



CITY DEVELOPMENT DEPARTMENT

DESIGN AND PROPERTY DIVISION

BROUGHTY FERRY FLOOD PROTECTION SCHEME

2018 – SCHEME DOCUMENTS

Appendix 1 – Design Statement



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Appendix

Appendix A - Proposed General Arrangement Drawings

1. Introduction

This report has been written to document the Broughty Ferry Flood Protection Scheme design philosophy from inception to the final detailed design. The aim is to provide details of how and why the scheme was originally identified. It will refer to the studies and reports that have been undertaken to examine the site and identify potential solutions. The report will then discuss the development of the design in each of the design areas. Key design decisions have been made based on a mixture of physical constraints, public opinion and conservation area aesthetics, while considering how the area is anticipated to be used in future. The overall aim of this document is to provide a better understanding of why the final designs have been selected for notification to the Public.

2. History of Project

2.1 Existing Coastal Defences

Throughout the history of Broughty Ferry the extent of the coastline has changed very little. Fisher Street has changed the most over the last 150 years including the construction of Pilot Pier and removal of the Jetty (once outside the Ship Inn) and public baths in the late 1800's. The lifeboat shed was constructed in 1909 and new jetty constructed in 2001. There have been various buildings and sheds in the area including Public Toilets and cabins located on the grass beach and grass area at pilot pier removed in 1980s. *(See photos 2-4 below)*



Photo 1



Photo 2



Photo 3



Photo 4

The existing sea wall is a combination of inclined stone faced revetment, similar to what is shown in Photo 1, and vertical masonry or concrete wall supporting a surfaced footpath. Prior to wall and road construction the natural beach would have run up to the houses along the north side of the street. The walling provides a solid edge for the road protecting it from being washed out. As evident in Photos 1 & 7, the stone revetment, while protecting the structure of the road, allowed waves to roll up onto the carriageway causing flooding. A formal concrete footpath and vertical wall was constructed in the 1980s to help prevent this.

The existing condition of the sea wall is poor. Dundee City Council continually repair the wall as areas are washed out by the river. Frequency of the repairs is increasing as the condition of the wall continues to deteriorate. In 2017 alone the council spent £20,000 in repairing the existing wall and have previously had to fill areas of scour and washout below the road at similar substantial cost.

2.2 Historic Flooding



Photo 5

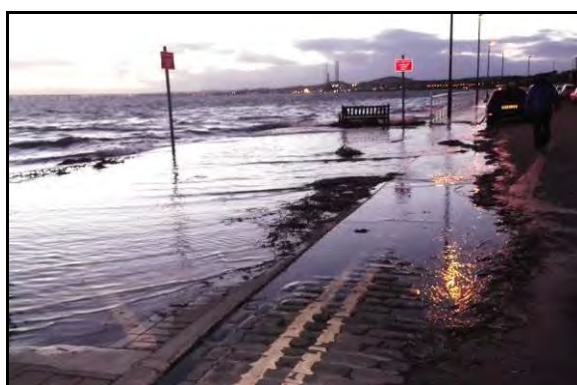


Photo 6



Photo 7

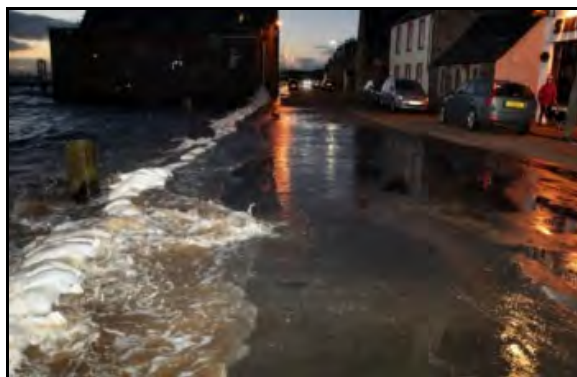


Photo 8

In accordance with recognised national guidelines flooding has been modelled to a 1:200year with climate change storm event. This does not mean that the event will occur every 200years but that there is a 0.5% chance of this type of event occurring, potentially multiple times a year. For tidal estuaries such as the Tay the predicted flood water level requires assumptions regarding the coincident mix of weather and tidal events. At Broughty Ferry the high tide with a storm surge and wind/waves from a compounding direction is known to create the right mix of conditions to breach the existing wall. Photos 6 and 8 show a recent high tide event that over topped the existing sea wall. Thankfully there was very little wave action that prevented this becoming more serious. Sandbags placed by Dundee City Council helped contain the majority of flooding. If however the flooding that is illustrated Photo 6 had coincident with the wind and waves shown in Photo. 5 and 7 the flood risk would be much more serious and difficult to manage.

With anticipated climate change predictions indicating a significant sea level rise and increased frequency of storm events. It has been calculated that there is a serious flood threat to Broughty Ferry.

2.3 Background to Project

With the Flood Risk Management (Scotland) Act 2009 receiving Royal Assent in 16 June 2009, a legal obligation to manage flood risk was put upon Scottish ministers, SEPA (Scottish Environmental Protection Agency) and Responsible Authorities.

SEPA became responsible for the preparation flood risk assessments and identification of Potential Vulnerable Areas (PVAs) within Local Plan Districts. The SEPA National Flood Risk Assessment was published in 2011 and informed the preparation of the Flood Risk Management Strategies which were published in 2015.

For each PVA, these Strategies identified the causes and consequences of flooding and set out clear objectives and actions to manage flood risk. The actions were prioritised and assigned to various organisations including Local Authorities to lead and oversee the implementation of local Flood Risk Management Plans.

The initial Local Flood Risk Management Plans were published by Lead Local Authorities, as set out under the 2009 Act, in 2016 and detailed:

- Proposed actions to reduce the impact of flooding
- Responsibilities for implementing actions
- Timetable of delivery of actions
- Required the co-ordination
- Funding arrangements.

Angus Council as Lead Local Authority for the Tay Estuary and Montrose Basin published the Local Flood Risk Management Plan for this local plan district with input from other Responsible Authorities, SEPA and Scottish Water. An action from this plan was for Dundee City Council to promote Flood Protection Schemes in Dundee and Broughty Ferry.

In 2007, in anticipation of the implementation of the Flood Risk Management Act, Dundee City Council commissioned consultant Atkins to undertake a Stage 1 Coastal Study that investigated the existing sea defences and their condition. Atkins also modelled tidal levels, taking into account global warming and sea level rise. The report also looked at maximum potential wave heights and where these would form. (*see table 1.1 for sample of wave model data*). These figures were used to assess the existing sea defences and their capability to protect Dundee.

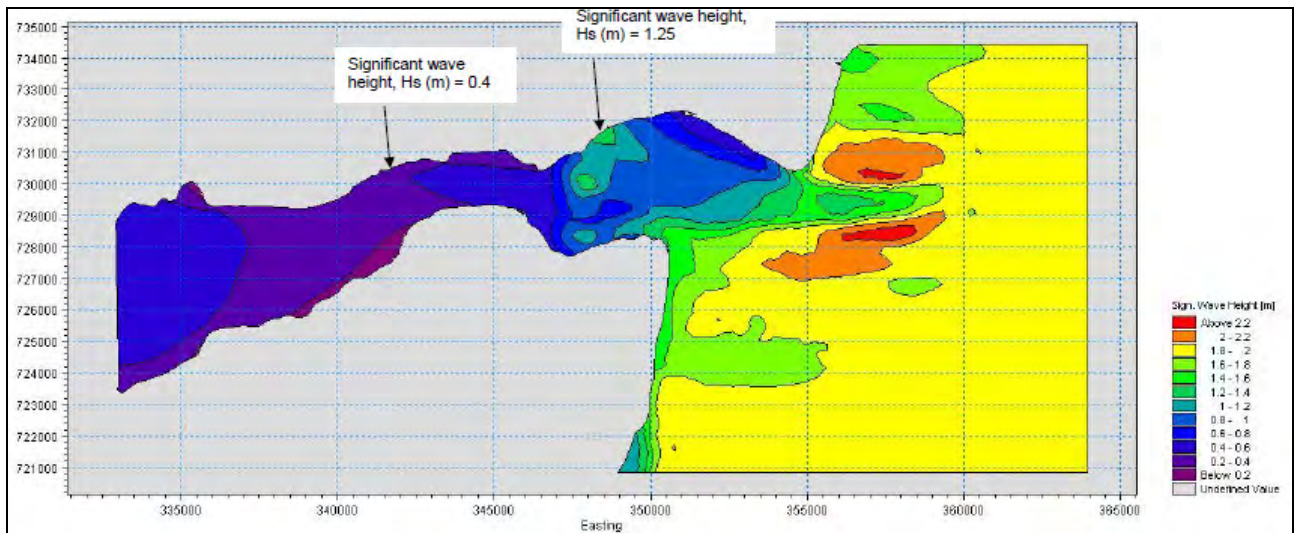


Table 1.1 – Wave Model Data from Atkins 2007 Met and Tides Assessment Report

Mott MacDonald (MM) were subsequently commissioned to undertake a Stage 2 Coastal Study for Dundee in 2013. MM developed the initial findings within the Atkins report and commenced additional modelling and development of option appraisals and cost benefits. This series of reports, finalised in 2013, assessed the risk of flooding in Dundee and the potential impact. Using estimated sea level rise and wave data, the worst case flood events were calculated and can be seen presented in Table 1.2 below.

