Area 1: Alignment and Flood Defence Options South of Cake Pill

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1.0 Introduction

Feedback received from local residents during the public engagement activities in July and August 2017 expressed concerns about the location and nature of the flood defences south of Cake Pill as shown on the available information.

The draft design for the flood defences, as presented to the public, indicates a raising of the existing grass covered earthwork flood defence embankment between Cake Pill and New Passage by 1.4m to a maximum of 2.5m above surrounding ground levels. There is also a secondary proposal to relocate the flood defence embankment adjacent to Cake Pill to the eastern boundary of the grazing marsh to create approximately 1 hectare of improved salt marsh habitat. Further work is being undertaken within the Environment Agency, Bristol City Council and South Gloucestershire Council to confirm the required defence levels. The raising of embankments requires a widening of the existing embankment footprint to accommodate the higher embankment, including earthwork slopes, crest, drainage ditch and a maintenance access route. The alignment is constrained between the internationally designated salt marsh to the west and a former waste disposal site to the east. The boundary of the existing waste disposal site, which has been reinstated as a group of hay fields, is formed by a hedge that incorporates approximately 500 poplar trees. The land-take of the currently proposed flood defence alignment requires removal of the hedge and trees, but allows for replanting with native shrub and tree species next to the proposed flood defences to offset the losses.

The location of the affected hedge and trees is indicated on Figure 1 below. Figure 2 shows a photograph of the trees viewed from the north, close to Cake Pill drainage outfall. Figure 3 shows an aerial photograph of the hedge and trees overlaid with a graphical representation of the ground levels derived from the Environment Agency's LIDAR ground model.

Residents and users of the Severn Way footpath, which runs along the existing defence embankment, have requested that the project considers alternative options to seek to avoid removal of the hedge and trees. This report considers the technical options that are available.

