Appendix A

Environmental Effects of the Options

A.1 Area 1&2 – Tir Cluain to Riverside Way

Table 59 Area 1&2 – Population and Human Health

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	This option would provide protection to the following features: • 281 residential properties in the area and 26 non-residential properties. • First Steps Creche, located in Tír Cluain. • The scenic walkway that stretches from Broomfield Ridge to Northern Relief Road, and a portion of the walkway that extends from Willowbank to Water Rock. • Darling Buds pre-school, located on Mill Road • Midleton GAA Club • Midleton Community Hospital • Midleton Medical Centre • My Place Community Centre • Midleton Courthouse and Garda Station
OPTION 1&2B - Direct defences only	As above
OPTION 1&2C - Upstream Storage and Direct Defences	As above

Table 60 Area 1&2 – Biodiversity

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	This option would require in channel dredging to occur, downstream of Moore's Bridge, which could directly impact invertebrate habitats within the channel. As dredging would become a maintenance requirement, biodiversity loss in the area designated for dredging would be significant and on-going. There is a potential impact on the change in sediment flux over time to the downstream Great Island Channel Special Area of Conservation (SAC) of which "Maintain/Restore Natural Circulation of sediments" is a conservation objective for the Atlantic Salt Marsh. The change in sediment flux may also negatively affect the Cork Harbour Special Protection Area (SPA) objectives, specifically surrounding the species reliant on wetlands. This option does not present the possibility of direct impacts at this stage on any qualifying habitat. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated. Otter habitats may be impacted where riverside works are required. Proposed flood defence wall construction would impact on fish (Salmonids, Lamprey and Eels). Downstream of construction, fish species would also be negatively impacted due to the reduced water quality during the in-stream construction period. Suitable mitigation measures are technically feasible. Medium to long-term alteration of fisheries habitat in sensitive waterbody due to proposed walls that will require excavation and restoration of banks. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. The replacement of the bridge upstream of Clohessy's Bridge and the removal of the bridge downstream of Northern Relief Road would likely result in the release of fine sediments and local disruption to flora and fauna. These fine sediments may smother downstream gravels during construction, but this would be a temporary feature. The construction of embankments and walls would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. The proposed flow control structure at mill race entrance on site north of Northern Relief Rd may alter hydraulics as well as water quality locally, which would negatively impact on fish habitats in the area.
OPTION 1&2B - Direct defences only	This option does not include dredging or bridge removal or replacement, but in-channel works for the construction of walls and embankments could still result in a change to sediment flux entering the downstream SAC/SPA, but to a significantly lesser degree than Option 1A&2A. This option does not present the possibility of direct impacts at this stage on any qualifying habitat. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated. Otter habitats may be impacted where riverside works are required. Proposed flood defence wall construction would impact on fish (Salmonids, Lamprey and Eels). Downstream of construction, fish species would also be negatively impacted due to the reduced water quality during the in-stream construction period. Suitable mitigation measures are technically feasible. Medium to long-term alteration of fisheries habitat in sensitive waterbody due to proposed walls that will require excavation and restoration of banks. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. The construction of embankments and walls would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats.

Option Description	Environmental Effects
	The proposed flow control structure at mill race entrance on site north of Northern Relief Rd may alter hydraulics as well as water quality locally, which would negatively impact on fish habitats in the area.
OPTION 1&2C - Upstream Storage and Direct Defences	This option would require the introduction of a flow control structure and river realignment, with the loss of sinusoidal meanders at the upstream storage embankment. This would have a significant impact on WFD objectives. This option does not present the possibility of direct impacts at this stage on any qualifying habitat of the SAC/SPA. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated. Otter habitats may be impacted where riverside works are required. Proposed flood defence wall and embankment construction would impact on fish (Salmonids, Lamprey and Eels). Downstream of construction, fish species would also be negatively impacted due to the reduced water quality during the in-stream construction period. Suitable mitigation measures are technically feasible. Permanent loss or removal of fisheries habitat due to channel realignment downstream of storage area was considered. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. The construction of embankments and walls would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Inside the storage area, the lands are currently in use as either agricultural or recreational. As such, the loss of biodiversity during a flood event in these areas is perceived to be minimal. The proposed flow control structure at mill race entrance on site north of Northern Relief Rd may alter hydraulics as well as water quality locally, which would negatively impact on fish habitats in the area.

Table 61 Area 1&2 – Land and Soil

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Localised excavation of alluvial sediments (900m^3) associated with channel widening and deepening.
OPTION 1&2B - Direct defences only	There are no significant issues identified in relation to this option for Land and Soils
OPTION 1&2C - Upstream Storage and Direct Defences	Potential impact on soil quality associated with recurring flooding in the storage areas including the potential for the deposition of fines (silt and clay) on the land and dis-improvement in the soil drainage and productivity as a result.

Table 62 Area 1&2 – Hydrogeology

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	There are no significant issues identified in relation to this option for hydrogeology.
OPTION 1&2B - Direct defences only	There are no significant issues identified in relation to this option for hydrogeology.
OPTION 1&2C - Upstream Storage and Direct Defences	There is a potential to induce groundwater flooding on adjacent land with the flooding of storage area due to groundwater underflow through the gravels underlying the embankment, particularly if the storage area remains full for a prolonged period of time. Mitigation measures, including sheet pile cut-offs, are technically viable.

Table 63 Area 1&2 – Water

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	In-channel dredging could directly impact invertebrate habitat in the channel. There is also the potential impact on the change in sediment flux over time to the downstream SAC of which "Maintain/Restore Natural Circulation of sediments" is a conservation objective for the Atlantic Salt Marsh. Detailed sediment transport modelling would be required to confirm magnitude, duration and extent of impact on sediment flux. Channel deepening and widening further downstream could negatively impact hydromorphology, and the associated physical habitat within the channel. Proposed deepening and widening will increase channel cross sectional area and are likely to influence flow velocity, hydraulic habitat and alter sediment storage and transport. Damage is likely to occur to existing bed forms and sediment structure. The dredged section downstream of Moore's Bridge will require ongoing maintenance with regular dredging likely to be required and would represent an on-going impact. The removal of Moore's Bridge is likely to have a minor short-term, localised impact on hydromorphological condition, sediment mobilisation, and fish and invertebrate habitat during construction. Construction would release fine sediment and possibly lead to smothering of gravels downstream. Over time, the river is likely to return to a more natural geometry as sediment is more likely to be deposited in deeper / low energy sections of the channel. Following construction, the removal of the bridge would improve lateral connectivity and riparian habitat. The proposed flow control structure at mill race entrance on site north of Northern Relief Rd may alter hydraulics as well as water quality locally.
OPTION 1&2B - Direct defences only	This option includes more limited in-channel works and no realignment of the river. The downstream SAC includes conservation objectives relating to maintaining sediment flux characteristics which could be impacted by proposed works. Maintenance and upgrades to embankments which are existing and/or set back from the channel are unlikely to directly impact upon the river channel or riparian zone or restrict lateral connectivity to the immediate floodplain (when compared to the existing scenario).

Option Description	Environmental Effects
	Tree clearance poses the greatest risk to the degradation of riparian corridor degradation and the environment under this option, which could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow. It is understood that the length of channel within this flood cell is already heavily modified therefore alterations may not necessarily reduce the hydromorphological status of the waterbody. The proximity of direct defences to the river channel and the associated impacts on the riparian corridor are a key issue. The implementation of the flow control structure may lead to localised impacts on channel hydraulics and water quality, and limit water entering the mill race during flood events. The proposed weir is likely to affect flow regime, sediment transport and longitudinal connectivity for fish.
OPTION 1&2C - Upstream Storage and Direct Defences	Flow control structure and the realignment of the river downstream of the storage area would be a significant impact on WFD objectives in relation to hydromorphology. This could impact the natural planform of the river, alter the form of the banks, increase flow velocity and cause localised erosion. The proposed 3 m high online storage embankment will significantly alter river form, continuity, and floodplain connectivity. This structure will lead to the direct loss of river length under the footprint of the embankment and alteration of the river upstream and downstream the river connects to the embankment / flow control. There will be a need to cut and fill upstream of the embankment to enable functionality of the flood storage area. The embankment will contain a flow control structure to limit water flowing downstream during flood events. Dependent on design, the flow control structure has the potential to form a barrier to sediment transport and fish passage. Further regrading works may also be required to ensure that levels and gradients are suitable. The proposed flow control structure at mill race entrance on site north of Northern Relief Rd may alter hydraulics as well as water quality locally.

Table 64 Area 1&2 – Air

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors. Also, potential for odour impacts during dredging.
OPTION 1&2B - Direct defences only	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.
OPTION 1&2C - Upstream Storage and Direct Defences	Greater separation from sensitive receptors for this option.

Table 65 Area 1&2 – Climate

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 1&2B - Direct defences only	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 1&2C - Upstream Storage and Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.

Table 66 Area 1&2 – Material Assets

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Midleton Railway Station and railway lines. Foul sewer and watermain infrastructure running along the R626 road, with connections servicing a mixture of residential, commercial, and industrial areas in Midleton. Extensive network of medium and low power (38kV and 110kV) power lines present underground in this area. This area also features numerous overhead powerlines. These are located through Water Rock Golf Course and a large number of the agricultural fields to the north. These are powered by a 110kV substation located between Water Rock Golf Course and East Cork Golf Club. The area is serviced by ENET infrastructure, with 4 ducts having been laid along the R626, Cork Road, Connolly Street and Main Street. EIR services are also present beneath these roads, and further extend into the adjacent areas. An extensive underground gas distribution system is present in the area, with gas mains located beneath the majority of roads in the study area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. Drainage networks are present in these areas. A large network runs down Mill Road, through Millbrook Estate and discharges to the Owenacurra River. A smaller network runs along a section of Mill Road further south, before discharging to the river adjacent to Riversdale Service Centre. A section of drainage network also discharges into the river from Market Green Shopping Centre Car Park.
OPTION 1&2B - Direct defences only	Midleton Railway Station and railway lines. Foul sewer and watermain infrastructure running along the R626 road, with connections servicing a mixture of residential, commercial, and industrial areas in Midleton. Extensive network of medium and low power (38kV and 110kV) power lines present underground in this area. This area also features numerous overhead powerlines. These are located through Water Rock Golf Course and a large number of the agricultural fields to the north. These are powered by a 110kV substation located between Water Rock Golf Course and East Cork Golf Club.

Option Description	Environmental Effects
	The area is serviced by ENET infrastructure, with 4 ducts having been laid along the R626, Cork Road, Connolly Street and Main Street. EIR services are also present beneath these roads, and further extend into the adjacent areas. An extensive underground gas distribution system is present in the area, with gas mains located beneath the majority of roads in the study area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. Drainage networks are present in these areas. A large network runs down Mill Road, through Millbrook Estate and discharges to the Owenacurra River. A smaller network runs along a section of Mill Road further south, before discharging to the river adjacent to Riversdale Service Centre.
OPTION 1&2C - Upstream Storage and Direct Defences	Midleton Railway Station and railway lines. Foul sewer and watermain infrastructure running along the R626 road, with connections servicing a mixture of residential, commercial, and industrial areas in Midleton. Extensive network of medium and low power (38kV and 110kV) power lines present underground in this area. This area also features numerous overhead powerlines. These are located through Water Rock Golf Course and a large number of the agricultural fields to the north. These are powered by a 110kV substation located between Water Rock Golf Course and East Cork Golf Club. The area is serviced by ENET infrastructure, with 4 ducts having been laid along the R626, Cork Road, Connolly Street and Main Street. EIR services are also present beneath these roads, and further extend into the adjacent areas. An extensive underground gas distribution system is present in the area, with gas mains located beneath the majority of roads in the study area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. Drainage networks are present in these areas. A large network runs down Mill Road, through Millbrook Estate and discharges to the Owenacurra River. A smaller network runs along a section of Mill Road further south, before discharging to the river adjacent to Riversdale Service Centre.

Table 67 Area 1&2 – Resources and Waste

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Import 9,000m^3 material for proposed embankments. Export of material from 3 locations, embankment at Clohessey's Yard and Embankment upgrade at Millbrook and Willowbank. Quantities from these not known at this stage. Dredging works downstream of Moore's Bridge (1m deep and 8m widening in parts) is estimated to generate 900m^3 material for disposal.
OPTION 1&2B - Direct defences only	Import 11,000m^3 material for proposed embankments. Export of material from 2 locations at embankment at Clohessey's Yard and Embankment upgrade at Millbrook and Willowbank. Quantity from these not known at this stage.
OPTION 1&2C - Upstream Storage and Direct Defences	Import of 50,000m^3 material. Export of existing material proposed from Embankment upgrade at Millbrook and Willowbank. Quantity from these not known at this stage.

Table 68 Area 1&2 – Cultural Heritage

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	Objective 3. F. (i) Clonmullin House – Broomfield West Negative Effect: The setting of Clonmullin House (NIAH 20906519) would be altered by the construction of 0.7m high walls on the east bank of the river. Positive Effect: Proposed works would protect Clonmullin House and grounds from damaging flood events. This would have a positive effect by securing its future preservation. Cork Rd Bridge Negative Effect: There would be a direct negative effect on Cork Bridge listed in the NIAH (NIAH 20830013; RMP CO076-106) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Objective 3. F. (ii) Mill Complex – Mill Road Negative Effect: There would be a direct negative effect on the mill complex (RMP CO076-112) off Mill Road. The proposed construction of a 0.5m wall at the boundary to the complex would have a direct negative effect on two features associated with the mill complex which were identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These comprise a substantial random rubble wall, 6m in height with two blocked window opes (CHS 12) and a section of the tail race (CHS 14). In addition, proposed works would alter the setting of the mill complex. Positive Effect: Proposed works would protect the remains of the mill complex from damaging flood events. This would have a positive effect by securing its future preservation.

Option Description	Environmental Effects
	Cork Bridge Negative Effect: There would be a direct negative effect on the Cork Bridge listed in the RMP (RMP CO076-106; NIAH 20830013) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Potential Subsurface Archaeological sites The construction of embankments; 0.4m, 0.7m, 1.2m and 2m high over a distance of approximately 1.2km could have a negative effect on potential subsurface archaeological sites and features. Areas of Archaeological Potential Proposed works would have a direct effect on the Owenacurra River which has been assessed as an Area of Archaeological Potential (AAP 1). This is particularly the case in Area 1 where an approx. 200m stretch of the river between the townlands of Knockgriffin and Broomfield West would be deepened by 1m and widened by up to 8m. Cultural Heritage Negative Effect: This option would have a direct negative effect on the Carrigogna Bridge depicted on OS 1st edition map (1841) and eight Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 04: Tailrace of Broomfield Woollen Mill CHS 05: Weir of Avoncore Corn Mill CHS 06: Headrace of Avoncore Corn Mill CJS 07: Stone culvert, not evident but remains may survive within the riverbank CHS 08: Concrete and stone revetment walls CHS 09: Weir of Avoncore Corn Mill CHS 10: Buildings on east bank which contain remains of 19th century Avoncore Corn Mill CHS 11: Mill race and sluice not evident in survey but may survive within the riverbank
OPTION 1&2B - Direct defences only	Objective 3. F. (i) Clonmullin House – Broomfield West Negative Effect: The setting of Clonmullin House (NIAH 20906519) would be altered by the construction of 1.2m high walls on the east bank of the river. Positive Effect: Proposed works would protect Clonmullin House and grounds from damaging flood events. This would have a positive effect by securing its future preservation.

Option Description	Environmental Effects
	Cork Bridge Negative Effect: There would be a direct negative effect on the Cork Bridge listed in the NIAH (NIAH 20830013; RMP CO076-106) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Objective 3. F. (ii) Mill Complex – Mill Road Negative Effect: There would be a direct negative effect on the mill complex (RMP CO076-112) off Mill Road. The proposed construction of a 0.5m wall at the boundary to the complex would have a direct negative effect on two features associated with the mill complex which were identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These comprise a substantial random rubble wall, 6m in height with two blocked window opes (CHS 12) and a section of the tail race (CHS 14). In addition, proposed works would alter the setting of the mill complex. Positive Effect: Proposed works would protect the remains of the mill complex from damaging flood events. This would have a positive effect by securing its future preservation. Cork Bridge Negative Effect: There would be a direct negative effect on the Cork Bridge listed in the RMP (RMP CO076-106; NIAH 20830013) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Potential Subsurface Archaeological sites The construction of embankments; 0.4, 0.7m, 1.2m and 2m high over a distance of approximately 1.4km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct effect on the Owenacurra River which has been assessed as an Area of Archaeological Potential (AAP 1). Cultural Heritage This Option would have a direct negative effect on eight Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 04: Tailrace of Broomfield Woollen Mill CHS 05: Weir of Avoncore Corn Mill CHS 06: Headrace of Avoncore Corn Mill CJS 07: Stone culvert, not evident but remains may survive within the riverbank

Option Description	Environmental Effects
	CHS 08: Concrete and stone revetment walls CHS 09: Weir of Avoncore Corn Mill CHS 10: Buildings on east bank which contain remains of 19th century Avoncore Corn Mill CHS 11: Mill race not evident in survey but may survive within the riverbank
OPTION 1&2C - Upstream Storage and Direct Defences	Objective 3. F. (i). Cork Bridge Negative Effect: There would be a direct negative effect on the Cork Bridge listed in the NIAH (NIAH 20830013; RMP CO076-106) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Objective 3. F. (ii). Mill Complex – Mill Road Negative Effect: There would be a direct negative effect on the mill complex (RMP CO076-112) off Mill Road. The proposed construction of a 0.5m wall at the boundary to the complex would have a direct negative effect on two features associated with the mill complex which were identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These comprise a substantial random rubble wall, 6m in height with two blocked window opes (CHS 12) and a section of the tail race (CHS 14). In addition, proposed works would alter the setting of the mill complex. Positive Effect: Proposed works would protect the remains of the mill complex from damaging flood events. This would have a positive effect by securing its future preservation Cork Bridge Negative effect: There would be a direct negative effect on Cork Bridge listed in the RMP (RMP CO076-106; NIAH 20830013) by the construction of walls which would tie into the parapet of the bridge both upstream and downstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect Cork Bridge from damaging flood events. This would have a positive effect by securing its future preservation. Potential Subsurface Archaeological sites The construction of embankments; 0.5m, 0.7m, 2m and 3m high over a distance of approximately 3.1km could have a negative effect on potential subsurface archaeological sites and features Area of Archaeological Potential Proposed works would have a direct negative effect on the Owenacurra River which has been assessed as an Area of Archaeological Potential (AAP 1).

Option Description	Environmental Effects
	Cultural Heritage This Option would have a direct negative effect on three Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 09: Weir of Avoncore Corn Mill CHS 10: Buildings on east bank which contain remains of 19th century Avoncore Corn Mill CHS 11: Mill race not evident in survey but may survive within the riverbank

Table 69 Area 1&2 – Landscape

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	The receiving landscape for this area was assigned a local sensitivity weighting of 4 on the basis that it is designated as a High value Landscape (HVL) in the Cork CDP. There is also an aspirational Riverside Walkway shown on CDP maps. This sensitivity weighting applies to all three options set out below. Option 1A The provision of a 1.1m embankment upstream of the northern bridge and walls downstream of southern bridge (Moore's bridge) will result in the loss of some dense riparian vegetation and minor loss of visual connection to the river for 2-3 dwellings on opposite side of the road at Broomfield Ridge. The north-western 1.2m embankment will not result in any material loss or residential visual amenity in the direction of Water Rock Golf Course, nor will 0.4m embankment unduly interrupt river views within Tir Cluain housing estate. The consolidation of bridges to the housing estates will be beneficial and replacement of the existing northern bridge at Broomfield Ridge will be of little consequence to landscape character / views. There will be some loss of mature riparian vegetation and riverside visual amenity for several houses due to conveyance works at the southern end of the scheme. Option 2A There will be a loss of some riparian vegetation due to the new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. The provision of the Millrace represents a potential enhancement of amenity views from adjacent houses. The bridge removal will reduce clutter and confusing adjacent relationship with the main bridge. Overall, this option was assigned a score of -1.
OPTION 1&2B - Direct defences only	Option 1B The provision of 2m embankment upstream of the northern bridge and walls downstream of the southern bridge (Moore's bridge) will result in the loss of some dense riparian vegetation and visual connection to river for 2-3 dwellings on opposite side of the road at Broomfield Ridge. The north-western 1.2m embankment will not result in any material loss or residential visual amenity in the direction of Water Rock Golf Course, nor will 0.4m embankment unduly interrupt river views within Tir Cluain housing estate.

Option Description	Environmental Effects
	Retention of the two adjacent southern bridges to the housing estates will remain visually complex. Option 2B There will be a loss of some riparian vegetation due to new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. Provision of the Millrace represents a potential enhancement of amenity views from adjacent houses. Overall, this option was assigned a score of -1.
OPTION 1&2C - Upstream Storage and Direct Defences	Option 1C Blocking of the southern end of designated scenic route S43 due to the construction of a roadside 3m embankment as well as the amenity countryside/river views of several houses on opposite side of the road will result in a potentially significant impact. The southern leg of the same embankment also serves to truncate the river corridor and reduce borrowed views across golf course from housing estate to the southeast. There will be a potential loss of mature treeline vegetation from two 3m high embankments to the northwest of the golf course. Reduced river views within golf course will occur as a result of the 0.7m embankment adjacent to the watercourse. The provision of a 2m high embankment to the east of the golf course at Broomfield Ridge will result in the loss of some dense riparian vegetation and visual connection to the river for dwellings on opposite side of the road. Option 2C There will be a loss of some riparian vegetation due to new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. The provision of the Millrace is a potential enhancement of amenity views from adjacent houses. Predominantly on the basis of the potential obstruction of views from southern portion of scenic route designation S43 and associated adjacent dwellings, this option has been assigned a score of -3.

Table 70 Area 1&2 – Vulnerability to major accidents and/or disasters

Option Description	Environmental Effects
OPTION 1&2A - Direct Defences and Conveyance improvements	No impact on the vulnerability of the study area to a major accident or disaster.
OPTION 1&2B - Direct defences only	No impact on the vulnerability of the study area to a major accident or disaster.
OPTION 1&2C - Upstream Storage and Direct Defences	No impact on the vulnerability of the study area to a major accident or disaster.

A.2 Area 3 – Town Centre and Bailick Road

Table 71 Area 3 – Population and Human Health

Option Description	Environmental Effects
OPTION 3A - Direct defences only	This option would seek to protect the following features: 130 residential properties in the area and 81 non-residential properties. • IDL Heritage Centre • Imokilly Medical Centre • Main Street Medical Centre • Midleton Lodge Park • Midleton Library • John F. Kennedy Memorial Park

Table 72 Area 3 – Biodiversity

Option Description	Environmental Effects
OPTION 3A - Direct defences only	This area would require significant in-stream works for the construction of walls and embankments, however this option does not present the possibility of direct impacts at this stage on any qualifying habitat. Potential indirect impacts on SAC/SPA habitats but not on conservation objectives were considered. Suitable mitigation measures are technically feasible and the careful location of works will avoid impacts on the Conservation Objectives of the 2 adjacent European sites. Potential localised loss of or disturbance to flora/fauna would be possible. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated. Otter habitats may be impacted where riverside works are required. Proposed flood defence wall construction would impact on fish (Salmonids, Lamprey and Eels). Downstream of construction, fish species would also be negatively impacted due to the reduced water quality during the in-stream construction period. Suitable mitigation measures are technically feasible. This is a non-sensitive water body (WB) as the confluence of the Dungourney is saline and so the potential effects on fisheries value was considered lower than in upstream areas. The construction of embankments and walls would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. It is noted that some mature trees would require felling.

Table 73 Area 3 – Land and Soil

Option Description	Environmental Effects
OPTION 3A - Direct defences only	There are no significant impacts for land and soil expected for this option.

Table 74 Area 3 – Hydrogeology

Option Description	Environmental Effects
OPTION 3A - Direct defences only	There are no significant impacts for hydrogeology expected for this option.

Table 4 Area 3 – Water

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Potential temporary construction impacts on water quality associated with in-stream works and works within floodplains. Construction works have the potential to result in tree removal where bankside works are proposed. Clearance could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow. Some changes to hydromorphology would be expected during the construction phase where in-stream works occur, however no permanent changes are envisioned as bankside walls would only be replaced.

Table 75 Area 3 – Air

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.

Table 76 Area 3 – Climate

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.

Table 77 Area 3 – Material Assets

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Foul sewer and watermain infrastructure running along Youghal Road, St. Mary's Road and Bailick Road with connections servicing a mixture of residential and commercial areas in Midleton. These run south into Ballinacurra. Extensive network of medium and low power (38kV and 110kV) power lines present underground in this area. This area also features overhead powerlines. These are predominantly located to the east in this area, beyond Woodbury Lawn through the agricultural areas. The area is serviced by ENET infrastructure, with 4 ducts having been laid along Connolly Street, Main Street, Youghal Road and Saint Mary's Road. Further ducts follow the East Cork Parkway. EIR services are also present beneath these roads, and further extend into the adjacent areas below ground.

Option Description	Environmental Effects
	An extensive underground gas distribution system is present in the area, with gas mains located beneath the majority of roads in the study area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. The N25/ East Cork Parkway crosses through the middle of this area. This road is a vital commuter road to and from Cork City. A number of drainage networks are present in this area. A large network runs along Main Street, Distillery Walk and Church Lane; prior to discharging into the Owenacurra River. Another large network drains The Cotswolds, the R629 Road and Dark Road before discharging to the estuary. Smaller networks are present along Bailick Road and through John F. Kennedy Memorial Park.

Table 78 Area 3 – Resources and Waste

Option Description	Environmental Effects
OPTION 3A - Direct defences only	3,000m^3 import of material envisaged. No export of material.

Table 79 Area 3 – Cultural Heritage

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Objective 3. F. (i) Lewis Bridge– Midleton Town Negative Effect: There would be a direct negative effect on the Lewis Bridge a Protected Structure (PS40; CO076-073002) by the construction of a 1m high wall which would tie into the bridge parapet upstream. The works would also have a negative visual effect on the bridge. Positive Effect: Proposed works would protect the bridge from damaging flood events. This would have a positive effect on its future preservation. Midleton House – Midleton Town Negative Effect: The setting of Midleton House (PS 51) on the north bank of the river would be altered by the construction of 1m high walls which would tie into the parapet of Lewis Bridge. Positive Effect: These works would protect the house and grounds from damaging flood events. This would have a positive effect on its future preservation. Midleton Distillery – Midleton Town Negative Effect: The setting of outbuilding (NIAH 20830064) which is part of the Midleton distillery complex (PS 1; CO076-025) would be altered by the construction of a 1m high wall adjacent to the south of the structure. Positive Effect: The wall would provide protection to the outbuilding and the distillery complex as a whole from damaging flood events and add to the security of the overall complex. This would have a positive effect on the future perseveration of the distillery complex. Quayside Warehouse - Bailick Road Negative Effect: There would be a direct negative effect on the curtilage/boundary walls of Quayside warehouse (PS00517; NIAH 20907624; CO076-111;).

