A NEW FRONT FOR DOVER:
RECONNECTING LAND AND SEA
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1.0 INTRODUCTION

As the “Gateway to Europe”, Dover has been shaped by the relationships between the UK and the Continent throughout history. Due to its geographic location as the closest UK point to mainland Europe, Dover has been a trading post since the pre-Roman era. Times of trade have been interspersed with times of war and Dover has often closed its borders assuming the role of a garrison.

The last time this happened Dover was extensively damaged by shells from occupied France. Since then the town has been rebuilt but has lost much of its former Victorian and Georgian charm.

Once a seaside pleasure resort complete with grand hotels and pleasure pier, streets connected the town centre and seafront. Dover was a town of wealth fed by a tourist population as keen to relax in its salt baths as walk along the white cliffs. Dover’s identity belonged with the sea.

Today this close relationship between town and sea has been lost.

Responding to the global economic climate of trade and commerce, the post-war port has evolved from primarily servicing the tourist sector to operating in a fast-growing freight market. The port has developed a roll-on, roll-off (or ro-ro for short) embarkation system which allows vehicles to pass through the port quickly onto ferries which complete 8 ninety minute crossings per day. This has created a constant flow of traffic between Europe and the UK, through Dover.

Today, that flow of traffic occupies a trunk road which feeds the M20 to London. The A20 was built in 1995 to alleviate congestion on domestic roads in Dover. The 40mph dual carriageway runs parallel to the seafront severing the remaining links between the town and sea.

Dover Port is owned and managed under Trust Port Governance by the corporate body Dover Harbour Board (DHB) which is comprised of selected members appointed by the Department of Transport. DHB, which now also owns most of Dover’s remaining Victorian seafront, has recently published a 30 year masterplan proposing the expansion of the port at its Western Docks to service predicted freight growth.

As the port has expanded Dover has fallen into disrepair. Many buildings along the A20, starved of pedestrian activity, have become derelict; a symptom now common throughout the town. The decaying town’s facade does not attract visitors and most drive through Dover without stopping. Consequently local economy suffers and with the mechanisation of the port requiring less man-power, unemployment is among the highest in Kent.

In the 30 year masterplan DHB make no proposals to redevelop the town nor do they attempt to effectively solve the urban problem of the A20 which severs the waterfront from town. Indeed current plans reclaim yet more beach area for port infrastructure and propose the construction of ferry berths that would block the remaining sea views from the beach and promenade.

In light of the current proposals for development in Dover, this report will investigate an alternative proposal for port expansion. This study will outline designs for a new commercial dock which will match or exceed criteria set in current proposals as well as incorporate efficient means of expansion so that the port can continue to grow beyond the existing 30 year projection.

This report will outline further development propositions for a cruise ship terminal (able to serve the world’s biggest liners), a new marina and a man-made perched sand beach within the harbour.

The report addresses the balance between port development and the connection between the sea, the town and its inhabitants.
2.0 BASIS OF STUDY

2.1 A TOWN DIVIDED

By Royal Charter, effective from October 6, 1606, all control and management of Dover Port was given to a body called the “Guardian and Assistants of the Harbour of Dover”. Previously the port had been run by a group of local residents, but port activity had all but ceased and measures against the severe westerly shingle drift, responsible for blocking the harbour in the past, were not being made.

The new organisation, later to be known as Dover Harbour Board (DHB) comprised of 11 so-called “men of discretion” of whom only two were local residents; Dover Mayor and the Lieutenant-Governor of Dover Castle. These two members were elected but the remaining group held their positions indefinitely and no further residents were permitted to join the board after retirement or death of these members.

At this time a toll was introduced taxing cargo-laden ships wanting to dock at Dover Port. The money was used to pay for sea defences and improvements to the port. As the port developed more ships were able to dock and the town prospered.

From 1606 Dover became a town governed by two establishments; The Town Council and Harbour Board. These two bodies have clashed many times during their joint authority in Dover.

Today the toll continues to be charged to ferry companies that use the port on a daily basis as well as cruise and cargo ships that make occasional visits. The port make large profits each year amounting to £10.2m in 2006 and £19.8m in 2007. DHB, who “generate profit required to meet investment needs” (www.doverport.co.uk/MissionStatement), use the money for corporate gain as well as port maintenance and development.

No monies are given to Dover Town Council for the maintenance or development of the town.

In the past 150 years the port has expanded dramatically. Figure 2 shows the growth of DHB land ownership since 1876 showing the shift of primary operations from Western to Eastern Docks. Using the existing protection from shingle drift given by the western breakwater, the Admiralty Pier, the Eastern Docks were developed instead of developing further west. As explained later in this chapter, this decision would prove to cause serious urban problems for the town through conflicts between port vehicular access and town pedestrian movement.

