CLONASLEE FLOOD RELIEF SCHEME

Environmental Impact Assessment Report
Chapter 4: Consideration of Alternatives

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CHAPTER 4 - CONSIDERATION OF ALTERNATIVES

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4 CONSIDERATION OF ALTERNATIVES

4.1 Introduction

This chapter of the EIAR presents an overview of the reasonable alternatives considered during the development of the Proposed Scheme. It presents a summary of the detailed Options Development that has been undertaken to identify a preferred option for the Scheme. The preferred option has been further assessed in terms of alternative layouts and location aimed at reducing potential environmental impacts and maximising opportunities.

This consideration of alternatives has been undertaken by a multi-disciplinary technical, environmental and planning project team and comprises the identification and selection of solutions that provide the best balance between technical, environmental and community / social indicators.

4.2 Legislation, Policy and Guidance

The consideration of alternatives is a mandatory part of the EIA process in section 31 of EIA Directive 2014/52/EU. Article 5(1)(d) of the Directive, for example provides that the information to be provided by the developer shall include:

> "*A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.*"

The 2017 "Guidance on the preparation of the environmental impact assessment report (Directive 2011/92/EU as amended by 2014/52/EU)" notes that:

> *"Identifying and considering Alternatives can provide a concrete opportunity to adjust the Project's design in order to minimise environmental impacts and, thus, to minimise the Project's significant effects on the environment. Additionally, the proper identification and consideration of Alternatives from the outset can reduce unnecessary delays in the EIA process, the adoption of the EIA decision, or the implementation of the Project."*

The Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) states the following in respect of alternatives:

> "*The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative, and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required*".

Alternatives may be considered at several stages in the EIA process, reflective of initial stages where location and form are most relevant and at later stages where alternative designs may be required to address emerging environmental issues.

4.3 Screening of Options

4.3.1 Do Nothing

Annex IV, Part 3 of the EIA Directive states that the description of reasonable alternatives studied by the developer should include '*an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*.' This is referred to as the "do nothing" alternative. EU guidance (EU, 2017) states that this should involve the assessment of "an outline of what is likely to happen to the environment should the project not be implemented – the so-called 'Do Nothing Scenario."

In relation to the Proposed Scheme, the "Do Nothing Scenario" is defined as the option that involves **not** spending any budget on flood defences and does **not** consider any maintenance works of the existing

infrastructure. This involves maintaining the status quo without taking any proactive steps to address the existing and future flood risks associated with the Clodiagh River.

Currently, Clonaslee Village does not have any specifically designed flood defence structure to protect from flooding. The existing stone wall along Chapel Street delineates the riverbank from the vehicular road and does provide a degree of protection during flood events. This wall extends into the immediately adjacent private property as it curves around the bend of the river. While the wall serves as an informal defence against flooding, it is not structurally designed to provide reliable protection, and its vulnerability has been previously exposed:

- A section of the wall was knocked down by a vehicle collision. The resultant gap led to flooding of Chapel Street in the flood event of 2017;
- Anecdotal evidence from Public Information Events has recorded water visibly seeping through the wall, and up through the road;
- Similar seepage is recorded in the private property section at the northern end of the wall. The volume of water seeping through the wall was enough to cause flood damage to the adjacent property.

Figure 4-1 below shows the 1% AEP Flood Extents in the Present Day “Do-Nothing” scenario. This assumes that the existing wall on Chapel St is fully intact and capable of acting as a flood defence. For the reasons listed above, this is not a situation that can be relied upon to provide protection to the adjacent properties.

Figure 4-1 1% AEP Model Predicted flooding in Present Day “Do-Nothing” Scenario

The wall is the only physical structure that separates and protects the residents of the Village from the Clodiagh River. This means there is currently an unacceptable risk of flooding and damage to property and

infrastructure. Please see Figure 4.2 which illustrates the residential receptors at risk from the current and future flood extents of the Clodiagh River in the event that the wall fails under floodwater loading.