Option Description	Environmental Effects
	Positive Effect: Proposed works would protect the boundary walls of the complex from damaging flood events. This would have a positive effect by securing its future preservation. Charleston Maltings – Bailick Road Negative Effect: There would be a direct negative effect on the curtilage/boundary walls of Charleston Maltings (PS00521; NIAH 20907627; CO076-074). Positive Effect: Proposed works would protect the boundary walls of the complex from damaging flood events. This would have a positive effect by securing its future preservation. Objective 3. F. (ii) Lewis Bridge– Midleton Town Negative Effect: There would be a direct negative effect on Lewis Bridge an RMP (CO076-073002; PS40) by the construction of a 1m high wall which would tie into the bridge parapet upstream. The works would also have a negative visual effect on the bridge. Positive Effect: These works would protect the bridge from damaging flood events. This would have a positive effect by securing its future preservation. Midleton Distillery – Midleton Town Negative Effect: The setting of outbuilding (NIAH 20830064) which is part of the Midleton distillery complex (CO076-025; PS1) would be altered by the construction of a 1m high wall adjacent to the south of the structure. Positive Effect: The wall would provide protection to the individual building and the distillery complex as a whole from damaging flood events and add to the security of the overall complex. This would have a positive effect by securing its future preservation. Quayside Warehouse - Bailick Road Negative Effect: There would be a direct negative effect on the curtilage/boundary walls Quayside warehouse an RMP (CO076-111; PS00517; NIAH 20907624) Positive Effect: Proposed works would protect the boundary walls of the complex from damaging flood events. This would have a positive effect by securing its future preservation. Charleston Maltings – Bailick Road Negative Effect: There would be a direct negative effect on the curtilage/boundary walls of Charlestown Maltings an RMP (CO076-074; PS00521; NIAH 20907627) Positive Effect: Proposed works would protect the boundary walls of the complex from damaging flood events. This would have a positive effect by securing its future preservation. Maltings – South Quay, Ballinacurra Negative Effect: The construction of a 0.8m wall to the north of the maltings an RMP (CO07-080) would have a direct negative effect on views to and from the building. Positive Effect: Proposed works would protect the maltings and grounds from damaging flood events. This would have a positive effect by securing its future preservation. Potential Subsurface Archaeological sites

Option Description	Environmental Effects
	The construction of embankments; 0.6m, 0.8m and 1.2m high over a distance of approximately 650m could have a negative effect on potential subsurface archaeological sites and features. Areas of Archaeological Potential Proposed works would have a direct negative effect on three Areas of Archaeological Potential; Owenacurra River (AAP 1), Dungourney River (AAP 2) and Owenacurra Estuary (AAP 4). Cultural Heritage Negative Effect: There would be a direct negative effect on 19th century quays which are part of the cultural heritage of the Owenacurra Estuary and Ballinacurra and its former prominence as a major trading port. The setting of the quays would be altered by the construction of 1.2-1.3m high walls along the estuary. Positive Effect: Proposed works would protect the remains of quays from damaging flood events. This would have a positive effect by securing their future preservation.

Table 80 Area 3 – Landscape

Option Description	Environmental Effects
OPTION 3A - Direct defences only	There is a designated scenic route that runs across the Ballincurra Bridge in addition to several riverside walkway sections. There will be a loss of a corridor of mature woodland trees and division of woodland from northern 1m embankment section through People's Park. There will also be some potential loss of mature riverside trees due to the introduction of the north-western section of 0.7m high wall to the rear of the Funeral Home and resultant reduction of visual connection to river from road at northern end of this wall. There will be some intrusion on estuarine / river views to the south of the Cork Road (on Bailick Road) in the vicinity of the slipway resulting from new and raised walls sections. Embankment section of <1m have limited impacts throughout this option (e.g. Choctaw park, South Quays). Overall, this option was assigned a score of -1.

Table 81 Area 3 – Vulnerability to major accidents and/or disasters

Option Description	Environmental Effects
OPTION 3A - Direct defences only	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200.

A.3 Area 4 – Lauriston & Rugby Club

Table 82 Area 4 – Population and Human Health

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	This option would seek to protect the following features: 13 residential properties in the area and 5 non-residential properties. • Midleton Rugby Club • Midleton Cricket Club • The proposed Midleton to Youghal Greenway • The proposed Northern Relief Road Extension
OPTION 4B - Pumping and Direct Defences	As above
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	As above
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	As above
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	As above

Table 83 Area 4 – Biodiversity

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	No apparent impacts on Annexed habitats or species. Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. The construction of the embankment would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Potential impacts on bats will need to be mitigated. No fisheries potential in this area. Some minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway / Railway corridor.
OPTION 4B - Pumping and Direct Defences	No apparent impacts on Annexed habitats or species. The construction of the embankment would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Potential impacts on bats will need to be mitigated. No fisheries potential in this area.

Option Description	Environmental Effects
	Some minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway / Railway corridor.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	No apparent impacts on Annexed habitats or species. Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. The construction of the embankment would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Potential impacts on bats will need to be mitigated. No fisheries potential in this area. Minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway / Railway corridor.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	No apparent impacts on Annexed habitats or species. Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. The construction of the embankment would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Potential impacts on bats will need to be mitigated. No fisheries potential in this area. Minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway / Railway corridor.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	No apparent impacts on Annexed habitats or species. Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. The construction of the embankment would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. Potential impacts on bats will need to be mitigated. No fisheries potential in this area. Potential loss of existing vegetation where embankment runs adjacent to hedgerows and Greenway, and where it crosses proposed Greenway / Railway corridor.

Table 84 Area 4 – Land and Soil

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	There is no significant likely impact associated with this option on Land and Soils.
OPTION 4B - Pumping and Direct Defences	There is no significant likely impact associated with this option on Land and Soils.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	There is no significant likely impact associated with this option on Land and Soils.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	There is no significant likely impact associated with this option on Land and Soils.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	There is no significant likely impact associated with this option on Land and Soils.

Table 85 Area 4 – Hydrogeology

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	There is a potential for up-gradient groundwater flooding of the cut-off however there are limited sensitive receptors in this area and therefore it is not considered a significant impact.
OPTION 4B - Pumping and Direct Defences	There is a potential that the cut-off could lead to groundwater flooding in the IDL site due to increased water level along the northern boundary. The underlying clay confining the limestone may mean there is a good vertical cut-off but this would need to be confirmed. Considerable risk associated with this option.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	There is a potential for up-gradient groundwater flooding of the cut-off however there are limited sensitive receptors in this area and therefore it is not considered a significant impact.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	There is a potential for up-gradient groundwater flooding of the cut-off however there are limited sensitive receptors in this area and therefore it is not considered a significant impact.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	There is a potential for up-gradient groundwater flooding of the cut-off however there are limited sensitive receptors in this area and therefore it is not considered a significant impact.

Table 86 Area 4 – Water

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	There are no significant potential impacts on water quality associated with this option. In channel works in the wet associated with flow control structure upgrade will have a temporary impact on water quality. This option will result in increased in-channel flows due to groundwater cut-off and restriction of the floodplain, this could result in an increase in-channel flow speeds during high flow events which could mobilise sediment leading to increased turbidity and sediment deposition downstream. Construction works will result in tree removal where the embankment is proposed. Clearance could destabilise and alter the land form which helps to protect the material from erosion, runoff and flow.
OPTION 4B - Pumping and Direct Defences	There are no significant potential impacts on water quality associated with this option. In channel works in the wet associated with flow control structure upgrade will have a temporary impact on water quality. It is outlined that outflows from the pumping station will not be directed to the river channel, but back upstream within the same floodplain. This crucially does not interfere with channel flows or morphology. Construction works will result in tree removal where the embankment is proposed. Clearance could destabilise and alter the land form which helps to protect the material from erosion, runoff and flow.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	There are no significant potential impacts on water quality associated with this option. In channel works in the wet associated with flow control structure upgrade will have a temporary impact on water quality. This option will result in increased in-channel flows due to groundwater cut-off and restriction of the floodplain, this could result in an increase in-channel flow speeds during high flow events which could mobilise sediment leading to increased turbidity and sediment deposition downstream. Construction works will result in tree removal where the embankment is proposed. Clearance could destabilise and alter the land form which helps to protect the material from erosion, runoff and flow.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	There are no significant potential impacts on water quality associated with this option. In channel works in the wet associated with flow control structure upgrade will have a temporary impact on water quality. This option will result in increased in-channel flows due to groundwater cut-off and restriction of the floodplain, this could result in an increase in-channel flow speeds during high flow events which could mobilise sediment leading to increased turbidity and sediment deposition downstream. Construction works will result in tree removal where the embankment is proposed. Clearance could destabilise and alter the land form which helps to protect the material from erosion, runoff and flow.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	There are no significant potential impacts on water quality associated with this option. In channel works in the wet associated with flow control structure upgrade will have a temporary impact on water quality.

Option Description	Environmental Effects
	This option will result in increased in-channel flows due to groundwater cut-off and restriction of the floodplain, this could result in an increase in-channel flow speeds during high flow events which could mobilise sediment leading to increased turbidity and sediment deposition downstream. Construction works will result in tree removal where the embankment is proposed. Clearance could destabilise and alter the land form which helps to protect the material from erosion, runoff and flow.

Table 87 Area 4 – Air

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	Works removed from sensitive receptors and no significant extent of works.
OPTION 4B - Pumping and Direct Defences	Works removed from sensitive receptors and no significant extent of works.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	Works removed from sensitive receptors and no significant extent of works.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	Works removed from sensitive receptors and no significant extent of works.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	Works removed from sensitive receptors and no significant extent of works.

Table 88 Area 4 – Climate

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	Minimal structures and embodied carbon.
OPTION 4B - Pumping and Direct Defences	Minimal structures and embodied carbon.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Extent may be reduced should combination with Northern Relief Road Extension occur.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Extent may be reduced should combination with Northern Relief Road Extension occur.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.

Table 89 Area 4 – Material Assets

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	No foul sewer or watermain infrastructure have been identified in the vicinity of this area. Overhead powerlines are located on the north and south of the area. These run adjacent to the R627 and along the private road leading to Cahermone Castle respectively. A high voltage powerline runs through the IDL site but is not located near where works are proposed for this option. ENET records show that there is a Fibre Backhaul located on the south side of the area, which runs into Midleton south of the IDL site. There are also ENET cables below Connolly Street. Neither EIR nor Gas Networks Ireland services are recorded in this area. Land use in this area is predominantly agricultural, with the exception of the IDL site, which is industrialised. There are sports grounds located to the east and a small number of residential properties to the west. The construction of the Midleton to Youghal Greenway is ongoing in this area. The Northern Relief Road Extension would be constructed through this area, should the project be constructed.
OPTION 4B - Pumping and Direct Defences	No foul sewer or watermain infrastructure have been identified in the vicinity of this area. Overhead powerlines are located on the north and south of the area. These run adjacent to the R627 and along the private road leading to Cahermone Castle respectively. A high voltage powerline runs through the IDL site but is not located near where works are proposed for this option. ENET records show that there is a Fibre Backhaul located on the south side of the area, which runs into Midleton south of the IDL site. There are also ENET cables below Connolly Street. Neither EIR nor Gas Networks Ireland services are recorded in this area. Land use in this area is predominantly agricultural, with the exception of the IDL site, which is industrialised. There are sports grounds located to the east and a small number of residential properties to the west. The construction of the Midleton to Youghal Greenway is ongoing in this area. The Northern Relief Road Extension would be constructed through this area, should the project be constructed.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	No foul sewer or watermain infrastructure have been identified in the vicinity of this area. Overhead powerlines are located on the north and south of the area. These run adjacent to the R627 and along the private road leading to Cahermone Castle respectively. A high voltage powerline runs through the IDL site but is not located near where works are proposed for this option. ENET records show that there is a Fibre Backhaul located on the south side of the area, which runs into Midleton south of the IDL site. There are also ENET cables below Connolly Street. Neither EIR nor Gas Networks Ireland services are recorded in this area.

Option Description	Environmental Effects
	Land use in this area is predominantly agricultural, with the exception of the IDL site, which is industrialised. There are sports grounds located to the east and a small number of residential properties to the west. The construction of the Midleton to Youghal Greenway is ongoing in this area. The Northern Relief Road Extension would be constructed through this area, should the project be constructed.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	No foul sewer or watermain infrastructure have been identified in the vicinity of this area. Overhead powerlines are located on the north and south of the area. These run adjacent to the R627 and along the private road leading to Cahermone Castle respectively. A high voltage powerline runs through the IDL site but is not located near where works are proposed for this option. ENET records show that there is a Fibre Backhaul located on the south side of the area, which runs into Midleton south of the IDL site. There are also ENET cables below Connolly Street. Neither EIR nor Gas Networks Ireland services are recorded in this area. Land use in this area is predominantly agricultural, with the exception of the IDL site, which is industrialised. There are sports grounds located to the east and a small number of residential properties to the west. The construction of the Midleton to Youghal Greenway is ongoing in this area. The Northern Relief Road Extension would be constructed through this area, should the project be constructed.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	No foul sewer or watermain infrastructure have been identified in the vicinity of this area. Overhead powerlines are located on the north and south of the area. These run adjacent to the R627 and along the private road leading to Cahermone Castle respectively. A high voltage powerline runs through the IDL site but is not located near where works are proposed for this option. ENET records show that there is a Fibre Backhaul located on the south side of the area, which runs into Midleton south of the IDL site. There are also ENET cables below Connolly Street. Neither EIR nor Gas Networks Ireland services are recorded in this area. Land use in this area is predominantly agricultural, with the exception of the IDL site, which is industrialised. There are sports grounds located to the east and a small number of residential properties to the west. The construction of the Midleton to Youghal Greenway is ongoing in this area. The Northern Relief Road Extension would be constructed through this area, should the project be constructed.

Table 90 Area 4 – Resources and Waste

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	20,000m^3 import of material envisaged. No export of material.
OPTION 4B - Pumping and Direct Defences	700m^3 import envisaged. No export
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	20,000m^3 import of material envisaged. No export of material. Quantity of material required may be reduced should combination with Northern Relief Road Extension be progressed.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	15,000m^3 import of material envisaged. No export of material. Quantity of material required may be reduced should combination with Northern Relief Road Extension be progressed.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	40,000m^3 import of material envisaged. No export of material.

Table 91 Area 4 – Cultural Heritage

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	Objective 3. F. (i) Midleton Distillery Negative Effect: A proposed embankment, 1.6m high would have a direct impact on a section of a millrace associated with Midleton Distillery (PS 1; CO076-025). Cahermone Castle Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (PS 00855; CO076-027001) situated 200m to the east of a proposed 1.6m high embankment. Objective 3. F. (ii) Midleton Distillery Negative Effect: A proposed embankment, 1.6m high would have a direct impact on a section of a millrace associated with Midleton Distillery (CO076-025; PS 1). Cahermone Castle – Cahermone Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (CO076-027001; PS 00855) situated 200m to the east of a proposed 1.6m high embankment. Potential Subsurface Archaeological sites The construction of a 1.6m embankment over a distance of approximately 550m could have a negative effect on potential subsurface archaeological sites and features. A burnt mound (CO076-134) excavated in advance of development in 2007 is situated 150m to the west of the embankment and a fulacht fia (CO076-026) found during construction of gas pipeline in 1987 (unexcavated) is situated 110m to the southwest. Similar type subsurface archaeological sites may exist in this low-lying area.

Option Description	Environmental Effects
OPTION 4B - Pumping and Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. The proposed 1.6m high embankment would extend over a distance of approximately 35m, substantially less than Option 4A.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	Objective 3. F. (i) Midleton Distillery Negative Effect: A proposed embankment, 2.5m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (PS 1; CO076-025). The flood defence embankment would not directly cross the millrace. Cahermone Castle Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (PS 00855; CO076-027001) situated 280m to the east of the proposed 2.5m high embankment. Objective 3. F. (ii) Midleton Distillery Negative Effect: A proposed embankment, 2.5m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (CO076-025; PS 1). Cahermone Castle – Cahermone. The flood defence embankment would not directly cross the millrace. Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (CO076-027001; PS 00855) situated 280m to the east of a proposed 2.5m high embankment. Potential Subsurface Archaeological sites The construction of a 2.5m high embankment over a distance of approximately 600m could have a negative effect on potential subsurface archaeological sites and features. A burnt mound (CO076-134) excavated in advance of development in 2007 is situated 80m to the west of the embankment and a fulacht fia (CO076-026) found during construction of gas pipeline in 1987 (unexcavated) is situated in close proximity to the south. Similar type subsurface archaeological sites may exist in this low-lying area.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	Objective 3. F. (i) Midleton Distillery Negative Effect: A proposed embankment, 2.5m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (PS 1; CO076-025). The flood defence embankment would not directly cross the millrace. Cahermone Castle Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (PS 00855; CO076-027001) situated 280m to the east of the proposed 2.5m high embankment.

Option Description	Environmental Effects
	Objective 3. F. (ii) Midleton Distillery Negative Effect: A proposed embankment, 2.5m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (CO076-025; PS 1). Cahermone Castle – Cahermone. The flood defence embankment would not directly cross the millrace. Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (CO076-027001; PS 00855) situated 280m to the east of a proposed 2.5m high embankment. Potential Subsurface Archaeological sites The construction of a 2.5m high embankment over a distance of approximately 600m could have a negative effect on potential subsurface archaeological sites and features. A burnt mound (CO076-134) excavated in advance of development in 2007 is situated 80m to the west of the embankment and a fulacht fia (CO076-026) found during construction of gas pipeline in 1987 (unexcavated) is situated in close proximity to the south. Similar type subsurface archaeological sites may exist in this low-lying area.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	Objective 3. F. (i) Midleton Distillery Negative Effect: A proposed embankment, 3.1m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (PS 1; CO076-025). The flood defence embankment would not directly cross the millrace. Cahermone Castle Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (PS 00855; CO076-027001) situated 280m to the east of the proposed 3.1m high embankment. Objective 3. F. (ii) Midleton Distillery Negative Effect: A proposed embankment, 3.1m high would have an indirect impact on a section of a millrace associated with Midleton Distillery (CO076-025; PS 1). Cahermone Castle – Cahermone. The flood defence embankment would not directly cross the millrace. Negative Effect: There would be a limited negative visual effect on the setting of Cahermone Castle (CO076-027001; PS 00855) situated 280m to the east of a proposed 3.1m high embankment. Potential Subsurface Archaeological sites The construction of a 3.1m high embankment over a distance of approximately 600m could have a negative effect on potential subsurface archaeological sites and features. A burnt mound (CO076-134) excavated in advance of development in 2007 is situated 80m to the west of the embankment and a fulacht fia (CO076-026) found during construction of gas pipeline in 1987 (unexcavated) is situated in close proximity to the south. Similar type subsurface archaeological sites may exist in this low-lying area.

Table 92 Area 4 – Landscape

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There is also a proposed Greenway along the disused railway corridor. This sensitivity rating applies to all options. There will be some minor potential loss of existing vegetation where the embankment runs adjacent to hedgerows and where it crosses the proposed Greenway / Railway corridor.
OPTION 4B - Pumping and Direct Defences	There will be some very minor potential loss of existing vegetation where the embankment crosses the proposed Greenway / Railway corridor. There will also be a minor visual impact from the pumping station within the rugby club grounds.
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There is also a proposed Greenway along the disused railway corridor. This sensitivity rating applies to all options. There will be some minor potential loss of existing vegetation where the embankment runs adjacent to hedgerows and where it crosses the proposed Greenway / Railway corridor. It should be noted that the Northern Relief Road Extension may already cause the loss of visual amenity should that project progress, and a combination of schemes may reduce the overall impact, as opposed to the two schemes being constructed within close proximity of each other.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There is also a proposed Greenway along the disused railway corridor. This sensitivity rating applies to all options. There will be some minor potential loss of existing vegetation where the embankment runs adjacent to hedgerows and where it crosses the proposed Greenway / Railway corridor. It should be noted that the Northern Relief Road Extension may already cause the loss of visual amenity should that project progress, and a combination of schemes may reduce the overall impact, as opposed to the two schemes being constructed within close proximity of each other.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There is also a proposed Greenway along the disused railway corridor. This sensitivity rating applies to all options. There will be some significant potential loss of existing vegetation where the embankment runs adjacent to hedgerows and the Greenway, and where it crosses the proposed Greenway / Railway corridor.

Table 93 Area 4 – Vulnerability to major accidents and/or disasters

Option Description	Environmental Effects
OPTION 4A - Groundwater Cut-off and Direct Defences	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200.
OPTION 4B - Pumping and Direct Defences	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate increase in the vulnerability of the study area to a major accident or disaster: Potential for Groundwater Flooding in IDL due to embankment underflow. Although flooding occurred within IDL site during 2015/2016 event, it is unclear if it was groundwater flooding. It may have been mitigated due to natural barrier in the form of the low permeability clays under the gravels or due to IDL groundwater control infrastructure
OPTION 4C-1 – Combined Design with Embankment at Greenway Crossing	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200.
OPTION 4C-2 – Combined Design with Flood Barrier at Greenway Crossing	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200.
OPTION 4E - Groundwater Cut-offs and Direct Defences along Greenway	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd. Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200.

A.4 Area 5 – Ballinacurra

Table 94 Area 5 – Population and Human Health

Option Description	Environmental Effects
OPTION 5A - Direct Defences	This option would seek to protect the following features: • 30 residential properties in the area and 9 non-residential properties. • Rainbow Montessori
OPTION 5B - Upstream Storage	As above
OPTION 5B-1 – Refined Storage Area and Overpumping	As above
OPTION 5C – Optimised Direct Defences and Overpumping	As above
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	As above

Table 95 Area 5 – Biodiversity

Option Description	Environmental Effects
OPTION 5A - Direct Defences	Due to in-stream works, there is a potential for short-term or intermittent impediment to the achievement of waterbody objectives. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. Short-term minor impacts to fisheries habitat in a non-sensitive waterbody. Potential impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. The construction of the walls and embankments would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats.
OPTION 5B - Upstream Storage	Due to in-stream works, there is a potential for medium-term or recurring impediment to the achievement of waterbody objectives due to minor channel realignment works. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. Short-term minor impacts to fisheries habitat in a non-sensitive waterbody. Potential impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. The construction of the walls and embankments would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats.

Option Description	Environmental Effects
OPTION 5B-1 – Refined Storage Area and Overpumping	Due to in-stream works, there is a potential for medium-term or recurring impediment to the achievement of waterbody objectives due to minor channel realignment works. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. Short-term minor impacts to fisheries habitat in a non-sensitive waterbody. Potential impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. The construction of the walls and embankments would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats. This area would require a significant amount of in-stream works for the construction of the embankments. The reduction in water quality would likely adversely affect Fisheries Habitats downstream during the construction. Mitigation measures would be required.
OPTION 5C – Optimised Direct Defences and Overpumping	Due to in-stream works, there is a potential for short-term or intermittent impediment to the achievement of waterbody objectives. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. Short-term minor impacts to fisheries habitat in a non-sensitive waterbody. Potential impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. The construction of the walls and embankments would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Due to in-stream works, there is a potential for medium-term or recurring impediment to the achievement of waterbody objectives due to minor channel realignment works. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. Short-term minor impacts to fisheries habitat in a non-sensitive waterbody. Potential impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. The construction of the walls and embankments would require the removal of trees in some areas. This would likely negatively impact on bat and bird habitats.

Table 96 Area 5 – Land and Soil

Option Description	Environmental Effects
OPTION 5A - Direct Defences	There is no significant likely impact associated with this option on Land and Soils.
OPTION 5B - Upstream Storage	Potential minor impact on soil quality associated with recurring flooding in the storage areas including the potential for the deposition of fines (silt and clay) on the land and dis-improvement in the soil drainage and productivity as a result. This area is however already prone to flooding and the soil quality is relatively poor as a result.
OPTION 5B-1 – Refined Storage Area and Overpumping	Potential minor impact on soil quality associated with recurring flooding in the storage areas including the potential for the deposition of fines (silt and clay) on the land and dis-improvement in the soil drainage and productivity as a result. This area is however already prone to flooding and the soil quality is relatively poor as a result.
OPTION 5C – Optimised Direct Defences and Overpumping	There is no significant likely impact associated with this option on Land and Soils.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Potential minor impact on soil quality associated with recurring flooding in the storage areas including the potential for the deposition of fines (silt and clay) on the land and dis-improvement in the soil drainage and productivity as a result. This area is however already prone to flooding and the soil quality is relatively poor as a result.

Table 97 Area 5 – Hydrogeology

Option Description	Environmental Effects
OPTION 5A - Direct Defences	There is no significant likely impact associated with this option on hydrogeology.
OPTION 5B - Upstream Storage	There is no significant likely impact associated with this option on hydrogeology.
OPTION 5B-1 – Refined Storage Area and Overpumping	There is no significant likely impact associated with this option on hydrogeology.
OPTION 5C – Optimised Direct Defences and Overpumping	There is no significant likely impact associated with this option on hydrogeology.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	There is no significant likely impact associated with this option on hydrogeology.

