Appendices

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Appendix A. – Phasing of the Fingal East Meath FRMP

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Appendix A – Phasing of the Fingal East Meath FRMP

Phase I A (2011-13)	Phase I B (2014-15)	Phase II (2016-21)	Phase III (2022 onwards)	Who*
NON STRUCTURAL OPTIONS				
Undertake Strategic Review of FFWS	Implement findings of Strategic Review of FFWS			**OPW**
Assess scope and develop fluvial and integrated fluvial - tidal FFWS	Implement and test fluvial and integrated fluvial - tidal FFWS	Provide technical support, including technical reviews of system performance		**OPW**, FCC & MCC
		Operate FFWS (transfer to National Flood Forecasting Centre, if established)		**FCC, MCC, OPW**
Agree responsibility for proactive maintenance. Confirm locations of culverts to be maintained.	Implement proactive maintenance option. Review and update list of culverts that block.			**FCC, MCC & OPW**
Develop public awareness and preparedness campaign and review flood event response plans. Provide information on individual property flood proofing	Implement public awareness and preparedness campaign. Maintain, review and update flood event response plans. Provide information on individual property flood proofing			**FCC, MCC** & OPW
Reinstall existing and install additional hydrometric monitoring equipment		Operate additional hydrometric monitoring equipment		**OPW,** FCC
Coordinate, operate and maintain existing hydrometric network				**OPW,** FCC, MCC
Continue to implement the Planning System and Flood Risk Management Guidelines				**FCC & MCC**
EXISTING FLOOD DEFENCES				

Phase I A (2011-13)	Phase I B (2014-15)	Phase II (2016-21)	Phase III (2022 onwards)	Who*
Determine defence asset monitoring and maintenance programme	Proactive maintenance of existing defence assets including Duleek, Ratoath, Ashbourne, Swords, Balbriggan and coastal flap valves			**OPW, FCC & MCC**
STRUCTURAL MEASURES – OPW MINOR WORKS PROGRAMME < €0.5M				
MALAHIDE TOWN CENTRE (PORTMARNOCK & MALAHIDE AREAS APSR)				
Implement scheme for Malahide	Maintain scheme			**OPW,** FCC
ROWLESTOWN EAST (ROWLESTOWN EAST APSR)				
Implement scheme for Rowlestown East	Maintain scheme			**FCC**, OPW
ASPEN (SWORDS) (SWORDS AREA APSR)				
Implement scheme for Aspen (Swords)	Maintain scheme			**FCC**, OPW
STRUCTURAL MEASURES – OPW FLOOD RELIEF SCHEMES > €0.5M				
SKERRIES (SKERRIES AREA APSR)				
Detailed design, planning & procurement of scheme for Skerries		Implement scheme for Skerries	Maintain scheme for Skerries	**OPW**, FCC
BALGRIFFIN (ST MARGARET'S, DUBLIN AIRPORT, BELCAMP & BALGRIFFIN AREA APSR)				
Implement scheme for Balgriffin	Maintain scheme			**OPW,** FCC
LAYTOWN (LAYTOWN, BETTYSTOWN & COASTAL AREA APSR)				
Detailed design, planning & procurement of scheme for Laytown		Implement scheme for Laytown	Maintain scheme for Laytown	**MCC**, OPW
STRAND ROAD, PORTMARNOCK (PORTMARNOCK & MALAHIDE AREAS APSR)				

Phase I A (2011-13)	Phase I B (2014-15)	Phase II (2016-21)	Phase III (2022 onwards)	Who*
Detailed design, planning & procurement of scheme for Portmarnock		Implement scheme for Portmarnock	Maintain scheme for Portmarnock	**FCC**, OPW
OTHER WORK				
RUSH (RUSH AREA APSR)				
Further work to determine if positive BCR can be determined. Implement scheme for Rush	Maintain scheme for Rush			**OPW**, FCC
RATOATH (RATOATH APSR)				
Further work to determine if positive BCR can be determined	Detailed design, planning & procurement of scheme for Ratoath	Maintain scheme for Ratoath		**OPW**, MCC
DULEEK (DULEEK APSR)				
		Consider whether additional standard of protection should be provided at Duleek		**OPW**
INDIVIDUAL RISK RECEPTORS				
Operators to pursue detailed risk assessment and management measures				

Note: Bodies highlighted in bold text under the 'who' column are those responsible for leading the action

Appendix B

Multi-criteria assessment: Local weighting system

Core criteria		Objective		Sub-objective	Local weighting criteria
1	Technical	a	Ensure flood risk management options are operationally robust		Local weighting of 5 applied
		b	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction of flood risk management options	Local weighting of 5 applied
				Reduce and where possible eliminate health and safety risks associated with operation of flood risk management options	Local weighting of 5 applied
		c	Ensure flood risk managed effectively and sustainable into the future	Ensure flood risk management options are adaptable to future flood risk	Local weighting of 5 applied
2	Economic	a	Minimise economic risk	Minimise economic risk	5 = where annual average damages exceed €5 million 4 = where annual average damages are between €1 million and €4.99 million 3 = where annual average damages are between €0.5 million and €0.99 million 2 = where annual average damages are between €0.1 million and €0.49 million 1 = where annual average damages are less than €0.1 million 0 = where there are no annual average damages
		b	Minimise risk to infrastructure	Minimise risk to transport infrastructure	5 = where major transport infrastructure at risk, e.g. motorway, national rail route, national airport. 4 = where significant transport routes are at risk, e.g. National roadways. 3 = where regionally important infrastructure routes are at risk, Regional road network, regional airports. 2 = Where minor/local transport routes are at risk, e.g. secondary road network 1 = Where flood risk is likely to result in negligible impact, e.g. tertiary road network. 0 = No transport infrastructure at risk.
				Minimise risk to utility infrastructure	5 = where major utility infrastructure assets at risk, e.g. large power station, WWTW and WTP serving population equivalent (p.e) greater than 0.5 million. 4 = Where significant infrastructure assets at risk, e.g. WWTW and WTP serving a p.e greater than 100,000. 3 = Where medium infrastructure assets at risk, e.g. WWTW and WTP serving a population equivalent greater than 5000 2 = Where locally important infrastructure assets at risk, e.g. WWTW and WTP with p.e greater than 500 1 = Where minor infrastructure assets at risk, e.g. WWTW and WTP with p.e less than 500 0 = No infrastructure assets at risk.

Core criteria		Objective		Sub-objective	Local weighting criteria
		c	Manage risk to agricultural land		5 = where the area of agricultural land (not benefiting from FRM measures) at risk is greater than 500 hectares 4 = where the area of agricultural land (not benefiting from FRM measures) at risk is between 100 and 500 hectares 3 = where the area of agricultural land (not benefiting from FRM measures) at risk is between 50 and 99 hectares 2 = where the area of agricultural land (not benefiting from FRM measures) at risk is between 5 and 49 hectares 1 = where the area of agricultural land (not benefiting from FRM measures) at risk is less than 5 hectares 0 =where no agricultural land is at risk
3	**Social**	a	Minimise risk to human health and life	Minimise risk to human health and life	5 = Where the number of residential properties at risk of flooding is greater than 500 4 = Where the number of residential properties at risk of flooding is between 250 and 499 3 = Where the number of residential properties at risk of flooding is between 100 and 249 2 = Where the number of residential properties at risk of flooding is between 10 and 49 1 = Where the number of residential properties at risk of flooding is less than 10 0 = Where no residential properties are at risk of flooding
				Minimse risk to high vulnerability properties	5 = Where the number of high vulnerability properties at risk of flooding is greater than 25 4 = Where the number of high vulnerability properties at risk of flooding is between 11 and 24 3 = Where the number of high vulnerability properties at risk of flooding is between 6 and 10 2 = Where the number of high vulnerability properties at risk of flooding is between 2 and 5 1 = Where the number of high vulnerability properties at risk of flooding is equal to 1 0 = Where no high vulnerability properties are at risk of flooding
		b	Minimise risk to community	Minimise risk to social infrastructure	5 = where the number of high value social infrastructure assets (hospitals, schools, universities, fire stations, etc.) at risk of flooding is greater than 25 or where social infrastructure assets of major importance is at risk (i.e. National hospital) 4 = Where the number of high value social infrastructure assets at risk of flooding is between 11 and 25 or where social infrastructure asset of significant importance is at risk (i.e. regional hospital) 3 = Where the number of high value social infrastructure assets at risk of flooding is between 6 and 10 or where social infrastructure asset of medium importance is at risk (i.e. local hospital) 2 = where the number of high value social infrastructure assets at risk of flooding is between 2 and 5 or where social infrastructure asset of minor/local importance is at risk (i.e. local Garda station) 1 = Where the number of high value social infrastructure assets at risk of flooding is equal to 1

Core criteria		Objective		Sub-objective	Local weighting criteria
					0 = Where no social infrastructure assets are at risk.
				Minimise risk to employment	5 = where the number of commercial buildings at risk of flooding is greater than 500 4 = where the number of commercial buildings at risk is between 100 and 500 3 = where the number of commercial buildings at risk is between 50 and 99 2 = where the number of commercial buildings at risk is between 10 and 49 1 = where the number of commercial buildings at risk is less than 10 0 = Where no commercial buildings are at risk
		c	Minimise risk to, or enhance, social amenity	Minimise risk to flood-sensitive social amenity sites	5 = where the number of social amenity sites is greater than 25 4 = where the number of social amenity sites is between 11 and 25 3 = where the number of social amenity sites is between 6 and 10 2 = where the number of social amenity sites is between 2 and 5 1 = where the number of social amenity sites is equal to 1 0 = where no social amenity sites are at risk.
4	**Environmental**	a	Support the objectives of the WFD	Prevent deterioration, and where possible improve, ecological status / potential of water-bodies	5 = where the Water Framework Directive applies to waterbodies within the AU
				Prevent deterioration, and where possible improve, chemical status / potential of water-bodies	0 = where no waterbodies within the AU are identified under the Water Framework Directive
		b	Minimise risk of environmental pollution	Minimise risk to potential sources of pollution	5 = where there are licensed sites with high pollution potential at risk 0 = where there are no licensed sites with pollution potential at risk
		c	Avoid damage to, and where possible enhance, the flora and fauna of the study area	Avoid damage to, and where possible enhance, internationally and nationally designated sites of nature conservation importance	5 = where an internationally important site (e.g. SAC/SPA/Ramsar) is present and potentially affected 4 = where a nationally important site (NHA) is present and potentially affected 3 = where legally protected species/species of conservation concern are present/likely to be present and potentially affected 2 = where a site of local importance is present and potentially
				Avoid damage to or loss of, and where possible enhance, habitats supporting legally protected species and other known species and habitats of conservation concern	1 = where there are no designated sites or known records of legally protected species/species of conservation concern, but habitats are present that could be affected
				Avoid damage to or loss of existing riverine, wetland and coastal habitats and where possible create new habitat, to maintain a naturally functioning system	0 = no sites, habitats or species present that could be affected
		d	Avoid damage to, and where possible enhance, fisheries within the study area	Maintain existing, and where possible create new, habitat supporting fisheries and maintain upstream access	5 = where there are designated waters (e.g. under EU Shellfish Waters Directive; EU Freshwater Fish Directive) 4 = waterbody supports substantial salmonid fisheries/shellfisheries and is of national value for fishing/angling

Core criteria		Objective		Sub-objective	Local weighting criteria
					3 = waterbody supports substantial fisheries/shellfisheries and is of regional value for fishing/angling 2 = waterbody supports fisheries/shellfisheries and is of local value for fishing/angling
				Ensure no adverse effects on designated Shellfish Waters	1 = fisheries could be present but unlikely given the modified nature of the channel/presence of barriers to movement; no known angling/fishing activities 0 = no fisheries or angling areas present
		e	Protect, and where possible enhance, landscape character and visual amenity within the study area	Protect, and where possible enhance, landscape character, including designated highly sensitive landscapes, within the catchment	5 = landscape designated as a internationally/nationally important landscape and potentially affected 4 = landscape character type designated at a county level as highly sensitive and/or exceptional/high value and potentially affected 3 = landscape character type designated at a county level as moderate sensitivity and/or medium value; protected views present that could be affected 2 = landscape character type designated at a county level as low sensitivity and/or low value and potentially affected 1 = no specific landscape sensitivity/value, but landscape features/views are important at a local level and potentially affected
				Protect, and where possible enhance, important views within the catchment	0 = no specific landscape designation, and no landscape value/sensitivity
		f	Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	Avoid damage to or loss of known buildings, structures and areas of cultural heritage importance, including their setting and heritage value, within the study area	5 = internationally important feature(s) (i.e. World Heritage Site) present and potentially affected 4 = nationally important feature(s) (e.g. National Monuments) present and potentially affected 3 = 5 or more sites/features listed on the RMP/RPS/SMR are present and potentially affected 2 = less than 5 sites/features listed on the RMP/RPS/SMR are present and potentially affected 1 = where no sites/features are at risk from flooding, but may be indirectly affected by the proposed works (e.g. setting) 0 = no sites/features at risk

Appendix B. Multi-criteria assessment

B1 Local weighting system

B2 Scoring system

Appendix B

Multi-criteria assessment: Scoring system

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Objective		Score	Description							
Technical										
1a	Level of operational risk of option i.e. mechanical or human intervention required (e.g. lengths/numbers of demountables, pumps etc)	5	No mechanical or human intervention	or	accessible most of the time	or	Not reliant of telemetry or forecasting	or	No future maintenance requirements over life of option (say 50yrs)
		3	Limited mechanical or human intervention (say 25% reliant)	or	Inaccessible in flood conditions	or	Reliant on simple mechanical controls	or	Limited future maintenance requirements over life of option
		1	Medium mechanical or human intervention (say 50% reliant)	or	Restricted tidal access	or	Reliant on real time telemetry, not forecasted or modelled	or	Medium future maintenance requirements over life of option
		0	Significant mechanical or human intervention (say 75% reliant)	or	Difficult or long access (journey length > 2 hours)	or	Reliant on flood forecast certainty	or	Regular future maintenance required (say every 5 years)
		-1	All mechanical or human intervention	or	Inaccessible most of the time without new infrastructure	or	Reliant on flood forecast certainty yet certainty not available	or	Significant maintenance requirements
1b	Health and safety risk of FRM options	5	No health and safety risk to construction workers	or	No health and safety risk to operators of FRM options	or	No construction works carried out		
		3	Limited health and safety risk to construction workers	or	Limited health and safety risk to operators of FRM options	or	Minor works to flood defence infrastructure away from river channel, and minimal manual handling needed		
		1	Medium health and safety risk to construction workers	or	Medium health and safety risk to operators of FRM options	or	Works away from river channel, and avoiding trafficked areas with all heavy items able to be lifted mechanically		
		0	Significant health and safety risk to construction workers	or	Significant health and safety risk to operators of FRM options	or	Working in proximity to river channels, or near heavily trafficked routes, near services requiring diversion, large amounts of items		
		-1	Very significant health and safety risk to construction workers	or	Very significant health and safety risk to operators of FRM options	or	Extensive in channel working, requiring heavy plant, diving, BA confined space entry ,hot works, extensive service clashes		
1c	Level of adaptability of FRM option to future flood risk	5	Already meeting requirements of HEFS						
		3	Exceeds requirements of MRFS and adaptable to HEFS						
		1	Meets requirements of MRFS and adaptable to HEFS						
		0	Meets current requirements and adaptable to MRFS						
		-1	Only meets requirements of current risk and not adaptable						
Economic										
2a	Minimise economic risk	5	All economic damages removed						
		3	Significant reduction in economic damages						
		1	Limited reduction in economic damages						
		0	No increase in economic damages						
		-1	Potential for limited increase in economic damages						
		-3	Potential for increase in economic damages						
		-5	Potential significant increase in economic damages						
2b	Minimise risk to transport infrastructure	5	All transport routes (road, rail, navigation) protected from the risk of flooding.						
		3	Flood risk reduced to a significant number of transport routes						
		1	Flood risk reduced to a limited number of transport routes						
		0	No increase in the number of transport routes at risk of flooding.						
		-1	Potential for impacts on a limited number of transport routes (either directly or indirectly).						
		-3	Potential for impacts on a number of transport routes (either directly or indirectly).						
		-5	Potential for impacts on a significant number of transport routes (either directly or indirectly).						
2c	Minimise risk to utility infrastructure	5	All utility infrastructure assets (power stations, WWTWs, WTWs, telecom exchanges etc) protected from the risk of flooding.						
		3	Flood risk reduced to a significant number of utility infrastructure assets.						
		1	Flood risk reduced to a limited number of utility infrastructure assets.						
		0	No increase in the number of utility infrastructure assets at risk of flooding.						
		-1	Potential for impacts on a limited number of utility infrastructure assets (either directly or indirectly).						
		-3	Potential for impacts on a number of utility infrastructure assets (either directly or indirectly).						
		-5	Potential for impacts on a significant number of utility infrastructure assets (either directly or indirectly).						
2c	Manage risk to agricultural land not benefiting from FRM measures	5	All agricultural land not benefiting from FRM measures (non-irrigated arable land, pastures, land with complex cultivation and land principally occupied by areas of natural vegetation) protected from the risk of flooding.						
		3	Flood risk reduced to a significant area of agricultural land not benefiting from FRM measures.						
		1	Flood risk reduced to a limited area of agricultural land not benefiting from FRM measures.						
		0	No increase in the area of agricultural land at risk of flooding not benefiting from FRM measures.						
		-1	Potential for impacts on a limited area of agricultural land not benefiting from FRM measures (either directly or indirectly).						
		-3	Potential for impacts on an area of agricultural land not benefiting from FRM measures (either directly or indirectly).						
		-5	Potential for impacts on a significant area of agricultural land not benefiting from FRM measures (either directly or indirectly).						
Social										
3a	Minimise risk to human health and life	5	All residential properties protected from the risk of flooding. All high vulnerability properties protected from risk of flooding.						
		3	Flood risk reduced to a significant number of residential properties and to high vulnerability properties						
		1	Flood risk reduced to a limited number of residential properties and high vulnerability properties						
		0	No increase in the number of residential properties at risk of flooding and hih vulnerability properties						
		-1	Potential for impacts on a limited number of residential properties (either directly or indirectly) and high vulnerability properties						
		-3	Potential for impacts on a number of residential properties (either directly or indirectly) and high vulnerability properties.						
		-5	Potential for impacts on a significant number of residential properties (either directly or indirectly) and high vulnerability properties.						
3b	Minimise risk to community	5	All high-value social infrastructural assets, commercial businesses and industrial premises protected from the risk of flooding.						
		3	Flood risk reduced to a significant number of high-value social infrastructural assets, commercial businesses and industrial premises.						
		1	Flood risk reduced to a limited number of high-value social infrastructural assets, commercial businesses and industrial premises.						
		0	No increase in the number of high-value social infrastructural assets, commercial businesses and industrial premises at risk of flooding.						
		-1	Potential for impacts on a limited number of high-value social infrastructural assets, commercial businesses and industrial premises (either directly or indirectly).						
		-3	Potential for impacts on a number of high-value social infrastructural assets, commercial businesses and industrial premises (either directly or indirectly).						
		-5	Potential for impacts on a significant number of high-value social infrastructural assets, commercial businesses and industrial premises (either directly or indirectly).						
3c	Minimise risk to, or enhance, social amenity	5	All flood sensitive social amenity sites protected from the risk of flooding.						
		3	Flood risk reduced to a significant number of flood sensitive social amenity sites.						
		1	Flood risk reduced to a limited number of flood sensitive social amenity sites.						
		0	No increase in the number of flood sensitive social amenity sites at risk of flooding.						
		-1	Potential for impacts on a limited number of flood sensitive social amenity sites (either directly or indirectly).						
		-3	Potential for impacts on a number of flood sensitive social amenity sites (either directly or indirectly).						
		-5	Potential for impacts on a significant number of flood sensitive social amenity sites (either directly or indirectly).						
Environmental										
4a	Support the objectives of the WFD	5	Significant contribution of flood risk management measures to the achievement of good ecological status/potential by 2015.						

Objective		Score	Description
		3	Contribution of flood risk management measures to the achievement of good ecological status/potential by 2015.
		1	Potential to provide opportunities to aid the achievement of good ecological status/potential by 2015.
		0	Provide no constraint associated with flood management measures to the achievement of good ecological status/potential by 2015.
		-1	Potential constraint to the achievement of good ecological status as proposed works over short stretches of river/estuary.
		-3	Potential constraint to the achievement of good ecological status as proposed works over longer stretches of river/estuary.
		-5	Significant constraint to the achievement of good ecological status.
4b	Minimise risk of environmental pollution	5	Potentially polluting sites protected from flooding
		3	Potential for a moderate reduction in flood risk to potentially polluting sites.
		1	Potential for a minor reduction in flood risk to potentially polluting sites.
		0	No positive or negative change in risk to potentially polluting sites.
		-1	Potential for a minor increase in flood risk to potentially polluting sites.
		-3	Potential for a moderate increase in flood risk to potentially polluting sites.
		-5	Potential for a significant increase in flood risk to potentially polluting sites.
4c	Avoid damage to, and where possible enhance, the flora and fauna of the study area	5	Improvement in conservation status of designated sites; increase in population sizes and/or extent of suitable habitat supporting target species; and/or, increase in extent of riverine, wetland and coastal habitats.
		3	Potential for habitat enhancement within designated sites.
		1	Potential for localised habitat enhancement.
		0	No deterioration in the conservation status of designated sites; no net decrease in population sizes of and/or loss of extent of suitable habitat supporting target species; and/or, no net loss of or permanent damage to existing riverine, wetland and coastal habitats.
		-1	Potential for impacts on designated sites and their features, and/or damage to and/or loss of existing riverine, wetland and coastal habitats and associated species, although limited by the already modified nature of the channel/shoreline or by the localised nature of the option.
		-3	Potential for impacts on designated sites and their features, and/or damage to and/or loss of existing riverine, wetland and coastal habitats and associated species.
		-5	Potential for a significant effect on designated sites, which may lead to deterioration of the conservation status; significant loss of habitats and associated species.
4d	Avoid damage to, and where possible enhance, fisheries within the catchment	5	Increase extent of suitable habitat for fisheries and improve existing upstream access; increase length of waterside accessible for fishing; and/or, improve classification of shellfish waters.
		3	Potential for enhancement of recreational fishing areas and fisheries habitat.
		1	Potential for enhancement of recreational fishing areas.
		0	No net loss of suitable habitats for fisheries and provide no new upstream barriers to fish movement; maintain existing length of waterside accessible for fishing; and/or no deterioration in classification for shellfish waters.
		-1	Potential loss of/disturbance to riverine/estuarine habitat and dependent fisheries.
		-3	Localised loss and widespread disturbance to riverine/estuarine habitat and associated fisheries.
		-5	Significant loss of suitable habitat for fisheries; potential for deterioration in classification for shellfish waters, significant loss of waterside accessible for fishing.
4e	Protect, and where possible enhance, landscape character and visual amenity within the catchment	5	Contribute to existing or new areas of attractive, vibrant, accessible and safe waterway corridors within urban areas; and/or, improvement to visual amenity into/from designated areas.
		3	Opportunities identified to enhance visual amenity and landscape character in the wider area.
		1	Opportunities identified to enhance visual amenity and landscape character in the local area.
		0	No adverse impacts on landscape character; and/or, no deterioration in quality of views into/from designated areas.
		-1	Adverse change in local landscape character, although severity of impact reduced by use of demountables or low height of defences, impact is temporary, the fact that existing defences already exist in this area or landscape is designated as being of low sensitivity.
		-3	Adverse change in local landscape character within a landscape designated as being of medium to high sensitivity.
		-5	Significant adverse change in landscape character across a wide area; significant change in views into/from landscapes designated as being of medium to high sensitivity.
4f	Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the catchment	5	Enhance the physical context and structure of water-based heritage features; reduce flood risk to features sensitive to the impacts of flooding; and/or, contribute to the understanding of context of water-based features listed on the RMP.
		3	Risk to a number of heritage features reduced.
		1	Risk to a limited number of heritage features reduced.
		0	No impact on heritage features; and/or, no increase in flood risk to features sensitive to the impacts of flooding.
		-1	Potential for impacts on a limited number of heritage features (either directly or indirectly).
		-3	Potential for impacts on a number of heritage features (either directly or indirectly).
		-5	Potential for impacts on a significant number of heritage features (either directly or indirectly).

Appendix C. Option details

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Appendix C1 – Option details

Table C-1 – Study area: options 1 and 2

Assessment units	Fingal East Meath Study Area
Water bodies	Fingal and Meath coastline, Mayne River, Sluice River, Gaybrook Stream, Broadmeadow River, Ward River, Lissenhall Stream, Turvey River, Ballyboghil River, Corduff River, Baleally Stream, Bride's Stream, Jones's Stream, Rush Town Stream, St. Catherine's Stream, Mill Stream, Bracken River, Delvin River, Mosney Stream, Nanny River and Brookside stream
Flood risk management options	(1) Proactive maintenance and (2) Targeted public awareness and preparedness campaign combined with IPFP

Flood Risk (1% fluvial/0.5% tidal AEP event)

A total of 311 properties in the study area are at risk of flooding from the 1% fluvial/0.5% tidal AEP events, of which 295 incur economic damages as a result of that flooding. The results indicate that there are a relatively limited number of locations within the study area that are at significant risk of flooding. The main flood risk occurs along the coastline where some properties are at risk from both fluvial and tidal flooding. Fluvial flood risk can be increased in this area due to difficulties in rivers discharging to the sea during high tides. Flooding occurs on many of the watercourses due to under capacity structures. This flood risk can be exacerbated if structures or trash screens become blocked during flood events. However, the baseline case does not consider the flood risk due to blockage. Seven IRRs have been identified in the study area including two roads, three wastewater treatment works, one wastewater pumping station and one utility asset (Eircom, Bord Gais or ESB).

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
246	65	5	5.2	1286	13

Environmental features and receptors at risk or present in the study area

- 51 river water bodies: 9 = high status; 3 = good status; (no deterioration required); 14 = moderate status; 23 = poor status; 3 = bad status (improvements required)
- 4 transitional (i.e. estuarine) water bodies: 4 = moderate status
- 4 coastal water bodies: 2 = high status; 2 = moderate status
- 3 Wastewater treatment works
- 1 waste water pumping station
- 35 Waste Management Permit Sites
- 22 Section 4 licences and 34 Section 16 licences in the study area
- 14 internationally designated sites and 17 nationally designated sites
- 57 sites on SMR/RPS/RMP registers at risk

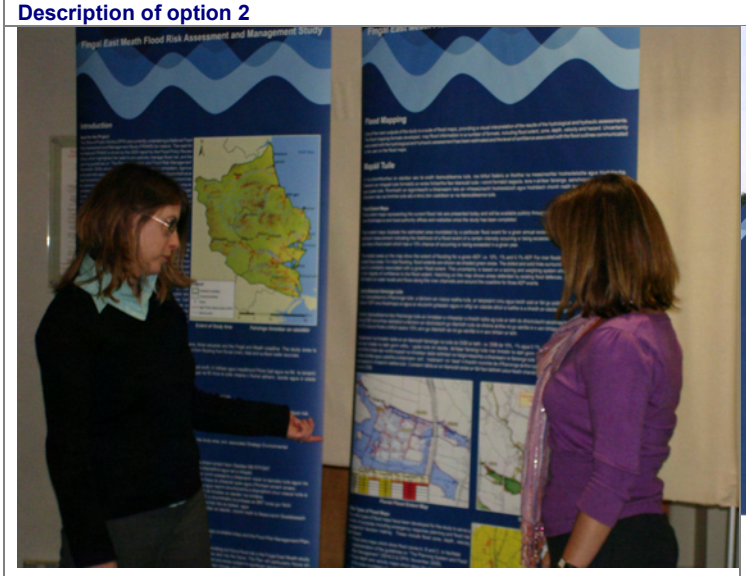
Description of option 1

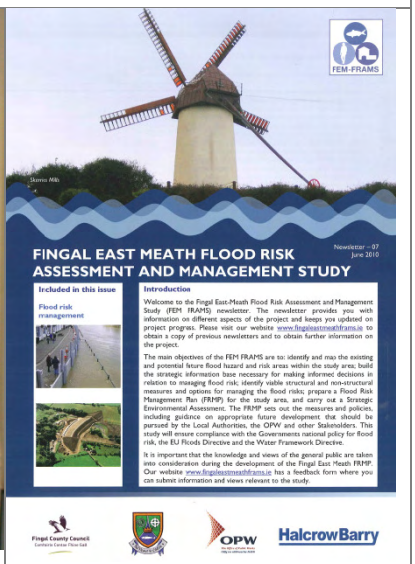
This option involves the development (Meath County Council (MCC)) and enhancement (Fingal County Council (FCC)) of a proactive maintenance regime targeting potential culvert blockage locations along the watercourses in the

study area. It should be noted that the ownership and viability of this option is currently under discussion at national level as it places additional duty on Local Authorities which may not have the resources or the legal ability to implement this option. FCC currently carries out maintenance at approximately 20 locations at risk of flooding in Fingal. This involves the cleaning of screens on a two to three week basis, with the frequency increased when heavy rain is forecast. A limited maintenance regime is carried out by MCC. This option would involve including additional culverts as part of the FCC proactive maintenance regime and setting out a proactive maintenance regime for culverts in MCC. Proactive maintenance would involve the removal of debris (vegetation, silt, rubbish) at the entrance and exit of culverts on a regular basis (i.e. monthly) and in advance of, and subsequent to, a flood event. This option would also involve the monitoring of culverts prone to blockages during a flood event. FCC currently uses weather forecast information to identify when a flood is likely. There is an opportunity to link this option to the FFWS identified for the following analysis units (Broadmeadow and Ward, Nanny and Delvin, Mayne and Sluice and Coastal).

Hydraulic modelling indicates that properties in the following locations are at risk due to culvert blockages (based on a comparison of flood maps for the 1% AEP fluvial event against the 70% culvert blockage flood maps for the 1% AEP event): Swords, Dardistown, Balgriffin, Portmarnock Bridge, Warbelstown, Ashbourne, Ratoath, Ballyboghil, Skerries and Bettystown.

Description of option 2





The targeted public awareness and preparedness campaign is necessary to educate the public of the risk of flooding to their properties and the protection methods available to them to reduce potential damage from flood events (i.e. IPFP measures). Information would be disseminated through the distribution of information leaflets, FEM FRAMS website and the provision of public information days.

IPFP involves the use of 'off the shelf' flood defence products to provide individual flood protection to residential and commercial properties. Such products include flood gates, flood barriers, air vent blocks and the installation of non return valves to service pipes. The level of protection afforded by individual property protection is dependant on a number of factors including the uptake, advance warning of flood risk and depth of flooding. For the purposes of assessment, it is assumed that this measure is only applicable when the depth of flooding at a property is less than 0.6m.

The BCR for this option is 0.85 and is based on an assumed 20% reduction in economic risk. The benefits of this option would be significantly greater if the option was provided with a FFWS. Details of the FFWS are detailed in the following Analysis Units (Broadmeadow and Ward, Nanny and Delvin, Mayne and Sluice and Coastal). The BCR for this option when combined with a FFWS is 2.96.

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Table C-2 – Nanny and Delvin AU

Assessment units	Nanny and Delvin AU
Water bodies	Nanny, Delvin
Flood risk management options	Flood forecasting and warning system for the Nanny River

Flood Risk (1% AEP event)

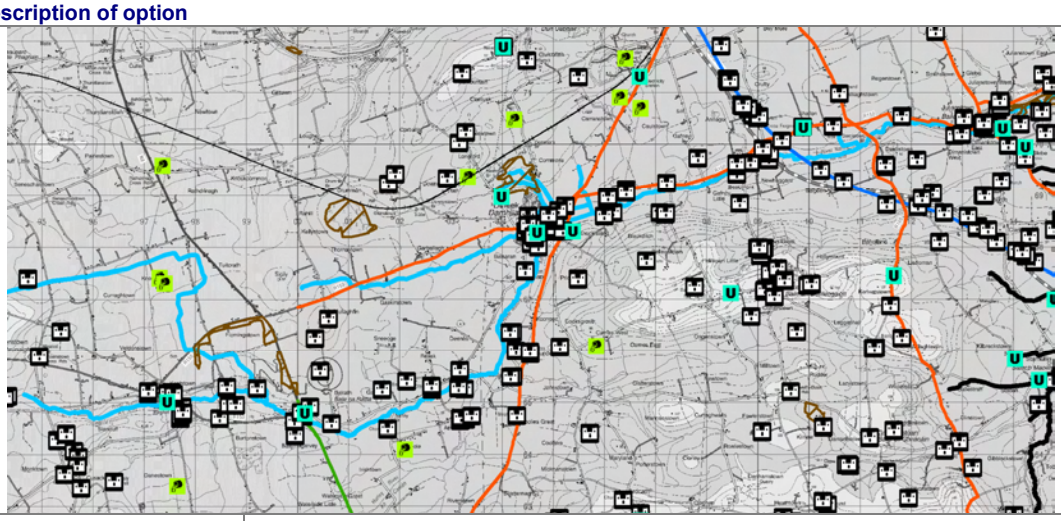
There is limited economic flood risk for the 1% AEP event, with the majority of the risk along the Nanny River. There is a small cluster of properties at risk of flooding at Beaumont Bridge, with the remainder of the risk limited to isolated properties along the rivers. One IRR has been identified in the Nanny and Delvin AU, a utility asset at Stamullin.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
15	5	2	1.5	485	0

Environmental features and receptors at risk or present in the study area

- 13 river water bodies: 7 = moderate status; 6 = poor status
- 1 Wastewater treatment works
- 2 Waste Management Permit Sites
- 4 Section 4 licences
- Duleek Commons pNHA; Thomastown Bog pNHA; Balrath Woods pNHA; and Cromwell's Bush Fen pNHA
- 71 sites listed on Meath County Council's Wetland Inventory
- 11 sites on RPS/RMP/SMR at risk

Description of option



Flood forecasting and warning systems involve the use of mathematical computer models to predict flood water levels based on actual meteorological data and tools to disseminate flood hazard data to people at risk. Further information on the viability of various flood forecasting options are reported on in the Preliminary Options Report. Flood forecasts would be disseminated through a dedicated website and messaging service to provide advance warning to communities.

A FFWS for the Nanny River would provide advance flood warning to properties at risk along the Nanny River including properties in Duleek area APSR and properties in rural areas along the watercourse. The image above shows the Nanny River and flood risk indicators within the catchment of the Nanny River. Those indicators in the floodplain of the Nanny River are likely to benefit from the proposed FFWS.

Table C-3 – Duleek area APSR

Assessment units	Duleek area APSR
Water bodies	Nanny, Paramadden
Flood risk management options	Raising existing defence embankment to a higher standard of protection

Flood Risk (1% AEP event)

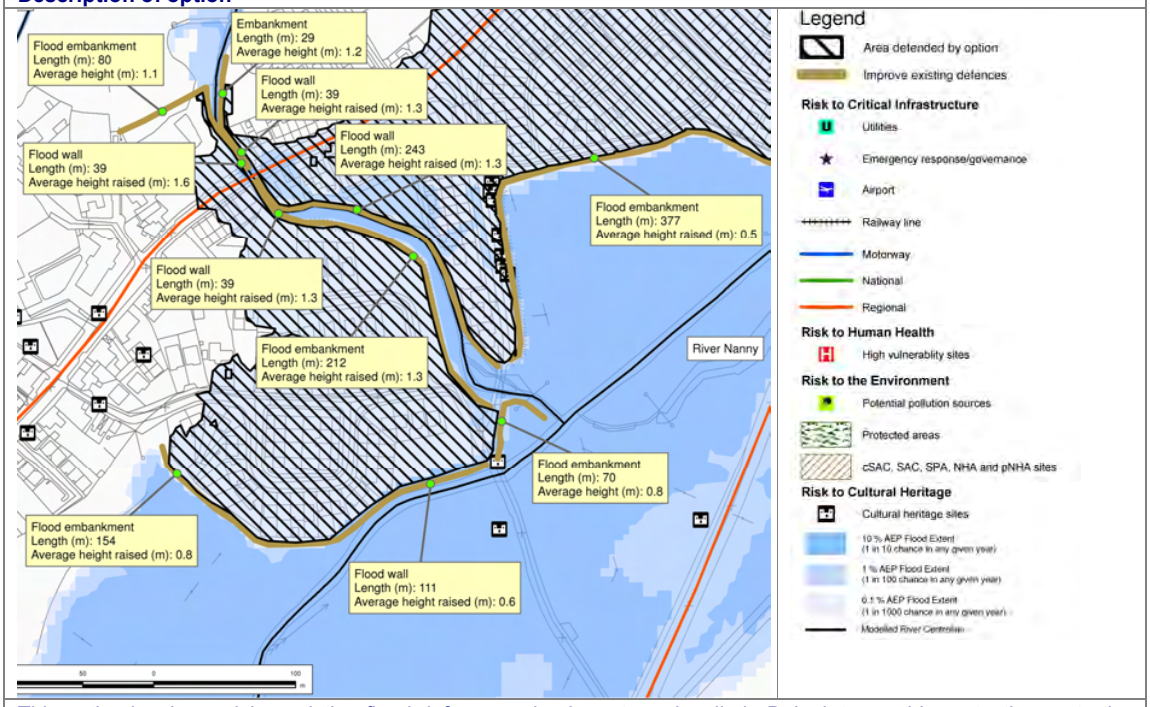
Duleek area APSR is at significant risk of flooding for events greater than the 1% AEP event due to overtopping of the flood defence embankments. The defences along the Nanny River and its tributary, the Paramadden are overtopped by events greater than the 1% AEP. Flooding from the 0.1% AEP affects 191 properties compared to just 5 properties for the 1% AEP event. Due to the significant level of the risk from the 0.1% AEP event, options were considered above the normal 1% AEP standard of protection.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
5 *191 (0.1% AEP)*	0 *0 (0.1% AEP)*	0	0.05	26	0

Environmental features and receptors present or at risk

- 2 river water bodies: 2 = poor status
- Duleek Commons pNHA and
- 26 sites listed on Meath County Council's Wetland Inventory
- 4 sites on RPS/RMP/SMR at risk

Description of option



This option involves raising existing flood defence embankments and walls in Duleek to provide protection up to the 0.1% AEP event. Hydraulic modelling indicates that some new defences would also be required as part of this option.

The existing flood defences at Duleek include embankments, walls, a pumping station and channel maintenance works. Hydraulic modelling indicates that these defences provide protection to the majority of properties in Duleek up to the 1% AEP event. The results from the hydraulic modelling indicate that the existing flood embankments would need to be raised by an average of 1.4m and that the existing flood walls would need to be raised by an average of 1.4m for the 0.1% AEP event. This option assumes that existing flood defences are structurally sound to allow them to be raised to a higher standard of protection. Upstream of the bridge on the main street through Duleek, approximately

40m of new flood embankments are required along the left bank and 20m along the right bank of the Paramadden River. The average height of the embankments on the left bank is 1.2m and the average height of embankments on the right bank is 1m. The figure above shows the location where defences would need to be raised in Duleek.

Hydraulic modelling indicates that there is a negligible impact on water levels along the Nanny River with this option. Along the Paramadden tributary, the construction of new defences and raising of existing defences has an impact on water levels. Water levels are raised by an average of 0.8m along a 0.5km stretch of the river channel. The maximum increase in water levels is 0.93m.

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Table C-4 –Broadmeadow and Ward AU

Assessment units	Broadmeadow and Ward AU
Water bodies	Broadmeadow, Ward
Flood risk management options	Flood forecasting and warning system for the Broadmeadow River

Flood Risk (1% AEP event)

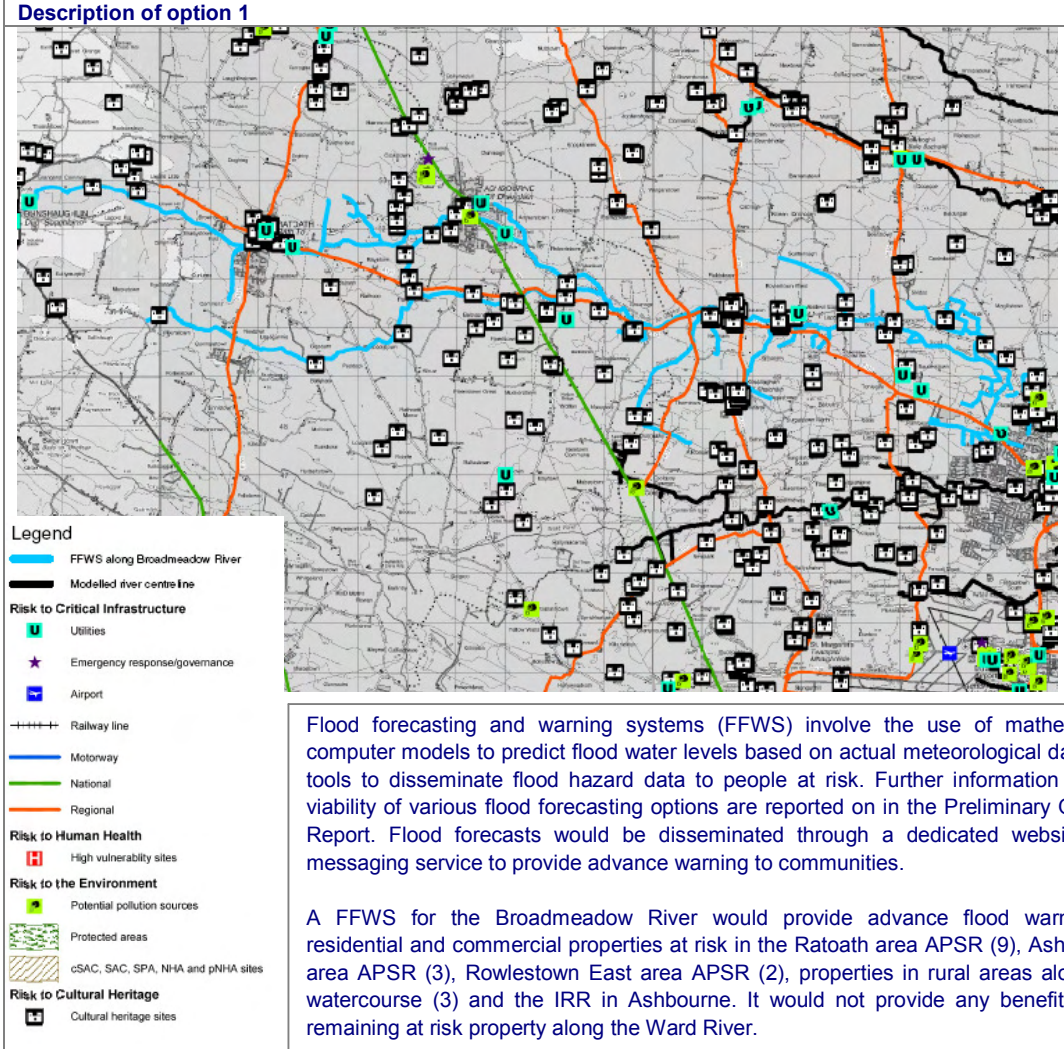
There is limited economic flood risk to properties in the AU for the 1% AEP event with the majority of the risk confined to small clusters of properties at Rowlestown East area APSR and Ratoath area APSR. The remainder of the risk is limited to isolated properties along the rivers. Two IRRs have been identified in the AU, wastewater treatment works at Ashbourne and Toberburr (in Owens Bridge APSR).