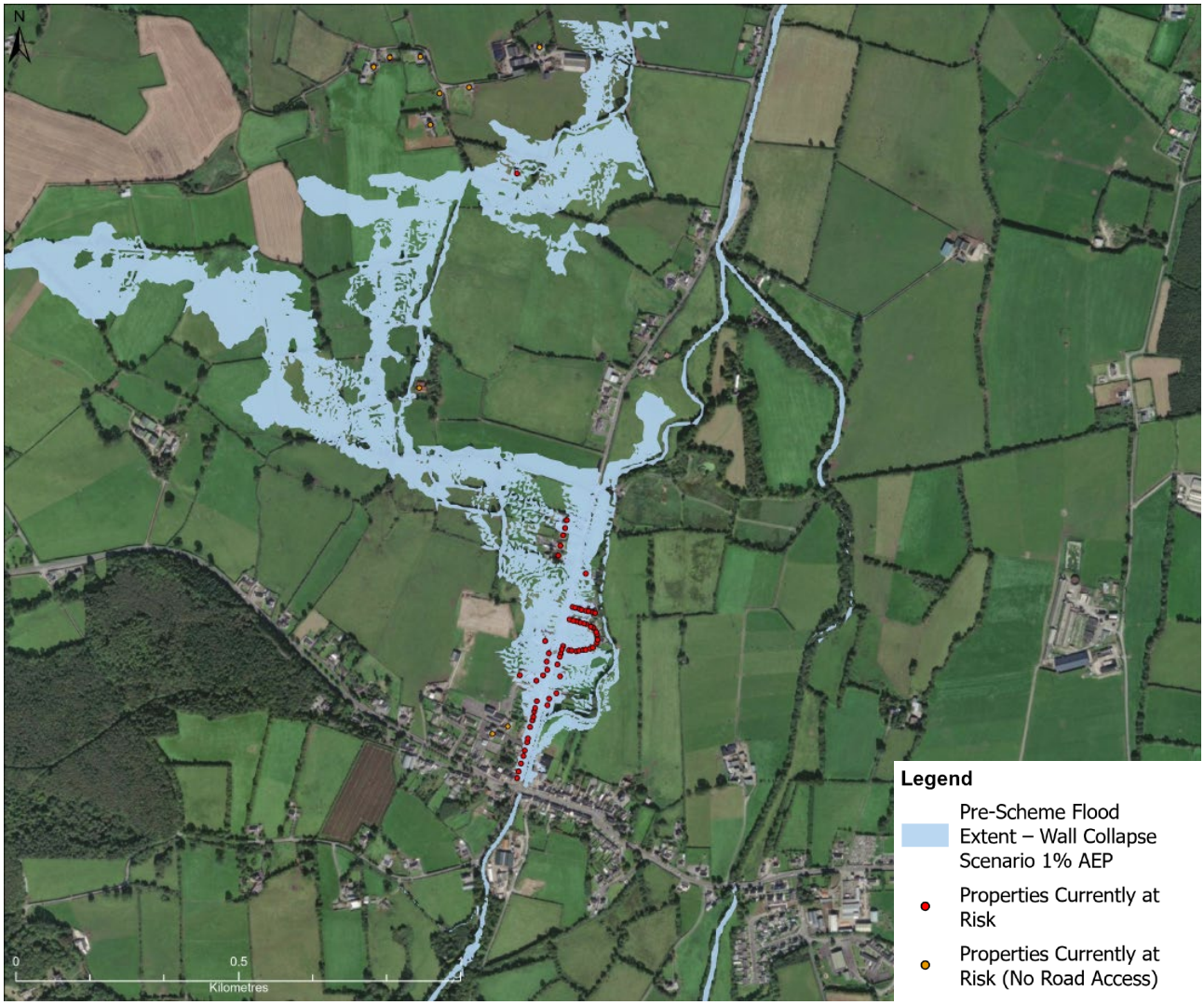

Figure 4-2 1% AEP event in the Undefended Scenario (incl. properties at risk)

No maintenance works such as debris trapping and removal from the river are considered for the "do-nothing" scenario. There therefore remains a significant risk of a blockage at the Clonaslee Bridge resulting from fallen trees being washed down the river in storm flow conditions.

The "Do Nothing" scenario does not meet the required level of flood protection and would permanently maintain the risk of flooding and associated damage to properties and infrastructure. This risk may increase in the future when considering known climate change effects and projected increases in pluvial and fluvial flooding. Therefore, the "Do Nothing" scenario is not a viable alternative and is not considered for further.

In the short term, the "Do Nothing" scenario will would avoid environmental risks associated with the construction of a flood relief scheme. The high likelihood is that the wall will collapse in future and require emergency, unplanned repair works. In an emergency situation, environmental impact mitigation will not be a priority. Planned and pre-emptive improvement work is the preferred approach for this reason. It will avoid multiple future unplanned emergency repairs, and give the time to consider, mitigate and avoid environmental impacts.

4.3.2 Do Minimum

The "Do Minimum" scenario can be defined as the least burdensome option to maintain or adapt the current situation, with the objective of avoiding a full-scale construction project.

The “Do Minimum” scenario in the case of Clonaslee flood protection could consists of the implementation of measures as described below:

- **Debris Removal from the Clodiagh River:** This involves periodic inspection of the woodland upstream of the Clonaslee Bridge. Fallen trees, or trees at risk of falling would need to be removed from the riparian zone;
- **Repointing of the Existing Stone Wall:** Perform maintenance work on the stone wall along Chapel Street to strengthen its structure, reduce the risk of collapse, and prevent water seepage; and
- **Individual Property Flood Barriers:** Provide and install individual property demountable flood barriers for the properties at risk should the Chapel St wall collapse or the bridge block with debris. Flood barriers are removable devices designed to redirect or hold back floodwaters. Their primary purpose is to protect homes or businesses from flooding, preventing damage or obstruction during floods.

The implementation of these flood remediation measures may provide a public perception of flood protection to the village but in reality, unacceptable vulnerabilities to future flooding would remain:

- Debris removal and individual property protection requires human intervention. Considering the flashy nature of this river in this location, it is unlikely that there would be sufficient notice to enable individuals or the Local Authority to take action;
- Targeted removal of fallen trees in Brittas Wood would cause habitat destruction in the riparian zone, not to mention the benefits of fallen trees for instream fish habitats; and
- The stone wall would still not be suitable as a flood defence asset and could not be certified as such.

The “Do Minimum” scenario would not provide the required standard of flood protection to the village.

4.3.3 Relocate and Reconstruct Properties

This radical measure considers relocating receptors out of the floodplain. This may be achieved if the receptor can be physically moved, if there are suitable, equivalent replacement receptors, or if the receptors can be demolished and re-constructed in a suitable location. This option was not taken forward due to the quantity of properties at flood risk and the social and economic impact moving a considerable number of properties out of the Chapel Street would have on the Village.

4.3.4 Conclusion of Screening of Options

Having considered the Do Nothing, Do Minimum and Property Relocation Options, it is clear that a designed flood relief scheme is required to deliver the desired standard of protection to the Community of Clonaslee. This will be to the long-term benefit of the residents and to the receiving environment. The sections below discuss the Optioneering Process and the reasons why alternative design options were ruled out.

4.4 Overview of Reasonable Design Measures

An Option Development Process was undertaken to identify engineering options for the Clonaslee FRS that deliver the required SoP. The process undertaken aimed at identifying options that are technically viable and environmentally acceptable, while also being satisfactory to the community and other stakeholders. The sections below examine common flood relief measures and discuss their suitability.

4.4.1 Natural Water Retention Measures (Upstream Storage)

The option of creating upstream storage via Natural Water Retention Measures was considered on the Clodiagh River. Generally, where suitable storage areas are available in upstream 'uninhabited land', flood water can be stored during a flood event, thereby reducing flood flows and volumes in the risk area. Using the hydraulic model developed for the Proposed Scheme, two potential upstream storage locations were trialled by modelling dams across the river valley. However, the steep nature of the catchment rendered these locations unsuitable for water storage. In order to deliver a benefit to the village of Clonaslee, the modelled dams would have to be unfeasibly high. Therefore, this design option was not investigated further.