Table 98 Area 5 – Water

Option Description	Environmental Effects
OPTION 5A - Direct Defences	No significant and permanent potential impacts on water quality. In-channel works could lead to temporary construction impacts on water quality. Due to the tightly constrained area, these defences will be placed onto or close to the riverbank, requiring in-channel structures if they do not already exist. However, since this portion is already heavily modified, replacements of floodwalls may not necessarily decrease the hydromorphological status of the waterbody. Channel realignment works also have the potential to cause in-channel damage to morphology (e.g. by utilising in-channel structures during construction which damage the riverbed) and ecology (e.g. by potentially removing valuable invertebrate assemblages and utilised fish spawning areas that could contain eggs or recently hatched fish). However, this is a relatively limited extent therefore potential impact is limited.
OPTION 5B - Upstream Storage	No significant impact on water quality as a result of proposed option. In-channel works could lead to temporary construction impacts on water quality. Flow control structure could impede sediment transport and reduce light over a stretch of the channel. This would also alter the natural hydromorphology. Channel realignment works also have the potential to cause in-channel damage to morphology (e.g. by utilising in-channel structures during construction which damage the riverbed) and ecology (e.g. by potentially removing valuable invertebrate assemblages and utilised fish spawning areas that could contain eggs or recently hatched fish). However, this is a relatively limited extent therefore potential impact is limited.
OPTION 5B-1 – Refined Storage Area and Overpumping	No significant impact on water quality as a result of proposed option. In-channel works could lead to temporary construction impacts on water quality. Flow control structure could impede sediment transport and reduce light over a stretch of the channel. This would also alter the natural hydromorphology. Channel realignment works also have the potential to cause in-channel damage to morphology (e.g. by utilising in-channel structures during construction which damage the riverbed) and ecology (e.g. by potentially removing valuable invertebrate assemblages and utilised fish spawning areas that could contain eggs or recently hatched fish). However, this is a relatively limited extent therefore potential impact is limited.
OPTION 5C – Optimised Direct Defences and Overpumping	No significant and permanent potential impacts on water quality. In-channel works could lead to temporary construction impacts on water quality. Due to the tightly constrained area, these defences will be placed onto or close to the riverbank, requiring in-channel structures if they do not already exist. However, since this portion is already heavily modified, replacements of floodwalls may not necessarily decrease the hydromorphological status of the waterbody. Channel realignment works also have the potential to cause in-channel damage to morphology (e.g. by utilising in-channel structures during construction which damage the riverbed) and ecology (e.g. by potentially removing valuable invertebrate assemblages and utilised fish spawning areas that could contain eggs or recently hatched fish). However, this is a relatively limited extent therefore potential impact is limited.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	No significant and permanent potential impacts on water quality. In-channel works could lead to temporary construction impacts on water quality. Due to the tightly constrained area, these defences will be placed onto or close to the riverbank, requiring in-channel structures if they do not already exist. However, since this portion is already heavily modified, replacements of floodwalls may not necessarily decrease the hydromorphological status of the waterbody. Channel realignment works also have the potential to cause in-channel damage to morphology (e.g. by utilising in-channel structures during construction which damage the riverbed) ecology (e.g. by potentially removing valuable invertebrate assemblages and utilised fish spawning areas that could contain eggs or recently hatched fish). However, this is a relatively limited extent therefore potential impact is limited. Flow control structure could impede sediment transport and reduce light over a stretch of the channel. This would also alter the natural hydromorphology.

Table 99 Area 5 – Air

Option Description	Environmental Effects
OPTION 5A - Direct Defences	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.
OPTION 5B - Upstream Storage	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors. Extent is less with this option, as works would predominantly occur away from residential areas.
OPTION 5B-1 – Refined Storage Area and Overpumping	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors. Extent is less with this option, as works would predominantly occur away from residential areas.
OPTION 5C – Optimised Direct Defences and Overpumping	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Potential for significant temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.

Table 100 Area 5 – Climate

Option Description	Environmental Effects
OPTION 5A - Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 5B - Upstream Storage	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 5B-1 – Refined Storage Area and Overpumping	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Operation of pumping station would also result in the indirect generation of carbon emissions.
OPTION 5C – Optimised Direct Defences and Overpumping	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Operation of pumping station would also result in the indirect generation of carbon emissions.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Operation of pumping station would also result in the indirect generation of carbon emissions.

Table 101 Area 5 – Material Assets

Option Description	Environmental Effects
OPTION 5A - Direct Defences	Foul sewer and watermain infrastructure are present along Lower Road and Upper Road, with connections to residential properties and businesses in Ballinacurra. A watermain is present along Geragh Road, without a foul sewer. Low and medium power (38kV and 110kV) power lines are present underground in some locations. These are primarily along Upper Road and Rose Lane. An extensive network of overhead cables runs through the area, covering Upper Road, Lower Road, Geragh Road, Rocky Road and Bailick Road. Overhead cables are also located through many of the agricultural fields to the east of Ballinacurra. No ENET or EIR services have been identified in this area. An extensive network of underground gas mains is present throughout the urban section of the scheme area. These cover most roads, with the exception of Geragh Road east of Kearney's Cross and South Quay Road. A gas compressor station is located to the south, approximately 800m from the area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.
OPTION 5B - Upstream Storage	Foul sewer and watermain infrastructure are present along Lower Road and Upper Road, with connections to residential properties and businesses in Ballinacurra. A watermain is present along Geragh Road, without a foul sewer. Low and medium power (38kV and 110kV) power lines are present underground in some locations. These are primarily along Upper Road and Rose Lane. An extensive network of overhead cables runs through the area, covering Upper Road, Lower Road, Geragh Road, Rocky Road and Bailick Road. Overhead cables are also located through many of the agricultural fields to the east of Ballinacurra. No ENET or EIR services have been identified in this area. An extensive network of underground gas mains is present throughout the urban section of the scheme area. These cover most roads, with the exception of Geragh Road east of Kearney's Cross and South Quay Road. A gas compressor station is located to the south, approximately 800m from the area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.
OPTION 5B-1 – Refined Storage Area and Overpumping	Foul sewer and watermain infrastructure are present along Lower Road and Upper Road, with connections to residential properties and businesses in Ballinacurra. A watermain is present along Geragh Road, without a foul sewer. Low and medium power (38kV and 110kV) power lines are present underground in some locations. These are primarily along Upper Road and Rose Lane. An extensive network of overhead cables runs through the area, covering Upper Road, Lower Road, Geragh Road, Rocky Road and Bailick Road. Overhead cables are also located through many of the agricultural fields to the east of Ballinacurra. No ENET or EIR services have been identified in this area. An extensive network of underground gas mains is present throughout the urban section of the scheme area. These cover most roads, with the exception of Geragh Road east of Kearney's Cross and South Quay Road. A gas compressor station is located to the south, approximately 800m from the area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.
OPTION 5C – Optimised Direct Defences and Overpumping	Foul sewer and watermain infrastructure are present along Lower Road and Upper Road, with connections to residential properties and businesses in Ballinacurra. A watermain is present along Geragh Road, without a foul sewer.

Option Description	Environmental Effects
	Low and medium power (38kV and 110kV) power lines are present underground in some locations. These are primarily along Upper Road and Rose Lane. An extensive network of overhead cables runs through the area, covering Upper Road, Lower Road, Geragh Road, Rocky Road and Bailick Road. Overhead cables are also located through many of the agricultural fields to the east of Ballinacurra. No ENET or EIR services have been identified in this area. An extensive network of underground gas mains is present throughout the urban section of the scheme area. These cover most roads, with the exception of Geragh Road east of Kearney's Cross and South Quay Road. A gas compressor station is located to the south, approximately 800m from the area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Foul sewer and watermain infrastructure are present along Lower Road and Upper Road, with connections to residential properties and businesses in Ballinacurra. A watermain is present along Geragh Road, without a foul sewer. Low and medium power (38kV and 110kV) power lines are present underground in some locations. These are primarily along Upper Road and Rose Lane. An extensive network of overhead cables runs through the area, covering Upper Road, Lower Road, Geragh Road, Rocky Road and Bailick Road. Overhead cables are also located through many of the agricultural fields to the east of Ballinacurra. No ENET or EIR services have been identified in this area. An extensive network of underground gas mains is present throughout the urban section of the scheme area. These cover most roads, with the exception of Geragh Road east of Kearney's Cross and South Quay Road. A gas compressor station is located to the south, approximately 800m from the area. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.

Table 102 Area 5 – Resources and Waste

Option Description	Environmental Effects
OPTION 5A - Direct Defences	2,000m^3 import envisaged. No export of material.
OPTION 5B - Upstream Storage	8,000m^3 import envisaged. No export of material.
OPTION 5B-1 – Refined Storage Area and Overpumping	4,000m^3 import envisaged. No export of material.
OPTION 5C – Optimised Direct Defences and Overpumping	2,000m^3 import envisaged. No export of material.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	3,000m^3 import envisaged. No export of material.

Table 103 Area 5 – Cultural Heritage

Option Description	Environmental Effects
OPTION 5A - Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Negative Effect: Direct impact on five features of architectural/cultural heritage note (CHS 18-CHS 22) identified by the Underwater Survey. Positive Effect: The proposed works would increase the level of protection from flooding for architectural sites included in RPS and NIAH to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Potential Subsurface Archaeological sites The construction of a 0.9m high embankment over a distance of approximately 250m could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on the Ballinacurra River which has been assessed as an Area of Archaeological Potential (AAP 3). Cultural Heritage Negative Effect: This Option would have a direct negative effect on five Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 18: Wall of coursed roughly squared limestone up to 2m in height and 0.3m in width. CHS 19: Culvert beneath Lower Road CHS 20: Culvert beneath Lower Road CHS 21 – Canalised section of the Ballinacurra river with well-preserved walls 1.5m in height CHS 22 – Causeway/bridge
OPTION 5B - Upstream Storage	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Positive Effect: The proposed works would increase the level of protection from flooding for architectural sites included in RPS and NIAH to the south of the river in the village of Ballinacurra and would also increase the level of protection on five features of architectural/cultural heritage note (CHS 18-CHS 22) identified by the Underwater Survey. This would have a positive effect by securing their future preservation. Objective 3. F. (ii)

Option Description	Environmental Effects
	Fulacht fia – Castleredmond Negative Effect: Fulacht fia (CO076-064) adjacent to a proposed 2m high embankment. The site was partially excavated in 1982. The remainder of the site may be preserved in situ following minor changes to the embankment location. Burial – Coppingerstown Negative Effect: The site of burial in a stone-lined cist (CO076-052) situated in a proposed storage area. The burial was excavated in 1961 and therefore removed and preserved by record. Castle - Coppingerstown Negative Effect: The construction of a 1.3m high embankment could have a negative visual effect on a tower house (CO076-051) situated to north. Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Potential Subsurface Archaeological sites The construction of three embankments; 0.6m high, 1.3m high and 2m high over a distance of approximately 1.1km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on a small section of the Ballinacurra River which has been assessed as an Area of Archaeological Potential (AAP 3). Cultural Heritage Positive Effect: Proposed works would increase the level of protection from flooding on five cultural heritage features identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 18: Wall of coursed roughly squared limestone up to 2m in height and 0.3m in width. CHS 19: Culvert beneath Lower Road CHS 20: Culvert beneath Lower Road CHS 21 – Canalised section of the Ballinacurra river with well-preserved walls 1.5m in height CHS 22 – Causeway/bridge
OPTION 5B-1 – Refined Storage Area and Overpumping	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Positive Effect: The proposed works would increase the level of protection from flooding for architectural sites included in RPS and NIAH to the south of the river in the village of Ballinacurra and would also increase the level of protection on five features of architectural/cultural heritage note (CHS 18-CHS 22) identified by the Underwater Survey. This would have a positive effect by securing their future preservation. Objective 3. F. (ii)

Option Description	Environmental Effects
	Fulacht fia – Castleredmond Positive Effect: Fulacht fia (CO076-064) downstream of 1.9m high embankment. The site was partially excavated in 1982. The remainder of the site may be preserved in situ following minor changes to the embankment location. Burial – Coppingerstown Negative Effect: The site of burial in a stone-lined cist (CO076-052) situated in a proposed storage area. The burial was excavated in 1961 and therefore removed and preserved by record. Castle - Coppingerstown Negative Effect: The construction of a 0.5m high embankment could have a negative visual effect on a tower house (CO076-051) situated to north. Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Potential Subsurface Archaeological sites The construction of four embankments; 0.4m high, 1.9m high, 0.5m high and 1.4m high over a distance of approximately 0.5km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on a small section of the Ballinacurra River which has been assessed as an Area of Archaeological Potential (AAP 3). Cultural Heritage Positive Effect: Proposed works would increase the level of protection from flooding on five cultural heritage features identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 18: Wall of coursed roughly squared limestone up to 2m in height and 0.3m in width. CHS 19: Culvert beneath Lower Road CHS 20: Culvert beneath Lower Road CHS 21 – Canalised section of the Ballinacurra river with well-preserved walls 1.5m in height CHS 22 – Causeway/bridge
OPTION 5C – Optimised Direct Defences and Overpumping	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Negative Effect: Direct impact on five features of architectural/cultural heritage note (CHS 18-CHS 22) identified by the Underwater Survey. Positive Effect: The proposed works would increase the level of protection from flooding for architectural sites included in RPS and NIAH to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Objective 3. F. (ii)

Option Description	Environmental Effects
	There are no known/recorded archaeological sites in the area of proposed works. Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Potential Subsurface Archaeological sites The construction of a 0.9m high embankment over a distance of approximately 250m could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on the Ballinacurra River which has been assessed as an Area of Archaeological Potential (AAP 3). Cultural Heritage Negative Effect: This Option would have a direct negative effect on five Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 18: Wall of coursed roughly squared limestone up to 2m in height and 0.3m in width. CHS 19: Culvert beneath Lower Road CHS 20: Culvert beneath Lower Road CHS 21 – Canalised section of the Ballinacurra river with well-preserved walls 1.5m in height CHS 22 – Causeway/bridge
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Negative Effect: Direct impact on four features of architectural/cultural heritage note (CHS 18,19,21 and 22) identified by the Underwater Survey. Positive Effect: The proposed works would increase the level of protection from flooding for architectural sites included in RPS and NIAH to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Objective 3. F. (ii) Fulacht fia – Castleredmond Positive Effect: Fulacht fia (CO076-064) downstream of 1.1m high embankment. The site was partially excavated in 1982. The remainder of the site may be preserved in situ following minor changes to the embankment location. Burial – Coppingerstown Negative Effect: The site of burial in a stone-lined cist (CO076-052) situated in a proposed storage area. The burial was excavated in 1961 and therefore removed and preserved by record. Castle - Coppingerstown Negative Effect: The construction of a 1.0m high embankment could have a negative visual effect on a tower house (CO076-051) situated to north.

Option Description	Environmental Effects
	Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Positive Effect: The proposed works would increase the level of protection from flooding for archaeological sites included in the RMP to the south of the river in the village of Ballinacurra. This would have a positive effect by securing their future preservation. Potential Subsurface Archaeological sites The construction of a 0.9m high embankment over a distance of approximately 250m could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on the Ballinacurra River which has been assessed as an Area of Archaeological Potential (AAP 3). Cultural Heritage Negative Effect: This Option would have a direct negative effect on four Cultural Heritage Sites identified in the Underwater Survey (O'Donoghue and Haskins, 2020). These consist of the following; CHS 18: Wall of coursed roughly squared limestone up to 2m in height and 0.3m in width. CHS 19: Culvert beneath Lower Road CHS 21 – Canalised section of the Ballinacurra river with well-preserved walls 1.5m in height CHS 22 – Causeway/bridge

Table 104 Area 5 – Landscape

Option Description	Environmental Effects
OPTION 5A - Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There is also a designated scenic route that runs across the Ballincurra Bridge. This applies to all scheme options. There will be a very minor intrusion on river views for local residents at Gearagh Road from increased height of walls and bridge parapets. There will also be some minor visual impacts arising from the above ground elements of the pumping stations.
OPTION 5B - Upstream Storage	There will be a potential loss of hedgerow and treeline vegetation and associated visual impact from 2m and 1.3m high embankments around retention area. There will be minor visual impacts from above ground elements of the pumping stations.
OPTION 5B-1 – Refined Storage Area and Overpumping	There will be a potential loss of hedgerow and treeline vegetation and associated visual impact from 1.9m and 1.4m high embankments around retention area. There will be minor visual impacts from above ground pumping stations. The extents would be more limited than Option 5B.
OPTION 5C – Optimised Direct Defences and Overpumping	There will be a very minor intrusion on river views for local residents at Gearagh Road from increased height of walls and bridge parapets. There will also be some minor visual impacts arising from the above ground pumping stations.

Option Description	Environmental Effects
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	There will be a very minor intrusion on river views for local residents at Gearagh Road from increased height of walls and bridge parapets. There will also be some minor visual impacts arising from the above ground pumping stations. There will be a potential loss of hedgerow and treeline vegetation and associated visual impact from 1.1m and 1.0m high embankments around retention area. There will be minor visual impacts from above ground pumping stations.

Table 105 Area 5 – Vulnerability to major accidents and/or disasters

Option Description	Environmental Effects
OPTION 5A - Direct Defences	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 5B - Upstream Storage	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 5B-1 – Refined Storage Area and Overpumping	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 5C – Optimised Direct Defences and Overpumping	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 5D – Optimised Direct Defences, Upstream Storage and Overpumping	No impact to the vulnerability of the study area to a major accident or disaster.

A.5 Area 6 – Water Rock to Dwyer's Rd

Table 106 Area 6 – Population and Human Health

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	This option would seek to protect the following features: • 9 residential properties in the area and 5 non-residential properties. • Gaelscoil Mhainistir Na Corann
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	As above
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	As above
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	As above

Table 107 Area 6 – Biodiversity

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	This area would require in-stream works for the construction of the embankments and the flow control structure upstream. Short-term or intermittent impediment to the achievement of waterbody objectives. Flow diversion is considered limited impact as will only be operational in extreme flood events. Potential impact from in-channel works No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. This will be a requirement for control of water quality during construction using suitable mitigation measures. Potential localised loss of low value biodiversity areas. Short-term minor impacts to non-sensitive waterbody of low fisheries value.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	This area would require in-stream works for the construction of the embankments and the flow control structure upstream. Short-term or intermittent impediment to the achievement of waterbody objectives. Flow diversion is considered limited impact as will only be operational in extreme flood events. Potential impact from in-channel works No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. This will be a requirement for control of water quality during construction using suitable mitigation measures. Potential localised loss of low value biodiversity areas. Short-term minor impacts to non-sensitive waterbody of low fisheries value.

Option Description	Environmental Effects
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	This area would require in-stream works for the construction of the embankments and the flow control structure upstream. Short-term or intermittent impediment to the achievement of waterbody objectives. Flow diversion is considered limited impact as will only be operational in extreme flood events. Potential impact from in-channel works No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. This will be a requirement for control of water quality during construction using suitable mitigation measures. Potential localised loss of low value biodiversity areas. Long lengths of new open channel may facilitate new biodiversity opportunities however. Short-term minor impacts to non-sensitive waterbody of low fisheries value.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	Permanent impediment to the achievement of waterboady objectives. Change in channel hydromorphology where the Water Rock stream emerges would see an open channel replace a section of the natural stream, in a new alignment. No apparent impacts on Annexed habitats or species. However there may be potential temporary disturbance to Wintering birds. However this can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming activity. This will be a requirement for control of water quality during construction using suitable mitigation measures. Potential localised loss of low value biodiversity areas. Long lengths of new open channel may facilitate new biodiversity opportunities however. Permanent loss or removal of fisheries habitat within non sensitive watercourse due to channel realignment and introduction of short lengths of culverts.

Table 108 Area 6 – Land and Soil

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	No significant impacted expected for Land and Soils with the proposed option.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	No significant impacted expected for Land and Soils with the proposed option.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	No significant impacted expected for Land and Soils with the proposed option.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	No significant impacted expected for Land and Soils with the proposed option.

Table 109 Area 6 – Hydrogeology

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	There is a potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra however there remains some uncertainty on the hydrogeological processes and hydraulic connection between the swallow hole and spring as dye tracing experiments have not proved conclusive. As such the beneficial impact is scored as relatively minor, residual groundwater flooding issues may persist at the spring outlet.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	There is a potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra however there remains some uncertainty on the hydrogeological processes and hydraulic connection between the swallow hole and spring as dye tracing experiments have not proved conclusive. As such the beneficial impact is scored as relatively minor, residual groundwater flooding issues may persist at the spring outlet.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	There is a potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra however there remains some uncertainty on the hydrogeological processes and hydraulic connection between the swallow hole and spring as dye tracing experiments have not proved conclusive. As such the beneficial impact is scored as relatively minor, residual groundwater flooding issues may persist at the spring outlet.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	There is a potential reduction in groundwater flooding due to diversion of flood waters to the Water Rock Stream downstream of springs, however there remains some uncertainty on the hydrogeological processes and hydraulic connection between the swallow hole and spring as dye tracing experiments have not proved conclusive. As such the beneficial impact is scored as relatively minor, residual groundwater flooding issues may persist at the spring outlet.

Table 110 Area 6 – Water

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	Flow diversion is considered limited impact as will only be operational in extreme events. Water volumes are not expected to be large enough to cause significant sediment erosion at the confluence of the culverted diversion into the Owenacurra River. The upgrades in this option to embankments are not expected to alter the hydromorphological status of the river. Temporary potential impact on water quality from in-channel works during construction. Culvert existing open channel at the WWTP is a potential permanent impact on channel morphology, however this, plus the upgradient embankment will prevent water quality impacts on the SAC by limiting the potential for flooding of wastewater during storm events. Construction works could result in tree removal where the embankment is proposed. Clearance could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	Flow diversion is considered limited impact as will only be operational in extreme events. Water volumes are not expected to be large enough to cause significant sediment erosion at the confluence of the culverted diversion into the Owenacurra River. The upgrades in this option to embankments are not expected to alter the hydromorphological status of the river. Temporary potential impact on water quality from in-channel works during construction.

Option Description	Environmental Effects
	Culvert existing open channel at the WWTP is a potential permanent impact on channel morphology, however this, plus the upgradient embankment will prevent water quality impacts on the SAC by limiting the potential for flooding of wastewater during storm events. Construction works could result in tree removal where the embankment is proposed. Clearance could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow. This option would discharge directly into a floodplain.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	Flow diversion is considered limited impact as will only be operational in extreme events. Water volumes are not expected to be large enough to cause significant sediment erosion at the confluence of the culverted diversion into the Owenacurra River. The upgrades in this option to embankments are not expected to alter the hydromorphological status of the river. Temporary potential impact on water quality from in-channel works during construction. Culvert existing open channel at the WWTP is a potential permanent impact on channel morphology, however this, plus the upgradient embankment will prevent water quality impacts on the SAC by limiting the potential for flooding of wastewater during storm events. Construction works could result in tree removal where the embankment is proposed. Clearance could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	Flow diversion is considered limited impact as will only be operational in extreme events. Water volumes are not expected to be large enough to cause significant sediment erosion at the confluence of the culverted diversion into the Water Rock Stream downstream of the spring outlet. The upgrades in this option to embankments are not expected to alter the hydromorphological status of the river. Temporary potential impact on water quality from in-channel works during construction. Culvert existing open channel at the WWTP is a potential permanent impact on channel morphology, however this, plus the upgradient embankment will prevent water quality impacts on the SAC by limiting the potential for flooding of wastewater during storm events. Construction works could result in tree removal where the embankment is proposed. Clearance could destabilise and alter the form of the bank which helps to protect the material from erosion, runoff and flow.

Table 111 Area 6 – Air

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	Potential for temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	Potential for temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	Potential for temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	Potential for temporary adverse noise impacts during the construction phase due to works occurring in close proximity to residential receptors.

Table 112 Area 6 – Climate

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.

Table 113 Area 6 – Material Assets

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	An Irish Rail railway line runs through this area. The East Cork Parkway is present in this area. This road connects commuters to Cork City. Watermains are present throughout North Point Business Park, with one notably located between the business park and the railway line to the south. Another notable watermain is currently present underneath Castle Rock Avenue. A network of foul sewers run throughout the southern parts of the scheme area, through the agricultural lands adjacent to Water Rock Stream. These connect to the Midleton Wastewater Treatment Plant (WWTP) in the area. As part of the Lihaf project, a storm culvert and foul sewer are proposed in this area. A rising main is also being proposed by Irish Water as part of the Midleton Wastewater Load Diversion project.

Option Description	Environmental Effects
	Low and medium power (38kV and 110kV) power lines are present underground in this area. They are present throughout North Point Business Park, the L3619 Road and along the East Cork Parkway, south of the road. They are also noted in the WWTP and along the railway line. Overhead power lines are present in the area, predominantly through the agricultural land. ENET ducts are present along the East Cork Parkway and Cork Road. EIR services are present in North Point Business Park and on both sides of the East Cork Parkway at the WWTP. Gas mains are present underground throughout the area, servicing the business park and residential areas. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. Drainage infrastructure is present along The Green, Cork Road and Millbrook Crescent. Another drainage system is located through Europa Business Park, which discharges to Water Rock Stream south of the East Cork Parkway.
OPTION 6B – Flood Diversion Culvert South of Railway	An Irish Rail railway line runs through this area. The East Cork Parkway is present in this area. This road connects commuters to Cork City. Watermains are present throughout North Point Business Park, with one notably located between the business park and the railway line to the south. Another notable watermain is currently present underneath Castle Rock Avenue. A network of foul sewers run throughout the southern parts of the scheme area, through the agricultural lands adjacent to Water Rock Stream. These connect to the Midleton Wastewater Treatment Plant (WWTP) in the area. As part of the Lihaf project, a storm culvert and foul sewer are proposed in this area. A rising main is also being proposed by Irish Water as part of the Midleton Wastewater Load Diversion project. Low and medium power (38kV and 110kV) power lines are present underground in this area. They are present throughout North Point Business Park, the L3619 Road and along the East Cork Parkway, south of the road. They are also noted in the WWTP and along the railway line. Overhead power lines are present in the area, predominantly through the agricultural land. ENET ducts are present along the East Cork Parkway and Cork Road. EIR services are present in North Point Business Park and on both sides of the East Cork Parkway at the WWTP. Gas mains are present underground throughout the area, servicing the business park and residential areas. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area. Drainage infrastructure is present along The Green, Cork Road and Millbrook Crescent. Another drainage system is located through Europa Business Park, which discharges to Water Rock Stream south of the East Cork Parkway.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	An Irish Rail railway line runs through this area. The East Cork Parkway is present in this area. This road connects commuters to Cork City. Low and medium power (38kV and 110kV) power lines are present underground in this area. They are noted in the WWTP and along the railway line. Overhead power lines are present in the area, predominantly through the agricultural land. ENET ducts are present along the East Cork Parkway and Cork Road.

Option Description	Environmental Effects
	EIR services are present on both sides of the East Cork Parkway at the WWTP. Gas mains are present underground throughout the area, servicing the business park and residential areas. Land use and ownership in the area varies significantly. There is a mixture of public, private, residential, commercial and recreational land in this area.

Table 114 Area 6 – Resources and Waste

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	1,500m^3 import of material envisaged. 6,000m^3 export of material envisaged.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	1,500m^3 import of material envisaged. 6,000m^3 export of material envisaged.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	1,500m^3 import of material envisaged. 7,000m^3 export of material envisaged.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	1,500m^3 import of material envisaged. 8,000m^3 export of material envisaged.

Table 115 Area 6 – Cultural Heritage

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. The closest recorded archaeological sites to the proposed works are; A section of the Claidh Buidhe (CO076-092), a linear earthwork which forms the townland boundary between Water-rock and Baneshane. A limekiln (CO076-018) in the townland of Water-Rock. The site is situated 50m to the west of a proposed culverted flood diversion (1.8m wide by 2.4m deep). The construction of the culvert would have no direct effect on the limekiln. Potential Subsurface Archaeological sites The construction of embankment 2.3m high, over a distance of approximately 236m could have a negative effect on potential subsurface archaeological sites and features. In addition, the construction of a culverted and open flood diversion channels over a distance of approximately 1.2km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on small sections of the Water Rock Stream, an Area of Archaeological Potential.