The area of the Eastern Docks is now physically comparable in scale to Dover Town centre. Dover has a population of 26,000 and the port sees 15.5 million people pass through it each year. The division of Dover has never been more pronounced than by the contrast of groups who inhabit the town; on one side exists a transient international population passing through with a wealth culture and on the other, a provincial population who rarely interact with people they might label as “foreigners”. Unfortunately, as described later in the report, few tourists or commuters enter the town. Unlike in more prosperous times, Dover today has become a place to pass through, rather than to stay.

2.2 THE ROAD

Figure 3 shows the development of principle vehicular access routes to Dover Port and its impact on pedestrian links between town centre and seafront.

The natural landward entrance to Dover Port lies toward the west where the cliffs and hills rise at a relatively shallow incline. The old routes to Dover, such as Folkestone Road and Old London Road run through valleys on the western side of the town. This was ideal for accessing the original port which we today call the Western Docks as service routes would not clash with the life in the town.
Developing the Eastern Docks into the principle commercial terminal significantly increased traffic passing across the town to access the port. In 1978 Jubilee Way was constructed as a spiralling ramp that took traffic to the summit of the sheer eastern cliff.

However by 1995, after the addition of further ferry births to the Eastern Dock Jubilee Way could no longer cope with the traffic. A new trunk road was built to link the port with the recently constructed M20 that stretched to London. This trunk road, the A20, runs parallel to the seafront, rising beyond the Western Dock to meet the new motorway.

Any remaining traditional links between the town centre and the seafront have now been severed. The 40 mph dual carriageway is in constant heavy use and frequently comes to a standstill when there are delays at the port cause by conditions such gale force winds in the Channel or industrial action by French port workers in Calais.

With only 5 places to cross the road in a 2km stretch between docks, the A20 forms formidable physical barrier between the town and its seafront. Crossing points exist at four sets of traffic light and a dank subway which sits along the main seaward route from the market square.

The road also forms a new social barrier. The A20, shown in photographs in figure 4, marks a new borderline between the dilapidated town and a relatively attractive, yet unpopulated, seafront. This borderline is inhabited by a transient population of cars and especially lorries. Understandably few people walk by the side of the road and as activity along this strip of the town has dwindled, so too its building have fallen in disrepair.

2.3 A DECAYING TOWN

Figure 5 shows a selection of the many derelict buildings in Dover. Figure 5 highlights the number of derelict buildings in Dover located on the boundary of the A20 with the highest concentration existing at the junction between the road and the extension of the High Street.

Pedestrian inactivity in these areas has led to under use of a number of public buildings, pubs, restaurants and amusement arcades. Some of the many Victorian hotels that occupy a strip of buildings at the eastern end of the seafront have closed. Others maintain much of their business from government money which pays for accommodation of asylum seekers waiting to be relocated in the UK.

Closer to the town centre, Burlington House, a landmark 14 storey office tower block, has stood derelict for over a decade. Dover has lost much of its appeal as a commercial centre for national and international business; a condition counter intuitive given its transport links to Europe.

At the base of Burlington Tower a number of buildings lay derelict including the Tourist Information Centre (figure 6). Once positioned in a key location in town to meet and greet visitors wandering along the coast, today high noise and pollution levels deter any pedestrian activity in the area. The Tourist Information Centre is currently located at the rear end of the town in the basement of the Town Hall.

The decline in the tourist industry has spearheaded the gradual economic fall in Dover. Other contributing factors include the closure of many local coal mines and the end of town based port jobs such as transit documentation management, required prior to the 1992 Single European Act.

Many local businesses struggle to survive against corporate competition from supermarkets in and out of town and shops throughout Dover today have boarded up windows and “to let” signs on their doors.

2.4 A BLEAK FUTURE

Although the number of tourists that pass through the port each year remain constant, the frequency of freight has grown dramatically in the
past decade. As the popularity of the Channel Tunnel lures most of the cross channel tourist traffic, cheaper fares, frequent availability and large capacity parking have encouraged more haulage companies to travel by ferry. Freight traffic is predicted to continue to increase and will soon have overtaken tourist traffic as the primary market sector at Dover Port.

Freight traffic forecasts (figure 8) show that in 2014 vehicle units will have grown from the current 2.3 million per year, to 3.12 million. By 2034 forecasts estimate the number to be around 4.5 million units, doubling the current volume.

The A20 carries around 80% of the 5 million vehicles and 13.7 million passengers who travel through the port each year. Jubilee Way and major roads through Dover account for the rest.

In response to freight growth DHB have published proposals and conducted a 30 year masterplan exercise. DHB state that “There is little scope to significantly increase the capacity of the Eastern Docks Ferry Terminal for future traffic growth due to land and ship manoeuvring constraints” (DHB: Planning for the Next Generation - Second Round Consultation Document Jan 2007)

DHB plan to develop four more ro-ro ferry berths at the Western Docks as shown in figure 7. Three of the berths will stretch into the harbour parallel to the length of the beach. Ferries manoeuvring into dock will turn in a position directly in front of the seafront promenade only 500 metres from shore. Ship activity in the harbour will significantly increase as will pollution and noise levels while space for sailing and swimming would be reduced.