It should be noted that these upstream locations are located in the uplands of the Hen Harrier SPA and would likely encroach of habitats of this ground nesting bird. Should this option have been technically feasible, it may not have been acceptable from the wildlife conservation point of view.

4.4.2 Increased Conveyance - Dredging

Again, using the hydraulic model, the hydraulic benefit of dredging the Clodiagh River was analysed. Dredging is a technique that clears sediment, live vegetation, and deadwood from the riverbed. These natural elements can accumulate over time, reducing the river's flow capacity.

The cross-sectional area of the river channel was increased in the hydraulic model, to a degree that could be reasonably achieved by dredging. The model outputs showed that this did not remove the flood risk. Predicted flood water levels still reached road level on Chapel St.

Furthermore, this option has a significant environmental impact and a high future maintenance requirement. Should it have been technically viable, it may have been ruled out on environmental grounds.

4.4.3 Increased Conveyance - Weir Removal

To assess this option, the existing weirs upstream of the village, including the historic weir at Brittas Wood, were removed from the hydraulic model and the riverbed was smoothed out at these locations. When a weir is removed, it allows water to flow freely with no obstructions. This improves the river's capacity to handle excess water during heavy rainfall. Weirs create backwater areas upstream, causing water levels to rise. By removing a weir, these backwater effects are minimized, preventing water from backing up and contributing to flooding. However, the model outputs show the removal of the weirs provided no benefit to the flood risk area. Therefore, this design option was not investigated further.

Similar to dredging, albeit on a smaller scale, the instream works in removing weirs can cause an environmental impact. The removal of weirs, however, is beneficial from a fish passage and migration perspective. As we see no benefit, from a flood protection point of view, there is not a strong argument for pursuing fish passage barrier removal under the Clonaslee FRS.

4.4.4 Increased Conveyance – Preferential Flow Path

The logic behind this flood reduction measure is to provide the flood water with an alternative, preferential route to pass through the flood risk area, thereby diverting it away from properties at risk. It is sometimes referred to as "Room for the River" approach. There is a viable candidate land in Clonaslee, where earth excavation could allow increased water flows to cut the corner of the river bend downstream of the Clonaslee bridge. This design was taken forward to optioneering as a technically viable proposal.

4.4.5 Wall and Embankments

Hard defences such as flood walls or embankments form a barrier between the river and the floodplain, effectively reducing the size of the river's floodplain where receptors are at risk. Replacement or bolstering of the existing Chapel Street wall is an immediately evident flood defence option. Modelled variations of hard defences were taken forward to optioneering.

4.4.6 Debris Management

Anecdotal evidence received at public information days identified the need to manage debris upstream of the Clonaslee bridge in Brittas Wood. A permanent means of trapping debris in-stream or human intervention management were taken forward to optioneering.

It was reported that the blockage risk to the river had increased since the old hump-backed stone arch bridge was replaced with a flat concrete singe span bridge. The option of replacing the bridge to provide more clearance was not carried forward to optioneering, as the risk of fallen trees getting caught across the channel would still remain i.e. even if the bridge was rebuilt with a larger opening, a debris trap upstream would still be required.

4.5 Options Development

4.5.1 Public Information Day on Emerging Options

The Second Public Information Day was held at the Clonaslee Heritage Centre on 22nd November 2022 and was focused on presenting the emerging options arising from the screening process described above. There was good engagement from the local community and discussion points were recorded.

Further details of this Public Information Day along with the follow-on actions made on issues raised during the event can be found in the Summary Report Prepared on this event (MDW0867RP0031).

The main outcomes of the day were the following:

1. Identified the need for management of debris arising from the wooded area upstream of the Clodiagh Bridge;
2. Gathered further information relating to the existing wall that would inform the design of the defence on Chapel St i.e. water observed bubbling up through the road highlights the need to cut-off a flow path underneath the wall;
3. Some 'quick win' interventions that could be actioned outside of a 'Flood Relief Scheme' were identified:
    a. Blockages in a drain arising from the woods in the Brittas Lake area;
    b. A collapsed small box culvert crossing the road on the same drain;
    c. The need to continue the ongoing maintenance of Laois Co Co to remove gravel build up from underneath the Clonaslee Bridge;
    d. Local residents were informed of an initiative for Laois Co Co to partially fund individual property protection measures should there be a perceived flood risk to that property.

4.5.2 Defining the Available Options

Following the Public Information Day No. 2, further assessment of the screened options was undertaken to determine levels and dimensions of proposed flood defences, using the calibrated/validated hydraulic models. The outcome of the screening process was two main options listed below:

1. Relying on hard defences; and
2. Creating a conveyance area downstream of the Clonaslee Bridge. Note that in this option, some hard defences were still required.

These are shown in Figure 4-3 and Figure 4-4 below.