Option Description	Environmental Effects
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. The closest recorded archaeological sites to the proposed works are; A section of the Claidh Buidhe (CO076-092), a linear earthwork which forms the townland boundary between Water-rock and Baneshane. A limekiln (CO076-018) in the townland of Water-Rock. The site is situated 50m to the west of a proposed culverted flood diversion (2m wide by 2m deep). The construction of the culvert would have no direct effect on the limekiln. Potential Subsurface Archaeological sites The construction of embankment 2.3m high, over a distance of approximately 236m could have a negative effect on potential subsurface archaeological sites and features. In addition, the construction of a culverted and open flood diversion channels over a distance of approximately 1.26km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on small sections of the Water Rock Stream, an Area of Archaeological Potential.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. The closest recorded archaeological sites to the proposed works are; A section of the Claidh Buidhe (CO076-092), a linear earthwork which forms the townland boundary between Water-rock and Baneshane. A limekiln (CO076-018) in the townland of Water-Rock. The site is situated 50m to the west of a proposed culverted flood diversion (1.8m wide by 2.4m deep). The construction of the culvert would have no direct effect on the limekiln. Potential Subsurface Archaeological sites The construction of embankment 2.3m high, over a distance of approximately 236m could have a negative effect on potential subsurface archaeological sites and features. In addition, the construction of a culverted and open flood diversion channels over a distance of approximately 1.26km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on small sections of the Water Rock Stream, an Area of Archaeological Potential.

Option Description	Environmental Effects
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	Objective 3. F. (i) There are no known/recorded architectural sites in the area of proposed works. Objective 3. F. (ii) There are no known/recorded archaeological sites in the area of proposed works. The closest recorded archaeological sites to the proposed works are; A section of the Claidh Buidhe (CO076-092), a linear earthwork which forms the townland boundary between Water-rock and Baneshane. The earthwork is situated to the west of a proposed culvet in the townland of Baneshane. The construction of the culvert would have no direct effect on the Claidh Buidhe. A limekiln (CO076-018) in the townland of Water-Rock. Potential Subsurface Archaeological sites The construction of embankment 2.3m high, over a distance of approximately 236m could have a negative effect on potential subsurface archaeological sites and features. In addition, the construction of a culverted and open flood diversion channels over a distance of approximately 1.4km could have a negative effect on potential subsurface archaeological sites and features. Area of Archaeological Potential Proposed works would have a direct negative effect on small sections of the Water Rock Stream, an Area of Archaeological Potential.

Table 116 Area 6 – Landscape

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There will be a very minor loss of vegetation in the immediate vicinity of open channel and culvert construction corridors There will also be some very localised loss of vegetation from the 'S' shaped 1.3m high embankment upstream of the WwTP.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There will be a very minor loss of vegetation in the immediate vicinity of open channel and culvert construction corridors. There will also be some very localised loss of vegetation from the 'S' shaped 1.3m high embankment upstream of the WwTP.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There will be a very minor loss of vegetation in the immediate vicinity of open channel and culvert construction corridors. There will also be some very localised loss of vegetation from the 'S' shaped 1.3m high embankment upstream of the WwTP.

Option Description	Environmental Effects
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	This landscape setting has been assigned a local sensitivity rating of 4 on the basis that it is Designated as a High value Landscape (HVL) in the Cork CDP. There will be a very minor loss of vegetation in the immediate vicinity of open channel and culvert construction corridors. There will also be some very localised loss of vegetation from the 'S' shaped 1.3m high embankment upstream of the WwTP.

Table 117 Area 6 – Vulnerability to major accidents and/or disasters

Option Description	Environmental Effects
OPTION 6A - Flood Diversion Channel and Direct Defences	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences	No impact to the vulnerability of the study area to a major accident or disaster.
OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences	No impact to the vulnerability of the study area to a major accident or disaster.

Appendix B

Multi-Criteria Analysis Summary

Core Criteria	Objective	Sub objective	Code	Global Weighting	Local Weighting	Local Weighting Rationale	OPTION 1&2A - Direct Defences and Conveyance improvements			OPTION 1&2B - Direct defences only			OPTION 1&2C - Upstream Storage and Direct Defences			Note
Social	Minimise risk to human health and life - residents	(i) Minimise risk to human health and life residents	1.A.(i)	0	0	(to be based on calculated assessment adjusted by professional judgement)	5	Option to provide full protection from design flood risk	0	5	Option to provide full protection from design flood risk	0	5	Option to provide full protection from design flood risk	0	
	Minimise risk to human health and life - high vulnerability properties	(ii) Minimise risk to high vulnerability properties	1.A.(ii)	0	0	(to be based on calculated assessment adjusted by professional judgement)	5	Option to provide full protection from design flood risk	0	5	Option to provide full protection from design flood risk	0	5	Option to provide full protection from design flood risk	0	
	Minimise risk to community - social infrastructure and amenity		1.B.(i)	10	5	A Golf course, Midleton Health Centre, My Place (Community Centre), a library, Market Green and a Garda Station are at risk from flooding within the affected area. Important area of industry and social infrastructure.	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	
	Minimise risk to community - local employment		1.B.(ii)	10	5	Important area of local employment with a large number of non-residential (i.e., commercial) properties at risk including SuperValu, Maxol Service Station, Midleton Community Hospital and a large number of commercial properties (Shops, Restaurants and Pubs) on Main Street and south of the Rail Line	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	
	Minimise project delivery risk by consideration of social acceptability of option	Ensure flood risk management option is socially acceptable to public	1.C	15	5	Considered to be an important factor in this area	5	Based on feedback from PPD Option 1A received a net of 11 positive responses, Option 2A received a net of 5 positive responses. Resulting in a total net of 16 positive responses received. Significantly greater number of submissions in favour of the option versus those against. Public perception of option is very positive. No project delivery risk.	375	5	Based on feedback from PPD Option 1B received a net of 5 positive responses, Option 2B received a net of 4 positive responses. Resulting in a total net of 9 positive responses received. Significantly greater number of submissions in favour of the option versus those against. Public perception of option is very positive. No project delivery risk.	375	0	Based on feedback from PPD Option 1C received a net of 13 positive responses, Option 2C received a net of 15 positive responses. Resulting in a total net of 28 positive responses received. There was a number of written responses received after the PPD2 (9) which were strongly opposed to this option. Accounting for these responses the total net of positive responses is reduced to 19 made up of 30 positive responses and 11 negative ones. Majority of submissions in favour of the option versus those against. Public perception is that the option is acceptable but there is significant opposition. Project delivery risk identified, possible significant delays to the programme for statutory consent process.	0	
	Minimise project delivery risk by consideration of the proportionality of option on impacted community	Minimise impact on private landowners who are not at risk of flooding but who may be adversely affected during construction and operation of scheme	1.D	15	5	Considered to be an important factor in this area	3	Option requires the removal of Moores Bridge and the provision of an alternative access route, there is some opposition to this from some local residents. Minimal delivery risk to the option being considered – most impacted landowners are in favour of the option with limited opposition, as per the feedback received to date.	225	5	No delivery risk to the option being considered – all impacted landowners are in favour of the option as per the feedback received to date	375	1	A delivery risk to the option being considered has been identified in the area of the proposed storage area. Most impacted landowners are in favour of the option however there is some vocal opposition. In the professional judgement of the Steering committee, a way forward through statutory consent process is deemed to be viable with limited delays.	75	
	Maximise wider benefit of project	Provide opportunities for additional social infrastructure and amenity. Promote health and well being. Enhance opportunities for local investment. Catalyst for regeneration of area.	1.E	10	5	Considered to be an important factor in this area	3	Option incorporates/ facilitates the proposed Linear Park and pedestrian/ cycle scheme from Midleton to Ballinacurra, these projects have a wider societal value which will have a very significant positive impact on local health and well being.	225	3	Option incorporates/ facilitates the proposed Linear Park and pedestrian/ cycle scheme from Midleton to Ballinacurra, these projects have a wider societal value which will have a very significant positive impact on local health and well being.	225	3	Option incorporates/ facilitates the proposed Linear Park and pedestrian/ cycle scheme from Midleton to Ballinacurra, these projects have a wider societal value which will have a very significant positive impact on local health and well being.	225	
				60					**Social Score 1325**			**Social Score 1475**			**Social Score 800**	
Economic	Reduce economic damages	Minimise economic risk	2.A	24	5	AAD for the SSA/€75000	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600	
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	2.B	10	5	A number of key transport routes are at risk including the R626 in several locations, Main Street and the Midleton to Cork Rail Line	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	
	Minimise risk to utilities infrastructure	Minimise risk to utilities infrastructure	2.C	14	5	Considered to be an important area for utility services and assets	5	Option to provide full protection from design flood risk	350	5	Option to provide full protection from design flood risk	350	5	Option to provide full protection from design flood risk	350	
	Manage risk to agriculture	Minimise risk to agriculture	2.D	12	2	Considered to be of Minor / Local importance. Small area of Agricultural land adjacent to the Waterrock Golf Course on the left bank of the Owenacurra	0	No increase in the negative impact of flooding on agricultural production	0	0	No increase in the negative impact of flooding on agricultural production	0	-3	Proposed storage area will impact the agricultural land during flood events. Proposed embankments to retain water may also have a temporary negative impact.	-72	
				60					**Economic Score 1200**			**Economic Score 1200**			**Economic Score 1128**	
	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives	3.A	15	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018	-4	In channel dredging could directly impact invertebrate habitat in the channel. There is also the potential impact on the change in sediment flux over time to the d/s SAC of which "Maintain/Restore Natural Circulation of sediments" is a conservation objective for the Atlantic Salt Marsh. May require sediment transport modelling to confirm magnitude, duration and extent of impact on sediment flux	-300	-2	Limited in-channel works and no realignment but d/s SAC with CO relating to sediment conservation	-150	-5	Flow control structure and especially Realignent of River d/s of Storage area with the loss of sinusiodal meanders would be a signficiant impact on WFD objectives	-375	

Enviromental	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	3.B	9	5	There are two European sites located adjacent to the general study area: Great Island Channel SAC (Site code 001058) Cork Harbour SPA (Site code 004030). The Great Island Channel SAC is designated for the presence of two QIs; Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]. Cork Harbour SPA is designated for 23 SCIs and Wetlands. This MCA has regard to Article 6, Artice 10 and Article	-2	The FRS does not present the possibility of direct impacts at this stage on any qualifying habitat. The overall effects of changes in sediment dynamics in the estuary area either from accretion or will be addressed at the EIAR stage. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality and they are considered further in 3D below. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated. The score is marginally lower for this option given the potential for instream works to present a greater impact downstream on the estuarine habitat,	-90	-1	The FRS does not present the possibility of direct impacts at this stage on any qualifying habitat. The overall effects of changes in sediment dynamics in the estuary area either from accretion or will be addressed at the EIAR stage. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality and they are considered further in 3D below. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated.	-120	-1	The FRS does not present the possibility of direct impacts at this stage on any qualifying habitat. The overall effects of changes in sediment dynamics in the estuary area either from accretion or will be addressed at the EIAR stage. The potential for indirect impacts from sediment release or pollutants from construction phase works can be avoided or ameliorated with suitable mitigation measures. Salmon are Annex II species and while not a QI for the SAC, their ecology is related to good status water quality and they are considered further in 3D below. Otters, Bats and Lamprey are Annex IV species and indirect impacts on water quality and fish as food sources would need to be mitigated.	-45
	Avoid damages to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to, and where possible enhance, legally protected sites / habitats and other sites / habitats of national, regional and local nature conservation importance	3.C	4	5	Presence of Fish (Salmonids, Lamprey, Eels) Otters and Bats. Otters and Lamprey species are Habitat Directive Annexed species. These areas support habitats for Otters and the presence of salmonids as food sources is important. The presence of an number of species of bats is also a driving factor in these areas.	-5	Potential localised loss of or disturbance to flora/fauna. Potential Impacts on Fish (Salmonids, Lamprey, Eels) Otters and Bats will need to be mitigated. Suitable mitigation measures are technically feasible. The score is marginally lower for this option given the potential for instream works to present a greater impact downstream on the estuarine habitat including salt marsh.	-100	-4	Potential localised loss of or disturbance to flora/fauna. Potential Impacts on Fish (Salmonids, Lamprey, Eels) Otters and Bats will need to be mitigated. Suitable mitigation measures are technically feasible.	-120	-3	Potential localised loss of or disturbance to flora/fauna. Potential Impacts on Fish (Salmonids, Lamprey, Eels) Otters and Bats will need to be mitigated. Suitable mitigation measures are technically feasible. Footprint is less than Option 1&2B.	-60
	Protect and where possible enhance fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species	3.D	10	3	Presence of Fish (Salmonids, Lamprey, Eels) and Otters. Otters and Lamprey species are Habitat Directive Annexed species. The water courses are of regional value for fishing/angling.	-5	Medium to long-term alteration of fisheries habitat in senstive wb due to proposed walls that will require excavation and restoration of banks. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. The score is marginally higher for this option given the potential for instream works to present a greater impact downstream on fish species in a wider area.	-150	-4	Medium to long-term alteration of fisheries habitat in senstive wb due to proposed walls that will require excavation and restoration of banks. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated.	-120	-5	Permanent loss or removal of fisheries habitat due to channel realignment d/s of storage area. Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated.	-150
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor/zone of influence.	Protect, and where possible enhance, visual amenity, landscape protection zones and views into/from designated scenic areas in the river corridor/zone of influence	3.E	7	4	Designated as a High value Landscape (HVL) in the Cork CDP. Aspirational Riverside Walkway also shown on CDP maps	-1	1A - Provision of 1.1m embankment upstream of northern bridge and walls downstream of southern bridge will result in the loss of some dense riparian vegetation and minor loss of visual connection to River for dwellings on opposite side of the road. Northwestern 1.2m embankment will not result in material loss or residential visual amenity in direction of Water Rock Golf Course nor will 0.4m unduly interupt river views in same estate. Consolidation of bridges to housing estates will be beneficial and replacement of existing northern bridge of little consequence to landscape character / views. Loss of mature riparian vegetation and riverside visual amenity for several houses due to conveyance works. 2A - Loss of some riparian vegetation due to new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. Provision of the Millrace a potential enhancement of amenity views from adjacent houses. Bridge removal will reduce clutter and confusing adjacent relationship with the main bridge.	-28	-1	1B - Provision of 2m embankment upstream of northern bridge and walls downstream of southern bridge will result in the loss of some dense riparian vegetation and visual connection to river for dwellings on opposite side of the road. Northwestern 1.2m embankment will not result in material loss or residential visual amenity in direction of Water Rock Golf Course nor will 0.4m unduly interupt river views in same estate. Bridges to housing estates will be remain visually complex. 2B - Loss of some riparian vegetation due to new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. Provision of the Millrace a potential enhancement of amenity views from adjacent houses.	-28	-3	1C - Blocking of southern end of designated scenic route S43 by roadside 3m embankment as well as amenity countryside/river views of several houses on opposite side of the road will result in a potentially significant impact. The southern leg of the same embankment also serves to truncate the river corridor and reduce borrowed views across golf course from housing estate to the southeast. Potential loss of mature treeline vegetation from two 3m high embankments to the northwest of the golf course. Reduced river views within golf course from 0.7m embankment.Provision of 2m embankment east of golf course will result in the loss of some dense riparian vegetation and visual connection to river for dwellings on opposite side of the road. 2C - Loss of some riparian vegetation due to new walls, but this will potentially open up views of the river for dwellings adjacent to southernmost sections. Provision of the Millrace a potential enhancement of amenity views from adjacent houses.	-84
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(i) Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(i)	4	2	Based on the number and type of recorded arcitectural features in the area and professional judgment	-2	Direct impact on one NIAH structure; Cork Bridge (NIAH 20830013; RMP CO076-106). Direct Impact on the setting of Clonmullin House (NIAH 20906519). Direct impact on mill complex (RMP CO076-112). Increased level of protection from flooding for architectural features included in RPS and NIAH	-16	-2	Direct impact on one NIAH structure; Cork Bridge (NIAH 20830013; RMP CO076-106). Direct Impact on the setting of Clonmullin House (NIAH 20906519). Direct impact on mill complex (RMP CO076-112). Increased level of protection from flooding for architectural features included in RPS and NIAH	-16	-2	Direct impact on one NIAH structure; Cork Bridge (NIAH 20830013; RMP CO076-106). Direct impact on mill complex (RMP CO076-112). Increased level of protection from flooding for architectural features included in RPS and NIAH	-16
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(ii) Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(ii)	4	2	Based on the number and type of recorded archaeological features in the area and professional judgment	-3	Direct Impact on two RMPs; Cork Bridge (CO076-106; NIAH 20830013) and Mill Complex (CO076-112). The construction of a wall will have a direct impact on two features associated with the Mill Complex identified in the Underwater Survey, a substantial wall (CHS 12) and a section of a tailrace (CHS 14). Direct impact on eight additional cultural heritage features (CHS04, 05, 06, 07, 08, 09, 10 and 11) identified by Underwater Survey. Direct Impact on Carrigogna Bridge depicted on the OS 1st edition map (1841). Direct impact on Owenacurra River (AAP 1), greater impact than other options due to dredging. Increased level of protection from flooding for archaeolgical sites included in RMP	-24	-2	Direct Impact on two RMPs; Cork Bridge (CO076-106; NIAH 20830013) and Mill Complex (CO076-112). The construction of a wall will have a direct impact on two features associated with the Mill Complex identified in the Underwater Survey, a substantial wall (CHS 12) and a section of a tailrace (CHS 14). Direct impact on eight additional cultural heritage features (CHS04, 05, 06, 07, 08, 09, 10 and 11) identified by Underwater Survey. Direct impact on Owenacurra River (AAP 1). Increased level of protection from flooding for archaeolgical sites included in RMP	-16	-2	Direct Impact on two RMPs; Cork Bridge (CO076-106; NIAH 20830013) and Mill Complex (CO076-112). The construction of a wall will have a direct impact on two features associated with the Mill Complex identified in the Underwater Survey, a substantial wall (CHS 12) and a section of a tailrace (CHS 14). Direct impact on three additional cultural heritage features (CHS 09, 10 and 11) identified by Underwater Survey. Direct impact on Owenacurra River (AAP 1). Increased level of protection from flooding for archaeolgical sites included in RMP	-16
	Protect land, soil and bedrock and improve their protection from extreme floods	Avoid damage to or erosion of land, soil and solid geology, and improve their protection from extreme floods	3G	1	1	(by professional judgement, taking account of local advice)	-1	Potential localised loss of land, soil and geology: loss of alluvial sediments with channel widening and deepening	-1	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	-1	Potential localised loss of land, soil and geology: Impact on soil quality associated with recurring flooding in storage area, potential for increasing fines and disimprovement of drainage quality	-1
	Avoid changes to hydrogeology	Avoid changes to hydrogeology	3H	1	2	Regionally important aquifer	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0	-2	potential to induce groundwater flooding on adjacent land with flooding of storage area (underflow) through the gravels underlying this area.	-4
	Avoid negative impact on air	Avoid measures which would have a negative impact on air and, if possible, adopt measures which would improve air	3I	1	4	500+ dwellings and presence of habitats and species designated as of national importance	-3	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors. Also potential for odour impacts during dredging.	-12	-3	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-12	-1	Greater separation from sensitive receptors for this option.	-4
	Avoid measures which would increase the rate of climate change	Avoid measures which would increase the rate of climate change and, if possible, adopt measures which would reduce the rate climate change	3J	2	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10

	Minimise waste generation	Minimise waste generation. Where materials are generated their reuse should be incorporated into the scheme where possible.	3K	1	5	Waste management considered to be relevant to all construction projects	-1	Generation of wastes (dredging) which are suitable for recovery or disposal and for which capacity exists within the region.	-5	0	Generation of quantities of wastes in line with current industry practice	0	0	Generation of quantities of wastes in line with current industry practice	0
	Avoid increasing the vulnerability of the study area to major accidents or disasters	Avoid increasing the vulnerability of the study area to major accidents or disasters	3L	1	0	No presence of high vulnerability establishments	0	No impact on the vulnerability of the study area to a major accident or disaster	0	0	No impact on the vulnerability of the study area to a major accident or disaster	0	0	No impact on the vulnerability of the study area to a major accident or disaster	0
				60					**Environmental Score**			**Environmental Score**			**Environmental Score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	4.A.	20	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018	3	Some operational risk, potential maintenance dredging requirements. This option has a greater operational risk than Option 1&2B and the score should be reduced accordingly relative to Option 1&2B	300	4	Some operational risk exists, e.g. non return valves/ pump stations	400	-1	Potentially significant operational risk with an upstream storage option. As there are some unknowns around the flow control approach, it is assumed that the operation of this option would be complex and require significant operational and maintenance input.	-100
	Minimise risk of failure of option	Minimise risk of failure of option	4.B	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	2	Very low to low residual risk, i.e. - Increased conveyance where maintenance required, failure of which would result in localised or minor flooding - Direct defences option, failure of which would result in localised or minor flooding - Decrease in residual risk due to conveyance improvements and removal/replacement of bridge structures	150	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding	75	0	Moderate residual risk, i.e. - Storage option, failure of which would result in significant flooding	0
	Ensure flood risk management options are adaptable to impacts of climate change, and can be managed effectively and sustainably into the future		4.C	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	4	Option is readily adaptable to 3 future pathways with limited difficulty, cost and impact. The option provides no impediment to future interventions to address future risk. Direct defences can be built to permit an acceptable extension in height in a future scenario in order to maintain the required level of protection (less than 1.5m in height in public realm areas after being adapted in a High End Future Scenario). The required level of protection can also be achieved through other means such as upstream storage instead of increasing wall heights.	300	4	Option is readily adaptable to 3 future pathways with limited difficulty, cost and impact. The option provides no impediment to future interventions to address future risk. Direct defences built to permit an acceptable extension in height in a future scenario in order to maintain the required level of protection (less than 1.5m in height in public realm areas after being adapted in a High-End Future Scenario). The required level of protection can also be achieved through other means such as upstream storage instead of increasing wall heights.	300	4	Option is readily adaptable to 3 pathways with limited difficulty, cost and impact. The option provides no impediment to future interventions to address future risk. Direct defences built to permit an acceptable extension in height in a future scenario in order to maintain the required level of protection (less than 1.5m in height in the town centre after being adapted in a High End Future Scenario). The required level of protection can also be achieved through other means such as additional direct defences, conveyance improvements or increased upstream storage.	300
	Maximise benefit in case of scheme design exceedance events		4.D	5	5	Professional judgement applied to scoring	2	Option can reduce a portion of the residual risk associated with exceedance events (Q200) in some areas in particular Willowbank as the wall height defending this area will be defined by the minimum guard height (1.1m) and not the Q100 defence height (0.7m). Similarly the wall heights defending the Mill Race development and The Woodlands Estate will be increased beyond the required SoP to comply with guard height requirements. The conveyance improvements around structures will also reduce flood risk during exceedance events. It is estimated that circa 55% of properties currently at risk of flooding will be protected beyond the SoP.	50	1	Option can reduce a portion of the residual risk associated with exceedance events (Q200) in some areas in particular Willowbank as the wall height defending this area will be defined by the minimum guard height (1.1m) and not the Q100 defence height (0.7m). Similarly the wall heights defending the Mill Race development and The Woodlands Estate will be increased beyond the required SoP to comply with guard height requirements. It is estimated that circa 50% of properties currently at risk of flooding will be protected beyond the SoP.	25	3	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) in a number of areas including Tir Cluain and Willowbank. In areas where direct defences would still be required a number of these will be increased beyond the required SoP to comply with guard height requirements. The Mill Race development and The Woodlands Estate will benefit from the this increased SoP. It is estimated that circa 70% of properties currently at risk of flooding will be protected beyond the SoP.	75
	Minimise project delivery risk by consideration of third party stakeholder interaction and/or existing infrastructure	Minimise interaction with critical infrastructure	4.E	5	5	Critical infrastructure in area - OH power lines	2	There is interaction with existing infrastructure but it can be managed through design of diversions.	50	2	There is interaction with existing infrastructure but it can be managed through design of diversions.	50	1	There is interaction with existing infrastructure which is more significant than the other two options but it can be managed through design of diversions.	25
				60					**Technical Score**			**Technical Score**			**Technical Score**
							SCORING	**Rationale**	**MCA SCORE**						
								MCA Benefit Score	**1789**						
								Option Selection Benefit Score	**2639**						
								Total Capital Costs (M€)	**10.70**						
								MCA Benefit/Cost Ratio	**0.17**						
								Economic Benefit (M€)	**11.11**						
								Economic Benefit/Cost Ratio	**1.04**						
								MCA Benefit Score	**2083**						
								Option Selection Benefit Score	**2933**						
								Total Capital Costs (M€)	**10.00**						
								MCA Benefit/Cost Ratio	**0.21**						
								Economic Benefit (M€)	**11.11**						
								Economic Benefit/Cost Ratio	**1.11**						
								MCA Benefit Score	**1163**						
								Option Selection Benefit Score	**1463**						
								Total Capital Costs (M€)	**8.80**						
								MCA Benefit/Cost Ratio	**0.13**						
								Economic Benefit (M€)	**11.11**						
								Economic Benefit/Cost Ratio	**1.26**						

MCA Scoring performance	
Fully Achieving Aspirational Target	5
Partially Achieving Aspirational Target	3
Exceeding Basic Requirement	1
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	-1
Partially Failing Basic Requirement	-3
Totally Failing Basic Requirement (Illegal/Unacceptable)	-999