The proposals also plan to infill the historic Granville Dock to provide space for port operation activity and vehicle parking. A new marina is proposed to replace the Granville Dock and the Georgian Wellington Dock which will be redesigned as a freshwater pool encircled by new retail and residential developments.

A new marina is proposed to occupy the area alongside Prince of Wales pier, which divides inner from outer harbour. Along with plans to construct a new slip road at the Eastern Docks, these proposals would remove further space from the already depleted pebble beach.

These proposals maintain DHB’s intention to expand the port within the existing breakwater walls instead of conducting feasibility studies for sites outside the harbour. Expansion within the harbour has resulted in a scheme that would jeopardize what remaining seaside identity still exists in Dover. Historic marina docks and beach would be repossessed and sea views replaced by car ferries and concrete jetties.

Although a new slip road would take traffic off the A20 to the Western Docks, the DHB proposal do not plan to alleviate traffic congestion along the A20 feeding the Eastern Docks. There are no plans to relocate or reduce services from what would remain the principle commercial terminal.

DHB’s proposals, which are estimated to cost up to £400 million do not attempt to solve what is a fundamental and identifiable urban problem in Dover, caused mainly by the port and its operations.

DHB’s proposals represent the port’s continuing trend of removing much of the historic character of Dover. This has a negative impact on the town economically as its potential for tourism is harmed, and socially as the town’s identity and link with the sea is lost. Today Dover is a town associated with a port rather than a port associated with the town.

“At a relatively early stage in our master planning we considered the options for developing port capacity both within and outside the existing harbour walls. For both financial and environmental reasons we concluded that a development inside the existing harbour would be preferable.”

The economic decision to continue development within the existing harbour has resulted in a scheme that would jeopardize what remaining seaside identity still exists in Dover. Historic marina docks and beach would be repossessed and sea views replaced by car ferries and concrete jetties.

When asked if consideration had been given to development outside Dover Harbour Michael Krayenbrink, the Director of Dover Port Development, stated:
2.5 A VISION: REMOVING THE ROAD

In this section an alternative future for Dover is imagined, where the relationship between port and town is redefined urbanistically, economically and psychologically.

A flavour of this vision, captured in figures 9 and 10, is a result of an urban infrastructural redesign for the town. Dover is remade as a tourist destination able to provide visitors cultural, historic and entertaining experiences.

Typically solutions to the problem of “bridging” roads that cut towns and cities manifest in localised interventions such as footbridges or subways. However, these solutions commonly fail in creating an impression of a contiguous pedestrian environment and are often under used. These sites attract anti social behaviour due to their under supervised and unpopulated nature. This is particularly evident in subways with many across the country have been in filled as part of schemes to reduce crime and improve the public domain.

Unlike in most cases where major roads pass through towns connecting motorways or cities with each other, Dover marks the terminus for traffic on the A20. This factor enables a different approach be investigated to reconnecting a town beyond bypasses, elevated roads, footbridges or more subways.

A reconfiguration of Dover’s urban infrastructure would solve the problem posed by A20 by removing the road entirely.

The vision depicts how Dover may evolve should the A20 be removed. The scenes show the town reconnected to its seafront and beach.

The vision establishes a park which stretches along the strip from Eastern to Western Docks. Along the strip a new civic square is created. The square, shown in figure 9, is defined by the existing strip of apartments (The Gateway building located in figure 7) which have been raised on stilts to expose the sea and sand beach to the town. The Gateway building is reclad with new winter garden conservatories on its south facade and hydroponic garden balconies on its north facade. Residents can grow their chosen plants to create a seasonally changing facade to the square. Heliotats located at roof level direct sunlight onto the gardens of each apartment.

Cuts in the landscape are filled with salt water streams flowing from fountains at their head within the square, to the edge of the boardwalk on the seafront. Seawater is pumped to the fountains using floating tidal powered generators located in the harbour. The salt streams increase the salt smell in the air, bringing the sea closer to the town.

Circling the square is a new public library, art gallery, outdoor theatre (with retractable roof), tourist information centre and 200 town maisonettes.

Also envisioned along the new seafront is a residential quarter of 3000 new homes, seafront connections to the Western Heights Napoleonic Fort and Dover Castle, and a adaptable retail park made from bespoke ship containers.

The vision of how Dover may develop should the road be removed is not fully described in this document. The purpose of this thesis is to describe the infrastructural change that may lead to such a vision being implemented.
3.0 STRATEGIC SOLUTION

By relocating commercial ferry operations from the Eastern Docks to the west, the possibility of removing the A20 before it reaches the town centre from the west becomes achievable.

This report will investigate the feasibility of relocating all commercial freight and tourist ferry terminals to a new dock constructed outside the harbour enclosure. The new dock will be located to the west of Admiralty Pier at Shakespeare Beach. A new slip road from the A20 will connect the port with the M20 and the route to London. The A20 will terminate at the entrance to the current Western Docks.

