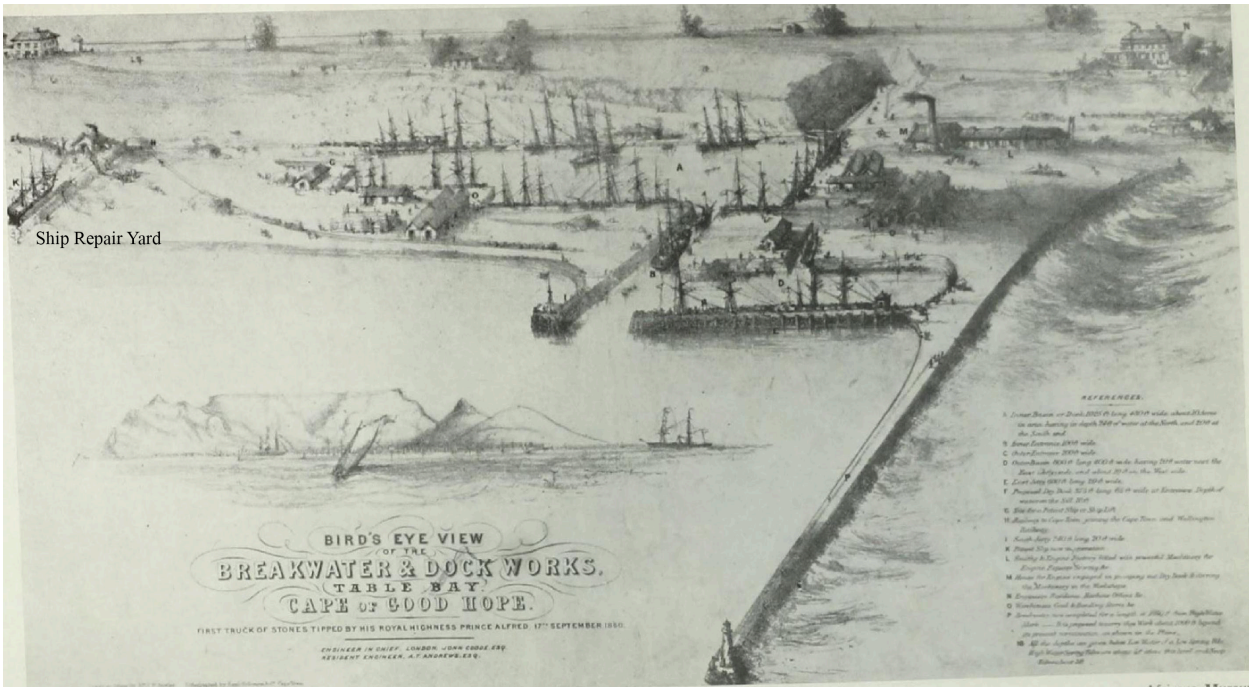


PLATE 1. Lithograph by Thomas Bowler showing a view of the original harbor expansion from 1860 to 1870 (Bradlow and Bradlow 1955:Plate 131).

1823 Green Point Lighthouse is completed.

1825 SS *Enterprise*, the first steamship to enter Table Bay, arrives at Cape Town on 13 October.

1830 Elaborate plan for an enclosed harbor including a breakwater, landing pier and interior sea wall is submitted by Captain Robert Knox, but was not adopted by the Admiralty.

1831 During a heavy gale from 16-17 August, 6 ships and £40,000 of cargo were lost. A stone pier (original foundation for North Wharf) was begun at the foot of Bree Street. Work was suspended in 1833 due to high costs by the Secretary of State after the work had reached a length of 200ft.

1836 Lord Glenelg, Governor of the Cape, authorized the creation of the first Harbour Board for Table Bay. The purpose of this Board was to collect wharfage charges, borrow money on security of these charges and complete the stone pier.

Formation of the Cape of Good Hope Steam Navigation Company to establish steamship communication between Cape Town and other coastal ports.

1838 The Commercial Wharf Company was formed for the purpose of landing and shipping merchandise conveyed in boats to and from vessels at anchor

South Jetty construction began near the site of the old Dutch watering jetty (Old South Jetty).

1839 South Jetty was completed at the end of Buitenkant Street at a cost of £1,404.

Local maritime communities raised £2,900 to purchase a tract of land and associated buildings near the whale fishery and transfer the property to the government as the site for a new wharf made of the already placed stone and additional timber. On 11 November, 1839 orders were given to begin work building the new North Wharf. The buildings purchased by the local shipping community were to be converted to Customs and Wharf Offices to augment the new commercial quarter already established in that area.

1842 North Wharf completed at the end of Bree Street.

Northwest storm system causes wrecking of six vessels in Table Bay.

1844 Two harbor improvement schemes were submitted by Colonel C.C. Mitchell, Cape Surveyor-General of the colony and Sir E. Beteker calling for a breakwater, landing pier and sea wall. Neither scheme was carried out due to cost nor extent of the work proposed.

Col. Mitchell completes work on a stone pier at the site of the Amsterdam Battery (Coaling Jetty). A corrugated iron warehouse built at the site of this new pier to facilitate the storage of coal (Plate 2).



PLATE 2. Coal warehouse built near the Amsterdam Battery in 1844 (Image courtesy of the National Library of South Africa, PHA 4866).