Core Criteria	Objective	Sub objective	Code	Refer to GN	Indicator	Basic Requirement	Aspirational Target	Global Weighting	Local Weighting	Local Weighting Rationale		OPTION 3A - Direct defences only	
Social	Minimise risk to human health and life - residents	(i) Minimise risk to human health and life residents	1.A.(i)	OPW, Sept 2018	Annual Average Number of residential properties at risk from flooding	Number of properties at risk is not increased	100% reduction in number of residential properties at risk	0		(to be based on calculated assessment adjusted by professional judgement)			0
	Minimise risk to human health and life - high vulnerability propoerties	(ii) Minimise risk to high vulnerability properties	1.A.(ii)	OPW, Sept 2018	Number and type of high vulnerability properties at risk from flooding	Number of high vulnerability properties at risk not increased	100% reduction in number of high vulnerability properties at risk	0		(to be based on calculated assessment adjusted by professional judgement)			0
	Minimise risk to community - social infrastructure and amenity		1.B.(i)	OPW, Sept 2018	Number of social infrastructure assets at risk from flooding	Number of social infrastructure assets at risk not increased	100% reduction in number of social infrastructure assets at risk	10	5	Important area of social infrastructure.	5	Option to provide full protection from design flood risk	250
	Minimise risk to community - local employment		1.B.(ii)	OPW, Sept 2018	Number of non-residential (i.e., commercial) properties at risk not increased.	Number of non-residential properties at risk not increased	100% reduction in number of non-residential properties at risk	10	5	Significant area of local employment with substantial number of non-residential (i.e., commercial) properties at risk	5	Option to provide full protection from design flood risk	250
	Minimise project delivery risk by consideration of social acceptability of option	Ensure flood risk management option is socially acceptable to public	1.C	Arup, March 2021	Feedback from public and landowners	Acceptable level of negative feedback	No negative feedback	15	5	Considered to be an important factor in this area	5	Based on feedback from PPD Option 3A received a net of 14 positive responses. Significantly greater number of submissions in favour of the option versus those against. Public perception of option is very positive. No project delivery risk.	375
	Minimise project delivery risk by consideration of the proportionality of option on impacted community	Minimise impact on private landowners who are not at risk of flooding but who may be adversely affected during construction and operation of scheme	1.D	Arup, March 2021	Feedback from impacted landowners	Acceptable level of impact to affected private landowners	Private landowners who do not benefit from the scheme are not impacted by the construction or operation of the scheme	15	5	Considered to be an important factor in this area	5	No delivery risk to the option being considered – all impacted landowners are in favour of the option, as per the feedback received to date	375
	Maximise wider benefit of project	Provide opportunities for additional social infrastructure and amenity. Promote health and well being. Enhance opportunities for local investment. Catalyst for regeneration of area.	1.E	Arup, March 2021	Number of other projects enhanced/facilitated by option	Ensure compatibility with social objectives in Local Area Development Plan	Enhance opportunities for other projects and enable synergies with other projects	10	5	Considered to be an important factor in this area	5	Option incorporates/ facilitates the proposed Babys Walk/ Peoples park, Public Realm/ Bus Corridor Works on Main Street and pedestrian/ cycle scheme from Midleton to Ballinacurra, these projects have a very significant positive impact on local health and well being. Option is a catalyst for the improvement of the area.	250
								60				**Social Score**	**1500**
Economic	Reduce economic damages	Minimise economic risk	2.A	OPW, Sept 2018	Annual Average Damage (AAD) expressed in Euro / year, calculated in accordance with the economic risk assessment methods, but with no allowance for social / intangible benefits	AAD is not increased	100% reduction in AAD	24	5	AAD for the SSA/€75000	5	Option to provide full protection from design flood risk	600
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	2.B	OPW, Sept 2018	Number and type of transport routes at risk from flooding	No increase in risk to transport infrastructure	Reduce risk to transport infrastructure to zero	10	5	A number of key transport routes are at risk including the Main Street and Bailick Rd	5	Option to provide full protection from design flood risk	250
	Minimise risk to utilities infrastructure	Minimise risk to utilities infrastructure	2.C	OPW, Sept 2018	Number and type of infrastructure assets at risk from flooding	No increase in risk to utility infrastructure	Reduce risk to utility infrastructure to zero	14	5	Considered to be an important area for utility services and assets	5	Option to provide full protection from design flood risk	350
	Manage risk to agriculture	Minimise risk to agriculture	2.D	OPW, Sept 2018	Agricultural production	No increase in the negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12	0	No agricultural land in this area	0	N/A	0
								60				**Economic Score**	**1200**
	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives	3.A	OPW, Sept 2018	-	Provide no constraint to the achievement of water body objectives.	Contribute to the achievement of water body objectives	15	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018	-2	Instream Works with immediate d/s SAC Estuary with sediment related CO	-150
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	3.B	OPW, Sept 2018	-	No deterioration in the conservation status of designated sites as a result of flood risk management measures.	Improvement in the conservation status of designated sites as a result of flood risk management sites.	9	5	There are two European sites located adjacent to the general study area: Great Island Channel SAC (Site code 001058) Cork Harbour SPA (Site code 004030). The Great Island Channel SAC is designated for the presence of two QIs; Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]. Cork Harbour SPA is designated for 23 SCIs and Wetlands. This MCA has regard to Article 6, Artice 10 and Article 12 of the Habitats Directive in relation to the Conservation Objectives of designated site in the Zone of Influence of the Project and both in situ and ex situ potential effects on habitats and species such as those listed in Annex IV.	-3	The FRS does not present the possibility of direct impacts at this stage on any qualifying habitat. Potential indirect impacts on SAC/SPA habitats but not on conservation objectives were considered. Suitable mitigation measures are technically feasible and the careful location of works will avoid impacts on the Conservation Objectives of the 2 adjacent European sites.	-135

Environmental	Avoid damages to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to, and where possible enhance, legally protected sites / habitats and other sites / habitats of national, regional and local nature conservation importance	3.C	OPW, Sept 2018	-	No deterioration in the condition of existing sites due to the implementation of flood risk management option	Creation of new or improvement in condition of existing sites due to the implementation of flood risk management option	4	5	Presence of Fish (Salmonids, Lamprey, Eels) and Otters. Otters and Lamprey species are Habitat Directive Annexed species. These areas support habitats for Otters and the presence of salmonids as food sources is improtant.	-3	Potential localised loss of or disturbance to flora/fauna. Potential indirect on SAC/SPA habitat but not on conservation objectives. Suitable mitigation measures are technically feasible.	-60
	Protect and where possible enhance fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species	3.D	OPW, Sept 2018	-	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fisheries habitat. Improvement in habitat quality / quantity. Enhanced upstream accessibility	10	3	Presence of Fish (Salmonids, Lamprey, Eels) and Otters. Otters and Lamprey species are Habitat Directive Annexed species. The water courses are of regional value for fishing/angling.	-3	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. This is a non sensitive water body (WB) as the confluence of the Dungourney is saline.	-90
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor/zone of influence.	Protect, and where possible enhance, visual amenity, landscape protection zones and views into/from designated scenic areas in the river corridor/zone of influence	3.E	OPW, Sept 2018	-	No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures. No significant change in the quality of existing landscape characteristics of the receiving environment	No change to the existing landscape form. Enhancement of existing landscape or landscape feature	7	4	Designated as a High value Landscape (HVL) in the Cork CDP. Designated scenic route across Ballincurra Bridge. Riverside Walkway sections	-1	Loss of corridor of mature woodland trees and division of woodland from northern 1m embankment section. Potential loss of mature riverside trees due to northwestern section of 0.7m high wall and reduction of visual connection to river from road at northern end of this wall. There will be some intrusion on estuarine / river views south of Cork Road in the viscinity of the slipway from new an drained walls. Embankment section of <1m have limited impacts throughout this option.	-28
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(i) Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(i)	OPW, Sept 2018	-	No increase in the risk to architectural features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of architectural features, institutions and collections arising from the implementation of the selected measures.	4	3	Based on the number, type and rating (NIAH) of recorded architectural features in the area and professional judgment	-2	Impacts on Protected Structures (PS) in the town of Midleton; Direct impact on Lewis Bridge (PS40; CO076-073002). Impact on the setting of Midleton House (PS 51). Impact on the setting of outbuilding (NIAH 20830064) and warehouse (NIAH 20830060) which are part of the Midleton distillery complex (PS 1; CO076-025). Impacts on curtillage of PSs on Ballick Road. Direct impact by flood defence walls on the boundary walls of the Quayside warehouse (PS 00517; CO076-111) and Charleston Maltings (PS00521; CO076-074) and also direct impact on 19th century quays. Increased level of protection from flooding for architectural sites included in RPS and NIAH	-24
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(ii) Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(ii)	OPW, Sept 2018	-	No increase in the risk to archaeological features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of archaeological features, institutions and collections arising from the implementation of the selected measures.	4	3	Based on the number, type and rating (NIAH) of recorded archaeological features in the area and professional judgment	-2	Impacts on RMP sites in the town of Midleton; Direct impact on Lewis Bridge (CO076-073002; PS40). Impact on the setting of outbuilding (NIAH 20830064) and warehouse (NIAH 20830060) which are part of the Midleton distillery complex (CO076-025; PS1). Impacts on ZAP of RMP sites on Ballick Road. Direct impact by flood defence walls on the boundary walls of the Quayside warehouse (CO076-111; PS00517) Charleston Maltings (CO076-074; PS00521), and maltings (CO076-080). Direct impact on 19th century quays which are part of the cultural heritage of the Owenacurra Estuary and Ballinacurra, a former major trading port. The setting of the quays would be altered by the construction of walls along the estuary. Direct impact on Owenacurra River (AAP 1), Dungourney River (AAP 2) and Owenacurra Estuary (AAP 4). Increased level of protection from flooding for archaeolgical features included in RMP.	-24
	Protect land, soil and bedrock and improve their protection from extreme floods	Avoid damage to or erosion of land, soil and solid geology, and improve their protection from extreme floods	3G	Arup, March 2021	-	No increased risk of negative effect on land, soil or solid geology, or of erosion of land or soil, or negative effect on soil fertility	Enhancement of land, soil and bedrock condition, stability, fertility, economic value	1	1	(by professional judgement, taking account of local advice)	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
	Avoid changes to hydrogeology	Avoid changes to hydrogeology	3H	Arup, March 2021	-	No increased risk of negative effect on hydrogeology	Enhancement of hydrogeology	1	2	Regionally important aquifer	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
	Avoid negative impact on air	Avoid measures which would have a negative impact on air and, if possible, adopt measures which would improve air	3I	Arup, March 2021	-	No increased risk of negative effect on air	Enhance air	1	5	1000+ dwellings and presence of habitats and species designated as of national importance	-3	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-15
	Avoid measures which would increase the rate of climate change	Avoid measures which would increase the rate of climate change and, if possible, adopt measures which would reduce the rate climate change	3J	Arup, March 2021	-	Rate of climate change does not change	Rate of climate change reduced	2	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10
	Minimise waste generation	Minimise waste generation. Where materials are generated their reuse should be incorporated into the scheme where possible.	3K	Arup, March 2021	-	Avoid generating waste for which there is unlikely to be regional capacity for treatment, recovery or disposal.	Zero waste projects	1	5	Waste management considered to be relevant to all construction projects	0	Generation of quantities of wastes in line with current industry practice	0
	Avoid increasing the vulnerability of the study area to major accidents or disasters	Avoid increasing the vulnerability of the study area to major accidents or disasters	3L	Arup, March 2021	-	No impact on the vulnerability of the study area to major accidents or disasters	Reduction in the vulnerability of the study area to major accidents or disasters	1	5	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd.	3	Moderate reduction in the vulnerability of the study area to a major accident or disaster, i.e. fluvial flooding for Q100 and tidal flooding for T200	15
								60				**Environmental Score**	**-521**

Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	4.A.	OPW, Sept 2018	Level of operational risk of option - Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully	Moderate to high, but manageable, degree of operational risk, i.e., an option with a high degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, but which, with the allocation of adequate resources, could be operated with an acceptable degree of risk of failure	No operational risk, i.e., no reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision for the option to operate or perform successfully	20	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018	2	Low risk, i.e., there is a requirement for systems or interventions for the option to operate, with regular monitoring and maintenance required, and / or a low to moderate likelihood of system / operation failure Complex flood forecasting and warning systems, with a limited number (3-4No) of rapidly deployed in-situ flood defences, i.e., flood gates at Baby Walk and Bailick Rd Some operational risk, e.g. non return valves/ pump stations.	200
	Minimise risk of failure of option	Minimise risk of failure of option	4.B	Arup, March 2021	Minimise consequences of failure of option. Reduce residual risk by designing out risk where possible.	Moderate to high, but acceptable and manageable, level of residual risk post construction	Negligible inherent safety risk post construction	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding	75
	Ensure flood risk management options are adaptable to impacts of climate change, and can be managed effectively and sustainably into the future		4.C	Arup, March 2021	Compatible with relevant SCCAP.	Option to be adaptable and maintain the required standard of protection at acceptable cost	Option to be adaptable to multiple adaptation pathways with flexibility to respond to multiple CC scenarios and timelines	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021	1	Option is adaptable for the MRFS at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. Direct defences can be built to permit an extension in height to maintain the required standard of protection / risk reduction for the MRFS, this would be acceptable locally. However, these adaptation measures would have other negative implications / costs e.g. more than a 1.7m high direct defences in public areas with demountable defences necessary to provide protection above 1.7m. This option would not be adaptable for the HEFS as the required defence height would have significant negative implications with defence heights greater than 2.2m in public areas. It is noted that there are no reasonable alternative options for this area and that Direct Defences is the only viable current option. Alternative options may be viable when adapting the scheme for the MRFS and HEFS.	75
	Maximise benefit in case of scheme design exceedance events		4.D	Arup, March 2021	Number and type of additional properties that would be defended in a design exceedance event (Q200 / T1000)	Number of properties at current risk is not increased	Increase in the Standard of Protection for properties that are at risk beyond the scheme SOP (Q100 / T200)	5	5	Professional judgement applied to scoring	1	The majority of the defences in this area are defined by the tidal risk. In most cases the required T200 level is lower than the Q200 exceedance event max water level. Therefore almost all the properties do not experience flooding during the Q200 fluvial exceedance events. However, there is very little reduction in flood extent during a tidal exceedance event (T1000). There are some areas south of the N25 where defences will be increased beyond the required SoP to comply with guard height requirements. In these areas there will be some additional benefit provided during exceedance events provided the defence extent is sufficient and areas where no works are proposed are above the T1000 max water level.	25
	Minimise project delivery risk by consideration of third party stakeholder interaction and/or existing infrastructure	Minimise interaction with critical infrastructure	4.E	Arup, March 2021	Interaction with concerned stakeholders including utility companies	Acceptable level of interaction with existing infrastructure	No interaction with critical infrastructure	5	5	Critical infrastructure in area, HP gas line in Peoples' Park, treated effluent from IDL site under Lewis Bridge	1	There is interaction with existing infrastructure but it can be managed through design of diversions.	25
								60				**Technical Score**	**400**

SCORING	Rationale	MCA SCORE
	MCA Benefit Score	**2179**
	Option Selection Benefit Score	**2579**
	Total Capital Costs (M€)	**14.30**
	MCA Benefit/Cost Ratio	**0.15**
	Economic Benefit (M€)	**26.63**
	Economic Benefit/Cost Ratio	**1.86**

MCA Scoring performance	
Fully Achieving Aspirational Target	5
Partially Achieving Aspirational Target	3
Exceeding Basic Requirement	1
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	-1
Partially Failing Basic Requirement	-3
Totally Failing Basic Requirement (Illegal/Unacceptable)	-999

Core Criteria	Objective	Sub objective	Code	Refer to IGN	Indicator	Basic Requirement	Aspirational Target	Global Weighting	Local Weighting	Local Weighting Rationale	OPTION 4A - Groundwater Cut-off and Direct Defences		OPTION 4B - Pumpsire and Direct Defences		OPTION 4C - Combined Design with Embankment at Greenways Crossing		OPTION 4D - Combined Design with Flood Barrier at Greenways Crossing		OPTION 4E - Groundwater Cut-offs and Direct Defences along Waterway	
Social	Minimise risk to human health and life - residents	(i) Minimise risk to human health and life residents	1 A.(i)	10	OPW, Sept 2018	Annual Average Number of residential properties at risk from flooding	Number of properties at risk is not increased	100% reduction in number of residential properties at risk	10		(to be based on calculated assessment adjusted by professional judgement									
	Minimise risk to human health and life - high vulnerability properties	(ii) Minimise risk to hah vulnerability properties	1 A.(ii)		OPW, Sept 2018	Number and type of high vulnerability properties at risk from flooding	Number of high vulnerability properties at risk not increased	100% reduction in number of high vulnerability properties at risk	0		(to be based on calculated assessment adjusted by professional judgement									
	Minimise risk to community - social infrastructure and amenity		1 B.(i)	25	OPW, Sept 2018	Number of social infrastructure assets at risk from floodine	Number of social infrastructure assets at risk not increased	100% reduction in number of social infrastructure assets at risk	10	1	A gym, Midleton Rugby Club and its facilities are at risk from flooding within the affected area. Important area of social infrastructure. Proposed Midleton to Youghal Greenway not considered impacted due to its flood compatible nature as specified in the project FRA	5	Option to provide full protection from design flood risk	25	5	Option to provide full protection from design flood risk	25	5	Option to provide full protection from design flood risk	25	5	Option to provide full protection from design flood risk	25
	Minimise risk to community - local employment		1 B.(ii)	250	OPW, Sept 2018	Number of non-residential (i.e., commercial) properties at risk not increased	Number of non-residential properties at risk not increased	100% reduction in number of non-residential properties at risk	10	5	Some areas of local employment with a number of non-residential (i.e., commercial) properties at risk including warehouses in Park North Industrial Estate	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250
	Minimise project delivery risk by consideration of social acceptability of option	Ensure flood risk management option is socially acceptable to public	1 C		Anap, March 2021	Feedback from public and landowners	Acceptable level of negative feedback	No negative feedback	15	5	Considered to be an important factor in this area	4	Based on feedback from PPD Option 4A received a net of 10 positive responses. Significantly greater number of submissions in favour of the option versus those against. Public perception of option is positive. No project delivery risk foreseen.	200	3	Based on feedback from PPD Option 4B received a net of 4 positive responses. Greater number of submissions in favour of the option versus those against. Public perception of option is positive and there is limited opposition. Minimal project delivery risk foreseen.	225	4	This option was developed post PPD due to the requirement to consider interacting projects - NIRE alignment, and as such feedback on the option from the public has not been received. Location of proposed embankment would correspond with the proposed Northern Relief Road Extension (NIRE). It is assumed that the land will be in public ownership for the construction of the road. Therefore minimising land intake and mitigating any negative public perception of scheme. No project delivery risk foreseen.	200	4	This option was developed post PPD due to the requirement to consider interacting projects - NIRE alignment, and as such feedback on the option from the public has not been received. Location of proposed embankment would correspond with the proposed Northern Relief Road Extension (NIRE). It is assumed that the land will be in public ownership for the construction of the road. Therefore minimising land intake and mitigating any negative public perception of scheme. No project delivery risk foreseen.	200	4	This option was developed post PPD due to the requirement to consider interacting projects - NIRE alignment, and as such feedback on the option from the public has not been received. It is similar to Option 4A which recieved a net of 10 positive responses. Location of proposed embankment would require additional land take when compared to Option 4A, however no project delivery risk foreseen.	200
	Minimise project delivery risk by consideration of the proportionality of option on impacted community	Minimise impact on private landowners who are not at risk of flooding but who may be adversely affected during construction and operation of scheme	1 D		Anap, March 2021	Feedback from impacted landowners	Acceptable level of impact to affected private landowners	Private landowners who do not benefit from the scheme are not impacted by the construction or operation of the scheme	15	5	Considered to be an important factor in this area	3	Location of proposed embankment will require significant land take resulting in potential numerous agreements required with land owners. Potential for impacted landowners to not be in favour of the option.	225	3	Location of proposed pump station will require land take from Midleton rugby club's pitches. Upgrade of IGL embankments likely required, interaction with IGL required. Potential for impacted landowners to not be in favour of the option.	225	3	Location of proposed embankment would correspond with the proposed Northern Relief Road Extension (NIRE), therefore minimising the additional land required for the scheme alone. Should the NIRE not proceed, the embankment would require significant land take and potential numerous agreements required with land owners. Potential for impacted landowners to not be in favour of the option.	225	3	Location of proposed embankment would correspond with the proposed Northern Relief Road Extension (NIRE), therefore minimising the additional land required for the scheme alone. Should the NIRE not proceed, the embankment would require significant land take and potential numerous agreements required with land owners. Potential for impacted landowners to not be in favour of the option.	225	3	Location of proposed embankment will require significant land take resulting in potential numerous agreements required with land owners. Potential for impacted landowners to not be in favour of the option.	225
	Maximise wider benefit of project	Provide opportunities for additional social infrastructure and amenity. Promote health and well being. Enhance opportunities for local investment. Catalyst for regeneration of area.	1 E		Anap, March 2021	Number of other projects enhanced/facilitated by option	Ensure compatibility with social objectives in Local Area Development Plan	Enhance opportunities for other projects and enable synergies with other projects	10	10	Considered to be an important factor in this area	-3	Option incorporates / facilitates the Midleton to Youghal Greenway, this project will have wide societal value which will have a significant positive impact on local health and well being. Option could create technical challenges and result in cost increases for the proposed NIRE due to the Greenway regrading requirements. This would have a wider societal impact.	-150	1	Option incorporates / facilitates the Midleton to Youghal Greenway, this project will have a wider societal value which will have a very significant positive impact on local health and well being.	50	-4	Option incorporates / facilitates the Midleton to Youghal Greenway, this project will have wide societal value which will have a significant positive impact on local health and well being. Option could create significant technical challenges (including issues with proposed access to IDL site) and result in significant cost increases for the proposed NIRE due to the Greenway regrading requirements. This would have a wider societal impact.	-200	-3	Option incorporates / facilitates the Midleton to Youghal Greenway and NIRE, both of which will have wide societal value. However option would restrict use of Greenway during a flood event.	-150	1	Option incorporates / facilitates the Midleton to Youghal Greenwayand NIRE, both of which will have wide societal value.	50
									60		Social Score	650		775		630		600		650
Economic	Reduce economic damages	Minimise economic risk	2 A		OPW, Sept 2018	Annual Average Damage (AAD) expressed in Euro / year, calculated in accordance with the economic risk assessment methods, but with no allowance for social / intaxible benefits	AAD is not increased	100% reduction in AAD	24	5	AAD for the SSA/C*5000	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600	5	Option to provide full protection from design flood risk	600
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	2 B		OPW, Sept 2018	Number and type of transport routes at risk from flooding	No increase in risk to transport infrastructure	Reduce risk to transport infrastructure to zero	10	1	Moderate threshold of flooding on regional road R626. Proposed Midleton to Youghal Greenway not considered impacted due to its flood compatible nature as specified in the Scheme FRA	5	Option to provide full protection from design flood risk	50	5	Option to provide full protection from design flood risk	50	5	Option to provide full protection from design flood risk	50	5	Option to provide full protection from design flood risk	50	5	Option to provide full protection from design flood risk	50
	Minimise risk to utilities infrastructure	Minimise risk to utilities infrastructure	2 C		OPW, Sept 2018	Number and type of infrastructure assets at risk from flooding	No increase in risk to utility infrastructure	Reduce risk to utility infrastructure to zero	14	2	A number of infrastructure assets in area. Professional judgement applied to scoring	5	Option to provide full protection from design flood risk	140	5	Option to provide full protection from design flood risk	140	5	Option to provide full protection from design flood risk	140	5	Option to provide full protection from design flood risk	140	5	Option to provide full protection from design flood risk	140
	Manage risk to aericulture	Minimise risk to aericulture	2 D		OPW, Sept 2018	Aericultural production	No increase in the negative impact of flooding on aericultural production	Provide the potential for enhanced aericultural production	12	2	Considered to be of Minor / Local importance.	-4	Location of proposed embankment may have an impact on water levels on agricultural land to the east. Proposed embankment at this location will also require significant land take. Phasing of construction required, as this option results in an increase in downstream max water levels.	-96	-1	Location of proposed embankment less likely to have an impact on water levels on agricultural land to the east due to the small reduction of existing floodplain. Proposed embankment at this location will also require significants less land take.	-24	-3	Location of proposed embankment may have an impact on water levels on agricultural land to the east. Proposed embankment at this location will also require significant land take. This option does not result in an increase in downstream max water levels.	-72	-3	Location of proposed embankment may have an impact on water levels on agricultural land to the east. Proposed embankment at this location will also require significant land take, as it will combine with the NIRE land take. This option does not result in an increase in downstream max water levels.	-72	-4	Location of proposed embankment may have an impact on water levels on agricultural land to the east. Proposed embankment at this location will also require significant land take. Phasing of construction required, as this option results in an increase in downstream max water levels.	-96
									60		Economic Score	594		766		718		718		594
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives	3 A		OPW, Sept 2018	-	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	15	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018	0	No constraint to the achievement of wb objectives	0	0	No constraint to the achievement of wb objectives	0	0	No constraint to the achievement of wb objectives	0	0	No constraint to the achievement of wb objectives	0	0	No constraint to the achievement of wb objectives	0
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and designa tions.	3 B		OPW, Sept 2018	-	No deterioration in the conservation status of designated sites as a result of flood risk management measures.	Improvement in the conservation status of designated sites as a result of flood risk management sites.	9	1	There are no Annexed habitats under the footprint works areas. Ex situ potential for Wintering Annexed birds was considered to be a low level driver in this regard.	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farmina activity.	-9	0	No apparent impacts on Annexed habitats or species.	0	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farmina activity.	-9	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farmina activity.	-9	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farmina activity.	-9
	Avoid damages to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to, and where possible enhance, legally protected sites / habitats and other sites / habitats of national, regional and local nature conservation importance	3 C		OPW, Sept 2018	-	No deterioration in the condition of existing sites due to the implementation of flood risk management option	Creation of new or improvement in condition of existing sites due to the implementation of flood risk management option	4	2	Areas of Woodland/Hedgerow may provide roosting habitat for Bats	-2	Potential impacts on Bats will need to be mitigated. The proposed magnitude of works in this option are relatively larger than 4B and so a marginally lower score is assigned.	-16	-1	Potential impacts on Bats will need to be mitigated.	-8	-2	Potential impacts on Bats will need to be mitigated. The proposed magnitude of works in this option are similar to 4A and so a similar score is assigned.	-16	-2	Potential impacts on Bats will need to be mitigated. The proposed magnitude of works in this option are larger in scale than 4A and so a marginally lower score is assigned.	-24
	Protect and where possible enhance fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species	3 D		OPW, Sept 2018	-	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fisheries habitat. Improvement in habitat quality / quantity. Enhanced upstream accessibility	10	0	No fisheries potential	0	No fisheries potential	0	0	No fisheries potential	0	0	No fisheries potential	0	0	No fisheries potential	0	0	No fisheries potential	0
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor/zone of influence.	Protect, and where possible enhance, visual amenity, landscape protection zones and views into/from designated scenic areas in the river corridor/zone of influence	3 E		OPW, Sept 2018	-	No significant impact on landscape designation (protected site, scenic route/amenity, natural landcape form) within zone of visibility of measures. No significant change in the quality of existing landscape characteristics of the receiving environment	No change to the existing landscape form. Enhancement of existing landscape or landscape feature	7	4	Designated as a High value Landscape (HA) in the Cork CDP. Proposed Greenway along railway corridor	-1	Some minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway corridor.	-28	0	Some very minor potential loss of existing vegetation where embankment crosses proposed Greenway corridor. Minor visual impact from pumping station within nuthc club arounds	0	-1	Some minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway corridor.	-28	-1	Some minor potential loss of existing vegetation where embankment runs adjacent to hedgerows and where it crosses proposed Greenway corridor.	-28	-2	Potential loss of existing vegetation where embankment runs adjacent to hedgerows and Greenway (N&G) and where it crosses proposed Greenway corridor. The proposed magnitude of works in this option are larger in scale than 4A and so a marginally lower score is assigned.	-56
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(i) Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods where this is beneficial	3 F.(i)		OPW, Sept 2018	-	No increase in the risk to architectural features, institutions and collections at risk from flooding No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of architectural features, institutions and collections arising from the implementation of the selected measures.	4	1	Based on the number and type of recorded architectural features in the area and professional iudement.	-1	Proposed embankment could have a direct impact on a section of a millrace associated with Midleton Distillery (PS (; C0076-025). Limited potential for effects on the setting of Cahermone Castle (PS 00855: C0076-027001).	-4	0	No known/recorded architectural sites in the area of proposed works.	0	0	Limited potential for effects on the setting of Cahermone Castle (PS-00855; C0076-027001). This impact will be more limited than for other options, due to difference in proximity.	0	0	Limited potential for effects on the setting of Cahermone Castle (PS-00855; C0076-027001). This impact will be more limited than for other options, due to difference in proximity.	0	-1	Proposed embankment could have a direct impact on a section of a millrace associated with Midleton Distillery (PS-1; C0076-025). Limited potential for effects on the setting of Cahermone Castle (PS-00855: C0076-027001).	-4
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(ii) Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial	3 F.(ii)		OPW, Sept 2018	-	No increase in the risk to archaeological features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of archaeological features, institutions and collections arising from the implementation of the selected measures.	4	1	Based on the number and type of recorded archaeological monuments/features in the area and professional iudement.	-1	Proposed embankment would have a direct impact on a section of a millrace associated with Midleton Distillery (C0076-025; PS 1). Limited potential for effects on the setting of Cahermone Castle (C0076-027001: PS 00855).	-4	0	No known/recorded archaeological sites in the area of proposed works.	0	0	Limited potential for effects on the setting of Cahermone Castle (PS-00855; C0076-027001). This impact will be more limited than for other options, due to difference in proximity.	0	0	Limited potential for effects on the setting of Cahermone Castle (PS-00855; C0076-027001). This impact will be more limited than for other options, due to difference in proximity.	0	-1	Proposed embankment would have a direct impact on a section of a millrace associated with Midleton Distillery (PS-1; C0076-025). Limited potential for effects on the setting of Cahermone Castle (PS-00855: C0076-027001).	-4
	Protect land, soil and bedrock and improve their protection from extreme floods	Avoid damage to or erosion of land, soil and solid geology, and improve their protection from extreme floods	3C		Anap, March 2021	-	No increased risk of negative effect on land, soil or solid geology, or of erosion of land or soil, or negative effect on soil fertility	Enhancement of land, soil and bedrock condition, stability, fertility, economic value	5	2	Midleton Distillery Springs - geological heritage feature on a county scale	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
	Avoid changes to hydrogeology	Avoid changes to hydrogeology	3E		Anap, March 2021	-	No increased risk of negative effect on hydrogeology	Enhancement of hydrogeology	5	2	Regionally important aquifer	-3	Potential localised negative impact on aquifers, groundwater flooding: Potential for groundwater flooding in the distillery due to increased water level along the northern boundary. The underlying clay confining the limestone may mean there is a good vertical cut off but this would need to be confirmed	-12	-2	Potential localised negative impact on aquifers, groundwater flooding: upstream groundwater flooding but no significant receptors	-8	-3	Potential localised negative impact on aquifers, groundwater flooding: upstream groundwater flooding but no significant receptors	-12	-1	Potential localised negative impact on aquifers, groundwater flooding: upstream groundwater flooding but no significant receptors	-4
	Avoid negative impact on air	Avoid measures which would have a negative impact on air and, if possible, adopt measures which would improve air	3F		Anap, March 2021	-	No increased risk of negative effect on air	Enhance air	1	2	100+ dwellings and presence of habitats and species designated as of local importance	0	Works removed from sensitive receptors and not significant extent of works	0	0	Works removed from sensitive receptors and not significant extent of works	0	0	Works removed from sensitive receptors and not significant extent of works	0	0	Works removed from sensitive receptors and not significant extent of works	0	0	Works removed from sensitive receptors and not significant extent of works	0
	Avoid measures which would increase the rate of climate change	Avoid measures which would increase the rate of climate change and, if possible, adopt measures which would reduce the rate climate change	3I		Anap, March 2021	-	Rate of climate change does not change	Rate of climate change reduced	2	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note. March 2021	0	Minimial structures and embodied carbon	0	0	Minimial structures and embodied carbon	0	0	Minimial structures and embodied carbon	0	0	Minimial structures and embodied carbon	0	0	Minimial structures and embodied carbon	0