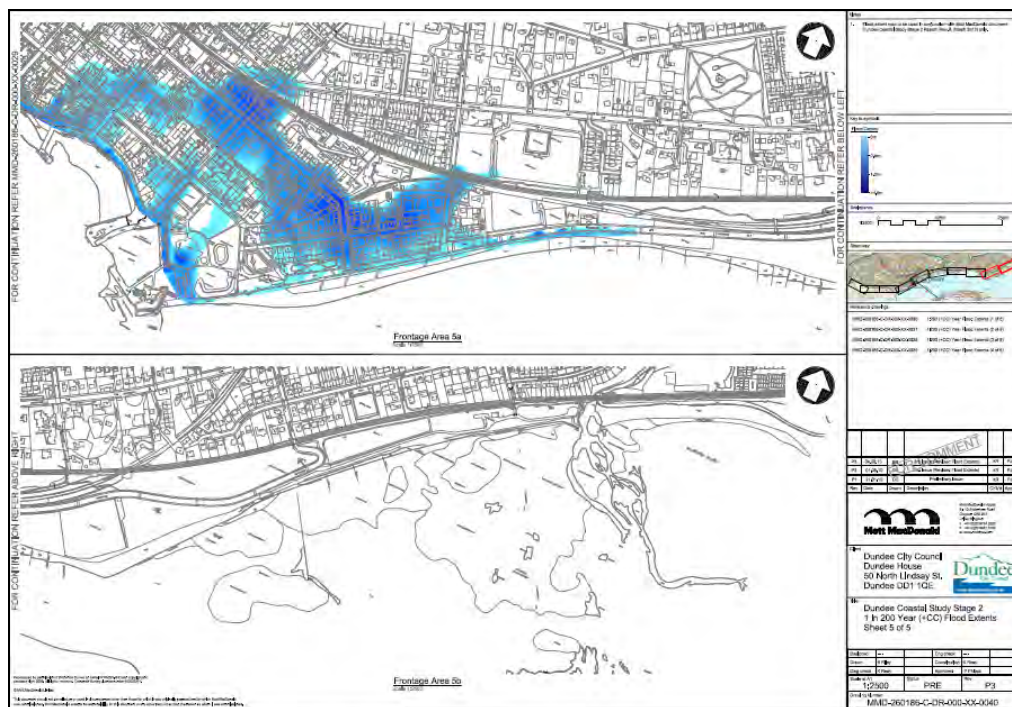


Table 1.2 – Flood extent plan from Mott MacDonald Coastal Study 2013

The Stage 2 Coastal Study therefore identified there was a need to improve river edge defences at Broughty Ferry. Not just to protect the river front but to protect the town centre as a whole. A range of outline solutions for each section of the river front were assessed in relation to the potential environmental effect and the capital cost of the works compared with the consequential cost of doing nothing.

At Broughty Ferry the preferred solution for providing flood protection was a new primary sea wall incorporating glass panels at Douglas terrace and Beach Crescent (see photos 9) and a solid re-curve wave wall at fisher street (see photo 10). When compared with the consequential cost of a flood event to property and the local economy the cost of implementing the preferred solution there was predicted to be a benefit to cost ratio of almost twelve to one.



Source: Images courtesy of Niall Barry & Co. Ltd.

Photos 9 – Example of Initial Proposal Douglas Terrace / Beach Crescent from Mott MacDonald Coastal Study 2013



Photo 10 – Example of Initial Proposal – Fisher Street

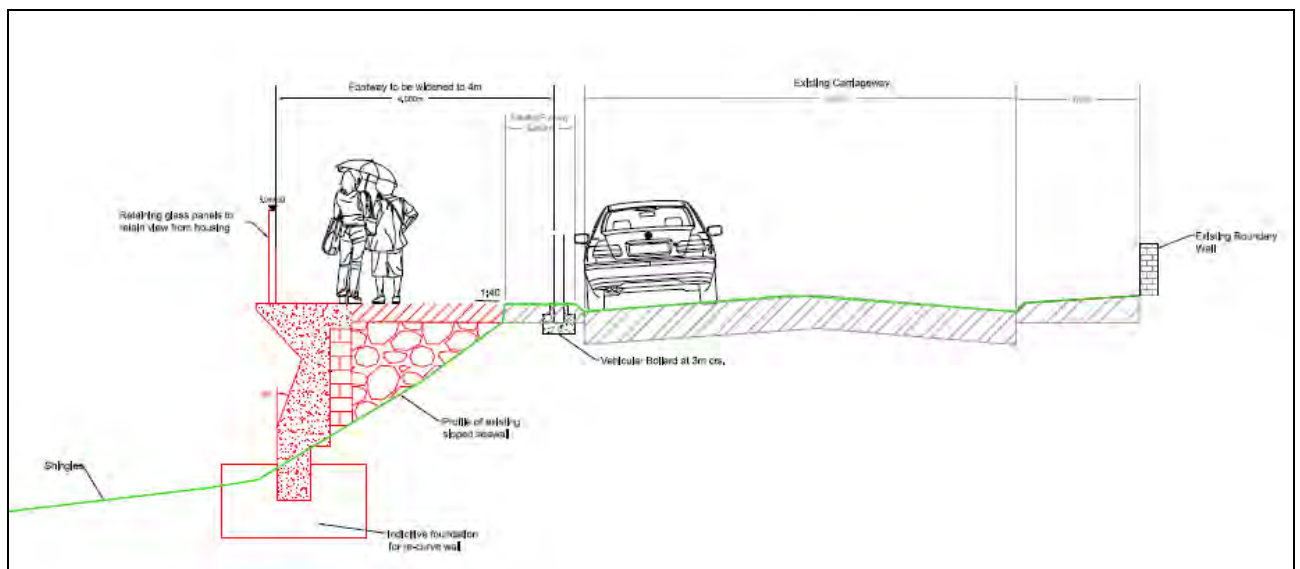
Scottish Government funding was made available to help local authorities achieve their legal flood protection obligations. Funding applications by local governments since 2016/2017 were assessed by the Scottish Government and funding for a total of 42no. Flood Protection Schemes were committed. Funding from Scottish Government for each project is currently provided for 80% of the cost with the remaining 20% to be provided from the Dundee City Council Capital Budget. Broughty Ferry Flood Protection Scheme has been prioritised by SEPA as no. 2 of the 42 schemes within Scotland.

3. Design

Dundee City Council Engineers have, since 2015, developed and refined the initial design of the flood protection measures as presented in the Mott Macdonald Stage 2 report. The Mott MacDonald Stage 2 report determined that the Above Ordnance Datum (AOD) level that a rivers edge wall would have to be set at was 5.0m AOD. This would adequately provide flood protection for the predicted combination of water level and coincident wave height during a design event (1 in 200 year event). With an existing river edge level as low as 3.7m OD the initial challenge was to assess how the recommended solution would look aesthetically whilst providing the necessary flood protection.

3.1 Initial Design options

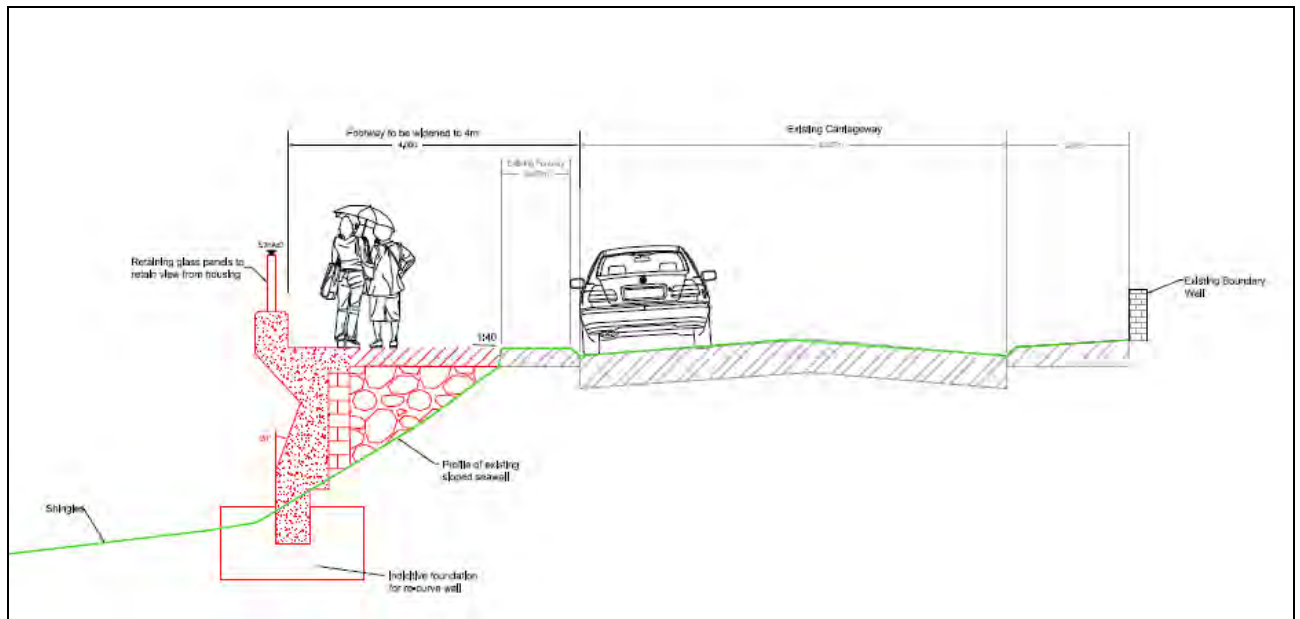
The outline design from Mott MacDonald was based on providing a new glass panel wall that would sit on the existing sea wall. However, on closer inspection the poor condition of the existing wall would prevent this from being a viable solution unless a new wall was constructed. Construction of a new sea wall would also provide the opportunity to widen the footpath and improve access along the river edge. (See *Initial Design Option 1*)



Initial Design Option 1

The new sea wall design was based on the concrete wall that had previously been constructed at the Douglas Terrace walkway towards Grassy Beach with the addition of a glass panel wall providing the required height for Flood Protection. A row of bollards was also considered as a means of excluding vehicles and protecting against any potential vehicle damage to the glass panel wall.