1845 Cape of Good Hope Steam Navigation Company absorbed into the Phoenix Steam Navigation Company to facilitate steam links between Cape Town and Port Elizabeth with stops in Mossel Bay and Plettenberg Bay.

1848 In 26 July the Board of Commissioners for Improving the Point and Harbour of Table Bay was appointed. Their first task was directed to repair and extend the wharves and jetties then in existence.

Construction began on an additional jetty (Central Jetty) to deal with lack of space on older docks at the foot of Adderley Street, which was called Heerengracht St. at the time.

1849 Captain Pilkington submits plans for enclosing the area between the North Wharf and Central Jetty with a breakwater to form a complete harbor. This scheme is not adopted.

1850 Central Jetty construction completed in March.

Plans submitted, but not approved for a potential breakwater in Table Bay by I. Irving, which called for the placement of moorings in the roadstead one the lee of the proposed work.

1851 On January 27 the first mail-steamship *Bosphorous* arrives in Table Bay.

1852 Upon failure of the Phoenix Steam Navigation Company, the General Screw Steamship Company assumed the mail service between England and South Africa with an extension of the contract to run mails between Cape Town and Natal via coastal ports.

1853 Old South Jetty removed after suffering severe damage during several northwesterly storms.

1854 Cape Colony granted representative government.

1856 Union Steam Company Ltd. Formed from the previous Union Steam Collier Company.

Capt. James Vetch R.E., Harbour Surveyor for the Admiralty puts forward a plan for a harbor of refuge based on the 1846 survey by Capt. Sir Edward Beteker. This plan estimates cost at £1,000,000 and consists of a 5,600' breakwater enclosing an inner and outer harbor of 1508 acres with an East Pier starting from Fort Knokke.

1857 Central Jetty extended using material from the dismantled Rogge Bay Battery. Legislation passed to carry out Vetch's plan, but promise of financial assistance from British Government in London is withdrawn.

On 4 September the Union Steamship Company was awarded the Cape mail contract.

Severe northwesterly gale causes seven ships to wreck in Table Bay (Plate 2).

1858 Mr. Scott Tucker provided a report to the Houses of Parliament in London for the construction of a harbor of refuge in Table Bay. Act 20 passed by Parliament consenting for the improvement of the harbor using Vetch's plan as a guideline with a cost of no more than £200,000.

Sir (then Mr.) John Coode was appointed Engineer-in-chief to prepare definitive plans and estimates for the new harbor. His design included a 3,000ft long breakwater, an Inner Dock and Outer Basin at an estimated cost of £399,000. The labor would be supplied using 400 local convicts.

1859 Plans made to begin work on the breakwater beyond the site of the Chavonnes Battery.

A Breakwater Prison was built to house the large consort of convict labor used to build the breakwater.

1860 On 17 August the Table Bay Dock and Breakwater Management Commission was appointed to supervise the construction of the works and manage the finances and properties associated with the development.

On 17 September H.R.H. Prince Alfred tipped the first truck of stones for the construction of the breakwater. The stone was taken from a quarry adjoining the breakwater, which would be subsequently flooded following completion of the works and form part of the Inner Harbor.

1860 Cargo stores developed at the Pierhead, which would become the site of the entrance to the Alfred Docks.

Dock house built, referred to as Harbor Master's residence and offices.

Colonial Shipping Act 13 of 1855 and Act 30 of 1860 provided for police at the port and regulations on boating activity. Included under the auspices of this act were all registered vessels as well as smaller vessels down to 15 tons. These smaller boats arrived in the harbor with native produce to sell.

1862 In June, considerable damage was done to the timber staging of the breakwater by a gale lasting for seventeen days. Detail of timber staging shown in Plate 4.

New Somerset Hospital was opened.

1865 On 16-17 May a violent gale swept over Table Bay, which would become known as the historic Great Gale of 1865. Eighteen vessels were driven ashore, sixty lives lost, and the breakwater works severely damaged.

East Jetty, perpendicular to the breakwater, was completed to enclose the Inner Basin.

1867 Preliminary excavations for the ship-lift and dry dock in the harbor quarry begin.

A slip for ship repairs was completed by De Pass, Spence & Co. to the southeast of the harbor.

1868 Patent Slipway was moved into the narrower, southeastern corner of the Alfred Basin.

1869 On 15 June the excavations of the Alfred Basin were completed and the cofferdam holding the water from entering the old quarry site was removed.

Suez Canal opened.

1870 On 17 May the first ship to enter the completed Alfred Docks was the sailing vessel *Haitienne*.

1870 The ceremonial opening and naming of the new basin by H.R.H. Prince Alfred, deemed the Alfred Basin, took place on 4 July after 10 years of construction work. The total harbor to date consisted of an Inner and Outer Harbor, the total water area of 4.5 hectares and quay space of 1240m. The breakwater was 545.5m long and supported with concrete blocks of 80 tons each. The Alfred Basin contained dock space along a North, West and East Quay with warehouses alongside the docks.

1870 On 5 November the first Union Steam liner to enter was *Saxon*. Mail ships that previously anchored near the Central Jetty now used the East Quay as their berth.

A road connecting the Central Jetty and North Wharf with the new docks was completed.

1871 Establishment of the Cape and Natal Steam Navigation Company by London broker, George Payne.

1872 Donald Currie begins private mail service through Donald Currie and Company steam lines.

1873 Discovery of diamond fields along the Orange and Vaal Rivers. The mining town of Kimberley was established.

1876 Sir John Coode submitted plans for the extension of the breakwater and for increased dock accommodation. Warehouses were built on the East Quay and near the Pierhead.