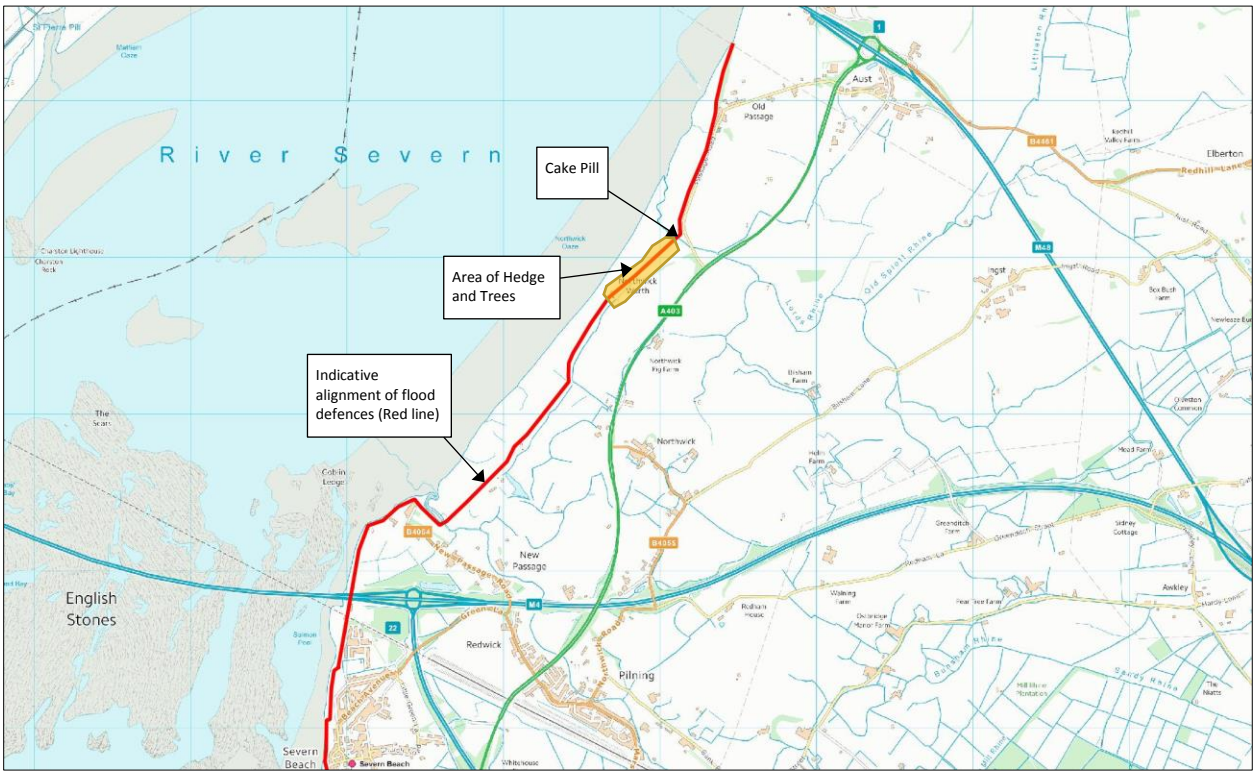

Figure 1 – Location Plan

Figure 2 – Photo of the Poplar Trees from Cake Pill

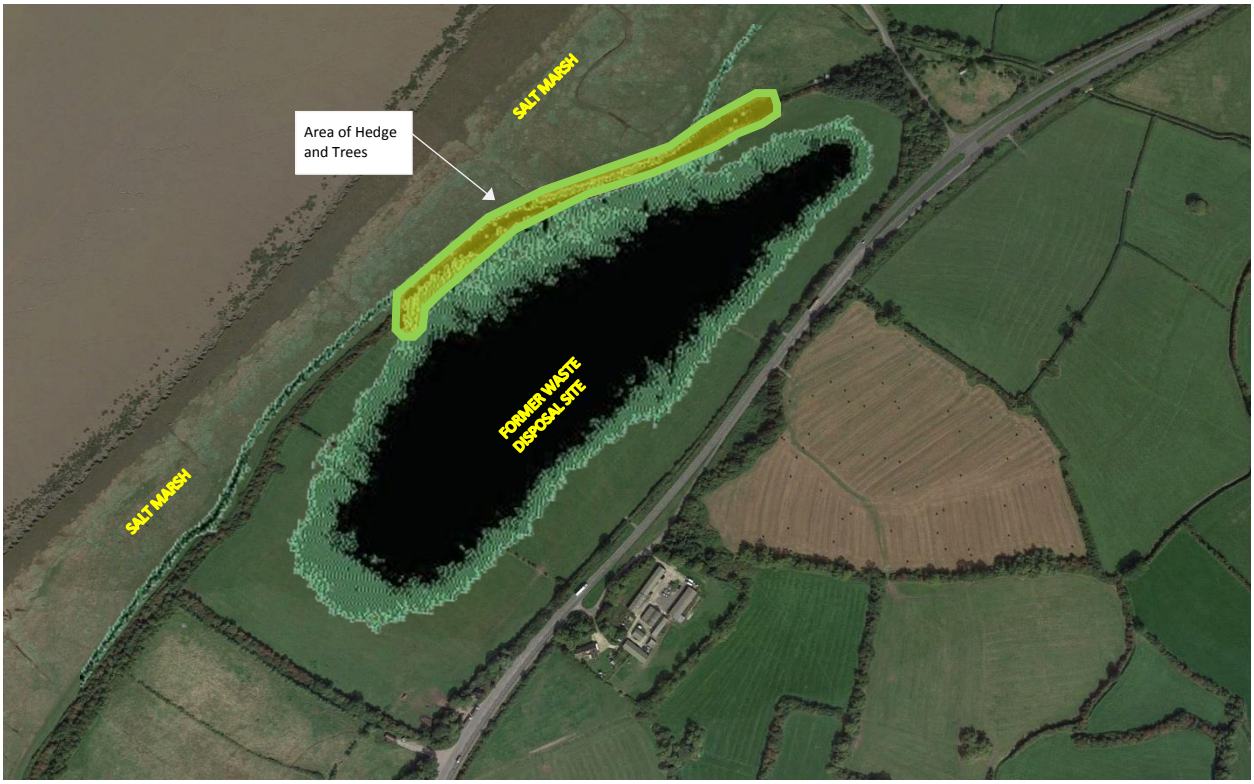

Figure 3 – Aerial Photo with Ground Level Overlay (Dark colour represents high ground in the former waste disposal site)

2.0 Current Proposal

The scheme design has sought to minimise impacts on the environment and to maximize the chances of obtaining necessary planning and environmental consents by avoiding the internationally designated Severn Estuary Special Protected Area and the registered historic waste disposal site.

Natural England have confirmed the boundary of the SPA as including the salt marsh and the seaward face of the existing flood defence embankment. Within the context of adjacent reaches of the estuary, the saltmarsh is at its narrowest at this location, and any direct loss of the saltmarsh at this point would mean that is particularly vulnerable to 'coastal squeeze' through rising sea levels in the future.

However the exact location and nature of potentially contaminating material within the waste site is unknown until more detailed records have been obtained from the landowner. Given the current uncertainty in the spatial constraints of this existing feature, the current proposal seeks to minimise environmental risk by following the alignment of the existing flood defences.