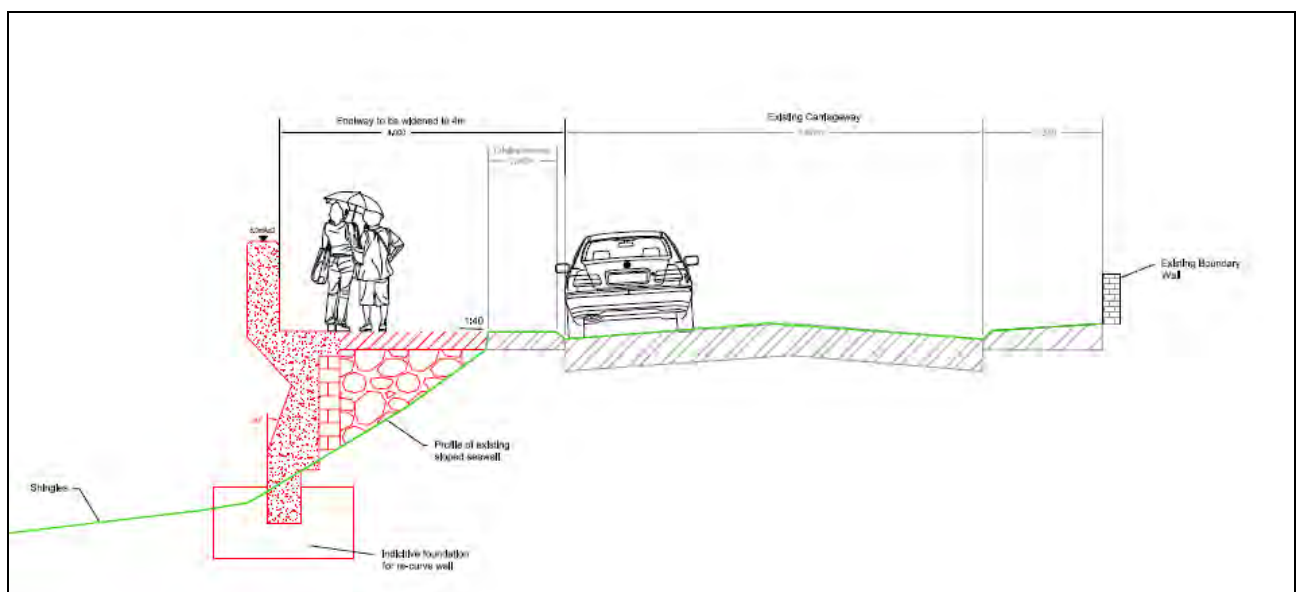
To help reduce the high cost of a glass wall the design was refined to make the glass wall smaller by introducing a concrete upstand in the wall. (See *Initial Design Option 2*)



Initial Design Option 2

Two major disadvantages of installing a glass panel wall were high supply and installation costs but also high ongoing maintenance costs of cleaning glass. It was felt sea water spray would leave salt residue on the surface and without regular cleaning would frost the glass affecting visibility through it. For these reasons this option was discounted.

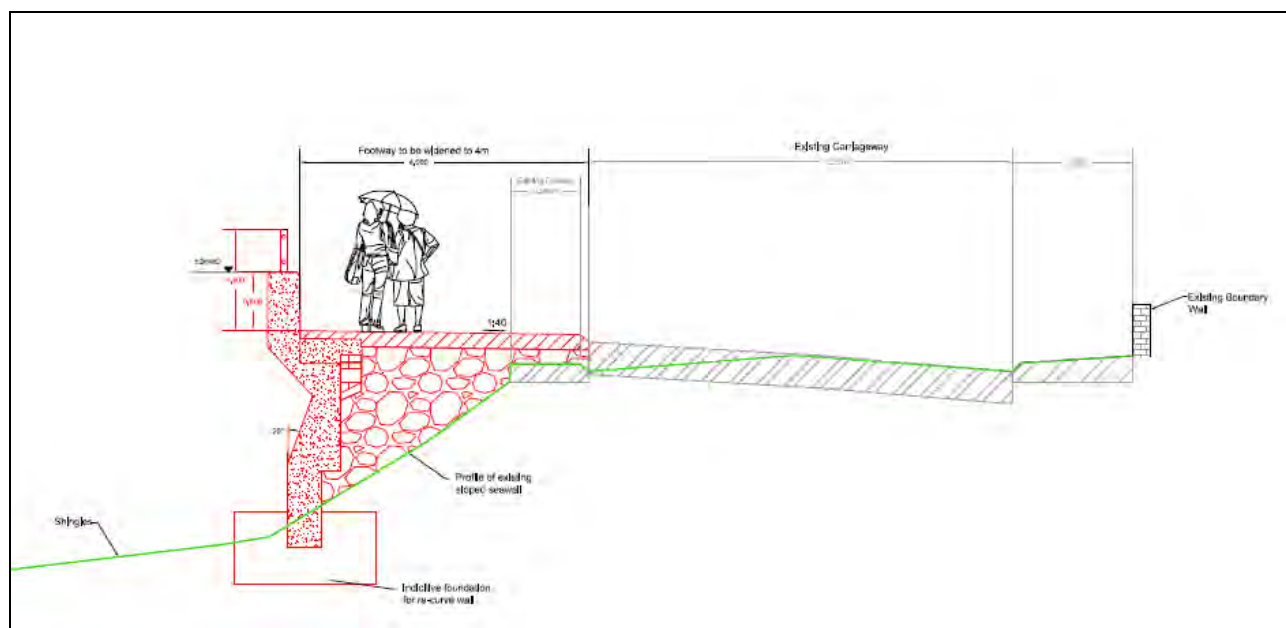
The next option explored was to build a solid wall at the full flood protection height. (See *Initial Design Option 3*)



Initial Design Option 3

This option was effective in providing the required flood protection and less expensive than the previous options but had its own disadvantages. Mainly, it created a disconnection from the river and created a significant visual intrusion eliminating views for children and chair bound users of the footpath.

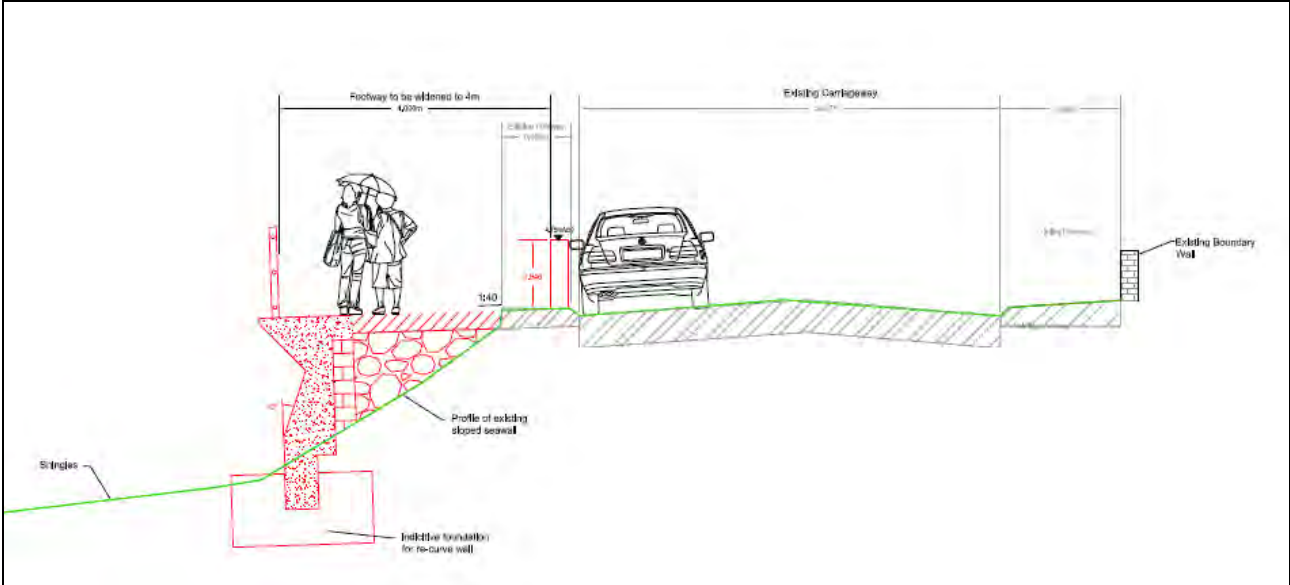
Raising the whole footpath including reshaping the carriageway was considered as it allowed the height of the primary sea wall to be reduced albeit requiring a protective pedestrian guardrail on top. (See *Initial Design Option 4*). The improvement in visibility could not however fully address the disconnection between footpath users and the river. The design also raised concerns about accumulation of surface water and any over topping water on the other side of the carriageway as the new footpath and both sides of road would be draining to the lowest point at the opposite kerb line.



Initial Design Option 4

Recognising the relatively infrequent occurrence of storm events which would over top the existing footway an option to retain the existing connection with the river and manage / exclude footpath access during extreme events became the preferred option. The initial wave impact would continue to be taken by the new river edge wall but a “set back” wall set at a distance and height to contain any water overtopping the wall and footpath would be required. (See *Initial Design Option 5*)

The last option considered was to remove any wall or barrier at the sea wall altogether. The flood protection would then be provided by a secondary setback wall located at the road side. For the proposed 4,0m footpath the required set back wall height is calculated to be 0.3m lower than it would be on the river edge and had the added advantage of improving the segregation of road vehicles and pedestrians.(See *Initial Design Option 5*)



Initial Design Option 5

Following these considerations Option 5 design concept was selected to be taken further into detailed design.

3.2 Detailed Design

A river edge walkway with set back wall was identified as the preferred flood protection solution (Option 5) but required further detailed design to address varying physical and environmental issues local to each section of the scheme. Maximising public access to the river front has been a design objective from the outset but the detailed design needed to be developed to provide a usable asset that would fit in with how the community want to use the river edge which, based on feedback obtained, led to dividing the proposals into three different sections.

- **Section 1 – Douglas Terrace to Lifeboat Shed**
- **Section 2 – Fisher Street**
- **Section 3 – Beach Crescent**

The design of each section was looked at individually to address the characteristics unique to them.

Section 1 – Douglas Terrace to Lifeboat Shed

(Refer to Appendix A for Section 1 General Arrangement Drawing)



Photo 11 - James Place



Photo 12 – Douglas Terrace

Along Douglas Terrace the new sea wall / primary wall location is constrained by proximity to the Scottish Water box culvert / Hatton rising main buried within the foreshore. The available footway width between the new setback wall and river edge is therefore proposed to be set at 4.0 metres which, given that this length of coastline forms part of the National Cycle network, is considered adequate to accommodate Cyclists, Pedestrians and street furniture (benches etc). see Section 1 - Proposed design Section.