Excavations of the dry dock in the Alfred Basin commenced and the beginning of foreshore reclamation using excavated material begins between the Central Jetty and Castle.

Both the Union Steamship Company and Donald Currie awarded a joint-mail contract for the Cape.

1877 Castle Packets Company formed by Donald Currie.

Fire Engine House built on the docks, known widely as the “Ratcatcher’s Store”.

1878 A severe gale with greater velocity than historic Great Gale hit the Cape between 18-23 July with five vessels driven ashore due to anchoring too far to the southeast. Coode used this event as a way to convince authorities of the need for extending the length of the breakwater to the originally intended length.

Construction began of the Breakwater Jetty inside the breakwater with a shed for the storage of coal.

Excavations of the dry dock extended to accommodate larger, deep draught steamships that frequently called in Table Bay.

1880 Sir John Coode proposed additional plans for the expanded Outer Harbor, later Victoria Basin. Act passed authorizing the extension of the Breakwater using stone from the dry dock excavation.

Breakwater Jetty is completed to a length of 400 feet with a shed capable of storing 2,000 tons of coal.

Supplemental Coaling Jetty built to the southeast of the entrance to the Alfred Docks and root for the later South Arm.

Barracks built for housing additional native dock workers imported from Delagoa Bay.

1881 Castle Mail Packets Company Ltd. formed.

In September a new Table Bay Harbour Board consisting of four government nominees and three elected commissioners was appointed.

The Alfred Dock Fire brigade was established.

1882 On 20 October the dry dock was formally opened when the Union Company's RMS *Athenian* was taken in. The dock and ship-lift was named the Robinson Graving Dock in honor of Sir Hercules Robinson (Plate 3).

The docks were first lighted by electricity through a contract with the South African Dynamo-Electric Light and Brush Co lit the docks that provided 22 lamps on 29 June.

Initial placement of foundations for proposed South Pier to run parallel to the breakwater and enclose the Outer Harbor.

Reclamation of land at Rogge Bay with material from the West Quay excavation finally removed the Fish Market St. George's Street. The town constructed a retaining wall of concrete blocks at the end of the reclamation which left the

beach clear for the fishermen's boats with a jetty, shed and tramway connected with a new Fish Market.