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
18	0	2	0.5	150	4

Environmental features and receptors present or at risk

- 25 river water bodies: 4 = high status; 1 = good status; 5 = moderate status; 12 = poor status; 3 = bad status
- 1 Wastewater Pumping Station
- 8 Waste Management Permit Sites
- 4 Section 4 licences
- 13 sites on the SMR/RPS/RMP

Description of option 1



Flood forecasting and warning systems (FFWS) involve the use of mathematical computer models to predict flood water levels based on actual meteorological data and tools to disseminate flood hazard data to people at risk. Further information on the viability of various flood forecasting options are reported on in the Preliminary Options Report. Flood forecasts would be disseminated through a dedicated website and messaging service to provide advance warning to communities.

A FFWS for the Broadmeadow River would provide advance flood warning to residential and commercial properties at risk in the Ratoath area APSR (9), Ashbourne area APSR (3), Rowlestown East area APSR (2), properties in rural areas along the watercourse (3) and the IRR in Ashbourne. It would not provide any benefit to the remaining at risk property along the Ward River.

Table C-5 – Ratoath area APSR

Assessment units	Ratoath area APSR
Water bodies	Broadmeadow
Flood risk management options	Improving channel conveyance by replacing a bridge on the Broadmeadow River at the R125 Ratoath Road and replacing a culvert on a tributary of the Broadmeadow River.

Flood Risk (1% AEP event)

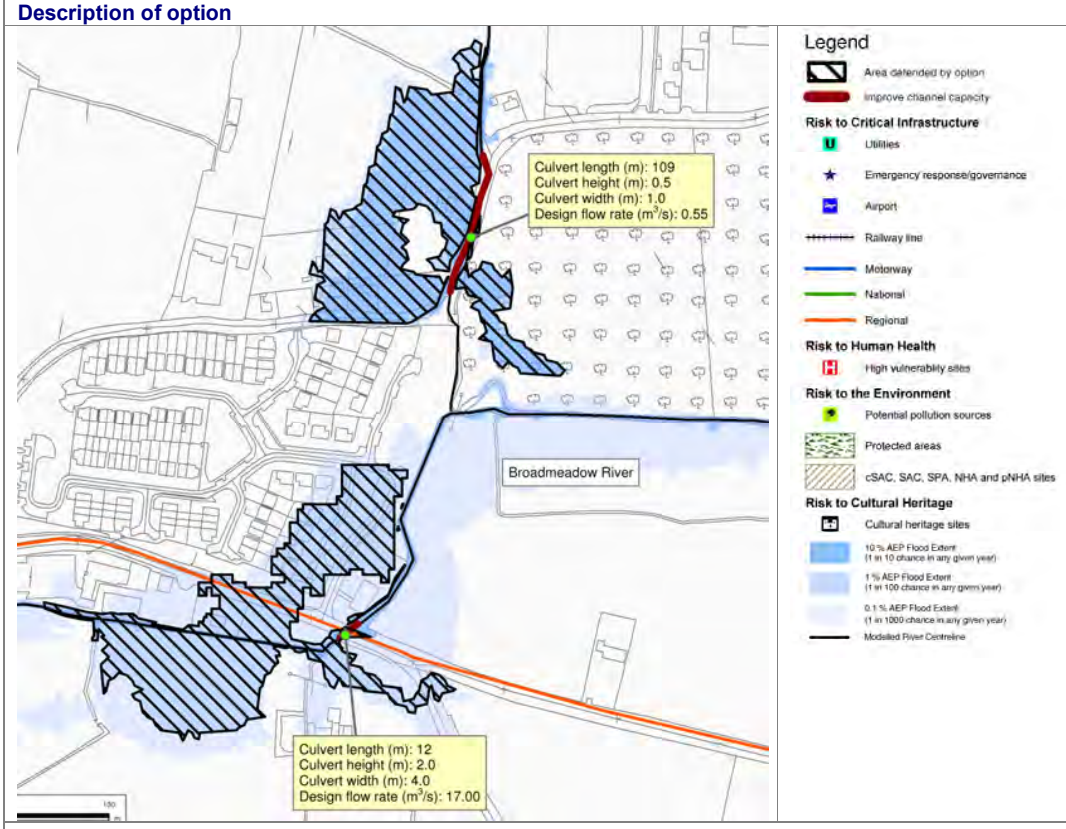
Flood risk in Ratoath Area APSR results form out of bank flooding along the Broadmeadow River primarily due to under capacity culverts under the R125 and along the Broadmeadow tributary to the north of the R125. Flood water spills out of bank upstream of the R123 culvert and floods a number of properties in the housing estate at Moulden Bridge. Existing flood defences (a flood embankment) protect a new housing estate at Somerville in the Ratoath area APSR.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
9	0	0	0.09	2.7	0

Environmental features and receptors present or at risk

- 3 river water bodies: 1 = good status; 2 = bad status

Description of option



This option involves replacing two structures where the existing capacity of the structures is insufficient to convey large flows and results in surcharging and spilling of flood waters. The option is slightly amended from the option proposed at Stage 2 following the modelling of this option. The modelling indicates that the proposed embankments identified at stage 2 are not required.

Modelling results indicate that a rectangular concrete culvert of 2m high by 4m wide would be sufficient to reduce flood risk at the R125 crossing. This culvert can convey a flow of 17m^3/s which equates to the 1% AEP MRFS 95%ile flow without surcharging. The replacement culvert on the Broadmeadow River tributary is also designed to convey the 1% AEP MRFS 95%ile flow without surcharging. The dimensions for this culvert are 0.5m high by 1m wide by 109m in length and has a capacity of 0.6m^3/s. Due to the sizing of the culverts the 0.1% AEP flood extent will be significantly reduced. The figure above shows the location where the culvert capacity needs to be increased.

Modelling results indicate that this option will have negligible impact on water levels upstream and downstream of the proposed location for this option. Changes in water levels are localised (i.e. along a 0.4km stretch of the river) to the location of the proposed option. The option results in a decrease in water levels, the maximum of 0.7m occurring on the Broadmeadow River (cross section 4Ba19221U - directly upstream of the R125 crossing) and 0.9m on the Broadmeadow tributary (cross section 4Bax322In).

Table C-6 – Rowlestown East area APSR

Assessment units	Rowlestown East area APSR
Water bodies	Broadmeadow
Flood risk management options	Construction of flood defence embankments along left bank of Broadmeadow River tributary upstream of the R125.

Flood Risk (1% AEP event)

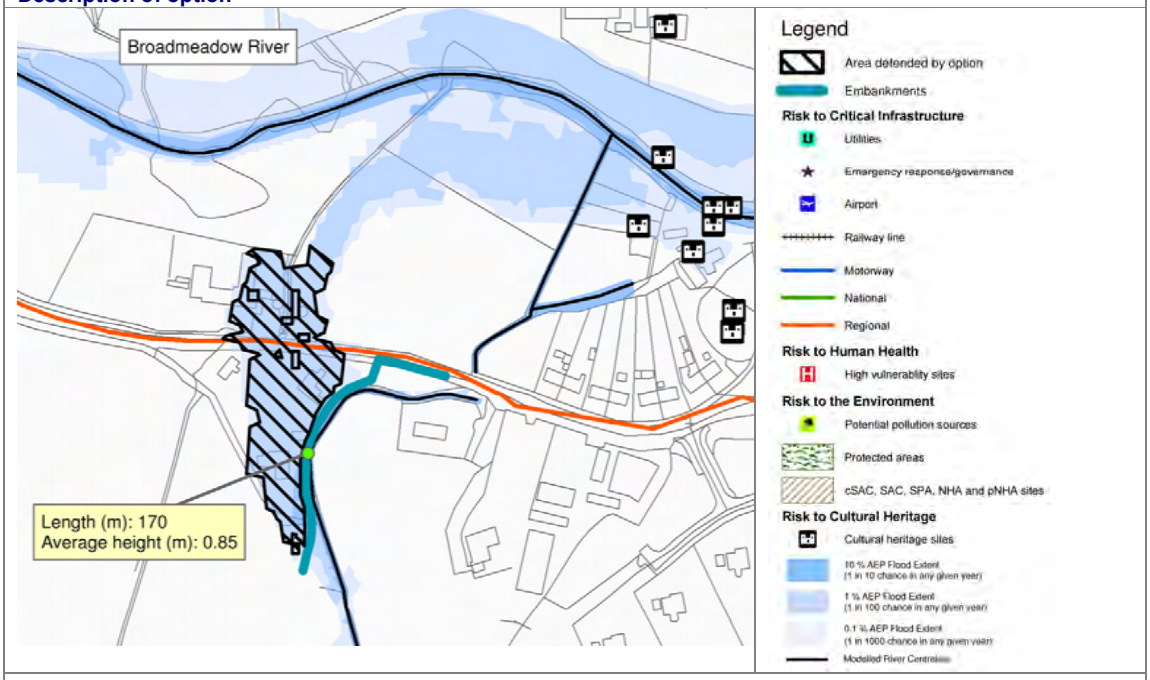
Flood risk in Rowlestown East area APSR is caused by out of bank flooding along the Broadmeadow River primarily due to an under capacity channel upstream of the R125. Two properties are at risk of flooding in this location.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
2	0	0	0.08	5.4	0

Environmental features and receptors present or at risk

- 3 river water bodies: 3 = poor status
- 2 Waste Management Permit Sites
- 3 sites on the SMR/RPS/RMP

Description of option



This option involves the construction of a flood defence embankment along the left bank of the Broadmeadow tributary in Rowlestown. Out of bank flows along the left bank results in flooding of two properties. A total of 170m of embankment is required with an average height of 0.85m above ground level including 0.5m freeboard. The figure above shows the location of the proposed embankments.

Modelling results indicate that this option will have negligible impact on water levels upstream and downstream of the location of the proposed option. Changes in water levels are localised to the vicinity of the proposed option (within 120m upstream and 240m downstream of the embankment). The option results in an increase in water levels with a maximum increase of 0.32m (cross section 4Bap205U).

Table C-7 – Mayne & Sluice AU

Assessment units	Mayne and Sluice AU
Water bodies	Mayne, Sluice
Flood risk management options	Flood forecasting and warning system for the Mayne River

Flood Risk (1% AEP event)

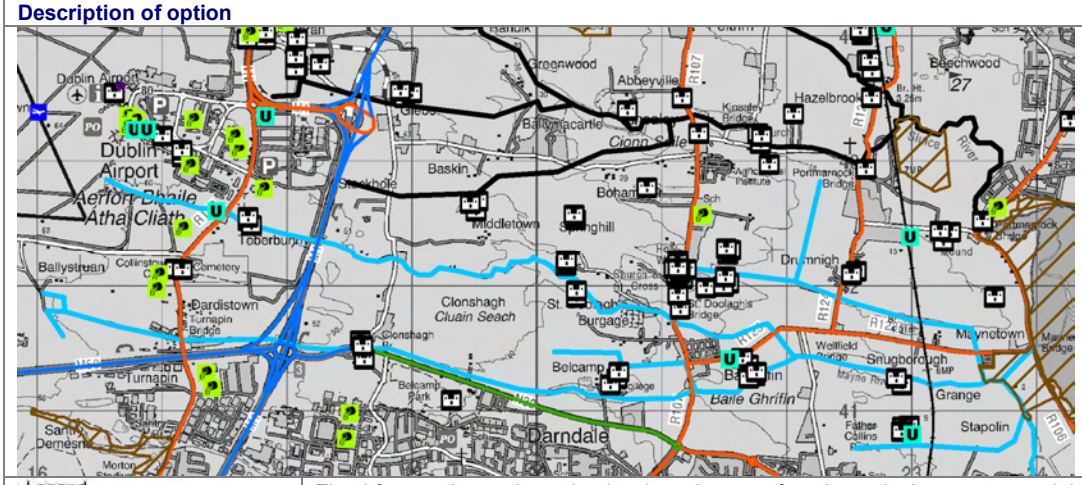
There is limited economic flood risk to properties in the AU for the 1% AEP event with the majority of the risk confined to small clusters of properties at Balgriffin and Streamstown. Elsewhere in the AU, the risk is limited to isolated properties along the rivers. There is one IRR in the AU; approximately 100m of the N32 near Bewleys Airport Hotel in Clonshaugh.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
28	3	0	0.7	31	2

Environmental features and receptors present or at risk

- 2 river water bodies: 1 = high status; 1 = poor status
- 6 Waste Management Permit Sites
- 4 Section 4 licences and 18 Section 16 licences
- Feltrim Hill pNHA
- 6 sites on the SMR/RPS/RMP

Description of option



Flood forecasting and warning involves the use of mathematical computer models to predict flood water levels, based on actual meteorological conditions, and tools to disseminate flood hazard data to people at risk. Further information on the viability of various flood forecasting options are reported on in the Preliminary Options Report. Flood forecasts would be disseminated through a dedicated website and messaging service to provide advance warning to communities.

A FFWS for the Mayne River would provide advance flood warning to properties at risk along the Mayne River in St Margaret's, Dublin Airport, Belcamp and Balgriffin areas APSR. The image above shows the Mayne River and flood risk indicators within the catchment of the Mayne River. Those indicators in the floodplain of the Mayne River are likely to benefit from the proposed FFWS.

Potential impact on principal overland flow routes and areas of significant natural floodplain storage

This option has no impact on overland flow paths or significant natural flood plain storage.

Multi Criteria Analysis (MCA) Results						
Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€185,305	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€450,803	200	25	0	0	**225**
BCR	0.41 (1.64 with IPFP)	More benefit can be achieved from FFWS if it is implemented in conjunction with IPFP (study area option 2).				

Table C-8 – St Margaret's, Dublin Airport, Belcamp and Balgriffin areas APSR

Assessment units	Mayne and Sluice AU
Water bodies	Mayne, Sluice
Flood risk management options	Improve channel conveyance by removing a disused bridge with construction of flood defence embankments & walls.

Flood Risk (1% AEP event)

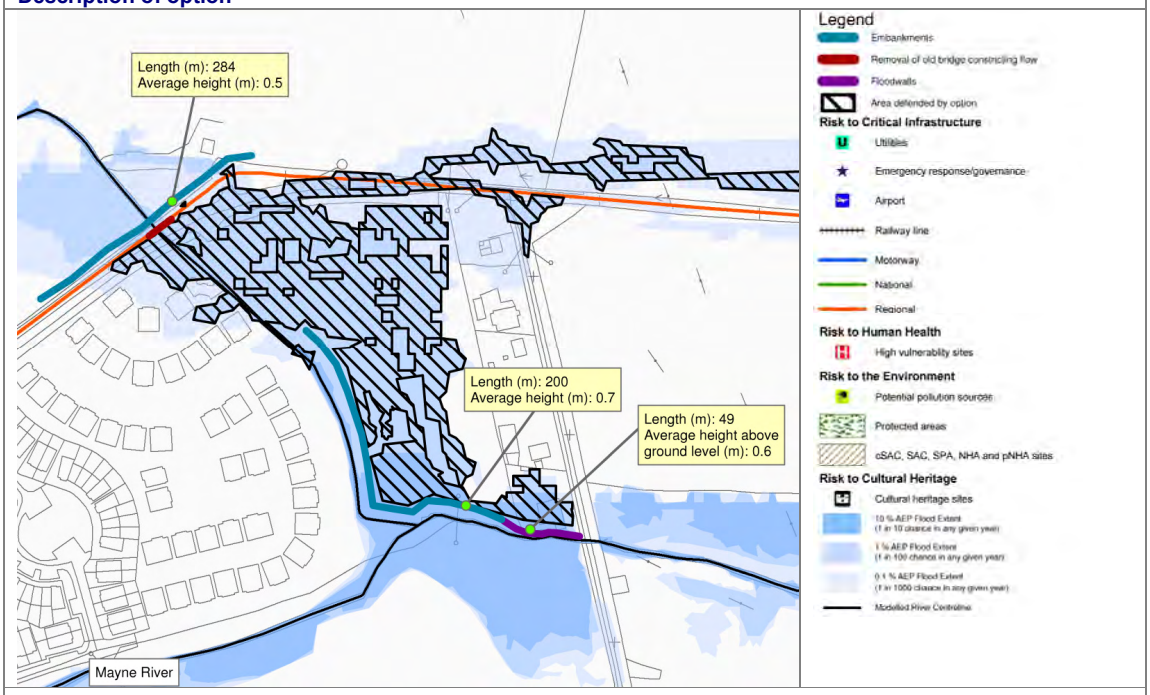
There is limited economic flood risk to properties in the AU for the 1% AEP event with the majority of the risk confined to small clusters of properties at Balgriffin and Streamstown. Elsewhere in the AU, the risk is limited to isolated properties along the rivers. There is one IRR at risk; approximately 100m of the N32 near Bewleys Airport Hotel in Clonshaugh.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
19	2	0	0.7	5	1

Environmental features and receptors present or at risk

- 3 river water bodies: 1 = high status; 2 = poor status
- 6 Section 4 licences and 17 Section 16 licences
- 4 sites on the SMR/RPS/RMP

Description of option



This option involves the construction of a flood defence embankment north of the R123 on the Mayne River tributary and the construction of embankments and walls along the left bank of the Mayne River and tributary at Balgriffin. The option also involves removing an unused bridge structure north of the R123. Hydraulic modelling indicates that this unused bridge increases water levels locally. By removing this bridge structure, the extent and height of embankments to the north of the R123 will be reduced. Hydraulic modelling also indicates that replacing existing culverts at the R123 and housing development at Balgriffin is not necessary as part of this option as they are sufficient to accommodate the 1% AEP event without surcharging.

A 280m embankment with an average height of 0.5m running east west along the R123 is required to prevent flood water spilling south across the R123. Further downstream, a 200m long embankment with an average height of 0.7m is required on the left bank of the Mayne River and its tributary to prevent out of bank flooding downstream. This embankment is linked to a flood wall on the Mayne River, 50m in length, with an average height of 2.4m (due to space constraints, wall constructed to the bed of the channel). The average height of this wall above ground level is approximately 0.6m.

Modelling results indicate that this option will have some localised impact on water levels upstream and downstream of the proposed location for this option. Upstream of the R123, water levels on the Mayne River tributary are lowered by an average of 0.12m along a 120m stretch of the channel. Downstream of the R123, water levels on the Mayne River and its tributary are raised by an average of 0.16m along 430m of river channel. Downstream of the bridge at The Hollow, there are no changes in water levels.

Multi Criteria Analysis (MCA) Results – option 1a

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€955,548	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€752,281	100	130	210	-100	**340**
BCR	1.27					

Table C-9 Coastal AU

Assessment units	Coastal AU
Water bodies	Fingal and Meath coastline, Mayne River, Sluice River, Gaybrook Stream, Broadmeadow River, Ward River, Lissenhall Stream, Turvey River, Ballyboghil River, Corduff River, Baleally Stream, Bride's Stream, Jones's Stream, Rush Town Stream, St. Catherine's Stream, Mill Stream, Bracken River, Delvin River, Mosney Stream, Nanny River and Brookside stream
Flood risk management options	Develop a combined fluvial and tidal FFWS.

Flood Risk (1% AEP event)

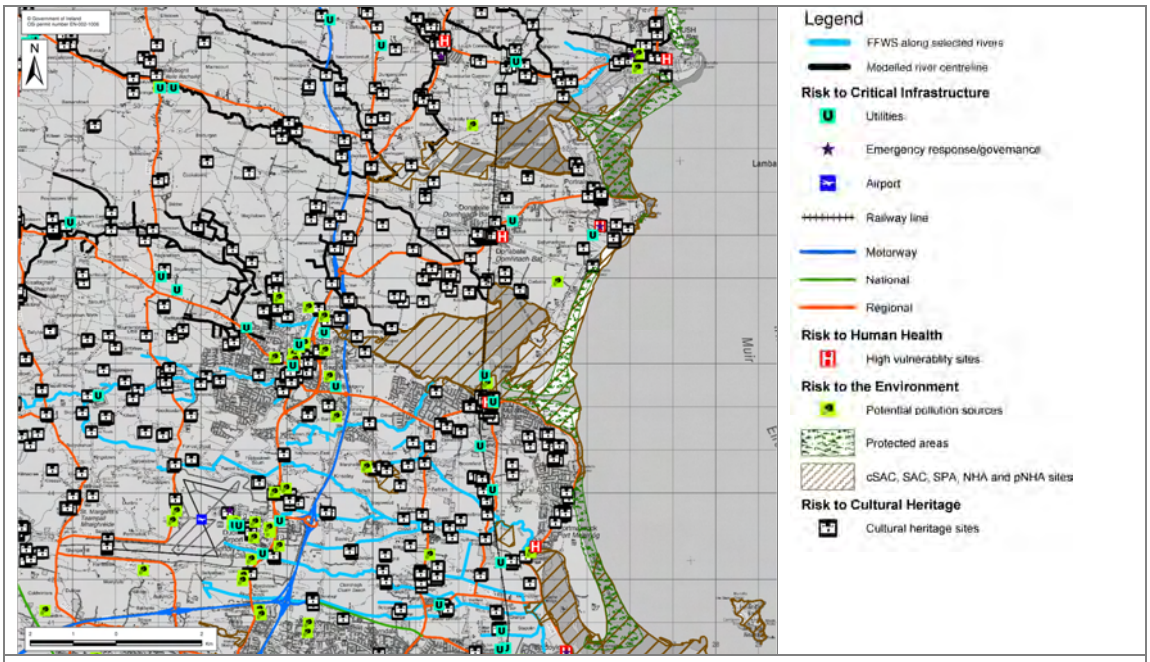
The Coastal AU is at risk from a number of sources of flooding: tidal flooding only, fluvial flooding only and a combination of tidal and fluvial flooding. There are a number of areas along the Fingal and Meath coast at economic risk for the 1% AEP fluvial event and 0.5% AEP tidal event. The majority of the risk is confined to urban areas along the coast and in particular along the estuaries of the rivers discharging to the Irish Sea. There are a number of locations where the economic risk is directly from coastal flooding from the Irish Sea (e.g. Harbour Road in Skerries area APSR) or from fluvial flooding from the rivers (e.g. Mill Stream in Skerries area APSR). There is one IRR at risk, a WWTW in Julianstown area APSR.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
182	54	1	2.5	350	7

Environmental features and receptors present or at risk

- 8 river water bodies: 1 = high status; 2 = good status; 1 = moderate status; 3 = poor status; 1 = bad status
- 4 transitional (i.e. estuarine) water bodies: 4 = moderate status
- 4 coastal water bodies: 2 = high status; 2 = moderate status
- 1 wastewater treatment works
- 13 Waste management permit sites
- 4 Section 4 licences and 15 Section 16 licences
- Boyne Coast and Estuary SAC/pNHA; Boyne Estuary SPA; River Nanny Estuary and Shore SPA; Laytown Dunes and Nanny Estuary; Loughskinny Coast pNHA; Rogerstown Estuary SAC/SPA/Ramsar site/pNHA; Malahide Estuary SAC/pNHA; Broadmeadow-Swords Estuary SPA/Ramsar site; Baldoyle Bay SAC/SPA/Ramsar site/pNHA; Sluice River Marsh pNHA
- 21 sites on Meath County Council's Wetland Inventory, and 92 sites listed on the Coastal Inventory
- 29 sites on the SMR/RPS/RMP

Description of option



Flood forecasting and warning involves the use of mathematical computer models to predict flood water levels, based on actual meteorological conditions, and tools to disseminate flood hazard data to people at risk. Further information on the viability of various flood forecasting options are reported on in the Preliminary Options Report. Flood forecasts would be disseminated through a dedicated website and messaging service to provide advance warning to communities.

Through the Irish Coastal Protection Strategy Study (ICPSS), low-resolution tidal-surge forecasting capability has been developed around the Irish Coast. The system is a purely tidal-surge forecasting model and as part of this option would be developed to generate a combined fluvial and tidal FFWS.

FFWS would be required for the Irish Sea along the Meath and Fingal coastline and for the following rivers: Mill Stream, Rush West Stream, Ward River, Gaybrook Stream and Sluice River (consideration has been given to a fluvial FFWS on the Nanny River, Broadmeadow River and Mayne River as part of the Nanny and Delvin AU and the Mayne and Sluice AU respectively).

Multi Criteria Analysis (MCA) Results – option 1

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€3,669k	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€1,762k	200	25	0	0	**225**
BCR	2.08 (7.29 with IPFP)	Significantly more benefit can be achieved from FFWS if it is implemented in conjunction with IPFP (study area option 2).				

Table C-10 – Portmarnock and Malahide areas APSR

Assessment units	Portmarnock and Malahide areas APSR
Water bodies	Fingal and Meath coastline, Gaybrook Stream, Broadmeadow Estuary, Sluice River
Flood risk management options	(1) Rehabilitating and raising existing coastal defences at **Strand Road, Portmarnock** (including rehabilitation of flapped outfall) and construction of flood defence embankment. (2) Construction of demountable flood defences at underpass, along with flood walls/demountable walls and localised raising of existing defences to the north-east of Malahide, to protect at risk properties in **Malahide town centre**.

Flood Risk (1% AEP event)

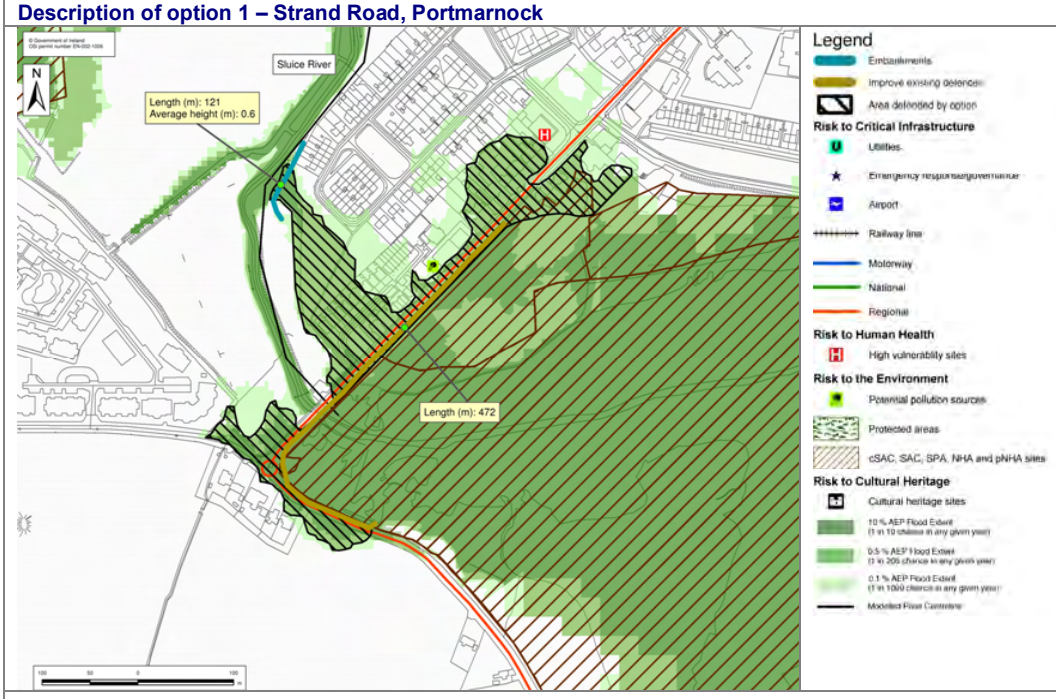
At Strand Road in Portmarnock, 18 properties are at risk from a combination of fluvial (Sluice River) and tidal flooding. In Malahide, the flood risk is from tidal flooding only from the Broadmeadow estuary resulting in 37 properties in Malahide town centre being at risk of flooding. A small number of properties in other locations within the APSR are also at risk of flooding.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
46	16	0	1.0	38	0

Environmental features and receptors present or at risk

- 2 river water bodies: 1 = high status; 1 = poor status
- 2 transitional (i.e. estuarine) water bodies: 2 = moderate status
- 2 coastal water bodies: 2 = moderate status
- 3 Section 16 licences
- Malahide Estuary cSAC/pNHA; Broadmeadow-Swords Estuary SPA/Ramsar site; Baldoyle Bay cSAC/SPA/Ramsar site/pNHA; Sluice River Marsh pNHA
- 1 site on the SMR/RPS/RMP

Description of option 1 – Strand Road, Portmarnock



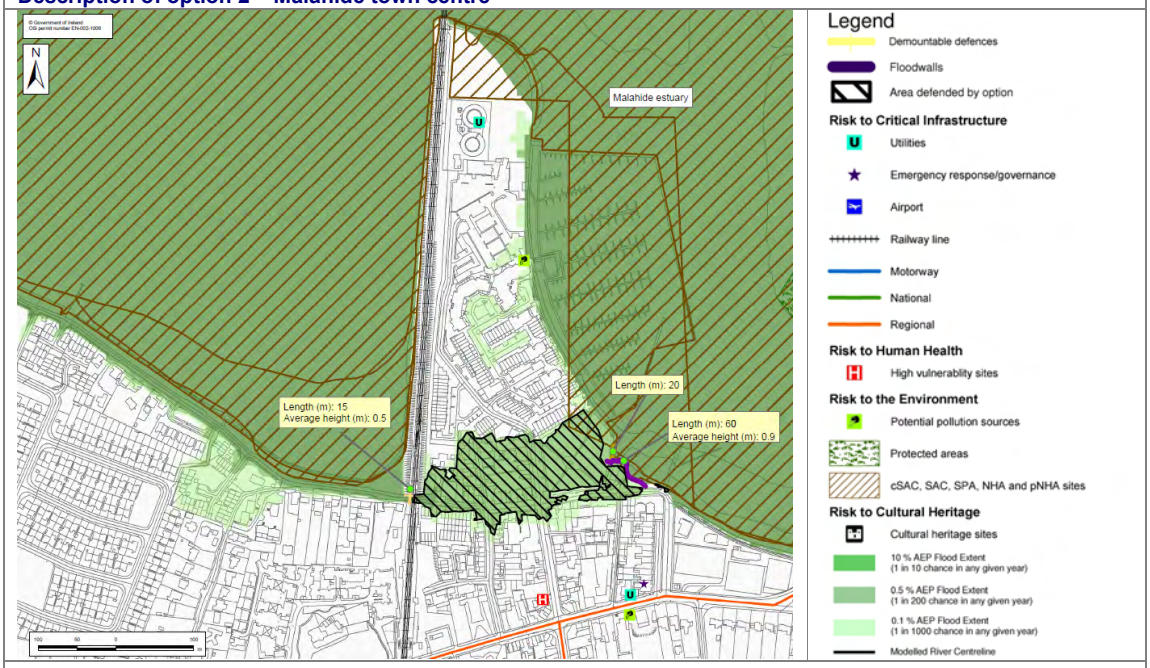
This option involves rehabilitating (i.e. strengthening and raising) 0.5km of existing walls which run alongside the R106 at Strand Road. The option also involves rehabilitating of the flapped gates on the Sluice River at Portmarnock Bridge and the construction of a flood embankment on the left bank of the Sluice River upstream of Portmarnock Bridge.

The existing flood walls and their foundations would be strengthened using structural engineering works to allow walls to provide sufficient flood defence function up to the 0.5% AEP tidal event. The flapped gates on the Sluice River at Portmarnock Bridge prevent the propagation of high tides upstream of this bridge. These gates would be replaced with new flapped gates as part of this option. 120m of flood embankments are required upstream of Portmarnock Bridge. The average height of these embankments is 0.6m and provides protection up to the 1% AEP fluvial event and 0.5% AEP tidal event. Hydraulic modelling indicates that there is no impact on water levels upstream or downstream of Strand Road.

Multi Criteria Analysis (MCA) Results – option 1

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€1,554k	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€1,555k	25	120	210	-260	**95**
BCR	1.0					

Description of option 2 – Malahide town centre



This option involves the construction of 60m of flood walls and raising of a short section of flood wall (approximately 10m) in Malahide town centre. It also includes the construction of a demountable flood defence across the railway underpass to prevent the propagation of flood waters along the coast road eastwards into Malahide town centre. The option provides protection to properties in Malahide town centre against tidal flooding up to the 0.5% AEP tidal event. It does not protect properties along the coast road. It is noted that the Local Authority and the OPW will need to agree who is responsible for the installation of these demountable defences. It is also noted that the permission of Irish Rail may also be required.

A demountable defence across the railway underpass on the coast road would cut off the flow path of flood water under the railway underpass and into Malahide town centre. This option would limit the movement of people and traffic prior to and during a flood event and the traffic management plan would need to consider this issue. Additional investigations would be required to determine if the railway embankment would prevent the ingress of water eastwards into Malahide town centre. This option does not prevent flooding of properties along the coast road. In Malahide town centre, flood embankments with an average height of 0.6m are required for approximately 75m. These embankments would be landscaped into the existing park and would tie into new demountable flood defences. These demountable flood defences would be mounted to a permanent flood defence structure. The average height of demountable defences above ground level would be 0.9m.

Multi Criteria Analysis (MCA) Results – option 2

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€2,730k	Technical	Economic	Social	Environmental	**Overall**

Cost of option	€2,203k	0	180	240	-70	**350**
BCR	1.2 (6.2 with FFWS)	This option requires a FFWS to be implemented. The higher cost/lower BCR includes a specific FFWS with this option. If it is assumed that Coastal AU option 1 is implemented the specific cost for a FFWS for this option can be removed thus increasing the BCR.				

Table C-11 – Swords area APSR

Assessment units	Swords area APSR
Water bodies	Gaybrook Stream, Broadmeadow River, Ward River, Lissenhall Stream
Flood risk management options	Widening the Gaybrook Stream to reduce fluvial flood risk to properties at Aspen near Kinsaley

Flood Risk (1% AEP event)

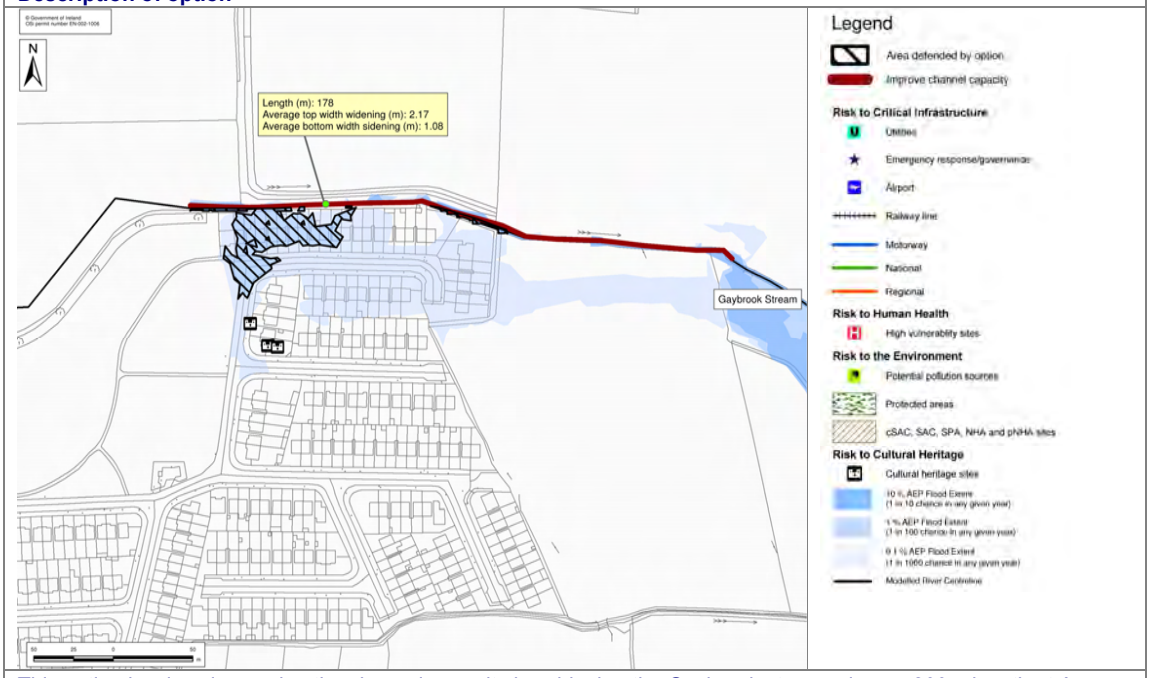
In Swords area APSR, 9 residential properties are at risk of flooding in the Aspen estate from the Gaybrook Stream and 7 non-residential properties (including a fire station) are at risk Swords town centre from the Ward River. The remaining at risk properties are in isolated locations around Swords, including 4 non-residential properties in the Airside Retail Park, which are at risk from the Gaybrook Stream but incur very low economic damages.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
13	15	0	0.12	12	0

Environmental features and receptors present or at risk

- 4 river water bodies: 1 = high status; 2 = moderate status; 1 = poor status
- 1 transitional (i.e. estuarine) water bodies: 1 = moderate status
- 2 Section 4 licences and 7 Section 16 licences
- Malahide Estuary SAC/pNHA; Broadmeadow-Swords Estuary SPA/Ramsar site
- 3 sites on the SMR/RPS/RMP

Description of option



This option involves increasing the channel capacity by widening the Gaybrook stream along a 200m length at Aspen. Hydraulic modelling indicates that the top width of the channel would need to be widened by an average of 2m while the bottom width of the channel would need to be widened by an average of 1m between surveyed cross sections 3Ga2306 and 3Ga2128. These channel modifications contain the 1% AEP fluvial event in bank with a 0.3m freeboard (i.e. 1% AEP water levels are 0.3m below top of bank).

The results of the hydraulic modelling show that this option modifies water levels locally with an average decrease in water levels of 0.3m along the 200m length of widened channel. Downstream of the channel widening, there is a negligible increase in water levels.

Multi Criteria Analysis (MCA) Results – option

Benefit Cost Ratio (BCR)	MCA scores

Benefits of option	€193,440	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€54,166	125	90	90	-110	**195**
BCR	3.6					

Table C-12 Rush area APSR

Assessment units	Rush area APSR
Water bodies	St Catherine's Stream, Rush Town Stream, Rush West Stream, Jone's Stream, Rogerstown Estuary
Flood risk management options	Construction of secondary culvert along Channel Road to protect properties at risk from fluvial flooding along the Rush West stream.

Flood Risk (1% AEP event)

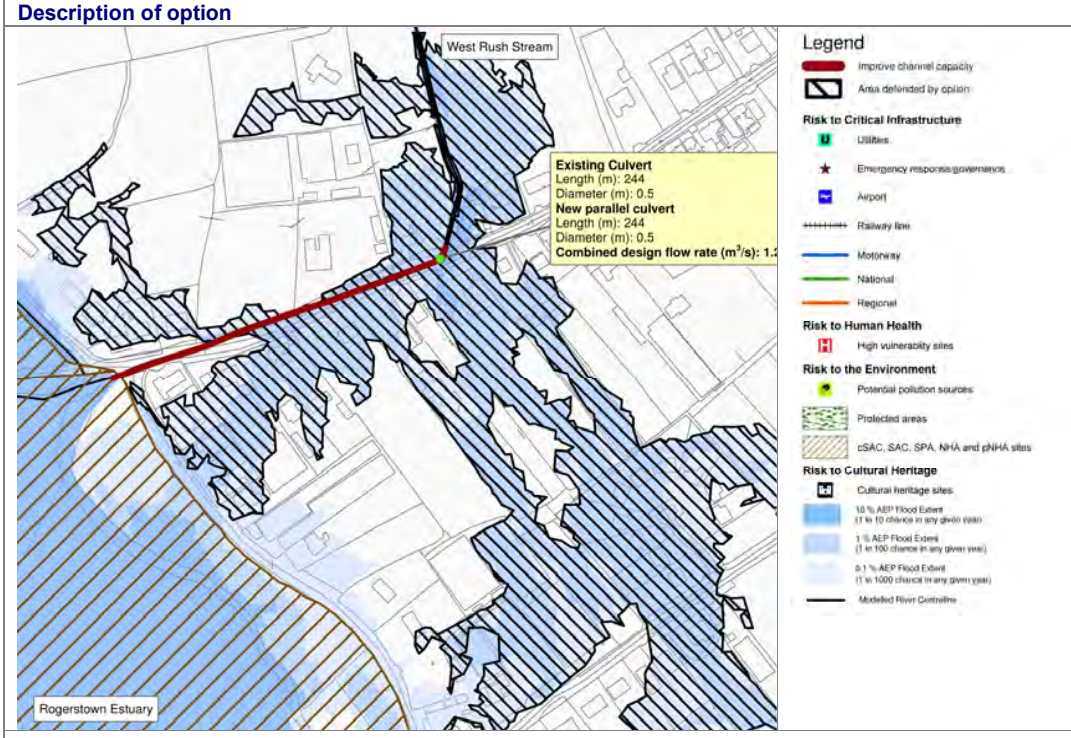
At Rush area APSR, the flood risk is from two separate sources; fluvial flooding from the Rush West Stream and tidal flooding from Rogerstown estuary. The option proposed does not protect 17 properties at risk from tidal flooding, however, the risk from tidal flooding is less than that from fluvial flooding with significantly less economic damages being incurred from tidal flooding only.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
25	2	0	0.6	4	1

Environmental features and receptors present or at risk

- 1 river water body: 1 = poor status
- 1 transitional (i.e. estuarine) water bodies: 1 = moderate status
- 1 coastal water bodies: 1 = moderate status
- 1 Waste management permit site
- 2 Section 16 licences
- Rogerstown Estuary SPA/SAC/pNHA
- 2 sites on the SMR/RPS/RMP

Description of option



As more economically viable variation of option 1, this option would involve constructing a secondary culvert along side the existing culvert on the downstream end of the Rush West Stream. The capacity of the existing structure is insufficient to convey large flows and results in surcharging and spilling of flood waters and flooding of properties. As the culvert is sized for the 1% MRFS 95%ile flow it can pass the 0.1% AEP fluvial flow without causing any flood damage to property.

Modelling results indicate that a new circular culvert with a diameter of 0.5m when combined with the capacity of the

existing structure would be sufficient to reduce fluvial flood risk in Rush. The combined culverts would convey a flow of 1.2m^3/s, which equates to the 1% AEP MRFS 95%ile flow without surcharging.

Modelling results indicate that this option will have some impact on water levels upstream and no impact downstream of the proposed location for this option. Changes in water levels are localised along a 0.3km stretch of the river upstream of the culvert inlet. The option results in an average decrease of 0.36m in water levels upstream of the culvert inlet. The maximum decrease in water levels is 1.0m at the culvert inlet.