Although the footpath rises towards the west end of Douglas Terrace the height of the proposed new set back wall has been maintained at the same height as required at the east end (1.0 metre). Access openings through the wall will incorporate flood gates and access steps from the footpath to the beach both of which would both be positioned at existing and established pedestrian desire lines.

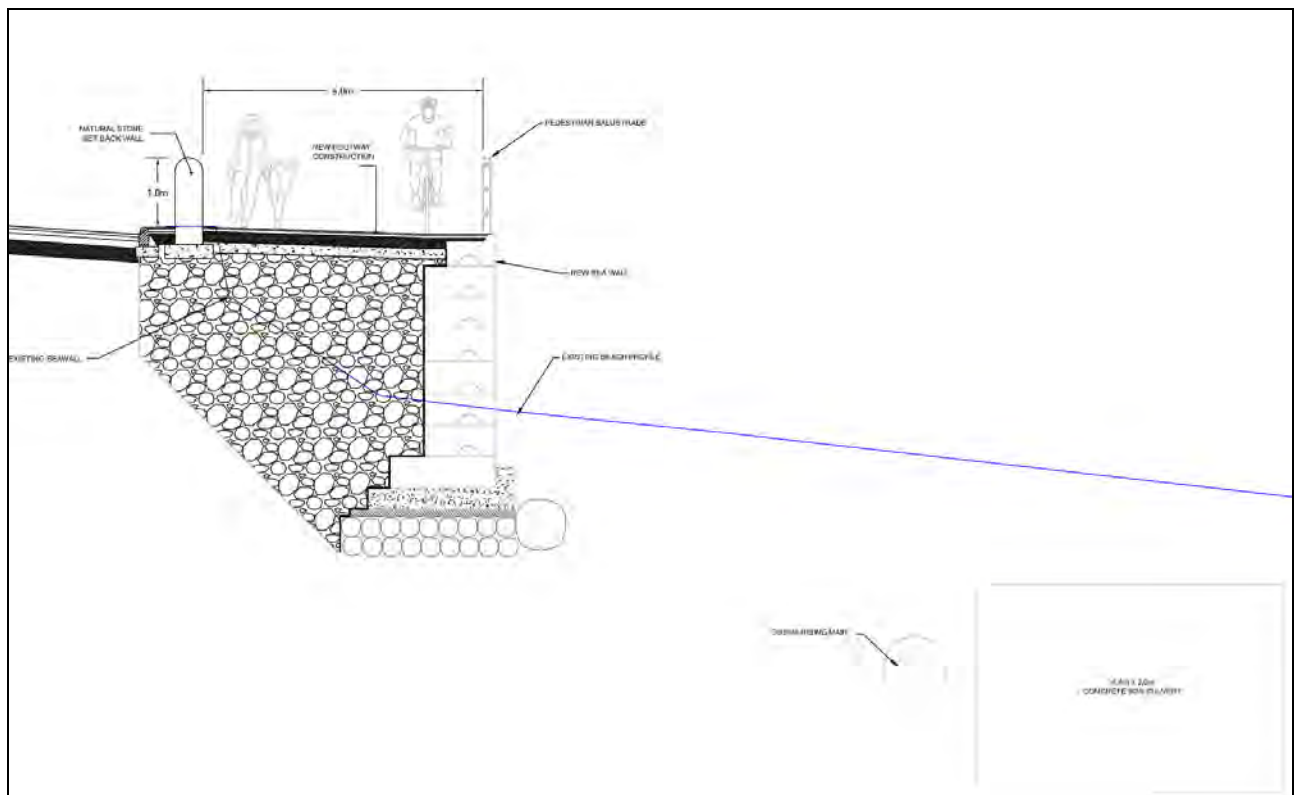
The footpath surfacing in this section is proposed to be of bituminous construction. The width of the existing carriageway will be maintained and re surfaced on completion of the works, however as parking on both sides of the road causes congestion and access issues for emergency vehicles double yellow lining is proposed, west of life boat shed and on the south side of James Place.

The initial design had assumed that a piled foundation would be used to form the foundation of the new sea wall. Through consultation the preliminary design as revised due to potential construction issues associated with marine piling impacts on marine resources and the close proximity of the Scottish Water Hatton Main. The design solution now proposes to use a pad foundation with a precast modular retaining wall system. The advantage of using this system is it should increase the speed of construction and also provides a stone finish in place of the grey concrete wave return wall. See Photo 13 as an example of a suitable retaining wall system.



Photo 13 Example of Precast Concrete Retaining Wall

A typical cross-section of latest design for Section 1 is shown below. Refer to Appendix A for a copy of the proposed General Arrangement design drawing.



Section 1 - Proposed Design Section

Section 2 – Fisher Street

(Refer to Appendix A for Section 2 General Arrangement Drawing)



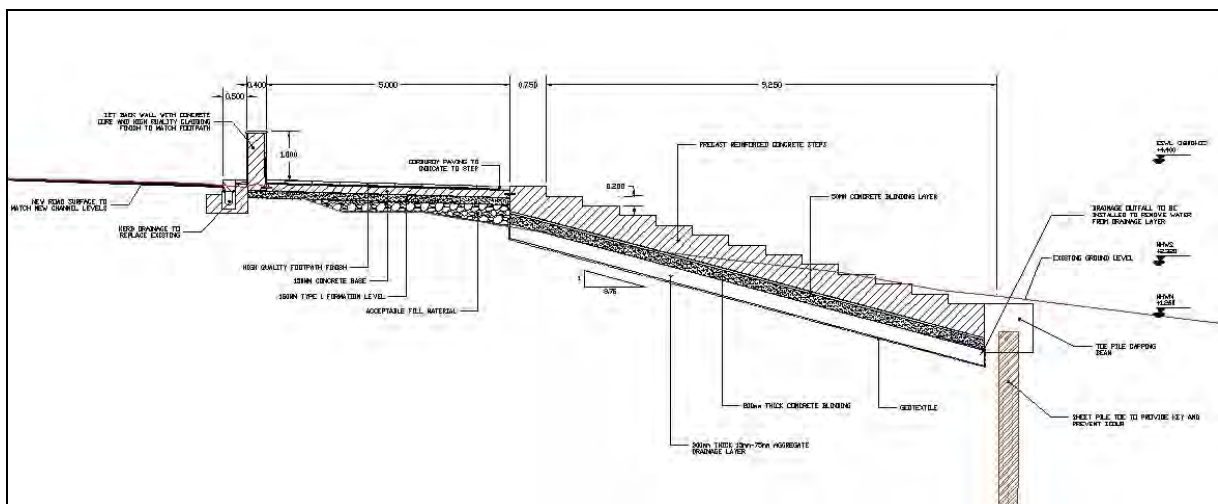
Photo 14 – Fisher Street



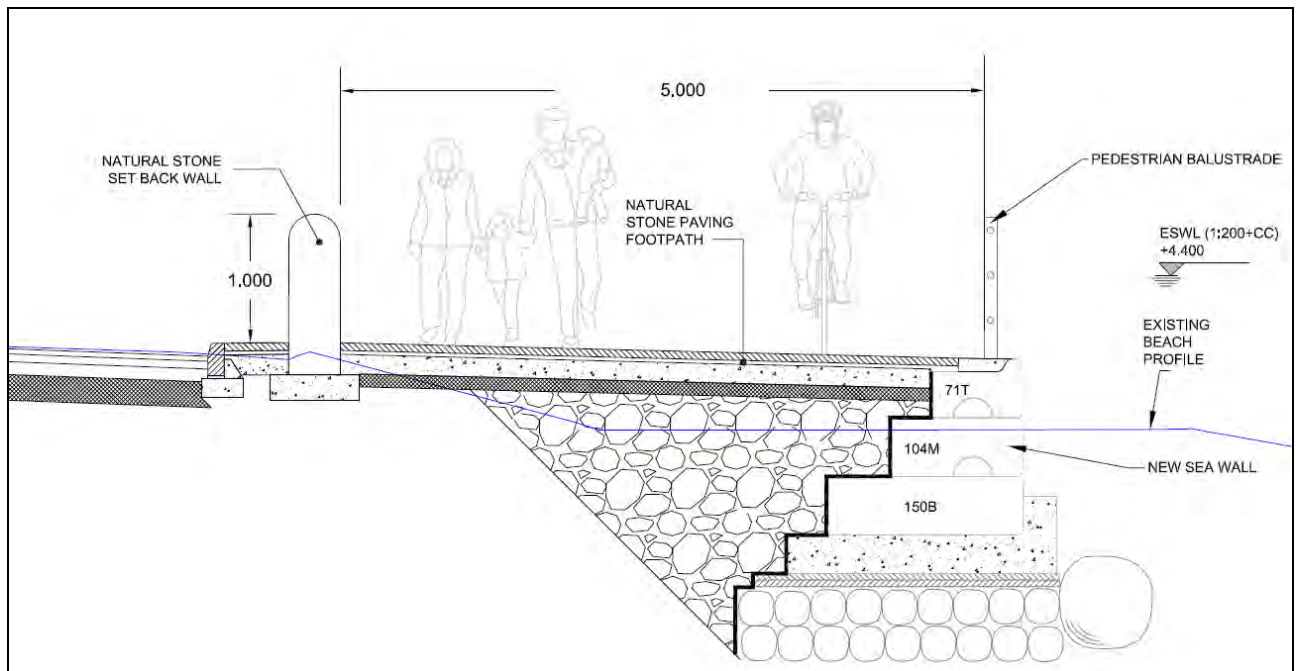
Photo 15 – Fisher Street

Fisher Street is a unique area within Broughty Ferry, the area of grass beach is well used by the public as are the benches at this location. This is the lowest lying area within the scheme and therefore is the most susceptible to flooding. Sand bags are regularly deployed to reduce the risk of water reaching the carriageway, when high tides and storm events are predicted.

In order to limit the height of the flood protection barrier the concept of providing a set back wall to the rear of a widened footpath is proposed. However with the existing shingle beach a vertical re curve wall at the footpath edge as the river edge would be largely buried and ineffective. Initially it was thought that steps accessing the water / beach in the form of a stepped revetment would protect the river edge (*See Section 2 Design Option 1*). However following consultation events detailed in part 6 of this report, the general opinion from local residents was that the steps were not in keeping with the historic nature of this section. The current proposals are therefore reverted to a vertical river edge wall similar to the Section 1 design solution.