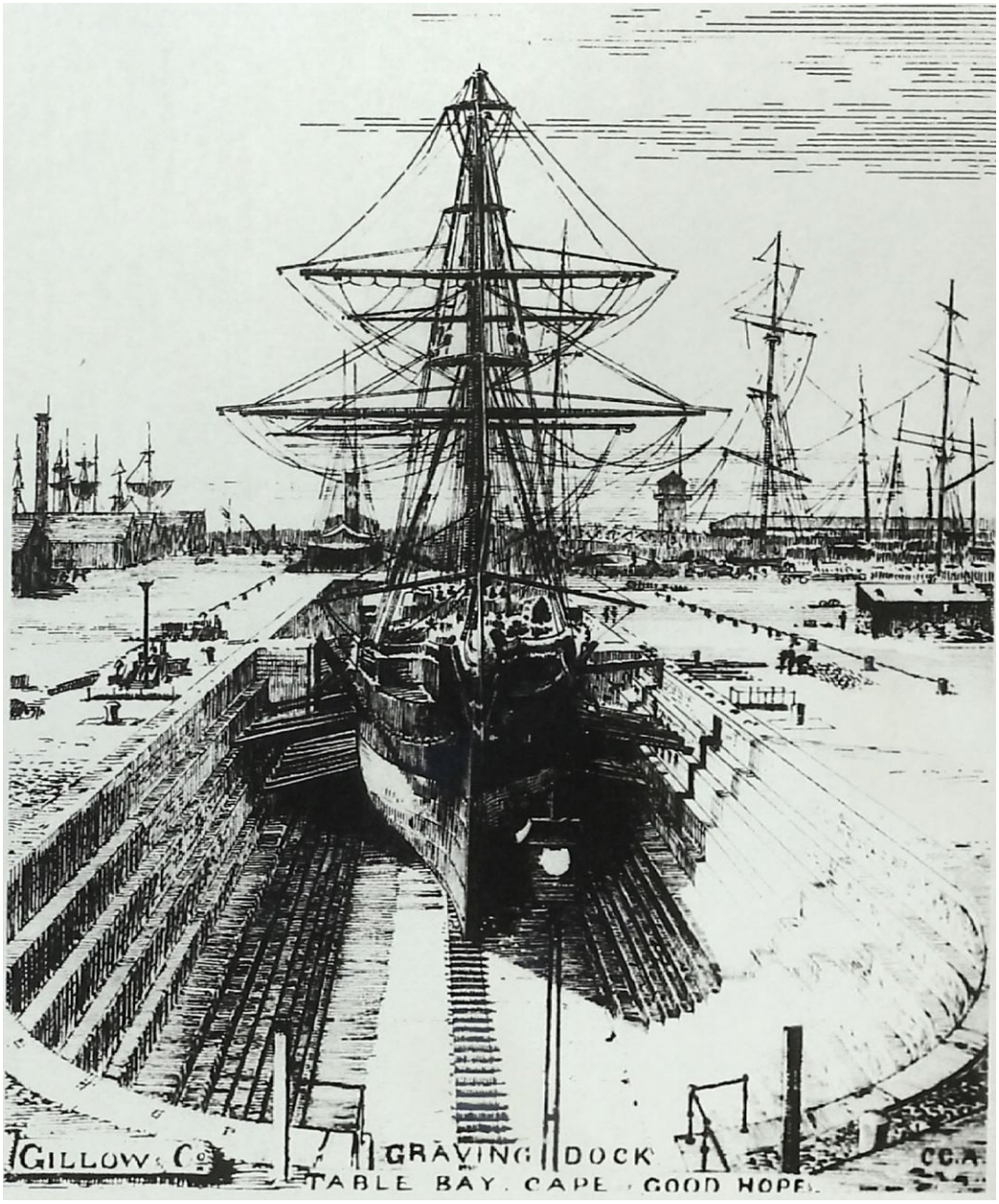


PLATE 3. Engraving of the Robinson Graving Dock located within the enclosed Alfred Basin of the harbor (Veitch 1994:76).

1883 Dock Clock and Tide-Gauge Tower completed to the south of the "Cut," or entrance to the Alfred Basin, and linked with the Observatory to calculate accurate times. A Légè's self-recording tide gauge was also put inside the tower (Plate 3).

Time Ball Tower erected and linked with Greenwich-time to regulate the work of dock laborers.



PLATE 4. Clock Tower at the "Cut" or the entrance to the Alfred Basin in 1898 (Photo courtesy of the National Library of South Africa, PHA 5088).

1884 Fish Jetty in Rogge Bay erected for the cleaning and drying of fish.

The Board took over and removed the South African Electric Light and Power Company plant and machinery to the Docks.

1886 Discovery of gold reefs in the stretch of Highveld, Witwatersrand.

The first truck of material for the mound of the South Pier was tipped on 19 October. Stone was obtained from the excavation of a quarry to the south of the Alfred Basin.

1889 Parliament authorized a loan for the completion of the Outer Harbor scheme designed by Sir John Coode in 1883.

1892 First block of the South Pier Quay Wall was laid as well as the mound for the East Pier to enclose Outer Harbor and further protect inner jetties.

Sir John Coode dies on 3 March.

1893	On 6 December the Loch Jetty, named after Governor Sir Henry Loch, was opened for trade. The Jetty, 600ft long and 75ft wide was built entirely of iron to deter the effects of marine worms and met the pressing need for increased space for deep draught steamers.
1896	Additional land reclamation took place in between the North Wharf and Coaling Jetty, known as Combrink's Concession.
1897	Foundations for a Collier Jetty established on the western side of the South Pier.
	Union Steamship Company built the first-ever 10,000 gross ton steamship, *Briton*.
	South Pier turned to face the East Pier, perpendicular to the breakwater through construction of an elbow to the dock.
	Boat Jetty built near the Clock Tower for the mooring of tug boats in the harbor.
1899	Beginning of The Second Anglo-Boer War between Britain and President Stephanus Johannes Paulus "Paul" Kruger's republic in the Transvaal.
1900	On 3 March, Union Castle Mail Steamship Company formed after an amalgamation of the Union Steamship Company and Castle Mail Packets Company. to become the Union Castle Mail Steamship Co. Ltd.
1901	Electric Light and Power Station built.
1902	Cold Storage warehouse built at the site of the North Jetty on land reclaimed during Combrink's Concession.
	The Harbor Tearoom built, which was commonly known as the Harbor Café.
1903	Port Captain's building completed across the Cut from the Clock Tower.
	Collier Jetty completed and equipped with eight electric cranes to effectively supply coal to steamships and transfer goods directly from the boat to a rail system.
1904	Breakwater extension and capping project completed.
	Three-story North Quay Warehouse built, which is the site of the present Victoria and Alfred Hotel.
	Amsterdam Battery purchased from the government by the Table Bay Harbour Board to allow for additional warehouse space.

1905	Victoria Basin formally completed with an increase in the available water space by 27 hectares and dock space by 1525 meters.
1905	Abolished the use of the treadmill at the old Breakwater Prison.
1910	Table Bay Harbour Board absorbed into the newly formed South African Railways and Harbours Administration.

APPENDIX 2: ORIGINAL DATA & STATISTICAL BREAKDOWN

FREQUENCIES

Statistics

		Circumstances of loss	Nationality of vessel	Season lost	Wrecking Zones	Location of wreck
N	Valid	290	246	301	225	195
	Missing	30	74	19	95	125

Circumstances of loss

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Gale/Storm	109	34.1	37.6	37.6
	Grounded	106	33.1	36.6	74.1
	Beached	1	.3	.3	74.5
	Navigational Error	10	3.1	3.4	77.9
	Abandoned	17	5.3	5.9	83.8
	Collision	5	1.6	1.7	85.5
	Repurposed	11	3.4	3.8	89.3
	Wrecked	28	8.8	9.7	99.0
	Fire	3	.9	1.0	100.0
	Total	290	90.6	100.0	
Missing	System	30	9.4		
Total		320	100.0		

Wrecking Zones

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Western Zone	62	19.4	27.6	27.6
	Southern Zone	88	27.5	39.1	66.7
	Eastern Zone	32	10.0	14.2	80.9
	Northern Zone	43	13.4	19.1	100.0
	Total	225	70.3	100.0	
Missing	System	95	29.7		
Total		320	100.0		