In discussion with the local planning authorities, the project designers have considered a variety of defence types with stakeholder groups in the early stages of our investigations. There was a strong preference for using grass covered flood defences embankments rather than visually more imposing walls, particularly in rural areas. The raising of embankments using earth material leads to a consequential widening of the footprint of the defence. Where the new or improved defences are higher, they must occupy more space. With the currently proposed alignment between the SPA and the waste site, this leads to an unavoidable encroachment into space where the current hedgerow and trees are located. The poplars are not of a sub-species that is native to the UK, and these are often planted to screen other features due to their fast-growth rates. Although the trees are considered to be of low ecological value and they have a relatively short estimated life of 60 years, their presence contributes to the bat and bird foraging habitat offered by the hedge and it is acknowledged that the trees provide a visual focus. Therefore, replacement hedge and tree planting is included in the scheme proposals to offset the losses incurred, and these could include tree species that are both native and non-native (such as fast-growing poplars). Furthermore this approach to landscape planting associated with the flood defence scheme could offer ecological improvements by improving species diversity. Figure 4 below shows a plan of the proposed defence embankment and Figure 5 shows a typical cross section.

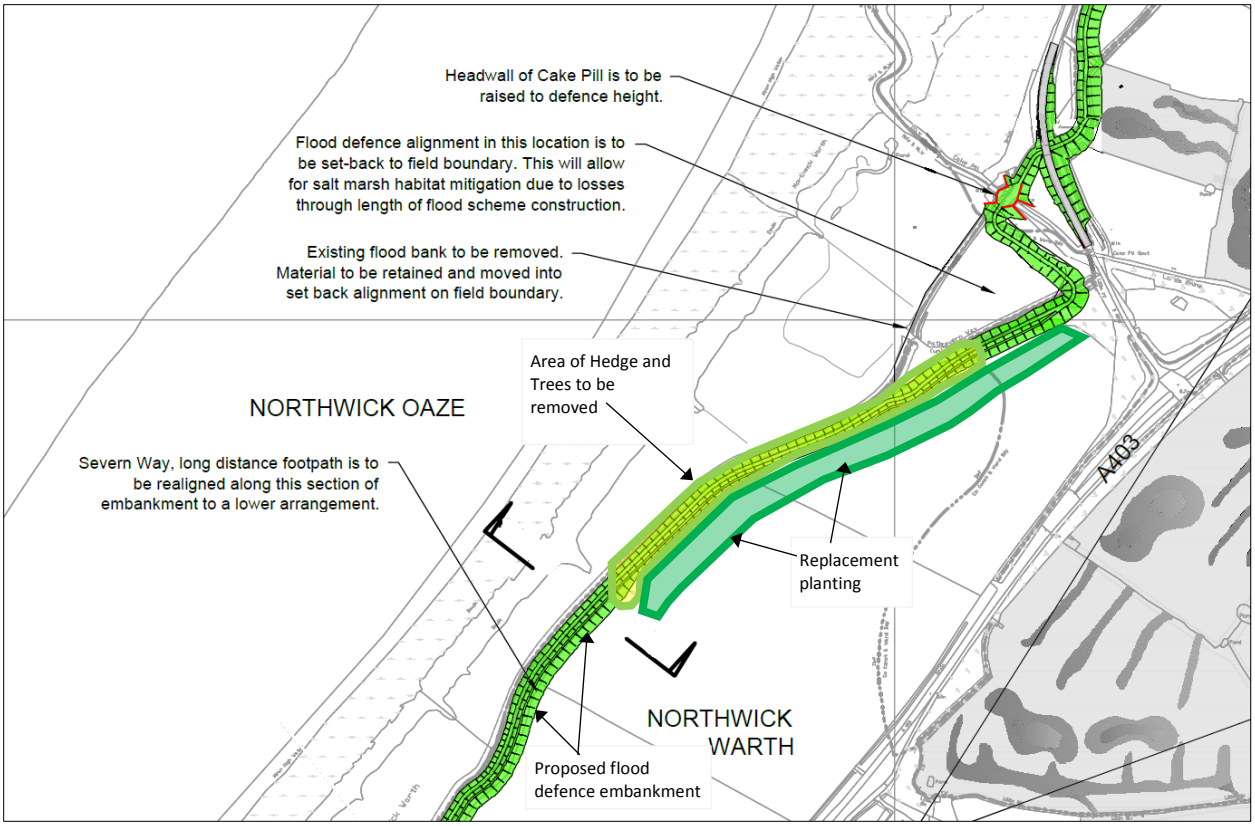

Figure 4 – Plan of Currently Proposed Flood Defence Embankment

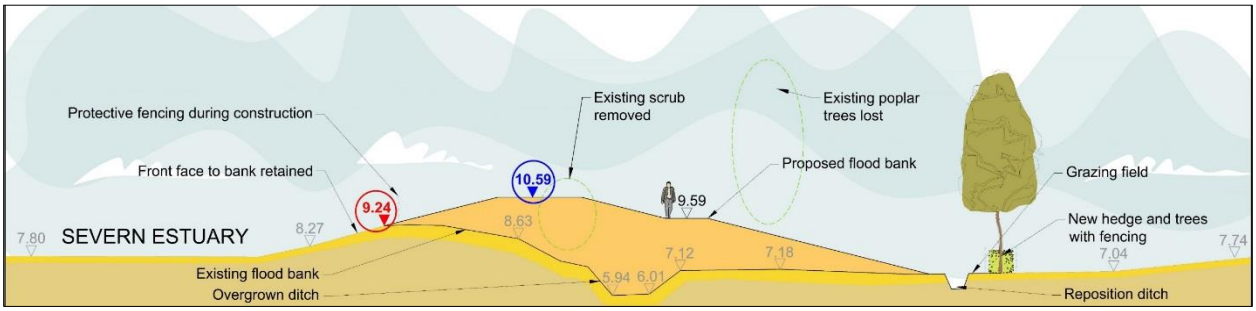

Figure 5 – Typical Cross Section Through Currently Proposed Flood Defence Embankment

3.0 Alternative Option 1 - Realign Flood Defences Seaward of the Trees

This option would realign the proposed flood defence embankment in a north-westerly direction to avoid the trees and hedge. The embankment would be constructed on the seaward side of the existing defences, but to the same height and overall footprint area as the currently proposed option shown in section 2.0. Figure 6 below shows a plan of the proposed defence embankment and Figure 7 shows a typical cross section.

This alignment would cause the flood defence embankment to encroach onto the environmentally designated intertidal marsh, and this would lead to disturbance of protected habitat and a number of protected species of wading birds. The Habitats Regulations demand avoidance of any losses to the existing designated habitat if these could not be reasonably avoided by any other engineering solution. As other engineering solutions do exist that avoid impacting on the protected area, planning permission is unlikely to be achieved for an alignment that encroaches onto the SPA.