Multi Criteria Analysis (MCA) Results

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€432,280	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€584,046	225	35	180	-10	**430**
BCR	0.74 (0.9 for 0.1% AEP)	Replacement culverts designed to pass the 95%ile 1% MRFS without surcharging. This flow is less than the 0.1% AEP current scenario flow and therefore reduction in the 0.1% AEP damage is also achieved, thus increasing the BCR.				

Table C-13 – Skerries area APSR

Assessment units	Skerries area APSR
Water bodies	Fingal coastline, Mill Stream
Flood risk management options	Improve channel conveyance by replacing culverts under roads and railway with larger capacity culverts and widening channel through park to reduce fluvial flood risk to properties at Miller Lane and Sherlock Park.

Flood Risk (1% AEP event)

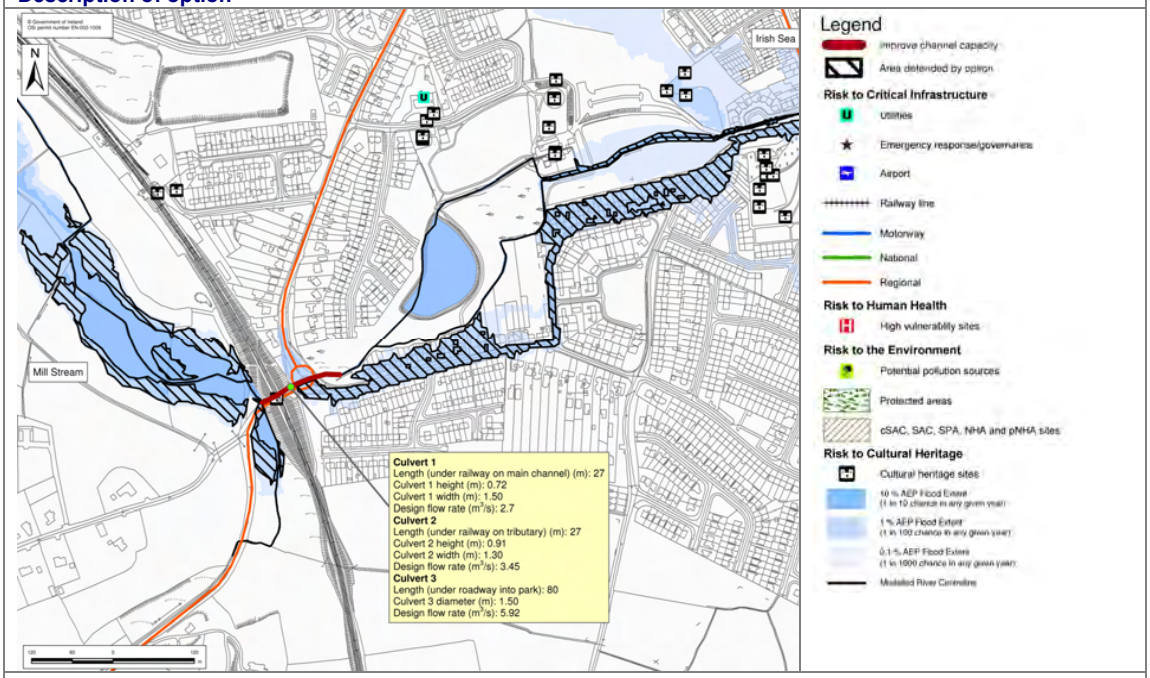
For Skerries area APSR, two separate locations are at risk from different sources of flooding. Along Harbour Road, 12 properties are at risk from tidal flooding. A total of 49 residential properties along Millar Lane and Sherlock Park are at risk of fluvial flooding from the Mill Stream.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
59	2	0	1.7	4	0

Environmental features and receptors present or at risk

- 1 river water body: 1 = good status
- 1 coastal water bodies: 1 = moderate status
- 1 site on the SMR/RPS/RMP

Description of option



This option would involve replacing the existing culverts under the Dublin to Belfast railway line with new larger capacity culverts (which will require consents from Irish Rail). The capacity of the existing culverts is insufficient to convey large flows and results in flood waters ponding on land to the west of the railway embankment and surcharging of existing culverts. This surcharging results in spilling of flood waters along the R127 and floods properties at Millar Lane and Sherlock Park. Hydraulic modelling indicates that it is not necessary to widen and deepen the channels in the park.

The existing culverts under the railway would be replaced with three larger capacity culverts. Hydraulic modelling indicates that the following culverts would be required to convey the 1% AEP MRFS 95%ile flow without surcharging:
- Culvert under the railway on main channel - Box section culvert: Length 27m. Width 1.5m. Height 0.72m
- Culvert under the railway on 15Maa tributary - Box section culvert: Length 27m. Width 1.3m. Height 0.91m
- Culvert under the roadway into the park - Circular culvert: Length 80m. Diameter 1.50m.

Modelling results indicate that this option will have an impact on water levels upstream and downstream of the proposed new culverts. Upstream of the culverts (i.e. to the west of the railway embankment), flood risk to agricultural

land is reduced with water levels in the Mill Stream lowered by an average of 0.56m along a 650m length of channel. Along the Mill Stream tributary (west of the railway embankment) water levels are reduced by an average of 0.35m along the modelled reach (i.e. 200m). Downstream of the railway, the increased conveyance capacity of the culverts results in an increase in water levels along the Mill Stream. Water levels are raised by an average of 0.21m along 1.1km of river channel. The maximum increase in water levels occurs at cross section 15Ma1123CD where water levels are raised by 0.44m.

Multi Criteria Analysis (MCA) Results – option

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€1,876k	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€1,496k	225	135	180	-35	**505**
BCR	1.3					

Table C-14 – Laytown, Bettystown and coastal areas APSR

Assessment units	Laytown, Bettystown and coastal areas APSR
Water bodies	Meath coastline, Nanny River, Brookside Stream
Flood risk management options	Construction of flood defence embankments to protect properties at risk along the coast and from the Nanny River.

Flood Risk (1% AEP event)

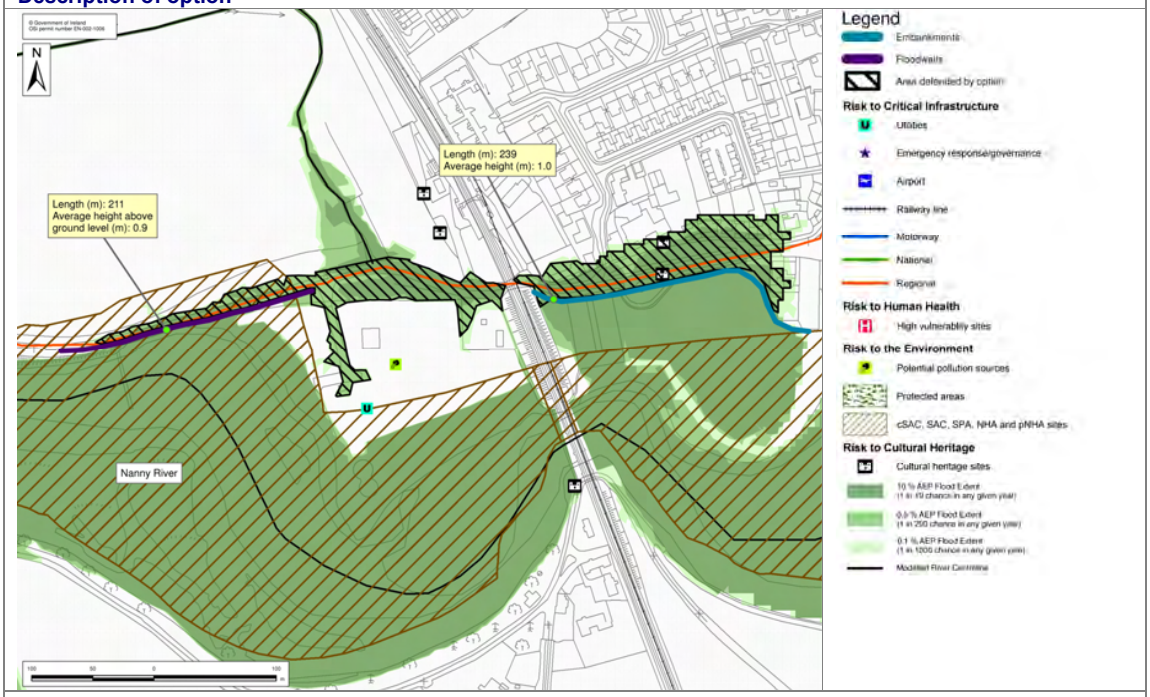
The main flood risk in this APSR is to Laytown from combined fluvial and tidal flood risk along the Nanny River estuary.

Properties		Utility assets (No.)	Transport routes (length km)	Agricultural land (hectares)	Social amenity sites (No.)
Residential (No.)	Non-residential (No.)				
10	1	0	0.5	11	0

Environmental features and receptors present or at risk

- 2 transitional (i.e. estuarine) water bodies: 2 = moderate status
- 2 coastal water bodies: 2 = high status
- Boyne Coast and Estuary SAC/pNHA; Boyne Estuary SPA; River Nanny Estuary and Shore SPA; Laytown Dunes and Nanny Estuary
- 7 sites listed on Meath County Council's Wetland Inventory, and 37 sites listed on the Coastal Inventory
- 2 sites on the SMR/RPS/RMP

Description of option



This option involves the construction of flood embankments and walls on the left bank of the River Nanny along the R150 southwest of Laytown. Approximately 210m of flood defence walls are required and, where space is available, the flood walls have been set back from the river bank. Along the R150, there is limited space to set the walls back from the river bank and these walls are constructed to the river bed level. The average height of these walls is 1.0m above the top of bank. Immediately downstream of the railway bridge, approximately 240m of flood embankment are required along the left bank of the Nanny River. This embankment is set back from the channel and has an average height of 1.0m. Hydraulic modelling indicates that there is no impact on water levels upstream or downstream of Laytown with this option.

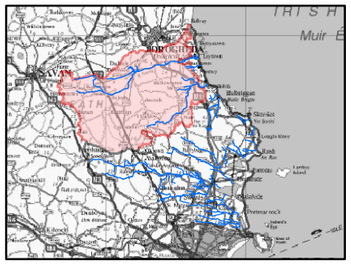
Multi Criteria Analysis (MCA) Results

Benefit Cost Ratio (BCR)		MCA scores				
Benefits of option	€1,705k	Technical	Economic	Social	Environmental	**Overall**
Cost of option	€,1412k	100	120	180	-260	**140**

N

2 1 0 2 Km

Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along River Nanny
- Modelled river centreline

Risk to Critical Infrastructure

- U — Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- H — High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Clients:

Fingal County Council · OPW

Project :
FEM FRAMS

Map :
Nanny and Delvin - Option 1

Figure By :	Kevin Daly	Date : 04 Oct 2010
Checked By :	Clare Dewar	Date : 04 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 04 Oct 2010

Figure No. : NannyDelvinAU/CURS/001 — Revision 0

Drawing Scale : 1:65,000 — Plot Scale : 1:1 @ A3

N

Flood embankment
Length (m): 80
Average height (m): 1.1

Embankment
Length (m): 29
Average height (m): 1.2

Flood wall
Length (m): 39
Average height raised (m): 1.3

Flood wall
Length (m): 243
Average height raised (m): 1.3

Flood wall
Length (m): 39
Average height raised (m): 1.6

Flood embankment
Length (m): 377
Average height raised (m): 0.5

Flood wall
Length (m): 39
Average height raised (m): 1.3

Flood embankment
Length (m): 212
Average height raised (m): 1.3

River Nanny

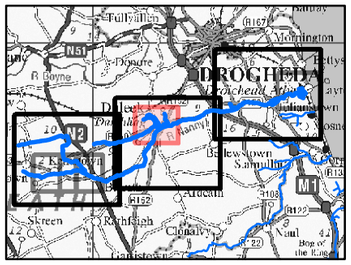
Flood embankment
Length (m): 70
Average height (m): 0.8

Flood embankment
Length (m): 154
Average height raised (m): 0.8

Flood wall
Length (m): 111
Average height raised (m): 0.6

100 50 0 100
m

Location Plan :



FRM OPTIONS MAP

Legend

- Area defended by option
- Improve existing defences

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Project :
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Map :
Duleek area APSR - Option 1

Figure By :	Kevin Daly	Date :	15 Oct 2010
Checked By :	Clare Dewar	Date :	15 Oct 2010
Approved By :	Anne-Marie Conibear	Date :	15 Oct 2010

Figure No. : Duleek/CURS/001

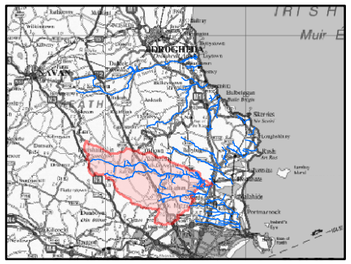
Revision 0

Drawing Scale : 1:2,500 Plot Scale : 1:1 @ A3

N

2 1 0 2 Km

Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along Broadmeadow River
- Modelled river centreline

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Fingal County Council
OPW

Project :
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Map :
Broadmeadow and Ward AU - Option 1

Figure By :	Kevin Daly	Date :	06 Oct 2010
Checked By :	Clare Dewar	Date :	06 Oct 2010
Approved By :	Anne-Marie Conibear	Date :	06 Oct 2010

Figure No. : BroadmeadowWardAU/CURS/001
Revision 0

Drawing Scale : 1:65,000
Plot Scale : 1:1 @ A3

N

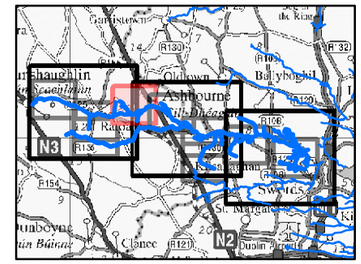
Culvert length (m): 109
Culvert height (m): 0.5
Culvert width (m): 1.0
Design flow rate (m^3/s): 0.55

Broadmeadow River

Culvert length (m): 12
Culvert height (m): 2.0
Culvert width (m): 4.0
Design flow rate (m^3/s): 17.00

100 50 0 100 m

Location Plan :



FRM OPTIONS MAP

Legend

- Area defended by option
- Improve channel capacity

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Fingal County Council

OPW

Project :
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Map :
Ratoath area APSR

Figure By :	Kevin Daly	Date : 07 Oct 2010
Checked By :	Clare Dewar	Date : 07 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 07 Oct 2010

Figure No. : Ratoath/CURS/001

Revision 0

Drawing Scale : 1:2,500 Plot Scale : 1:1 @ A3

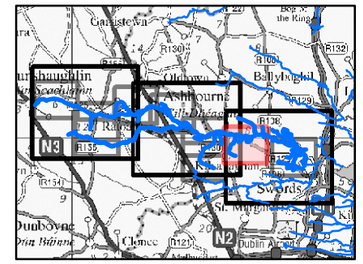
N

Broadmeadow River

Length (m): 170
Average height (m): 0.85

100 50 0 100
m

Location Plan :



FRM OPTIONS MAP

Legend

- Area defended by option
- Embankments

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Project :
FEM FRAMS

Map :
Rowelstown East area APSR

Figure By :	Kevin Daly	Date : 07 Oct 2010
Checked By :	Clare Dewar	Date : 07 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 07 Oct 2010

Figure No. :
Rowelstown/CURS/001

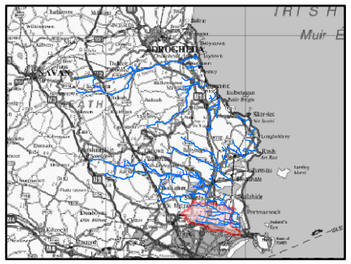
Revision
0

Drawing Scale : 1:2,500 Plot Scale : 1:1 @ A3

N

0.8 0.4 0 0.8 Km

Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along Mayne River
- Modelled river centreline

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Clients:

Project :
FEM FRAMS

Map :
Mayne and Sluice - Option 1

Figure By :	Kevin Daly	Date : 04 Oct 2010
Checked By :	Clare Dewar	Date : 04 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 04 Oct 2010

Figure No. : MayneSluiceAU/CURS/001
Revision 0

Drawing Scale : 1:30,000
Plot Scale : 1:1 @ A3

N

Length (m): 284
Average height (m): 0.5

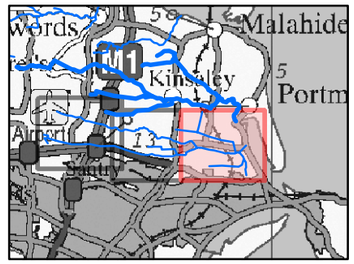
Length (m): 200
Average height (m): 0.7

Length (m): 49
Average height above ground level (m): 0.6

Mayne River

100 50 0 100 m

Location Plan :



FRM OPTIONS MAP

Legend

- Embankments
- Removal of old bridge constricting flow
- Floodwalls
- Area defended by option

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

USER NOTE :

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Dublin 6
Tel: +353-1-4975716

Clients: Fingal County Council; OPW

Project : FEM FRAMS

Map : Balgriffin - Option 1a

Figure By :	Kevin Daly	Date : 17 Jan 2011
Checked By :	Clare Dewar	Date : 17 Jan 2011
Approved By :	Anne-Marie Conibear	Date : 17 Jan 2011

Figure No. : Balgriffin/CURS/001a

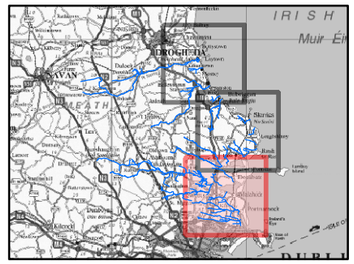
Revision 0

Drawing Scale : 1:2,000 Plot Scale : 1:1 @ A3

N

2 1 0 2 Km

Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along selected rivers
- Modelled river centreline

Risk to Critical Infrastructure

- U — Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- H — High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Clients:

Fingal County Council · OPW

Project : FEM FRAMS

Map : Coastal - Option 1

Figure By :	Kevin Daly	Date : 12 Oct 2010
Checked By :	Clare Dewar	Date : 12 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 12 Oct 2010

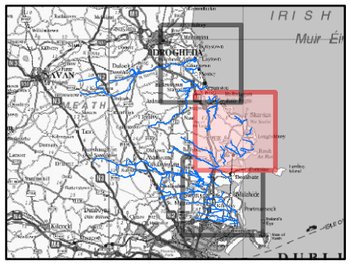
Figure No. : Coastal/CURS/001/1 — Revision 0

Drawing Scale : 1:54,000 — Plot Scale : 1:1 @ A3

N

2 1 0 2 Km

Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along selected rivers
- Modelled river centreline

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Clients:

Project :
FEM FRAMS

Map :
Coastal - Option 1

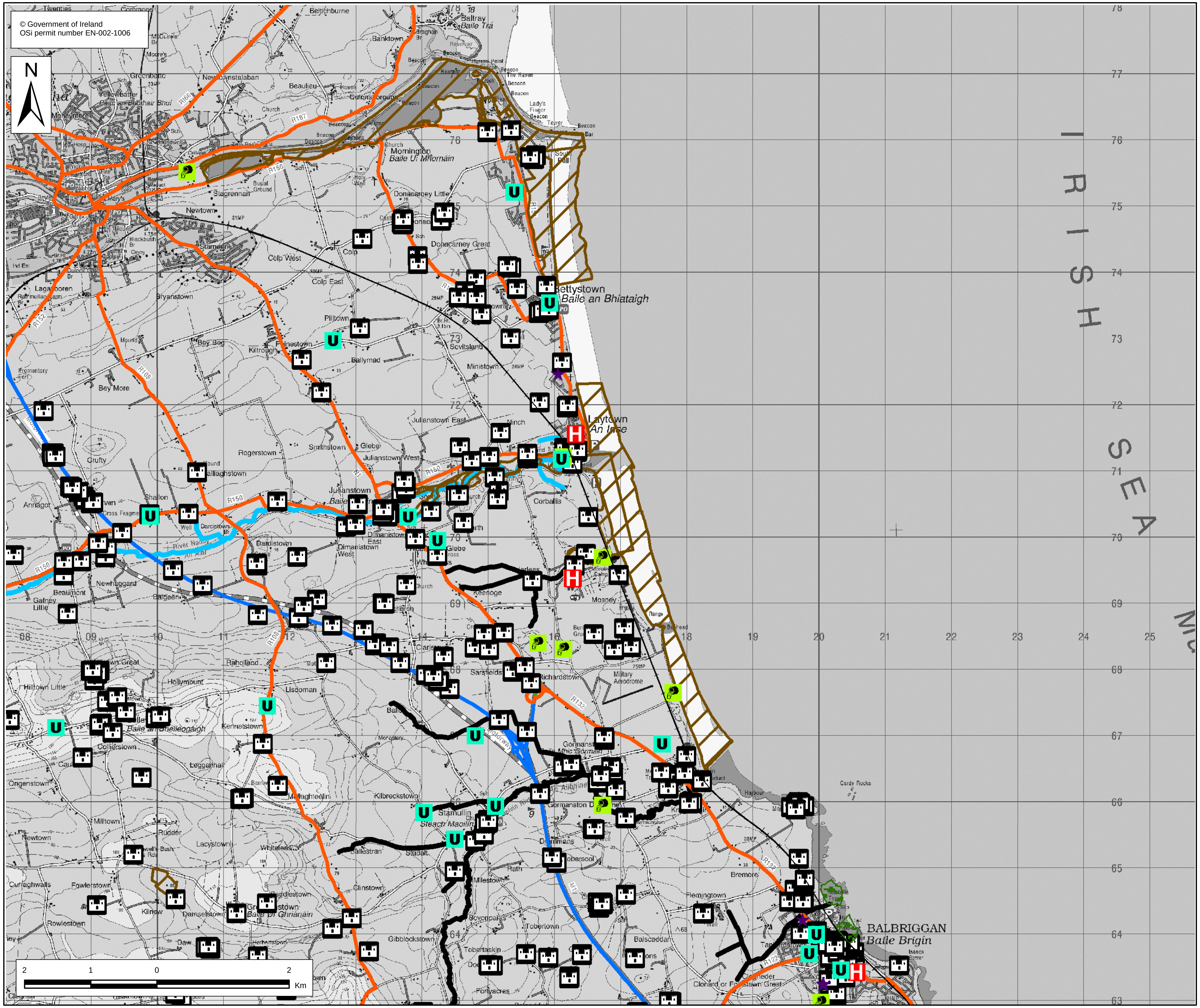
Figure By :	Kevin Daly	Date : 12 Oct 2010
Checked By :	Clare Dewar	Date : 12 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 12 Oct 2010

Figure No. : Coastal/CURS/001/2

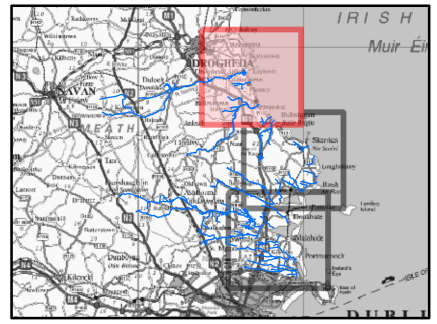
Revision 0

Drawing Scale : 1:54,000

Plot Scale : 1:1 @ A3



Location Plan :



FRM OPTIONS MAP

Legend

- FFWS along selected rivers
- Modelled river centreline

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites

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Clients: Fingal County Council, OPW The Office of Public Works

Project : FEM FRAMS

Map : Coastal - Option 1

Figure By :	Kevin Daly	Date : 12 Oct 2010
Checked By :	Clare Dewar	Date : 12 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 12 Oct 2010

Figure No. : Coastal/CURS/001/3

Revision 0

Drawing Scale : 1:54,000 Plot Scale : 1:1 @ A3

N

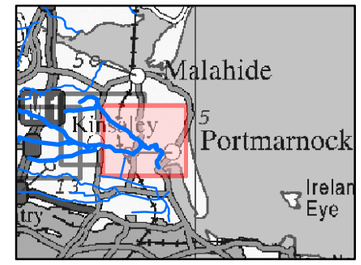
Sluice River

Length (m): 121
Average height (m): 0.6

Length (m): 472

100 50 0 100
m

Location Plan :



FRM OPTIONS MAP

Legend

- Embankments
- Improve existing defences
- Area defended by option

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Clients:

Project :
FEM FRAMS

Map :
Portmarnock and Malahide areas APSR
Strand Road - Option 1

Figure By :	Kevin Daly	Date : 17 Jan 2011
Checked By :	Clare Dewar	Date : 17 Jan 2011
Approved By :	Anne-Marie Conibear	Date : 17 Jan 2011

Figure No. :
StrandRd/CURS/T/001

Revision
0

Drawing Scale : 1:2,500 Plot Scale : 1:1 @ A3

N

Malahide estuary

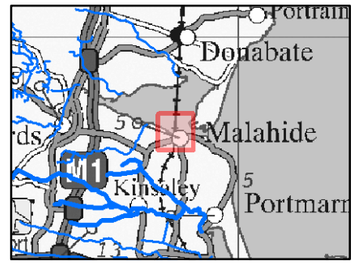
Length (m): 15
Average height (m): 0.5

Length (m): 20

Length (m): 60
Average height (m): 0.9

100 50 0 100 m

Location Plan :



FRM OPTIONS MAP

Legend

- Area defended by option
- Demountable walls
- Floodwalls_Mal_5
- Improve existing defences

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Clients:

Fingal County Council
OPW

Project :
FEM FRAMS

Map :
Portmarnock and Malahide areas APSR
Option 5a - Malahide town centre

Figure By :	Kevin Daly	Date : 04 Apr 2011
Checked By :	Clare Dewar	Date : 04 Apr 2011
Approved By :	Anne-Marie Conibear	Date : 04 Apr 2011

Figure No. : Malahide/CURS/T/005a

Revision 1

Drawing Scale : 1:3,000 Plot Scale : 1:1 @ A3

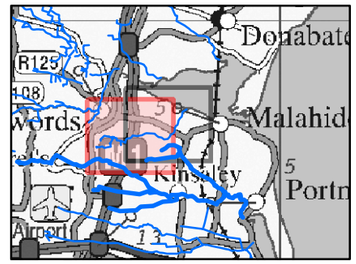
N

Length (m): 178
Average top width widening (m): 2.17
Average bottom width sidening (m): 1.08

Gaybrook Stream

50 25 0 50 m

Location Plan :



FRM OPTIONS MAP

Legend

- Area defended by option
- Improve channel capacity

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
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- Modelled River Centreline

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Clients:

Fingal County Council
OPW

Project :
FEM FRAMS

Map :
Swords area APSR - Aspen

Figure By :	Kevin Daly	Date : 14 Oct 2010
Checked By :	Clare Dewar	Date : 14 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 14 Oct 2010

Figure No. :
Swords/Aspen/CURS/001

Revision
0

Drawing Scale : 1:1,500

Plot Scale : 1:1 @ A3

N

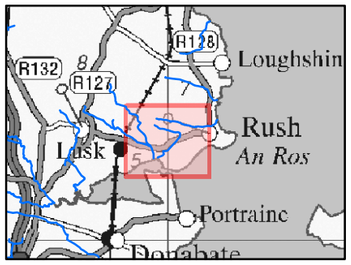
West Rush Stream

Existing Culvert
Length (m): 244
Diameter (m): 0.5
New parallel culvert
Length (m): 244
Diameter (m): 0.5
Combined design flow rate (m^3/s): 1.2

Rogerstown Estuary

100 50 0 100 m

Location Plan :



FRM OPTIONS MAP

Legend

- Improve channel capacity
- Area defended by option

Risk to Critical Infrastructure
- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health
- High vulnerablity sites

Risk to the Environment
- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage
- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Clients:

Project :
FEM FRAMS

Map :
Rush West - Option 2

Figure By :	Kevin Daly	Date : 20 Oct 2010
Checked By :	Clare Dewar	Date : 20 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 20 Oct 2010

Figure No. : Rushwest/CURS/002
Revision 0

Drawing Scale : 1:2,000 Plot Scale : 1:1 @ A3

N

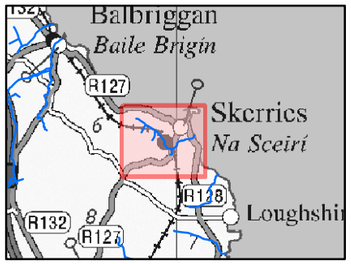
Irish Sea

Mill Stream

120 60 0 120 m

Culvert 1
Length (under railway on main channel) (m): 27
Culvert 1 height (m): 0.72
Culvert 1 width (m): 1.50
Design flow rate (m^3/s): 2.7
Culvert 2
Length (under railway on tributary) (m): 27
Culvert 2 height (m): 0.91
Culvert 2 width (m): 1.30
Design flow rate (m^3/s): 3.45
Culvert 3
Length (under roadway into park): 80
Culvert 3 diameter (m): 1.50
Design flow rate (m^3/s): 5.92

Location Plan :



FRM OPTIONS MAP

Legend

- Improve channel capacity
- Area defended by option

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Clients:

Fingal County Council
OPW

Project :
FEM FRAMS

Map :
Skerries APSR - Option 2

Figure By :	Kevin Daly	Date : 20 Oct 2010
Checked By :	Clare Dewar	Date : 20 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 20 Oct 2010

Figure No. :
SkerriesAPSR/CURS/002

Revision
0

Drawing Scale : 1:3,500 Plot Scale : 1:1 @ A3

N

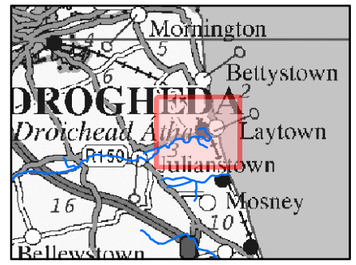
Length (m): 211
Average height above ground level (m): 0.9

Length (m): 239
Average height (m): 1.0

Nanny River

100 50 0 100 m

Location Plan :



FRM OPTIONS MAP

Legend

- Embankments
- Floodwalls
- Area defended by option

Risk to Critical Infrastructure

- Utilities
- Emergency response/governance
- Airport
- Railway line
- Motorway
- National
- Regional

Risk to Human Health

- High vulnerablity sites

Risk to the Environment

- Potential pollution sources
- Protected areas
- cSAC, SAC, SPA, NHA and pNHA sites

Risk to Cultural Heritage

- Cultural heritage sites
- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Modelled River Centreline

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Clients:

Fingal County Council

OPW

Project :
FEM FRAMS

Map :
Laytown - option 1

Figure By :	Kevin Daly	Date : 14 Oct 2010
Checked By :	Clare Dewar	Date : 14 Oct 2010
Approved By :	Anne-Marie Conibear	Date : 14 Oct 2010

Figure No. : Laytown/CURS/T/001

Revision 0

Drawing Scale : 1:2,000 Plot Scale : 1:1 @ A3

Appendix D. Stakeholder and public engagement activities, feedback and responses

HalcrowBarry

Appendix D: Stakeholder and public engagement activities, feedback and responses

Date	Description	Feedback received	How addressed?
Dec 2008 – Jan 2009	Consultation pack issued by FCC to range of stakeholders comprising: • Consultation letter, including figure and newsletters • List of stakeholders • Questionnaire	Eleven responses received – key comments included: • Flooding related impacts are considered as part of the EIA process for road schemes and there are several schemes in the area that have gone through the EIA process in last five years): M3, M2, M1, M50 • Flooding becomes an issue when national roads are affected and with climate change it may become a significant issue • Key environmental issues: increased urbanisation - more impermeable surfaces; changes in rainfall pattern; increase in demand for water. • The Dublin Airport Authority plc (DAA) has information regarding drainage within Dublin Airport; historical monitoring results from grab samples taken on the watercourses which drain the airport lands. • The DAA has recently installed water monitoring equipment on the outlets of the streams to log the flow and quality characteristics in the streams. The DAA has already participated with the OPW and Halcrow Barry in their undertaking of a risk-based survey of the Cuckoo Stream as part of the FEM-FRAMS. Does organisation consider flooding is a significant issue in the Fingal East Meath Area? • Preventative maintenance of the drainage systems is a core aspect of the ongoing site management of Dublin Airport - a fundamental safety aspect is to prevent flooding in the vicinity of the airport on the approaches to the runways as this has the potential to increase bird hazard activity. DAA has invested in both local and global containment systems to facilitate the proper drainage of active pavements, and storing the water arising in attenuation facilities on site to ensure a controlled rate of discharge in accordance with the principles of the GDSDS with the aim of preventing flooding downstream. • Would be very useful for the Environment Department to have the flood risk data for the Fingal area to use in the processing of waste facility permits and in environmental risk assessments. Also has data regarding potentially contaminated lands (legal and illegal landfills) that you could	All points raised/information described were used to guide the development of objectives and the scope of the SEA Scoping Report. In addition, they have been used to develop a picture of the current state of the environment and guide data collection. This information was useful both to the SEA and to improve the understanding of the flood risk management situation within the study area to inform the FRMP. Where parties expressed an interest in being involved in the study, further communications were undertaken as appropriate. The following was also carried out to address the feedback. • Climate change factors were identified in the Hydrology Report and included in the Hydraulic modelling and mapping. • DAA were contacted in relation to available data and their maintenance

Date	Description	Feedback received	How addressed?
		incorporate into your dataset. • ERFB provided data on the following catchments: the Nanny is salmonid, salmon, sea trout and brown trout; the Delvin is salmonid, sea trout and brown trout; the Broadmeadow is salmonid, salmon in the lower reaches brown trout throughout; the Ward is salmonid, salmon sea trout and brown trout; the Ballyboughal River is salmonid and sea trout in lower reaches and brown trout throughout; the Corduff is salmonid with brown trout throughout and sea trout in the lower reaches (salmon were recorded for the first time downstream of Corduff Bridge in 2007); the Sluice is salmonid above Kinsaley. • The habitat requirements of fish vary between species, life stage etc salmonids require clean a silt free gravel bed to breed, well developed pool/glide/riffle areas for nursery and growth and good variation in a stable riparian zone. • Flood management must protect and enhance the fisheries status of theses catchments. The environmental objectives should protect water quantity and quality. Standards should maintain and improve water quality and support the achievement of" good ecological status" in line with EU Framework Directive. The Plan should maintain and improve biodiversity, enhance the natural functioning of the floodplain and leave it free from development. The Plan must maintain and improve angling potential and facilities. • We recommend a pre-construction ecological assessment to provide a detailed baseline dataset of fish populations, salmonid habitat, macrophyte populations etc (much of this data may already exist). A Fisheries Enhancement and Rehabilitation Programme under the supervision of a Fisheries Biologist is essential to ameliorate the impacts and enhance fisheries. • Sufficient consideration should be given to RBMPs and the Regional Planning Guidelines. • The project team need to ensure that the SEA and development of the FRMP are integrated and are not developed separately. • The AA screening should be integrated into the SEA process.	regime • ERFB data on fish species and habitats/ rivers was used in the SEA process. Further consultation with ERFB (now IFI) undertaken. • FCC currently investigating requirement for baseline ecological surveys • The project team has ensured that the SEA, AA and FRM Plan are fully integrated.

Date	Description	Feedback received	How addressed?
		• Some Plans and Environmental Reports that may be of use during scoping or during the assessment: Eastern River Basin District Management Plan and Programme of Measures and SEA Environmental Report (Currently in draft form and out for consultation); Greater Dublin Strategic Drainage Strategy (Dublin, Meath, Kildare) and Environmental Report; Greater Dublin Strategic Water Supply Scheme Phases 1 and 2 (Phase 2 Currently undergoing SEA); Transport Strategy for the Greater Dublin Area 2010 - 2030 (Dublin Transportation Office); Regional Planning Guidelines (due for review and SEA); Fingal and Meath County Development Plans (and SEA Environmental Reports where available); County Waste Management, Heritage and Biodiversity Plans; Relevant Development and Local Area Plans (and SEA Environmental Reports where available) for towns/districts local to the FEM study area. • Under Section 22 of the Waste Management Act, it is a requirement that Local Authorities maintain a register of all waste sites in their jurisdiction. You should contact the relevant waste enforcement personnel in Fingal and Meath County Councils to see the sites that they have registered. Outside of the register, these personnel will have first hand knowledge of closed landfills and illegal sites etc. within the catchments. I feel that this matter that should be examined for potential inclusion in the assessment process. • The EPA's web based Environmental Mapping/Geographical Information system (GIS) ENVision, which can be found at: http://maps.epa.ie/InternetMapViewer/MapViewer.aspx. Please note the Draft River Basin District (RBD) - River Basin Management Plan (RBMP) and associated Programme of Measures (POM) for the Eastern River Basin District (EBRD) are available.	• Reference has been made to other reports relevant to the catchment such as the ERBD, GDSDS, Dublin Coastal flood protection policy etc. in the hydrological analysis, hydraulic modelling and SEA process. • Noted
2 Feb 2009	Presentation to FCC Strategic Policy Committee	The presentation was well received and members considered that the project was required for the catchment. Councillors agreed to advise constituents about the project and to collate data about historic flood events (Peter Coyle).	Photographs of flood events were used during the modelling process
Feb 2009	Articles in local newspapers e.g. Fingal News and the Meath	N/A	N/A

Date	Description	Feedback received	How addressed?
	Chronicle		
10 Feb 2009	Stakeholder workshop 1 covering: • Overview of the FEM FRAMS study • Strategic issues relating to flood risk management to help define the scope of the SEA • Availability of data • Stakeholder and public engagement • Feedback session	24 attendees excluding Halcrow Barry Key points raised in relation to strategic issues and the availability of data: ***Geology and Soils*** • Contaminated sites (mapping/risk assessments) • Contaminated land – preliminary Section 22 register in place (FCC). Held until verified – all local authority historic landfills – can see from aerial photographs raised areas. Environmental Protection Agency holds information on legally closed landfills ***Water*** • Morphology: a survey was carried out on the River Delvin by Fingal County Council. The water quality was considered good (biologically & chemically) however the habitat was degraded and watercourse heavily modified in places. Bats/otters not present now. • There is a need to recognise the constraints to the study by morphology – a lot is damaged mainly due to drainage works (affects habitats, building of banks etc • Need to consider cumulative effects of small projects (e.g. infilling, banking etc) • The WFD and RBMP/Programme of Measures should be considered as they are an important framework • Water quality, fisheries, habitats, pollution sources • Drinking water, attenuation, storage, SUDS • Other strategies for Dublin that require consideration include drinking water, transport, drainage, energy and land use. • The WFD has just launched a new website with a public consultation plan and availability of spatial data. • Flood storage was not considered a technically viable option on the Tolka • The environmental impacts of waste sites and permitted areas needs consideration i.e. how to deal with these and how to manage the flood risk to them – cumulative impacts in some areas • Water quality is detailed in the Eastern River Basin District (ERBD) RBMP, which sets out objectives and programme of measures: critical	All points raised were used to guide the development of objectives and the scope of the SEA Scoping Report. In addition, they have been used to develop a picture of the current state of the environment and guide data collection. The following was also carried out to address the feedback. The various reports mentions at the workshop were reviewed. A groundwater Technical Note (TN) and a geomorphological TN & SUDS TN were prepared which considered available information. These two TNs were included in the Hydraulics Report.

Date	Description	Feedback received	How addressed?
		input to study • Traditional philosophy has been to get the water down the catchment as soon as possible. This FRMP has an opportunity to make a change. • There is a study to supply floodwater to Dublin • Harnessing of power for source of energy and movement of water • Separation of foul and surface water drainage if there is an opportunity to do so. The RBD will address this. • Volume of foul discharge to SW is very low – low level of old historic development • Lack of gauging stations • Lack of attenuation for surface water drainage at Dublin airport – Mayne River (small pave catchment) – airport pumping water into the streams – programme • Changes in rainfall pattern. Increase in demand for water. • The DAA has information regarding the layout of ditches and streams that originate and cross the site of Dublin Airport, which discharge into rivers systems within the proposed study area. The DAA has historical monitoring results from grab samples taken on the watercourses which drain the airport lands. The DAA has recently installed water monitoring equipment on the outlets of the streams to log the flow and quality characteristics in the streams. ***Landscape*** • Need to consider landscape character and visual amenity • Gabion baskets – Tolka – 10-15m high and didn't become naturalised-target for vandalism • Seek soft engineering solutions with amenity, recreation and landscape considered e.g. reedbeds and willow planting • Provide adaptive measures for climate change e.g. green roofs, habitat creation & links to SUDS • Other good European examples of FRM actions with multiple benefits • Barriers – include amenity – relate to water • Water towers • Historic landscape – Fingal have put high value in studies being carried out at present: Margaret Gower	A recommendation for the reinstallation of gauging stations was included in the FRM Plan and final report. The DAA provided data about their existing drainage layout. The FEM FRAMS models have been used to model the attenuation system at Dublin airport. The landscaping comments were noted but the detailed design of the scheme has not been undertaken

Date	Description	Feedback received	How addressed?
		• Low impact designs • Opportunities should be sought for amenity, tourism and education • A landscape character assessment is available in the County Development Plans ***Biodiversity and nature conservation*** • The study area supports a large diversity of protected habitats (e.g. coastal flora at Mornington dunes, eelgrass beds along the coast and estuaries) and species. Protected species include kingfisher, dipper (a good indicator of the health of a river), curlew and invertebrates. • There is a fine balance between freshwater and saline habitat (good quality saltmarsh is present in the Baldoyle Estuary). • There is an opportunity to map intertidal habitat to determine its condition and to reinstate habitats • The Broadmeadow River supports a range of protected species. • Monitoring recommendations • Priority habitats/species • Impacts on European or Natura 2000 sites (SPAs, SACs and Ramsar sites) will need to be considered during the development of the FRMP through Appropriate Assessment, where necessary. • Impacts on other designated conservation sites (e.g. NHAs) are important • Consideration should be given to undesignated nature conservation (e.g. hedgerows and their protection) and loss of habitat in the footprint of flood risk management options. • Opportunities exist for wetland habitat creation though this can lead to problems such as waterborne diseases (e.g. Malahide mosquito) • Opportunities for improvements to water quality with associated beneficial impacts on aquatic species • Information on species in the study area is available through a project carried out on the M1 over the Broadmeadow Estuary • Ensuring that the important sites and habitat for them are maintained; especially species which are considered to be of conservation concern at European level (Annex/species and migratory species) ***Fisheries***	The AA screening report considered these issues. The AA screening report was issued to the NPWS for comment. They approved of our approach and will be sent the SEA ER when it is complete.