Section 2 - Design Option 1



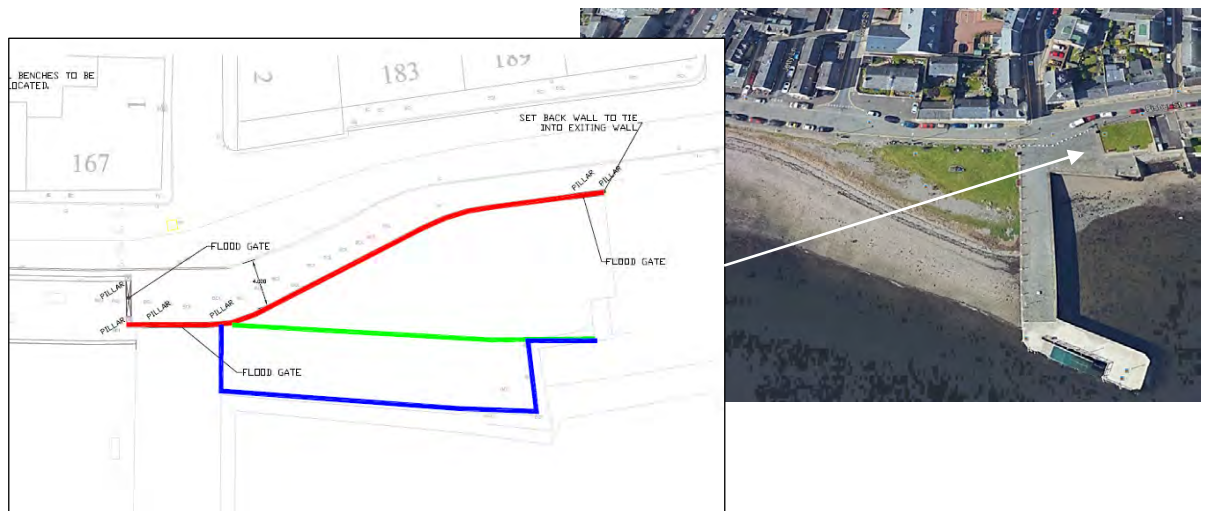
Section 2 - Proposed Design Section

With no restriction on the width of the footpath a wider 5m wide combined Footway/Cycleway is proposed at this location as this is likely to be a place where people congregate to sit and enjoy the view and surroundings. By increasing the width at this location all users can be accommodated and the likelihood of conflict between users is reduced.

To the east of Pilot Pier three solutions were investigated. (See plan and image below)

The blue line located the wall on the existing sea wall. As discussed previously this would require a higher wall and would cut members of the public off from the river. The green line provided a wall far enough back to be a lower height however it split the area creating an unusable space on the river side of the wall. The red line is the solution proposed as this is the lowest height of wall and provides a usable space behind the wall encompassing the grass area and pier.

Please refer to appendix 1 for a copy of the proposed General Arrangement design drawing for Section 2.



Section 2 – Pilot Pier

Section 3 – Beach Crescent

(Refer to Appendix A for Section 3 General Arrangement Drawing)



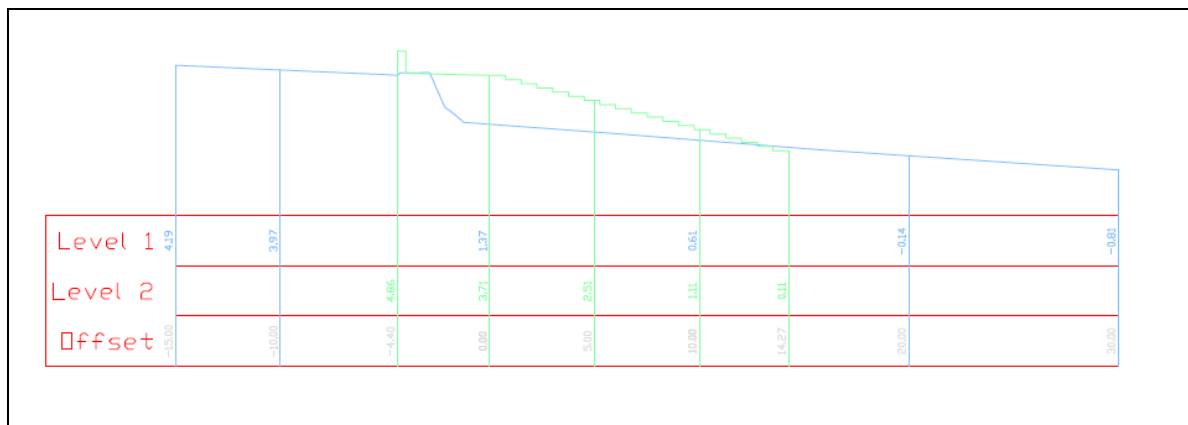
Photo 16 – Beach Crescent



Photo 17 – Beach Crescent

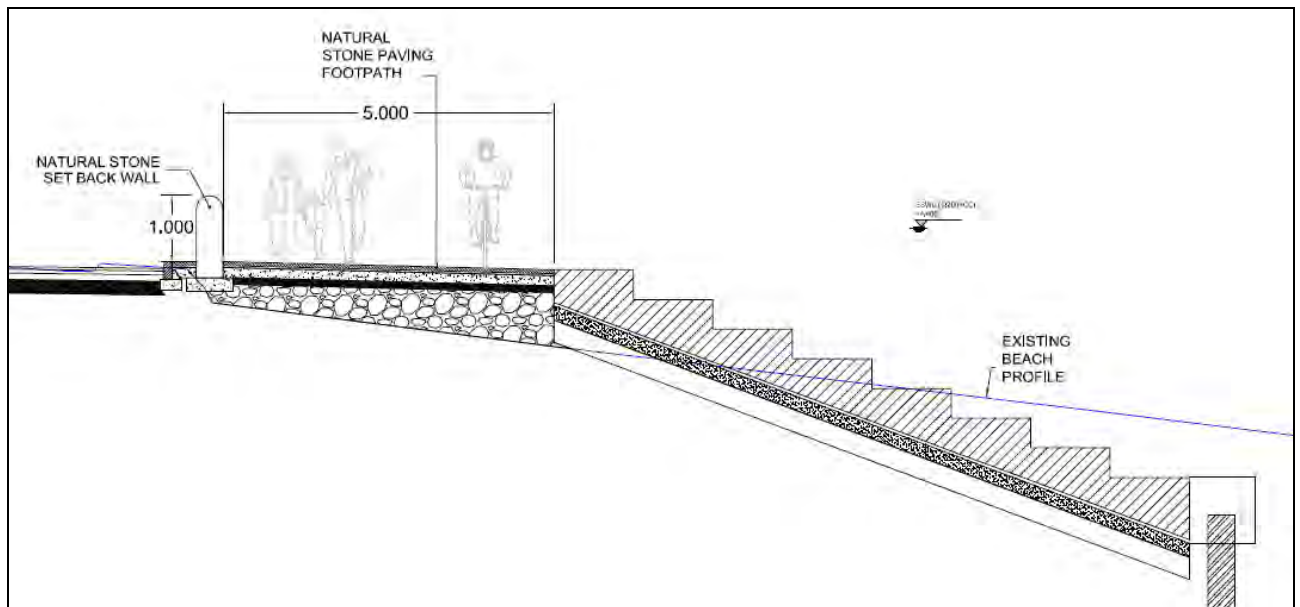
Beach Crescent is the area most used by the public. The section is close to the park, sand beach, and castle, providing a large amount of parking for these attractions and retail shopping. The existing narrow footpath and unprotected large drop is a barrier to access for all users. The shingle beach is not heavily used, however during summer months the benches are full with people taking in the views.

The proposals for beach Crescent present an opportunity to incorporate features that will improve the safety and attractiveness of the area encouraging public use and enjoyment. Seating space with access to the beach was identified as key to providing a solution in this area. Like Section 2, a 5m wide footpath was designed to allow sufficient space for all potential public uses. The investigation of other flood protection solutions around the UK had identified a stepped revetment as a means of improving the overall effectiveness of the flood protection by reducing the energy in approaching waves but which also had the added advantage of allowing access to the beach at any point along the frontage.



Section 3 - Design Option 1

An option appraisal regarding the width and height of the revetment terraces (See Section 3 Design Option 1) concluded that in general a 1.2 metre wide horizontal width with a 0.45 metre step maximised longitudinal access and the opportunities for seating (See Section 3 Proposed Design Option). Additional steps would however be required at individual locations to provide easier access between the walkway and beach.



Section 3 – Proposed Design Option

A similar solution has been successfully completed in Margate in Kent, England. . (see **Photo 18 Margate Kings Steps**) where the larger steps allow users to walk along safely but are high enough to comfortably sit on.

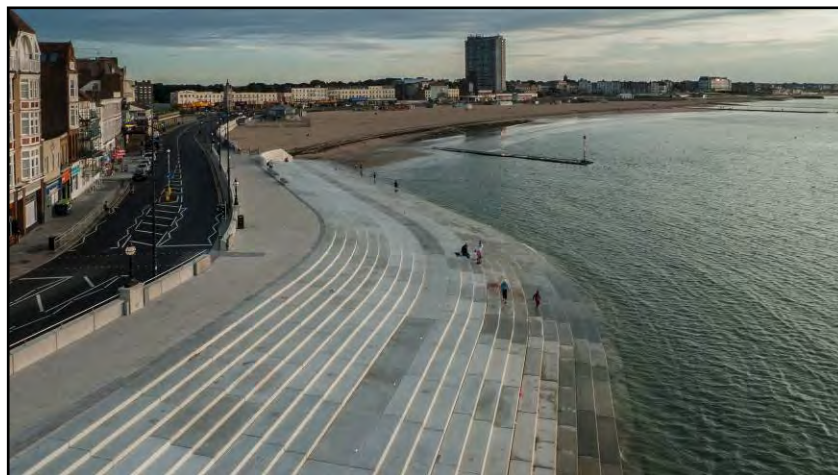


Photo 18 - Margate, Kings Steps

Throughout the consultation with residents of Broughty Ferry, lack of car parking has been raised as a major concern. Although the positioning of the proposed set back wall and the required 5.0 metre footway offset to the crest of the stepped revetment is primarily to provide flood protection, the design team have considered car parking as the project developed. Central to the design at Beach Crescent has been the desire to optimise the layout of the land available between the footpath on the north edge of Beach Crescent and the foreshore whilst maintaining existing carriageway widths. This restriction initially led to the loss of up to eight current spaces but following consultation events and feedback from members of the public regarding the importance of parking, the design team undertook further design with the existing carriageway reduced were able to facilitate end on parking for the full length of Beach Crescent resulting in the available parking at Beach Crescent being increased by approximately 20 official spaces.