The proposition, detailed in the following five chapters, will propose the pedestrianisation of the entire the seafront strip.

The proposal will also include designs for a new cruise terminal at the Eastern Docks in which the world’s largest cruise ships could berth.

The proposal will include a new marina at the Eastern Docks and the construction of a sand beach to replace the existing pebble beach.

Finally a proposal to re-establish the Victorian Western Dock railway station will be made to reintroduce a UK rail service directly to Dover seafront and port.
4.0 MOVING THE FERRY PORT

This chapter outlines my proposal to develop the port outside the harbour. This option requires the construction of a new breakwater to protect a future port from shingle drift, wave impact and wind. This chapter proposes a breakwater design efficient in terms construction, sustainability and cost.

The site for my proposed development will be Shakespeare Beach as shown in figure 11. This small shingle beach is located adjacent to the Admiralty Pier breakwater and is bordered by disused port wasteland and the Dover to Folkestone railway line. The Channel Tunnel, buried approximately 40m below the seabed, runs past the site.

The new dock, for the purposes of this document, will be known as the Shakespeare Ferry Terminal.

4.1 ENVIRONMENTAL CONSTRAINTS

Before beginning to design the layout of the new ferry terminal it is important to ascertain if the space for development falls within a number of environmentally protected areas. Government have listed particular regions around the UK as important for either their natural beauty or as habitats for wildlife.

The site for my proposed terminal falls partly within one category of protect zone as a Site of Special Scientific Interest (SSSI). This is an area that has “been notified as being of special interest under the Wildlife and Countryside Act 1981”(www.defra.gov.uk).

SSSI’s were introduced to “safeguard the diversity and geographic range of habitats, species, and geological and physiographical features, including the full range of natural and semi-natural ecosystems and of important geological and physiographical phenomena throughout England”(SSSI code of Guidance 2003).

Proposals for areas within an SSSI receive additional scrutiny at the planning stage and such a process would include direct attention from the Secretary of State.

As shown in figure 14, only a small proportion of the Shakespeare Terminal site falls within the SSSI with the majority of the protected area occupying cliff land behind the existing railway. This railway would act as a buffer zone between the natural habitat of local wildlife and a site sensitive constructions.

Precedents of developments breaching yet supporting SSSIs exist and an example of similar scale can be found a few kilometres down the coast. There, Samphire Hoe was constructed from waste material dug to build the Channel Tunnel. Designed as a large concrete slab protruding into the sea, Samphire Hoe today is a part of a national wildlife reserve and supports many species on its surface.

Although there are no commercial functions at Samphire Hoe, its construction forms a precedent for how a new port terminal would interface with the natural environment at its junction with the cliff.

A new dock at Shakespeare Beach would be designed to be as sensitive as possible to the local natural environment. The new terminal borders the exiting railway line which provides a natural buffer zone between the cliffs and operational areas.

Falling within an SSSI site creates a challenge for designers to construct a port that integrates with its natural environment. This notion extends this report’s intention as a whole, to consider a port which also integrates with Dover’s social and psychological environment.

4.2 METOCEAN STUDY

Figure 16 and 17 illustrate the tidal water level variations around Dover. Spring ranges average 6 metre variations while Neap ranges are at 3.2 metres. This data helps determine dredging...
depths required to maintain access for vessels using the port. As more variation occurs in spring time, the seabed at this site would need to be dredged, for access of the design vessel, to a depth of 8.3m below LAT as shown in figure 19. The additional 1 metre tolerance accounts for squat, exposure, bottom material allowance and over depth allowance. All marine structures would be built to a lower level than 8.3m to ensure adequate foundation.

Figure 15 indicates that the site does not lie within the flood plain. However due to tidal, wave and storm surge heights, the new terminal would be built from a ground level of 6.5m OD (fig.19). This site is subject to prevailing south-westerly winds that can reach gale forces. The breakwater will be designed to a height that minimises overtopping of waves during severe storms and its plan layout will protect the port from reflected waves entering the harbour.

Storm surges in this area are infrequent but an additional tolerance of 1metre will be added to the height of the breakwater and operational area to protect against flash flooding.

Other data such as sea water quality levels, which have been assessed as excellent, have been collected for the site. However, for the purpose of this preliminary analysis a detailed site analysis is not required. A detailed environmental and climatic survey would be undertaken if proposals for this site develop into detailed design.

4.3 GEOTECHNICAL SURVEY

To determine which method of breakwater and dock construction is suitable for this area a full site investigation survey would be undertaken. As a preliminary indication of the sites geological properties, research has been conducted from sources accessible in the public domain such as websites and published papers.