Date	Description	Feedback received	How addressed?
		• Opportunities exist for improvements to fisheries e.g. provision of fish passes (and opportunities to restore as salmonid river~~ and fish shelters, removal of weirs, increase light (e.g. by removal of structures casting shadows) and channel obstructions • Presence of salmonid fisheries and lamprey • Shellfish designations • Shellfish in Fingal is a contentious issues due to dredging • The habitat requirements of fish vary between species, life stage etc salmonids require clean a silt free gravel bed to breed, well developed pool/glide/riffle areas for nursery and growth and good variation in a stable riparian zone. Flood Management must protect and enhance the fisheries status of theses catchments. The Environmental objectives should protect water quantity and quality. Standards should maintain and improve water quality and support the achievement of" good ecological status" in line with EU Framework Directive. The Plan should maintain and improve biodiversity, enhance the natural functioning of the floodplain and leave it free from development. The Plan must maintain and improve angling potential and facilities. ***Land use*** • Land use plans • Transport – roads and bridges, rail • Buffer zones • Changes in land ownership/use • Changes in land use (diversification) e.g. tourism, rambling, fishing, cycling, horticulture, glass houses and allotments • SUDS • Wells – no datasets in rural areas. John Daly is putting together a borehole register • Bog of the Ring: only one aquifer there – extracting water into the supply system for drinking water • Coillte – National development plan for forestry – planting on harvested raised bogs – relevant here? • Future of farming in Fingal – aging population – what will change? Land to lie unused, will farms change – will affect land alongside river, which is	Information was provided to the project team by the ERFB/IFI. Further consultation was undertaken during the preparation of the scoping document, AA screening report and SEA ER. Their information and concerns were incorporated into these reports. FCC and MCC provided Halcrow Barry with the land use and planning data for the study area. Halcrow Barry held meetings with FCC and MCC planning departments (Aug 2010) to discuss the options and the implications of the flood extent maps and FRM Plan. The shapefile for the 100 and

Date	Description	Feedback received	How addressed?
		least productive; less than 12 full time farmers left in Fingal. • G1 conference (FCC) – delivers green river corridors proposed – links to FRM • Horticulture – traditionally in eastern part – now intensive under glass • Land use datasets – Irish Farmers Association/Teagasc • Car parks with large housing estates – policy in London – manage surface run off – SUDS • Development plans/Transportation plans may hold useful information. SDS apply to motorway schemes; swales at side of road. • Access requirements & buffer zone in policies under Greater Dublin SDS & OPW relief schemes – policy developments to avoid building along river corridors • Opportunities to create towpaths • Increased urbanisation - more impermeable surfaces. • Important to ensure that when we identify flood risk options, that we incorporate other opportunities into the plan such as beneficial changes in land use e.g. biodiversity enhancements (wetland habitat creation), SUDS, change in agricultural use • Flooding could be a significant issue if not managed properly thereby affecting development potential of the area. ***Population and health*** • Health – psychological effects e.g. fear of drowning, flood damage to houses and stress, children and youths are attracted to flooded areas, worry about risks • Health – physical problems e.g. pollution risks/wells, flooding of sewers/overloading, the elderly are at particular risk, water-borne diseases e.g. Weil's disease, mosquitoes • Community – restricted movement, pressure on community facilities, access to food and services, financial/insurance problems, break up of communities through allowing areas to flood • Planning policy – relocation of communities; where do future populations go? • Sustainability ***Development and regeneration***	1000yr flood extents were included in the draft Development Plans for both councils. Comments noted. The aim of the study is to develop, where economically feasible, flood mitigation measures. The flood maps will identify the flood zone. The FRM Plan also provides for non structural measures such as FFWS, individual property flood protection, public awareness.

Date	Description	Feedback received	How addressed?
		• Need to review planning policies • Need to protect existing and future development • The Development Plan review is starting on 1st May 2009, therefore avoid duplication and ensure consistency • The Regional Planning Guidelines are under review. ***Material assets*** • Infrastructure • Flood threshold levels – need an absolute level for development planning • Appropriate developments • Agriculture plans • Any design should take floodplain into account and should have a maintenance plan ***Tourism and recreation*** • Sustainable development • Opportunity for tourism – linear parks; develop wetlands • Potential damage to existing recreational facilities through flooding e.g. football fields ***Air and Climate*** • Noise and vibration issues (e.g. for the structural integrity of buildings) would require consideration at detailed design stage of a scheme • The EDS study covers climate change predictions in detail • Useful documents or gurus on climate change include 'Ireland in a Warmer Climate', IPCSS Coastal Protection Strategy, John Sweeney and Prof. Lynch' • The study should be adaptable to climate change • The study area is likely to experience an increased intensity of flooding/more flashy floods • Rising sea levels will have impacts on estuaries ***Archaeology and cultural heritage*** • High archaeological potential in the study area and can be significantly impacts by development • Chris Taine (FCC) and Gill Chadwick (MCC) are good contacts • Buffer zones around monuments	As noted above the shapefiles for the 100 and 1000yr flood extents were provided for inclusion in the Development Plan. It is hoped that the flood maps will provide the council with data on flood risk and thus provide data to assist with the planning process. The IPCSS study was reviewed. Climate change was considered in the hydrology report and incorporated into the models and maps Archaeological data was provided by FCC, MCC and DoE and incorporated into the options process.

Date	Description	Feedback received	How addressed?
		• Need to understand the importance of non-scheduled archaeology, below ground and underwater archaeology • It would be useful if the FRMP shows archaeological assets at flood-risk and those sites that are vulnerable. The FRMP should be clear where and how archaeology will be impacted. • Need to recognise that overriding objectives encompass designated, non-scheduled archaeology and underwater assets. • Need to recognise the constraints and limitations that archaeology can pose to the study e.g. raised listed structures to increase channel flow • There is an opportunity to identify new archaeological sites through survey work at scheme level • Margaret Dunn Archaeologists has carried out a study on historic landscapes • Need to consider architecture such as bridges, weirs that are listed, railway viaduct, harbour walls in Balbriggan and the remnants of tidal mills in Rogerstown. • Coastal helicopter imagery is available • Both Development Plans list the protected structures in the relevant counties	
2 March 2009	Presentation to MCC councillors	Presentation was well received, no other feedback	N/A
May – July 2009	Consultation on Environmental Scoping Report: • Published on website • Hard copy consultation brochure • Feedback directly requested from stakeholders	Four responses received, with two responses raising specific issues. Key issues raised included: • The current state of the environment within the FEM FRAMS study area should be described using most recent and up-to-date environmental data, information and reports. Where updating of significant environmental data and associated reports become available during the SEA process, where possible, this information should be incorporated into the description of the current state of the environment and where relevant related environmental problems • The use, and application, of GIS should be considered where possible at the various key stages in the SEA process. • The Plan making authorities for FEM FRAMS should consult with the	• The Environmental Report will be produced in line with the requirements of the SEA Directive and will provide an up to date picture of the state of the environment, use GIS where applicable, justification for topics scoped out, details of the alternatives assessed, provide further detail on the types and nature of impacts, mitigation, and monitoring

Date	Description	Feedback received	How addressed?
		National Parks and Wildlife Service (NPWS) with regard to screening for Appropriate Assessment. Where Appropriate Assessment is required, any findings or recommendations should be incorporated into the SEA Environmental Report and FEM FRAMS outputs, as appropriate. • We would suggest that the convening of a Scoping Meeting / Workshop with key staff within the FEM FRAMS making authorities (planning, roads, water services, environment, heritage etc.) be considered. There would also be merits in having personnel from National Parks and Wildlife Service (NPWS), Department of Communications, Energy and National Resources (DCENR), and Environmental Protection Agency, as appropriate, at this meeting. • For any environmental issue(s) determined to be scoped out of the SEA process, clear justification should be included in the Environmental Report as to why the specific environmental issues were not considered likely to be potentially affected by the outputs of the FEM FRAMS. • Alternatives: In considering and assessing alternatives, the alternatives proposed should be reasonable and realistic and should be set at the appropriate strategic level at which the outputs from the FEM FRAMS will be implemented. They should be assessed against the relevant environmental objectives established for the key environmental aspects of the environment likely to be significantly affected. Clear justification should be provided for the selection of the preferred alternative/ combination of alternatives. • Consultation: It is recommended that the public be given an opportunity to make submissions on the issues to be addressed in the SEA process for the FEM-FRAMS. • Water Framework Directive (WFD): The FEM FRAMS should promote the protection of surface water, groundwater coastal and estuarine water resources and their associated habitats and species, including fisheries. Provisions should be made in the outputs from the FEM FRAMS for the incorporation of the specific relevant objectives and measures for individual water bodies set out in the relevant River Basin Management Plan (RBMP) and associated Programme of Measures (POM). • Secondary, cumulative, synergistic, short, medium and long term,	proposals. • NPWS have been consulted on the screening for the Appropriate Assessment and will be consulted on the Appropriate Assessment once complete. • Typos in Table 8 rectified. • Further workshops with range of stakeholders held to discuss key issues and the option assessment following scoping • The development of the FRM Plan was fully integrated with the development of the SEA ER

Date	Description	Feedback received	How addressed?
		permanent, temporary, positive and negative effects, should be assessed and reported on. • Mitigation of significant effects: Where significant adverse effects are identified associated with the implementation of the outputs from the FEM FRAMS, there should be a clear link with relevant and appropriate mitigation measure(s). • Monitoring Proposals: Monitoring arrangements should be clearly set out along with responsibilities, frequency of monitoring, analysis, and reporting on monitoring. Monitoring arrangements should be sufficiently flexible so as to be able to react to unforeseen / unexpected events. Maximum use should be made of existing environmental monitoring programmes. • Process and SEA-Environmental Report Compliance: The SEA Process for the FEM FRAMS should comply fully with the procedural and output requirements set out in the SEA Directive, and the relevant national SEA Regulations. • Integration of SEA and FEM FRAMS outputs: Particular emphasis should be given during the SEA and the FEM FRAMS process to ensuring that both processes are fully integrated from the outset. • Documentation of the SEA Process: Where key decisions are made during the SEA process e.g. scoping in/out environmental topics, selection of preferred alternative (s) etc. these decisions should be documented as part of an overall SEA/FEM FRAMS processes. • While not a mandatory requirement consideration should be given at the Draft FEM FRAMS outputs stage to providing summary key information on the key findings of the environmental assessment and how these findings have been integrated within the outputs of the FEM FRAMS. • Table 8 - SEA objectives, sub-objectives, indicators and targets for the Fingal East Meath FRAMS. Under the Objective "Minimise risk to the local community" the minimum requirement is stated as “No increase in number of areas of significant employment" Should this be "No increase in number of areas of significant employment at risk from flooding". The Aspirational target is stated as "Number of areas of significant employment reduced to 0" Should this be "Number of areas of significant	The SEA Process took this into account. The SEA process complied with the SEA Directive. As noted above, the NPWS were consulted in relation to the AA screening document and will be issued with a copy of the SEA ER.

Date	Description	Feedback received	How addressed?
		employment at risk from flooding reduced to 0".	
16 June 2010	Stakeholder workshop 2 covering: • Progress update • Flood risk management objectives • Link to options and summary of options process	13 attendees excluding Halcrow Barry Questions/issues raised during discussions included: • Is the SEA fully integrated into the optioneering process? • Have critical infrastructure locations been identified? • Question for the OPW in relation to the national context and programme and extent of the national FRAMS • Question for the OPW as to whether data from the Nov 2009 flood events had been collated • Has the geology of the catchment been incorporated into the study? Has it also been included in the hydrological analysis? • Do the models take account of existing embankments? • Do the models take account of the recent dredging in the Broadmeadow river/estuary? • Where/how does Appropriate Assessment fit into the process? • Concern raised when some smaller drains not included in the models – artificial confidence in the maps as some drains not modelled and therefore these areas do not show flooding. • What sort of feedback was received on the Lee CFRM Plan? • Has the study looked at the extent of forestry on flows in the catchment? • Question on programme and key dates • What data will be available to the public and where will they be able to access it?	All points raised were responded to directly at the workshop and All feedback received informed the development of the flood risk management objectives, the flood risk assessment and mapping processes and the staged multi-criteria option assessment process.
15 November 2010	Stakeholder workshop 3 covering: • Progress update • Flood risk management option assessment process and outputs – presentation of results and	20 attendees excluding Halcrow Barry Key discussion points and questions raised in relation to the flood risk management option assessment process and outputs are as follows:	
		Alternative options • Have options to move individual houses out of the flood risk area been considered? • Consideration of SUDS	• Halcrow Barry provided the LA and OPW with a list of properties at risk from flooding. Topographic survey

Date	Description	Feedback received	How addressed?
	discussion		of finished floor levels required to confirm if individual properties are at risk. OPW/LA to advise homeowners. • A SUDS technical note was produced that addresses this topic.
		Additional information • More detailed information requested regarding types of utilities at risk.	• OPW to consult with utility companies re the identification of types of utilities on the maps (currently these are grouped as utility and not type of utility) • OPW to advise the utility companies about the availability of these flood maps
		Option assessment process • Modelling undertaken to assess the effect of any proposed flood defence options? • Where two options are proposed – which one has the higher ranking? Which is more important – the BCR or MCA score? • Was the option to increase culvert sizes modelled? Can others use these models to determine the effects of their proposals? • Further details of the MCA scores requested • Concerns raised by the 30pts allocated to human health within the global weighting system set by the OPW	• Further detail on MCA/BCR and modelling undertaken provided • OPW to review of global weighting marks and in particular the 30 marks allocated for human health

Date	Description	Feedback received	How addressed?
		Specific local issues • Concerns in relation to any widening or deepening of the Gaybrook stream. • Effects on the left bank of the Swords area APSR • Specific queries regarding details of proposed options at Balbriggan, Balgriffin and Aspen • Effects of flooding on transportation routes – disruption to use of minor roads and impacts on/arrangements for Portmarnock	• Balgriffin – proposed embankment is not located at the back of the houses because the land that would then become a floodplain is zoned • No measures were identified that proved to be cost beneficial for Balbriggan • Local Authorities to carry out a traffic study to consider the effect of flooding of roads on the movement of traffic i.e. consideration of defending critical routes, provision of traffic information to the public – Portmarnock a particular problem.
		Implementation • Who is responsible for the implementation of the FRM Plan? • Who is responsible for the inspection of culverts? • Will the FRM Plan identify who is responsible for the implementation of the options/measures? • Future selection of flood risk management options nationally for implementation? Will the MCA and BCR be used to rank projects nationally? • Legal and insurance issues associated with the publication of the flood extent maps • Application of Planning and Development and Flood Risk Management Guidelines and the associated justification test for building within these flood extent areas	• OPW for the funding and Local Authority for inclusion in their Development Plan/Local Area Plans • Local Authority generally unless it was installed under the Arterial Drainage Act which would mean the OPW have this responsibility. • The FRMP identifies responsibilities • OPW to provide further information on how the proposed works will be ranked nationally and then implemented

Date	Description	Feedback received	How addressed?
			• Local Authorities and OPW to ensure the inclusion of the results of the study in the Development Plan.
		Engagement with stakeholders • Will Irish Rail be consulted separately? The maps indicate that the railway forms a physical barrier to fluvial and tidal flows. Are Irish Rail concerned about ponding water adjacent to their railway lines? • Do Irish Rail have a database of their culverts/structures? Does this database include any information about flooding of these structures or adjacent to their embankments? Irish Rail to comment. • Compensation for land owners	• Local Authority/OPW to consider compensation for land owners
		Public consultation • Will the public be able to comment on the flood extent maps and options proposed. • Will the public consultation process target individual houses? How will these home owners be informed? Will they get insurance in the future? • How will the public be informed of the public consultation days? Can a message be posted on Balbriggan.net and other local website and newspapers?	• Halcrow Barry confirmed that there would be four days of consultation with the public (22-25 Nov). • Advertised public consultation days on Balbriggan.net and local radio • Local authority to consider public consultation at weekends
		Environmental impacts • Potential impacts on fisheries impact due to much longer culverts? • It is a requirement of local authorities not to reduce the quality of the watercourses including widening or deepening (WFD). • Consideration of diffuse agricultural pollution sources such as slurry tanks • Undertaking of an AA?	• No new culverts are proposed. Where culvert works are proposed they will involve making the culverts bigger and will not affect fish migration adversely. • Local authorities to compile agricultural pollution, diffuse pollution sources databases. Register of slurry tanks. • Halcrow Barry confirmed that

Date	Description	Feedback received	How addressed?
			a screening stage was being undertaken at the moment on the options proposed and their effects.
November 2010	Public consultation days held: • Monday, 22nd November - Fingal County Hall, Swords, Co Dublin • Tuesday, 23rd November - Ashbourne Library, 1-2 Killegland Square Upper, Killegland Street, Ashbourne, Co Meath • Wednesday, 24th November - Balbriggan Library, George's Square, Balbriggan, Fingal, Co Dublin • Thursday, 25th November - Duleek Library, Main Street, Duleek, Co Meath Public exhibition, banners, venue posters, handouts, handout for MCC. Presentation to	Swords – approximately 25 people attended Ashbourne – 2 people attended Balbriggan – 1 person attended Duleek – 3 people attended **Key issues raised:** • Would like to see more maps in relation to coastal flooding and more provision for clusters of houses where flooding already occurs. • The Gaybrook stream needs to be cleaned out every 3-4 years. The Gaybrook causes flooding of back gardens and backing up of the manholes (Aspen Drive, Swords). • Concerned about the options for the outflow of the Mayne River. Will the flood defences, river piping through Baldoyle be sufficient if and when the sea level rises? • Water speeds in the Cuckoo stream have increased exponentially. The river bank is seriously damaged at Limekiln Lane. Need for reinforcement of the bank and replacement of eroded bank. • I understand that you will focus on areas where there are many homes but I live in an area that floods but has fewer houses. Traffic can be badly affected. • Would like flood forecasting system along with county council protection measures. Would like a contact person specific to areas that flood. Better local plans to maintain drainage streams. • Not yet understood is what the upper and lower restrictive considerations might be (i.e. parameters) for planning (excluding other general planning issues) for a minor intrusion into say a 1000yr flood risk area, by say an otherwise complying extension where the ground level is brought to well above any required level. Halcrow Barry prepared an actions arising list following the stakeholder	• IFI to prepare a response to the query raised regarding Gaybrook stream • Local Authorities to carry out a traffic study to consider the effect of flooding of roads on the movement of traffic i.e. consideration of defending critical routes, provision of traffic information to the public – Portmarnock a particular problem. • FCC to consider bank protection works on the Cuckoo stream (Limekiln Lane) • Local Authorities to consider the need for a designated contact person for dealing with flooding issues

Date	Description	Feedback received	How addressed?
	FCC. Newspaper advertisement	workshop and consultation days in Nov 2010 (responsibility in brackets): • Compilation of agricultural pollution, diffuse pollution sources databases. Register of slurry tanks. (Local authorities) • Review of Global weighting marks and in particular the 30 marks allocated for Human Health. (OPW) • Consultation with utility companies re the identification of types of utilities on the maps (currently these are grouped as utility and not type of utility) (OPW) • Advise utility companies of flood risk and maps available (OPW) • Halcrow Barry to provide the Local authorities and OPW with a list of properties at risk from flooding (done). • Topographic survey of finished floor levels required to confirm if individual properties are at risk. OPW/LA to advise homeowners. • Relocation of individual properties at flood risk (OPW to consider on a national scale). • Traffic study to consider the effect of flooding of roads on the movement of traffic i.e. consideration of defending critical routes, provision of traffic information to the public – Portmarnock a particular problem. (Local authority) • IFI do not want any widening or deepening of the Gaybrook stream. IFI to prepare a response. It was noted that one of the comments from the public was that this river should be cleaned out every 3-4 years. • Implementation of the proposed works. Inclusion of the results of the study in the Development Plan. (Local authority/OPW) • Further information required on how the proposed works will be ranked nationally and then implemented. (OPW) • All options to ensure the protection of the quality and ecology of the watercourse. (Halcrow Barry/OPW/ Local authorities) • Removal of the embankment at Aspen which was constructed by the farmer. Modelling the effect of this embankment. (Fingal County Council/Halcrow Barry) • The Golf course on the Sluice River has a new embankment (constructed over last 2-3 yrs). What is the effect of this embankment? (Fingal County Council/Halcrow Barry)	Halcrow Barry prepared an actions arising list following the stakeholder workshop and consultation days in Nov 2010 (responsibility in brackets)

Date	Description	Feedback received	How addressed?
		• Consideration of locations for further public consultation days and more advertising of the events. Weekend events should also be considered. (Halcrow Barry, OPW, Local authorities) • Water speeds in the Cuckoo stream have increased exponentially. The river bank is seriously damaged at Limekiln Lane. Need for reinforcement of the bank and replacement of eroded bank. (Fingal County Council) • LA should consider the need for a designated contact person for dealing with flooding issues. (Local authority) • Consideration of compensation for landowners (Local authority/OPW)	

Appendix E. Data used within the study

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Appendix E – Data used within the study

Aspect/Objective	Data used	Source
Geology, soils and land use	CORINE land cover map - 2006	EPA
	Sub-soil map	EPA
	Bedrock and groundwater information	www.gsi.ie
Water	ERBD River Basin Management Plan (2009)	Eastern River Basin District project
	Abstractions, WWTP, WTPs, IPCC discharges, licensed landfills/waste sites, Seveso sites	EPA Meath County Council Fingal County Council
	Protected areas	Eastern River Basin District – River Basin Management Plan
	History of flooding	OPW: www.floodmaps.ie
	Bathing water quality	www.epa.ie
Morphology, fluvial and coastal processes	ERBD River Basin Management Plan (2009)	ERBD project Fingal and Meath County Development Plans
Air and climate	Air quality data Air quality in Ireland 2009: Key indicators of ambient air quality (2010)	www.epa.ie
Flora and fauna	Biological diversity in Ireland	National Biodiversity Plan
	European Site and pNHAs site citations and GIS data General biodiversity information	NPWS (http://www.npws.ie/en/MapsData/); DEHLG; Meath and Fingal County Councils – Biodiversity Action Plans; National Biodiversity Plan
Fisheries	Anecdotal evidence of fisheries including salmonids and barriers to fish movement	Eastern Regional Fisheries Board
	Salmonid Waters	Eastern River Basin District – River Basin Management Plan
	Shellfish Waters	www.environ.ie/en/Environment/Water/WaterQuality/ShellfishWaterDirective/ Sea Fisheries Protection Authority
Landscape and visual amenity	Landscape Character Areas and Important Views	Meath County Council – Meath Development Plan Fingal County Council - County Development Plan
Population and health	Population statistics	2006 census
	Population trends	Regional Planning Guidelines
	Property classifications	An Post GeoDirectory
	Social infrastructure	Sports grounds, parks – OSi 1:2500 maps – 2005, 1:1000 maps -2007
Development, infrastructure and material assets	Railway alignment proposals	www.irishrail.ie
	Transport infrastructure - rail, tunnel, ports and airports	OSi 1:2500 maps – 2005, 1:1000 maps -2007
	Road network	Fingal and Meath County Councils – GIS data

Aspect/Objective	Data used	Source
	Utilities infrastructure – electrical sub-stations, power stations, water treatment works	An Post GeoDirectory; EPA and OSi
Tourism and recreation	Recreation and amenity	Meath County Council – Meath Development Plan Fingal County Council - County Development Plan
Archaeology and cultural heritage	National Sites and Monuments Record (SMR) GIS data	GIS and Business Systems, Meath County Council, Fingal County Council
	Recorded Monuments (RMP, RPS) and National Monuments	Meath County Council – Meath Development Plan Fingal County Council - County Development Plan
	National monuments subject to preservation orders/in state care	www.archaeology.ie
	Architectural Conservation Areas (ACA)	Meath County Council – Meath Development Plan Fingal County Council - County Development Plan

Appendix F. Summary of preferred option assessment

Appendix F

Summary of preferred option assessment

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		Economic			Social			Environmental					
		Transport	Utilities	Agricultural land	Health & life	Community	Social amenity	WFD	Pollution	Flora & fauna	Fisheries	Landscape	Cultural heritage
Study Area 1	Significance	✓	✓	-	✓	✓	-	-	✓	-	-	-	-
	Mitigation	N	N	N	N	N	N	N	N	N	N	N	N
	Residual significance	✓	✓	-	✓	✓	-	-	✓	-	-	-	-
Study Area 2	Significance	-	-	-	-	-	-	-	-	-	-	-	-
	Mitigation	N	N	N	N	N	N	N	N	N	N	N	N
	Residual significance	-	-	-	-	-	-	-	-	-	-	-	-
Nanny and Delvin AU	Significance	-	-	-	-	-	N/A	-	-	-	-	-	-
	Mitigation	N	N	N	N	N	N/A	N	N	N	N	N	N
	Residual significance	-	-	-	-	-	N/A	-	-	-	-	-	-
Duleek APSR	Significance	✓✓✓	N/A	-	✓✓	N/A	N/A	X	N/A	X	X	XX	X
	Mitigation	N	N/A	N	N	N/A	N/A	Y	N/A	Y	Y	Y	Y
	Residual significance	✓✓✓	N/A	-	✓✓	N/A	N/A	X	N/A	X	X	X	X
Broadmeadow Ward AU	Significance	-	-	-	-	N/A	-	-	-	-	-	-	-
	Mitigation	N	N	N	N	N/A	N	N	N	N	N	N	N
	Residual significance	-	-	-	-	N/A	-	-	-	-	-	-	-
Ratoath APSR	Significance	✓✓	N/A	✓✓	✓✓	N/A	N/A	-	N/A	X	X	X	N/A
	Mitigation	N	N/A	N	N	N/A	N/A	N	N/A	Y	Y	Y	N/A
	Residual significance	✓✓	N/A	✓✓	✓✓	N/A	N/A	-	N/A	X	X	X	N/A
Rowelstown East APSR	Significance	✓✓	N/A	✓	✓✓	N/A	N/A	X	-	X	X	XX	✓
	Mitigation	N	N/A	N	N	N/A	N/A	Y	N	Y	Y	Y	N
	Residual significance	✓✓	N/A	✓	✓✓	N/A	N/A	X	-	X	X	X	✓
Mayne and Sluice AU	Significance	-	N/A	-	-	-	-	-	-	-	-	-	-
	Mitigation	N	N/A	N	N	N	N	N	N	N	N	N	N
	Residual significance	-	N/A	-	-	-	-	-	-	-	-	-	-
Balgriffin APSR	Significance	✓✓	N/A	X	✓✓	✓✓	-	X	-	XX	X	X	-
	Mitigation	N	N/A	Y	N	N	N	Y	N	Y	Y	Y	N
	Residual significance	✓✓	N/A	X	✓✓	✓✓	-	X	-	X	X	X	-
Coastal AU	Significance	-	-	-	-	-	-	-	-	-	-	-	-
	Mitigation	N	N	N	N	N	N	N	N	N	N	N	N
	Residual significance	-	-	-	-	-	-	-	-	-	-	-	-
Portmarnock APSR - Strand Road, Portmarnock	Significance	✓✓	N/A	-	✓✓	✓✓	N/A	X	-	XX	X	XX	-
	Mitigation	N	N/A	N	N	N	N/A	Y	N	Y	Y	Y	N
	Residual significance	✓✓	N/A	-	✓✓	✓✓	N/A	X	-	X	X	X	-
Portmarnock APSR - Malahide	Significance	✓✓	N/A	-	✓✓	✓✓	N/A	-	-	X	-	X	-
	Mitigation	N	N/A	N	N	N	N/A	N	N	Y	N	Y	N
	Residual significance	✓✓	N/A	-	✓✓	✓✓	N/A	-	-	X	-	X	-
Swords APSR	Significance	✓✓	N/A	-	✓✓	-	N/A	X	-	X	X	X	-
	Mitigation	N	N/A	N	N	N	N/A	Y	N	Y	Y	Y	N
	Residual significance	✓✓	N/A	-	✓✓	-	N/A	X	-	X	X	X	-
Rush APSR	Significance	✓	N/A	-	✓✓	-	-	X	-	X	X	-	-
	Mitigation	N	N/A	N	N	N	N	N	N	N	Y	N	N
	Residual significance	✓	N/A	-	✓✓	-	-	X	-	X	X	-	-
Skerries area APSR	Significance	✓✓	N/A	✓✓	✓✓	-	N/A	-	N/A	-	X	X	✓
	Mitigation	N	N/A	N	N	N	N/A	N	N/A	N	Y	Y	N
	Residual significance	✓✓	N/A	✓✓	✓✓	-	N/A	-	N/A	-	X	X	✓
Laytown APSR	Significance	✓✓	N/A	-	✓✓	-	N/A	X	N/A	XX	X	XX	-
	Mitigation	N	N/A	N	N	N	N/A	Y	N/A	Y	Y	Y	N
	Residual significance	✓✓	N/A	-	✓✓	-	N/A	X	N/A	X	X	X	-

Location:	**Study area**
Option Description:	**Development (MCC) and enhancement (FCC) of a proactive maintenance regime targeting potential culvert blockage locations**

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	4	Total of **5.1km of Regional (R)** roads, **0.1km of National Primary (NP)** at risk within the study area (1% AEP fluvial/0.5% AEP tidal event).	This option will result in at least a limited reduction in baseline risk to the transport infrastructure at risk of flooding, thus exceeding the minimum target and scoring 1. There would be a significant reduction in potential risk due to structure blockage, however this is not considered in the scoring.	1	20	L	P	R	✓	None required	✓
	C) Minimise risk to utilities infrastructure	10	5	**4 WWTW** (Ballyboghill area APSR, Owens Bridge APSR, Julianstown area APSR and Naul area APSR).**1 Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR) and **1 utilities asset** (ESB, GAS and EIRCOM utilities) at risk within the study area (1% AEP fluvial/0.5% AEP tidal event event).	This option will result in at least a limited reduction in risk to the utility infrastructure at risk of flooding, thus exceeding the minimum target and scoring 1. There would be a significant reduction in potential risk due to structure blockage, however this is not considered in the scoring.	1	50	N/A	N/A	N/A	✓	None required	✓
	D) Minimise risk to agricultural land.	5	5	**1286 hectares of agriculture land** not benefitting from flood defences at risk of flooding within the Study area. This represents approximately 13% of the total agricultural land in the study area (1% AEP fluvial/0.5% AEP tidal event event).	This option will be focussed on preventing culvert blockages in locations where signifcant economic damage or significant disruption to utilities could occur. Therefore, it is unlikely there would be any reduction in risk to agricultural land. However, there will be no increase in risk to agricultural land. Therefore, option scores 0 as meets the minimum target.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	4	Total of **246 residential properties at risk** within the study area (1% AEP fluvial/0.5% AEP tidal event event). 5 at risk in Ballyboghill area APSR, 9 at risk in Rathoath area APSR, 2 at risk in Rowelstown East area APSR , 3 at risk in Ashbourne area APSR, 1 at risk in Owens Bridge area APSR, 1 in Kinsaley Lane area APSR , 19 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR. 5 at risk in Duleek area APSR , 10 at risk in Laytown Bettystown and coastal area APSR, 1 at risk in Balbriggan area APSR, 68 in Skerries area APSR, 25 in Rush area APSR, 13 in Swords area APSR and 46 in Portmarnock and Malahide areas APSR. Remaining properties at risk are in rural areas outside of the APSR. **0 high vulnerability properties** at risk	This option will result in at least a limited reduction in risk to the residential properties at risk of flooding, thus exceeding the minimum target and scoring 1. The option will also prevent additional residential properties from flooding as a result of minimising the risk of blockage of culverts.	1	120	L	P	R	✓	None required	✓
	B) Minimise risk to community	10	3	Total of **65 non-residential buildings at risk** within the study area (1% AEP fluvial/0.5% AEP tidal event event) including 1 in Kinsaley Lane area APSR, 19 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR, 1 in Laytown, Bettystown and coastal areas APSR, 5 in Balbriggan area APSR, 6 in Skerries area APSR, 1 in Rush area APSR, 14 in Swords area APSR and 16 in Portmarnock and Malahide areas APSR. 1 retail park at risk (Airside Retail Park) in Swords area APSR. Remaining properties at risk are in rural areas outside of the APSR. **1 flood sensitive social amenity site** at risk, a firestation in Swords area ASPR.	This option will result in at least a limited reduction in risk to the non-residential buildings at risk of flooding, thus exceeding the minimum target and scoring 1.	1	30	L	P	R	✓	None required	✓
	C) Minimise risk to, or enhance, social amenity	5	5	The following social amenity sites are at risk from flooding (1% AEP fluvial/0.5% AEP tidal event event):**8 golf courses** (Beechmount, Portmarnock Strand, Forrest Little, Roberstown near Ashbourne, Owens Bridge, Corrstown, Beaverstown near Donabate and Malahide Point), **1 pitch and putt course** (Ring Commons), **1 sports pitch** (ALSAA sports complex. , **3 holiday home/mobile home parks** (Donabate, Rush and The Burrows).	This option will be focussed on preventing culvert blockages in locations where signifcant economic damage or significant disruption to utilities could occur. Therefore, it is unlikely there would be any reduction in risk to the social amenity sites at risk in this study area. However, there will be no increase in risk to these social amenity sites. Therefore, option scores 0 as meets the minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	A) Support the objectives of the WFD	5	5	The study area contains 51 river waterbodies : 9 = high status; 3 = good status; (no deterioration required); 14 = moderate status; 23 = poor status; 3 = bad status (improvements required). The study area contains 4 transitional (i.e. estuarine) waterbodies, all of which have been classified as being of moderate status. The study area contains 4 coastal waterbodies: 2 = high status; 2 = moderate status. The RBMP reports that the problems constraining achievement of good status relate to pollution pressures from agriculture, dangerous substances and wastewater and industrial discharges. The Broadmeadow Water waterbody is designated as a heavily modified water body (HMWB) beacuse of the presence of the causeway for the Dublin, but risks have been identified relating to physical modifications and morphology for all waterbodies. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). Additional measures have been identified for the Rogerstown Estuary, the Mayne Estuary and the Broadmeadow Water (as a HMWB) relating to further investigate the risks resulting from the physical modification of these waterbodies.	No contribution nor constraint to the achievement of WFD objectives as maintenance works will be confined to the existing drainage infrastructure within the river channels, estuaries and coastal waters and will be of limited extent and scale. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	The following sites are at risk from flooding for the 1% AEP fluvial/0.5% AEP tidal events:**4 WWTW** (Ballyboghill area APSR, Owens Bridge APSR, Julianstown area APSR and Naul area APSR), **1 Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR) and **35 Waste Management Permit Sites** (2 along the Ballyboghill River, 1 along the Corduff River and 3 on the Bracken River, 3 along the Broad Meadow River and 5 along the Ward River, 6 along the Sluice River, 3 along the Delvin River, 1 along the Bracken River, 3 along Baleally Stream, 1 along the Lissenhall stream, 1 along Jone's Stream and 6 in coastal areas). There are a total of **22 Section 4 licences and 34 Section 16 licences** in the study area.	No positive or negative change in flood risk to potentially polluting sites as a result of the proposed maintenance works. Meeting minimum target. There is the potential for this option to result in at least a limited reduction in risk to the potentially polluting sites currently at risk of flooding, thus just exceeding the minimum target.	1	75	L	P	R	✓	Not required	✓

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Environmental	**C) Avoid damage to, and where possible enhance, the flora and fauna of the study area**	10	5	There are 14 internationally designated sites (SAC, cSAC, SPA, pSPA and Ramsar sites), including two sites offshore, and 17 nationally designated sites (NHA, pNHA) within the study area. Sites located within the floodplain (1% AEP fluvial event/0.5% AEP tidal event) include: Bog of the Ring pNHA (22.8 hectares at risk - 45% of overall area); Knock Lake pNHA; part of Rogerstown Estuary pNHA/SAC/SPA; Feltrim Hill pNHA at risk from flooding (16 hectares at risk - 40% of overall area); Balrath Woods pNHA; Thomastown Woods pNHA; Duleek Commons pNHA at risk from flooding (5.4ha at risk - 15% of overall area); Cromwells Bush Fen pNHA; Boyne Coast and Estuary pNHA/SAC; Laytown Dunes and Nanny Estuary pNHA (at risk from flooding); Loughshinny Coast pNHA; Malahide Estuary pNHA/SAC; Baldoyle Bay pNHA/SPA; Sluice River Marsh pNHA (100% of site at risk) Outside the designated sites, there are areas of valuable habitat; indicated through their inclusion of Meath County Council's Wetland and Coastal Inventory, and Fingal County Council's Ecological Network. The rivers, estuaries and coastal waters within the study area support or have the potential to support legally protected spec concern. Aquatic species of particular nature conservation interest within the study area include the freshwater pearl mussel roosting bats; all of which are legally protected. The study area also contains a diverse range of birds, including dippers, curl flora (including eel grass beds in some of the estuaries).	Maintenance works within the river channels, estuaries and to regularly unblock culverts would have limited adverse impacts on the potentially sensitive riverine and estuarine habitats, flora and fauna at these locations due to their temporary nature and localised scale. No changes to the current flooding and tidal regime and hydrology are anticipated, except when the volume and speed of flows are temporarily increased following the removal of blockages. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	4	The primary rivers (Nanny, Delvin, Broadmeadow, Ward, Ballyboghill, Brides, Bracken, Mayne, and Sluice), and other rivers and streams within the AU support or are capable of supporting salmonid species, which are sensitive to changes in physical and chemical conditions. They are also likely to provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. Many of the rivers in the study area are popular with anglers, who enjoy both game and coarse fishing. Along the coast, recreational sea fishing is also very popular; key locations for this being Portmarnock, the Malahide Estuary, the Rogerstown Estuary, Skerries and Balbriggan. Just south of the study area boundary, Howth Harbour is the biggest commercial fishing harbour on the east coast, and the fifth largest in the country. The following is present in the study area: 3 weirs (1 weir on the Ballyboghill river, 1 weir on the Ward River near Owens Bridge, 1 impassable weir on the Sluice River), 1 culvert (1 motorway culvert on the Corduff River), 1 sluice gate (1 sluice gate on the Sluice river), 1 tidal flex (1 tidal flex on the Mayne River) and shellfish waters (located along the Fingal and Meath coastline).	Maintenance works within the river channels, estuaries and to regularly unblock culverts would have limited adverse impacts on potentially sensitive fisheries/shellfisheries at these locations due to their temporary nature and localised scale. No changes to the current flooding and tidal regime and hydrology are anticipated, except when the volume and speed of flows are temporarily increased following the removal of blockages, which could reduce any slower water areas that may have built up that fish can rest in. There would be no impact on angling activity as works would be limited to the locations of existing flow control structures. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	5	The Meath area of the AU comprises the following seven landscape character areas Central Lowlands, Bellewstown Hills, Coastal Plains, Nanny Valley, South East Lowlands, and The Ward Lowlands (all of regional importance), and Tara-Skryne Hills (international importance). The Meath area of the AU contains landscapes classified as being of primarily high but also some medium sensitivity. The Fingal area of the AU comprises the following five landscape character types: Coastal, Estuary, High Lying Agricultural Low Lying Agricultural, and Rolling Hills with Tree Belts. Fingal contains landscapes classified as being of high sensitivity and high to exceptional value along the coast and estuary corridors, and also to the north of the county; central and southern areas of the county are classified as being low to modest value and low to medium sensitivity. Fingal County Council also designates 'Important Views'; these are concentrated in the northern half of the county, both on the coast and inland.	No changes in landscape character and visual amenity are anticipated as maintenance works will be limited to existing drainage infrastructure and channel and no new structural changes will be made. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**3**	57 sites on SMR/RPS/RMP at risk (1% AEP fluvial event and 0.5% AEP tidal event). Parts of 4 ACAs at risk - a total of 26.7ha at risk (1% AEP fluvial event and 0.5% AEP tidal event). Ballyboghill and Lusk - 2 sites at risk (a bridge on the Ballyboghill River and an unclassified Ring Ditch at Gibbonsmoor). 24ha of Newbridge Demense ACA at risk (16% of total area). Broadmeadow and Ward - 9 sites at risk. 3 on RPS: Owens Bridge and 2 unknowns. One site is unique to the RMP (classcode GRAV). The remaining 5 sites are within the SMR/RPS/RMP datasets: 4 Bridges (Rowletown Bridge, Roganstown Bridge, Knocksedan Bridge and a bridge at Balheary Demesne/Lissenhall Great) and 1 Crannog north of Dunshaughlin). 0.8ha of 1 ACA at risk at Rowelstown (c.10% of total). Mayne and Sluice - 6 sites at risk. 4 sites on RMP (Habitation Site, a possible castle site, a dwelling and classcode MOND). 2 sites on SMR: a ringfort - cashel at Feltrim and a building at Balgriffin Park. Nanny and Delvin - 11 sites at risk. 3 sites on RPS: a 2 Arch Bridge at Arcarne, a Wayside Cross at Gaulstown and 1 Bridge - Old Mill Bridge. 1 unclassified site on RMP (classcode WAMI) at Garristown. 1 site on SMR - a Ritual Site - Holy We Coastal - 29 sites at risk. 20 sites on RPS: Knocknagin Viaduct, Gormanston; converted mill building, Julianstown; a former mill house, Julianstown; a lime kiln, Julianstown; a cast-iron railway bridge, Laytown; a motte, Laytown; a single-storey former house, Laytown; three-storey hotel, Laytown; and an additional 12 sites (no details available). 2 sites on SMR: a tidemill at Lissenhall Great and a Ritual Site - Holy Well at Rush. 2 sites on RMP: the remains of a castle at Stephenstown and an unknown near Donabate. The remaining 5 sites are on the SMR/RPS/RMP datasets: 2 Tide Mills (in Ballymadrough and Kilcrea); a Ritual Site - Holy Well (In Burrow); a Bridge (Lissenhall Great); and Mill Bridge in Swords. 0.5ha of Julianstown ACA at risk (c.22% of the total area). 0.1ha of Skerries ACA at risk (<1% of the total area). 0.5ha of Portraine ACA at risk (<1% of the total area). 0.1ha of Bawn & St Sylvesters Villas ACA at risk (<1% of the total area). 0.5ha of Portraine ACA at risk (<1% of the total area). <0.1ha of Malahide Castle Demesne ACA at risk (<1% of the total area).	Maintenance works within the river channels, estuaries and to regularly unblock culverts would result in no positive or negative change in risk to, or impacts on setting of known SMR/RPS/RMP features (through either direct impacts or impacts on setting) or ACAs. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Location:	**Study area**
Option Description:	**Targeted public awareness and education campaign and individual property flood proofing**