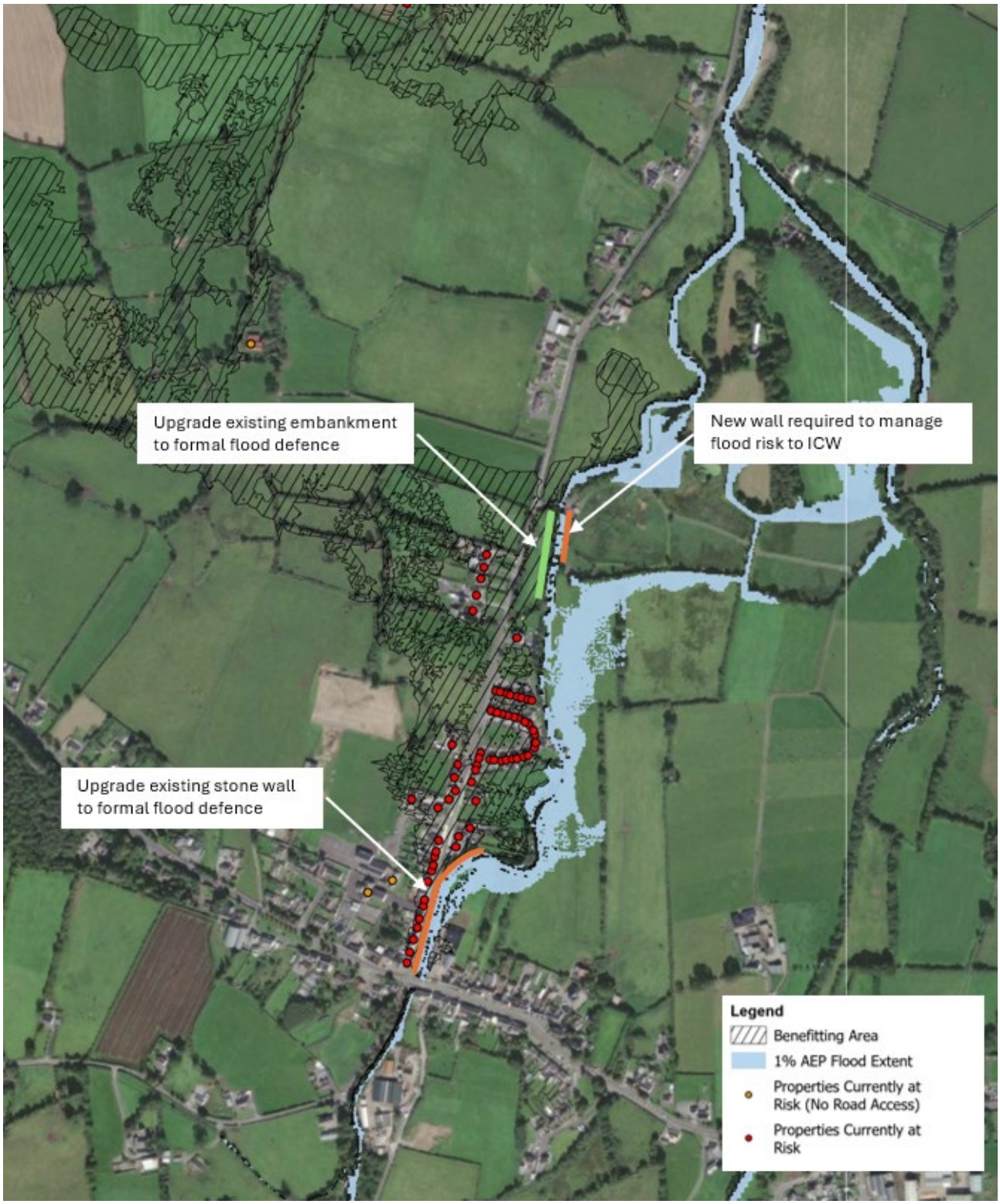

Figure 4-3 Option 1 – Hard Defences

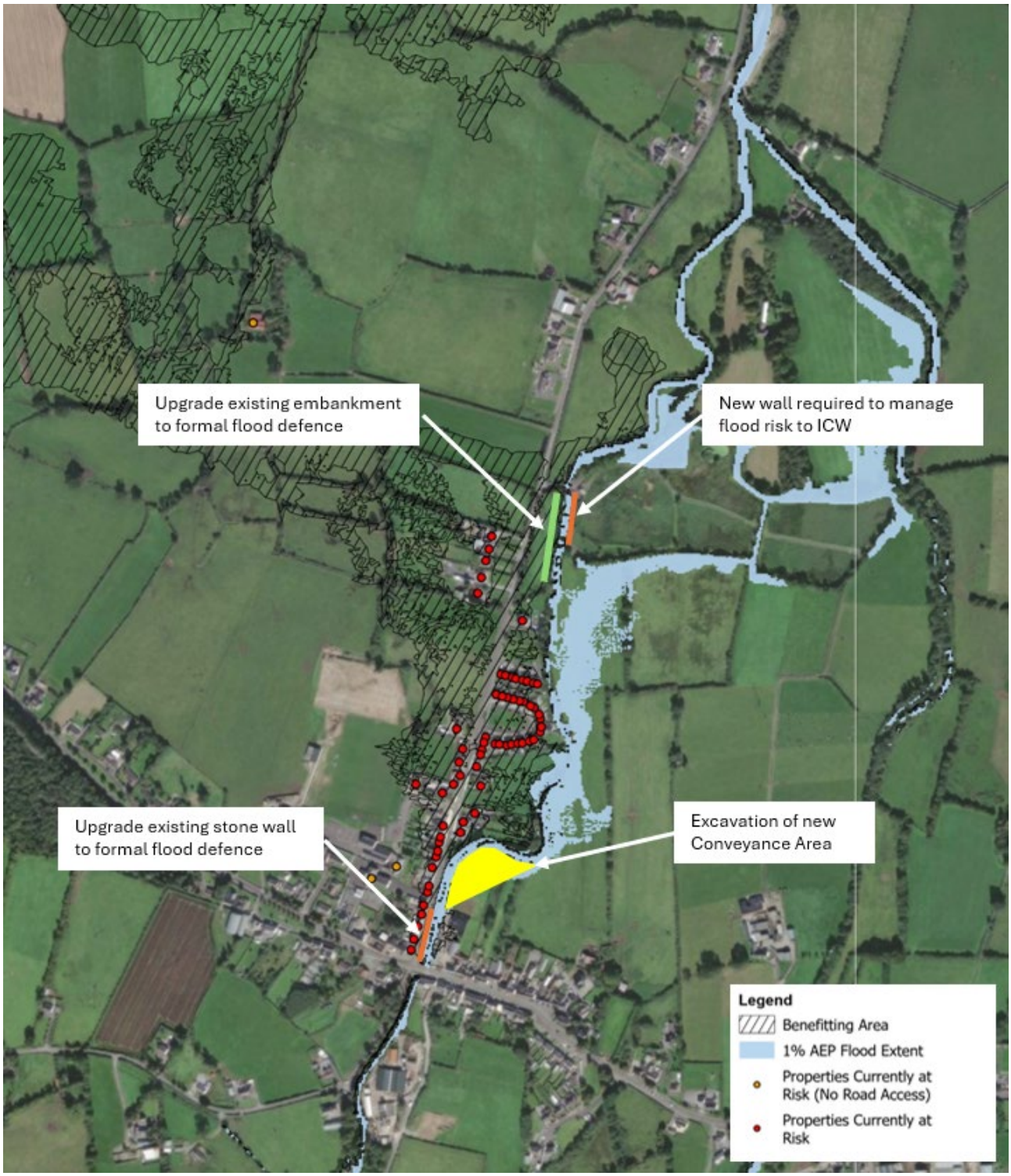

Figure 4-4 Option 2 – Improved Conveyance

The following variations within the main options were considered:

a. The wall on Chapel Street would be demolished and replaced, requiring in-stream works along its length;

b. The new wall would be constructed outside of the existing wall, thereby reducing the need for in-stream works;

c. Aside from the defences, the inclusion of a debris trap upstream of the village needed to be considered. Its presence would give guarantee that the bridge could not be blocked by fallen trees. When modelling

the scenario when the debris trap blocks, it was determined that an embankment was required to keep water in-stream.

d. The option to proceed without a debris trap was also considered. In this case the operation of the scheme would depend on emergency maintenance action during a time of debris gathering at the Clonaslee Bridge.

The potential options developed for inclusion in the Proposed Scheme are provided in Table 4-1.

Table 4-1 Potential Design Options

Option Reference	Description
Option 1a	• Construct debris trap located in Brittas Wood upstream of Clonaslee village. • Construct 130 m road elevation at an average height of 440mm in Brittas Wood (associated with debris trap) • Demolition and clearance of 243 m of old walls. • Construct 243 m of walls (assumed with sheet pile cores/mass concrete as appropriate) to replace demolished wall at assumed 1 m height. Temporary river diversion to accommodate replacement. • Construct new 150 m embankment at an average height of 770 mm adjacent to Tullamore Road behind existing embankment. • Construct 70 m wall at an average height of 330mm in IW ICW along right bank.
Option 1b	**Option 1b is the same as Option 1a with the following alteration:** • Set wall back from original the riverbank to avoid the need for instream works or a temporary river diversion at that location
Option 1c	**Option 1c is the same as Option 1b with the following alteration:** • No debris trap included with increased maintenance/human intervention flood response required to prevent the bridge from blocking
Option 2a	• Construct debris trap located in Brittas Wood upstream of Clonaslee village. • Construct 130 m road elevation at an average height of 440mm in Brittas Wood (associated with debris trap) • Demolition and clearance of 75 m of old walls. • Construct 75 m of walls (assumed with sheet pile cores/mass concrete as appropriate) to replace demolished wall at assumed 1 m height. • Excavate area of 4934 m^2 and 0.8 m deep in field opposite Chapel St to allow preferential flow path during flood events. • Construct new 150 m embankment at an average height of 770 mm adjacent to Tullamore Road behind existing embankment. • Construct 70 m wall at an average height of 330 mm in IW ICW along right bank.