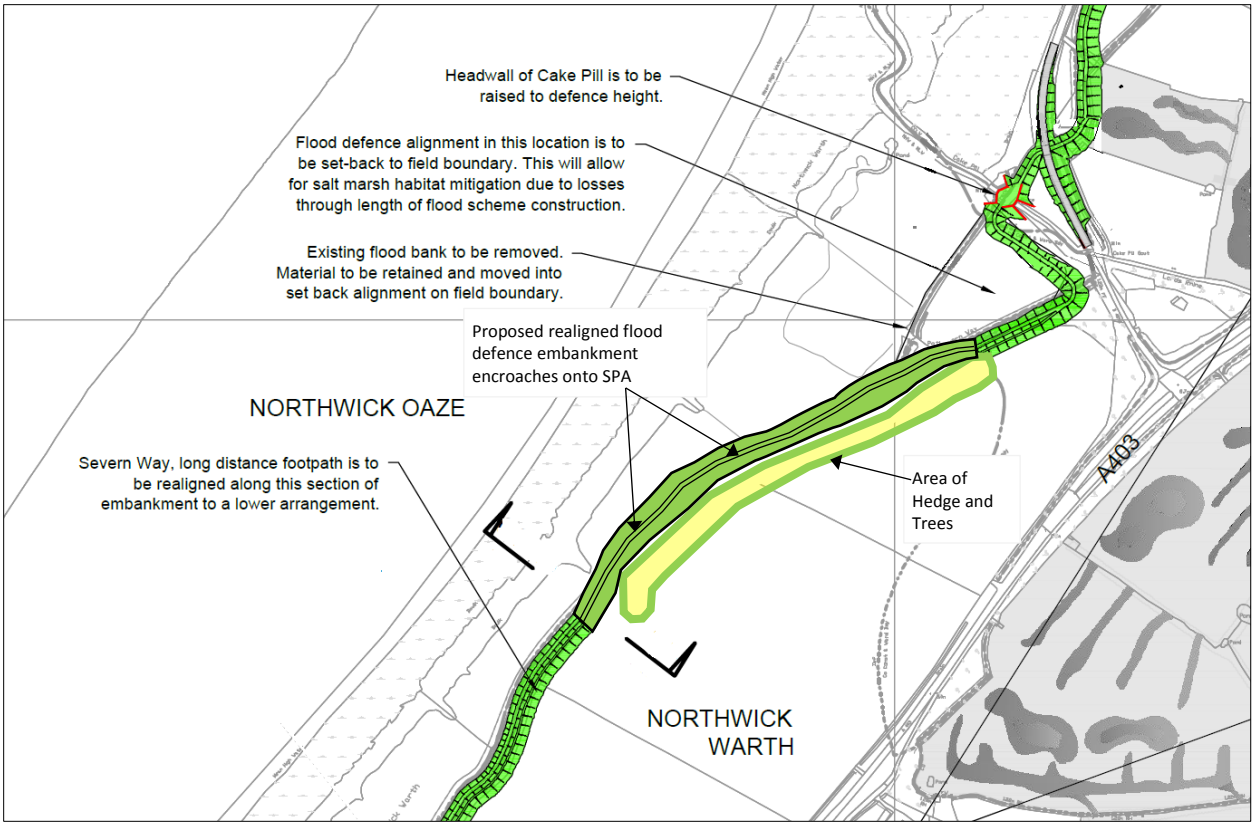

Figure 6 – Plan of Alternative Flood Defence Embankment Encroaching into SPA

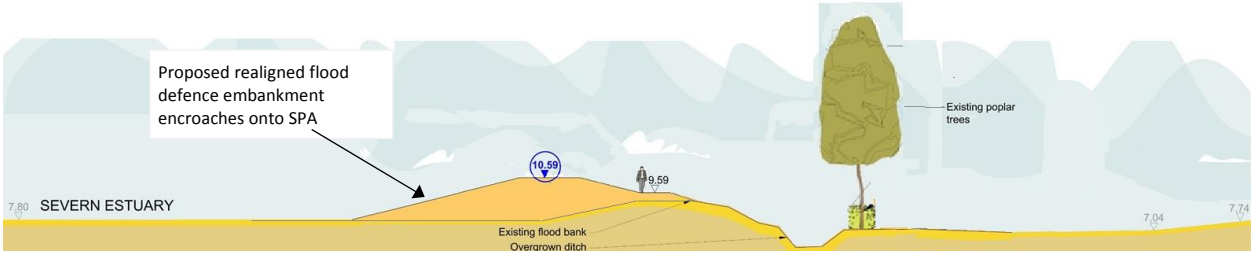

Figure 7 – Typical Cross Section Through Alternative Flood Defence Embankment Encroaching into SPA

4.0 Alternative Option 2 - Realign Flood Defences Landward of the Trees

This option would realign the proposed flood defence embankment in a south-easterly direction to avoid the trees and hedge. The embankment would be constructed on the landward side of the existing defences, but to the same height. Figure 8 below shows a plan of the proposed defence embankment and Figure 9 shows a typical cross section.

This option would encroach into the former waste disposal site, as shown on figure 10. The site was licensed (Reference S/NA/T/22) for use in disposal of "Non-toxic controlled wastes" up to May 1983. Changes in waste licensing legislation since that time mean that many materials now considered to be toxic or unsuitable for landfill may be present, and alignment of flood defences landward of the existing western boundary of the site could present a risk of disturbing contaminants and excavation in the

landfill could cause a risk to the local environment and possibly to nearby residents. We are awaiting information from the landowner about the structure and nature of the land-fill and this will, we hope, include significant ground investigation information. When we receive this information, we will assess the opportunities for working within the land-fill area without disturbing contaminants or risking pollution, and that may lead to opportunities to avoid damaging some of the trees. However, until such information is obtained, the option to construct the bank on top of the waste disposal site presents a risk that the defence would be constructed on an unknown erodible waste material. This risk could only be mitigated by excavating a cut-off trench into the western side of the site and constructing a hard surfacing to encapsulate and protect the waste material, costing an estimated additional £1.1M. In order to achieve planning consent the project must commit to a defence option that does not carry the risk of incursion into a contaminated site.

A further consequence of pursuing the landward alignment is that the trees would be subject to increased salinity as the existing bank degrades and so would die off over time. This would reduce their landscape value and cause safety issues.

A modification to this option would be to tie the flood defences into the raised ground in the centre of the site itself as the flood defence, but this would expose the unprotected waste disposal site to a risk of coastal erosion.