Please refer to appendix A for a copy of the proposed General Arrangement design drawing for Section 3.

4 Environment

The potential environmental effects of the proposals and required mitigation measures have been considered throughout the development of the proposals. The location of the site in close proximity to both the built environment and significant natural resources of local, national and European significance has influenced the development of outline construction sequence for each section of the proposed works.

Mitigation measures which have been identified to be required will be incorporated within the construction contract as will the requirement for the contractor to prepare and implement a Construction Environmental Management Plan (CEMP).

The assessment of the environmental impact included undertaking an EIA screening of the proposals in accordance with statutory regulations on which basis it was determined that the proposals did not require an EIA but did require preparation of a report to inform the appropriate assessment (RIAA) of the potential effects of the proposals on designated nature conservation areas, Refer to RIAA included as Appendix 4 within the Flood Protection Scheme documents.

Consultees have advised that the RIAA is satisfactory and agree with its conclusions which are that the proposed works should not adversely affect the integrity of these sites and that their conservation objectives will continue to be met during and after development.

5 Street Lighting

With the provision of a new footpath/cycleway along the river's edge a requirement to improve the street lighting was required. A feasibility study has been undertaken by KSLD lighting designers on behalf of Dundee City Council to look at potential lighting solutions. Criteria for the design were to provide adequate lighting for both road and footway, ensuring that there were no dark areas behind the new setback wall. Also a lamppost design to enhance the area.

It is proposed to rationalise the existing lighting and replacing columns where necessary. Lighting of the flood gates, with light columns on the gate piers will identify access points. The listed lighting columns in Beach Crescent are to be retained and the potential for refurbishing the historical columns on Pilot Pier is being investigated. LED lighting is proposed to reduce energy consumption and light pollution. Figures 2, 3, 4 are some of the design concepts that were proposed.



Figure 2



Figure 3

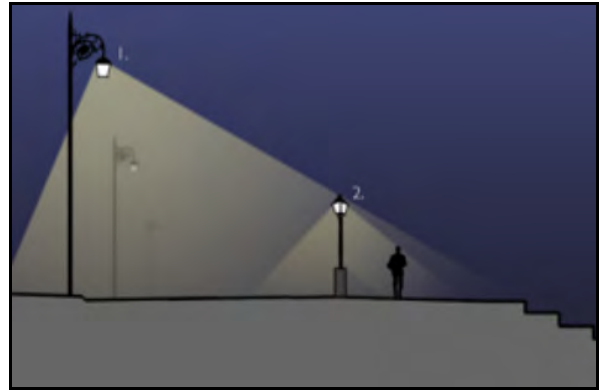


Figure 4

6 Drainage Design Statement

The overall drainage strategy for Broughty Ferry is to collect surface and foul water within the town and connect into the adopted Scottish Water pipe systems (Hatton Main). The majority of the Surface water is collected in combined sewers and directed towards the coast discharging into a combined Scottish Water culvert and pipe network. Surface water West of Fort Street is collected in a large culvert that runs the length of the beach at Douglas Terrace/James Place. The culvert then discharges into a pumping station at the far western periphery of Douglas Terrace and into the Hatton Rising Main, this main runs along the beach parallel with the combined culvert, up Fort Street and through Broughty Ferry Town to the Esplanade and eventually onto Hatton sewage treatment works near Arbroath.

Surface water to the east of Fort Street is transported in a combined sewer along Fisher Street and Beach Crescent terminating at the Windmill car park pumping station, where it is injected into the Hatton Rising Main. Since the construction of the Hatton Sewer main there are relatively few surface water outfalls that directly discharge into the Tay Estuary. This is limited to a few road drainage gullies and car park drainage from a house development. These will be picked up by the new proposed road and pavement drainage system.

Surface Water Drainage Provision for the Broughty Ferry Flood Protection Scheme:-

In order to drain both overtopping water and surface water the walkway will slope towards the Tay, Surface water flows from the adjacent carriageway surface will be collected in new road gullies and then into a new pipe network which will be constructed within the proposed walkway. Each pipe has been oversized to allow storage of a 200 year return period storm with an additional 30% for climate change during high tide, when no outflow is possible. Once the tide recedes the stored surface water will then outfall into the Tay Estuary. The outfall pipe will be fitted with a non-return valve, and manholes fitted with sealed covers, to ensure no tidal water can enter the surface water system. It is proposed to connect all remaining surface water outfalls into the new drainage system

The new drainage system will work independently of the existing drainage. It is envisaged that the proposed Flood Protection works will have no effect on how the existing drainage system operates. During heavy rainfall events the current system will continue to operate using storage within the pumping stations and culvert to store water until the pumps clear the excess water.

6. Conservation Statement

This statement has been written in conjunction with Dundee City Council's Planning Service.

Broughty Ferry is within a Conservation area and therefore the designers have been aware that the final design shall be required to enhance the unique character and appearance of the area. As the proposed scheme will present a visual change on the area it has been important to identify where the design can be developed to help the final works complement the aesthetics of the area.

The main visual feature of the proposed works is the setback wall. This wall runs the whole of the scheme and helps to provide the flood protection solution. The material proposed is a local sandstone, quarried at Denfind Quarry, Monikie. This material was selected to match the stone that was used in the area to build a large percentage of the buildings in Broughty Ferry. This stone also matches sections of the existing sea wall. See photo 19-20 below.



Photo 19



Photo 20

Photo 17 shows the sample wall provided for public comment during the public exhibitions. Through these exhibitions public opinion was to go for a rounded hammer finished cope that matches a large percentage of the walls in the area.

Any carriageway setts that are to be removed will be incorporated to the design of the project where possible. Those that cannot be will be recycled and reused elsewhere in Dundee.

It is the intention of the scheme to upgrade and replace the existing concrete kerbs where possible. Where Whinstone kerbs are present within the area these will be retained.

The area contains a number of benches that vary significantly in terms of appearance and materials. The scheme intends to replace and standardise these retaining the memorial plaques where currently present.

It is proposed to use natural stone paving for the new promenade at Beach Crescent and Fisher Street (East of the Lifeboat House) the colour of this is to match other slabbing in the area (Brook Street).

It is proposed to upgrade the street lighting as part of the scheme. New columns will be in keeping with the look of the area when adjacent to the listed historic columns which will be retained as part of the scheme.

The decorative boat planter located on the grass beach at Fisher Street will be protected during the works and be retained within the final design.

5.1 Listed Structures

There are several listed structures within the scope of the works. Please find the list below.

Listed Structure	Scheme Effect on Structure
Lifeboat House, Fisher Street (Historic Scotland Ref 25805)	The proposed flood protection scheme wall will be built up to either side of the Lifeboat house. The wall will be independent of the buildings and will have no direct impact on the structure of the building.
Pilot Quay and Pier, Fisher Street (Historic Scotland Ref 25806)	The proposed setback wall will be constructed over the north side of the pier. All existing surfaced setts will be reinstated. Some bollards may be temporarily removed to facilitate works but will be reinstated.
K6 Telephone Box, Beach Crescent (Historic Scotland Ref 25732)	The Telephone box is to be retained but will be repositioned in close proximity to its existing location. Dundee City Council will apply for approval through the appropriate channels to do this.
Lamp Standard, Beach Crescent (Historic Scotland Ref 25764)	One lamp standard is to be repositioned in close proximity to its existing location. Dundee City Council will apply for approval through the appropriate channels to do this.
The Castle Harbour (Historic Scotland Ref 25732)	The proposed setback wall will be constructed over the north side of the pier. The removal of a section of wall is required to facilitate the works Dundee City Council will apply for approval through the appropriate channels to do this.

5.2 Conclusion to Conservation Statement

Overall the proposed flood protection scheme design is viewed positively as having the potential to transform the existing poor public access and amenity of the area. The use of natural stone in the wall and footpaths that match the surrounding buildings and walls is in keeping with the appearance and character of the surrounding buildings.

Steps to protect the historically important structures in the area are being progressed in consultation with the appropriate authorities and the works have been designed to minimise impact on them. The reuse of natural materials arising from the site will help to enhance the project and should be considered where possible. The proposed flood protection scheme shall build on the unique character and appearance of the Brought Ferry Conservation Area, enhancing the historic environment through improving access and using high quality materials.

7 Community Feedback

As part of the Public Engagement plan for the Broughty Ferry Flood Protection scheme, a public exhibition and presentation to the local community council were undertaken on 1 June 2016 and 9 June 2016, respectively. This was the first public engagement regarding the proposed Broughty Ferry Flood Protection scheme. The purposes of these events were to outline the need and aims of the project, to discuss the solutions considered and the reasoning behind the initial design. Engineers at the events discussed with interested parties the design, why it was required and why the proposed design was selected. A computer generated fly through of the project was presented to the public to help visualise the impact that it would have on shoreline. Both events were well attended and with over 200 people attending over the two events.