Location of wreck

		Frequency	Percent	Valid Percent	Cumulative Percent
	Blaauwbergstrand	18	5.6	9.2	9.2
	Woodstock Beach	36	11.3	18.5	27.7
	Milnerton	3	.9	1.5	29.2
	Paarden Eiland	10	3.1	5.1	34.4
	Cape Castle	9	2.8	4.6	39.0
	Green Point	15	4.7	7.7	46.7
	Salt River	18	5.6	9.2	55.9
	Rietvlei	9	2.8	4.6	60.5
	Sea Point	4	1.3	2.1	62.6
	Robben Island	14	4.4	7.2	69.7
	Military Hospital	8	2.5	4.1	73.8
Valid	Amsterdam Battery	2	.6	1.0	74.9
	Mouille Point	20	6.3	10.3	85.1
	Granger Bay	3	.9	1.5	86.7
	Imhoff Battery	8	2.5	4.1	90.8
	Sceptre Reef	2	.6	1.0	91.8
	Chavonnes Battery	1	.3	.5	92.3
	Black River Mouth	1	.3	.5	92.8
	Old South Jetty	9	2.8	4.6	97.4
	South Jetty	3	.9	1.5	99.0
	Breakwater	1	.3	.5	99.5
	Fort Knokke	1	.3	.5	100.0
	Total	195	60.9	100.0	
Missing	System	125	39.1		
Total		320	100.0		

Season lost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Summer	110	34.4	36.5	36.5
	Winter	191	59.7	63.5	100.0
	Total	301	94.1	100.0	
Missing	System	19	5.9		
Total		320	100.0		

CROSSTABULATION

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Wrecking Zones * Circumstances of loss * Year before or after breakwater	220	68.8%	100	31.2%	320	100.0%

Chi-Square Tests

Year before or after breakwater		Value	df	Asymp. Sig. (2-sided)
Shipwrecked Prior to Breakwater	Pearson Chi-Square	80.916[b]	21	.000
	Likelihood Ratio	87.584	21	.000
	Linear-by-Linear Association	.907	1	.341
	N of Valid Cases	183		
Shipwrecked After Breakwater	Pearson Chi-Square	33.588[c]	21	.040
	Likelihood Ratio	40.456	21	.007
	Linear-by-Linear Association	1.211	1	.271
	N of Valid Cases	37		
Total	Pearson Chi-Square	92.834[a]	24	.000
	Likelihood Ratio	105.213	24	.000
	Linear-by-Linear Association	1.557	1	.212
	N of Valid Cases	220		

a. 27 cells (75.0%) have expected count less than 5. The minimum expected count is .15.

b. 23 cells (71.9%) have expected count less than 5. The minimum expected count is .16.

c. 32 cells (100.0%) have expected count less than 5. The minimum expected count is .08.

Wrecking Zones * Circumstances of loss * Year before or after breakwater Crosstabulation