KEY

Abbreviations/Acronyms
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LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	4	Total of **5.1km of Regional (R)** roads, **0.1km of National Primary (NP)** at risk within the study area (1% AEP fluvial/0.5% AEP tidal event).	Option would have no impact on transport infrastructure at risk. Meeting minimum target as option would not result in an increase in transport infrastructure at risk.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to utilities infrastructure	10	5	**4 WWTW** (Ballyboghil area APSR, Owens Bridge APSR, Julianstown area APSR and Naul area APSR).**1 Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR) and **1 utilities asset** (ESB, GAS and EIRCOM utilities) at risk within the study area (1% AEP fluvial/0.5% AEP tidal event event).	Option would have no impact on the number of utility infrastructure assets at risk. Meeting minimum target as option would not result in an increase in utility infrastructure assets at risk.	0	0	N/A	N/A	N/A	-	None required	-
	D) Minimise risk to agricultural land.	5	5	**1286 hectares of agriculture land** not benefitting from flood defences at risk of flooding within the Study area. This represents approximately 13% of the total agricultural land in the study area (1% AEP fluvial/0.5% AEP tidal event event).	Option would have no impact on the area of agricultural land at risk. Meeting minimum target as option would not result in an increase in area of agricultural land at risk	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life.**	30	4	Total of **246 residential properties at risk** within the study area (1% AEP fluvial/0.5% AEP tidal event event). 5 at risk in Ballyboghill area APSR, 9 at risk in Rathoath area APSR, 2 at risk in Rowelstown East area APSR , 3 at risk in Ashbourne area APSR, 1 at risk in Owens Bridge area APSR, 1 in Kinsaley Lane area APSR , 19 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR. 5 at risk in Duleek area APSR , 10 at risk in Laytown Bettystown and coastal area APSR, 1 at risk in Balbriggan area APSR, 68 in Skerries area APSR, 25 in Rush area APSR, 13 in Swords area APSR and 46 in Portmarnock and Malahide areas APSR. Remaining properties at risk are in rural areas outside of the APSR. **0 high vulnerability properties** at risk	Option would reduce the flood damage to the residential properties targeted as part of the individual property protection. The targeted public awareness campaign would increase knowledge of flooding but not necessarily reduce flood risk. The number of properties located in the flood risk area would remain the same. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk to community.	10	3	Total of **65 non-residential buildings at risk** within the study area (1% AEP fluvial/0.5% AEP tidal event event) including 1 in Kinsaley Lane area APSR, 19 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR, 1 in Laytown, Bettystown and coastal areas APSR, 5 in Balbriggan area APSR, 6 in Skerries area APSR, 1 in Rush area APSR, 14 in Swords area APSR and 16 in Portmarnock and Malahide areas APSR. 1 retail park at risk (Airside Retail Park) in Swords area APSR. Remaining properties at risk are in rural areas outside of the APSR. **1 flood sensitive social amenity site** at risk, a firestation in Swords area ASPR.	Option would reduce the flood damage to the non-residential properties targeted as part of the individual property protection. The targeted public awareness campaign would increase knowledge of flooding but not necessarily reduce flood risk. The number of properties located in the flood risk area would remain the same. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	5	The following social amenity sites are at risk from flooding (1% AEP fluvial/0.5% AEP tidal event event):**8 golf courses** (Beechmount, Portmarnock Strand, Forrest Little, Roberstown near Ashbourne, Owens Bridge, Corrstown, Beaverstown near Donabate and Malahide Point), **1 pitch and putt course** (Ring Commons), **1 sports pitch** (ALSAA sports complex. , **3 holiday home/mobile home parks** (Donabate, Rush and The Burrows).	Option would have no impact on social amenity sites at risk. Meeting minimum target as option would not result in an increase to the number of social amenity sites at risk.	0	0	N/A	N/A	N/A	-	None required	-
	A) Support the objectives of the WFD	5	5	The study area contains 51 river waterbodies : 9 = high status; 3 = good status; (no deterioration required); 14 = moderate status; 23 = poor status; 3 = bad status (improvements required). The study area contains 4 transitional (i.e. estuarine) waterbodies, all of which have been classified as being of moderate status. The study area contains 4 coastal waterbodies: 2 = high status; 2 = moderate status. The RBMP reports that the problems constraining achievement of good status relate to pollution pressures.from agriculture, dangerous substances and wastewater and industrial discharges. The Broadmeadow Water waterbody is designated as a heavily modified water body (HMWB) beacuse of the presence of the causeway for the Dublin, but risks have been identified relating to physical modifications and morphology for all waterbodies. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). Additional measures have been identified for the Rogerstown Estuary, the Mayne Estuary and the Broadmeadow Water (as a HMWB) relating to further investigate the risks resulting from the physical modification of these waterbodies.	No contribution nor constraint to the achievement of WFD objectives as there will be no physical works within or modification to the river channels, estuaries or coastline. The only physical measures will be the installation of flood protection measures for individual properties located beyond the waterbodies. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	The following sites are at risk from flooding for the 1% AEP fluvial/0.5% AEP tidal events: **4 WWTW** (Ballyboghill area APSR, Owens Bridge APSR, Julianstown area APSR and Naul area APSR), **1 Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR) and **35 Waste Management Permit Sites** (2 along the Ballyboghill River, 1 along the Corduff River and 3 on the Bracken River, 3 along the Broad Meadow River and 5 along the Ward River, 6 along the Sluice River, 3 along the Delvin River, 1 along the Bracken River, 3 along Baleally Stream, 1 along the Lissenhall stream, 1 along Jone's Stream and 6 in coastal areas). There are a total of **22 Section 4 licences and 34 Section 16 licences** in the study area.	No positive or negative change in flood risk to potentially polluting sites within the study area as there will be no physical works within or modification to the river channels, estuaries or coastliine. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	There are 14 internationally designated sites (SAC, cSAC, SPA, pSPA and Ramsar sites), including two sites offshore, and 17 nationally designated sites (NHA, pNHA) within the study area. Sites located within the floodplain (1% AEP fluvial event/0.5% AEP tidal event) include: Bog of the Ring pNHA (22.8 hectares at risk - 45% of overall area); Knock Lake pNHA; part of Rogerstown Estuary pNHA/SAC/SPA; Feltrim Hill pNHA at risk from flooding (16 hectares at risk - 40% of overall area); Balrath Woods pNHA; Thomastown Woods pNHA; Duleek Commons pNHA at risk from flooding (5.4ha at risk - 15% of overall area); Cromwells Bush Fen pNHA; Boyne Coast and Estuary pNHA/SAC; Laytown Dunes and Nanny Estuary pNHA (at risk from flooding); Loughskinny Coast pNHA; Rogerstown Estuary pNHA/SPA/SAC; Malahide Estuary pNHA/SAC; Baldoyle Bay pNHA/SPA; Sluice River Marsh pNHA (100% of site at risk) Outside the designated sites, there are areas of valuable habitat; indicated through their inclusion of Meath County Council's Wetland and Coastal Inventory, and Fingal County Council's Ecological Network. The rivers, estuaries and coastal waters within the study area support or have the potential to support legally protected species or other species of conservation concern. Aquatic species of particular nature conservation interest within the study area include the freshwater pearl mussel, grey seals, otters, the river lamprey, and roosting bats; all of which are legally protected. The study area also contains a diverse range of birds, including dippers, curlew and kingfishers, invertebrates and flora (including eel grass beds in some of the estuaries).	No impacts on potentially sensitive riverine, estuarine and coastal habitats or species (located within or outside designated nature conservation sites) as there will be no physical works or modifications within or adjacent to the river channels, estuaries or coastline. The only physical measures will be the installation of flood protection measures for individual properties located beyond the waterbodies, and it is assumed that these will be installed in already modified areas. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Environmental	**D) Avoid damage to, and where possible enhance, fisheries within the study area**	5	4	The primary rivers (Nanny, Delvin, Broadmeadow, Ward, Ballyboghill, Brides, Bracken, Mayne, and Sluice), and other rivers and streams within the AU support or are capable of supporting salmonid species, which are sensitive to changes in physical and chemical conditions. They are also likely to provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. Many of the rivers in the study area are popular with anglers, who enjoy both game and coarse fishing. Along the coast, recreational sea fishing is also very popular; key locations for this being Portmarnock, the Malahide Estuary, the Rogerstown Estuary, Skerries and Balbriggan. Just south of the study area boundary, Howth Harbour is the biggest commercial fishing harbour on the east coast, and the fifth largest in the country. The following is present in the study area: 3 weirs (1 weir on the Ballyboghill river, 1 weir on the Ward River near Owens Bridge, 1 impassable weir on the Sluice River), 1 culvert (1 motorway culvert on the Corduff River), 1 sluice gate (1 sluice gate on the Sluice river), 1 tidal flex (1 tidal flex on the Mayne River) and shellfish waters (located along the Fingal and Meath coastline).	No impacts on fisheries/shellfisheries (including designated areas) or angling activity as there will be there will be no physical works or modifications within or adjacent to the river channels, estuaries or coastline. The only physical measures will be the installation of flood protection measures for individual properties located beyond the waterbodies which will have no impact on fisheries. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	**5**	**5**	The Meath area of the AU comprises the following seven landscape character areas Central Lowlands, Bellewstown Hills, Coastal Plains, Nanny Valley, South East Lowlands, and The Ward Lowlands (all of regional importance), and Tara-Skryne Hills (international importance). The Meath area of the AU contains landscapes classified as being of primarily high but also some medium sensitivity. The Fingal area of the AU comprises the following five landscape character types: Coastal, Estuary, High Lying ~~Agricultural~~, Low Lying ~~Agricultural~~, and Rolling Hills ~~with Tree Belts.~~ Fingal contains landscapes classified as being of high sensitivity and high to exceptional value along the coast and estuary corridors, and also to the north of the county; central and southern areas of the county are classified as being low to modest value and low to medium sensitivity. Fingal County Council also designates 'Important Views'; these are concentrated in the northern half of the county, both on the coast and inland.	No change in landscape character and visual amenity as there will be there will be no physical works within or modification to the river channels, estuaries or coastline. The only physical measures will be the installation of flood protection measures for individual properties located beyond the waterbodies which will have no impact on landscape character or visual amenity. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**3**	57 sites on SMR/RPS/RMP at risk (1% AEP fluvial event and 0.5% AEP tidal event). Parts of 4 ACAs at risk - a total of 26.7ha at risk (1% AEP fluvial event and 0.5% AEP tidal event). Ballyboghill and Lusk - 2 sites at risk (a bridge on the Ballyboghill River and an unclassified Ring Ditch at Gibbonsmoor). 24ha of Newbridge Demense ACA at risk (16% of total area). Broadmeadow and Ward - 9 sites at risk. 3 on RPS: Owens Bridge and 2 unknowns. One site is unique to the RMP (classcode GRAV). The remaining 5 sites are within the SMR/RPS/RMP datasets: 4 Bridges (Rowletown Bridge, Roganstown Bridge, Knocksedan Bridge and a bridge at Balheary Demesne/Lissenhall Great) and 1 Crannog north of Dunshaughlin). 0.8ha of 1 ACA at risk at Rowelstown (c.10% of total). Mayne and Sluice - 6 sites at risk. 4 sites on RMP (Habitation Site, a possible castle site, a dwelling and classcode MOND). 2 sites on SMR: a ringfort - cashel at Feltrim and a building at Balgriffin Park. Nanny and Delvin - 11 sites at risk. 3 sites on RPS: a 2 Arch Bridge at Arcarne, a Wayside Cross at Gaulstown and 1 Bridge - Old Mill Bridge. 1 unclassified site on RMP (classcode WAMI) at Garristown. 1 site on SMR - a Ritual Site - Holy Well at the Naul. The remaining 6 sites are within the SMR/RPS/RMP datasets: 4 Bridges (2 Bridges at Prioryland; Beaumont Bridge at Beaumont and Naul Bridge, Naul), an Enclosure at Prioryland and a Ring Barrow at Abbeyland. 0.1ha of 1 ACA at risk in Naul (c.1% of the total area). Coastal - 29 sites at risk. 20 sites on RPS: Knocknagin Viaduct, Gormanston; converted mill building, Julianstown; a former mill house, Julianstown; a lime kiln, Julianstown; a cast-iron railway bridge, Laytown; a motte, Laytown; a single-storey former house, Laytown; three-storey hotel, Laytown; and an additional 12 sites (no details available). 2 sites on SMR: a tidemill at Lissenhall Great and a Ritual Site - Holy Well at Rush. 2 sites on RMP: the remains of a castle at Stephenstown and an unknown near Donabate. The remaining 5 sites are on the SMR/RPS/RMP datasets: 2 Tide Mills (in Ballymadrough and Kilcrea); a Ritual Site - Holy Well (In Burrow); a Bridge (Lissenhall Great); and Mill Bridge in Swords. 0.5ha of Julianstown ACA at risk (c.22% of the total area). 0.1ha of Skerries ACA at risk (<1% of the total area). 0.5ha of Portraine ACA at risk (<1% of the total area). 0.1h	There will be no positive or negative change in risk to, or impacts on, SMR/RPS/RMP features (ranging from low to moderate vulnerability) through either direct impacts or impacts on setting) and ACAs as there will be there will be no physical works within or modification to the river channels, estuaries or coastline. The only physical measures will be the installation of flood protection measures for individual properties located beyond the waterbodies which will have no impact on cultural heritage. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Location:	**Nanny and Delvin AU**
Option Description:	**Develop a fluvial FFWS for the Nanny River**

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	Approximately **1.5km of Regional (R)** roads at risk for the 1% AEP fluvial event (50m of R roads at risk in Duleek area APSR)	Option would have no impact on the transport infrastructure at risk. Meeting minimum target as no increase in risk to transport infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to utilities infrastructure	10	2	**1 WWTW** at risk in the Naul area APSR	Option would have no impact on the number of utility infrastructure assets at risk. Meeting minimum target as no increase in risk to utility infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	D) Minimise risk to agricultural land	5	4	**485 hectares of agriculture l**and not benefiting from flood defences at risk of flooding (1% AEP fluvial event). This represents approximately 1.5% of the total agricultural land in the AU.	Option would have no impact on the agricultural land at risk. Meeting minimum target as no increase in risk to agricultural land.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**15 residential properties at risk** with 5 at risk in Duleek area APSR (1% AEP fluvial event)	Option would not reduce flood risk to residential properties. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk to community	10	2	**5 non-residential buildings** at risk (1% AEP fluvial event).	Option would not reduce flood risk to non-residential buildings. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	0	No social amenity sites at risk	N/A	0	0	N/A	N/A	N/A	-	N/A	-
Environmental	**A) Support the objectives of the WFD**	5	5	AU contains the Nanny WMU and the Delvin AMU. The 13 river waterbodies within the **Nanny WMU** are of moderate (7) and poor (6) status which means that improvements in status are required. The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture, wastewater and industrial discharges and septic tanks. The 3 river waterbodies within the Delvin WMU are of moderate (1) and poor (2) status, which means that improvements in status are required. The RBMP reports that problems constraining achievement of good status include high nutrient concentration (phosphorus, ammonia), oxygen levels and low ecological rating; with the principal causes identified as agriculture and wastewater and industrial discharges. The RBMP also identifies a morphological risk from the dredging regime for flood risk management for both WMUs and the measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning and Development Regulations etc).	No contribution nor constraint to the achievement of WFD objectives as there will be no physical works within or modifications to the Nanny River and its sub-catchment Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	The following potentially polluting sites are at risk for the 1% AEP fluvial event: **1 WWTW** in the Naul area APSR **2 Waste Management Permit Sites** along the Delvin River at Westown. **4 Section 4** licences present in AU	No positive or negative change in flood risk to potentially polluting sites within the AU as no intervention involved. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	There are **four proposed (p)NHAs** within the AU boundary: **Duleek Commons** (calcareous marsh and fen system), **Thomastown Bog** (raised bog surrounded by wet woodland and wet grassland), **Balrath Woods** (mature woodland) and **Cromwell's Bush Fen** (wetland with fen communities in pastoral/arable setting). Of these pNHAs, only approximately 5.4 hectares of **Duleek Commons** may be subject to flooding (1% AEP fluvial event), which represents approximately 15% of the overall area of this pNHA. Given the nature of the predominantly wet habitats in this pNHA the risk of flooding is not considered a concern and may be beneficial to the site. Immediately outside of the AU boundary, to the east, the River Nanny flows into the **River Nanny Estuary & Shore SPA**, and the **Laytown Dunes/Nanny Estuary pNHA**. This area is important for its (non breeding) bird populations, including five species in nationally important numbers. Changes in the catchment, which alter the flooding regime and/or freshwater input into the estuary may affect the habitats upon which these populations rely. 71 sites listed on Meath County Council's Wetland Inventory are present within the AU. The rivers and their floodplain within the AU support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	No impacts on potentially sensitive riverine habitats and associated fauna (located within or outside designated nature conservation sites) as there will be there will be no physical works within or modification to the river channels or adjacent land within the Nanny sub-catchment. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	3	The Nanny and Delvin rivers and other streams within the AU support or are capable of supporting salmonid species, which are sensitive to changes in physical and chemical conditions. They are also likely to provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. There is angling activity along rivers in the AU, though the exact locations of popular angling areas are unknown. There are no fisheries designations within the AU (e.g. Salmonid Waters) and no known barriers to fish movement.	No impacts on fisheries or angling activity as there will be no physical works or modification within or adjacent to the river channels in the Nanny sub-catchment. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	5	The Meath area of the AU comprises the following five landscape characters types: **Central Lowlands, Bellewstown Hills, Coastal Plains, Nanny Valley (all of regional importance), and Tara-Skryne Hills (international importance).** To the south of the AU, land inside the Fingal County boundary falls within the **High Lying Agricultural** landscape character area (classified as being of high value and sensitivity). Fingal County Council also designates **'Important Views'**, which in the AU are concentrated around Garristown and along the R130 and R122.	No change in landscape character and visual amenity as there will be no physical works or modifications within or adjacent to the river channels in the Nanny sub-catchment. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	3	Within the AU, 11 Sites on RPS/RMP/SMR at risk (1% AEP fluvial event). 3 sites on RPS including a two Arch Bridge at Arcarne, a Wayside Cross at Gaulstown and a Bridge - Old Mill Bridge. 1 site on RMP (class code WAMI) at Garristown. 1 site on SMR - a Ritual Site - Holy Well at Naul. The remaining 6 sites are within the SMR/RPS/RMP datasets and include 4 bridges (2 bridges at Prioryland; Beaumont Bridge at Beaumont and Naul Bridge, Naul), an Enclosure at Prioryland and a Ring Barrow at Abbeyland. Three ACAs are present in the AU: Naul ACA, Blascadden ACA, and Garristown ACA. Of these, only the Naul ACA is at risk of flooding; approximately 0.1ha is at risk, representing approximately 1% of the total ACA.	There will be no positive or negative change in risk to, or impacts on SMR/RPS/RMP features through either direct impacts or impacts on setting) and the ACA as there will be there will be no physical works as a result of this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Location:	**Broadmeadow Ward AU**
Option Description:	**Flood forecasting and warning system (Broadmeadow River**

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	Approximately **0.5km of Regional (R)** roads at risk for the 1% AEP fluvial event. (approx. 90m of R roads at risk in Ratoath area APSR and 80m of R roads at risk in Rowelstown East area APSR)	Option would have no impact on the transport infrastructure at risk. Meeting minimum target as no increase in risk to transport infrastructure	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to utilities infrastructure	10	2	1 **Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR) at risk **1 Waste Water Treatment Works** in Owens Bridge APSR at risk. Risk assessed for the 0.1% AEP fluvial event.	Option would have no impact on the number of utility infrastructure assets at risk. Meeting minimum target as no increase in risk to utility infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	D) Minimise risk to agricultural land	5	4	**150 hectares of agriculture land** not benefitting from flood defences at risk of flooding (1% AEP fluvial event). This represents approximately 1% of the total agricultural land in the AU.	Option would have no impact on the agricultural land at risk. Meeting minimum target as no increase in risk to agricultural land.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**18 residential properties at risk** with 9 at risk in Ratoath area APSR, 3 at risk in Ashbourne area APSR, 2 at risk in Rowelstown East area APSR and 1 at risk in Owens Bridge area APSR (1% AEP fluvial event). No **high vulnerability properties** at risk from flooding.	Option would not reduce flood risk to residential properties. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk to community	10	0	No **non-residential building** at risk (1% AEP fluvial event). No large commercial business parks at risk. No **high-value social infrastructural assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Minimise risk to, or enhance, social amenity	5	2	The following flood sensitive social amenity sites are at risk for the 1% AEP fluvial event: **1 sports club house** at Swords AFC **3 golf courses** at Ashbourne, Owens Bridge and Corrstown	Option would have no impact on the number of social amenity sites at risk. Meeting minimum target as no increase in risk to social amenity sites.	0	0	N/A	N/A	N/A	-	None required	-
Environmental	**A) Support the objectives of the WFD**	5	5	AU contains 25 river water bodies (27 in WMU): 4 = high status; 1 = good status; (i.e. no deterioration allowed); 5 = moderate status; 12 = poor status; 3 = bad status (i.e. improvements in status required). The RBMP reports that problems constraining achievement of good status include high nutrients, low ecological rating and dredging; with the principal causes identified as agriculture (diffuse pollution) and wastewater and industrial discharges (septic tank pollution). The measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc) and to ensure compliance with OPW Environmental Drainage Maintenance Guidance Notes	No contribution nor constraint to the achievement of WFD objectives as there will be no physical works within or modification to the river channels or adjacent land. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	The following are at risk for the 1% AEP fluvial event: **1 Waste Water Pumping Station** (Castle Street Pumping Station in Ashbourne area APSR);**1 Waste Water Treatment Works** in Owens Bridge APSR; **8 waste management permit sites** at risk; 3 along the Broad Meadow River and 5 along the Ward River. There are **4 Section 4 licences** within the AU.	No positive or negative change in flood risk to potentially polluting sites within the AU as no intervention involved. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	There are no internationally or nationally designated nature conservation sites within the AU. Approximately 1km downstream of the AU boundary are the **Malahide Estuary cSAC/pNHA** and the **Broadmeadow-Swords Estuary SPA/Ramsar site**. This area comprises intertidal sandflats, mudflats, saltmarshes, and sand dunes, which support internationally important wintering populations of Brent geese as well as nationally important populations of a further 15 waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with impacts on associated designated waterbird populations. There are 31 sites listed on Meath County Council's Wetland Inventory within the AU, including a significant stretch of both the Broadmeadow and Ward rivers. Within the AU, the Broadmeadow and Ward rivers primarily run through rural areas and, although modified in stretches, are likely to be of biodiversity interest. All rivers and their floodplains in the AU support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed	No impacts on potentially sensitive riverine habitats, flora and fauna (located within or outside designated nature conservation sites) as there will be there will be no physical works within or modification to the river channels or adjacent land. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	3	The Broadmeadow and Ward rivers and other streams within the AU support or are capable of supporting salmonid species and are likely to provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. There are no fisheries designations within the AU (e.g. Salmonid Waters). There are known areas of angling activity along both rivers, although the location of popular angling areas are not known. **1 weir** on the Ward River near Owens Bridge presents a barrier to fish movement (migratory salmon).	No impacts on fisheries or angling activity as there will be no physical works within or modification to the river channels. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The Meath area of the AU falls within **The Ward Lowlands** landscape character type, classified as being of high sensitivity. The Fingal area of the AU comprises the **Low lying Agricultural** and **Rolling Hills** landscape character types, both of which are classified as being of modest value and low to medium sensitivity). In the east of the AU, the R125 (approx 2.8km) and R108 (approx 1.5km) are designated as **'Important Views'** (Fingal County Council designation).	No change in landscape character and visual amenity as there will be there will be no physical works within or modification to the river channels. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	3	Within the AU, **13 sites** on the SMR/RPS/RMP are at risk: Four sites on the RPS, including Owens Bridge and Rowelstown Bridge, and two unknown sites; two sites unique to RMP (graveyard and an unclassified site); one site unique to SMR - a Crannog north of Dunshaughlin; the remaining six sites are within the SMR/RPS/RMP datasets and includes three bridges (Roganstown Bridge, Knocksedan Bridge and a bridge at Balheary Demesne/Lissenhall Great). There is one ACA present in the AU, Rowelstown ACA, of which approximately 0.8ha is at risk of flooding (representing approximately 10% of the total ACA).	There will be no positive or negative change in risk to, or impacts on, SMR/RPS/RMP features (through either direct impacts or impacts on setting) and the ACA as there will be there will be no physical works as a result of this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A

Location:	**Mayne & Sluice AU**
Option Description:	**Flood forecasting and warning system (Mayne River**

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	4	Approximately **0.1km of National Primary (NP)** roads and 0.6km of Regional (R) roads at risk	Option would have no impact on the transport infrastructure at risk. Meeting minimum target as no increase in risk to transport infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to utilities infrastructure	10	0	**No utility infrastructure assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land	5	2	Approximately **31 hectares of agricultural** land not benefiting from flood defences at risk of flooding. This represents approximately 1.5% of the total agricultural land in the AU.	Option would have no impact on the agricultural land at risk. Meeting minimum target as no increase in risk to agricultural land.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**28 residential properties** including 1 in Kinsaley Lane area APSR and 19 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR at risk. **No high vulnerability properties** at risk	Option would not reduce flood risk to residential properties. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk to community	10	2	**3 non-residential properties** at risk including 1 in Kinsaley Lane area APSR and 2 in St Margarets, Dublin Airport, Belcamp, Balgriffin APSR. **No high-value social infrastructural assets** at risk from flooding	Option would not reduce flood risk to non-residential buildings. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	2	**1 Golf course** at risk at Forrest Little **Sports pitches** at ALSAA sports complex near Dublin Airport	Option would have no impact on the number of social amenity sites at risk. Meeting minimum target as no increase in risk to social amenity sites.	0	0	N/A	N/A	N/A	-	None required	-
Environmental	**A) Support the objectives of the WFD**	5	5	The Sluice River is classified as a "High" status river water body, which means that this highly senstive and valuable status should be maintained and no deterioration allowed. The Mayne River is classified as a "Poor" status river water body, which means that measures are required to achieve "Good" status by 2027. The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), oxygen demand, low ecological rating and inferior habitat, with the principal pressure within the WMU (which also includes the Santry River to the south of the study area/AU), wastewater and industrial discharges and diffuse pollution. The measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc) and to ensure compliance with OPW Environmental Drainage Maintenance Guidance Notes	No contribution nor constraint to the achievement of WFD objectives as there will be no physical works within or modification to the river channels and adjacent land. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	Within the AU, there are **6 Waste Management Permit Sites** at risk (1% AEP fluvial event), all of which are located along the Sluice River (note that the 6 sites refer to 6 separate licence numbers issued for one WMP site). The following are present in the AU: **4 Section 4 licences** and **18 Section 16 licences.**	No positive or negative change in flood risk to potentially polluting sites within the AU as no intervention involved. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	Within the AU boundary, **Feltrim Hill pNHA** is at risk from flooding. 16 hectares are at risk (1% AEP fluvial event) which represents 40% of the overall area of this pNHA. Approximately 1.5km downstream of the AU is the **Baldoyle Bay cSAC/SPA/Ramsar site/pNHA.** The bay contains large areas of sandflats, mudflats and saltmarshes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further seven waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with associated impacts on designated waterbird populations. The rivers and their floodplain within the AU support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	No impacts are anticipated on potentially sensitive riverine habitats or associated fauna (located within or outside the designated nature conservation sites) as there will be no physical works within channels or modification to the river channels or adjacent land. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	3	The Mayne and Sluice rivers and other streams within the AU are capable of supporting salmonid species and potentially provide salmonid spawning or nursery areas. There is also the potential that these watercourses may support brook, river and or sea lamprey. There are no fisheries designations within the AU (e.g. Salmonid Waters). There are known areas of angling activity along rivers in the AU, though the exact locations of popular angling areas are unknown. A sluice gate on the Sluice River provides a barrier to fish movement (migratory salmon).	No impacts on fisheries or angling activity as there will be no physical works within or modification to the river channels. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	2	The AU falls within the **Low Lying** landscape character area, classified as being of modest value and low sensitivity. No 'Important Views' within the AU.	No change in landscape character and visual amenity as there will be n physical works within or modification to the river channels. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	3	**6 sites on SMR/RMP** at risk (1% AEP fluvial event). 4 sites unique to RMP (a habitation site, a possible castle site and dwelling at Balgriffin Park and a MOND). The remaining 2 sites are unique to the SMR: a Ringfort - cashel at Feltrim and a building at Balgriffin Park. There is one ACA present in the AU; Abbeyville ACA, of which 5.4ha is at risk, representing approximately 15% of the total ACA.	There will be no positive or negative change in risk to 6 sites on the SMR/RPS/RMP (through either direct impacts or impacts on setting) as there will be no physical works as a result of this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

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Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Coastal AU**
Option Description:	**Fluvial & tidal flood forecasting and warning system**

KEY

Abbreviations/Acronyms
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Dur = Duration
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Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	**No rail** at risk Approximately **2.5km of Regional (R) roads** at risk (approx. 350m at risk in Laytown Bettystown and coastal area APSR, 50m at risk in Julianstown area APSR, 170m in Skerries area APSR, 120m in Swords area APSR and 1km in Portmarnock and Malahide areas APSR)	Option would have no impact on the transport infrastructure at risk. Meeting minimum target as no increase in risk to transport infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to utilities infrastructure	10	2	**1 WWTW at risk** in Julianstown area APSR	Option would have no impact on the number of utility infrastructure assets at risk. Meeting minimum target as no increase in risk to utility infrastructure.	0	0	N/A	N/A	N/A	-	None required	-
	D) Minimise risk to agricultural land	5	4	Approximately **320 hectares of agriculture land** not benefitting from flood defences at risk of flooding. This represents approximately 7% of the total agricultural land in the AU.	Option would have no impact on the agricultural land at risk. Meeting minimum target as no increase in risk to agricultural land.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	3	**182 residential properties at risk** (10 at risk in Laytown Bettystown and Coastal area APSR, 1 at risk in Balbriggan area APSR, 73 in Skerries area APSR, 29 in Rush area APSR, 22 in Swords area APSR and 46 in Portmarnock and Malahide areas APSR). **No high vulnerability** properties at risk	Option would not reduce flood risk to residential properties. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk to community	10	5	**53 non-residential buildings** at risk including 1 at risk in Laytown Bettystown and coastal area APSR, 5 at risk in Balbriggan area APSR, 6 in Skerries area APSR, 1 in Rush area APSR, 14 in Swords area APSR and 16 in Portmarnock and Malahide areas APSR). 1 retail park at risk (Airside Retail Park) in Swords area APSR. **1 high-value social infrastructural asset** at risk, a fire station in Swords	Option would not reduce flood risk to non-residential buildings. Number of properties located in at risk areas would remain the same. Therefore, just meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	5	**4 golf courses at risk**: 1 golf course at Beaverstown, Donabate; 1 golf course at Malahide Point and 2 golf courses in Portmarnock (1 at Beechmount and 1 at Portmarnock Strand) **3 holiday home (mobile home park)** ar risk: 1 near Donabate, 1 near Burrow Beach and 1 in Rush.	Option would have no impact on the number of social amenity sites at risk. Meeting minimum target as no increase in risk to social amenity sites.	0	0	N/A	N/A	N/A	-	None required	-
Environmental	**A) Support the objectives of the WFD**	5	5	The AU contains 8 river waterbodies: 1 = high status; 2 = good status; (no deterioration required); 1 = moderate status; 3 = poor status; 1 = bad status (improvements required). The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. The AU contains 4 transitional (i.e. estuarine) waterbodies: Nanny Estuary, Rogerstown Estuary, Broadmeadow Water, Mayne Estuary; all are of moderate status/potential (i.e. improvements required). To the north, the AU borders the Boyne Estuary transitional waterbody; also of moderate status/potential. The RBMP reports that the problems constraining achievement of good status or potential relate to pollution pressures.from agriculture, dangerous substances, and wastewater and industrial discharges. The Broadmeadow Water waterbody is designated as a heavily modified water body (HMWB) because of the presence of the causeway for the Dublin-Belfast railway line, but risks have been identified relating to physical modifications and morphology for all waterbodies. The basic measures directly relevant to the FEM FRAMS (physic The AU contains 4 coastal waterbodies: Boyne Estuary Plume Zone and Northwestern Irish Sea (HA08) = high status (i.e. no deterioration llowed); and Malahide Bay and Irish Sea Dublin (HA09) = moderate status (i.e. improvements required). None of these waterbodies have been identified as heavily modified and the RBMP reports that the problems constraining achievement of good status primarily relate to pollution pressures (although risks from physical modifications have been identified for all waterbodies). No specific issues have been identified relating to physical modifications and morphology. The only measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc).	No contribution nor constraint to the achievement of WFD objectives as there will be no physical works within or modification to the river channels, estuaries or coastline. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	The following are at risk in the AU: **1 Waste Water Treatment Works** in Julianstown **13 Waste Management Permit Sites** based on issued licences: 1 along the Delvin River, 1 along the Bracken river, 3 along Baleally Stream, 1 along the Lissenhall Stream, 1 along Jone's Stream and 6 in coastal areas. The following are present in the AU: **6 Section 4 and 15 Section 16 licences**.	No positive or negative change in flood risk to potentially polluting sites within the study area as there will be no physical works within or modification to the river channels, estuaries or coastline, beyond standard maintenance activities. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	The Coastal AU contains numerous designated nature conservation sites including: Boyne Coast and Estuary SAC/pNHA; Boyne Estuary SPA; River Nanny Estuary and Shore SPA; Laytown Dunes and Nanny Estuary pNHA (Laytown dunes at risk from flooding); Loughshinny Coast pNHA; Rogerstown Estuary SAC/SPA/Ramsar site/pNHA; Malahide Estuary SAC/pNHA; Broadmeadow-Swords Estuary SPA/Ramsar site; Baldoyle Bay SAC/SPA/Ramsar site/pNHA; Sluice River Marsh pNHA (100% at risk). Also, Skerries Islands SPA and Ireland's Eye SAC/SPA are located offshore, just outside the Coastal AU boundary. Howth Head SAC and Howth Head Coast SPA are located adjacent to the southern end of the AU boundary. There are 21 sites listed on Meath County Council's Wetland Inventory, and 92 sites listed on the Coastal Inventory present within the AU. Rivers, estuaries and coast are also important for European protected species (e.g. Atlantic salmon, otter). All rivers/estuaries within the AU, together with their floodplains, support or have the potential to support legally protected species or other species of conservation concern, although detailed distribution information is not available.	No impacts on potentially sensitive riverine, estuarine and coastal habitats or species (located within or outside designated nature conservation sites) as there will be no physical works or modifications within or adjacent to the river channels, estuaries or coastline. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Envir	**D) Avoid damage to, and where possible enhance, fisheries within the study area**	5	5	All rivers and streams within the AU support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the AU area are also likely to support brook, river and/or sea lamprey. In the AU, estuaries provide spawning, nursery and feeding habitats for a range of fish species, particularly bass, sand goby, grey mullet, flounder and sprat. In addition, important migratory fish species, namely salmon, sea trout, eels and lampreys, pass through on their way to or from their spawning grounds. A tidal flex on the Mayne River and a weir on the Sluice River present a **potential barrier to upstream fish movement** (salmonids). Many of the rivers in the AU are popular with anglers, who enjoy both game and coarse fishing. Along the coast, recreational sea fishing is also very popular; key locations are Portmarnock, the Malahide Estuary, the Rogerstown Estuary, Skerries and Balbriggan. Just south of the AU boundary, Howth Harbour is the biggest commercial fishing harbour on the east coast, and the fifth largest in the country. There are **Shellfish Waters** at Malahide and Balbriggan/Skerries, designated under the EU Shellfish Waters Directive.	No impacts on fisheries/shellfisheries (including designated areas) or angling activity as there will be there will be no physical works within or modification to the river channels, estuaries or coastline. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The Meath area of the AU comprises two landscape characters types: **Coastal Plains** and **Nanny Valley;** both of which are of regional importance and are classified as being of high sensitivity. The Fingal area of the AU comprises five landscape character types: **Coastal**, **Estuary** (both classified as being of exceptional value and high sensitivity), **High Lying Agricultural** (high value, high sensitivity), **Low Lying Agricultural** (modest value, low sensitivity), and Rolling Hills (modest value, medium sensitivity). Fingal County Council also designates **'Important Views'**; these are distributed throughout the AU, both on the coast and inland.	No change in landscape character or visual amenity as there will be no physical works within or modification to the river channels, estuaries or coastline. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	3	**29 sites** on SMR/RPS/RMP at risk. 20 sites on RPS including: Knocknagin Viaduct, Gormanstown; a converted mill building, Julianstown; a former mill house, Julianstown; a lime kiln, Julianstown; a cast-iron railway bridge, Laytown; a motte, Laytown; a single-storey former house, Laytown; a three-storey hotel, Laytown; 12 other sites (no details available). 2 sites on SMR, a Tidemill at Lissenhall Great and a Ritual Site - Holy Well at Rush. 2 sites on RMP: the remains of a castle at Stephenstown; and an unknown feature near Donabate. The remaining 5 sites are on the SMR/RPS/RMP datasets and include: 2 Tide Mills (in Ballymadrough and Kilcrea); a Ritual Site - Holy Well (In Burrow); and 2 bridges (Lissenhall Great and Mill Bridge in Swords). Parts of 5 ACAs at risk: <0.5ha of Julianstown ACA at risk (c.22% of the total ACA). 0.1ha of Skerries ACA at risk (<1% of the total ACA). 0.5ha of Portraine ACA at risk (< 1% of the total ACA). 0.1ha of Bawn & St Sylvesters Villas ACA at risk (<1% of the total ACA) and <0.1ha of Malahide Castle Demesne ACA at risk (<1% of the total ACA).	There will be no positive or negative change in risk to or impacts on SMR/RPS/RMP features (through either direct impacts or impacts on setting) and ACAs as there will be there will be no physical works within or modification to the river channels, estuaries or coastline. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Location:	**Duleek area APSR**
Option Description:	**Raising existing defence embankment to a higher standard of protection (to protect up to 0.1% AEP)** *(includes construction of new embankment)*

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	**5**	**3**	Approximately **50m of R roads** at risk (R152)	Option provides protection to the roads at risk up to the 0.1% AEP. Meeting aspirational target.	5	75	L	P	L	✓✓✓	None required	✓✓✓
	C) Minimise risk to utilities infrastructure	**10**	**0**	**No utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	**5**	**2**	Approximately **26 hectares of agriculture land** not benefiting from flood defences at risk of flooding.	Option has no impact on agricultural land not benefiting from flood risk management measures	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life.**	**30**	**1**	**5 residential properties** at risk **No high vulnerability properties** at risk from flooding.	Option provides protection to 4 of the 5 residential properties at risk of flooding up to the 0.1% AEP. Partly achieving aspirational target.	3	90	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community.	**10**	**0**	**No non residential building** at risk **No high-value social infrastructural assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Minimise risk to, or enhance, social amenity	**5**	**0**	**No social amenity** sites at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	**5**	**5**	The APSR contains two river waterbodies, both of which are classified as being of poor status meaning that improvements in status is required; although existing defences are not identified as a morphological pressure. The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture, wastewater and industrial discharges and septic tanks.	Potential constraint to the achievement of WFD objectives as the new flood defence structures, together with the raised existing structures, could create a new morphological pressure. Just failing minimum target.	-1	-25	L	P	L	X	Ensure that the new flood defences are designed in such a way to limit potential morphological pressure and enable the river to maintain and develop its natural course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the relevant waterbodies.	X
	B) Minimise risk of environmental pollution	**15**	**0**	**No potential sources of pollution** at risk or present in this APSR	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	**10**	**4**	Within the APSR, **Duleek Commons pNHA** is designated for its calcareous marsh and fen system. Approximately 5.4 hectares is at risk of flooding, which represents 15% of the overall area of this pNHA. Given the wet nature of the habitats in this site, the risk of flooding is not considered a concern and may be beneficial to the site. The **River Nanny Estuary & Shore SPA**, important for its (non breeding) bird populations, including five species in nationally important numbers, and **Laytown Dunes/Nanny Estuary pNHA** are approximately 9km downstream of the APSR. 26 sites listed on Meath County Council's Wetland Inventory are present within the APSR. Within the APSR, the river primarily runs through rural areas and, although modified along short stretches, is likely to be of biodiversity interest. The river and other channels within the APSR, and their floodplain, support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Provision of new embankments and raising of the existing embankments/walls, would only make a significant difference to the volume of water in the river during a 0.1% AEP flood event. This, combined with the distance of the works from the River Nanny Estuary & Shore SPA (approximately 9km) indicates that a significant effect on the SPA is unlikely. Potential for localised loss/disturbance of terrestrial habitat and species in the footprint of the new embankments or the construction works. Also, potential for loss of marginal habitats and associated supporting species on the Parmadan River. Just failing minimum target.	-1	-40	S	T	L	X	Assess and identify the specific ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial and riverine habitats and species of nature conservation value. Consult with NPWS and the MCC heritage/biodiversity officer at the option development stage of the scheme	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	**5**	**3**	The Nanny river and other streams within the APSR support or are capable of supporting salmonid species and are likely to provide salmonid spawning or nursery areas. These watercourses may also potentially support brook, river and/or sea lamprey. There is known angling activity along the River Nanny, though the exact locations of popular angling areas are unknown. There are no fisheries designations within the APSR (e.g. Salmonid Waters) and no known barriers to fish movement.	Potential for localised loss of or disturbance to riverine habitat and dependent fisheries during construction of new flood defences, and potential for changes in turbidity and sediment dispersion/deposition. Ecological impacts associated with the raising of existing defences (depending on the increased base of defence required) are considered unlikely, assuming appropriate working practices are implemented. Potential for works to disrupt access for anglers during construction, although there is a potential for enhancement of facilities. Just failing minimum target.	-1	-15	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and angling facilities at the option development stage of the scheme in consultation with Inland Fisheries Ireland and relevant angling bodies	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	**5**	**3**	The APSR falls within the **Central Lowlands** landscape character area (of regional importance). This landscape type is classified as being of medium sensitivity	Adverse change in visual amenity, and potentially a deterioration in local landscape character, resulting from the introduction of new flood defence structures (60m) and raising of existing defences by an average of 1.4m, within a sensitive landscape setting. Partly failing minimum target.	-3	-45	L	P	L	XX	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**2**	**Four features** on SMR/RPS at risk: three sites on SMR (two bridges at Prioryland and an enclosure at Prioryland), and one site on the RPS at risk (Ring Barrow at Abbeyland). Additional sites (not at risk) within immediate vicinity. No ACAs present.	There would be no change in flood risk to the four sites, although the introduction of new flood defence structures within their immediate vicinity would be expected to affect their historical setting. Further, a small number of additional heritage sites not identified as being at risk, would also experience a change in their historical setting. Just failing minimum target.	-1	-10	L	P	L	X	Design the appearance of the new flood defence structures and raised structures to complement the historical setting of the sites. Consult with the DAHGA and the MCC heritage/archaeological officer during scheme development prior to construction.	X

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Ratoath APSR**
Option Description:	**Improving channel conveyance by replacing a bridge on the Broadmeadow River at the R125 Ratoath Road and replacing a culvert on a tributary of the Broadmeadow River**