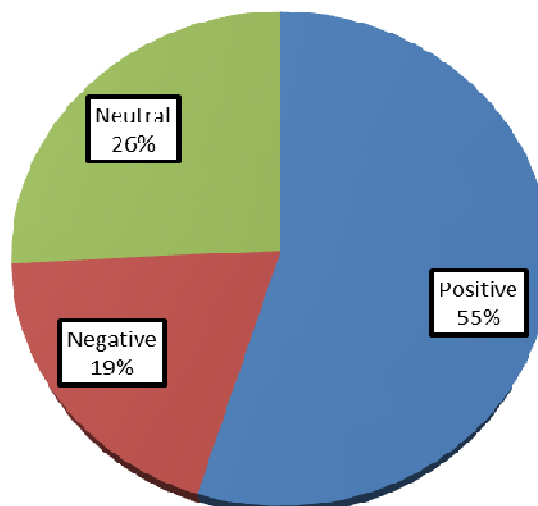
At these events feedback forms were provided and attendees were encouraged to complete these, detailing what they thought of the initial design and if they had any concerns or positive feedback about the project. The drawings and fly through were left as a blank canvas of colour to try and invoke discussion on finishes and what people would like to see. Feedback forms were also delivered with letters to the properties directly adjacent to the shoreline with the option of returning them or emailing the engineers directly. Each individual correspondence has been replied to by the addressed engineer.

The purpose of this report is to summarise the feedback and try to determine public opinion of the project and inform the design of any changes that should be considered.

Summary of Results

In total we have had 33no pieces of individual feedback from stakeholders. These have been classified as Positive, Neutral and Negative. Neutral comments have been classified as comments that ask questions or raise items to be considered within the project but do not give a clear positive or negative opinion.

General Opinion



It should be noted that through discussions with the engineers present on the day of the event, although not formally recorded, the general feedback from members of the public was positive.

Detailed Analysis

The items below are a summary taken from the letters and emails received by project engineers up to the end of November 2017.

Summary of Positive Feedback

- Impressed with quality of Drawings and Information of show.
- Well done for forward planning and trying to avert the situation before it causes a problem.
- The proposal seems to be a satisfactory solution if done properly
- The Project looks very well thought out and attractive and I would have no objection to it going ahead as planned.
- Scheme has my approval. Also pleased with the improved facilities, included in the project, for pedestrians and cyclists.
- The proposals seem generally well thought through and hopefully will address serious concerns re flooding in the Ferry
- We welcome the retention of multiple accesses to the beaches and in particular the widening of the footway along Douglas Terrace.
- The aim is admirable. As we discussed at the exhibition, it is also an opportunity to enhance the built environment
- The option you are looking to explore further I feel would only enhance the front of Broughty Ferry.
- This is a one-time opportunity for regeneration and upgrade of this area of great historical value
- Great Design
- A detailed presentation - the computer fly through really helped visualise the scheme A good overall scheme, as long as the environmental and historical/architectural aspects are maintained (where possible)
- I'm in favour of the flood defences and improvements to the pedestrian/cycleway through Broughty Ferry. If there are any temporary restrictions on sailing access we will live with them.
- I believe the proposed works look good and may enhance the look of the streets. I particularly like the wider joint walkway/cycling path along Douglas Terrace/James Place, as long as we can still easily access the beach from where the steps are now
- I was impressed by the quality and breadth of charts and plans that you and your colleagues were able to mount for the initial consultation about the coastal protection measures for Broughty Ferry
- I intimated on my feedback form that I approve of the 1 metre wall that is going to be built as flood protection,
- The approach is sympathetic to the whole area and provides overall improvement to the environment

Summary of Negative Feedback

- 4-5m wide footpath is too wide. Cyclists and Pedestrians should not be mixed as is dangerous
- Major Changes appear to be between Fort St (Life boat shed) and Broughty Castle are the steps really necessary? Surely a walkway is enough.
- I am against this scheme, as I have lived here most of my life and have never seen any sign of flooding. Please leave Broughty Ferry as it is.
- I bought my flat in Fisher Street because of the unspoilt and stunning views. I don't want to look out on miles of concrete. The proposals would totally destroy everything that is lovely about Broughty Ferry.
- I strongly object to certain aspects of the above proposal. I live at the west end of Douglas Terrace and our area has never been flooded nor is likely to be
- Concerns that introducing a wall will encourage antisocial behaviour.
- Your project radically changes the sea front of Broughty ferry. Your proposals are not sympathetic to the environment or feel of Broughty Ferry
- There is no flooding issue in Broughty ferry and this project is not required.
- The disruption to traffic, parking and noise in a very quiet area which I appreciate so much living in Fisher Street will go on endlessly for months and months and months.
- This scheme is unnecessary and will destroy the unique beauty of Broughty Ferry.
- Destruction of wild life especially wild birds. The huge variety of species of sea birds that now feed on the beach will disappear as they will not find food on a concrete beach and they will be scared away by the noise and upheaval.

General Comments

The following are comments expressed through the feedback process. They are not deemed positive or negative and are an opinion of the writer. They are only something that stakeholders would like to be considered through the design process.

- Drawings and information to be made available online for further public consultation. Residents to be kept up to date with regular updates as project develop. (These comments were replicated by a number of correspondence)
- Can proposals take into account coastal erosion between Grassy Beach and Stannergate.
- How would access be made to the path and beach - are steps integrated into this wall defence.
- One concern is over animal conservation, can there be sufficient breaks in the wall so that animals may escape to the beach when frightened by traffic.

- At present the pavement at Douglas Terrace is underused and most people use the opposite one. Once they are protected by the wall and the railing it will become more popular with pedestrians and cyclists (These comments were replicated by a number of correspondence)
- The speed of commuter cyclists is too high and can be dangerous can width of pavement be reduced or traffic calming measures put in place to reduce speed. The road is perfectly adequate for cyclists as it is quiet.
- Constructed with suitable materials & build quality which will have a long lifespan and not require regular repairs which will cost more money & time in the future (which will look awful) - not a short-term fix with long-term problems.
- Adequate drainage from Road
- Strengthen existing road at Douglas Terrace which now takes numerous heavy vehicles that access Hatton Rising main on regular basis
- Enough Dog/Rubbish bins
- Regular cleaning of walkway and steps
- Can assurances be given with regards works and vibrations causing damage to properties
- Crucial in our view will be the choice of materials used in walls, railings and steps. Natural materials such as stone walls would be most appropriate in sympathy with the predominant materials for buildings in the Ferry and the conservation area status.
- Use of sandstone finishes for the walls and metal railings of a design that reflects the "areas" Georgian and Victorian history would help with this. As long as the right stone and paving slabs are used then the majority would be happy. (These comments were replicated by a number of correspondence)
- How much Beach is going to be lost?
- Can something be done about wooden hut at the end of the lifeboat pier that blights the view.
- Openings & position need to be carefully considered Integrated gates would be desirable to avoid vandalism, etc
- Traffic flow should become part of the consideration (one way?)
- Can street lighting upgrade be considered as part of the project
- If you must build a wall, then it need not come all the way along to end of Douglas Terrace
- How can parking be improved for both residents and visitors.
- I have reservations as to the width of the cycle path/walkway that is to be built behind the wall.
- Can the footpath level remain as it is to avoid people look down into the adjacent houses.

- As part of the dune replenishment please ensure current ecosystem and bio diversity is not negatively affected.
- Protect as much of the existing dunes as possible while replenishing the sections that are required.
- Can access to drives and households be maintained during works

The above design considerations are to be considered by the design team and look to be addressed as part of the project.

Summary

The project was generally well received by the public. The look and finish will be vital in the success and acceptance of the project. Negative opinions may well be changed if the project can be delivered to high quality standards and sympathetic to the unique setting of the area. Cycling and the interface between pedestrians and road users is a concern of many, ways to reduce speed or the perceived speed should be considered. Accessibility to beach, the environment, cleaning and lighting should all be carefully considered. Although not reflected fully in the recorded feedback, car parking and vehicle movements were mentioned verbally as being a wider issue in Broughty Ferry.

The table below presents a summary of the main issues identified through the community engagement and briefly outlines how the design team have tried to address them in developing the current proposals:

	Summarised Comments from Public	Designers Action
1	Minimise noise and vibration during works	Investigated the location and minimised the required length of driven piles at Douglas terrace and reviewed alternative methods of piling that reduce noise and vibration for inclusion in DRAFT Construction Environmental Management Plan (CEMP) to be included within contract conditions.
2	Maintain Access to Beach for walking etc	Gates and steps located at established desire locations / regular intervals along the scheme to maintain access.
3	Crucial in our view will be the choice of materials used in walls, railings and steps. Natural materials such as stone walls would be most appropriate in sympathy with the predominant materials for buildings in the Ferry and the conservation area status. Don't want to look at a concrete structure	Investigated the use of modular concrete block for river wall which although concrete is shaped and coloured to look like stone. Selected locally sourced natural stone material for setback wall in keeping with the aesthetics of the surrounding buildings. Proposing to use natural stone paving for the footpath in Beach Crescent and Fisher Street.
4	Lifeboat Parking	Changed the design to incorporate more spaces in the lifeboat Carpark. This not only helps the Lifeboat station but eases vehicle congestion in the vicinity during emergency call outs.
5	Worries over conflict between cyclists and Pedestrians	Set footpath width at 5m wide where possible. This will allow maximum space for both pedestrians and cyclists to navigate the area safely.

6	Are the steps required a fisher street as this is not in keeping with area.	Revetment proposal replaced with vertical wall.
7	Wall will encourage anti-social behaviour	Height of set back wall minimised while maintaining the required flood protection level. Street Lighting is to be improved to remove any dark areas that might encourage groups to linger. Consulted with police who indicated that patrols can be increased if required.
8	Car parking issues including cars blocking street James Place / Fisher Street	Double yellow lines are to be installed on the river side of the road west of the Lifeboat house. This will allow two cars to pass and prevent occasions where emergency service vehicles have not been able to pass.
9	Car parking issues Beach Crescent	Road and parking layout altered to incorporate more end on parking which increases available parking spaces by approximately 20.
10	'Proposals are not sympathetic to the environment or feel of Broughty Ferry'. And 'Destruction of wild life especially wild birds. The huge variety of species of sea birds that now feed on the beach will disappear as they will not find food on a concrete beach and they will be scared away by the noise and upheaval'	<p>There will be construction effects but the methods have been developed to ensure that they will be short term and reversible. The construction contract will require strict adherence to an agreed Construction Environment Management Plan.</p> <p>The proposals have attempted to respect and consider the look and feel of Broughty Ferry throughout the design process. Providing adequate flood protection measures is however not possible without introducing some change to the river edge. By using Natural products and enhancing the footway in a manner which could improve connection with the river and a potential asset for the community it is hoped that the positives outweigh the negatives.</p> <p>The effects on the existing wildlife and the quality interests of the adjacent designated wildlife sites in particular have been assessed and presented in a Report to Inform an Appropriate Assessment. See Appendix 4</p>
11	Can proposals take into account coastal erosion between Grassy Beach and Stannergate	A solution has been proposed for this location to prevent further Coastal Erosion
12	The speed of commuter cyclists is too high and can be dangerous can width of pavement be reduced or traffic calming measures put in place to reduce speed	Consultation has taken place with cycling organisations to help identify solutions in slowing cyclists down. There are various solutions from localised narrowing the footpath using street furniture to putting in cycling chicanes. Measures will be put in place where speeds are likely to be increased. For Commuting cyclists who wish to travel at speed the road will still be available for use.
13	Constructed with suitable materials & build quality which will have a long lifespan and not require regular repairs which will cost more money & time in the future	It is proposed to use concrete products where erosion from the river and beach will occur. This is the best and most cost effective solution in resisting this type of erosion.
14	Strengthen existing road at Douglas Terrace which now takes numerous heavy vehicles that access Hatton Rising main on regular basis	The scheme will upgrade the roads and footpaths in the area.