Time Period				Circumstances of loss									Total
				Gale/Storm	Grounded	Beached	Navigational Error	Abandoned	Collision	Repurposed	Wrecked	Fire	
Shipwrecked Prior to Breakwater	Wrecking Zones	Western Zone	Count	5	29	0	6	2	0	0	5		47
			Expected Count	22.1	17.2	.3	2.3	1.0	.5	.3	3.3		47.0
			% within Wrecking Zones	10.6%	61.7%	0.0%	12.8%	4.3%	0.0%	0.0%	10.6%		100.0%
			% within Circumstances of loss	5.8%	43.3%	0.0%	66.7%	50.0%	0.0%	0.0%	38.5%		25.7%
			% of Total	2.7%	15.8%	0.0%	3.3%	1.1%	0.0%	0.0%	2.7%		25.7%
		Southern Zone	Count	58	13	1	0	1	0	1	4		78
			Expected Count	36.7	28.6	.4	3.8	1.7	.9	.4	5.5		78.0
			% within Wrecking Zones	74.4%	16.7%	1.3%	0.0%	1.3%	0.0%	1.3%	5.1%		100.0%
			% within Circumstances of loss	67.4%	19.4%	100.0%	0.0%	25.0%	0.0%	100.0%	30.8%		42.6%
			% of Total	31.7%	7.1%	0.5%	0.0%	0.5%	0.0%	0.5%	2.2%		42.6%
		Eastern Zone	Count	16	8	0	1	0	0	0	4		29
			Expected Count	13.6	10.6	.2	1.4	.6	.3	.2	2.1		29.0
			% within Wrecking Zones	55.2%	27.6%	0.0%	3.4%	0.0%	0.0%	0.0%	13.8%		100.0%
			% within Circumstances of loss	18.6%	11.9%	0.0%	11.1%	0.0%	0.0%	0.0%	30.8%		15.8%
			% of Total	8.7%	4.4%	0.0%	0.5%	0.0%	0.0%	0.0%	2.2%		15.8%
		Northern Zone	Count	7	17	0	2	1	2	0	0		29
			Expected Count	13.6	10.6	.2	1.4	.6	.3	.2	2.1		29.0
			% within Wrecking Zones	24.1%	58.6%	0.0%	6.9%	3.4%	6.9%	0.0%	0.0%		100.0%
			% within Circumstances of loss	8.1%	25.4%	0.0%	22.2%	25.0%	100.0%	0.0%	0.0%		15.8%
			% of Total	3.8%	9.3%	0.0%	1.1%	0.5%	1.1%	0.0%	0.0%		15.8%
	Total		Count	86	67	1	9	4	2	1	13		183
			Expected Count	86.0	67.0	1.0	9.0	4.0	2.0	1.0	13.0		183.0
			% within Wrecking Zones	47.0%	36.6%	0.5%	4.9%	2.2%	1.1%	0.5%	7.1%		100.0%
			% within Circumstances of loss	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%
			% of Total	47.0%	36.6%	0.5%	4.9%	2.2%	1.1%	0.5%	7.1%		100.0%
Shipwrecked After Breakwater	Wrecking Zones	Western Zone	Count	0	5		1	0	2	3	1	1	13
			Expected Count	3.9	4.2		.4	.7	.7	1.1	1.8	.4	13.0
			% within Wrecking Zones	0.0%	38.5%		7.7%	0.0%	15.4%	23.1%	7.7%	7.7%	100.0%
			% within Circumstances of loss	0.0%	41.7%		100.0%	0.0%	100.0%	100.0%	20.0%	100.0%	35.1%
			% of Total	0.0%	13.5%		2.7%	0.0%	5.4%	8.1%	2.7%	2.7%	35.1%
		Southern Zone	Count	7	0		0	1	0	0	1	0	9
			Expected Count	2.7	2.9		.2	.5	.5	.7	1.2	.2	9.0
			% within Wrecking Zones	77.8%	0.0%		0.0%	11.1%	0.0%	0.0%	11.1%	0.0%	100.0%
			% within Circumstances of loss	63.6%	0.0%		0.0%	50.0%	0.0%	0.0%	20.0%	0.0%	24.3%
			% of Total	18.9%	0.0%		0.0%	2.7%	0.0%	0.0%	2.7%	0.0%	24.3%
		Eastern Zone	Count	2	1		0	0	0	0	0	0	3
			Expected Count	.9	1.0		.1	.2	.2	.2	.4	.1	3.0
			% within Wrecking Zones	66.7%	33.3%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
			% within Circumstances of loss	18.2%	8.3%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%
			% of Total	5.4%	2.7%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%
		Northern Zone	Count	2	6		0	1	0	0	3	0	12
			Expected Count	3.6	3.9		.3	.6	.6	1.0	1.6	.3	12.0
			% within Wrecking Zones	16.7%	50.0%		0.0%	8.3%	0.0%	0.0%	25.0%	0.0%	100.0%
			% within Circumstances of loss	18.2%	50.0%		0.0%	50.0%	0.0%	0.0%	60.0%	0.0%	32.4%
			% of Total	5.4%	16.2%		0.0%	2.7%	0.0%	0.0%	8.1%	0.0%	32.4%
	Total		Count	11	12		1	2	2	3	5	1	37
			Expected Count	11.0	12.0		1.0	2.0	2.0	3.0	5.0	1.0	37.0
			% within Wrecking Zones	29.7%	32.4%		2.7%	5.4%	5.4%	8.1%	13.5%	2.7%	100.0%
			% within Circumstances of loss	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	29.7%	32.4%		2.7%	5.4%	5.4%	8.1%	13.5%	2.7%	100.0%
Total	Wrecking Zones	Western Zone	Count	5	34	0	7	2	2	3	6	1	60
			Expected Count	26.5	21.5	.3	2.7	1.6	1.1	1.1	4.9	.3	60.0
			% within Wrecking Zones	8.3%	56.7%	0.0%	11.7%	3.3%	3.3%	5.0%	10.0%	1.7%	100.0%
			% within Circumstances of loss	5.2%	43.0%	0.0%	70.0%	33.3%	50.0%	75.0%	33.3%	100.0%	27.3%
			% of Total	2.3%	15.5%	0.0%	3.2%	0.9%	0.9%	1.4%	2.7%	0.5%	27.3%
		Southern Zone	Count	65	13	1	0	2	0	1	5	0	87
			Expected Count	38.4	31.2	.4	4.0	2.4	1.6	1.6	7.1	.4	87.0
			% within Wrecking Zones	74.7%	14.9%	1.1%	0.0%	2.3%	0.0%	1.1%	5.7%	0.0%	100.0%
			% within Circumstances of loss	67.0%	16.5%	100.0%	0.0%	33.3%	0.0%	25.0%	27.8%	0.0%	39.5%
			% of Total	29.5%	5.9%	0.5%	0.0%	0.9%	0.0%	0.5%	2.3%	0.0%	39.5%
		Eastern Zone	Count	18	9	0	1	0	0	0	4	0	32
			Expected Count	14.1	11.5	.1	1.5	.9	.6	.6	2.6	.1	32.0
			% within Wrecking Zones	56.2%	28.1%	0.0%	3.1%	0.0%	0.0%	0.0%	12.5%	0.0%	100.0%
			% within Circumstances of loss	18.6%	11.4%	0.0%	10.0%	0.0%	0.0%	0.0%	22.2%	0.0%	14.5%
			% of Total	8.2%	4.1%	0.0%	0.5%	0.0%	0.0%	0.0%	1.8%	0.0%	14.5%
		Northern Zone	Count	9	23	0	2	2	2	0	3	0	41
			Expected Count	18.1	14.7	.2	1.9	1.1	.7	.7	3.4	.2	41.0
			% within Wrecking Zones	22.0%	56.1%	0.0%	4.9%	4.9%	4.9%	0.0%	7.3%	0.0%	100.0%
			% within Circumstances of loss	9.3%	29.1%	0.0%	20.0%	33.3%	50.0%	0.0%	16.7%	0.0%	18.6%
			% of Total	4.1%	10.5%	0.0%	0.9%	0.9%	0.9%	0.0%	1.4%	0.0%	18.6%
	Total		Count	97	79	1	10	6	4	4	18	1	220
			Expected Count	97.0	79.0	1.0	10.0	6.0	4.0	4.0	18.0	1.0	220.0
			% within Wrecking Zones	44.1%	35.9%	0.5%	4.5%	2.7%	1.8%	1.8%	8.2%	0.5%	100.0%
			% within Circumstances of loss	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	44.1%	35.9%	0.5%	4.5%	2.7%	1.8%	1.8%	8.2%	0.5%	100.0%