	Minimise waste generation	Minimise waste generation. Where materials are generated their reuse should be incorporated into the scheme where possible.	3K	Arup, March 2021	-	Avoid generating waste for which there is unlikely to be regional capacity for treatment, recovery or disposal.	Zero waste projects	1	5	Waste management considered to be relevant to all construction projects
	Avoid increasing the vulnerability of the study area to major accidents or disasters	Avoid increasing the vulnerability of the study area to major accidents or disasters	3L	Arup, March 2021	-	No impact on the vulnerability of the study area to major accidents or disasters	Reduction in the vulnerability of the study area to major accidents or disasters	1	5	Presence of Upper Tier Seveso Establishment - Irish Distillers Ltd.
								60		
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	4.A	OPW, Sept 2018	Level of operational risk of option - Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully	Moderate to high, but manageable, degree of operational risk, i.e., an option with a high degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, but which, with the allocation of adequate resources, could be operated with an acceptable degree of risk of failure	No operational risk, i.e., no reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision for the option to operate or perform successfully	20	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018
Technical	Minimise risk of failure of option	Minimise risk of failure of option	4.B	Arup, March 2021	Minimise consequences of failure of option. Reduce residual risk by designing out risk where possible.	Moderate to high, but acceptable and manageable, level of residual risk post construction	Negligible inherent safety risk post construction	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note. March 2021
Technical	Ensure flood risk management options are adaptable to impacts of climate change, and can be managed effectively and sustainably into the future		4.C	Arup, March 2021	Compatible with relevant SCCAP	Option to be adaptable and maintain the required standard of protection at acceptable cost	Option to be adaptable to multiple adaptation pathways with flexibility to respond to multiple CC scenarios and timelines	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note. March 2021
Technical	Maximise benefit in case of scheme design exceedance events		4.D	Arup, March 2021	Number and type of additional properties that would be defended in a design exceedance event (Q200 / T1000)	Number of properties at current risk is not increased	Increase in the Standard of Protection for properties that are at risk beyond the scheme SOP (Q100 / T200)	5	5	Professional judgement applied to scoring
Technical	Minimise project delivery risk by consideration of third party stakeholder interaction and/or existing infrastructure	Minimise interaction with critical infrastructure	4.E	Arup, March 2021	Interaction with concerned stakeholders including utility companies	Acceptable level of interaction with existing infrastructure	No interaction with critical infrastructure	5	4	Critical infrastructure in area: HP gas line New Greenway Northern Relief Rd Extension Recommissioning of rail line
								60		

SCORING	Rationale	MCA SCORE
0	Generation of quantities of wastes in line with current industry practice	0
0	No impact on the vulnerability of the study area to a major accident or disaster	0
	Environmental Score	-63
3	Very low operational risk exists, e.g. pumping station for residual flooding on dry side. Potential for groundwater flooding due to uncertainty in ground conditions	300
1	Low residual risk, i.e. - This option addresses flood risk further upstream and away from risk area	75
3	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the assumptive approach be adopted in the present day and that the embankment be designed to accommodate the MRFS and HEFS required standard of protection. This approach will have minimal further cost or intervention, however there will be a minimum increase in present day capital costs. The assumptive approach for the groundwater cut-off is also applicable to accommodate the MRFS and HEFS required standard of protection.	225
1	The risk associated with groundwater flooding during exceedance events would be reduced for circa 23 properties (residential and commercial) as part of this option. It is estimated that circa 100% of properties currently at risk of groundwater flooding will be protected beyond the SoP. There is no additional reduction in the risk associated with fluvial overland flow during exceedance events (Q200). However, if an assumptive approach is taken as discussed in 4C, it is estimated that circa 100% of properties currently at risk of fluvial flooding will be protected beyond the SoP (Q200)	25
-4	Very significant delivery risks to the option being considered are identified. There are multiple significant interactions with existing and proposed critical infrastructure, and possible opposition from concerned stakeholders. The interaction with the proposed Greenway would require regrading on approach to the embankment crossing point, which may interfere with the proposed NRRE alignment and new access to the IDL site to the south. This integration represents a potential delivery risk to the option.	-80
	Technical Score	545
	MCA Benefit Score	1281
	Option Selection Benefit Score	1826
	Total Capital Costs (M€)	3.70
	MCA Benefit/Cost Ratio	0.35
	Economic Benefit (M€)	2.26
	Economic Benefit/Cost Ratio	0.61

SCORING	Rationale	MCA SCORE
0	Generation of quantities of wastes in line with current industry practice	0
-5	Moderate increase in the vulnerability of the study area to a major accident or disaster: Potential for Groundwater Flooding in IDL due to embankment underflow. Although flooding occured within IDL site during 2015/2016 event, it is unclear if it was groundwater flooding. It may have been mitigated due to natural barrier in the form of the low permeability clays under the gravels or due to IDL groundwater control infrastructure	-25
	Environmental Score	-37
-3	Significant operational / technical risk, Potential for Groundwater Flooding to be induced within IDL due to storage of water adjacent to existing embankment. Although flooding occured within IDL site during 2015/2016 event, it is unclear if it was groundwater flooding. It may have been mitigated due to natural barrier in the form of the low permeability clays under the gravels or due to IDL groundwater control infrastructure. MItigation by upgrade to existing embankments	-300
0	Moderate residual risk, i.e -Pump system failure would result in localised or minor flooding -Potential for Groundwater Flooding in IDL due to embankment underflow.	0
2	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the assumptive approach be adopted in the present day and that the embankment be designed to accommodate the MRFS and HEFS required standard of protection. This approach will have minimal further cost or intervention, however there will be a minimum increase in present day capital costs. The assumptive approach for elements of the pumping systems is also applicable to accommodate the MRFS and HEFS required standard of protection e.g. pump chambers could be designed to accommodate larger/ more pumps in the future but the capacity of the pump would not be upgraded until required. As this option will require future input to accommodate the MRFS and HEFS due to the increased pumping capacity required, it was deemed appropriate to reduce this option score relative to Option 4A	150
0	The risk associated with groundwater flooding during exceedance events would not be reduced as part of this option. There is no additional reduction in the risk associated with fluvial overland flow during exceedance events (Q200). However, if an assumptive approach is taken as discussed in 4C, it is estimated that circa 100% of properties currently at risk of fluvial and groundwater flooding will be protected beyond the current SoP.	0
-4	Very significant delivery risks to the option being considered are identified. There are multiple significant interactions with existing critical infrastructure - IDL embankments - and possible opposition from concerned stakeholders.	-80
	Technical Score	-230
	MCA Benefit Score	1504
	Option Selection Benefit Score	1274
	Total Capital Costs (M€)	3.20
	MCA Benefit/Cost Ratio	0.47
	Economic Benefit (M€)	2.26
	Economic Benefit/Cost Ratio	0.71

SCORING	Rationale	MCA SCORE
0	Generation of quantities of wastes in line with current industry practice	0
0	No impact on the vulnerability of the study area to a major accident or disaster	0
	Environmental Score	-55
3	Very low operational risk exists, e.g. pumping station for residual flooding on dry side. Potential for groundwater flooding due to uncertainty in ground conditions	300
1	Low residual risk, i.e. - This option addresses flood risk further upstream and away from risk area	75
2	Option is limited in its ability to adapt to future climate change requirements due to its combination with the NRRE, which will be designed to a fixed height. However, an assumptive approach in design is possible to accommodate the MRFS and HEFS with this scheme to provide an increased level of protection. This would result in an increase in present day capital costs.	150
1	The risk associated with groundwater flooding during exceedance events would be reduced for circa 23 properties (residential and commercial) as part of this option. It is estimated that circa 100% of properties currently at risk of groundwater flooding will be protected beyond the SoP. There is no additional reduction in the risk associated with fluvial overland flow during exceedance events (Q200). However, if an assumptive approach is taken as discussed in 4C, it is estimated that circa 100% of properties currently at risk of fluvial flooding will be protected beyond the SoP (Q200)	25
-4	Very significant delivery risks to the option being considered are identified. There are multiple significant interactions with existing and proposed critical infrastructure, and possible opposition from concerned stakeholders. Option could create significant technical challenges (including issues with proposed access to IDL site) and result in significant cost increases for the proposed NRRE due to the Greenway regrading requirements. This integration represents a potential delivery risk to the option.	-80
	Technical Score	470
	MCA Benefit Score	1263
	Option Selection Benefit Score	1733
	Total Capital Costs (M€)	4.00
	MCA Benefit/Cost Ratio	0.32
	Economic Benefit (M€)	2.26
	Economic Benefit/Cost Ratio	0.57

SCORING	Rationale	MCA SCORE
0	Generation of quantities of wastes in line with current industry practice	0
0	No impact on the vulnerability of the study area to a major accident or disaster	0
	Environmental Score	-55
-4	High operational risk exists, i.e., this option is fully reliant on systems or interventions for the option to operate, i.e. flood forecasting and demountable flood barrier across Greenway (required at lower return periods), with regular monitoring and maintenance required. Pumping station for residual flooding on dry side. Potential for groundwater flooding due to uncertainty in ground conditions	-400
-3	High residual risk, i.e. - This option addresses flood risk further upstream and away from risk area, but relies on manual intervention and a flood forecasting system.	-225
2	Option is limited in its ability to adapt to future climate change requirements due to its combination with the NRRE, which will be designed to a fixed height. However, an assumptive approach in design is possible to accommodate the MRFS and HEFS with this scheme to provide an increased level of protection. This would result in an increase in present day capital costs.	150
1	The risk associated with groundwater flooding during exceedance events would be reduced for circa 23 properties (residential and commercial) as part of this option. It is estimated that circa 100% of properties currently at risk of groundwater flooding will be protected beyond the SoP. There is no additional reduction in the risk associated with fluvial overland flow during exceedance events (Q200). However, if an assumptive approach is taken as discussed in 4C, it is estimated that circa 100% of properties currently at risk of fluvial flooding will be protected beyond the SoP (Q200)	25
-4	Very significant delivery risks to the option being considered are identified. There are multiple significant interactions with existing and proposed critical infrastructure, and possible opposition from concerned stakeholders. Further liaison with Irish Rail would be required as the flood barrier proposal may not be acceptable to them.	-80
	Technical Score	-530
	MCA Benefit Score	1313
	Option Selection Benefit Score	783
	Total Capital Costs (M€)	3.60
	MCA Benefit/Cost Ratio	0.36
	Economic Benefit (M€)	2.26
	Economic Benefit/Cost Ratio	0.63

SCORING	Rationale	MCA SCORE
0	Generation of quantities of wastes in line with current industry practice	0
0	No impact on the vulnerability of the study area to a major accident or disaster	0
	Environmental Score	-99
3	Very low operational risk exists, e.g. pumping station for residual flooding on dry side. Potential for groundwater flooding due to uncertainty in ground conditions	300
1	Low residual risk, i.e. - This option addresses flood risk further upstream and away from risk area	75
3	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the assumptive approach be adopted in the present day and that the embankment be designed to accommodate the MRFS and HEFS required standard of protection. This approach will have minimal further cost or intervention, however there will be a minimum increase in present day capital costs. The assumptive approach for the groundwater cut-off is also applicable to accommodate the MRFS and HEFS required standard of protection.	225
1	The risk associated with groundwater flooding during exceedance events would be reduced for circa 23 properties (residential and commercial) as part of this option. It is estimated that circa 100% of properties currently at risk of groundwater flooding will be protected beyond the SoP. There is no additional reduction in the risk associated with fluvial overland flow during exceedance events (Q200). However, if an assumptive approach is taken as discussed in 4C, it is estimated that circa 100% of properties currently at risk of fluvial flooding will be protected beyond the SoP (Q200)	25
4	Minimal delivery risk to the option being considered - Minimal interaction with critical existing and proposed infrastructure. No impact on NRRE alignment. Greenway regadang required, offset from HP gas main.	80
	Technical Score	705
	MCA Benefit Score	1445
	Option Selection Benefit Score	2150
	Total Capital Costs (M€)	5.70
	MCA Benefit/Cost Ratio	0.25
	Economic Benefit (M€)	2.26
	Economic Benefit/Cost Ratio	0.40

MCA Scoring performance

Fully Achieving Aspirational Target	5
Partially Achieving Aspirational Target	3
Exceeding Basic Requirement	1
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	-1
Partially Failing Basic Requirement	-3
Totally Failing Basic Requirement (Illegal/Unacceptable)	-999

Core Criteria	Objective	Sub objective	Code	Refer to GN	Indicator	Basic Requirement	Global Weighting	Local Weighting	Local Weighting Rationale
Social	Minimise risk to human health and life - residents	(i) Minimise risk to human health and life residents	1.A.(i)	OPW, Sept 2018	Annual Average Number of residential properties at risk from flooding	Number of properties at risk is not increased	0		(to be based on calculated assessment adjusted by professional judgement)
	Minimise risk to human health and life - high vulnerability propoerties	(ii) Minimise risk to high vulnerability properties	1.A.(ii)	OPW, Sept 2018	Number and type of high vulnerability properties at risk from flooding	Number of high vulnerability properties at risk not increased	0		(to be based on calculated assessment adjusted by professional judgement)
	Minimise risk to community - social infrastructure and amenity		1.B.(i)	OPW, Sept 2018	Number of social infrastructure assets at risk from flooding	Number of social infrastructure assets at risk not increased	10	0	No social infrastructure or amenities impacted by flooding in Ballinacurra. Professional judgement applied to scoring.
	Minimise risk to community - local employment		1.B.(ii)	OPW, Sept 2018	Number of non-residential (i.e., commercial) properties at risk not increased.	Number of non-residential properties at risk not increased	10	3.5	Some areas of local employment with a number of non-residential (i.e., commercial) properties at risk including the Dairygold Co Op Store, a hair salon, a bar, a take away and a number of warehouses
	Minimise project delivery risk by consideration of social acceptability of option	Ensure flood risk management option is socially acceptable to public	1.C	Arup, March 2021	Feedback from public and landowners	Acceptable level of negative feedback	15	5	Considered to be an important factor in this area
	Minimise project delivery risk by consideration of the proportionality of option on impacted community	Minimise impact on private landowners who are not at risk of flooding but who may be adversely affected during construction and operation of scheme	1.D	Arup, March 2021	Feedback from impacted landowners	Acceptable level of impact to affected private landowners	15	5	Considered to be an important factor in this area
	Maximise wider benefit of project	Provide opportunities for additional social infrastructure and amenity. Promote health and well being. Enhance opportunities for local investment. Catalyst for regeneration of area.	1.E	Arup, March 2021	Number of other projects enhanced/facilitated by option	Ensure compatibility with social objectives in Local Area Development Plan	10	5	Considered to be an important factor in this area
							60		
Economic	Reduce economic damages	Minimise economic risk	2.A	OPW, Sept 2018	Annual Average Damage (AAD) expressed in Euro / year, calculated in accordance with the economic risk assessment methods, but with no allowance for social / intangible benefits	AAD is not increased	24	5	AAD for the SSA/€75000
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	2.B	OPW, Sept 2018	Number and type of transport routes at risk from flooding	No increase in risk to transport infrastructure	10	1	Moderate threshold of flooding on Ballinacurra Main Street
	Minimise risk to utilities infrastructure	Minimise risk to utilities infrastructure	2.C	OPW, Sept 2018	Number and type of infrastructure assets at risk from flooding	No increase in risk to utility infrastructure	14	2	A number of infrastructure assets in area. Professional judgement applied to scoring.
	Manage risk to agriculture	Minimise risk to agriculture	2.D	OPW, Sept 2018	Agricultural production	No increase in the negative impact of flooding on agricultural production	12	2	Considered to be of Minor / Local importance. There is an area of Agricultural Land upstream of Ballinacurra and adjacent to Kearney's Cross.
							60		
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives	3.A	OPW, Sept 2018	-	Provide no constraint to the achievement of water body objectives.	15	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	3.B	OPW, Sept 2018	-	No deterioration in the conservation status of designated sites as a result of flood risk management measures.	9	1	There are no Annexed habitats under the footprint works areas. The potential for indirect impacts in terms of aquatic connectivity to the Annexed habitats in the Estuary was considered. The primary receiving habitat is Sandflats and Mudflats. Ex situ potential for Wintering Annexed birds was also considered to be a low level driver in these options.
	Avoid damages to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to, and where possible enhance, legally protected sites / habitats and other sites / habitats of national, regional and local nature conservation importance	3.C	OPW, Sept 2018	-	No deterioration in the condition of existing sites due to the implementation of flood risk management option	4	2	Presence of Fish (Salmonids, Lamprey, Eels). The water courses are of local value for fishing/angling.
	Protect and where possible enhance fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species	3.D	OPW, Sept 2018	-	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	10	2	The waterbody supports possible nursery habitat for fish.
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor/zone of influence.	Protect, and where possible enhance, visual amenity, landscape protection zones and views into/from designated scenic areas in the river corridor/zone of influence	3.E	OPW, Sept 2018	-	No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures. No significant change in the quality of existing landscape characteristics of the receiving environment	7	4	Designated as a High value Landscape (HVL) in the Cork CDP. Designated scenic route across Ballinacurra Bridge.
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(i) Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(i)	OPW, Sept 2018	-	No increase in the risk to architectural features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	4	3	Based on the number, type and rating (NIAH) of recorded architectural features in the area and professional judgment
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(ii) Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(ii)	OPW, Sept 2018	-	No increase in the risk to archaeological features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	4	2	Based on the number and type of recorded archaeoloigcal monuments/features in the area and professional judgment
	Protect land, soil and bedrock and improve their protection from extreme floods	Avoid damage to or erosion of land, soil and solid geology, and improve their protection from extreme floods	3G	Arup, March 2021	-	No increased risk of negative effect on land, soil or solid geology, or of erosion of land or soil, or negative effect on soil fertility	1	1	(by professional judgement, taking account of local advice)
	Avoid changes to hydrogeology	Avoid changes to hydrogeology	3H	Arup, March 2021	-	No increased risk of negative effect on hydrogeology	1	2	Regionally important aquifer
	Avoid negative impact on air	Avoid measures which would have a negative impact on air and, if possible, adopt measures which would improve air	3I	Arup, March 2021	-	No increased risk of negative effect on air	1	2	100+ dwellings and presence of habitats and species designated as of local importance
	Avoid measures which would increase the rate of climate change	Avoid measures which would increase the rate of climate change and, if possible, adopt measures which would reduce the rate climate change	3J	Arup, March 2021	-	Rate of climate change does not change	2	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
	Minimise waste generation	Minimise waste generation. Where materials are generated their reuse should be incorporated into the scheme where possible.	3K	Arup, March 2021	-	Avoid generating waste for which there is unlikely to be regional capacity for treatment, recovery or disposal.	1	5	Waste management considered to be relevant to all construction projects
	Avoid increasing the vulnerability of the study area to major accidents or disasters	Avoid increasing the vulnerability of the study area to major accidents or disasters	3L	Arup, March 2021	-	No impact on the vulnerability of the study area to major accidents or disasters	1	0	No presence of high vulnerability establishments
							60		
	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	4.A.	OPW, Sept 2018	Level of operational risk of option - Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully	Moderate to high, but manageable, degree of operational risk, i.e., an option with a high degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, but which, with the allocation of adequate resources, could be operated with an acceptable degree of risk of failure	20	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018

Code		OPTION 5A - Direct defences	
1.A.(i)			0
1.A.(ii)			0
1.B.(i)	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	175
1.C	3	Based on feedback from PPD Option 5A received a net of 4 positive responses. Greater number of submissions in favour of the option versus those against. Public perception of option is positive and there is limited opposition. Minimal project delivery risk.	225
1.D	3	Minimal delivery risk identified, as negative feedback from impacted landowners has not been received to date. However there is impact on a significant number of properties in the urban area.	225
1.E	0	N/A	0
		Social Score	625
2.A	5	Option to provide full protection from design flood risk	600
2.B	5	Option to provide full protection from design flood risk	50
2.C	5	Option to provide full protection from design flood risk	140
2.D	-3	Direct Defences may have an impact on water levels on agricultural land at Kearney's Cross. Proposed embankment at this location will also impact agricultural land.	-72
		Economic Score	718
3.A	-2	Short-term or intermittent impediment to the achievement of wb objectives due to in-stream works	-150
3.B	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty.	-9
3.C	-1	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel.	-8
3.D	-1	Short-term minor impacts to fisheries habitat in a non-sensitive WB.	-20
3.E	0	Very minor reduction in river views for local residents from increased height of walls and bridge parapets. Minor visual impacts from above ground elements of 6 pumping stations	0
3.F.(i)	-1	No effect on known/recorded architectural features. Increased level of protection from flooding for architectural sites included in RPS and NIAH. Direct impact on 5 features of architectural/cultural heritage note (CHS 18-CHS 22) identified by Underwater Survey.	-12
3.F.(ii)	-2	No known/recorded archaeolgical sites in vicinity of proposed works. Increased level of protection from flooding for archaeological sites included in the RMP. Direct impact on Ballinacurra River (AAP 3) and on 5 Cultural Heritage Sites (CHS 18-CHS 22) identified in Underwater survey.	-16
3G	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
3H	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
3I	-3	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.	-6
3J	-3	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Use of pumps will also have an adverse environmental impact. Larger quantity of direct defences required increases embodied carbon amount.	-30
3K	0	Generation of quantities of wastes in line with current industry practice	0
3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-251
4.A.	3	Very low operational risk- failure of pumping system.	300