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	**5**	**3**	Approximately **90m of Regional roads** at risk in Ratoath area APSR.	The 90m of regional road at risk in Ratoath is protected by this option up to the 1% AEP event. There is likely to be some residual flooding for the 0.1%AEP although the extent of flooding will be reduced due to the increased capacity of the culverts. Partly	3	45	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	**10**	**0**	No utility assets at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	**5**	**1**	**2.7 hectares of agriculture land** not benefiting from flood defences at risk of flooding (1% AEP fluvial event).	This option results in a reduction in flood risk to agricultural land due to the increased flow through the culverts. Approximately 2ha of agricultural land (>70% of at risk land) will be protected from the 1% AEP event. There will also be some reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	15	L	P	L	✓✓	None required	✓✓
Social	**A) Minimise risk to human health and life.**	**30**	**1**	**9 residential properties** at risk in Ratoath area APSR No **high vulnerability properties** at risk from flooding.	This option fully protects properties at risk up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	90	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community.	**10**	**0**	No **non-residential building** at risk (1% AEP fluvial event). No large commercial business parks at risk. No **high-value social infrastructural assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Minimise risk to, or enhance, social amenity.	**5**	**0**	No **flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	**5**	**5**	The APSR contains three river water bodies: 1 = good status; (i.e. no deterioration allowed); 2 = bad status (i.e. improvements in status required). The RBMP reports that problems constraining achievement of good status include high nutrients, low	Improved channel conveyance will be achieved by replacing the existing hard structures with new replacement hard structures within the channel. This presents both opportunities and constraints to improving the existing status of the river water bodies; although overall there willl be no change. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	**15**	**0**	There are no potentially polluting sites at risk within the APSR (1% AEP fluvial event). There are also no waste management permit sites at risk. There are no Section 4 or Section 16 licenses present in the APSR.	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	**10**	**3**	There are **no designated nature conservation sites** within the APSR. Approximately 20km downstream are the Malahide Estuary SAC/pNHA and the Broadmeadow-Swords Estuary SPA/Ramsar site. The stretch of the Broadmeadow River flowing through the APSR is listed on Meath County Council's Wetland Inventory. 26 hectares of a Potential Top Wetland Site (large bog complexes) are at risk of flooding to the east of Dunshaughlin area APSR. Within the APSR, the river primarily runs through rural areas and, although modified along short stretches, is likely to be of biodiversity interest. The river and other channels within the APSR, and their floodplain, support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Localised loss of/disturbance to terrestrial and riverine habitats and species beneath and potentially adjacent to, the footprint of the new structures Any changes in flow regime and water levels of the river will be localised and are therefore unlikely to affect designated nature conservation sites approximately 20km downstream. There is potential for increased flow to promote pool formation with increased habitat diversity for aquatic flora and fauna. Just failing minimum target.	-1	-30	S	T	L	X	Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial and riverine habitats and species of nature conservation value.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	**5**	**3**	The Broadmeadow river and other streams within the APSR support or are capable of supporting salmonid species and are likely provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. There are no fisheries designations within the APSR (e.g. Salmonid Waters). There are known areas of angling activity along the Broadmeadow River, which potentially fall within the APSR. There are no known barriers to fish movement on the watercourses within the APSR.	Potential loss of/disturbance to fish habitat and potential disruption to angling activity (if present) in the vicinity of the two new structures during the construction period. Changes in flow speeds have the potential to affect local fish habitat, but the increased flow and water levels are likely to be dissipated downstream. There may be some improvements to fisheries as a result of improved channel conveyance, however, overall, there may be a net loss of habitat in the footprint or adjacent to the structures. Overall, just failing minimum target.	-1	-15	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and consult with Inland Fisheries Ireland.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	**5**	**4**	The primary landscape character area of this APSR is **The Ward Lowlands** (high sensitivity), though there are also small areas which fall within the **South East Lowlands** (sensitivity unknown) and **Central Lowlands** (medium sensitivity) character areas. There are no designated 'Important Views' in this APSR.	Potential for temporary change in landscape character and visual amenity during the construction works, though any impacts would be localised within the river channel. Just failing minimum target.	-1	-20	S	T	L	X	Design the appearance of the new flood defence structures and minimise visual intrusion during construction to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**0**	No sites on SMR/RPS/RMP at risk. No ACA designated within APSR.	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A

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Permanence		
T	Temporary	Effects that occur during construction
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Scale		
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N	National	Wider than AU/study area

Score / Significance	MCA	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Rowlestown East APSR**
Option Description:	**Construction of flood defence embankments along left bank of Broadmeadow River tributary upstream of R125**

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	Approximately **80m of Regional (R) roads** at risk in Rowelstown East area APSR	The R125 is protected by this option up to the 1% AEP. There will be some residual flooding for the 0.1% AEP although the extent of flooding will be reduced. Partly achieving aspirational target.	3	45	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	10	0	No **utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land	5	2	**5.4 hectares of agriculture land** not benefiting from flood defences at risk of flooding (1% AEP fluvial event).	This option results in a reduction in flood risk to agricultural land due to the proposed embankments. Approximately 2.4ha of agricultural land (<50% of at the risk land) will be protected from the 1% AEP event. There will also be some reduction in risk from the 0.1% AEP event. Therefore, exceeding minimum target.	1	10	L	P	L	✓	None required	✓
Social	**A) Minimise risk to human health and life**	30	1	**2 residential properties** at risk in Rowelstown East area APSR No **high vulnerability properties** at risk from flooding.	This option fully protects properties at risk up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	90	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	0	No **non-residential building** at risk (1% AEP fluvial event). No large commercial business parks at risk.	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Minimise risk to, or enhance, social amenity	5	0	No **flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	5	5	The APSR contains three river water bodies, all of which are classified as being of poor status. The RBMP reports that problems constraining achievement of good status include high nutrients, low ecological rating and dredging; with the principal causes identified as agriculture (diffuse pollution) and wastewater and industrial discharges (septic tank pollution). The measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc) and to ensure compliance with OPW Environmental Drainage Maintenance Guidance Notes	Potential to constrain the achievement of WFD objectives as introduction of a flood defence embankment along the Broadmeadow River on an unmodified section of the river could present a hydromorphological pressure. However, the length of the embankment (170m) in relation to the length of the river is considered to be short. Just failing minimum target.	-1	-25	L	P	L	X	Ensure that the new flood defences are designed in such a way to limit potential morphological pressure (e.g. by setting back defences) and enable the river to maintain and develop its natural course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the three waterbodies.	X
	B) Minimise risk of environmental pollution	15	5	There are no potentially polluting sites at risk within the APSR (1% AEP fluvial event). There are **two waste management permit sites** at risk along the Broadmeadow River within the APSR. There are no Section 4 or Section 16 licenses present in the APSR.	No positive or negative change in flood risk to potentially polluting sites within the APSR as options involves works downstream of the sites. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	There are **no internationally or nationally designated nature conservation sites within the APSR.** Approximately 6km downstream are the **Malahide Estuary cSAC/pNHA** and the **Broadmeadow-Swords Estuary SPA/Ramsar site**. Within the APSR, the river primarily runs through rural areas and, although modified along short stretches, is likely to be of biodiversity interest. The river and other channels within the APSR, and their floodplain, support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Potential for impacts on designated nature conservation sites downstream (e.g. potential changes in frequency and duration of flooding). However, given that the embankment provides protection during a 1% AEP flood event (1 in 100 chance in any given year) and the distance of the conservation sites from the proposed works, the frequency of any impact is anticipated to be low and no effects are predicted. Localised loss of/disturbance to terrestrial habitats and species beneath, and potentially adjacent to, the footprint of the flood defence embankment. Impact on riverine/marginal habitats/species.	-1	-50	S	T	L	X	Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial and riverine habitats and species of nature conservation value.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	3	The Broadmeadow river and other streams within the APSR support or are capable of supporting salmonid species and are likely provide salmonid spawning or nursery areas. These watercourses are also likely to support brook, river and/or sea lamprey. There are no fisheries designations within the APSR (e.g. Salmonid Waters). There are known areas of angling activity along the Broadmeadow River, which potentially fall within the APSR. There are no known barriers to fish movement on the watercourses within the APSR.	Potential disturbance to riverine habitat, dependent fisheries and potential disturbance to angling activity during construction period, although no works would be required directly within the watercourse. The construction of new flood defence embankments may constrain angling access if present within the vicinity of the works, although they could present opportunities for enhancement. Overall, just failing minimum target.	-1	-15	S	T	L	X	Avoid direct impacts within the river corridor and associated riparian habitat. Follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and angling facilities at the option development stage of the scheme in consultation with Inland Fisheries Ireland and relevant angling bodies	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	3	The landscape character of this APSR is classified as **Rolling Hills,** classified as being of medium sensitivity and modest value. There are no designated 'Important Views' in this APSR.	Likely change in local landscape character and visual amenity, resulting from the introduction of a new flood defence embankment to a height of 0.85m (170m length). As the surrounding landscape is classified as being of medium sensitivity, the changes will result in the option partly failing the minimum target.	-3	-45	L	P	L	XX	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	Within the APSR, a **single site unique to RPS** (description unknown) and **two sites unique to RMP** (graveyard of moderate vulnerability and an unclassified site) are known to be at risk of flooding. 0.8ha of an **ACA at risk** at Rowelstown representing approximately 10% of the total ACA.	All three sites could potentially experience a reduction in flood risk on completion of the new flood defence embankment. Further, the setting of each of the sites would be unlikely to be affected by the option, due to the nature and scale of the embankment. The embankment would be located outside of the designated ACA so its setting would not be affected. Exceeding minimum target.	1	10	L	P	L	✓	None required	✓

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Scale
Sig = Significance
RS = Residual significance

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S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
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Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**St Margaret's, Dublin Airport, Belcamp and Balgriffin areas APSR**
Option Description:	**Balgriffin: Improve channel conveyance by removing old bridge structure combined with construction of flood defence embankments & walls upstream of R123 and along left bank of Mayne River and tributary**

Category	Objective	GW	LW	Baseline	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	**5**	**4**	Approximately **0.1km of National Primary** roads and **0.6km of Regional** roads at risk.	The R123 is protected by this option up to the 1% AEP. There will be some residual flooding for the 0.1% AEP although the extent of flooding will be reduced. Partly achieving aspirational target.	3	60	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	**10**	**0**	**No utility infrastructure assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	**5**	**1**	Approximately **5 hectares of agriculture land** not benefiting from flood defences at risk of flooding.	This option results in a small increase in flood risk to agricultural land upstream of the R123 due to the construction of the embankment. Therefore, just failing minimum target.	-1	-5	L	P	L	X	No specific actions are identified at this stage, but further consideration will be undertaken when details of the specific agricultural land use and assoicated impacts are known	X
Social	**A) Minimise risk to human health and life**	**30**	**2**	**19 residential properties** at risk. **No high vulnerability properties** at risk	This option fully protects properties at risk up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	**10**	**1**	**2 non-residential properties** at risk **No high-value social infrastructural assets** at risk from flooding	This option fully protects the non-residential properties at risk up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	30	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to, or enhance, social amenity	**5**	**1**	**Sports pitches** at ALSAA sports complex near Dublin Airport	Option would have no impact on sports pitches. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
Environmental	**A) Support the objectives of the WFD**	**5**	**5**	The APSR contains areas of three river waterbodies: 1 = high status; 2 = poor status. The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), oxygen demand, low ecological rating and inferior habitat, with the principal pressure within the WMU (which also includes the Santry River to the south of the study area/AU) are wastewater and industrial discharges and diffuse pollution.	Potential constraint to the achievement of WFD objectives as the proposed floodwalls could create a new morphological pressure. Removal of the old bridge structure presents an opportunity to remove a physical constraint. Overall, just failing minimum target.	-1	-25	L	P	L	X	Ensure that the new flood defences are designed in such a way to limit potential morphological pressure and enable the river to maintain and develop its natural course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the three waterbodies.	X
	B) Minimise risk of environmental pollution	**15**	**0**	**No Waste Management Permit Sites** at risk. **Six Section 4** and **17 Section 16 licences** granted in the APSR - these sites are not at risk of flooding	No sites at risk; no change anticipated. All Section 4 and Section 16 licences are held in locations outside of the area anticipated to experience a change in water level. Thus, no risk to water quality anticipated. Meeting minimum target.	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	**10**	**5**	There are **no internationally or nationally designated nature conservation sites within the APSR**. However, approximately 1.5km downstream is the **Baldoyle Bay cSAC/SPA/Ramsar site/pNHA**. This bay contains large areas of sandflats, mudflats and saltmarshes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further seven waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, exten and character of intertidal habitat for which the site is designated, with associated impacts on designated waterbird populations. The river primarily runs through rural areas in this APSR, and, although modified along short stretches, is likely to be of biodiversity interest. The river and other channels within the APSR, and their floodplain, support or have the potential to support legally protected species or other species o conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Increased conveyance through this channel and the introduction of new flood embankments and a floodwall is likely to change the pattern of flow downstream of the APSR during a 1% AEP flood event (1 in 100 chance in any given year), and possibly during a 10% AEP flood event (1 in 10 chance). In particular, for Baldoyle Bay pNHA and Baldoyle Bay cSAC/SPA (approx 1.5km downstream and 2km downstream of proposed works respectively), there is the potential for these sites to be affected by a change in the pattern of freshwater input. However, any effects on these designated sites are expected to be localised. Undertaking works within the channel is anticipated to result in disturbance to and potential loss of riverine and terrestrial habitats and species, albeit localised, particularly given that these sections of the channel appear to be un-modified. Overall, option considered to be just failing minimum target. *The Appropriate Assessment has concluded that is unlikely to have an adverse effect on the integrity of Baldoyle Bay cSAC/SPA and its Special Conservation Interests because of the localised nature of the effects.*	-1	-50	S	P	L	XX	Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial and riverine habitats and species of nature conservation value.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	**5**	**2**	The Mayne river is capable of supporting salmonid species and potentially provide salmonid spawning or nursery areas. There is also the potential that these watercourses may support brook, river and or sea lamprey. There are no fisheries designations within the APSR (e.g. Salmonid Waters). There are known areas of angling activity along rivers in the APSR, though the exact locations of popular angling areas are unknown. A sluice gate on the Sluice River provides a barrier to fish movement (migratory salmon).	Potential loss of/disturbance to riverine habitat and dependent fisheries during the construction of the flood embankments and flood walls to the channel floor. No new barriers to fish movement are proposed. Having reviewed aerial photographs of the works area, no impacts on angling activity are anticipated. Just failing minimum target.	-1	-10	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and consult with Inland Fisheries Ireland.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	**5**	**3**	The APSR falls within the **Low Lying** character type, classified as being of modest value and medium sensitivity. Fingal County Council also designates 'Important Views'; though none are present within the APSR.	Adverse change in visual amenity (though there are no Important Views present), and potentially local landscape character, resulting from introduction of new flood defence structures within a sensitive landscape setting [medium sensitivity]. Removal of old bridge may also result in a change to local landscape character. Just failing minimum target.	-1	-15	L	P	L	X	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**2**	4 Sites on SMR/RMP at risk (1% AEP fluvial event). 3 sites unique to RMP (a possible castle site and dwelling at Balgriffin Park, and classcode MOND). The remaining site, a building at Balgriffin Park, is unique to the SMR. No ACAs present.	Balgriffin Park is located approximately 350m from the proposed works. Due to the height of the proposed embankments/wall at less than 1m and the intervening vegetation and buildings, no effects on the historical setting of these features are anticipated. Flood risk to these features will also not change as a result of the proposed works. Therefore, meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

KEY

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WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limted to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Portmarnock and Malahide areas APSR**
Option Description:	**Strand Road, Portmarnock: Rehabilitating and raising existing coastal defences at Strand Road (including rehabilitation walls and flapped outfall) and construction of flood defence embankmen**

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Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limted to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-6	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	**5**	**3**	**No rail** at risk Approximately **1km of roads** at risk (0.65 km of the R106 at Strand Road and 0.35km of	The R106 is protected by this option up to the 1% AEP. There will be some residual flooding for the 0.1%AEP although the extent of flooding will be reduced. Partly achieving aspirational target.	3	45	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	**10**	**0**	No **utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	**5**	**2**	Approximately **38 hectares of agriculture land** not benefiting from flood defences at risk of flooding	This option reduces the flood risk to approximately 0.2ha of agricultural land (<1% of total area). As benefit is to such a tiny percentage of land assume meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	**30**	**2**	**46 residential properties** at risk in Portmarnock and Malahide areas APSR (17 at risk at Strand Road, Portmarnock and 22 at risk in Malahide town centre) . **No high vulnerability properties** at risk from flooding.	This option fully protects properties on Strand Road at risk up to the 0.5% AEP event and provides reduction in risk from the 0.1% AEP event in the Portmarnock flood cell. Therefore, partly achieving aspirational target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	**10**	**1**	**16 non residential buildings at risk** (1 at risk at Strand Road - Strand centre and 15 at risk in Malahide). **No high-value social infrastructural assets** at risk	This option fully protects 1 non-residential property on Strand Road at risk up to the 0.5% AEP event and provides reduction in risk from the 0.1% AEP event in the Portmarnock flood cell. Therefore, partly achieving aspirational target.	3	30	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to, or enhance, social amenity	**5**	**0**	**No flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	**5**	**5**	The APSR contains two river waterbodies, one of which is classified as being of high status (to be maintained); the other is classified as being of poor status (improvement required). The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. Along the eastern and southern boundaries of the APSR are Broadmeadow Water and Mayne Estuary respectfully; both are transitional (i.e. estuarine) waterbodies, and both are classified as being of moderate status/potential. Broadmeadow Water is also designated as a heavily modified water body (HMWB). The RBMP reports that the problems constraining achievement of good status/potential relate to pollution pressures.from agriculture, dangerous substances and wastewater and industrial discharges. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). Additional measures have been identified fo Estuary and the Broadmeadow Water (as a HMWB) relating to further investigate the risks re from the physical modification of these waterbodies. The APSR is adjacent to two coastal waterbodies: Malahide Bay and Irish Sea Dublin (HA09) = moderate status (i.e. improvements required). The RBMP reports that the problems constraining achievement of good status primarily relate to pollution pressures (although risks from phyical modifications have been identified for both waterbodies). The only measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc).	Potential constraint to the achievement of WFD objectives as the new embankement would create a new morphological pressure. It is also assumed that raising the wall will require the footprint of the defence to be increased, potentially presenting an additional hydromorphologial pressure through advancing the line. This option has been assessed as just failing minimum target.	-1	-25	L	P	L	X	Ensure that the new flood defences are designed in such a way to limit potential morphological pressure and enable the river to maintain and develop its natural course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the three waterbodies.	X
	B) Minimise risk of environmental pollution	**15**	**5**	**No WMP sites** at risk in the APSR. **Three Section 16 licenses** are present in the APSR (one at Strand Road and two in Malahide). There are no Section 4 licenses present.	No change in risk anticipated to result from implementation of this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	**10**	**5**	**Baldoyle Bay cSAC/SPA/pNHA** is located at the southern extent of the APSR. The bay contains large areas of sandflats, mudflats, and saltmarshes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further seven waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with associated impacts on designated waterbird populations. The **Broadmeadow-Swords Estuary SPA/Ramsar site** and **Malahide Estuary cSAC/pNHA** border the APSR along its northern edge. This area comprises a range of intertidal sandflats, mudflats, and saltmarshes, and sand dunes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further 15 waterfowl species. This site has similar sensitivities to Baldoyle Bay cSAC/SPA/pNHA. The **Sluice River Marsh pNHA**, situated in the APSR, is a freshwater marsh developed on th Habitats associated with the rivers, and their floodplains, and Baldoyle Bay have the potentia legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats salmon), although detailed distribution information is not available.	The existing wall to be raised is located on the boundary of Baldoyle Bay cSAC/SPA/pNHA. The raised wall will remain within the existing footprint of the defence, but there is potential for temporary damage to qualifying habitats beneath the footprint of the construction platform should it encroach into the designated site, although the area potentially affected is estimated to cover only 0.4% of the total habitat area in the cSAC. There will also be temporary disturbance (e.g. noise, line of sight etc) to qualifying habitats and species (i.e. birds) during the construction period; the degree of disturbance will depend on the timing and methodology of the construction works. Although Portmarnock and Malahide areas APSR is adjacent to Malhide/Broadmeadow Estuary cSAC/SPA, this option is located over 3km to the south of the estuary, at the head of Baldoyle Bay, and has no potential to affect Malahide/Broadmeadow Estuary. During a 0.5% AEP flood event, freshwater that previously flooded the area upstream of Portmarnock Bridge will enter the estuary directly, thus resulting in a temporary change to the pattern of freshwater input into the estuary. However, this Repairs to the flapgate will prevent saline water entering the river, thereby leading to a gradual change in conditions i.e. a river. Whilst this is considered to be a positive impact on the river, the repaired flapgate will effectively restrict the extent of downstream of the bridge. Localised loss of/disturbance to terrestrial and riverine habitats and species beneath, and potentially adjacent to, the areas Located approximately 500m from the works area, Sluice River Marsh pNHA will be affected to some degree by the propo Overall, partly failing minimum target. *The Appropriate Assessment has concluded that is not likely to adversely affect the Baldoyle Bay cSAC/SPA and its Special Conservation Interests, provided that recommended mitigation measures are imp*	-3	-150	S	P	L	XX	Minimise the footprint of the proposed works at the detailed design and construction phases to avoid, as far as possible, the intertidal zone. Undertake the works outside the main migration and wintering season for the birds. Reduce noise and visual disturbance using appropriate construction methods. Create new intertidal habitat to replace any lost under the footprint of the works or that may be lost through coastal squeeze. Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial, riverine and estuarine habitats and species of nature conservation value.	X

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
	D) Avoid damage to, and where possible enhance, fisheries within the study area	**5**	**5**	All rivers and streams within the APSR support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the AU area are also likely to support brook, river and/or sea lamprey. The estuaries provide spawning, nursery and feeding habitats for a range of fish species, particularly bass, sand goby, grey mullet, flounder and sprat. In addition, important migratory fish species, namely salmon, sea trout, eels and lampreys, pass through on their way to or from their spawning grounds. There is a known barrier to fish movement (migratory salmon) on the Sluice River due to the presence of an impassable weir; however, its exact location is unknown. Portmarnock is a key location for recreational sea fishing. Also, there are known areas of angling along the Sluice River in the APSR, though the exact locations of popular angling areas are unknown. There are Shellfish Waters at Malahide, off the coastline of this APSR, designated under the EU Shellfish Waters Directive.	Potential for negative impacts on fisheries during in-channel works (e.g. replacement of flap gates) due to loss of habitat and potential disturbance associated with changes in turbidity etc. As new flap gates would remain open for most of the day, migratory fish movement would still be possible and current velocities are likely to be similar to the present. Potential for localised disruption to angling access. As the proposed works are located at the head of Baldoyle Bay, and any effects are expected to be localised, no downstream changes in estuarine/coastal processes are predicted that would affect the Shellfish Waters which lie in the Irish Sea north of Baldoyle Bay entrance. Just failing minimum target.	-1	-25	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce impacts on bankside/estuarine habitat. Consult with Inland Fisheries Ireland and relevant angling bodies at the option development stage of the scheme.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	**5**	**4**	The APSR falls within three landscape character types: **Coastal**, **Estuary** (both classified as being of high sensitivity and exceptional value), and **Low Lying** (classified as being of low sensitivity and modest value). The R106 along the eastern and northern boundaries of the APSR, fronting the Portmarnock Point (approx. 2km) and the Malahide Estuary (approx. 4.5km) respectively, is designated an 'Important View' (Fingal County Council designation).	Although flood defence structures already exist in this area, raising of the defences in this highly sensitive landscape, alongside a road which is designated as an 'Important View', is likely to cause a deterioration in landscape character and permanent adverse change in visual amenity. Partly failing minimum target.	-3	-60	L	P	L	XX	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	**5**	**2**	**1 Site on RPS** at risk (nature of site unknown) Less than **0.1 hectares of Malahide Castle Demesne ACA** at risk, which represents less than 1% of the total ACA.	This option will not reduce the level of flood risk at this site. Also, due to the nature of the works and their location in relation to the historical site, the option will not affect the historical setting of the site. Meeting minimum target.	0	0	N/A	N/A	N/A	-	N/A	-

Location:	**Portmarnock and Malahide areas APSR**
Option Description:	**Malahide town centre: Construction of demountable flood defences at underpass along with floodwalls to protect at risk properties in Malahide town centre**

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Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	2	**No rail** at risk Approximately **1km of roads** at risk (0.65 km of the R106 at Strand Road and 0.35km of secondary roads in Malahide)	This option will protect the secondary roads at risk in Malahide town centre up to the 0.5% AEP event and will reduce flood risk from the 0.1% AEP event. Partly achieving aspirational target.	3	30	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	10	0	No **utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	5	2	Approximately **38 hectares of agriculture land** not benefiting from flood defences at risk of flooding	This option has no impact on agricultural land	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**46 residential properties** at risk in Portmarnock and Malahide areas APSR (17 at risk at Strand Road, Portmarnock and 22 at risk in Malahide town centre) . **No high vulnerability properties** at risk from flooding.	This option fully protects properties in Malahide town centre at risk up to the 0.5% AEP event and provides a significant reduction in risk from the 0.1% AEP event in the Malahide town centre flood cell. Therefore, exceeding minimum target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	1	**16 non residential buildings at risk** (1 at risk at Strand Road - Strand centre and 15 at risk in Malahide). **No high-value social infrastructural assets** at risk	This option fully protects the 15 non-residential properties in Malahide town centre at risk up to the 0.5% AEP event and provides significant reduction in risk from the 0.1% AEP event in the Malahide town centre flood cell. Therefore, partly achieving aspirational target.	3	30	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to, or enhance, social amenity	5	0	**No flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	5	5	The APSR contains two river waterbodies, one of which is classified as being of high status (to be maintained); the other is classified as being of poor status (improvement required). The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. Along the eastern and southern boundaries of the APSR are Broadmeadow Water and Mayne Estuary respectfully; both are transitional (i.e. estuarine) waterbodies, and both are classified as being of moderate status/potential. Broadmeadow Water is also designated as a heavily modified water body (HMWB). The RBMP reports that the problems constraining achievement of good status/potential relate to pollution pressures.from agriculture, dangerous substances and wastewater and industrial discharges. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). Additional measures have been identified for the Mayne Estuary and the Broadmeadow Water (as a HMWB) relating to further investigate the risks resulting from the physical modification of these waterbodies. The APSR is adjacent to two coastal waterbodies: Malahide Bay and Irish Sea Dublin (HA09) = moderate status (i.e. improvements required). The RBMP reports that the problems constraining achievement of good status primarily relate to pollution pressures (although risks from phyical modifications have been identified for both waterbodies). The only measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc).	New structures situated along an already modified stretch of coastline. Therefore, although the proposals will not improve the existing status, there will be no constraint to the achievement of WFD objectives. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	5	**No WMP sites** at risk in the APSR. **Three Section 16 licenses** are present in the APSR (one at Strand Road and two in Malahide) There are no Section 4 licenses present.	No change in risk anticipated to result from implementation of this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	**Baldoyle Bay SAC/SPA/pNHA** is located at the southern extent of the APSR. The bay contains large areas of sandflats, mudflats, and saltmarshes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further seven waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with associated impacts on designated waterbird populations. In addition, the **Broadmeadow-Swords Estuary SPA/Ramsar site** and **Malahide Estuary cSAC/pNHA** border the APSR along its northern edge. This area comprises a range of intertidal sandflats, mudflats, and saltmarshes, and sand dunes, and supports internationally important wintering populations of Brent geese as well as nationally important populations of a further 12 waterfowl species. This site has similar sensitivities to Baldoyle Bay cSAC/SPA/pNHA. **Sluice River Marsh pNHA**, situated in the APSR, has been proposed as it provides a good example of a relatively intact freshwater marsh, but this is situated at the head of Baldoyle Bay and will not be affected by this option. Habitats associated with the rivers, and their floodplains, and Baldoyle Bay have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Despite being located within the Malahide Estuary cSAC/pNHA boundary, the new embankment/demountable defences are not anticipated to have any direct impact on cSAC interest features, though there is the potential for disturbance to SPA bird species during the construction period. There is also potential for localised (temporary) disturbance to other habitats/species during the construction period. Just failing minimum target. *The Appropriate Assessment concluded no adverse effect on the integrity of the SPA and cSAC and their Special Conservation Interests, provided that recommended mitigation measures are implemented.*	-1	-50	S	T	L	X	The proposed works should take place between April and August to avoid the main migration and wintering period. Appropriate construction methods should be used to minimise noise and visual disturbance. Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial, riverine and estuarine habitats and species of nature conservation value.	X

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	5	All rivers and streams within the APSR support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the AU area are also likely to support brook, river and/or sea lamprey. The estuaries provide spawning, nursery and feeding habitats for a range of fish species, particularly bass, sand goby, grey mullet, flounder and sprat. In addition, important migratory fish species, namely salmon, sea trout, eels and lampreys, pass through on their way to or from their spawning grounds. There is a known barrier to fish movement (migratory salmon) on the Sluice River due to the presence of an impassable weir; however, its exact location is unknown. Portmarnock is a key location for recreational sea fishing. Also, there are known areas of angling along the Sluice River in the APSR, though the exact locations of popular angling areas are unknown. There are **Shellfish Waters** at Malahide, off the coastline of this APSR, designated under the EU Shellfish Waters Directive.	Loss of / disturbance to estuarine habitat and associated fisheries is unlikely during construction of the defences as there will be no works within the water itself. No disruption to angling anticipated. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The APSR falls within three landscape character areas: **Coastal**, **Estuary** (both classified as being of high sensitivity and exceptional value), and**Low Lying Agricultural** (classified as being of low sensitivity and modest value). The R106 along the eastern and northern boundaries of the APSR, fronting the Portmarnock Point (approx. 2km) and the Malahide Estuary (approx. 4.5km) respectively, is designated an 'Important View' (Fingal County Council designation).	Localised change in visual amenity in an area which is designated an 'Important View', and potential deterioration in local landscape character, due to the introduction of new flood defence structures. However, due to the the short length of the proposed defences, option is considered to be just failing minimum target.	-1	-20	L	P	L	X	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	**1 Site on RPS** at risk (nature of site unknown) Less than **0.1 hectares of Malahide Castle Demesne ACA** at risk, which represents less than 1% of the total ACA.	Option will not reduce the level of flood risk at this site. Nor, due to the nature of the works and their location in relation to the historical site, will the option affect the historical setting of the site. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

Location:	**Swords area APSR**
Option Description:	**Aspen: Improve channel conveyance by widening the Gaybrook Stream to reduce fluvial flood risk to properties at Aspen near Kinsaley**

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	1	**No rail** at risk Approximately **120m of roads** at risk, including approximately 20m of the R125 and short lengths of secondary and tertiary roads.	This option prevents flood risk to the local roads in the Aspen flood cell for the 1% AEP an reduces flood risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	15	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	10	0	No **utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	5	2	Approximately **12 hectares of agriculture land** not benefiting from flood defences at risk of flooding.	This option has no impact on the risk to agricultural land. Therefore, meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	1	**13 residential properties** at risk including 9 at Aspen and none in Swords town centre. The remaining 4 residential properties at risk are in isolated areas around Swords APSR **No high vulnerability properties** at risk from flooding.	This option fully protects properties at risk in Aspen up to the 1% AEP event and the 0.1% AEP event (contained within the larger channel but with reduced freeboard). It has no impact on the other at risk residential properties in the APSR. Therefore, partly achieving aspirational target.	3	90	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	0	**14 non residential properties** at risk in Swords area APSR including 6 in Swords town centre. 4 non-residential properties in **1 retail park** at risk (Airside Retail Park) in Swords area APSR. **1 high-value social infrastructural asset** at risk, a fire station in Swords.	This option has no impact on any of the properties at risk.	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Minimise risk to, or enhance, social amenity	5	0	**No flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	5	5	The APSR contains four river waterbodies one = high status (to be maintained), two = moderate status, one = poor status (improvement required). The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. At the eastern extent of the APSR, is the Broadmeadow Water, a transitional (i.e. estuarine) and heavily modified water body (HMWB) classified as moderate potential. The RBMP reports that the problems constraining achievement of good potential relate to pollution pressures from agriculture, dangerous substances and wastewater and industrial discharges. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). Additional measures have been identified for the Broadmeadow Water (as a HMWB) relating to further investigate the risks resulting from the physical modification of this waterbody.	By changing the morphology of the channel through widening, this option has the potential to constrain to the achievement of WFD objectives. Due to uncertainty, the precautionary principle has been applied, and option has been assessed as just failing minimum target.	-1	-25	L	P	L	X	Ensure that the channel works are undertaken in such a way to enable the river to maintain and develop its natura course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the river waterbody.	X
	B) Minimise risk of environmental pollution	15	0	**No WMP sites** at risk. **7 Section 16 licences** present (6 of which are located along the Ward and Broadmeadow Rivers in Swords town and 1 on the Gaybrook Stream). **2 Section 4 licences** present (located in Swords town along the Ward and Broadmeadow Rivers).	No change in risk anticipated to result from implementation of this option. All Section 4 and Section 16 licences are held in locations outside of the area anticipated t experience a change in water level. Thus, no risk to water quality anticipated. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	The Broadmeadow River flows into the **Broadmeadow-Swords Estuary SPA/Ramsar site** and **Malahide Estuary SAC/pNHA** at the eastern extent of this APSR. This area comprises intertidal sandflats, mudflats, saltmarshes, and sand dunes, which support internationally important wintering populations of Brent geese as well as nationally important populations of further 15 waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with impacts on associated designated waterbird populations. The rivers and their floodplain within the AU support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	The area of works is located approximately 2km upstream of Broadmeadow - Swords Esuary SPA/Ramsar site and Malahide Estuary SAC/pNHA. Owing to the small size of the stream, the location of the works and the negligible hydrological effects predicted on the estuary, no impact on these designated sites is anticipated to arise as a result of the works. Widening of the channel will result in a direct loss of riverine and marginal habitats along this stretch, and species which these support. However, the widened channel would be expected to re-colonise with riverine vegetation and fauna, although the composition of this is unknown. Due to uncertainty, the precautionary principle has been applied, and option has been assessed as just failing minimum target.	-1	-50	S	T	L	X	Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on terrestrial and riverine habitats and species of nature conservation value.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	3	All rivers and streams within the APSR support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the APSR area are also likely to support brook, river and/or sea lamprey. There is the potential for angling activity along the Gaybrook Stream in the APSR. There are no fisheries designations within the APSR (e.g. Salmonid Waters), nor are there any known barriers to fish movement.	Likely loss of/or disturbance to riverine habitat and dependent fisheries during the widening of the Gaybrook Stream. The works will result in a temporary loss of angling access along this stretch (if present) although they could provide opportunities for enhancement. Just failing minimum target.	-1	-15	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and angling activities and consult with Inland Fisheries Ireland.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The APSR falls within the following three landscape character types **Estuary** (classified as being of exceptional value and high sensitivity) **Low Lying** (modest value and low sensitivity) and **Rolling Hills** (modest value and medium sensitivity). Fingal County Council also designates 'Important Views'. Within the APSR, short stretches fronting onto the Ward River are designated 'Important Views'.	The proposed works are located within an area of low sensitivity. Potential for temporary change in landscape character and visual amenity during the construction works, although in the long term, no change to visual amenity or local landscape character anticipated, assuming that there will be no loss of significant landscape elements (i.e mature trees) where widening is proposed. Just failing minimum target.	-1	-20	S	T	L	X	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	**3 Sites on RPS/RMP** at risk. Two sites on RPS (nature of sites unknown). The remaining site, a Mill site at Mill Bridge in Swords, is in both the RPS/RMP datasets. **No ACA** at risk.	The option will not reduce the level of flood risk at any of these sites or affect their historic setting. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limted to works area
R	Regional	With AU/catchment
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Rush area APSR**
Option Description:	**Rush: Improve channel conveyance by constructing secondary culvert along Channel Road to protect properties at risk from fluvial flooding along the Rush West stream**

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	2	**No rail** at risk Approximately **0.6km** of secondary and tertiary **roads** at risk	Option will reduce the risk of flooding to the transport infrastructure from a 1% AEP fluvial event to 0 and will also significantly reduce the risk from a 0.1% fluvial AEP event. However, the option will not protect the roads at risk (including the Coast Road) from the the 0.5% or 0.1% AEP tidal events. Therefore exceeding minimum target.	1	10	L	P	L	✓	None required	✓
	C) Minimise risk to utilities infrastructure	10	0	No **utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	5	1	Approximately **4 hectares of agriculture land** not benefiting from flood defences at risk of flooding.	This option has no impact on the flood risk to agricltural land	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**25 residential properties** at risk **No high vulnerability properties** at risk from flooding	This option fully protects properties at risk up to the 1% AEP event and provides a very significant reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	1	**1 non residential** building at risk **No high-value social infrastructural assets** at risk	The non-residential building is at risk from tidal flooding and therefore is not protected by this option. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	1	**1 mobile holiday home park** at risk	The mobile home park at risk is located to the north of Rush adjacent to the Rush Town Stream and is not impacted on by this option.	0	0	N/A	N/A	N/A	-	None required	-
Environmental	**A) Support the objectives of the WFD**	5	5	This APSR contains one **river waterbody** (poor status i.e. improvement required). The RBMP reports that problems constraining achievement of good status of this river waterbody include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. Also, Rogerstown Estuary, at the southern extent of the APSR, is a **transitional (estuarine) waterbody**, identified as being of moderate status. The RBMP reports that problems constraining achievement of good status include high nutrients (phosphorus), low oxygen saturation, low ecological rating and dredging; with the principal causes identified as agriculture and wastewater. The APSR is also adjacent to the Northwestern Irish Sea (HA08) **coastal waterbody, which is of** moderate status (i.e. improvements required). The RBMP reports that the problems constraining achievement of good status primarily relate to pollution pressures (although risks from phyical modifications have been identified for all waterbodies). The only measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc).	By changing the morphology of the channel through constructing a secondary culvert, this option has the potential to constrain to the achievement of WFD objectives. Due to uncertainty, the precautionary principle has been applied, and option has been assessed as just failing minimum target.	0	0	N/A	N/A	N/A	X	Ensure that the works are undertaken in such a way to enable the river to maintain and develop its natural course. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the river waterbody.	X
	B) Minimise risk of environmental pollution	15	5	Within the APSR, there is **one WMP site at risk**, adjacent to Spout Road at the eastern extent of the town. There are also two **Section 16 licenses** present within the APSR, in the centre of Rush.	The level of flood risk at the WMP site will not change as a result of the works. Both Section 16 licenses are held in locations outside of the area anticipated to experience a change in water level. Thus, no risk to water quality anticipated. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	The **Rogerstown Estuary SPA/cSAC/pNHA** is located along the southern boundary of this APSR. This area comprises intertidal sandflats, mudflats, saltmarshes, and sand dunes, which support internationally important wintering populations of Brent geese as well as nationally important populations of a further 16 waterfowl species. Changes in the catchment, which alter the flooding regime and freshwater input into the estuary could potentially affect the nature, extent and character of intertidal habitat for which the site is designated, with impacts on associated designated waterbird populations. The rivers and their floodplains, and Rogerstown Estuary and its adjacent habitats have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	This option will involve work within or on the boundary of the **Rogerstown Estuary SPA/cSAC/pNHA**. During a 1% AEP flood event, freshwater that previously left the channel upstream of the existing culvert will remain in-channel and thus enter the estuary directly, resulting in a temporary change to the pattern of freshwater input into the estuary. However, this will not affect the regular pattern of freshwater inflow. *The Appropriate Assessment concluded that, provided recommended mitigation measures are implemented, not likely to adversely affect the SPA/cSAC and its Special Conservation Interests.* Works to install new culvert will be within a modified section of the channel so disturbance to flora and fauna will be negligible. Meeting minimum target.	0	0	S	T	L	X	Scour protection should be installed at the downstream end of the culvert to protect the intertidal mudflat habitat. The proposed works should take place between April and August to avoid the main bird migration and wintering period. Appropriate construction methods should be used to minimise noise and visual disturbance of birds.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	2	All rivers and streams within the APSR support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the APSR area are also likely to support brook, river and/or sea lamprey. The estuary provides spawning, nursery and feeding habitats for a range of fish species, particularly bass, sand goby, grey mullet, flounder and sprat. In addition, important migratory fish species, namely salmon, sea trout, eels and lampreys, pass through on their way to or from their spawning grounds. Rivers and streams in the APSR have a potential recreational use for anglers, though popular angling locations are unknown. There are no fisheries designations within the APSR (e.g. Salmonid Waters), nor are there any known barriers to fish movement.	Potential loss of/disturbance to riverine habitat and dependent fisheries during the installation of the new culvert, although works will be within an already modified stretch of the watercourse. No disruption to angling or angling access anticipated. Just failing minimum target.	-1	-10	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and angling activities and consult with Inland Fisheries Ireland.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The APSR falls primarily within the **Coastal** landscape character area; the southwestern boundary of the APSR, adjacent to Rogerstown Estuary, falls within the **Estuary** landscape character area. Both landscape character areas are classified as being of high sensitivity and of exceptional value. Along the south-eastern boundary of the APSR, approximately 1km of the coastal frontage is designated an 'Important View' by Fingal County Council. Other locations receiving the same designation are: 300m and 1.2km of the R128, to the south-west and north of the APSR respectively.	Temporary change to landscape character and visual amenity during works period only. In the long term, no impacts anticipated as no change to above ground structures will result from the works. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	**Two sites on SMR/RPS** at risk. One site on the SMR is a Ritual Site - Holy Well and there is one site on the RPS (nature of site unknown). **No ACA** at risk.	The option will not reduce the level of flood risk or affect the setting at either of these sites. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-

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Abbreviations/Acronyms
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Scale
Sig = Significance
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Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Skerries area APSR**
Option Description:	**Skerries: improve channel conveyance by replacing culverts under roads and railway with larger capacity culverts and widening channel through park to reduce fluvial flood risk to properties at Millar Lane and Sherlock Park**