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Wrecking Zones * Circumstances of loss * Year before or after breakwater	220	68.8%	100	31.2%	320	100.0%

Chi-Square Tests

Year before or after breakwater		Value	df	Asymp. Sig. (2-sided)
Shipwrecked Prior to Breakwater	Pearson Chi-Square	80.916[b]	21	.000
	Likelihood Ratio	87.584	21	.000
	Linear-by-Linear Association	.907	1	.341
	N of Valid Cases	183		
Shipwrecked After Breakwater	Pearson Chi-Square	33.588[c]	21	.040
	Likelihood Ratio	40.456	21	.007
	Linear-by-Linear Association	1.211	1	.271
	N of Valid Cases	37		
Total	Pearson Chi-Square	92.834[a]	24	.000
	Likelihood Ratio	105.213	24	.000
	Linear-by-Linear Association	1.557	1	.212
	N of Valid Cases	220		

a. 27 cells (75.0%) have expected count less than 5. The minimum expected count is .15.

b. 23 cells (71.9%) have expected count less than 5. The minimum expected count is .16.

c. 32 cells (100.0%) have expected count less than 5. The minimum expected count is .08.

Wrecking Zones * Circumstances of loss * Year before or after breakwater Crosstabulation

Time Period				Circumstances of loss									Total
				Gale/Storm	Grounded	Beached	Navigational Error	Abandoned	Collision	Repurposed	Wrecked	Fire	
Shipwrecked Prior to Breakwater	Wrecking Zones	Western Zone	Count	5	29	0	6	2	0	0	5		47
			Expected Count	22.1	17.2	.3	2.3	1.0	.5	.3	3.3		47.0
			% within Wrecking Zones	10.6%	61.7%	0.0%	12.8%	4.3%	0.0%	0.0%	10.6%		100.0%
			% within Circumstances of loss	5.8%	43.3%	0.0%	66.7%	50.0%	0.0%	0.0%	38.5%		25.7%
			% of Total	2.7%	15.8%	0.0%	3.3%	1.1%	0.0%	0.0%	2.7%		25.7%
		Southern Zone	Count	58	13	1	0	1	0	1	4		78
			Expected Count	36.7	28.6	.4	3.8	1.7	.9	.4	5.5		78.0
			% within Wrecking Zones	74.4%	16.7%	1.3%	0.0%	1.3%	0.0%	1.3%	5.1%		100.0%
			% within Circumstances of loss	67.4%	19.4%	100.0%	0.0%	25.0%	0.0%	100.0%	30.8%		42.6%
			% of Total	31.7%	7.1%	0.5%	0.0%	0.5%	0.0%	0.5%	2.2%		42.6%
		Eastern Zone	Count	16	8	0	1	0	0	0	4		29
			Expected Count	13.6	10.6	.2	1.4	.6	.3	.2	2.1		29.0
			% within Wrecking Zones	55.2%	27.6%	0.0%	3.4%	0.0%	0.0%	0.0%	13.8%		100.0%
			% within Circumstances of loss	18.6%	11.9%	0.0%	11.1%	0.0%	0.0%	0.0%	30.8%		15.8%
			% of Total	8.7%	4.4%	0.0%	0.5%	0.0%	0.0%	0.0%	2.2%		15.8%
		Northern Zone	Count	7	17	0	2	1	2	0	0		29
			Expected Count	13.6	10.6	.2	1.4	.6	.3	.2	2.1		29.0
			% within Wrecking Zones	24.1%	58.6%	0.0%	6.9%	3.4%	6.9%	0.0%	0.0%		100.0%
			% within Circumstances of loss	8.1%	25.4%	0.0%	22.2%	25.0%	100.0%	0.0%	0.0%		15.8%
			% of Total	3.8%	9.3%	0.0%	1.1%	0.5%	1.1%	0.0%	0.0%		15.8%
	Total		Count	86	67	1	9	4	2	1	13		183
			Expected Count	86.0	67.0	1.0	9.0	4.0	2.0	1.0	13.0		183.0
			% within Wrecking Zones	47.0%	36.6%	0.5%	4.9%	2.2%	1.1%	0.5%	7.1%		100.0%
			% within Circumstances of loss	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%
			% of Total	47.0%	36.6%	0.5%	4.9%	2.2%	1.1%	0.5%	7.1%		100.0%
Shipwrecked After Breakwater	Wrecking Zones	Western Zone	Count	0	5		1	0	2	3	1	1	13
			Expected Count	3.9	4.2		.4	.7	.7	1.1	1.8	.4	13.0
			% within Wrecking Zones	0.0%	38.5%		7.7%	0.0%	15.4%	23.1%	7.7%	7.7%	100.0%