Option 2b	**Option 2a with the following alteration:** • No debris trap included with increased maintenance/flood response required to prevent the bridge from blocking

4.5.3 Multi-Criteria Analysis of Options

A Multi-Criteria Analysis (MCA) was used to compare the options. The MCA was undertaken in accordance with the specification set out in the OPW document *"Technical Methodology Note - Option Appraisal and the Multi-Criteria Analysis (MCA) Framework (September 2018)"*. The document prescribes a scoring methodology to enable the options to be ranked against the four flood risk management objectives:

- Social;
- Economic;
- Environmental; and
- Technical.

Each objective contains sub-objectives which receive a weighting based on the specifics of the river reach and flood risk area, and a score based on the benefit or detriment caused by the specific option.

The scheme options run through the process all provided equivalent levels of flood defence, supported by similar permanent physical structures. Consequently, the Social and Economic Scores remained consistent across all options. The selection of the optimal option was therefore guided by Environmental and Technical factors. The scoring summary is presented in **Table 4-2**.

Table 4-2 MCA Scoring

Scheme Option	Option 1a	Option 1b	Option 1c	Option 2a	Option 2b
Social Score	1265.0	1265.0	1265.0	1265.0	1265.0
Economic Score	981.1	981.1	981.1	981.1	981.1
Environmental Score	-697.0	-498.0	-405.0	-531.0	-438.0
Technical Score	1100.0	1100.0	200.0	1000.0	200.0
Option Selection Score	**2649.1**	**2848.1**	**2041.1**	**2715.1**	**2008.1**

Below is a summary of the key deciding factors for each option.

Option 1a received the lowest Environmental Score due to the considerable instream work required on the Clodiagh River. The potential environmental effect from instream works include but are not limited to:

- impacts on aquatic ecology;
- impacts on unrecorded underwater archaeology;
- impacts on water quality due to the release of suspended solids and hydrocarbons during groundworks;
- impacts on and human health due to the release of suspended solids and hydrocarbons during groundworks;
- surface and groundwater contamination;
- impacts on human health (noise, dust and noxious emissions) due to an increase in plant machinery; and
- impacts on traffic and roads due to movements of plant to/from works areas to compounds.

This option also involved demolishing and reconstructing the entire existing stone wall on Chapel Street.

Option 1b improved the Environmental Score by 199 points compared to Option 1a. This option avoids instream works on the Chapel Street stretch of the Clodiagh River. Instead, it proposes to bolster the existing wall, with the condition that all work will be carried out on Chapel Street side. This option also includes for a debris trap in Brittas Wood.