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	**No rail** at risk Approximately **0.2km of Regional (R)** roads at risk (R127). Approximately **1.5km of secondary and tertiary roads** at risk.	Option would protect the majority of at risk roads in the Sherlock Park/Miller Lane flood cell , including the regional roads at risk. There would still be residual risk from the 0.1% event though the risk would be reduced. Therefore, partly achieving aspirational target.	3	45	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	10	0	**No utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	5	1	Approximately **4 hectares of agriculture land** not benefiting from flood defences at risk of flooding	This option results in a reduction in flood risk to agricultural land due to the increased flow through the culverts. The majority of agricultural land will benefit from a reduction in risk as a result of this option. There will also be some reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	15	L	P	L	✓✓	None required	✓✓
Social	**A) Minimise risk to human health and life**	30	2	**59 residential properties** at risk (including 10 at Harbour Rd and 49 in Sherlock Park/Miller Lane) **No high vulnerability properties** at risk from flooding	This option fully protects properties at risk on Sherlock Park and Miller Lane up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. The option will also result in a reduction in risk from the 0.1% AEP. Therefore, partly achieving aspirational target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	0	**2 non residential properties** at risk at Harbour Rd **No high-value social infrastructural assets** at risk	This option has no impact on non-residential properties in Skerries.	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	0	**No flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	5	5	This APSR contains one **river waterbody** (good status). The APSR is also adjacent to the Northwestern Irish Sea (HA08)**coastal waterbody** of moderate status (i.e. improvements required). The RBMP reports that the problems constraining achievement of good status primarily relate to pollution pressures (although risks from phyical modifications have been identified for all waterbodies). The only measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc).	No contribution nor constraint to the achievement of WFD objectives as works will be within an already modified stretch of the channel, although channel widening has the potential to change morphology. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	B) Minimise risk of environmental pollution	15	0	**No potential sources of pollution** at risk or present in this APSR	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	**Skerries Islands SPA** comprises three small, uninhabited islands located between 0.5km and 1.5km off the coast of this APSR. There are no other internationally or nationally designated sites within or adjacent to the APSR. The coastal and river habitats within the APSR support or have the potential to support legally protected species or other species of conservation concern, although detailed distribution information is not available.	No impact on the Skerries Islands SPA due to nature and location of works Culverts will be installed within an already modified section of the channel so disturbance to flora and fauna will be negligible. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	5	The rocky coastline and islands support or are capable of supporting a variery of sea fish and shellfish species. Balbriggan and Skerries, off the coast of this APSR, are key locations for recreational sea fishing along the east coast of Ireland. Also, rivers and streams in the APSR have to support fisheries and provide a potential recreational use for anglers, though popular angling locations are unknown. There are **Shellfish Waters** at Balbriggan/Skerries, designated under the EU Shellfish Waters Directive.	Potential for temporary impacts on fisheries and angling during the construction period, although the works will be undertaken within an already modified section of the watercourse. Just failing minimum target.	-1	-25	S	T	L	X	Ensure fish passage is retained during construction and follow best practice construction measures to reduce any damage to or loss of habitat. Seek opportunities for enhancement of habitat and angling activities and consult with Inland Fisheries Ireland.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The APSR falls within the **Coastal** landscape character type (of exceptional value), parts of which are at risk from flooding. This landscape type is classified as being of high sensitivity. Stretches of the coastal road in the APSR are designated 'Important Views' by Fingal County Council: approx. 500m of the R128 in the south; approx. 500m of the R127 in the north; a 400m stretch fronting the eastern beach; and a 350m stretch fronting the western beach.	Temporary adverse change in visual amenity, and potential deterioration in local landscape character, during construction period. However, on completion of works, there will be no long term impacts as there will be no change to above ground structures. Just failing minimum target.	-1	-20	S	T	L	X	Apply best practice construction measures to minimise impacts on landscape character and visual amenity and minimise changes to channel morphology.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	**One site on RPS** at risk (nature of site unknown). **0.1 hectares of Skerries ACA** at risk which represents less than 1% of the total ACA.	Option could potentially reduce the level of flood risk to this site. Due to its distance from the works, the setting of the site would not be affected. Exceeding minimum target.	1	10	L	P	L	✓	None required	✓

KEY

Abbreviations/Acronyms
GW = Global weighting
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S = Score
WS = Weighted score
Dur = Duration

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X

Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A
Details of the global and local weighting system used are provided in Appendix A

Location:	**Laytown, Bettystown and coastal areas APSR**
Option Description:	**Laytown: Construction of flood defence embankments to protect properties at risk along the coast and from the Nanny River**

Category	Objective	GW	LW	Baseline (relates to entire APSR)	Option Assessment	S	WS	Dur	Perm	Scale	Sig	Mitigation	RS
Economic	**B) Minimise risk to transport infrastructure**	5	3	**No rail** at risk Approximately **0.45km of Regional (R) roads** at risk (R150).	The R150 is protected by this option up to the 1% AEP. There will be some residual flooding for the 0.1%AEP although the extent of flooding will be reduced. Partly achieving aspirational target.	3	45	L	P	L	✓✓	None required	✓✓
	C) Minimise risk to utilities infrastructure	10	0	**No utility assets** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	D) Minimise risk to agricultural land.	5	2	Approximately **11 hectares of agriculture land** not benefitting from flood defences at risk of flooding.	This option has no impact on flood risk to agricuiltural land. Meeting minimum target.	0	0	N/A	N/A	N/A	-	None required	-
Social	**A) Minimise risk to human health and life**	30	2	**10 residential properties** at risk **No high vulnerability properties** at risk from flooding.	This option fully protects properties at risk up to the 1% AEP event and provides reduction in risk from the 0.1% AEP event. Therefore, partly achieving aspirational target.	3	180	L	P	L	✓✓	None required	✓✓
	B) Minimise risk to community	10	1	**1 non residential building** at risk **No high-value social infrastructural assets** at risk	N/A	0	0	N/A	N/A	N/A	-	None required	-
	C) Minimise risk to, or enhance, social amenity	5	0	**No flood sensitive social amenity sites** at risk	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Environmental	**A) Support the objectives of the WFD**	5	5	The APSR borders **two transitional (estuarine) waterbodies**: the Boyne Estuary to the north, and Nanny Estuary to the south. Both are classified as being of moderate status. The RBMP reports that the problems constraining achievement of good status relate to pollution pressures from agriculture, dangerous substances and wastewater and industrial discharges. The basic measures directly relevant to the FEM FRAMS (physical modifications - morphological pressures) for all waterbodies relate to the need for compliance with legal requirements (EIA, Planning & Development Regulations etc). The APSR also borders **two coastal waterbodies**: Boyne Estuary Plume Zone and Northwestern Irish Sea (HA08) = high status (i.e. no deterioration allowed).	Potential constraint to the achievement of WFD objectives as the proposed embankments could create a new morphological pressure. Just failing minimum target.	-1	-25	L	P	L	X	Ensure that the new flood defences are designed in such a way to limit potential morphological pressure and enable the estuaries/coast to maintain and develop their natural morphology. A WFD assessment will be carried out at the scheme stage to assess the impact of the design on the waterbodies.	X
	B) Minimise risk of environmental pollution	15	0	**No potential sources of pollution** at risk or present in this APSR	N/A	0	0	N/A	N/A	N/A	N/A	N/A	N/A
	C) Avoid damage to, and where possible enhance, the flora and fauna of the study area	10	5	The **Boyne Coast and Estuary cSAC/pNHA** and the **Boyne Estuary SPA** is located alongside the northern boundary of the APSR, approximately 2km and 4km respectively from the mouth of the Nanny River. The Nanny River itself is designated as an SPA and in part, a **pNHA**. The **River Nanny Estuary & Shore SPA** covers the entire estuary and approximately 3km of shoreline to the north and south of the estuary. It is designated for seven non-breeding waterbird species, five of which occur in nationally important numbers. 7 sites listed on Meath County Council's Wetland Inventory, and 37 sites listed on the Coastal Inventory are present within the APSR. The rivers and their floodplain within the AU support or have the potential to support legally protected species or other species of conservation concern (e.g. otter, kingfisher, bats, Atlantic salmon), although detailed distribution information is not available.	Situated approximately 2km from the Boyne Coast & Estuary The new embankments will be situated within 50m of the SPA boundary, but set back at least 75m from the shore. As such, depending on the timing of the construction works, there is the potential for disturbance to roosting and foraging birds, which are designated interest features of the SPA. The new walls will be within the SPA boundary, and in places in the estuarine channel itself. As such, there will be permanent loss of estuarine habitat and disturbance to species beneath the footprint of the walls. In addition, there is potential for disturbance to the birds which are designated interest features of the SPA. Partly failing minimum target. *The Appropriate Assessment concluded no adverse effect is likely on the River Nanny Estuary and Shore SPA and its Special Conservation Interests, nor the Boyne Estuary SPA, provided that recommended mitigation measures are implemented.*	-3	-150	S	P	L	XX	Either set back the new walls and the present road to avoid intertidal zone and to compensate for future coastal squeeze, or create replacement intertidal habitat elsewhere on the estuary. Undertake proposed works between April and August to avoid the main migration and wintering period. Minimise noise and visual disturbance by use of appropriate construction methods. Assess and identify the ecological sensitivity of the works area during the development of the scheme, and identify and implement appropriate mitigation to address any identified impacts on estuarine and coastal habitats and species of nature conservation value.	X
	D) Avoid damage to, and where possible enhance, fisheries within the study area	5	5	All rivers and streams within the APSR support or are capable of supporting salmonid species such as salmon, brown trout and sea trout, and are likely to provide salmonid spawning or nursery areas. Some watercourses within the APSR area are also likely to support brook, river and/or sea lamprey. The estuaries provide spawning, nursery and feeding habitats for a range of fish species, particularly bass, sand goby, grey mullet, flounder and sprat. In addition, important migratory fish species, namely salmon, sea trout, eels and lampreys, pass through on their way to or from their spawning grounds. There are no known barriers to fish movement within the APSR. There are **Shellfish Waters** at Gormanston/Laytown, off the coastline of this APSR, designated under the EU Shellfish Waters Directive.	Potential for loss/disturbance to estuarine habitat and associated fisheries during the construction of the new flood defence structures within the river bed. Just failing minimum target.	-1	-25	S	T	L	X	Apply appropriate design and follow best practice construction measures to reduce impacts on estuarine habitat. Seek opportunities for enhancement of habitat and angling activities.	X
	E) Protect, and where possible enhance, landscape character and visual amenity within the study area	5	4	The APSR falls within the **Coastal Plains** and **Nanny Valley** landscape character areas (of regional importance). Both of these landscape types are classified as being of high sensitivity.	Adverse change in visual amenity, and potentially local landscape character, resulting from introduction of new flood defence structures within a highly sensitive landscape setting. Partly failing minimum target.	-3	-60	L	P	L	XX	Design the appearance of the new flood defence structures and raised structures to minimise impacts on landscape character and visual amenity.	X
	F) Avoid damage to or loss of features of cultural heritage importance, their setting and heritage value within the study area	5	2	**2 sites on RPS at risk**. These comprise: a detached double-pile four-bay single-storey former house, built c.1870, now in use as an office; and, a detached five-bay three-storey hotel, built c.1847, with return to rear. **No ACAs** at risk.	Both sites will experience a reduced level of flood risk following implementation of this option. However, being situated wtihin 100m of a new embankment (1m high), there may be some change to their setting. Given the reduction in flood risk, and scale of the new defences, this option is considered to be meeting the minimum target.	0	0	N/A	N/A	N/A	-	None required	-

KEY

Abbreviations/Acronyms
GW = Global weighting
LW = Local weighting
S = Score
WS = Weighted score
Dur = Duration
Perm = Permanence
Scale
Sig = Significance
RS = Residual significance

Duration		
S	Short term	Effects expected in the next 1-10 years
M	Medium term	Effects expected in the next 10-20 years
L	Long term	Effects expected in the next 20+ years

Permanence		
T	Temporary	Effects that occur during construction
P	Permanent	Effects that persist following construction

Scale		
L	Local	Within APSR or limited to works area
R	Regional	Within AU/study area
N	National	Wider than AU/study area

Score / Significance	MCA Score	Symbol
Achieving aspirational target / Major positive	5	✓✓✓
Partly achieving aspirational target / Moderate positive	3	✓✓
Exceeding minimum target / Minor positive	1	✓
Meeting minimum target / Neutral	0	-
Just failing minimum target / Minor negative	-1	X
Partly failing minimum target / Moderate negative	-3	XX
Mainly failing minimum target / Major negative	-5	XXX
Fully failing minimum target / Unacceptable	-999	XXXX
Uncertain	N/A	?

Details of the specific scoring system for each objective are provided in Appendix A

Appendix G. Appropriate Assessment, Stage 2: Statement for Appropriate Assessment

FEM-FRAMS

Fingal East Meath Flood Risk Assessment and Management Study

Appropriate Assessment
Stage 2: Statement for Appropriate Assessment

October 2011

comhairle chontae na mí
meath county council

OPW
The Office of Public Works
Oifig na nOibreacha Poiblí

Comhairle Contae Fhine Gall
Fingal County Council

HalcrowBarry

Contents amendment record

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1	0	First issue	June 2011	LB
2	0	Revised to address client comments	September 2011	LB

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Acknowledgements

In 2008, Fingal County Council (FCC), Meath County Council (MCC) and the Office of Public Works (OPW) commenced work on a Flood Risk Assessment and Management Study (FRAM Study) for the Fingal and East Meath area, as a means of addressing existing flood risk in the study area and the potential for significant increases in this risk in the future.

The Fingal East Meath Flood Risk Assessment Management Study (FEM FRAMS) was one of four pilot CFRAM studies for the new Flood Risk Assessment and Management Programme. The CFRAM studies are the core of the delivery of the new Flood Policy adopted by the Irish Government in 2004, shifting the emphasis in addressing flood risk towards a catchment-based, pro-active approach for identifying and managing existing, and potential future, flood risk'.

The principal output from FEM FRAMS is a Flood Risk Management Plan (FRMP). This has been prepared by Halcrow Barry in consultation with Fingal County Council, Meath County Council and the OPW.

An in-house Project Management Team consisting of representatives from the OPW, FCC and MCC managed the work of the Consultant on the Study. A Project Steering Group, which included representatives from the OPW, FCC, MCC, the Environmental Protection Agency, the Department of Agriculture, Fisheries and Food (DAFF, which, later on, became part of the OPW) was responsible for overseeing and directing the study, and reviewing key outputs and deliverables.

The project team would like to acknowledge and thank the data suppliers who have contributed to the project. These are listed below:

- Department of Agriculture Fisheries and Food (DAFF)
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- Forestry Services
- Geological Survey of Ireland
- Health Service Executive (HSE)
- Marcon Computation International Ltd
- Meath County Council (MCC)
- Met Eireann

- National Parks and Wildlife Services (NPWS)
- National University of Ireland, Galway
- National University of Ireland, Maynooth
- Office of Public Works (OPW)
- Teagasc
- University College Dublin (UCD)

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1. Introduction

1.1. Introduction

Halcrow Barry has been commissioned by Fingal County Council (FCC), Meath County Council (MCC) and The Office of Public Works (OPW) to prepare a Flood Risk Management Plan (FRMP) for the Fingal and East Meath (FEM) Study Area. Situated in the study area are several *Natura 2000* or European Sites designated under the EU Birds Directive[1] and Habitats Directive[2]. These are: Boyne Coast and Estuary candidate Special Area of Conservation (cSAC), Boyne Estuary Special Protection Area (SPA), River Nanny Estuary and Shore SPA, Skerries Islands SPA, Rogerstown Estuary cSAC and SPA, Broadmeadow Estuary/Swords SPA, Malahide Estuary cSAC, Baldoyle Bay cSAC and SPA and Ireland's Eye cSAC and SPA.

Under Article 6(3) of the EU Habitats Directive, an "appropriate assessment" (AA) is required where any plan or project, either alone or 'in combination' with other plans or projects, could have an adverse effect on the integrity of a European Site. This requirement is implemented in Ireland through Regulation 15 of the European Union (Natural Habitats) Regulations, SI 94/1997, as amended; and Circular Letter SEA 1/08 & NPWS 1/08[3]. Guidance in undertaking an appropriate assessment in Ireland is provided by the Department of Environment, Heritage and Local Government (DEHLG) (DEHLG, 2009)[4]. In addition, Draft European Communities (Birds and Natural Habitats) Regulations 2010 have been prepared to consolidate and update existing regulations, and were subject to public consultation in August 2010, but they have not yet entered into force.

The Screening for Appropriate Assessment stage (Stage 1) has concluded that the proposed draft Fingal East Meath FRMP has the potential to have significant effects, either alone or in-combination, on seven of the European Sites considered, and, therefore, that an appropriate assessment (AA) is required. The screening assessment was submitted to the Development Applications Unit of the DEHLG, in April 2011, which agreed with the conclusion that the FRMP should be subjected to a Stage 2 Appropriate Assessment (see Appendix A). Consequently this Statement for AA has been prepared in accordance with the DEHLG (2009) guidance, to "*examine the direct and indirect impacts that the plan . . . might have on its own or in combination with other plans or projects, on one or more Natura 2000 sites in view of the sites' conservation objectives*"[5].

[1] Council Directive 79/409/EEC on the conservation of wild birds (the 'Birds Directive'). This has now been replaced by Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version)
[2] Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (the 'Habitats Directive')
[3] Department of Environment, Heritage and Local Government Circular Letter SEA 1/08 & NPWS 1/08. Appropriate Assessment of Land Use Plans. 15 February, 2008
[4] DEHLG (2009) *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* Department of Environment, Heritage and Local Government, Dublin.
[5] DEHLG (2009) *Op.cit.*, p23

1.2. Habitats Directive requirements

Article 6(3) of the EU Habitats Directive requires that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Consequently, Circular Letter SEA 1/08 & NPWS 1/08 requires that, in Ireland:

Any draft land use plan (development plans, local area plans, regional planning guidelines, schemes for strategic development zones) or amendment/variation to it proposed under the Planning and Development Act 2000 (as amended) must be screened for any potential impact on areas designated as [European] Sites.

This screening should be based on any ecological information available to the authority and an adequate description of the plan and its likely environmental impacts. This should take into account any policies that will set the terms for future development. The results of the screening should be recorded and made available to the public.

This requirement is codified in Regulation 56(1) of the Draft European Communities (Birds and Natural Habitats) Regulations 2010 so that: *A public authority shall conduct a Screening for Appropriate Assessment of a plan or project before deciding to undertake, or give consent, permission or other authorisation for that plan or project to ascertain whether that plan or project . . . is likely to have a significant effect on a European Site, either individually or in combination with other plans or projects*; and

Therefore, it must first be established, through an initial screening assessment, whether: (1) the proposed Plan is directly connected with or necessary for the management of a European Site for nature conservation; and (2) it is likely to have a significant adverse effect on a European Site, either individually or in combination with other Plans or projects.

Following screening, Circular Letters SEA 1/08 & NPWS 1/08 require that *in any case where . . . it is found that the draft plan or amendment may have an impact on the conservation objectives of a [European Site] or that such an impact cannot be ruled out, adopting a precautionary approach, an appropriate assessment of the plan must be carried out. An appropriate assessment means an assessment, based on best scientific knowledge, by a person with ecological expertise, of the potential impacts of the plan on the conservation objectives of any [European] Site (including [European] Sites not situated in the area encompassed by the draft plan or scheme) and the development, where necessary, of mitigation or avoidance measures to preclude negative effects*.

In compliance with Article 6(3) of the EU Habitats Directive, this appropriate assessment must then determine whether or not the plan will adversely affect the integrity[6] of the European site.

Regulation 56(1) of the Draft European Communities (Birds and Natural Habitats) Regulations 2010 states that: *A public authority should conduct an Appropriate Assessment of the implications for a European Site of a plan or project in view of the site's conservation objectives before deciding to undertake, or give any consent, permission or other authorisation*; and that *Subject to the provisions of Regulation 57, a public authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European Site, which is the case where no reasonable scientific doubt remains as to the absence of such effects*.

Should the appropriate assessment identify that there is a perceived risk that a proposed Plan would have an adverse effect on the integrity of a European Site, Circular Letter SEA 1/08 & NPWS 1/08 requires that further conditions must be satisfied before a Plan can be finalised. Alternative solutions must be examined, including the option of not adopting the plan, or part of it. If there are no alternative solutions or mitigation measures that can avoid the adverse effects, approval of the plan can only be granted if it is accepted that there are there are imperative reasons of over-riding public interest (IROPI). In this case, compensatory measures must be taken to ensure that the overall coherence of the *Natura 2000* network is protected.

1.3. Approach to and scope of this assessment

Following the identification of the need for an assessment of the proposed draft FEM FRMP under the requirements of the regulations and guidance described above, it was established that the assessment would be undertaken in two phases – an initial Screening for Appropriate Assessment phase (Stage 1) and, if required, a subsequent, more detailed, appropriate assessment phase (Stage 2).

This report is the Stage 2: Statement for Appropriate Assessment prepared as part of the appropriate assessment phase, and is based on an examination of European Site Synopses and Standard Data Forms (obtained through consultation with the National Parks and Wildlife Service (NPWS) in October 2010), as well as readily accessible internet resources concerning the nature and wildlife value of the sites. The report will determine whether the proposed draft FEM FRMP is likely to have an adverse effect on integrity of the seven European Sites, for which the screening assessment identified potential significant effects, in view of their conservation objectives.

[6] The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified.

2. The Flood Risk Management Plan

2.1. Introduction

The OPW is currently undertaking a national programme of catchment-based Flood Risk Assessment and Management Studies (FRAMS) within Ireland. The need for this is driven by the 2004 report by the Flood Policy Review Group which highlighted the need to pro-actively and sustainably manage flood risk; and the requirements of the EU Floods Directive. As part of this programme, and to address flood risk issues in the Fingal and East Meath areas, FCC, along with project partners MCC and the OPW, have commissioned the Fingal East Meath Flood Risk Assessment and Management Study or FEM FRAMS for short.

The main output from this study is a suite of flood hazard and risk maps and a Flood Risk Management Plan (FRMP), which identifies a long-term programme of prioritised studies, actions and works to manage the flood risk in the Fingal East Meath study area (Figure 2-1). The plan also makes recommendations in relation to appropriate development planning.

Figure 2-1: Extent of the study area

The Fingal East Meath study area covers approximately 772km^2 and comprises a group of 23 rivers and streams, three estuaries and the Fingal and Meath coastline. The study area is highly susceptible to extreme flood events, despite having low annual rainfall and small

catchment areas, and there are records of at least 141 historic flood events since the 1940s. It is generally affected by four types of flooding, resulting from:

- Intense rainfall events, as in August 2008;
- Exceptionally high tide levels, as in February 2002;
- A combination of intense rainfall and high tides, as in 2004; and
- Lack of drainage capacity in urban areas.

In order to address this flood risk, the FEM FRAMS sets out to achieve the following objectives:

- Identify and map the existing and potential future flood hazard and risk areas;
- Build the strategic information base necessary for making informed decisions in relation to managing flood risk and provide appropriate data to inform future spatial planning and development;
- Identify viable structural and non-structural measures and options for managing flood risks for localised high-risk areas and within the study area as a whole;
- Integrate a Strategic Environmental Assessment (SEA) and Habitats Directive Appropriate Assessment into the FRMP development process so that environmental issues can be fully integrated into the plan; and
- Prepare a Flood Risk Management Plan (FRMP) for the study area, with associated environmental assessment reports.

2.2. The Draft FRMP

The FEM FRMP is intended to be a non-technical document, which summarises what has been done to date on the study and sets out a prioritised list of studies, actions and works (structural and non-structural), including indicative costs and benefits, to manage the flood risk in the study area in the long-term.

The draft FEM FRMP will be issued for consultation and made available on the project website www.fingaleastmeathframs.ie and in hard copy format at various Council offices in the study area. Following a review of the comments received, the draft FEM FRMP will be amended, finalised and published, together with an SEA Post Adoption Statement. The FEM FRMP will then be reviewed on a six-yearly cycle as required by the EU Floods Directive.

2.3. Proposed FRMP actions and works

In order to develop the flood risk management strategy which forms the basis of the FEM FRMP, the study area was divided into a number of assessment units, which are defined at four spatial scales:

(i) **Study area:** in this case the Fingal East Meath study area;

(ii) **Analysis unit (AU) scale:** these are individual or combined catchments (e.g. Nanny and Delvin) or areas of tidal influence (e.g. Coastal). For fluvial AUs that

have a tidal influence at their downstream end, there is overlap between this area of tidal influence and the Coastal AU;

(iii) **Areas of Potential Significant Risk (APSR):** for the option development process these are existing urban areas with high degrees of flood risk and hence economic damage;

(iv) **Individual risk receptor (IRR):** an individual asset of particular economic, environmental or social value that has been identified as being prone to flooding and hence represents a significant risk in its own right, such as transport and utilities infrastructure, which may require specific consideration during the development of the flood risk management options.

Following a flood risk assessment of the entire study area, the AUs and APSRs considered during the detailed option assessment process are shown on Figure 2-2.

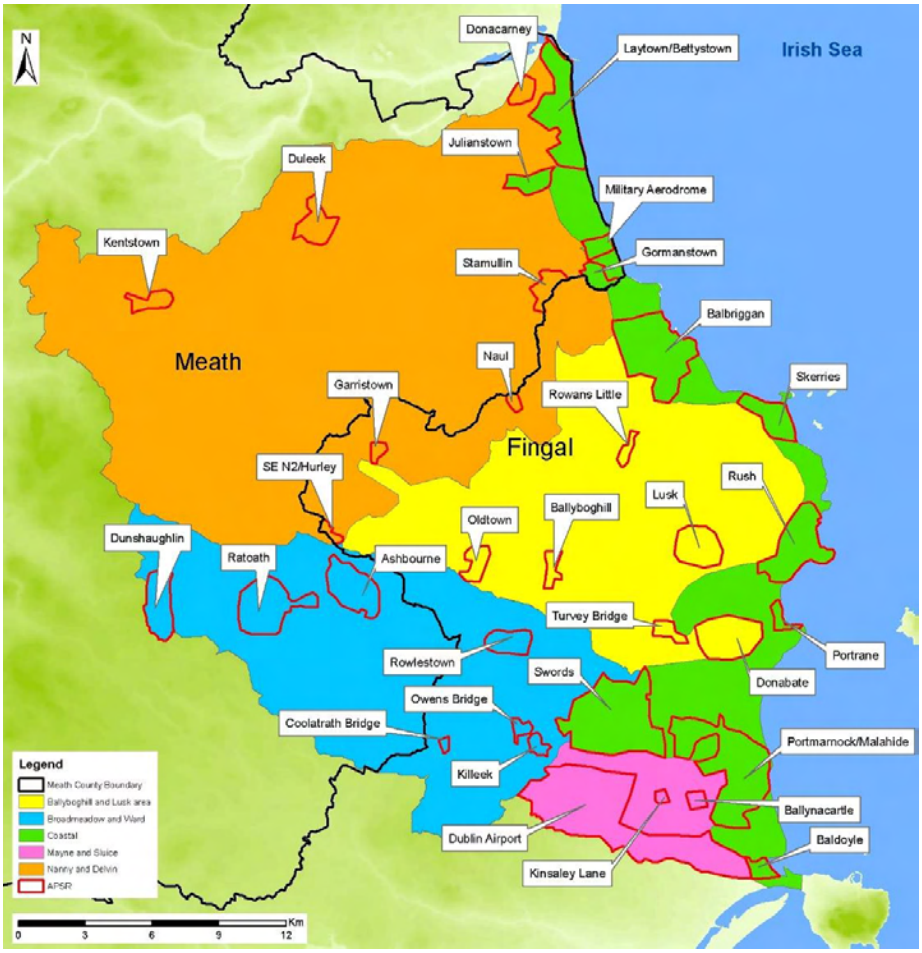

Figure 2-2: The study area and the assessed AUs and APSRs.

Following a comprehensive multi-criteria option assessment process[7], preferred flood risk management options have been recommended in the FRMP for the study area as a whole and several AUs and APSRs. These are summarised in Table 2-1 and are the subject of this Habitats Directive assessment.

An indicative implementation programme is set out in the FRMP, with suggested timescales linked loosely to EU Directive cycles:

- First phase - High priority: Plan implementation to 2015;
- Second phase – Medium priority: 2016 to 2021; and
- Third phase – Low priority: 2022 onwards.

Table 2-1: Preferred options identified for the study area, AUs and APSRs

Spatial scale	Preferred Options
Study area	
Study area	Development (Meath) and enhancement (Fingal) of a **proactive maintenance regime** targeting potential culvert blockage locations
	Targeted public **awareness and education** campaign and **individual property flood proofing (IPFP)**
Analysis Unit (AU)	
Nanny & Delvin (N&D)	Develop a fluvial **Flood Forecasting and Warning System (FFWS)** for the **Nanny River**
Broadmeadow & Ward (B&W)	Develop a fluvial **FFWS** for the **Broadmeadow River**
Mayne & Sluice (M&S)	Develop a fluvial **FFWS** for the **Mayne River**
Coastal (C)	Develop a combined fluvial and tidal **FFWS**
Area of Potential Significant Risk (APSR)	
Duleek area (N&D AU)	**Raising existing defence** embankment to a higher standard of protection (to protect up to 0.1% AEP) (included in the FRMP as a medium to low priority element[8])
Ratoath area (B&W AU)	**Improving channel conveyance** by replacing a bridge on the Broadmeadow River at the R125 Ratoath road, and replacing a culvert along a tributary of the Broadmeadow River with a larger capacity culvert
Rowlestown East area (B&W AU)	**Construction of flood defence embankments** along left bank of Broadmeadow River tributaries upstream of R125
St.Margaret's, Dublin Airport, Belcamp & Balgriffin areas	**Balgriffin: Improving channel conveyance** by removing old bridge structure combined with construction of flood defence embankments and walls upstream of R123 and along left bank of Mayne River

[7] Based on the following high-level criteria: applicability; technical feasibility; economic feasibility; social acceptability; and environmental acceptability

[8] It will not be implemented during this cycle of the FEM FRMP but will be reviewed under the next cycle commencing in 2016.

Spatial scale	Preferred Options
(M&S AU)	
Portmarnock & Malahide areas (C AU)	**Portmarnock: Rehabilitating and raising** existing coastal defences at **Strand Road** (including rehabilitation of flapped outfall) and construction of flood defence **embankment**
	Malahide town centre: Construction of demountable flood defences at underpass, along with flood walls/demountable walls and localised raising of existing defences to the north-east of Malahide, to protect at risk properties in Malahide town centre
Laytown, Bettystown & Coastal area (C AU)	Construction of flood defence **embankments** to protect properties at risk along the coast and from the **Nanny River**
Swords area (C AU)	Improve channel conveyance by **widening and deepening** of the Gaybrook Stream to reduce fluvial flood risk to properties at **Aspen near Kinsaley**
Rush area (C AU)	Improve conveyance by constructing secondary **culvert** along **Channel Road** to protect properties at risk from fluvial flooding along the West Rush stream
Skerries area (C AU)	Improve channel conveyance by **replacing culverts** under roads and railway with larger capacity culverts, and **widening** channel through park to reduce fluvial flood risk to properties at **Miller Lane and Sherlock Park**

Based on the results of the flood risk assessment, a list of Individual Risk Receptors (IRRs) at risk in the study area was prepared (Table 2-2). IRRs are essential infrastructure assets, sites with the potential to cause significant environmental pollution if flooded and important cultural heritage sites identified as being at significant risk of flooding from either the 1% AEP fluvial event or the 0.5% AEP tidal event. The list mainly includes utility assets, with one National Primary roadway at risk. All of the IRRs are at risk from either the 1% AEP fluvial event or 0.5% AEP tidal event with the exception of the wastewater treatment works at Owens Bridge which is only at risk for the 0.1% AEP event.

Table 2-2 Preferred options for IRRs

Risk receptor	Location	Likely FRM option
Utility asset at Stamullin	Stamullin area APSR	Construction of localised flood defence embankments or IPFP
WWTW at Ballyboghil	Ballyboghil area APSR	Construction of localised flood defence embankments
M1 at Staffordstown	Ballyboghil & Lusk AU	Construction of localised flood defence embankments
Wastewater pumping station in Ashbourne	Ashbourne area APSR	Construction of localised flood defence embankments
WWTWs at Toberburr	Owens Bridge area APSR	Construction of localised flood defence embankments
N32 at Clonshaugh	St Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR	Construction of localised flood defence embankments
WWTWs at Julianstown	Julianstown area APSR	Construction of localised flood defence embankments

3. Implications for the Conservation Objectives of the European Sites

3.1. Introduction

The screening assessment considered the 14 European Sites in the Fingal East Meath study area and immediately adjacent to it, and these are listed below and shown on Figure 3-1:

- Boyne Coast and Estuary candidate Special Area of Conservation (cSAC);
- Boyne Estuary Special Protection Area (SPA);
- River Nanny Estuary and Shore SPA;
- Skerries Islands SPA;
- Rogerstown Estuary cSAC;
- Rogerstown Estuary SPA;
- Broadmeadow Estuary/Swords SPA;
- Malahide Estuary cSAC;
- Baldoyle Bay cSAC;
- Baldoyle Bay SPA;
- Ireland's Eye cSAC;
- Ireland's Eye SPA;
- Howth Head cSAC; and
- Howth Head Coast SPA.

These were chosen on the basis that the most likely effects of a catchment FRMP would be within and downstream of the catchments involved, rather than adjacent catchments not connected hydrologically or ecologically. A number of other European Sites can be found within 15km of the Fingal East Meath study area boundary (as defined in Figure 2-1), and these are listed in Table 3-1. However, this assessment does not consider these European Sites further, as they are not within or downstream of the river catchments, or within or contiguous to the coastal cells of Fingal and East Meath, and would, therefore, not be affected by the FRMP. It is considered that there are very unlikely to be hydrological or ecological pathways that could result in the preferred flood risk management options for the Fingal East Meath study area having a significant effect on any of these sites.

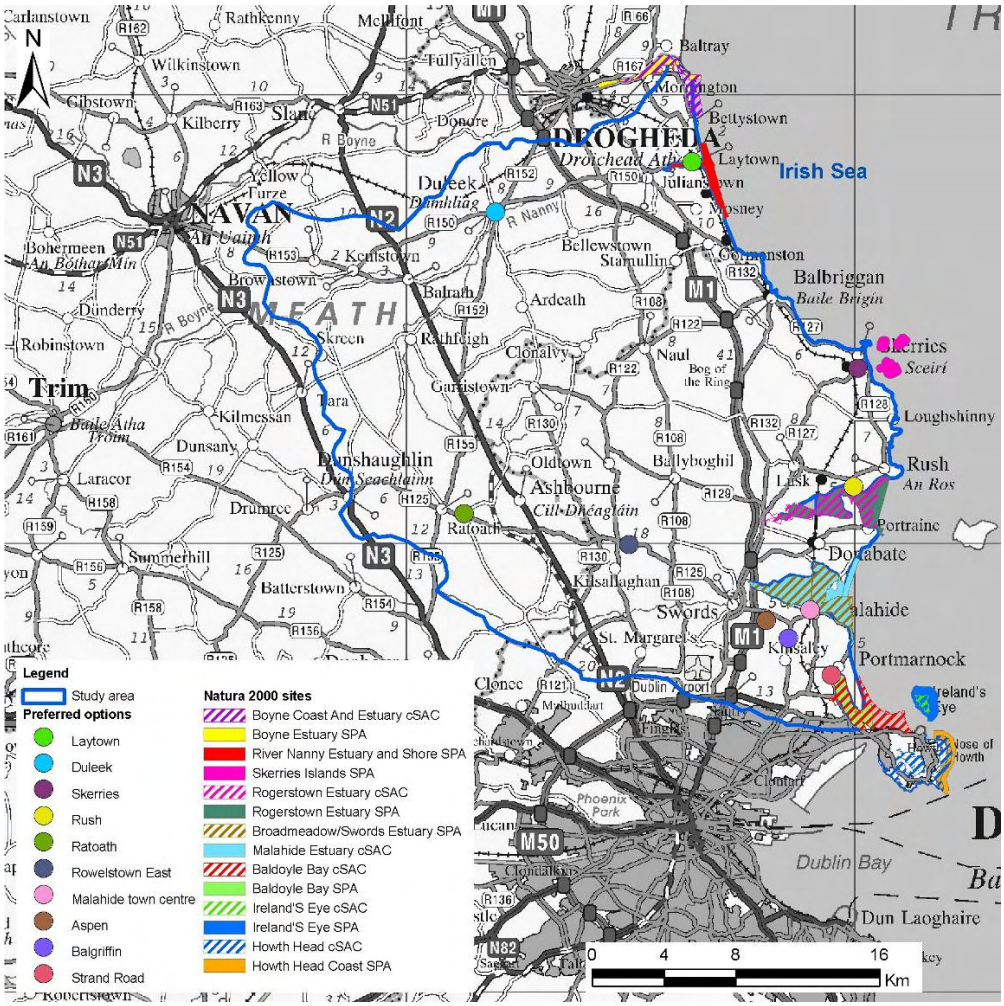

Figure 3-1 Natura 2000 or European Sites within the study area (Source: NPWS)

Table 3-1: Other European Sites within 15km of the study area boundary.

European Site	Summary Description	Comments
Clogher Head cSAC	Rocky coastal promontory designated for its dry heath and vegetated sea cliffs.	Located 6.7km north of the northern boundary of the study area. No potential or pathway for direct or indirect effects.
River Boyne and River Blackwater cSAC	The freshwater element of the Rivers Boyne and Blackwater and their tributaries. Designated for alkaline fen and alluvial woodlands, and populations of otter, salmon and river lamprey.	Within 2km of the study area boundary at closest point but, being a different catchment, there is no hydrological or hydro-ecological connection. No potential or pathways for direct or indirect effect.
Rockabill SPA	Small rocky islands with important seabird colonies, c.7km north-east of Skerries.	In the Irish Sea, c6km north-east of The Skerries Islands SPA. No potential or pathways for direct or indirect effect.

European Site	Summary Description	Comments
Lambay Island cSAC	Rocky island with good examples of vegetated sea cliffs and a colony of grey seals. 4km off the mouth of the Broadmeadow/ Swords/ Malahide estuary.	Located 3.7km offshore from the mouth of the Broadmeadow/ Malahide estuary. No potential or pathway for direct or indirect effect.
Lambay Island SPA	As above. Designated for its important seabird colonies,	As above.
North Dublin Bay cSAC	Excellent example of a coastal site with good examples of ten Annex I coastal habitats.	Located only 0.4km due south of study area, across the isthmus of Howth Head, but c.4km south of nearest option location and c.14km via the sea round Howth Head. No potential or pathway for direct or indirect effect.
North Bull Island SPA	Inner part of North Dublin Bay, of international importance for waterfowl.	Located only 0.4km due south of study area, across the isthmus of Howth Head, but c.4km south of nearest option location and c.12.5km via the sea round Howth Head. No potential or pathway for direct or indirect effect.
South Dublin Bay/ Tolka Estuary SPA	Intertidal sand and mudflats at mouth of the Liffey and Tolka Rivers, designated for important waterfowl populations.	Located over 5km south of the study area and over 14km round Howth Head. No potential or pathway for direct or indirect effect.
South Dublin Bay cSAC	Fine example of a coastal system with intertidal sand and mudflats, south of the River Liffey.	Located over 6km south of the study area and over 15km round Howth Head. No potential or pathway for direct or indirect effect.
Dalkey Islands SPA	Rocky island with important populations of roseate tern, common tern and arctic tern.	Over 13km due south of the study area boundary across the whole of Dublin Bay. No potential or pathway for direct or indirect effect.

As stated in Section 1.1, the Screening for Appropriate Assessment stage (Stage 1) concluded that the proposed draft Fingal East Meath FRMP has the potential to have significant effects, either alone or in-combination, on seven of the 14 European Sites:

- Boyne Estuary SPA;
- River Nanny Estuary and Shore SPA;
- Rogerstown Estuary SPA;
- Rogerstown Estuary cSAC;
- Broadmeadow/Swords Estuary SPA;
- Baldoyle Bay cSAC; and
- Baldoyle Bay SPA.

Table 3-2 is a copy of Table 4-2 of the Stage 1 screening assessment, and Table 3-3 is based on and summarises Table 4-1 of the screening assessment. They highlight the European Sites and interest features which are potentially sensitive and exposed to impacts arising from the implementation of the proposed Fingal East Meath FRMP.

The red shading in Table 3-2 indicates that the assessment has highlighted that a significant effect is likely, orange shading indicates that a significant effect is uncertain, and green shading indicates that the assessment has concluded no potential for a significant effect. The blank squares in Table 3.2 indicate that no link between the APSR and European Site was identified. None of the preferred options at the study area and AU scale was identified as having potential for a significant effect.

Table 3-2: Summary of screening assessment of the potential effects of the proposed FEM FRMP on European Sites in the study area

	Duleek APSR	Ratoath APSR	Rowlestown East APSR	St.Margaret's, Dublin Airport, Belcamp & Balgriffin APSR	Portmarnock & Malahide APSR	Laytown, Bettystown & Coastal APSR	Swords APSR	Rush APSR	Skerries APSR
Boyne Coast and Estuary cSAC						No effect			
Boyne Estuary SPA						Effect uncertain			
River Nanny Estuary and Shore SPA	No effect					Likely effect			
Skerries Islands SPA									No effect
Rogerstown Estuary cSAC								Effect uncertain	
Rogerstown Estuary SPA								Effect uncertain	
Broadmeadow Estuary/Swords SPA		No effect	No effect		Effect uncertain		No effect		
Malahide Estuary cSAC		No effect	No effect		No effect		No effect		
Baldoyle Bay cSAC				Effect uncertain	Effect uncertain				
Baldoyle Bay SPA				Effect uncertain	Effect uncertain				
Ireland's Eye cSAC					No effect		No effect		
Ireland's Eye SPA					No effect		No effect		
Howth Head cSAC and					No effect		No effect		
Howth Head Coast SPA					No effect		No effect		

Table 3-3: European Sites and features potentially sensitive and exposed to risks arising from the proposed FEM FRMP.

Features potentially affected	Risks to site
Boyne Estuary SPA	
• Birds listed in Annex 1 of Council Directive 79/409/EEC • Other regularly occurring migratory birds	*Laytown, Bettystown & Coastal area APSR* Potential impact on bird populations shared with the River Nanny Estuary and Shore SPA as a result of permanent loss of, and temporary damage to, intertidal habitats on the River Nanny Estuary, and potential for disturbance to birds during construction works. Potential long term habitat loss resulting from coastal squeeze.
River Nanny Estuary and Shore SPA	
• Birds listed in Annex 1 of Council Directive 79/409/EEC • Other regularly occurring migratory birds	*Laytown, Bettystown & Coastal area APSR* Permanent loss of, and temporary damage to, intertidal habitats of the SPA, and potential for disturbance to birds during construction works. Potential long term habitat loss resulting from coastal squeeze.
Rogerstown Estuary SPA	
• Birds listed in Annex 1 of Council Directive 79/409/EEC • Other regularly occurring migratory birds	*Rush APSR* Potential disturbance to bird populations of the SPA and damage to intertidal habitat during construction. Potential changes to the pattern of freshwater input into the estuary, affecting habitats and food supplies.
Rogerstown Estuary cSAC	
• Dune grassland • Shifting dunes with marram • Estuaries • Intertidal mudflats and sandflats • Pioneer saltmarshes • Atlantic salt meadows (or saltmarshes) • Mediterranean salt meadows (or saltmarshes) • Cord-grass swards (or saltmarshes)	*Rush APSR* Potential for changes to the frequency and duration of freshwater input into the estuary, which may affect intertidal cSAC habitats. Potential damage to cSAC habitats in the locality of the works during construction.
Broadmeadow Estuary/Swords SPA	
• Birds listed in Annex 1 of Council Directive 79/409/EEC • Other regularly occurring migratory birds	*Portmarnock and Malahide areas APSR: Malahide town centre* Potential disturbance to SPA bird species during the construction period. Potential long term intertidal habitat loss as a result of coastal squeeze.
Baldoyle Bay cSAC	

Features potentially affected	Risks to site
• Intertidal mudflats and sandflats • Pioneer saltmarshes • Atlantic saltmeadows (or saltmarshes) • Mediterranean salt meadows (or saltmarshes) • Cord grass swards (or saltmarshes)	*Portmarnock and Malahide areas APSR: Portmarnock* Potential permanent loss of, and temporary damage to, cSAC habitats beneath the footprint of the works. Potential long term habitat loss as a result of coastal squeeze. Potential changes to the frequency and duration of freshwater input into the estuary, which may affect intertidal cSAC habitats. *St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR* Potential changes to the frequency and duration of freshwater input into the estuary, which may affect intertidal cSAC habitats.
Baldoyle Bay SPA	
• Birds listed in Annex 1 of Council Directive 79/409/EEC • Other regularly occurring migratory birds	*Portmarnock and Malahide areas APSR Portmarnock* Potential loss of or damage to intertidal habitat beneath the footprint of the works, and temporary disturbance to birds of the SPA during construction. Potential long term habitat loss as a result of coastal squeeze. Potential for changes to the pattern of freshwater input into the estuary, affecting the birds' habitats and food supplies. *St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR* Potential changes to the pattern of freshwater input into the estuary, affecting habitats and food supplies.