Code		OPTION 5B - Upstream Storage	
1.A.(i)			0
1.A.(ii)			0
1.B.(i)	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	175
1.C	4	Based on feedback from PPD Option 5B received a net of 14 positive responses. Significantly greater number of submissions in favour of the option versus those against. Public perception of option is very positive. No project delivery risk.	300
1.D	2	Potential delivery risk with the option, some negative feedback received from landowners during site investigations. However limited impact in the urban area.	150
1.E	1	This option could facilitate a project of social value within the storage area.	50
		Social Score	675
2.A	5	Option to provide full protection from design flood risk	600
2.B	5	Option to provide full protection from design flood risk	50
2.C	5	Option to provide full protection from design flood risk	140
2.D	-4	Proposed storage area will impact the agricultural land during flood events, the proposed embankments to retain water may also have a negative impact.	-96
		Economic Score	694
3.A	-3	Medium-term or recurring impediment to the achievement of wb objectives due to minor Channel Realignment Works	-225
3.B	-1	Potential temprary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty.	-9
3.C	-2	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. However, the footprint area is slightly more extensive than in Option 5A.	-16
3.D	-2	Short-term minor impacts to fisheries habitat in a non-sensitive WB but with a larger footprint.	-40
3.E	-2	Potential loss of hedgerow and treeline vegetation and visual impact from 2m and 1m high embankments around retention area. Minor visual impacts from above ground elements of 2 pumping stations	-56
3.F.(i)	2	No effect on known/recorded architectural features. Increased level of protection from flooding for architectural features included in RPS and NIAH	24
3.F.(ii)	-1	Direct Impact on two RMP sites; a burial (CO076-052) in a proposed storage area and a fulacht fia (CO076-064) adjacent to a proposed 2m high embankment. The burial was fully excavated and therfore removed and preserved by record and the fulacht fia was partially excavated. The remainder of the fulacht fia may be preserved in situ following minor changes to the embankment location. Potential for visual effect on tower house (CO076-051) situated to north of proposed embankment (1.3m high). No impact on 5 cultural heritage sites identified in Underwater survey.	-8
3G	-1	Potential localised loss of land, soil and geology: Disimprovement of soil quality in storage area is minor as the area is already prone to flooding	-1
3H	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
3I	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.	-2
3J	-2	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Use of pumps will also have an adverse environmental impact. Assumed selection of earthwork material will carry less embodied carbon than concrete used to construct direct defences.	-20
3K	0	Generation of quantities of wastes in line with current industry practice	0
3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-353
4.A.	2	Potentially significant operational risk with an upstream storage option. As there are some unknowns around the flow control approach, it is assumed that there is a some operational risk with the option. Low operational risk of a failure occuring in the pumping system is also present.	200

Code		OPTION 5B-1 - Upstream Storage - Refined Storage Area and Overpumping	
1.A.(i)			0
1.A.(ii)			0
1.B.(i)	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	175
1.C	5	This option was not presented at the PPD2. As this option is a refinement of Option 5B, it is assumed that the reduction in the number of landowners impacted further reduces the risk of negative feedback.	375
1.D	3	Potential delivery risk with the option, some negative feedback received from landowners during site investigations. Fewer landowners impacted when compared to Option 5B.	225
1.E	1	This option could facilitate a project of social value within the storage area.	50
		Social Score	825
2.A	5	Option to provide full protection from design flood risk	600
2.B	5	Option to provide full protection from design flood risk	50
2.C	5	Option to provide full protection from design flood risk	140
2.D	-4	Proposed storage area will impact the agricultural land during flood events, the proposed embankments to retain water may also have a negative impact. Extent of agricultural lands impacted reduced when compared to Option 5B.	-96
		Economic Score	694
3.A	-3	Medium-term or recurring impediment to the achievement of wb objectives due to minor Channel Realignment Works and pumping	-225
3.B	-1	Potential temprary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty.	-9
3.C	-2	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. However, the footprint area is slightly less extensive than in Option 5B.	-16
3.D	-2	Short-term minor impacts to fisheries habitat in a non-sensitive WB but with a larger footprint than direct defence options.	-40
3.E	-1	Potential loss of hedgerow and treeline vegetation and visual impact from 1.9m and 1.4m high embankments around retention area. Minor visual impacts from above ground elements of 2 pumping stations. Extent is more limited than Option 5B due to smaller footprint.	-28
3.F.(i)	2	No effect on known/recorded architectural features. Increased level of protection from flooding for architectural features included in RPS and NIAH	24
3.F.(ii)	0	Direct Impact on one RMP site; a burial (CO076-052) in a proposed storage area. The burial was fully excavated and therfore removed and preserved by record. Potential for minor visual effect on tower house (CO076-051) situated to north of proposed embankment (0.5m high). No impact on 5 cultural heritage sites identified in Underwater survey. No percieved impact to fluacht fia (CO076-064) identified downstream.	0
3G	-1	Potential localised loss of land, soil and geology: Disimprovement of soil quality in storage area is minor as the area is already prone to flooding	-1
3H	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
3I	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.	-2
3J	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Use of pumps will also have an adverse environmental impact. Reduced nature of storage option limits embodied carbon amount.	-10
3K	0	Generation of quantities of wastes in line with current industry practice	0
3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-307
4.A.	2	Potentially significant operational risk with an upstream storage option. As there are some unknowns around the flow control approach, it is assumed that there is a some operational risk with the option. Low operational risk of a failure occuring in the pumping system is also present.	200

Code		OPTION 5C - Optimised Direct Defences and Overpumping	
1.A.(i)			0
1.A.(ii)			0
1.B.(i)	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	175
1.C	4	This option was not presented at the PPD2. As this optimised solution further reduces the scale of direct defences required in the urban area, it is considered project delivery risk is further reduced. Minimal project delivery risk.	300
1.D	3	Minimal delivery risk identified, as negative feedback from impacted landowners has not been received to date. Fewer landowners in the urban area impacted when compared to Option 5A.	225
1.E	0	N/A	0
		Social Score	700
2.A	5	Option to provide full protection from design flood risk	600
2.B	5	Option to provide full protection from design flood risk	50
2.C	5	Option to provide full protection from design flood risk	140
2.D	-3	Direct Defences may have an impact on water levels on agricultural land at Kearney's Cross. Proposed embankment at this location will also impact land. Despite the extent of direct defences being reducd, works are still required at Kearney's Cross.	-72
		Economic Score	718
3.A	-3	Short-term or intermittent impediment to the achievement of wb objectives due to in-stream works and pumping	-225
3.B	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty.	-9
3.C	-1	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel.	-8
3.D	-1	Short-term minor impacts to fisheries habitat in a non-sensitive WB.	-20
3.E	0	Very minor reduction in river views for local residents from increased height of walls and bridge parapets. Minor visual impacts from above ground elements of 1 pumping station	0
3.F.(i)	-1	No effect on known/recorded architectural features. Increased level of protection from flooding for architectural sites included in RPS and NIAH. Direct impact on 5 features of architectural/cultural heritage note (CHS 18-CHS 22) identified by Underwater Survey.	-12
3.F.(ii)	-2	No known/recorded archaeolgical sites in vicinity of proposed works. Increased level of protection from flooding for archaeological sites included in the RMP. Direct impact on Ballinacurra River (AAP 3) and on 5 Cultural Heritage Sites (CHS 18-CHS 22) identified in Underwater survey.	-16
3G	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
3H	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
3I	-3	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.	-6
3J	-3	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Larger size of pumps required increases embodied carbon during operation.	-30
3K	0	Generation of quantities of wastes in line with current industry practice	0
3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-326
4.A.	3	Very low operational risk- failure of pumping system.	300

Code		OPTION 5D - Optimised Direct Defences, Upstream Storage and Overpumping	
1.A.(i)			0
1.A.(ii)			0
1.B.(i)	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	175
1.C	4	This option was not presented at the PPD2. As this optimised solution further reduces the scale of direct defences required in the urban area, it is considered public preception would be positive and therefore project delivery risk is further reduced. Minimal project delivery risk.	300
1.D	2	Potential delivery risk with the option, some negative feedback received from landowners during site investigations. However there is impact on a number of properties in the urban area.	150
1.E	1	This option could facilitate a project of social value within the storage area.	50
		Social Score	675
2.A	5	Option to provide full protection from design flood risk	600
2.B	5	Option to provide full protection from design flood risk	50
2.C	5	Option to provide full protection from design flood risk	140
2.D	-4	Proposed storage area will impact the agricultural land during flood events, the proposed embankments to retain water may also have a negative impact. Extent of agricultural lands impacted reduced when compared to Option 5B.	-96
		Economic Score	694
3.A	-4	Medium-term or recurring impediment to the achievement of wb objectives due to minor Channel Realignment Works, in-stream works and pumping	-300
3.B	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty.	-9
3.C	-2	Potential Impacts on Fish (Salmonids, Lamprey, Eels) will need to be mitigated. Potential localised loss of or disturbance to flora/fauna limited by the already modified nature of the channel. However, the footprint area is slightly less extensive than in Option 5B.	-16
3.D	-2	Short-term minor impacts to fisheries habitat in a non-sensitive WB but with a larger footprint than direct defence options alone.	-40
3.E	-1	Potential loss of hedgerow and treeline vegetation and visual impact from 1.1m and 1m high embankments around retention area. Minor visual impacts from above ground elements of 1 pumping station. Extent is more limited than Option 5B due to smaller footprint.	-28
3.F.(i)	-1	No effect on known/recorded architectural features. Increased level of protection from flooding for architectural sites included in RPS and NIAH. Direct impact on 4 features of architectural/cultural heritage note (CHS 18-CHS 22) identified by Underwater Survey.	-12
3.F.(ii)	-3	Direct Impact on one RMP site; a burial (CO076-052) in a proposed storage area. The burial was fully excavated and therfore removed and preserved by record. Potential for minor visual effect on tower house (CO076-051) situated to north of proposed embankment (1m high). Direct impact on 4 cultural heritage sites identified in Underwater survey. No percieved impact to fluacht fia (CO076-064) identified downstream.	-24
3G	-1	Potential localised loss of land, soil and geology: Disimprovement of soil quality in storage area is minor as the area is already prone to flooding	-1
3H	0	No impact on existing national, regional and local aquifers, groundwater dependent ecosystems or groundwater resource as a result of flood risk management measures.	0
3I	-2	Potential for significant temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residential receptors.	-4
3J	-3	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions. Larger size of pumps required increases embodied carbon during operation.	-30
3K	0	Generation of quantities of wastes in line with current industry practice	0
3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-464
4.A.	2	Potentially significant operational risk with an upstream storage option. As there are some unknowns around the flow control approach, it is assumed that there is a some operational risk with the option. Low operational risk of a failure occuring in the pumping system is also present.	200

Technical	Minimise risk of failure of option	Minimise risk of failure of option	4.B	Arup, March 2021	Minimise consequences of failure of option. Reduce residual risk by designing out risk where possible.	Moderate to high, but acceptable and manageable, level of residual risk post construction	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
Technical	Ensure flood risk management options are adaptable to impacts of climate change, and can be managed effectively and sustainably into the future		4.C	Arup, March 2021	Compatible with relevant SCCAP.	Option to be adaptable and maintain the required standard of protection at acceptable cost	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
Technical	Maximise benefit in case of scheme design exceedance events		4.D	Arup, March 2021	Number and type of additional properties that would be defended in a design exceedance event (Q200 / T1000)	Number of properties at current risk is not increased	5	5	Professional judgement applied to scoring
Technical	Minimise project delivery risk by consideration of third party stakeholder interaction and/or existing infrastructure	Minimise interaction with critical infrastructure	4.E	Arup, March 2021	Interaction with concerned stakeholders including utility companies	Acceptable level of interaction with existing infrastructure	5	3	Critical infrastructure in area: Irish Water assets, GNI assets, ESB assets. Critical interactions at PS rising main crossing Dairygold site and R630 road
							60		

Ref.	SCORING	Rationale	MCA SCORE
4.B	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding	75
4.C	1	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. Direct defences can be built to permit an extension in height to maintain the required standard of protection / risk reduction for the MRFS, which would be acceptable locally but where adaptation would have other negative implications / costs (e.g., more than 1.2-1.5m height in public areas after being raised, but with demountable defences necessary to provide protection above 1.2-1.5m). The HEFS would have greater negative implications.	75
4.D	1	Option can reduce a portion of the residual risk associated with exceedance events (Q200) in some areas in particular in East Ballinacurra as the wall height defending this area will be defined by the minimum guard height (1.1m) and not the Q100 defence height (0.7m on the left bank and 0.5m on the right bank). It is estimated that circa 10% of properties currently at risk of flooding will be protected beyond the SoP.	25
4.E	4	Minimal delivery risk to the option being considered. Urban area - interaction with critical infrastructure at direct defences and PS RM.	60
		Technical Score	535

MCA Benefit Score	1092
Option Selection Benefit Score	1627
Total Capital Costs (M€)	5.10
MCA Benefit/Cost Ratio	0.21
Economic Benefit (M€)	4.32
Economic Benefit/Cost Ratio	0.85

Ref.	SCORING	Rationale	MCA SCORE
4.B	-1	Moderate residual risk, i.e. - Storage option, failure of which would result in significant flooding -Pump system failure would result in significant flooding	-75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the assumptive approach be adopted in the present day and that the upstream storage be designed to accommodate the MRFS and HEFS required standard of protection. This approach will have minimal further cost or intervention, however there will be a minimum increase in present day capital costs. Channel maintenance, replacement of pump station and flow control structures will still be required.	300
4.D	3	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Ballinacurra provided an assumptive approach in designing the storage area is taken. It is estimated that circa 90% of properties currently at risk of flooding will be protected beyond the SoP.	75
4.E	4	Minimal delivery risk to the option being considered. Urban area - interaction with critical infrastructure at PS RM. ESB Med voltage diversion may be required in upstream area	60
		Technical Score	560

MCA Benefit Score	1016
Option Selection Benefit Score	1576
Total Capital Costs (M€)	1.50
MCA Benefit/Cost Ratio	0.68
Economic Benefit (M€)	4.32
Economic Benefit/Cost Ratio	2.88

Ref.	SCORING	Rationale	MCA SCORE
4.B	-1	Moderate residual risk, i.e. - Storage option, failure of which would result in significant flooding -Pump system failure would result in significant flooding	-75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the assumptive approach be adopted in the present day and that the upstream storage be designed to accommodate the MRFS and HEFS required standard of protection. This approach will have minimal further cost or intervention, however there will be a minimum increase in present day capital costs. Channel maintenance, replacement of pump station and flow control structures will still be required.	300
4.D	3	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Ballinacurra provided an assumptive approach in designing the storage area is taken.	75
4.E	4	Minimal delivery risk to the option being considered. Urban area - interaction with critical infrastructure at PS RM. ESB Med voltage diversion may be required in upstream area	60
		Technical Score	560

MCA Benefit Score	1212
Option Selection Benefit Score	1772
Total Capital Costs (M€)	1.30
MCA Benefit/Cost Ratio	0.93
Economic Benefit (M€)	4.32
Economic Benefit/Cost Ratio	3.32

Ref.	SCORING	Rationale	MCA SCORE
4.B	-1	Moderate residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding - Pump system failure would result in significant flooding due to defences having been optimised	-75
4.C	1	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. Direct defences can be built to permit an extension in height to maintain the required standard of protection / risk reduction for the MRFS, which would be acceptable locally but where adaptation would have other negative implications / costs (e.g., more than 1.2-1.5m height in public areas after being raised, but with demountable defences necessary to provide protection above 1.2-1.5m). The HEFS would have greater negative implications.	75
4.D	-2	Option could be subject to significant residual risk in East Ballinacurra when exceedance events (Q200) occur and pumping rates are not sufficient. The optimisation of direct defences, would result in significant overtopping of existing walls where heights are not increased, as Option 5A.	-50
4.E	4	Minimal delivery risk to the option being considered. Urban area - interaction with critical infrastructure at direct defences and PS RM.	60
		Technical Score	310

MCA Benefit Score	1092
Option Selection Benefit Score	1402
Total Capital Costs (M€)	3.50
MCA Benefit/Cost Ratio	0.31
Economic Benefit (M€)	4.32
Economic Benefit/Cost Ratio	1.23

Ref.	SCORING	Rationale	MCA SCORE
4.B	-1	Moderate residual risk, i.e. - Storage option, failure of which would result in significant flooding -Pump system failure would result in significant flooding	-75
4.C	2	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. Direct defences can be built to permit an extension in height to maintain the required standard of protection / risk reduction for the MRFS, which would be acceptable locally but where adaptation would have other negative implications / costs (e.g., more than 1.2-1.5m height in public areas after being raised, but with demountable defences necessary to provide protection above 1.2-1.5m). The HEFS would have greater negative implications. Upstream storage adaptations can be integrated based on an assumptative approach to be adopted in the present day.	150
4.D	-1	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Ballinacurra provided an assumptive approach in designing the storage area is taken. Increased risk in East Ballinacurra where exceedance events correspond with tide locking events, as direct defences in the area have been reduced in height and extent.	-25
4.E	4	Minimal delivery risk to the option being considered. Urban area - interaction with critical infrastructure at direct defences and PS RM. ESB Med voltage diversion may be required in upstream area	60
		Technical Score	310

MCA Benefit Score	905
Option Selection Benefit Score	1215
Total Capital Costs (M€)	3.10
MCA Benefit/Cost Ratio	0.29
Economic Benefit (M€)	4.32
Economic Benefit/Cost Ratio	1.39

MCA Scoring performance	
Fully Achieving Aspirational Target	5
Partially Achieving Aspirational Target	3
Exceeding Basic Requirement	1
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	-1
Partially Failing Basic Requirement	-3
Totally Failing Basic Requirement (Illegal/Unacceptable)	-999

Core Criteria	Objective	Sub objective	Code	Refer to GN	Indicator	Basic Requirement	Aspirational Target	Global Weighting	Local Weighting	Local Weighting Rationale
Social	Minimise risk to human health and life - residents	(i) Minimise risk to human health and life residents	1.A.(i)	OPW, Sept 2018	Annual Average Number of residential properties at risk from flooding	Number of properties at risk is not increased	100% reduction in number of residential properties at risk	0		(to be based on calculated assessment adjusted by professional judgement)
	Minimise risk to human health and life - high vulnerability propoerties	(ii) Minimise risk to high vulnerability properties	1.A.(ii)	OPW, Sept 2018	Number and type of high vulnerability properties at risk from flooding	Number of high vulnerability properties at risk not increased	100% reduction in number of high vulnerability properties at risk	0		(to be based on calculated assessment adjusted by professional judgement)
	Minimise risk to community - social infrastructure and amenity		1.B.(i)	OPW, Sept 2018	Number of social infrastructure assets at risk from flooding	Number of social infrastructure assets at risk not increased	100% reduction in number of social infrastructure assets at risk	10	0	No social infrastructure or amenities impacted by flooding in Waterrock.
	Minimise risk to community - local employment		1.B.(ii)	OPW, Sept 2018	Number of non-residential (i.e., commercial) properties at risk not increased.	Number of non-residential properties at risk not increased	100% reduction in number of non-residential properties at risk	10	5	Some areas of local employment with a number of non-residential (i.e., commercial) properties at risk including mechanics garage
	Minimise project delivery risk by consideration of social acceptability of option	Ensure flood risk management option is socially acceptable to public	1.C	Arup, March 2021	Feedback from public and landowners	Acceptable level of negative feedback	No negative feedback	15	5	Considered to be an important factor in this area
	Minimise project delivery risk by consideration of the proportionality of option on impacted community	Minimise impact on private landowners who are not at risk of flooding but who may be adversely affected during construction and operation of scheme	1.D	Arup, March 2021	Feedback from impacted landowners	Acceptable level of impact to affected private landowners	Private landowners who do not benefit from the scheme are not impacted by the construction or operation of the scheme	15	5	Considered to be an important factor in this area
	Maximise wider benefit of project	Provide opportunities for additional social infrastructure and amenity. Promote health and well being. Enhance opportunities for local investment. Catalyst for regeneration of area.	1.E	Arup, March 2021	Number of other projects enhanced/facilitated by option	Ensure compatibility with social objectives in Local Area Development Plan	Enhance opportunities for other projects and enable synergies with other projects	10	5	Considered to be an important factor in this area
								60		
Economic	Reduce economic damages	Minimise economic risk	2.A	OPW, Sept 2018	Annual Average Damage (AAD) expressed in Euro / year, calculated in accordance with the economic risk assessment methods, but with no allowance for social / intangible benefits	AAD is not increased	100% reduction in AAD	24	0.1	AAD for the SSA/€75000
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	2.B	OPW, Sept 2018	Number and type of transport routes at risk from flooding	No increase in risk to transport infrastructure	Reduce risk to transport infrastructure to zero	10	5	Moderate threshold of flooding on local road (Castle Rock Ave and L3619), High threshold of flooding of the rail line and a low threshold of flooding of Dwyers Road
	Minimise risk to utilities infrastructure	Minimise risk to utilities infrastructure	2.C	OPW, Sept 2018	Number and type of infrastructure assets at risk from flooding	No increase in risk to utility infrastructure	Reduce risk to utility infrastructure to zero	14	5	Moderate threshold of flooding of WWTP. Professional judgement applied to scoring.
	Manage risk to agriculture	Minimise risk to agriculture	2.D	OPW, Sept 2018	Agricultural production	No increase in the negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12	2	Considered to be of Minor / Local importance. There is an area of Agricultural Land south of N25.
								60		
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives	3.A	OPW, Sept 2018	-	Provide no constraint to the achievement of water body objectives.	Contribute to the achievement of water body objectives	15	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	3.B	OPW, Sept 2018	-	No deterioration in the conservation status of designated sites as a result of flood risk management measures.	Improvement in the conservation status of designated sites as a result of flood risk management sites.	9	1	There are no Annexed habitats under the footprint works areas. The potential for indirect impacts in terms of aquatic connectivity to the Annexed habitats in the Estuary was considered. The primary receiving habitat is Sandflats and Mudflats. Ex situ potential for Wintering Annexed birds was also considered to be a low level driver in these options.
	Avoid damages to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to, and where possible enhance, legally protected sites / habitats and other sites / habitats of national, regional and local nature conservation importance	3.C	OPW, Sept 2018	-	No deterioration in the condition of existing sites due to the implementation of flood risk management option	Creation of new or improvement in condition of existing sites due to the implementation of flood risk management option	4	1	The areas are of low local biodiversity value.
	Protect and where possible enhance fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species	3.D	OPW, Sept 2018	-	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fisheries habitat. Improvement in habitat quality / quantity. Enhanced upstream accessibility	10	1	Low fisheries value.
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor/zone of influence.	Protect, and where possible enhance, visual amenity, landscape protection zones and views into/from designated scenic areas in the river corridor/zone of influence	3.E	OPW, Sept 2018	-	No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures. No significant change in the quality of existing landscape characteristics of the receiving environment	No change to the existing landscape form. Enhancement of existing landscape or landscape feature	7	4	(by professional judgement, taking account of local advice)
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(i) Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(i)	OPW, Sept 2018	-	No increase in the risk to architectural features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of architectural features, institutions and collections arising from the implementation of the selected measures.	4	0	Based on the number and type of recorded architectural features in the area and professional judgment.
	Avoid damage to or loss of features, institutions, and collections of cultural heritage importance and their setting and improve their protection from extreme floods	(ii) Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial	3.F.(ii)	OPW, Sept 2018	-	No increase in the risk to archaeological features, institutions and collections at risk from flooding. No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. Enhanced protection and value of archaeological features, institutions and collections arising from the implementation of the selected measures.	4	0	Based on the number and type of recorded archaeolgical features in the area and professional judgment.
	Protect land, soil and bedrock and improve their protection from extreme floods	Avoid damage to or erosion of land, soil and solid geology, and improve their protection from extreme floods	3G	Arup, March 2021	-	No increased risk of negative effect on land, soil or solid geology, or of erosion of land or soil, or negative effect on soil fertility	Enhancement of land, soil and bedrock condition, stability, fertility, economic value	1	2	Baneshane Quarry - geological heritage feature on a county scale
	Avoid changes to hydrogeology	Avoid changes to hydrogeology	3H	Arup, March 2021	-	No increased risk of negative effect on hydrogeology	Enhancement of hydrogeology	1	2	Regionally important aquifer
	Avoid negative impact on air	Avoid measures which would have a negative impact on air and, if possible, adopt measures which would improve air	3I	Arup, March 2021	-	No increased risk of negative effect on air	Enhance air	1	2	100+ dwellings and Gael Scoil Primary School and presence of habitats and species designated as of local importance
	Avoid measures which would increase the rate of climate change	Avoid measures which would increase the rate of climate change and, if possible, adopt measures which would reduce the rate climate change	3J	Arup, March 2021	-	Rate of climate change does not change	Rate of climate change reduced	2	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
	Minimise waste generation	Minimise waste generation. Where materials are generated their reuse should be incorporated into the scheme where possible.	3K	Arup, March 2021	-	Avoid generating waste for which there is unlikely to be regional capacity for treatment, recovery or disposal.	Zero waste projects	1	5	Waste management considered to be relevant to all construction projects

Code	OPTION 6A - Flood Diversion Channel/Culvert North of Railway and Direct defences			OPTION 6B-1 - Flood Diversion Culvert South of Railway and Direct Defences		
1.A.(i)			0			0
1.A.(ii)			0			0
1.B.(i)	0	N/A	0	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250
1.C	3	Based on feedback from PPD Option 6A received a net of 5 positive responses. Greater number of submissions in favour of the option versus those against. Public perception of option is positive and there is limited opposition. Minimal project delivery risk.	225	2	This option was developed post PPD and as such feedback on the option from the public has not been received. As the option is a derivative of Option 6A, it is assumed that a similiar response would be received. Due to the increased number of private landowners impacted however, a conservative reduction in score has been applied.	150
1.D	2	Potential delivery risk to the option as the diversion channel/culvert impacts a number of different land owners including the Nordic Business Park. Option also clashes with Lihaf and Irish Water planned infrastructure and would require close coordination during construction so as to ensure infrastruture fits in constrained area.	150	1	Potential delivery risk to the option as the diversion culvert interacts with a number of different land owners, in particular Irish Rail. Timing of construction works under the Midleton-Cork railway line would require close coordination with Irish Rail. Works on the line are being planned by Irish Rail however, so impact has potential to be eliminated based on timings and coordination.	75
1.E	1	Option facilitates and provides flood protection to the planned Waterrock LIHAF Development. However it clashes with the planned IW wastewater Load Diversion project and the planned Lihaf infrastructure. These projects have a siginificant wider societal value.	50	5	Option facilitates and provides flood protection to the proposed Waterrock LIHAF Development. Option also removes clashes with the proposed IW Wastewater Load Diversion project and the proposed Lihaf infrastructure. These projects have a siginificant wider societal value.	250
		Social Score	675		Social Score	725
2.A	5	Option to provide full protection from design flood risk	12	5	Option to provide full protection from design flood risk	12
2.B	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250
2.C	5	Option to provide full protection from design flood risk	350	5	Option to provide full protection from design flood risk	350
2.D	0	No increase in the negative impact of flooding on agricultural production	0	0	No increase in the negative impact of flooding on agricultural production	0
		Economic Score	612		Economic Score	612
3.A	-2	Short-term or intermittent impediment to the achievement of wb objectives. Flow diversion is considered limited impact as will only be operational in extreme events. Potential impact from in-channel works	-150	-2	Short-term or intermittent impediment to the achievement of wb objectives. Flow diversion is considered limited impact as will only be operational in extreme events. Potential impact from in-channel works	-150
3.B	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty. The score reflects the requirement for control of water quality during construction using suitable mitigation measures.	-9	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty. The score reflects the requirement for control of water quality during construction using suitable mitigation measures.	-9
3.C	-2	Potential localised loss of low value biodiversity areas.	-8	-2	Potential localised loss of low value biodiversity areas.	-8
3.D	-1	Short-term minor impacts to non-sensitive water course.	-10	-1	Short-term minor impacts to non-sensitive water course.	-10
3.E	0	Very minor loss of vegetation due to open channel and culvert construction and also from direct defences construction downsream	0	0	Very minor loss of vegetation due to culvert construction and also from direct defences construction downsream	0
3.F.(i)	0	No known/recorded architectural sites in the area of proposed works.	0	0	No known/recorded architectural sites in the area of proposed works.	0
3.F.(ii)	0	No known/recorded archaeological sites in the area of proposed works.	0	0	No known/recorded archaeological sites in the area of proposed works.	0
3G	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
3H	2	Potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra - but uncertainty on how significant a change this will bring due to karst nature of aquifer so beneficial impact is scored as relatively minor	4	2	Potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra - but uncertainty on how significant a change this will bring due to karst nature of aquifer so beneficial impact is scored as relatively minor	4
3I	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-2	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-2
3J	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10
3K	0	Generation of quantities of wastes in line with current industry practice	0	0	Generation of quantities of wastes in line with current industry practice	0