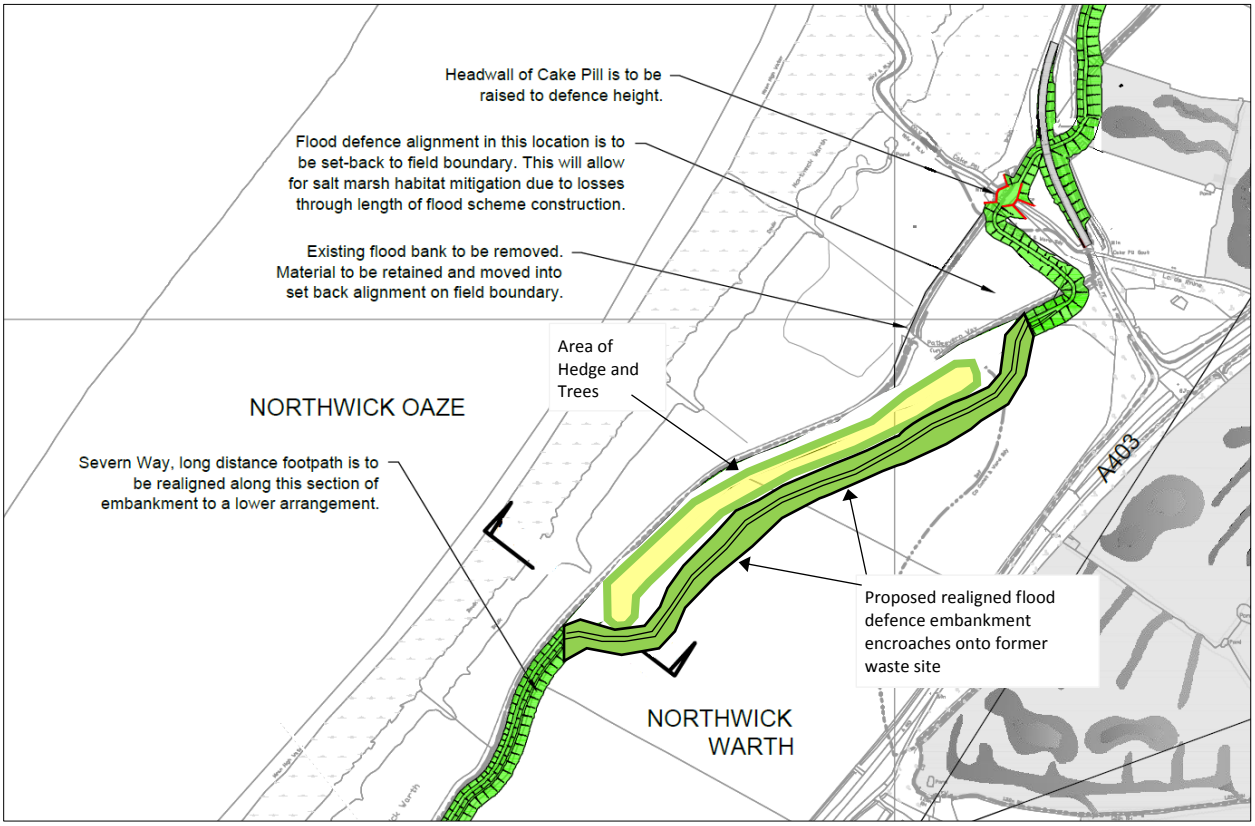

Figure 8 – Plan of Alternative Flood Defence Embankment Encroaching into Former Waste Site

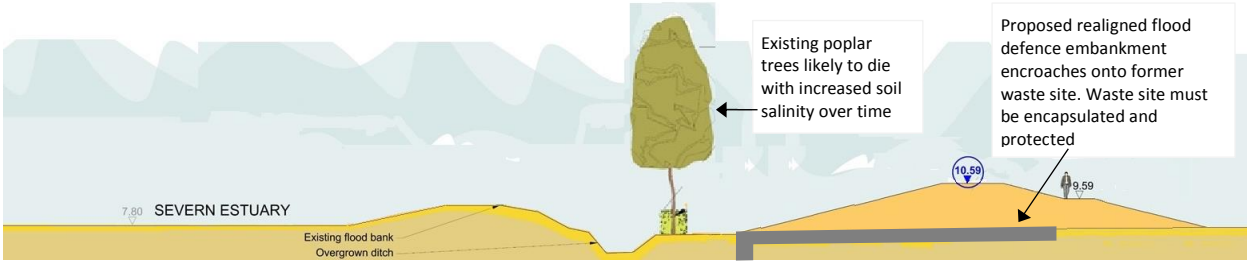

Figure 9 – Typical Cross Section Through Alternative Flood Defence Embankment Encroaching into Former Waste Site