Option 1c increased its Environmental Score by 93 points compared to Option 1b. However, its Technical Score was the lowest as Option 1c does not include the installation of a debris trap in Brittas Wood. As a result, regular maintenance and cleaning below the Clodiagh Bridge would be necessary to prevent blockages, and the risk of a blockage at the bridge during a flood event would remain high.

Option 2a received the second lowest Environmental Score as the proposal involved constructing a 75-meter new wall on Chapel Street and excavating an area for ‘preferential a flow path' which would require instream work and river diversion.

Option 2b obtained the second-highest Environmental Score but has a low Technical Score as per Option 1c. Option 2b lacks the installation of a debris trap in Brittas Wood and as stated above, this would result in the requirement for regular maintenance and cleaning below the Clodiagh Bridge and the risk of a blockage at the bridge during a flood event would remain high.

The higher environmental scores (i.e. Least impactful environmental options) avoid instream work where technically possible, i.e. both the wall option that necessitated a river diversion and construction of the conveyance area have been ruled out due to significant impact on the banks of the river.

The higher technical scores correlate to the options which include the debris trap. The need for human intervention during a flood event, to ensure the bridge does not block, has resulted in the low score for those options omitting the debris trap. To consider this further, the absence of a debris trap may prompt an initiative to remove fallen trees from the riverbank in Brittas Wood, or trees that are at risk of falling. This would be to the detriment of the local environment and habitats. The installation of a debris trap means the wood and the riparian zone need not be disturbed and the habitat can be preserved.

As demonstrated above, the selection option which has the second highest environmental score, but the joint highest technical score is **Option 1b**.

The proposed scheme as described in **Chapter 5: Project Description** represents **Option 1b** from the MCA.

4.6 Refinement of the Preferred Option

For the ease of design, surveys and planning the scheme has been divided into three works areas:

Area 1 – Brittas Wood;

Area 2 – Chapel St;

Area 3 – Tullamore Rd and ICW.

See Figure 4-5 below. The sections below discuss alternatives considered in refining the scheme emerging from the optioneering process.

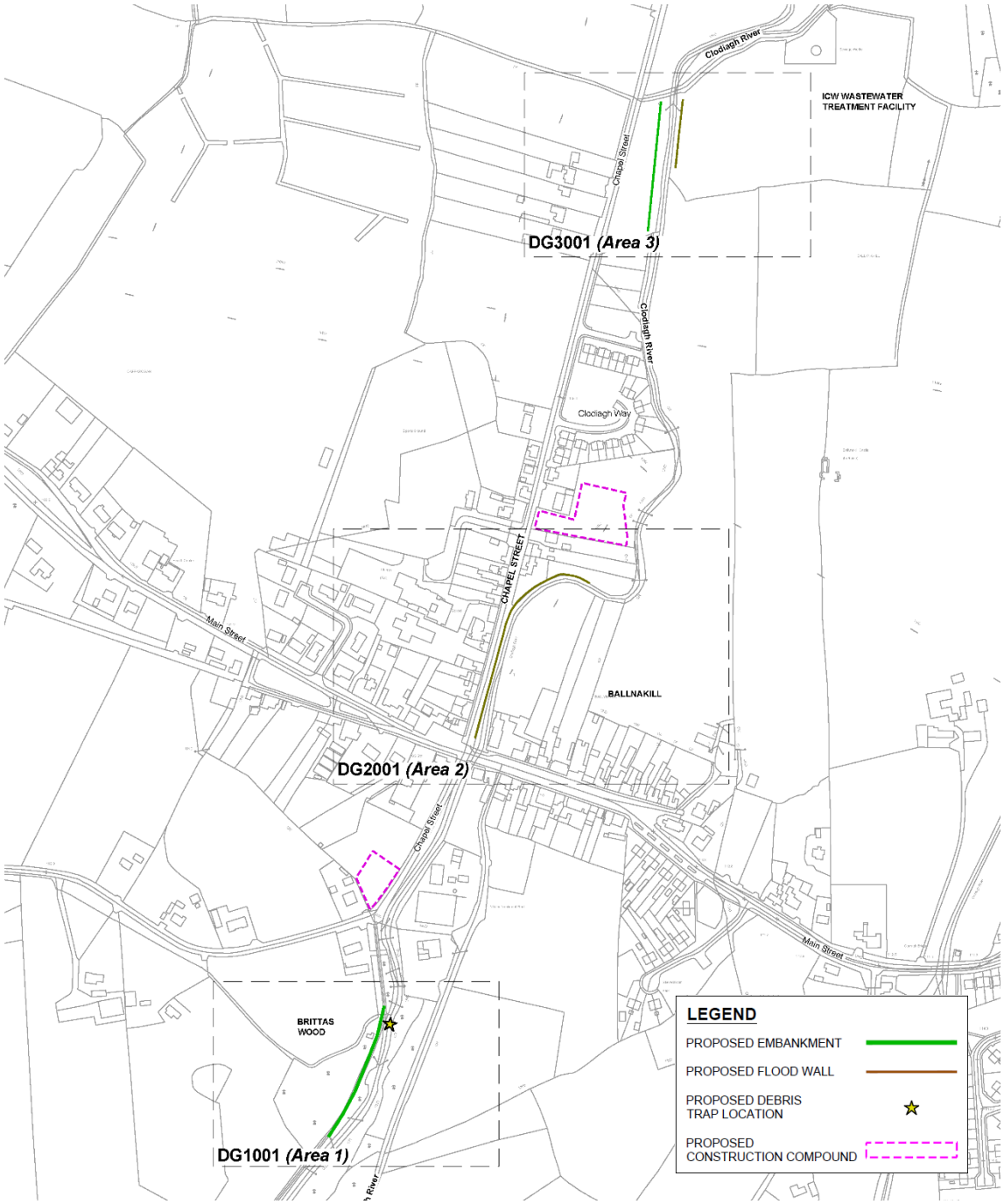

Figure 4-5 Clonaslee Flood Relief Measures

Alternative layouts and designs for each of the Scheme's areas evolved over a design process that included input from environmental experts, as well as contributions from stakeholders and feedback from public consultations (**Chapter 3: Consultation**). Key locations where alternative have been considered are summarised below.