Code	OPTION 6B-2 - Flood Diversion Channel/Culvert South of Railway and Direct Defences			OPTION 6C - Flood Diversion Channel (bypassing Cave System) and Direct Defences		
1.A.(i)			0			0
1.A.(ii)			0			0
1.B.(i)	0	N/A	0	0	N/A	0
1.B.(ii)	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250
1.C	2	This option was developed post PPD and as such feedback on the option from the public has not been received. The alignment follows that of Option 6B-1, and therefore impacts on the same number of private landowners.	150	2	This option was developed post PPD and as such feedback on the option from the public has not been received. However it is considered that it is likely to score similiarly to the other options due to the limited interation with the public realm and the number of private landowners impacted .	150
1.D	1	Potential delivery risk to the option as the diversion channel/culvert interacts with a number of different land owners, in particular Irish Rail. Timing of construction works under the Midleton-Cork railway line would require close coordination with Irish Rail. Works on the line are being planned by Irish Rail however, so impact has potential to be eliminated based on timings and coordination.	75	0	Potential delivery risk to the option as the diversion channel interacts with a number of different land owners, including Irish Rail and TII. Timing of construction works under the Midleton-Cork railway line would require close coordination with Irish Rail. Works on the line are being planned by Irish Rail however, so impact has potential to be eliminated based on timings and coordination. Channel also impacts land which is not at flood risk so there could be some opposition to the option	0
1.E	5	Option facilitates and provides flood protection to the proposed Waterrock LIHAF Development. Option also removes clashes with the proposed IW Wastewater Load Diversion project and the proposed Lihaf infrastructure. These projects have a siginificant wider societal value.	250	5	Option facilitates and provides flood protection to the proposed Waterrock LIHAF Development. Option also removes clashes with the proposed IW Wastewater Load Diversion project and the proposed Lihaf infrastructure. These projects have a siginificant wider societal value. Option also facilitates Baneshane housing development.	250
		Social Score	725		Social Score	650
2.A	5	Option to provide full protection from design flood risk	12	5	Option to provide full protection from design flood risk	12
2.B	5	Option to provide full protection from design flood risk	250	5	Option to provide full protection from design flood risk	250
2.C	5	Option to provide full protection from design flood risk	350	5	Option to provide full protection from design flood risk	350
2.D	0	No increase in the negative impact of flooding on agricultural production	0	0	No increase in the negative impact of flooding on agricultural production	0
		Economic Score	612		Economic Score	612
3.A	-2	Short-term or intermittent impediment to the achievement of wb objectives. Flow diversion is considered limited impact as will only be operational in extreme events. Potential impact from in-channel works	-150	-5	Permanent impediment to the achievement of wb objectives. Change in channel hydromorphology where the Water Rock stream emerges would see an open channel replace a section of the natural stream, in a new alignment.	-375
3.B	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty. The score reflects the requirement for control of water quality during construction using suitable mitigation measures.	-9	-1	Potential temporary disturbance to Wintering birds. However can be avoided by timing and suitable mitigation measures. The value of these grazed improved grasslands is relatively low to wintering birds given the existing level of farming actiivty. The score reflects the requirement for control of water quality during construction using suitable mitigation measures.	-9
3.C	1	Potential localised loss of low value biodiversity areas. Long lengths of new open channel may facilitate new biodiversity opportunities however.	4	1	Potential localised loss of low value biodiversity areas. Long lengths of new open channel may facilitate new biodiversity opportunities however.	4
3.D	-1	Short-term minor impacts to non-sensitive water course.	-10	-4	Permanent loss or removal of fisheries habitat within non sensitive watercourse due to channel realignment and introduction of short lengths of culverts.	-40
3.E	0	Very minor loss of vegetation due to open channel and culvert construction and also from direct defences construction downsream	0	-2	Minor loss of vegetation due to open channel and culvert construction and also from direct defences, open channel and culvert construction downsream	-56
3.F.(i)	0	No known/recorded architectural sites in the area of proposed works.	0	0	No known/recorded architectural sites in the area of proposed works.	0
3.F.(ii)	0	No known/recorded archaeological sites in the area of proposed works.	0	0	No known/recorded archaeological sites in the area of proposed works.	0
3G	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0	0	No impact on existing national, regional and local geological sites and no impact on land, soil and geology as a result of flood risk management measures.	0
3H	2	Potential reduction in groundwater flooding due to diversion of flood waters to the Owenacurra - but uncertainty on how significant a change this will bring due to karst nature of aquifer so beneficial impact is scored as relatively minor	4	2	Potential reduction in groundwater flooding due to diversion of flood waters to the downstream of cave system - but uncertainty on how significant a change this will bring due to karst nature of aquifer so beneficial impact is scored as relatively minor	4
3I	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-2	-1	Potential for temporary adverse noise impacts during the construction phase due to works occuring in close proximity to residenital receptors.	-2
3J	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10	-1	Embodied carbon associated with the proposed structures will result in the indirect generation of carbon emissions.	-10
3K	0	Generation of quantities of wastes in line with current industry practice	0	0	Generation of quantities of wastes in line with current industry practice	0

	Avoid increasing the vulnerability of the study area to major accidents or disasters	Avoid increasing the vulnerability of the study area to major accidents or disasters	3L	Arup, March 2021	-	No impact on the vulnerability of the study area to major accidents or disasters	Reduction in the vulnerability of the study area to major accidents or disasters	1	0	No presence of high vulnerability establishments
								60		
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	4.A.	OPW, Sept 2018	Level of operational risk of option - Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully	Moderate to high, but manageable, degree of operational risk, i.e., an option with a high degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, but which, with the allocation of adequate resources, could be operated with an acceptable degree of risk of failure	No operational risk, i.e., no reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision for the option to operate or perform successfully	20	5	Constant and equal to 5, as per TMN Option Appraisal and MCA Sept 2018
Technical	Minimise risk of failure of option	Minimise risk of failure of option	4.B	Arup, March 2021	Minimise consequences of failure of option. Reduce residual risk by designing out risk where possible.	Moderate to high, but acceptable and manageable, level of residual risk post construction	Negligible inherent safety risk post construction	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
Technical	Ensure flood risk management options are adaptable to impacts of climate change, and can be managed effectively and sustainably into the future		4.C	Arup, March 2021	Compatible with relevant SCCAP.	Option to be adaptable and maintain the required standard of protection at acceptable cost	Option to be adaptable to multiple adaptation pathways with flexibility to respond to multiple CC scenarios and timelines	15	5	Constant and equal to 5, as per Midleton FRS MCA Framework Modification Note, March 2021
Technical	Maximise benefit in case of scheme design exceedance events		4.D	Arup, March 2021	Number and type of additional properties that would be defended in a design exceedance event (Q200 / T1000)	Number of properties at current risk is not increased	Increase in the Standard of Protection for properties that are at risk beyond the scheme SOP (Q100 / T200)	5	5	Professional judgement applied to scoring
Technical	Minimise project delivery risk by consideration of third party stakeholder interaction and/or existing infrastructure	Minimise interaction with critical infrastructure	4.E	Arup, March 2021	Interaction with concerned stakeholders including utility companies	Acceptable level of interaction with existing infrastructure	No interaction with critical infrastructure	5	4	Critical infrastructure in area: Irish Water assets, existing and proposed. Irish Rail existing assets
								60		

3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-185
4.A.	3	Very low operational risk- blockage of flow diversion culvert/ channel and culvert at WWTP	300
4.B	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding -Flow diversion channel option, failure of which would result in localised or minor flooding	75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the flow diversion culvert/channel could be designed using the assumptive approach in the present day that can maintain the required standard of protection / risk reduction in a future scenario. There will be minimal further cost or intervention, however there will be an increase in present day capital costs.	300
4.D	1	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Waterrock provided an assumptive approach in designing the flow diversion channel is taken. It is estimated that circa 90% of properties currently at risk of flooding will be protected beyond the SoP. There is no additional reduction in the tidal risk to properties on Dwyer's road during a tidal exceedance event (T1000)	25
4.E	-3	A significant delivery risk to the option being considered is identified. There is interaction with existing and planned infrastructure which may not leave the space required for construction. Multiple clashes detected.	-60
		Technical Score	640

3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-185
4.A.	3	Very low operational risk- blockage of flow diversion culvert and culvert at WWTP	300
4.B	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding -Flow diversion culvert option, failure of which would result in localised or minor flooding	75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the flow diversion culvert could be designed using the assumptive approach in the present day that can maintain the required standard of protection / risk reduction in a future scenario. There will be minimal further cost or intervention, however there will be an increase in present day capital costs.	300
4.D	1	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Waterrock provided an assumptive approach in designing the flow diversion channel is taken. It is estimated that circa 90% of properties currently at risk of flooding will be protected beyond the SoP. There is no additional reduction in the tidal risk to properties on Dwyer's road during a tidal exceedance event (T1000)	25
4.E	-1	A delivery risk to the option being considered is identified. An underground railway crossing is required which would require coordination with Irish Rail.	-20
		Technical Score	680

3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-173
4.A.	3	Very low operational risk- blockage of flow diversion culvert - 3No with open channel between them and culvert at WWTP	300
4.B	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding -Flow diversion channel/culvert option, failure of which would result in localised or minor flooding	75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the flow diversion culvert/channel could be designed using the assumptive approach in the present day that can maintain the required standard of protection / risk reduction in a future scenario. There will be minimal further cost or intervention, however there will be an increase in present day capital costs.	300
4.D	1	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Waterrock provided an assumptive approach in designing the flow diversion channel is taken. It is estimated that circa 90% of properties currently at risk of flooding will be protected beyond the SoP. There is no additional reduction in the tidal risk to properties on Dwyer's road during a tidal exceedance event (T1000)	25
4.E	-1	A delivery risk to the option being considered is identified. An underground railway crossing is required which would require coordination with Irish Rail.	-20
		Technical Score	680

3L	0	No impact on the vulnerability of the study area to a major accident or disaster	0
		Environmental Score	-484
4.A.	2	Moderate operational risk- blockage of flow diversion channel/ culvert - 4No with open channel between them and culvert at WWTP	200
4.B	1	Low residual risk, i.e. - Direct defences option, failure of which would result in localised or minor flooding -Flow diversion channel option, failure of which would result in localised or minor flooding	75
4.C	4	Option is adaptable at moderate to significant cost, difficulty and impact. It provides no impediment to future interventions to address future flood risk. It is proposed that the flow diversion channel could be designed using the assumptive approach in the present day that can maintain the required standard of protection / risk reduction in a future scenario. There will be minimal further cost or intervention, however there will be an increase in present day capital costs.	300
4.D	1	Option can reduce a significant portion of the residual risk associated with exceedance events (Q200) throughout Waterrock provided an assumptive approach in designing the flow diversion channel is taken. It is estimated that circa 90% of properties currently at risk of flooding will be protected beyond the SoP. There is no additional reduction in the tidal risk to properties on Dwyer's road during a tidal exceedance event (T1000)	25
4.E	-3	A significant delivery risk to the option being considered is identified. An underground railway crossing is required which would require coordination with Irish Rail. A culvert crossign under the N25 is required which would require significnt coordination with TII.	-60
		Technical Score	540

SCORING

Rationale	MCA SCORE	Rationale	MCA SCORE	Rationale	MCA SCORE	Rationale	MCA SCORE
MCA Benefit Score	1102	MCA Benefit Score	1152	MCA Benefit Score	1164	MCA Benefit Score	778
Option Selection Benefit Score	1742	Option Selection Benefit Score	1832	Option Selection Benefit Score	1844	Option Selection Benefit Score	1318
Total Capital Costs (M€)	13.00	Total Capital Costs (M€)	16.00	Total Capital Costs (M€)	12.00	Total Capital Costs (M€)	14.50
MCA Benefit/Cost Ratio	0.08	MCA Benefit/Cost Ratio	0.07	MCA Benefit/Cost Ratio	0.10	MCA Benefit/Cost Ratio	0.05
Economic Benefit (M€)	5.61	Economic Benefit (M€)	5.61	Economic Benefit (M€)	5.61	Economic Benefit (M€)	5.61
Economic Benefit/Cost Ratio	0.43	Economic Benefit/Cost Ratio	0.35	Economic Benefit/Cost Ratio	0.47	Economic Benefit/Cost Ratio	0.39

MCA Scoring performance	
Fully Achieving Aspirational Target	5
Partially Achieving Aspirational Target	3
Exceeding Basic Requirement	1
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	-1
Partially Failing Basic Requirement	-3
Totally Failing Basic Requirement (Illegal/Unacceptable)	-999

Appendix C

Cost Estimates of Options and Emerging Preferred Option

Area 1

Option	Option 1A: Conveyance Improvements and Direct Defences	Option 1B: Direct Defences	Option 1C: Upstream Storage and Direct Defences
Gross Construction Cost Estimate	**€2,058,618.25**	**€1,720,230.90**	**€1,868,488.00**
Prelims (15%)	€308,792.74	€258,034.63	€280,273.20
Unmeasured Items (20%)	€411,723.65	€344,046.18	€373,697.60
Subtotal	€2,779,134.63	€2,322,311.71	€2,522,458.80
Archaeology & Environmental (15%)	€416,870.19	€348,346.76	€378,368.82
Baseline Construction Cost	**€3,196,004.83**	**€2,670,658.47**	**€2,900,827.62**
Contingency (20%)	€639,200.97	€534,131.69	€580,165.52
Construction Cost Subtotal	**€3,835,205.79**	**€3,204,790.16**	**€3,480,993.14**
Land Acquisition (15%)	€479,400.72	€400,598.77	€435,124.14
Fees and Supervision (10%)	€319,600.48	€267,065.85	€290,082.76
Art (1% or cap)	€20,833.33	€20,833.33	€20,833.33
Site Investigation & Surveys	€66,666.67	€66,666.67	€66,666.67
Capital Cost Total	**€4,721,707.00**	**€3,959,954.78**	**€4,293,700.05**
Maintenance (NPV)	€823,885.99	€688,458.94	€747,793.37
Project Cost Total	**€5,545,592.99**	**€4,648,413.72**	**€5,041,493.42**

Area 2

Option	Option 2A: Conveyance Improvements and Direct Defences	Option 2B: Direct Defences	Option 2C: Upstream Storage and Direct Defences
Gross Construction Cost Estimate	**€1,939,348.04**	**€1,861,560.44**	**€1,357,160.44**
Prelims (15%)	€290,902.21	€279,234.07	€203,574.07
Unmeasured Items (20%)	€387,869.61	€372,312.09	€271,432.09
Subtotal	€2,618,119.85	€2,513,106.59	€1,832,166.59
Archaeology & Environmental (15%)	€392,717.98	€376,965.99	€274,824.99
Baseline Construction Cost	**€3,010,837.83**	**€2,890,072.58**	**€2,106,991.58**
Contingency (20%)	€602,167.57	€578,014.52	€421,398.32
Construction Cost Subtotal	**€3,613,005.39**	**€3,468,087.10**	**€2,528,389.90**
Land Acquisition (15%)	€451,625.67	€433,510.89	€316,048.74
Fees and Supervision (10%)	€301,083.78	€289,007.26	€210,699.16
Art (1% or cap)	€20,833.33	€20,833.33	€20,833.33
Site Investigation & Surveys	€66,666.67	€66,666.67	€66,666.67
Capital Cost Total	**€4,453,214.85**	**€4,278,105.24**	**€3,142,637.79**
Maintenance (NPV)	€776,152.49	€745,020.87	€543,153.39
Project Cost Total	**€5,229,367.34**	**€5,023,126.11**	**€3,685,791.17**

Area 3

Option	Option 3A: Direct Defences
Gross Construction Cost Estimate	**€5,344,068.25**
Prelims (15%)	€801,610.24
Unmeasured Items (20%)	€1,068,813.65
Subtotal	€7,214,492.13
Archaeology & Environmental (15%)	€1,082,173.82
Baseline Construction Cost	**€8,296,665.95**
Contingency (20%)	€1,659,333.19
Construction Cost Subtotal	**€9,955,999.14**
Land Acquisition (15%)	€1,244,499.89
Fees and Supervision (10%)	€829,666.60
Art (1% or cap)	€20,833.33
Site Investigation & Surveys	€66,666.67
Capital Cost Total	**€12,117,665.63**
Maintenance (NPV)	€2,138,766.12
Project Cost Total	**€14,256,431.75**

Area 4

Option	Option 4A: Groundwater Cut-off and Direct Defences	Option 4B: Pumping and Direct Defences	Option 4C: Groundwater Cut-off and Direct Defences with NRRE embankment	Option 4D: Groundwater Cut-off and Direct Defences with NRRE embankment and flood gate across Greenway	Option 4E: Groundwater Cut-off and Direct Defences extending along Greenway
Gross Construction Cost Estimate	**€1,342,918.00**	**€1,151,698.00**	**€1,459,982.40**	**€1,324,449.60**	**€2,096,880.00**
Prelims (15%)	€201,437.70	€172,754.70	€218,997.36	€198,667.44	€314,532.00
Unmeasured Items (20%)	€268,583.60	€230,339.60	€291,996.48	€264,889.92	€419,376.00
Subtotal	€1,812,939.30	€1,554,792.30	€1,970,976.24	€1,788,006.96	€2,830,788.00
Archaeology & Environmental (15%)	€271,940.90	€233,218.85	€295,646.44	€268,201.04	€424,618.20
Baseline Construction Cost	**€2,084,880.20**	**€1,788,011.15**	**€2,266,622.68**	**€2,056,208.00**	**€3,255,406.20**
Contingency (20%)	€416,976.04	€357,602.23	€453,324.54	€411,241.60	€651,081.24
Construction Cost Subtotal	**€2,501,856.23**	**€2,145,613.37**	**€2,719,947.21**	**€2,467,449.60**	**€3,906,487.44**
Land Acquisition (15%)	€312,732.03	€268,201.67	€339,993.40	€308,431.20	€488,310.93
Fees and Supervision (10%)	€208,488.02	€178,801.11	€226,662.27	€205,620.80	€325,540.62
Art (1% or cap)	€20,833.33	€20,833.33	€20,833.33	€20,833.33	€20,833.33
Site Investigation & Surveys	€66,666.67	€66,666.67	€66,666.67	€66,666.67	€66,666.67
Capital Cost Total	**€3,110,576.28**	**€2,680,116.16**	**€3,374,102.88**	**€3,069,001.61**	**€4,807,838.99**
Maintenance (NPV)	€537,453.38	€460,924.63	€584,304.08	€530,062.08	€839,198.84
Project Cost Total	**€3,648,029.66**	**€3,141,040.79**	**€3,958,406.96**	**€3,599,063.69**	**€5,647,037.83**

Area 5

Option	Option 5A: Direct Defences	Option 5B: Upstream Storage	Option 5B-1: Revised Upstream Storage	Option 5C: Optimised Direct Defences and Overpumping	Option 5D: Optimised Direct Defences, Upstream Storage and Overpumping
Gross Construction Cost Estimate	**€1,868,980.91**	**€421,984.00**	**€346,242.00**	**€1,255,248.30**	**€1,054,005.42**
Prelims (15%)	€280,347.14	€63,297.60	€51,936.30	€188,287.24	€158,100.81
Unmeasured Items (20%)	€373,796.18	€84,396.80	€69,248.40	€251,049.66	€210,801.08
Subtotal	€2,523,124.22	€569,678.40	€467,426.70	€1,694,585.20	€1,422,907.32
Archaeology & Environmental (15%)	€378,468.63	€85,451.76	€70,114.01	€254,187.78	€213,436.10
Baseline Construction Cost	**€2,901,592.86**	**€655,130.16**	**€537,540.71**	**€1,948,772.98**	**€1,636,343.42**
Contingency (20%)	€580,318.57	€131,026.03	€107,508.14	€389,754.60	€327,268.68
Construction Cost Subtotal	**€3,481,911.43**	**€786,156.19**	**€645,048.85**	**€2,338,527.58**	**€1,963,612.10**
Land Acquisition (15%)	€435,238.93	€375,000.00	€375,000.00	€292,315.95	€375,000.00
Fees and Supervision (10%)	€290,159.29	€65,513.02	€53,754.07	€194,877.30	€163,634.34
Art (1% or cap)	€20,833.33	€20,833.33	€20,833.33	€20,833.33	€20,833.33
Site Investigation & Surveys	€66,666.67	€66,666.67	€66,666.67	€66,666.67	€66,666.67
Capital Cost Total	**€4,294,809.64**	**€1,314,169.21**	**€1,161,302.92**	**€2,913,220.82**	**€2,589,746.44**
Maintenance (NPV)	€747,990.64	€168,883.52	€138,570.58	€502,366.81	€421,826.78
Project Cost Total	**€5,042,800.28**	**€1,483,052.73**	**€1,299,873.50**	**€3,415,587.63**	**€3,011,573.22**

Area 6

Option	Option 6A: Flood Diversion Channel / Culvert - North of Rail line & Direct Defences	Option 6B-1: Flood Diversion Culvert - South of Rail line & Direct Defences	Option 6B-2: Flood Diversion Channel / Culvert - South of Rail line & Direct Defences	Option 6C: Flood Diversion Channel / Culvert to Water Rock Stream & Direct Defences
Gross Construction Cost Estimate	**€4,864,152.41**	**€5,964,010.47**	**€4,483,506.92**	**€5,421,971.17**
Prelims (15%)	€729,622.86	€894,601.57	€672,526.04	€813,295.67
Unmeasured Items (20%)	€972,830.48	€1,192,802.09	€896,701.38	€1,084,394.23
Subtotal	€6,566,605.75	€8,051,414.13	€6,052,734.35	€7,319,661.07
Archaeology & Environmental (15%)	€984,990.86	€1,207,712.12	€907,910.15	€1,097,949.16
Baseline Construction Cost	**€7,551,596.61**	**€9,259,126.25**	**€6,960,644.50**	**€8,417,610.23**
Contingency (20%)	€1,510,319.32	€1,851,825.25	€1,392,128.90	€1,683,522.05
Construction Cost Subtotal	**€9,061,915.93**	**€11,110,951.50**	**€8,352,773.40**	**€10,101,132.28**
Land Acquisition (15%)	€1,132,739.49	€1,388,868.94	€1,044,096.67	€1,262,641.54
Fees and Supervision (10%)	€755,159.66	€925,912.62	€696,064.45	€841,761.02
Art (1% or cap)	€20,833.33	€20,833.33	€20,833.33	€20,833.33
Site Investigation & Surveys	€66,666.67	€66,666.67	€66,666.67	€66,666.67
Capital Cost Total	**€11,037,315.09**	**€13,513,233.06**	**€10,180,434.52**	**€12,293,034.84**
Maintenance (NPV)	€1,946,697.51	€2,386,875.11	€1,794,358.20	€2,169,943.88
Project Cost Total	**€12,984,012.60**	**€15,900,108.17**	**€11,974,792.72**	**€14,462,978.72**

Area	Area 1 – Tír Cluain to Willowbank	Area 2 – Northern Relief Road to Riverside Way	Area 3 – Town Centre and Bailick Road	Area 4 – Lauriston Estate / Rugby Club / East of IDL	Area 5 – Ballinacurra
Option	**Option 1B: Direct Defences**	**Option 2B: Direct Defences**	**Option 3A: Direct Defences**	**Option 4E: Groundwater Cut-off and Direct Defences extending along Greenway**	**Option 5B-1: Revised Upstream Storage**
Gross Construction Cost Estimate	**€1,975,542.64**	**€1,056,942.83**	**€10,635,913.98**	**€2,698,287.09**	**€679,859.33**
Prelims (15%)	€296,331.40	€158,541.42	€1,595,387.10	€404,743.06	€101,978.90
Unmeasured Items (20%)	€395,108.53	€211,388.57	€2,127,182.80	€539,657.42	€135,971.87
Subtotal	€2,666,982.56	€1,426,872.82	€14,358,483.87	€3,642,687.57	€917,810.10
Archaeology & Environmental (15%)	€400,047.38	€214,030.92	€2,153,772.58	€546,403.14	€137,671.51
Baseline Construction Cost	**€3,067,029.95**	**€1,640,903.74**	**€16,512,256.45**	**€4,189,090.70**	**€1,055,481.61**
Contingency (20%)	€613,405.99	€328,180.75	€3,302,451.29	€837,818.14	€211,096.32
Construction Cost Subtotal	**€3,680,435.94**	**€1,969,084.49**	**€19,814,707.74**	**€5,026,908.85**	**€1,266,577.94**
Land Acquisition (15%)	€460,054.49	€246,135.56	€2,476,838.47	€628,363.61	€360,000.00
Fees and Supervision (10%)	€306,702.99	€164,090.37	€1,651,225.64	€418,909.07	€105,548.16
Art (1% or cap)	€25,000.00	€25,000.00	€25,000.00	€25,000.00	€25,000.00
Site Investigation & Surveys	€80,000.00	€80,000.00	€80,000.00	€80,000.00	€80,000.00
Capital Cost Total	**€4,552,193.42**	**€2,484,310.43**	**€24,047,771.85**	**€6,179,181.52**	**€1,837,126.10**
Maintenance (NPV)	€790,638.04	€423,002.37	€4,256,632.10	€1,079,889.84	€272,088.61
Project Cost Total	**€5,342,831.47**	**€2,907,312.80**	**€28,304,403.95**	**€7,259,071.36**	**€2,109,214.71**
Sub Total per Area	€5,400,000.00	€3,000,000.00	€28,400,000.00	€7,300,000.00	€2,200,000.00

Total	**€46,300,000.00**