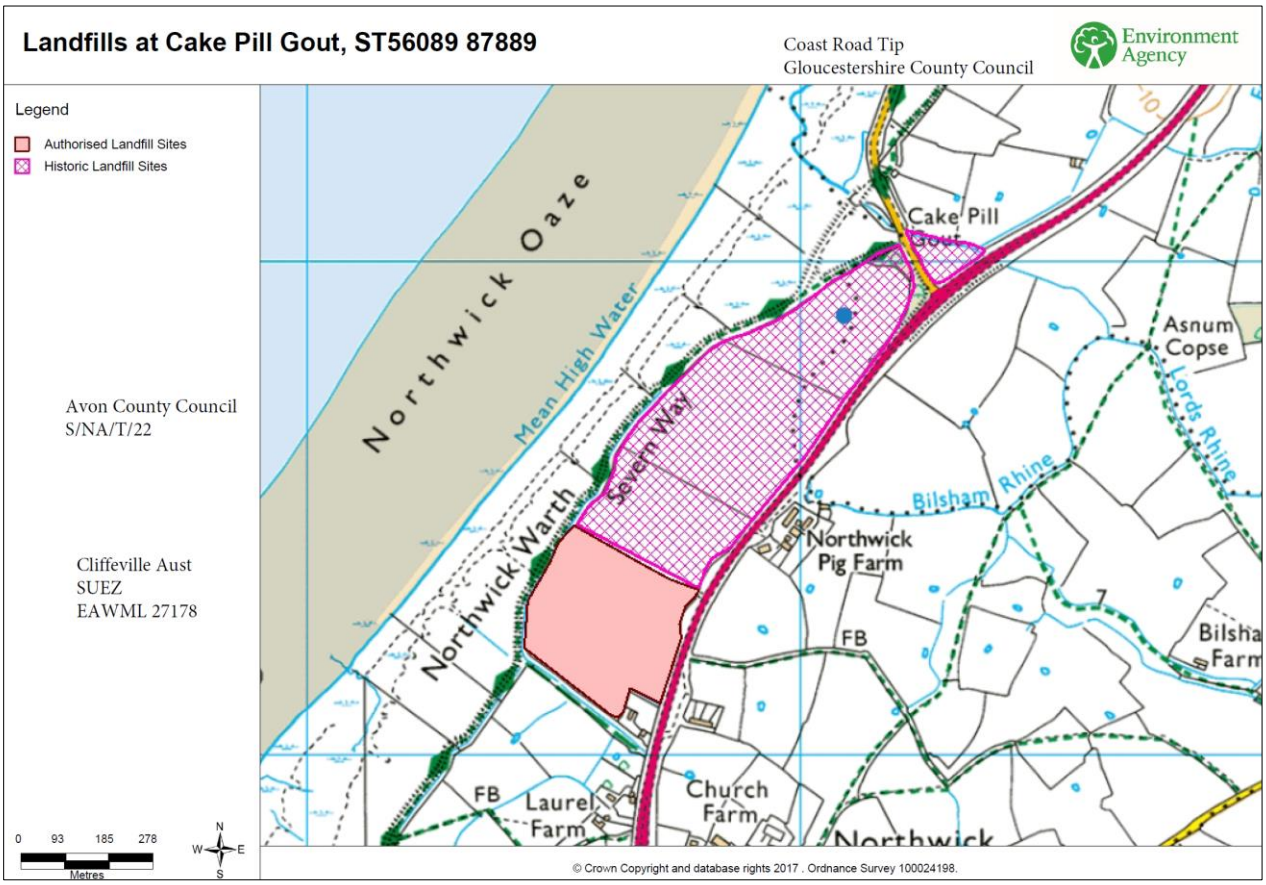

Figure 10 – Landfill Sites

5.0 Alternative Option 3 - Change Defence Type

This option considers the provision of flood defences along the currently proposed alignment (as described in section 3 of this report) but in the form of a flood defence wall instead of an embankment. The wall could be constructed from reinforced concrete or steel sheet piles. The wall would be of approximately the same height above general ground levels as the crest of the currently proposed embankment option (approximately 2.5m), but with a much smaller footprint to avoid impacting on the trees and hedge. The wall could be clad in a variety of materials, but painted steel, concrete or render finish are preferred due to ease of maintenance and durability. Example images are shown in Figures 10 and 11.

Following discussions with local stakeholder groups, including environmental specialists within EA, South Gloucestershire and Bristol City Councils, and Natural England, we have been asked to try to avoid the use of hard defences in rural areas. The visual impact of using these types of defence instead of earth embankments may not be acceptable to the local planning authorities. Furthermore, there is a risk that the proximity of the constructed wall to the root-zones of the trees may cause damage and reduce the life of the trees.

Figure 11 – Typical concrete flood defence wall

Figure 12 – Typical steel sheet flood defence wall

6.0 Alternative Option 4 – Current Alignment, but with Localised Encroachment onto Intertidal Marsh at Cake Pill

This option would generally follow the currently proposed alignment where constrained between the salt marsh and the former waste disposal site. However, at the northern end, close to Cake Pill outfall, the embankment would be allowed to encroach into the triangle of drier intertidal marsh at that location. This alternative alignment would avoid the destruction of approximately 25% of the trees in the affected hedgerow. Figure 13 below shows a plan of the proposed defence embankment.

The triangle of land in question is drier and less ecologically valuable than adjacent areas of salt marsh that have better connectivity with the foreshore. Within the current design of the flood defence scheme, the land has been designated for minor earthworks to lower the ground profile to improve hydraulic connectivity to the estuary and to provide an enhanced habitat for wading birds, so that it may better support the designations of the Special Protected Area relating to wading birds. This is the only intertidal site within the scheme area that is available for this type of improvement and has been held within the design as mitigation for other intertidal habitat losses that may arise from the scheme. Natural England has previously supported the provision of habitat at Cake Pill.

The area of ground taken up by the floodbank could reduce (by up to half) the area of new inter-tidal habitat that could be provided at Cake Pill. The Planning Authority and Natural England would need to be satisfied that saving the trees is more advantageous than maximising intertidal habitat creation. The Environment Agency has sought further advice from Natural England, who are a statutory consultee to the planning process, to determine if the reduction in the habitat provision of the project would be acceptable. In their response, Natural England said that it is keen to create as much new intertidal habitat as is possible, and consider that sacrificing half of the proposed new intertidal habitat in order to retain a proportion of the existing poplar trees would not be favoured.