The bathymetric survey (figure 18) indicates the parts of the site lie 21 meters below mean sea level. The bathymetric data also shows that shingle deposits have accumulated against Admiralty Pier and consequently the seabed rises to a depth of 11 along the length of the breakwater. The underwater topography within the site rises at a sharp incline of 1 in 5 from its deepest point to the shoreline. This will have implications for the extent of dredging required to create flat surfaces for breakwater construction. The incline will also determine the method of the incremental rise of the breakwater from deeper to sea to the shoreline.

4.4 FACILITIES

A newly designed terminal, free from the spatial constraints imposed by Georgian marinas and Victorian breakwaters, would operate more efficiently. This would result in a more compact layout and arrangement of facilities and the construction of more ferry berths in a given area. Much of the existing plant, including the Dover berthing structures and vehicle ramp and pedestrian gangways, would be relocated to the new terminal saving on cost for purchase and time for procurement. Plant could be transported by land or sea depending on the structures type.

4.5 DESIGN VESSEL: RO-RO FERRY

The spatial layout and configuration for the dock is based on the design vessel and area of operational spaces required for the port to function efficiently.

The design vessel for Dover docks is the latest ship to join the cross channel fleet. It is the SeaFrance Rodin diagrammatically shown in figure 20.
This vessel is part of a new generation of roll-on roll-off vehicle ferries. It is the largest ship currently employed on the cross-channel route between Dover and Calais and can hold up to 1900 passengers. It has a vehicle capacity of 120 lorries and 700 cars which are arranged on 2kms of parking lanes.

The overall length of the vessel is 185.82 metres with a breadth of 27.7 metres. The Rodin has a draught of 6.5 metres requiring a clear depth within the harbour of 8.5 meters below LAT. 1900 passengers. It has a vehicle capacity of 120 lorries and 700 cars which are arranged on 2kms of parking lanes.

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4.6 DOCK LAYOUT

Figure 21 shows the proposed layout of the new Shakespeare Terminal. The orientation of the breakewater runs parallel to Admiralty Pier. By mimicking the plan of existing breakewater, the new dock will minimise interference with sediment movement along the coast. The orientation of the proposed breakewater encourages sediment to drift alongside the wall and not bank up in one area. If the breakewater wall was positioned at an oblique angle to the sediment drift, large deposits would accumulate and beaches further along the coast east of Dover would be depleted of their material. Receding coastlines are already a feature of many areas to the east of Dover. A report by Dover District Council states:

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The construction of Dover Harbour appears to have created a self-contained unit between Dover and Sandwich bay. Very little beach material passes eastward across Dover Harbour and none leaves Sandwich Bay.

The breakewater and operational area would tie into land along the existing seawall as shown in figure 21. The breakwater would meet the end of the seawall at the base of Shakespeare Cliff. Toward the east of the new terminal, the dock would meet the Admiralty Pier at ground level providing access between the port and Western Dock cruise terminal.

The breakwater would terminate at head creating an opening between it and the Admiralty Pier. Protected harbour mouths should measure 0.7 to 1 times the length of the design vessel, in this case at a width of 172.5 metres. This allows for clear passage while also protecting the harbour from open sea waves. Ro-Ro ships are particularly susceptible to wave movement when manoeuvring and cannot berth in rough water.

The design vessel turning circle determines the designed manoeuvrable space within the protected harbour. The standard roll-on roll-off ferries at Dover will need to turn once around 180 degrees per return journey. This allows vehicles to drive forward onto and off the ferry.

The radius of the turning circle of a ferry is approximately equal to its length for modern vessels. The Shakespeare Terminal plan shows a 365 metre diameter turning circle required for the design vessel. Turning circles may be shared between a number of berths as it is assumed entry and exist into the harbour will be managed so that ships do not turn at neighbouring berths at the same simultaneously.

For the purposes of this exercise a notional plant and operation building layout has been proposed. Further iterations would result from detailed design of the terminal.

The new terminal is proposed to replicate the amount of facilities and assets currently managed by Dover Harbour Board at the Eastern Docks. 14 berths have been planned in accordance with predicted port operational levels within DHB's 30 year masterplan. Spatial provision for a future further 3 berths has been made for this reports proposal, should traffic growth exceed expectations within 30 years.

Predictions so far into the future are often subject to change. The new terminal could expand further west should traffic continue to rise. Further expansion of the dock would involve the construction of a second sister breakewater continuing along the direction of the new wall. This development would create a second entrance to what would be a much larger harbour. Notionally development could continue along this pattern if required.

The operational area for Shakespeare Terminal is based around a stacked design allowing vehicles to park on two levels. The top level would be covered where it met the shore.

Figure 21 describes the layout of single piers. Relevant to this study is the clear distance between piers for single berthed vessels. Following this design guide, pier centres should be 2 x the width of the Rodin (at approx.30m) plus an additional 30m. For additional tolerance in a particularly busy shipping zone a further 25% clearance is added. The designed berths are therefore spaced at 130m centres with a clear width of 120m between piers.