References

Flood Risk Management (Scotland) Act 2009 -
<http://www.gov.scot/Topics/Environment/Water/Flooding/FRMAct>

SEPA Local Flood Risk Management Strategy -
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Tay Estuary and Montrose Basin Flood Risk Management Plan
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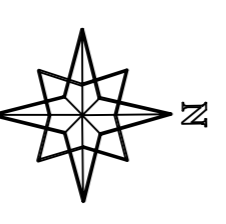
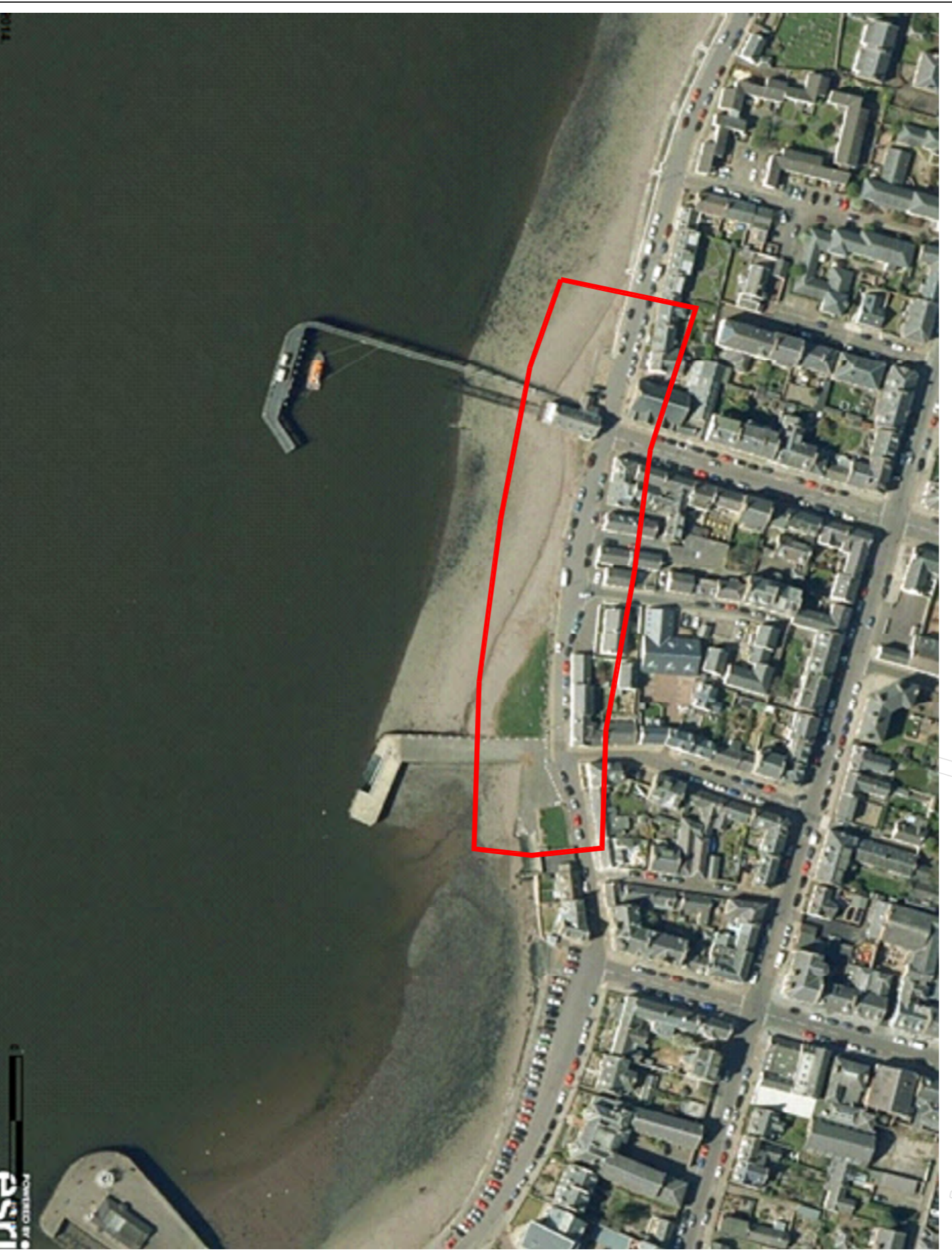
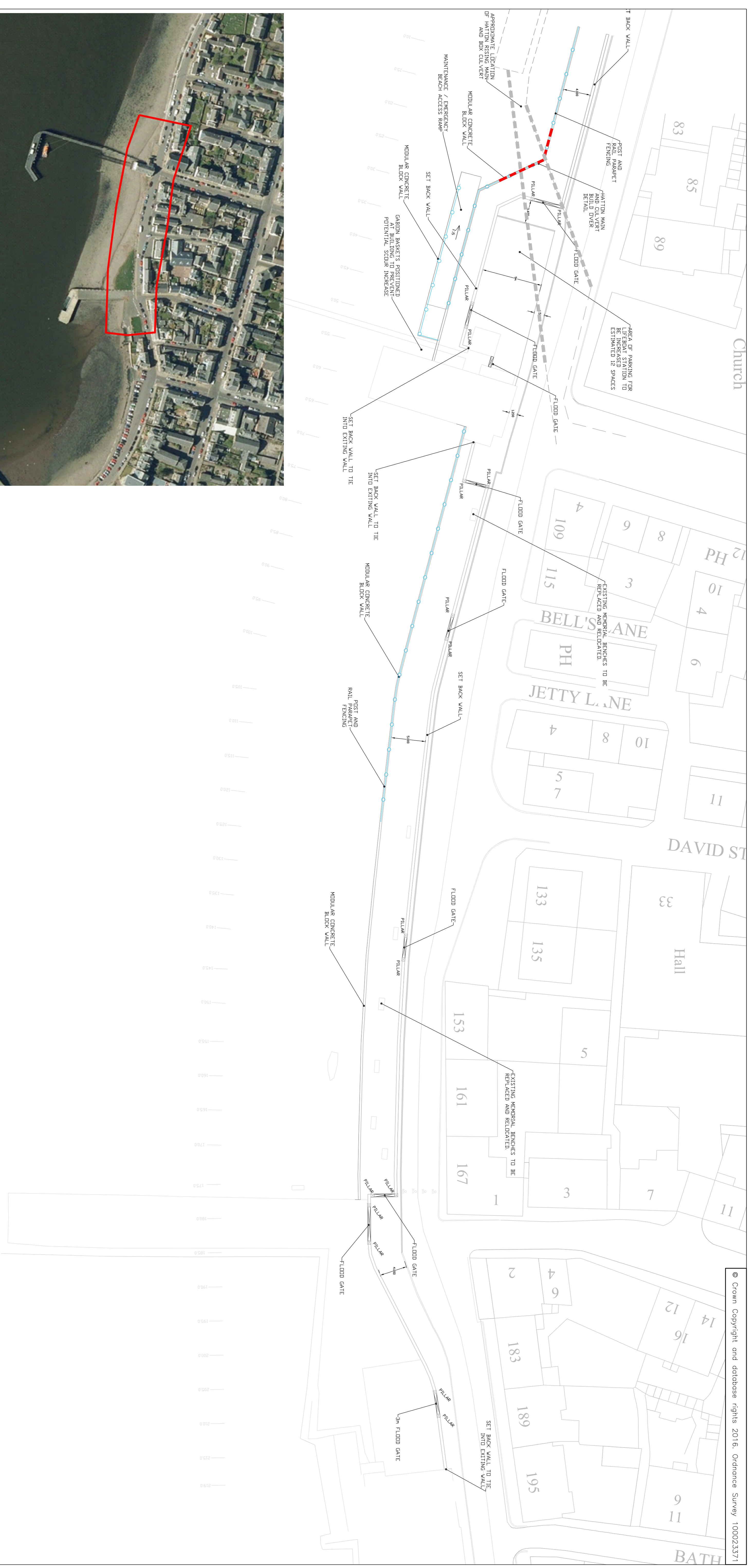
Mott MacDonald - Dundee Coastal Study Stage 1 and Stage 2 Study – 2013

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MacLeod Consulting (UK) Ltd, ECOS Countryside Service LLP – Report to Inform Appropriate Assessment – February 2018

Appendix A - Proposed Design General Arrangement Drawings



Drawn	MS	Checked	GS	Dwg.Nr.	15700/200/0	Scale	NTS @A1	Date	01.11.16
Project	BROUGHTRY FERRY FLOOD PREVENTION								
Drawing Title	SECTION 2 – GENERAL DESIGN DETAILS								

[A1]

Revision	Details	Date	Revised	Checked



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Drawn	MS	Checked	GS	Dwg.Nr.	15700/300/0	Scale	NTS @A1	Date	01.11.16
Project	BROUGHTY FERRY FLOOD PREVENTION								
Drawing Title	SECTION 3 - GENERAL DESIGN DETAILS								

(A1)

Revision	Details	Date	Revised	Checked



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