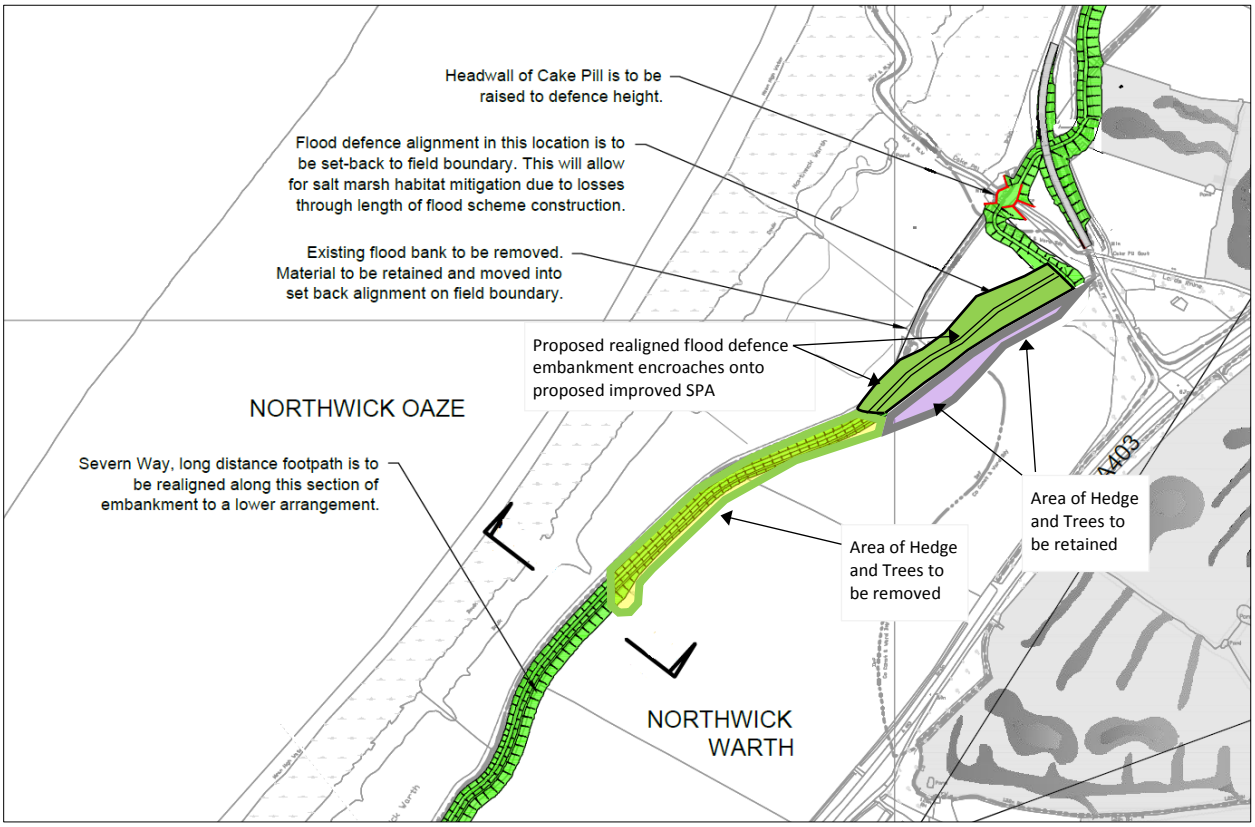

Figure 13 – Plan of Alternative Flood Defence Embankment Encroaching into Proposed Habitat Area at Cake Pill

7.0 Conclusion

The proposed flood defences must comply with UK environmental law, and this includes taking all practical steps to avoid harm to the environment. Therefore, we generally seek to avoid encroachment into environmentally designated areas and into areas of land that may be contaminated.

The flood defence alignment that was shown on the draft design presented to the public in summer 2017 is preferred because it:

- is legal under the Habitats Regulations
- minimises risk of erosion of the landfill site
- minimises land-take
- avoids slow, unsightly die-off of the poplars
- provides for new native planting to replace the existing landscape focal point
- retains the use of visually softer earthwork embankments in the formation of the new flood defences

We have investigated whether minor encroachment of the defences into the SPA may be allowed in the vicinity of Cake Pill, as shown in Option 4. However, this option is not favoured by Natural England. Therefore, at this time and based on current information, the current flood defence option is preferred.

The project proposals will be scrutinised by both Bristol City Council and South Gloucestershire Councils prior to commencement of construction, and the planning application for the project will include an Environmental Statement that will record all of the potential impacts, the options considered in the design, and the proposed mitigation to minimise and offset harm. This is intended to demonstrate that the least harmful option has been selected, taking into consideration all of the practical, policy and delivery constraints presented.