			% within Circumstances of loss	0.0%	41.7%		100.0%	0.0%	100.0%	100.0%	20.0%	100.0%	35.1%
			% of Total	0.0%	13.5%		2.7%	0.0%	5.4%	8.1%	2.7%	2.7%	35.1%
		Southern Zone	Count	7	0		0	1	0	0	1	0	9
			Expected Count	2.7	2.9		.2	.5	.5	.7	1.2	.2	9.0
			% within Wrecking Zones	77.8%	0.0%		0.0%	11.1%	0.0%	0.0%	11.1%	0.0%	100.0%
			% within Circumstances of loss	63.6%	0.0%		0.0%	50.0%	0.0%	0.0%	20.0%	0.0%	24.3%
			% of Total	18.9%	0.0%		0.0%	2.7%	0.0%	0.0%	2.7%	0.0%	24.3%
		Eastern Zone	Count	2	1		0	0	0	0	0	0	3
			Expected Count	.9	1.0		.1	.2	.2	.2	.4	.1	3.0
			% within Wrecking Zones	66.7%	33.3%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
			% within Circumstances of loss	18.2%	8.3%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%
			% of Total	5.4%	2.7%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%
		Northern Zone	Count	2	6		0	1	0	0	3	0	12
			Expected Count	3.6	3.9		.3	.6	.6	1.0	1.6	.3	12.0
			% within Wrecking Zones	16.7%	50.0%		0.0%	8.3%	0.0%	0.0%	25.0%	0.0%	100.0%
			% within Circumstances of loss	18.2%	50.0%		0.0%	50.0%	0.0%	0.0%	60.0%	0.0%	32.4%
			% of Total	5.4%	16.2%		0.0%	2.7%	0.0%	0.0%	8.1%	0.0%	32.4%
	Total		Count	11	12		1	2	2	3	5	1	37
			Expected Count	11.0	12.0		1.0	2.0	2.0	3.0	5.0	1.0	37.0
			% within Wrecking Zones	29.7%	32.4%		2.7%	5.4%	5.4%	8.1%	13.5%	2.7%	100.0%
			% within Circumstances of loss	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	29.7%	32.4%		2.7%	5.4%	5.4%	8.1%	13.5%	2.7%	100.0%
Total	Wrecking Zones	Western Zone	Count	5	34	0	7	2	2	3	6	1	60
			Expected Count	26.5	21.5	.3	2.7	1.6	1.1	1.1	4.9	.3	60.0
			% within Wrecking Zones	8.3%	56.7%	0.0%	11.7%	3.3%	3.3%	5.0%	10.0%	1.7%	100.0%
			% within Circumstances of loss	5.2%	43.0%	0.0%	70.0%	33.3%	50.0%	75.0%	33.3%	100.0%	27.3%
			% of Total	2.3%	15.5%	0.0%	3.2%	0.9%	0.9%	1.4%	2.7%	0.5%	27.3%
		Southern Zone	Count	65	13	1	0	2	0	1	5	0	87
			Expected Count	38.4	31.2	.4	4.0	2.4	1.6	1.6	7.1	.4	87.0
			% within Wrecking Zones	74.7%	14.9%	1.1%	0.0%	2.3%	0.0%	1.1%	5.7%	0.0%	100.0%
			% within Circumstances of loss	67.0%	16.5%	100.0%	0.0%	33.3%	0.0%	25.0%	27.8%	0.0%	39.5%
			% of Total	29.5%	5.9%	0.5%	0.0%	0.9%	0.0%	0.5%	2.3%	0.0%	39.5%
		Eastern Zone	Count	18	9	0	1	0	0	0	4	0	32
			Expected Count	14.1	11.5	.1	1.5	.9	.6	.6	2.6	.1	32.0
			% within Wrecking Zones	56.2%	28.1%	0.0%	3.1%	0.0%	0.0%	0.0%	12.5%	0.0%	100.0%
			% within Circumstances of loss	18.6%	11.4%	0.0%	10.0%	0.0%	0.0%	0.0%	22.2%	0.0%	14.5%
			% of Total	8.2%	4.1%	0.0%	0.5%	0.0%	0.0%	0.0%	1.8%	0.0%	14.5%
		Northern Zone	Count	9	23	0	2	2	2	0	3	0	41
			Expected Count	18.1	14.7	.2	1.9	1.1	.7	.7	3.4	.2	41.0
			% within Wrecking Zones	22.0%	56.1%	0.0%	4.9%	4.9%	4.9%	0.0%	7.3%	0.0%	100.0%
			% within Circumstances of loss	9.3%	29.1%	0.0%	20.0%	33.3%	50.0%	0.0%	16.7%	0.0%	18.6%
			% of Total	4.1%	10.5%	0.0%	0.9%	0.9%	0.9%	0.0%	1.4%	0.0%	18.6%
	Total		Count	97	79	1	10	6	4	4	18	1	220
			Expected Count	97.0	79.0	1.0	10.0	6.0	4.0	4.0	18.0	1.0	220.0
			% within Wrecking Zones	44.1%	35.9%	0.5%	4.5%	2.7%	1.8%	1.8%	8.2%	0.5%	100.0%
			% within Circumstances of loss	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
			% of Total	44.1%	35.9%	0.5%	4.5%	2.7%	1.8%	1.8%	8.2%	0.5%	100.0%