Dover berth structures would be recycled from the Eastern Dock for vehicle access ramps and pedestrian gangways for ferry access.
4.7 BREAKWATER CONSTRUCTION

This section will outline the preferred type of breakwater for this site and describes its construction.

The breakwater shown in figure 21 is orientated to deflect waves, with the largest heights, that follow the path of the prevailing south westerly wind from the Atlantic.

As Quinn states in his book “Design and Construction of Port and Marine Structures”;

“There are many different types of breakwaters which have been constructed in all parts of the world. Natural rock and concrete or a combination of both are the materials which form 95 per cent or more of all breakwaters constructed. Steel, timber and even compressed air have served to a lesser extent to break the force of the sea waves”.

The most efficient method of construction for a new dock at Dover comprises a rock bund and reinforced concrete caisson system. The cost and speed of construction would be vitally important in terms of maintaining operations while transferring the ferry terminal from one site to another.

The seabed is prepared in advance by a series of dredging vessels. Material is removed along the path of the breakwater leaving level sections which step down into the sea. Gravel is then laid along this strip to a depth 200mm to form a finished level surface. A rock bund is constructed on top of the gravel to provide a platform for the caissons. The width of the bund is larger than the caisson spreading its load across the seabed and providing a strong foundation to the caisson.

Each caisson arrives on site as empty concrete boxes. After the caisson is placed onto the rock bund, each of the four compartments is filled with material to secure it to the ground through gravity. Each caisson for this proposal would be filled with approximately 20 tons of seabed material.

The breakwater will protrude above sea level to a height of 8.9m as described in Figure 19.

Caissons are constructed in Britain to maximum heights of around 18 metres forming a total height of 30 metres with a 12 metre high rock bund. In areas along the breakwater where this height is exceeded in particularly deep water, an additional layer of concrete block work is built up from the gravel base. The layer is formed from 1 tonne blocks which key into each other to form a contiguous base, onto which the rock bund is placed.

The total height of that breakwater wall would therefore range between 12.5 metres at the shore line to 32 metres high at the deepest point in open sea as shown in Figure 24.

At a point when the breakwater wall has been constructed long enough to protect main operational ground construction from wave impact, sheet piling is laid along the perimeter of the dock outline. Once the piles have been rammed into sufficient depth to retain the ground slab, seawater is drained from the area. Silt, sand and other seabed material that is been dredged for the ongoing breakwater construction is poured into the hole and compacted either by leaving it over time to settle adequately, or through vibro-compaction. When then material reaches the designed ground level, concrete is poured on top to form a solid top layer to the ground slab.
In place of the relocated ferry port, a new cruise line terminal is proposed for the western end of the Eastern Docks.

Dover Port is currently the second busiest cruise port in the UK with an increasing number of cruise ships visiting each year. In 2004, 126 cruise ships called at Dover, with predictions of 140 in 2014, 190 in 2024 and 250 in 2034 ensuring the cruise industry remains an important market for the port.

The cruise season currently runs from April to September with the majority of ships calling during the summer months.

The cruise terminal is located at the end of Admiralty Pier at the Western Docks. Ships are limited in their size by the space available for manoeuvring in this area.

The cruise industry forms a potentially lucrative market for the town. Currently tourist spending within the town centre does not represent the volume of cruise stops at Dover each year. Increasing cruise facilities in conjunction with redeveloping the town centre would provide a sustained economic influx into Dover enabling it to continue development.

5.1 EXISTING FACILITIES

Currently the cruise terminal can berth up to two medium to small cruise ships up to 100,000 GRT. Recently terminal facilities have been modernised and the Victorian port train station has been refurbished as an arrivals lounge.

5.2 DESIGN VESSEL: QM 2

My proposed cruise terminal will cater for the world's largest cruise ships. The design vessel for this study is the Queen Mary 2 (figure 28) measuring 345 by 41.15 metres and able to carry 2,620 passengers. The ships draught is 10 metres, This 151,400 GRT vessel and others of its kind would complement the existing cruise ships that would continue to berth at the Western Docks.

5.3 ENVIRONMENTAL STUDY

The site for the proposed cruise terminal is located within the existing harbour and therefore subject to minimal wave disruption. Larger ships are less susceptible to waves. Maximum waves heights within the harbour are under half a metre well within limits for manoeuvrability, loading and offloading.

Cruise ships are particularly susceptible to high wind speeds due to their high sides and proportionally narrow beam lengths.

5.4 BATHYMETRIC STUDY

Figure 25 shows a bathymetric sonar survey of Dover Harbour. As expected the beach drops incrementally into the harbour. The harbour, at its deepest of 12-13 metres is dotted with wrecks shown in red as areas only 6-7 metres deep. The ship turning zone by the Eastern entrance has the clearest and deepest waters.

Seabed material is shown to accumulate at the ferry berths including the western corner of the Eastern Docks where it forms the beginning of the beach.

5.5 BERTH LAYOUT

Figure 26 shows my proposed layout of the cruise line terminal at the Eastern Docks.