4.6.1 Area 1 - Brittas Wood

4.6.1.1 Debris Trap

As outlined above, a key outcome of the MCA was the conclusion that a debris trap was required in the Clodiagh river upstream of the Clonaslee Bridge. Therefore, different locations were analysed to determine the best site for installing the debris trap.

From a design risk health and safety point of view, the debris trap must be located in a location that is readily accessible by plant suited for the removal of large woody debris. On a site walk RPS identified four possible locations for the debris trap, labelled A, B, C and D in the Figure 4-6 and described in Table 4-3.

Figure 4-6: Debris Trap analysis, four possible locations in Area 1

Table 4-3 Debris Trap Locations Considered

Location A Site of an existing small clearance and ramp sloping down to the river edge. Located immediately to the left as you enter the Brittas Wood entrance.	

Location B

As you proceed along the path this is the next location where the roadway is suitably close to the river.

Location C

The next location where the river is accessible from the roadway is the site of an old weir.

Location D

The next location where the river is accessible from the roadway is the site of a wooden footbridge.

Note: to proceed any further into the woods would greatly reduce the effectiveness of the debris trap i.e. a likely source of woody debris would be downstream of the trap.

An assessment of the four locations were carried out under the following criteria:

- Hydraulic suitability – will the debris trap create an unacceptable increase in water levels upstream;
- Operational suitability – is the area easily accessible for removal of captured branches;
- By-pass Route – when the debris trap catches debris, is there a suitable by-pass route for the river flow;
- Impact on social amenity;
- Impact on vegetation.

The Area 1 Debris Trap Locations Assessment is summarised in **Table 4-4.** This assessment has guided our decision to choose Location B for the debris trap.

Table 4-4: Area 1 Debris Trap Locations Assessment

Criteria	Location A	Location B	Location C	Location D
Impact on Trees	Some tree cutting will be necessary	Some tree cutting will be necessary	Removal of low-lying vegetation required	Some tree cutting will be necessary
Impact on Social Amenity Area	Visual impact at the entrance to the Loop Walk, potentially mitigated by the palisade fencing on the water treatment plant on the opposite side of the river	Visual impact beside the Loop Walk, potentially mitigated by proximity to existing water abstraction infrastructure (building, chambers and palisade fence)	Visual impact in the immediate vicinity of an old weir of possible local heritage value. Potential impact on archaeology also.	Visual impact adjacent to footbridge feature of the Loop Walk
Hydraulic Conditions	Steep banks at this location prohibit a flow bypass route	Gently sloped banks suitable for flow bypass route in blockage scenario	Gently sloped banks suitable for flow bypass route in blockage scenario	Gently sloped banks suitable for flow bypass route in blockage scenario Proximity of the footbridge may complicate hydraulic conditions
Access for clearing	An existing slipway in this location is too steep for safe access for cleaning machinery	Construction of accessway is possible due to gently sloped banks	An existing open and relatively flat space would allow easy access to the site for debris removal	There is enough space for vehicle access. The proximity of the footbridge my hamper tree removal

As a result of the assessment, it was concluded that **Location B** is the **preferred location** to install the debris trap.

4.6.1.2 Erosion Protection

Introducing an obstruction to a river channel increases the flow velocity of the water around the obstruction, and can lead to localised scour of the riverbed, and local erosion of the riverbanks. Installation of the debris trap must therefore be accompanied by protection measures for both the riverbed and the banks on either side.

For the riverbanks, a nature-based solution of 'willow-spiling' is preferred over hard defences such as installation of concrete protection of rocky rip-rap. The final design will be discussed and agreed with IFI before implementation.

For the riverbed, an extended concrete apron at riverbed level, or another means of artificial reinforcement, would deliver a viable engineering solution. In order to maintain as natural riverbed as possible, the design has set the concrete base of the debris trap at 500mm below the pre-existing riverbed level. This will set a limit to the maximum possible scour that may happen on occasions of high flow. The concrete finish will be roughened to promote re-sedimentation as the flow returns to normal.

4.6.1.3 Embankment

The design of the embankment in Brittas Wood has been completed following a tree survey, ecological surveys, a utility surveys and engagement with stakeholders from Coillte, Uisce Éireann and local residents. Table 4-5 below discusses key design decisions that were made, and alternatives considered but ruled out due to environmental considerations.

Table 4-5 Area 1 Embankment - Key Design Decisions

Design Consideration	Design Decision	Alternatives Considered - *and reasons rejected*
Location and Alignment of Defence	Embankment will be built along the alignment of the existing access road in Brittas Wood, and surfaced to reinstate the roadway on top of the embankment	Constructing the embankment in the adjacent field – *The embankment needs to be close to the river to redirect flows back into the channel, therefore an embankment in the adjacent field is not viable* Build the embankment parallel to the existing roadway – *This would require removal of a significant quantity of trees and vegetation*
Consider the type of flood defence (embankment of wall)	An embankment was chosen to blend in as much as possible to the local amenity area	Constructing a wall – *This would visually clash with the natural amenity area and create a barrier to walkers and fauna*
Protection of Services and Utilities	Pipelines associated with the Uisce Éireann water treatment plant are located in the roadway. These will be protected in-situ via concrete cover in consultation with Uisce Éireann Uisce Éireann will also be afforded the opportunity to replace/upgrade any of the infrastructure in advance of flood scheme construction works	Diversion of watermains outside of the embankment footprint – *This would require excavation outside of the current roadway with associated tree and habitat loss in the woods*

4.6.2 Area 2 - Chapel Street

The design of the flood defence wall on Chapel Street has had to consider the following constraints:

- The existing wall contributes to the character of the village and the Architectural Conservation Area;
- Works here will be in close proximity to the Clodiagh Riverbank;
- Works will be in close proximity to residential properties;
- Works will require roadworks and extensive traffic management.

Table 4-6 below discusses alternative considered.

Table 4-6 Area 2 Wall - Key Design Decisions

Design Consideration	Design Decision	Alternatives Considered - *and reasons rejected*
Consider the type of flood defence (embankment of wall)	A reinforced concrete floodwall is chosen with a below ground flow cut-off achieved via excavation and replacement with impermeable material	Embankment or other type of defence – *Given the proximity to the public road, a wall is the only practical option. An embankment type defence could be achieved by raising the entire road level, but this is impractical due to the residential houses adjoining the road* Underground flow cut-off via sheet piling – *Vibration caused by sheet piling could cause unacceptable risk to local properties and the integrity of the existing stone wall*
Location and Alignment of Defence	The flood defence will be achieved by building onto or bolstering the existing wall, with all works taking place on the roadside of the existing wall.	Building on the river side of the existing wall – *This would require extensive in-stream works and river diversion during construction* Demolition and replacement of the existing wall – *This would require extensive in-stream works and river diversion during construction. It would also create a high risk of flooding during the period when the wall is removed* Note: *The above alternatives would take longer to build than the design going forward to planning. This would increase traffic and other impacts to the local community during construction stage*
Protection of visual character	The new wall will be faced with stone to match the existing	Other finishes such as artificial cladding – *This was ruled out under consultation with a Conservation Architect*
Protection of visual character	Wall features such as stiles and bench/step will be reconstructed in the new wall stonework	Build around the existing features with ‘glass flood wall’ to preserve them – *This would render the features unusable*

4.6.3 Area 3 - Tullamore Rd and Integrated Constructed Wetland (ICW)

4.6.3.1 Embankment

There is an existing informal embankment on the left bank of the river in Area 3. Surveys and hydraulic modelling have shown that it is not fit for purpose to protect against the design flood event, due to gaps being present, and unverifiable structural stability and heavy vegetation.

The intention for the scheme in this area is to build a secondary embankment parallel to the existing. The alternative being to remove and rebuilt the exiting at the cost of removing all trees and mature hedgerow along the alignment.

The design of the embankment was further adjusted following results from the tree survey. The alignment was moved slightly to avoid root protection zones and avoid unnecessary tree felling. A summary of design decisions is presented in **Table 4-6** below.

4.6.3.2 Wall

The purpose of this wall is to ensure that there is not an increased flood risk to the Uisce Éireann Integrated Constructed Wetlands treatment plant, considering the enhanced protection delivered by the embankment being built on the opposite side of the river.

The design constraints in this area are as follows:

- Work will be required within an active wastewater treatment facility which must remain operational at all times;
- The defence will cross over incoming pipelines to the treatment plant;
- Construction will be in close proximity to the riparian habitat.

Table 4-7 below discusses alternative considered.

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Table 4-7 Area 3 Embankment - Key Design Decisions

Design Consideration	Design Decision	Alternatives Considered - *and reasons rejected*
Consider the type of flood defence (embankment of wall)	An embankment has been chosen here to blend in as much as possible with the existing environment	Constructing a wall – *This would visually clash with the greenfield surroundings. It could also create an unnecessary barrier to local fauna*
Location and Alignment of Defence	The embankment alignment is located in the green field parallel an existing embankment and treeline	Rebuild the existing embankment – *This would require the removal of 125m of mature treeline and hedgerow. It would also interfere with the riparian zone and left bank of the river*

Table 4-8 Area 3 Wall - Key Design Decisions

Design Consideration	Design Decision	Alternatives Considered - *and reasons rejected*
Consider the type of flood defence (embankment of wall)	A wall has been chosen doe to the space available within the ICW	Embankment or other type of defence – *Given the proximity to the ICW access road, a wall is the only practical option. An embankment type defence could be achieved by raising the entire road level, but this would require additional imported material with associated environmental impact*
Location and Alignment of Defence	The wall alignment chosen will match the kerb line of the existing access road	Building the wall closer to the river – *This would impact on the riparian habitat zone of the river*
Protection of Services and Utilities	Underground pipelines will be constructed over to a design developed in consultation with Uisce Éireann	Diversion of services – *A service diversion would create additional construction waste and may require new river crossing with associated impacts to the river and riparian zone*

4.6.4 Ancillary Works

4.6.4.1 Temporary Construction Compound Locations

The temporary construction compound locations were strategically identified throughout the Proposed Scheme based on their proximity to the proposed works, their size, accessibility and low environmental effects. Two areas have been identified and are located on private property agricultural land, of low ecological value. They are deemed necessary as the construction site they serve does not have sufficient space for storage of materials or to take large delivery vehicles. The locations are shown in **Figure 5-30** in **Chapter 5: Project Description** and are listed below:

- Compound Site A Brittas Wood; and
- Compound Site B Chapel Street.

The construction compounds will also function as material storage and spoil management storage areas. Further details regarding the proposed compound locations are provided in **Chapter 5: Project Description**.

Ecological surveys have been conducted to identify any sensitivities that might exist at the proposed sites. Additionally, an archaeological geophysical investigation has been completed, given the high archaeological potential of the area.

An alternative option to the 2 no. chosen locations would be to use just 1 no. larger construction compound. The use of multiple temporary construction compounds is deemed preferable to the alternative of a single large compound in the centre of the Scheme for several reasons. Principally, it will facilitate more efficient construction practices and will result in shorter distances for traffic movements within the Scheme area during construction. As a result, vehicle emissions and the potential for dust arisings will be reduced.

Based on the above, no further alternatives have been considered for the temporary construction compound locations.

4.7 References

RPS Clonaslee Flood Relief Scheme - Environmental Impact Assessment Scoping Report

RPS Clonaslee MCA and CBA Assessment