Due to the strong effect of wind impact against the sides of these large vessels, cruise ships will berth facing into the prevailing wind.

Cruise ships have individual doors for luggage, provision and passenger access. Depending on the ship, these doors can be located in a number
of areas. Passenger doors tend to be located toward the middle of the ship but vary in heights above the water line. Baggage doors are located anywhere along the length of the ship and provision doors are generally found toward the stern.

The quay at the cruise terminal stretches the length of the design vessel. This would allow the pedestrian gangway and baggage conveyor easy access to doors anywhere along the length or height of the ship. Pedestrian access will be via a passenger air bridge which will have adjustable height depending on the water level. Baggage will be taken on and off the ship using a quayside wheeled conveyor. Areas on the quayside are designed for baggage handling and transportation from the ship to the terminal collection area.

According to the British Standard 6349 Part 4 (1994), ships should berth against fender units, at a spacing of 0.3 to 0.4 times the length of the ship. Given the design vessel is around 350m long and the smallest ship might be 100m, fenders placed at intervals of 30m would allow safe berthing of all cruise ships. Dolphins would be installed at 15m intervals.

5.6 DREDGING

The draft of the design vessel is 10 metres. The cruise berth is located at the base of the beach where the seabed levels are approximately -7mCD.

Dredging will be carried to an approximate depth of -11.2CDm as required for cruise ship access. An underwater retaining wall will be constructed to stop beach material encroaching on the dredged zone. The wall will be constructed from concrete blocks with key fixing, and will join with the western sheet piled wall of the Eastern Docks.

A line of buoys will mark the line of the wall above water to highlight the separation between beach and dock.

5.7 PROPOSED FACILITIES

The following facilities would be required for the operation of the cruise terminal;

- Check-in desks located between land side entry to the terminal and the security control point.
- Security stations equipped with x-ray facilities and scanning devices.
- Customs and immigration interview and surveillance rooms. To reduce processing delays on the ships arrival current practice is often to board immigration officers at a previous port so checks may be carried out during the journey. This system would be implemented at Dover.
- Baggage handling areas and distribution points
- Short and long term car parks, coach parks and taxi ranks
- A sizeable quay area for ship refuelling and restocking and passenger access
- Services (water, electricity, etc)
- Access for emergency vehicles.

Vehicle access to the cruise terminal will be via the A2 Jubilee Way. The A2 connects with the M2 to Canterbury and London and forms a scenic route to and from Dover. In cases of emergency vehicles may also pass along Marine Parade on the seafront.
A new residential quarter is proposed to replace the ferry terminal at the Eastern Docks. Thousands of new homes would be built on the 40ha site and a marina would be constructed along the quay providing private berths for residents. This development would complement the existing marinas at Granville and Wellington Dock which sustain busy operations but are limited in the size of vessels able to dock.

6.1 ENVIRONMENTAL CONDITIONS

As the Eastern Docks is located within a protected harbour, wave climate would not cause any damage, or hinder manoeuvrability, of marina vessels. Although wash from manoeuvring cruise ships would create waves too high for marina vessels to sail, the infrequency of cruise visits would result in acceptable levels of disturbance.

6.2 DESIGN VESSEL

The marina can accommodate various sizes of power boats and yachts. For the purpose of this study the marina will accommodate vessels between 9 and 25m in length, 3.7 to 6.5 m beam and 1.2 to 3 m draught. However emphasis is made on the flexibility of pontoon layout so that vessels of varying sizes over the life span of the marina could berth.

6.3 ENTRANCE AND FAIRWAYS

In line with national codes of practice, marina access should be the greater value of either 30m or 6 times the beam of the widest design vessel. The entrance to Dover marina would therefore be (6 x 6.5m) 39m metres.

Following the same code of practice, the minimum width of fairways within the marina should be 1.5 times the length of the longest vessel. Therefore fairways serving the largest marina vessels will be (1.5 x 25) 37.5 metres wide and (1.5 x 12m(average)) 18metres for smaller vessels. Dredging would not be required.

6.4 PONTOON LAYOUT

The new marina will accommodate up to 600 vessels.

Floating double finger pontoons provide access to boats. The clear width between fingers is measure at 2 x design maximum vessel beam + 1m up to 20 m (length) and 1.5m above 20m. Therefore berths will range from (2x3.7+1) 8.4 m to (2x6.5+1.5) 14.5m.

2.5m wide jetties that enclose the marina provide access to gangways and fingers. Gangways are 2m wide and fingers are 0.75 and 1.85 m wide depending on the length of vessel they serve (e.g. a 15m ship requires a width of 1.4m). All walkways will be constructed from timber deck supported on galvanised steel frames.

6.5 ANCHORING

Floating jetties and pontoons connect to the quay and guide piles on sliding rings (figure 30).

6.6 ACCESS BRIDGE

Timber access bridges, connecting quay with jetty and walkways, are constructed on a sliding steel member proving constant access in all water levels as shown in figure 30.

6.7 PARKING AND STORAGE

290 car parks, in accordance with design guidelines of 40 per 80 vessels) are located beneath residential podium decks at grade with the quay. Each parking space is 6m long and 30m2 area.

6.8 FACILITIES

Water and electricity points would be installed. The Victorian holiday maker might have come to Dover to enjoy the expansive sea and cliff views while strolling along its long sandy beaches. Today this image has been replaced by a receding pebble beach flanked by the ports piers and operational zones.
7.0 SAND BEACH

The Victorian beach was relatively exposed to open sea where wave action would replenish the beach with sediment. Today, the contained harbour allows for little sediment movement and much of the sand has receded into the bottom of the harbour due to wave disturbances cause by high levels of ferry activity.

7.1 WAVE ABSORPTION

Today pebbles are a preferred beach material for the port as they diffuse waves, caused by berthing ferries, that have been reflected off breakwater walls. These waves, responsible for removing much of the beaches sand, would disturb ferry manoeuvrability if they were not absorbed.

The relocation of ferry services outside the harbour and the introduction of infrequent ship activity in its place mean a sand beach can be reconstructed in the harbour.

7.2 BEACH CONSTRUCTION

A top layer of pebbles would be removed from the beach and used as fill for the ferry terminal. In its place clean sand, dredged from the nearby Goodwin Sands in the Channel, would be poured onto site by suction dredgers.

A new sand beach, stretching into the harbour, would complement the cleaner sea water to create an environment able to catalyse regeneration through tourism. Continuing the Victorian revival of Dover, its marine railway station line would be reconnected to the main line forming the direct link between London and the Dover seafront. This link existed during Dover’s life as a seaside resort. The phasing out of this train service can be seen in the development of Dover in figure 34.

8.0 HARBOUR TRAIN STATION

The new train station would be located next to the original Victorian station which has been converted into a cruise passenger departure lounge. Alternatively the Victorian station could be reconverted into a working train station and share use with the cruise lounge. The building would therefore have use beyond the cruise season months.

Currently courtesy buses shuttle ferry foot passengers between the town train station and port. A new marine train station, located on the Admiralty pier, could also serve the new ferry terminal providing direct access between London and the docks, reconnecting the traditional route to the continent.

The proposal outlined in this report supports a regeneration for Dover Town by addressing its infrastructural economic, social and physical relationship with the port. The proposal highlights and describes ways in which Dover’s implicit potential as a tourist town might be exploited.
This report provides an indication of how large scale redevelopment is necessary in our current economic climate to tackle defined urban problems that exist in Dover. The proposition forms a framework by which such a redevelopment might be implemented.

Dover town and port exist inextricably together and for revival to occur on the scale required, the port must be addressed. The port is the face of Dover and is someway responsible for its health. The port once supported the town but today employs only 9% of local residents. It is the contention of this study that the port today does more harm than good to the quality of life of the Dovorian, highlighted particularly by the impact of the trunk road, but also by the encroachment of port operations into the public waterfront realm.

For urban change to occur the port must act. A relocation of the ferry terminal, enabling the removal of its trunk road, could bring about social and economic change to Dover town.

Crucial to this report is the balance between interests of the port and town. This report proposes an expansion of Dover port beyond its current confines within the harbour. As Port Development Director Michael Krayenbrink states in relation to DHB’s proposals (see Appendix), development may well have to continue outside the harbour within the forthcoming generation:

“Based on current traffic forecasts, market share predictions and expected changes in technology, the overall...port capacity should be sufficient to handle...the expected demand over the thirty year plan. However it has to be said that forecasting relatively far ahead becomes increasingly susceptible to changes in the assumptions used and if traffic does continue to grow there will inevitably be a point where further increases in port capacity will be required”

A cost analysis has been undertaken to estimate the market land value of the Eastern Docks for residential and retail use. The cost estimate is included in the Appendix by Land and New Homes. The value of the land has been calculated as approximately £1.7m per acre totalling at £165m for the entire site. This money could fund the breakwater and new terminal construction at Shakespeare Beach.

9.2 STRATEGIES FOR DISSEMINATION

I intend to gather comments and opinions on the proposal outlined in this thesis by issuing it to the various parties that have interest in Dover.

The report has been issued to Dover Harbour Board, the MP for Dover, and to Dover Pride, who are an independent organisation liaising between commercial and public to promote the regeneration of the town.

This thesis was presented to Kent Architecture Centre (KAC) in a meeting arranged at their office on 7th May 2008. After a comprehensive presentation and discussion, KAC stated:

“Kent Architecture Centre endorse the proposed development of Dover Seafront by the relocation of ferry operations outside the existing harbour, and the rejoining of Dover town with its Seafront.”

For further information on this proposal to reconnect Dover town and sea, please visit:

www.re-visionsite.org.uk