The detailed appropriate assessment that follows in Sections 3.2-3.6 analyses the potential risks to each of these European Sites, and the implications for their conservation objectives, to determine whether the FRMP will adversely affect its integrity. [Note that, although the sites have generally been listed in this document in approximate geographical order, from north to south, the assessment begins with the River Nanny Estuary and Shore SPA as the potential risks to the Boyne Estuary SPA relate to proposed works on the River Nanny Estuary.] The appropriate assessment also identifies specific avoidance or mitigation measures to ensure that the plan has no adverse effect on the integrity of the European Sites. Finally, a summary and conclusion of the assessment are provided in Section 3.9.

This assessment at the Plan level does not remove the need for an Appropriate Assessment at the project level, regardless of whether or not the project is consistent with the FRMP. As a result of uncertainties concerning the potential impacts of the preferred FRMP options on the European Sites, detail emerging at the scheme or project design stage may identify additional impacts which have not been assessed here. Consequently, any scheme or project arising

out of the plan will be assessed to ensure any adverse effects on the integrity of European Sites are avoided.

3.2. River Nanny Estuary and Shore SPA

3.2.1. Introduction

The River Nanny Estuary and Shore SPA covers 216ha, incorporating the entire 2km length of the River Nanny Estuary, and approximately 3km of shoreline to the north and south of the estuary mouth. The estuary is narrow and sheltered, and its principal habitats are mudflats, saltmarshes and, along the edges, freshwater marsh/wet grassland. The open sea shore, which extends approximately 500m to the low tide mark, comprises beach and intertidal sand flats and is backed in places by low clay cliffs. The site is nationally important for waterbirds, supporting five species in nationally important numbers, as well as smaller populations of several other species.

3.2.2. Potential risk to site resulting from the FRMP

As a result of construction of the preferred option for Laytown, Bettystown & Coastal area APSR, there is potential for permanent loss of estuarine habitat beneath the footprint of the walls, and, depending on the timing of the construction works, the potential for disturbance to birds which are designated interest features of the SPA. In the long term, this option, combined with sea level rise, could result in further coastal squeeze and loss of bird habitat.

3.2.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the *Natura 2000* Standard Data Form, are provided in Table 3-4.

Table 3-4: River Nanny and Shore SPA interest features[9]

River Nanny and Shore SPA interest features
Birds listed on Annex 1 of Council Directive 79/409/EEC
Pluvialis squatarola Golden plover (wintering) *Limosa lapponica* Bar-tailed godwit (wintering)
Regularly occurring migratory birds not listed on Annex 1 of Council Directive 79/409/EEC
Phalacrocorax carbo Cormorant (wintering) *Branta bernicla* Brent goose (wintering) *Anas platyrhynchos* Mallard (wintering) *Haematopus ostralegus* Oystercatcher (wintering) *Charadrius hiaticula* Ringed plover (wintering) *Pluvialis squatarola* Grey plover (wintering) *Vanellus vanellus* Lapwing (wintering) *Calidris canutus* Knot (wintering)

[9] As listed in the Natura 2000 Standard Data Form provided by NPWS.

River Nanny and Shore SPA interest features
Calidris alba Sanderling (wintering) *Calidris alpina* Dunlin (wintering) *Numenius arquata* Curlew (wintering) *Tringa totanus* Redshank (wintering) *Arenaria interpres* Turnstone (wintering) *Larus ridibundus* Black-headed gull (wintering) *Larus canus* Common or mew gull (wintering) *Larus argentatus* Herring gull (wintering)

However, a revised list of "Special Conservation Interests" for the SPA has been proposed by NPWS[10] as follows:

- The site is selected for: Ringed plover, Knot and Sanderling; and
- Additional Special Conservation Interests: Oystercatcher, Golden plover, Herring gull, Wetland and Waterbirds.

This revised list indicates the relative priorities assigned to the significant species occurring on the site, and facilitates the setting of conservation objectives. The inclusion of the category "Wetland and Waterbirds" reflects the requirements of the Birds Directive, Article 4(2), for Member States to pay particular attention to the protection of wetlands and all regularly occurring migratory species.

3.2.4. Ecological value of potentially affected features

The River Nanny Estuary and Shore is a nationally important waterbird site, ranked 36th in the list of 276 wetlands in the Republic of Ireland on the basis of its mean total waterbird count for the period 2002-2007[11]. During that period it supported a mean total of 6,696 birds, including nationally important numbers[12] of five species: Common scoter, Oystercatcher, Ringed plover, Knot and Sanderling. However, this list differs slightly from that published in the SPA Site Synopsis and the Natura 2000 Standard Data Form, which is based on average peaks for the 5-year period 1995/6-1999/2000 (given in parentheses): Golden plover (1759), Oystercatcher (1014), Ringed plover (185), Knot (1140) and Sanderling (240)[13]. Knot and

[10] NPWS, *pers.comm.* (October 2010).
[11] Boland, H., Crowe, O. & Walsh, A. (2008) Irish Wetland Bird Survey: Results of waterbird monitoring in Ireland in 2006/07. *Irish Birds 8*: 341-350.
http://www.birdwatchireland.ie/LinkClick.aspx?fileticket=lblqbv468Ac=&tabid=281
[12] This is based on the concept of the "1% rule", an arbitrary threshold that was developed under the Ramsar Convention, so that a wetland is considered important in a national (e.g. Great Britain or all-Ireland) context if it regularly holds 1% or more of one waterbird species, sub-species or population (in Great Britain or the island of Ireland respectively), and of international importance if it regularly supports the same proportion of the relevant international population. Normally this is measured by calculating the five-year peak mean for each species and expressing this as a percentage of the national/international population estimates.
[13] Figures are average peaks for the 5-year period 1995/6-1999/2000 taken from the site synopsis.

Sanderling numbers are particularly important as they represent 4% of the all-Ireland totals for both species, and these species are two of the three for which the site is selected.

The site synopsis and Natura 2000 Standard Data Form state that the SPA is most important as a roost area, but that the intertidal flats also provide feeding habitat. In addition it is stated that many of the birds also utilise the intertidal areas and beaches further to the north and south, as well as fields. As the estuary itself is very small and narrow, and the intertidal mudflats within it are quite restricted, this suggests that the main feeding areas are probably the intertidal sandflats on the open coast, whilst the beaches, and the saltmarshes and fringing wet grassland of the estuary itself, provide high tide roosting areas.

3.2.5. Conservation objectives

The draft main conservation objective[14] for River Nanny and Shore SPA is based on the proposed list of Special Conservation Interests, and is:

- To maintain the special conservation interests for this SPA at favourable conservation status[15]: Oystercatcher, Golden plover, Ringed plover, Knot, Sanderling, Herring gull, Wetland and Waterbirds.

3.2.6. Condition of site and management

According to the Natura 2000 Data Form (2004), the main threat to wintering bird populations is increased disturbance from walkers, dogs and other beach users.

3.2.7. Potential impact of scheme alone

The application of the preferred option for Laytown, Bettystown & Coastal area APSR would involve the construction of a total of 0.45km of permanent flood defence embankments and walls on the left bank of the River Nanny along the R150 southwest of Laytown (Figure 3-2). This would comprise 211m of flood defence walls, constructed 150m upstream of the railway bridge, and 239m of flood embankments built immediately downstream of the bridge. The downstream length would be set back from the channel but the upstream section would be constructed to the river bed level because of limited space. Hydraulic modelling indicates that there would be no impact on water levels, but there is potential impact on an existing overland flow route (eastwards along the R150 which continues under the railway bridge and into Laytown), although there are no areas of significant natural floodplain storage affected by this option.

[14] Supplied by NPWS, October 2010.
[15] The favourable conservation status of a species is achieved when: population data on the species concerned indicate that it is maintaining itself; the natural range of the species is neither being reduced or likely to be reduced for the foreseeable future; and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

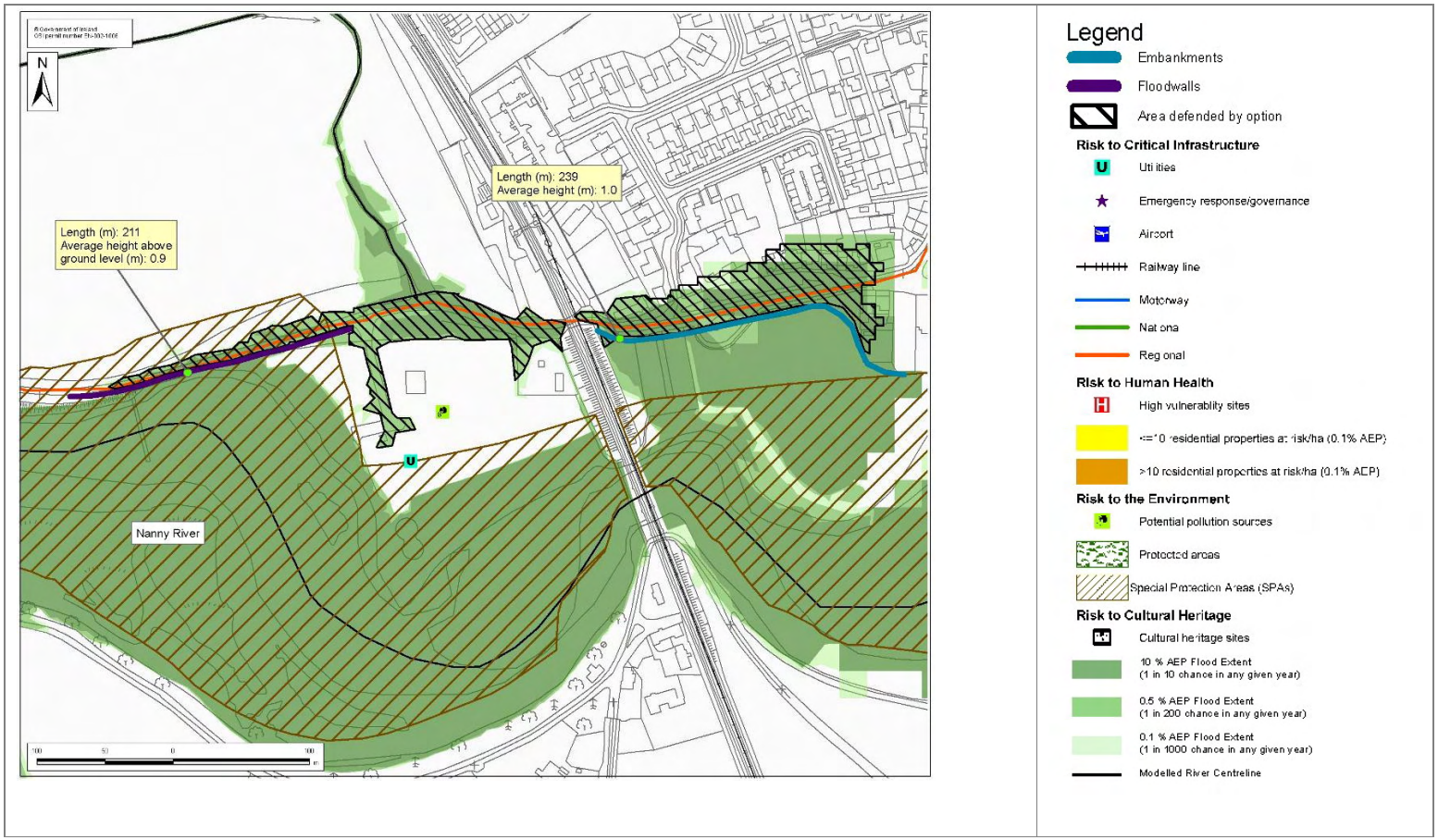

Figure 3-2: Location of preferred option for the Laytown, Bettystown & Coastal area APSR in relation to the River Nanny Estuary and Shore SPA.

The new downstream embankments would be situated within 50m of the SPA boundary, but set back at least 75m from the shore, along a busy residential road (Strand Road) and landward of a children's playground. However, the new upstream walls would be nearly 50m inside the SPA boundary and, in places, within the estuarine channel itself. As such, there will be temporary damage to and permanent loss of estuarine habitat beneath the footprint of the walls. In the long term, this option, as a "hold the line" option in terms of coastal management, could contribute to further coastal squeeze and a loss of intertidal habitat resulting from accelerated sea level rise In addition, depending on the timing of the construction works, there is the potential for disturbance to birds which are designated interest features of the SPA.

The estuary and its intertidal zones are very narrow, and constrained to landward by the current defences and roads, and, therefore, are unlikely to be used by large numbers of foraging birds. However, the upstream walls would be built along the broadest part of the inner estuary, which includes the largest mudflat and is, therefore, likely to be the most important part of the inner estuary for birds. During the construction of these walls, there is likely to be some disturbances to the intertidal habitat along the alignment of the defence as a result of excavation for foundations, temporary works, etc. Nevertheless, given the presence of the Strand Road and the R150 running close to the estuary shore, and the activity and noise levels associated with the road, it is likely that the narrow strip of mudflat adjacent to the road, which would be lost under the footprint of the new upstream walls, is little used by foraging birds.

There is, however, potential for temporary disturbance to foraging and roosting bird populations, as a result of noise and activity associated with the works. In addition to the intertidal mudflat which is used by foraging birds, the saltmarshes on the opposite side of the narrow channel from the proposed upstream walls are likely to be important high tide roost sites. Again, given the presence of the Strand Road and the R150 running close to the estuary shore, and the current activity and noise levels associated with the road, the response of birds to additional activity may be limited. A study by IECS (2007) on the Humber estuary concluded that birds become habituated to regular construction noise below 70dB. Consequently, it is not clear that the noise and activity levels associated with the proposed downstream works would represent a significant increase in relation to the present conditions, although the activity associated with the upstream works are likely to have a greater effect. It is very likely that birds will be displaced from the immediate vicinity of the upstream construction site as a result of personnel and plant, but the effects on more distant birds are more difficult to assess. However, the birds may become habituated to the new activity within a number of days thus reducing the magnitude of the effect. Potential disturbance to the SPA bird populations would be reduced to a minimum by undertaking the works, as far as possible, between April and August to avoid the main migration and wintering period, and by using good practice construction methods to reduce noise levels.

It is concluded that, provided these measures are implemented, the application of the preferred option for the Laytown, Bettystown & Coastal area APSR will not impact on a significant proportion of the estuary's bird populations and, therefore, will not adversely affect the integrity of the River Nanny Estuary and Shore SPA and its Special Conservation Interests.

3.2.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Site in-combination with the FEM FRMP, including Meath Development Plan 2007-

2013 and East Meath Local Area Plan 2005. No significant adverse 'in combination' effects were identified at the strategic level, although there is potential for such impacts at a local level depending on the timing of actions resulting from the FRMP and other plans. Objective LAY6 of the East Meath Local Area Plan 2005 provides for an Eco-residential Park on lands to the west of Laytown and bordering part of the north bank of the River Nanny Estuary, and this may lead to an increase in disturbance levels on a temporary (construction) or permanent basis. However, any in-combination effect would depend on the timing of works resulting from both plans, and it may only be possible to assess the potential for such effects during project-specific appropriate assessment.

3.2.9. Measures to avoid adverse effects

The works should be undertaken, as far as possible, between April and August to avoid the main migration and wintering period, and good construction practices should be implemented to reduce noise levels.

The potential for setting back the road and the flood defences from the estuary, or for intertidal habitat creation, should be investigated in order to mitigate for loss through coastal squeeze or to replace lost habitat.

A review of the plan mentioned in Section 3.2.8 (the East Meath Local Area Plan 2005) should be undertaken at the project stage as part of the project level appropriate assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

3.3. Boyne Estuary SPA

3.3.1. Introduction

The Boyne Estuary SPA is smaller than the Boyne Coast and Estuary SAC, covering an area of 407.7ha and only a small proportion of the site lies within the study area. The designated site covers most of the estuary of the River Boyne and comprises intertidal sand and mudflats, saltmarshes and eel grass (*Zostera*) beds, but not the open coast section of the cSAC. The Boyne Estuary is the second most important site for wintering and migratory birds along the Louth-Meath coastline, with nationally important wintering populations of up to ten waterfowl species, and smaller populations of several other species.

3.3.2. Potential risk to site resulting from the FRMP

Laytown, Bettystown & Coastal area APSR

It is suggested by the River Nanny Estuary and Shore SPA site synopsis that there may be some interchange of bird populations between the Nanny Estuary and Shore and the Boyne Estuary. The potential for permanent loss of estuarine habitat on the River Nanny Estuary beneath the footprint of the walls, and, depending on the timing of the construction works, the potential for disturbance to birds could affect species that are also designated interest features of the Boyne Estuary SPA. In the long term, this option, combined with sea level rise, could result in further coastal squeeze and loss of bird habitat.

3.3.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the *Natura 2000* Standard Data Form, are provided in Table 3-5.

Table 3-5: Boyne Estuary SPA interest features

Boyne Estuary SPA interest features
Birds listed on Annex 1 of Council Directive 79/409/EEC
Pluvialis squatarola Golden plover (wintering) *Limosa lapponica* Bar-tailed godwit (wintering) *Sterna albifrons* Little tern (breeding)
Regularly occurring migratory birds not listed on Annex 1 of Council Directive 79/409/EEC
Branta bernicla Brent goose (wintering) *Tadorna tadorna* Shelduck (breeding & wintering) *Anas penelope* Wigeon (wintering) *Anas crecca* Teal (wintering) *Anas platyrhyncos* Mallard (wintering) *Mergus serrator* Red-breasted merganser (wintering) *Phalacrocorax carbo* Cormorant (wintering) *Haematopus ostralegus* Oystercatcher (breeding & wintering) *Charadrius hiaticula* Ringed plover (breeding & wintering) *Pluvialis squatarola* Grey plover (wintering) *Vanellus vanellus* Lapwing (wintering) *Calidris canutus* Knot (wintering) *Calidris alba* Sanderling (wintering) *Calidris alpina* Dunlin (wintering) *Limosa limosa* Black-tailed godwit (wintering) *Numenius arquata* Curlew (wintering) *Tringa totanus* Redshank (breeding & wintering) *Tringa nebularia* Greenshank (wintering) *Arenaria interpres* Turnstone (wintering) *Larus ridibundus* Black-headed gull (wintering) *Larus canus* Common gull (wintering)

However, a revised list of “Special Conservation Interests” for the SPA has been proposed by NPWS (see section 3.2.3), as follows:

- The site is selected for: Golden plover, Black-tailed godwit and Turnstone.
- Additional Special Conservation Interests: Shelduck, Oystercatcher, Grey plover, Lapwing, Sanderling, Redshank, Little tern, Wetland and Waterbirds

There was a breeding colony of little terns *Sterna albifrons* on the site until 1996, and recent conservation efforts have been successful in re-establishing the colony on the beach and sand dunes at Baltray, just outside the SPA boundary.

3.3.4. Ecological value of potentially affected features

The Boyne Estuary is a nationally important waterbird site, ranked 25th in the list of 276 wetlands in the Republic of Ireland on the basis of its mean total waterbird count for the period 2002-2007[16]. During that period it supported a mean total of 11,006 birds, including nationally important numbers[17] of five species: Golden plover, Grey plover, Knot, Sanderling and Black-tailed godwit. However, this list differs from that published in the SPA Site Synopsis and the Natura 2000 Standard Data Form, which is based on average peaks for the 5-year period 1995/6-1999/2000 (given in parentheses): Shelduck (218), Oystercatcher (1,099), Golden plover (6,070), Grey plover (98), Lapwing (4,657), Knot (1,771), Sanderling (69), Black-tailed godwit (471), Redshank (583) and Turnstone (175)[18]. Golden plover and Knot numbers are particularly important as they represent 4% and 7% of their respective all-Ireland totals.

The site synopsis and Natura 2000 Standard Data Form state that the SPA provides both feeding and roosting areas for the birds. There may be some interchange between the bird populations of the Boyne Estuary SPA and the River Nanny Estuary and Shore SPA as their boundaries are only 3.52km apart at their nearest point and the River Nanny Estuary and Shore site synopsis refers to birds using intertidal areas and beaches to the north and south.

3.3.5. Conservation objectives

The draft main conservation objective[19] for Boyne Estuary SPA is based on the proposed list of Special Conservation Interests, and is:

- To maintain the special conservation interests for this SPA at favourable conservation status: Golden plover, Knot, Black-tailed godwit, Turnstone, Shelduck, Oystercatcher, Grey plover, Lapwing, Sanderling, Redshank, Little tern, Wetland and Waterbirds.

3.3.6. Condition of site and management

The main threats to the wintering bird populations and their habitats are infilling of intertidal habitats for land claim, sewage pollution and port expansion[20].

[16] Boland,*et al.* (2008) *Op.cit.*
[17] This is based on the concept of the "1% rule", an arbitrary threshold that was developed under the Ramsar Convention, so that a wetland is considered important in a national (eg. Great Britain or all-Ireland) context if it regularly holds 1% or more of one waterbird species, sub-species or population (in Great Britain or the island of Ireland respectively), and of international importance if it regularly supports the same proportion of the relevant international population. Normally this is measured by calculating the five-year peak mean for each species and expressing this as a percentage of the national/international population estimates.
[18] Figures are average peaks for the 5-year period 1995/6-1999/2000 taken from the site synopsis.
[19] Supplied by NPWS, October 2010.
[20] Natura 2000 Data Form.

3.3.7. Potential impact of scheme alone

Laytown, Bettystown & Coastal area APSR

The application of the preferred option for Laytown, Bettystown & Coastal area APSR would involve the construction of 0.45km of permanent flood defence embankments and walls within the Nanny River estuary, 4km south of the Boyne Estuary SPA (see Section 3.2.7 for full details). As a result of the possible interchange of bird populations between the Nanny Estuary and Shore and the Boyne Estuary, as suggested by the River Nanny Estuary and Shore SPA site synopsis (see Section 3.3.4), there is potential for the proposed works in the Nanny Estuary to affect birds associated with the Boyne estuary. However, given that the boundaries of the two SPAs are closest on the open sea shore it is likely that any interchange of bird populations occurs along the beaches in this area. It is unlikely, that birds from the Boyne estuary would occur regularly within the inner Nanny estuary, particularly in significant numbers.

Consequently, it is concluded that the application of the preferred option for Laytown, Bettystown & Coastal area APSR will not adversely affect the integrity of the Boyne Estuary SPA and its Special Conservation Interests, particularly if the proposed measures are implemented as outlined in Sections 3.2.7, 3.2.9 and 3.3.9.

3.3.8. Potential impact of scheme in-combination

As it is unlikely that birds from the Boyne estuary would occur regularly within the inner Nanny estuary, particularly in significant numbers, no significant adverse 'in combination' effects were identified.

3.3.9. Measures to avoid adverse effects

Adverse effects on the Boyne Estuary SPA and its bird populations are unlikely to result from the option for the Laytown, Bettystown & Coastal area APSR. However, any risk would be further reduced by the works being undertaken between April and August to avoid the main migration and wintering period, and good construction practices should be implemented to reduce noise levels.

A review of other plans and strategies that could potentially affect the European Site in-combination with the FEM FRMP, including Meath Development Plan 2007-2013 and East Meath Local Area Plan 2005, should be undertaken at the project stage as part of the project level appropriate assessment, in order to confirm whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

3.4. Rogerstown Estuary SPA

3.4.1. Introduction

Rogerstown Estuary SPA covers 586.5ha and is a relatively small, narrow estuary separated from the sea by a sand and shingle bar. The estuary receives freshwater input from two main rivers (Ballyboghill and Balleally) as well as several small streams, and has a wide salinity range. It contains good examples of estuarine habitat types including sand dunes, saltmarshes, and intertidal mud and sandflats and is a significant site for waterfowl. The population of Brent geese is internationally important, and there are nationally important

populations of a further 16-17 waterfowl species, including Oystercatcher, Golden plover, Lapwing, Knot and Dunlin, and smaller populations of several other species.

3.4.2. Potential risk to site resulting from the FRMP

Rush APSR

As a result of the construction of the preferred option for Rush APSR, there is a potential for temporary changes to the pattern of freshwater input into the estuary, which may affect the habitats and food supplies of the SPA bird populations. There is also potential, during the construction period, for disturbance to the bird populations that are designated features of the SPA. There is also potential for an in-combination effect with increased development in the catchment of the Rush (Brook) Stream.

3.4.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the *Natura 2000* Standard Data Form, are provided in Table 3-6.

Table 3-6: Rogerstown Estuary SPA interest features

Rogerstown Estuary SPA interest features
Birds listed on Annex 1 of Council Directive 79/409/EEC
Pluvialis squatarola Golden plover (wintering) *Philomachus pugnax* Ruff (staging)
Regularly occurring migratory birds not listed on Annex 1 of Council Directive 79/409/EEC
Phalacrocorax carbo Cormorant (wintering) *Anser anser* Greylag goose (wintering) *Branta bernicla* Brent goose (wintering) *Tadorna tadorna* Shelduck (breeding & wintering) *Anas penelope* Wigeon (wintering) *Anas crecca* Teal (wintering) *Anas platyrhyncos* Mallard (wintering) *Anas clypeata* Shoveler (breeding and wintering) *Mergus serrator* Red-breasted merganser (wintering) *Haematopus ostralegus* Oystercatcher (wintering) *Charadrius hiaticula* Ringed plover (breeding & wintering) *Pluvialis squatarola* Grey plover (wintering) *Vanellus vanellus* Lapwing (wintering) *Calidris canutus* Knot (wintering) *Calidris alba* Sanderling (wintering) *Calidris alpina* Dunlin (wintering) *Calidris ferruginea* Curlew sandpiper (staging) *Gallinago gallinago* Snipe (wintering) *Calidris minuta* Little stint (staging) *Limosa limosa* Black-tailed godwit (wintering) *Numenius arquata* Curlew (wintering) *Tringa totanus* Redshank (breeding & wintering) *Tringa nebularia* Greenshank (wintering) *Tringa ochropus* Green sandpiper (staging) *Arenaria interpres* Turnstone (wintering)

However, a revised list of "Special Conservation Interests" for the SPA has been proposed by NPWS (see section 3.2.3) as follows:

- The site is selected for: Light-bellied brent goose, Shelduck, Oystercatcher, Ringed plover and Knot.
- Additional Special Conservation Interests: Greylag goose, Shoveler, Grey plover, Dunlin, Black-tailed godwit, Redshank, and Wetland and Waterbirds.

3.4.4. Ecological value of potentially affected features

The Rogerstown Estuary is an internationally important waterbird site, ranked 11th in the list of 276 wetlands in the Republic of Ireland on the basis of its mean total waterbird count for the period 2002-2007[21]. During that period it supported a mean total of 22,375 birds, including internationally important numbers[22] of Light-bellied brent goose and Black tailed godwit, as well as nationally important numbers of seventeen other species: Greylag goose, Shelduck, Wigeon, Teal, Shoveler, Oystercatcher, Ringed plover, Golden plover, Grey plover, Lapwing, Knot, Sanderling, Dunlin, Curlew, Greenshank, Redshank and Turnstone. However, this list differs slightly from those published in the SPA Site Synopsis and the Natura 2000 Standard Data Form, which are based on data from previous periods and list totals of seventeen and sixteen species respectively. The *Natura 2000* Standard Data Form highlights the international importance of the Light-bellied brent goose population which represents 5.9% of the all-Ireland total, as well as nationally important populations of Knot (8.6%), Shelduck (5.3%) and Golden plover (4.5%).

3.4.5. Conservation objectives

The draft main conservation objective for Rogerstown Estuary SPA is:

- To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied brent goose, Shelduck, Oystercatcher, Ringed plover, Knot, Greylag goose, Shoveler, Grey plover, Dunlin, Black-tailed godwit, Redshank, Wetland and Waterbirds.

3.4.6. Condition of site and management

The main threats to the wintering bird populations and their habitats are pollution from a landfill site, sewage pollution and agricultural run-off[23]. Illegal shooting causes disturbance to wintering waterfowl.

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[21] Boland, et.al.. (2008) *Op.cit.*
[22] This is based on the concept of the "1% rule", an arbitrary threshold that was developed under the Ramsar Convention, so that a wetland is considered important in a national (e.g. Great Britain or all-Ireland) context if it regularly holds 1% or more of one waterbird species, sub-species or population (in Great Britain or the island of Ireland respectively), and of international importance if it regularly supports the same proportion of the relevant international population. Normally this is measured by calculating the five-year peak mean for each species and expressing this as a percentage of the national/international population estimates.
[23] Natura 2000 Data Form.

3.4.7. Potential impact of scheme alone

Rush APSR

The preferred option for Rush APSR shown on Figure 3.3 would involve constructing a secondary culvert alongside the existing culvert on the downstream end of the Rush West Stream. Modelling results indicate that a new circular culvert with a diameter of 0.5m when combined with the capacity of the existing structure would be sufficient to reduce fluvial flood risk in Rush. The combined culverts would convey a flow of 1.2m^3/s, which equates to the 1% AEP flow without surcharging. The results of the modelling indicate that this option modifies existing overland flood flow paths which are the result of capacity problems at the entrance to the existing culvert and lead to the flooding of properties in Rush. The option prevents these overland flow paths through increasing the capacity of the culvert. There are no areas of significant natural floodplain storage affected by this option.

Consequently, freshwater that previously left the channel upstream of the existing culvert, during a 1% AEP flood event, will remain in-channel and thus enter the estuary directly, resulting in a temporary change to the pattern of freshwater input into the estuary. However the volume discharged will increase (approximately double the existing peak discharge) and will be discharged over a shorter time period during a flood event. This increase in volume may lead to some scouring so it should be recommended that scour protection is included at the outlet of this structure.

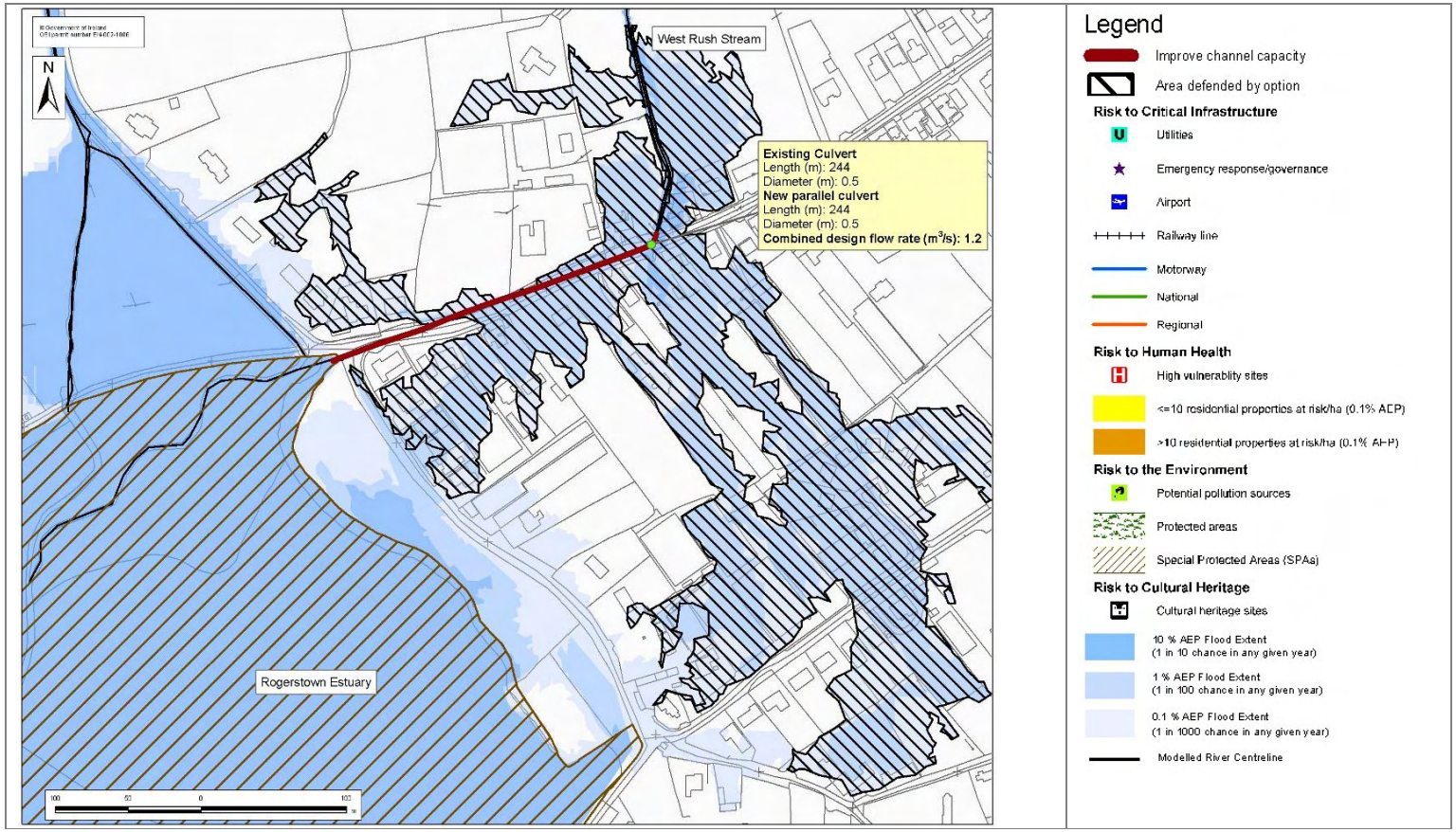

Figure 3-3: Location of Preferred Option for Rush APSR in relation to Rogerstown Estuary SPA.

The normal physical and biological functioning of estuaries depends in part on the pattern of freshwater inflow which influences salinity gradients, turbidity and organic matter inputs. Changes could, therefore, affect the intertidal habitats and food supplies of the SPA bird populations in the Rogerstown estuary. However, the predicted changes are for an extreme event and, during such an event, the proposed new culvert will only channel flow which is normally out of bank. Consequently, there should be no change for in-bank events and, therefore, no change in the regular pattern of freshwater inflow beyond the limits of natural variation. In addition, the input of the West Rush Stream into the estuary is extremely small, and the stream forms only a very narrow meandering tributary channel of only 1-3m wide across the fronting mudflat.

There is potential for temporary disturbance to foraging bird populations on the fronting mudflat, as a result of noise and activity associated with the works at the downstream end of the new culvert. Nevertheless, given the enclosed nature of works site bounded on the north side by Channel Road and on the south by an area of amenity grassland fronting South Shore Road, it is unlikely that the immediate vicinity of the proposed works is used by more than a few foraging waterbirds. In addition, as a result of existing local traffic and activity along Channel Road and South Shore Road running close to the estuary shore, the response of birds to additional activity may be limited. A study by IECS (2007) on the Humber estuary concluded that birds become habituated to regular construction noise below 70dB. It is very likely that birds will be displaced from the immediate vicinity of the construction site as a result of personnel and plant, but the effects on more distant birds are more difficult to assess. However, the birds may become habituated to the new activity within a number of days thus reducing the magnitude of the effect. Potential disturbance to the SPA bird populations would be reduced to a minimum by the mitigation measures of undertaking the works, as far as possible, between April and August to avoid the main migration and wintering period.

Consequently, it is concluded that, provided that these measures are implemented, the application of the preferred option for Rush APSR will not impact a significant proportion of the estuary's bird populations and, therefore, will not adversely affect the integrity of the Rogerstown Estuary SPA and its Special Conservation Interests.

3.4.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Site in-combination with the FEM FRMP, including Fingal Development Plan 2011-2017 and local area development plans. No significant adverse 'in combination' effects were identified at the strategic level. However, there is potential for such impacts resulting from Zoning Objectives "RU" Rural and "RA" Residential Area in the Fingal Development Plan 2011-2017, and their implementation through the Rush Kenure and Rush (Skerries Road) Local Area Plans, if these lead to additional changes to the flow characteristics of Rush West Stream. However, given the small size and capacity of the stream, it is unlikely that in-combination effects would significantly change the regular pattern of freshwater input into the estuary beyond the limits of natural variation. Nevertheless, this would be assessed at the project stage as part of the project-level Appropriate Assessment.

3.4.9. Measures to avoid adverse effects

Scour protection should be installed at the downstream end of the culvert to prevent scour of the intertidal habitats.

The works should be undertaken, as far as possible, between April and August to avoid the main migration and wintering periods for the birds that are the Special Conservation Interests of the SPA.

A review of the Fingal Development Plan 2011-2017, Rush Kenure Local Area Plan and the Rush (Skerries Road) Local Area Plan should be undertaken at the project stage as part of the project level appropriate assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

3.5. Rogerstown Estuary cSAC

3.5.1. Introduction

Rogerstown Estuary cSAC covers the same area as the SPA (586.5ha) and is a relatively small, narrow estuary separated from the sea by a sand and shingle bar. The estuary receives freshwater input from two main rivers (Ballyboghill and Balleally) as well as several small streams, and has a wide salinity range. It contains good examples of estuarine habitat types including sand dunes, saltmarshes, and intertidal mud and sandflats.

3.5.2. Potential risk to site resulting from the FRMP

Rush APSR

As a result of the construction of the preferred option for Rush APSR, there is a potential for temporary changes to the pattern of freshwater input into the estuary, which may affect the intertidal cSAC habitats of the Rogerstown estuary. There is also a risk that construction of the culvert could have an effect on cSAC habitats in the locality of the works. There is also potential for an in-combination effect with increased development in the catchment of the Rush West Stream.

3.5.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the *Natura 2000* Standard Data Form, are provided in Table 3-7.

Table 3-7: Rogerstown Estuary cSAC interest features.

Rogerstown Estuary cSAC interest features.	
Habitat types listed in Annex I of Council Directive 92/43/EEC (* = priority habitat)	**Common Name**
2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) (Category C: significant representativity)	Dune grassland
2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (Category C: significant representativity)	Shifting dunes with marram
1130 Estuaries (Category B: good representativity)	Estuaries
1140 Mudflats and sandflats not covered by sea water at low tide (Category B: good representativity)	Intertidal mudflats and sandflats
1310 *Salicorna* and other annuals colonizing mud and sand (Category B: good representativity)	Pioneer saltmarshes
1330 Atlantic salt meadows (*Glauco-Puccinelliatelia maritimae*) (Category B: good representativity)	Atlantic salt meadows (or saltmarshes)

Rogerstown Estuary cSAC interest features.	
Habitat types listed in Annex I of Council Directive 92/43/EEC (* = priority habitat)	**Common Name**
1410 Mediterranean salt meadows (*Juncetalia maritimi*) (Category B: good representativity)	Mediterranean salt meadows (or saltmarshes)
1320 *Spartina* swards (*Spartinion maritimae*) (Category D: non-significant presence)	Cord-grass swards (or saltmarshes)

3.5.4. Ecological value of potentially affected features

The intertidal habitats of the estuary are variable in quality owing to pollution from a number of sources. The fringing saltmarshes of the estuary are of moderate importance and quality, and the sand dunes are limited in their distribution and quality. The estuary experiences wide variations in salinity range from near full sea water to near full freshwater.[24]

A large area of the mudflats fronting South Shore Road, in the vicinity of the proposed works, is thinly vegetated with plants indicative of lower saltmarsh, i.e. stands of glasswort *Salicornia* spp. and cord grass *Spartina* spp[25].

3.5.5. Conservation objectives

The draft conservation objectives for the Rogerstown Estuary cSAC are:

- To maintain the Annex I habitats for which the cSAC has been selected, at favourable conservation status: Estuaries; Mudflats and sandflats not covered by sea water at low tide; *Salicorna* and other annuals colonizing mud and sand; Atlantic salt meadows (*Glauco-Puccinelliatelia maritimae*); Mediterranean salt meadows (*Juncetalia maritimi*); Shifting shifting dunes along the shoreline with *Ammophila arenaria* (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes);
- To maintain the extent, species richness and biodiversity of the entire site; and
- To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

3.5.6. Condition of site and management

The main threats to the ecology of the site and the quality of the intertidal habitats are pollution from a landfill site, sewage pollution and agricultural run-off[26]. "The dunes are considered to be in a highly vulnerable state owing to a combination of natural (erosion) and anthropogenic factors." On the northern side of the estuary, in the Rogerstown area, nutrient-

[24] Natura 2000 standard data form.
[25] Doogue, D., Tiernan, D. & Visser, H. (2004) *Ecological Study of the Coastal Habitats in County Fingal, Phase I& II: Habitats & Flora*. Fingal County Council. Pp 13-14, 41.
http://www.fingalbiodiversity.ie/resources/fingal_coast/2004%20Floral%20Habitats.pdf
[26] Natura 2000 Data Form.

rich groundwater seeps over the shore, and one of the streams entering the estuary at the end of Spout Road (Bride's Stream) is heavily polluted[27].

3.5.7. Potential impact of scheme alone

Rush APSR

The preferred option for Rush APSR shown on Figure 3.4 would involve constructing a secondary culvert along side the existing culvert on the downstream end of the Rush West Stream, and full details are given in Section 3.4.7.

The normal physical and biological functioning of estuaries depends in part on the pattern of freshwater inflow which influences salinity gradients, turbidity and organic matter inputs. Changes could, therefore, affect the intertidal habitats that are designated features of Rogerstown Estuary cSAC. However, the predicted changes are for an extreme event, and are unlikely to alter the regular pattern of freshwater inflow beyond the limits of natural variation. In addition, the input of the West Rush Stream into the estuary is extremely small, and the stream forms only a very narrow meandering tributary channel of only 1-3m wide across the fronting mudflat.

However the volume discharged will increase (approximately double the existing peak discharge) and will be discharged over a shorter time period during a flood event. This increase in volume may lead to some scouring so it should be recommended that scour protection is included at the outlet of this structure.

Consequently, it is concluded that provided the above mitigation measures are implemented, the application of the preferred option for Rush APSR will not adversely affect the conservation status of the Special Conservation Interests, and the species richness of the site, and will not therefore, adversely affect the integrity of the Rogerstown Estuary cSAC.

3.5.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Sites in-combination with the FEM FRMP, including Fingal Development Plan 2011-2017 and Local area development plans. No significant adverse 'in combination' effects were identified at the strategic level. However, there is potential for such impacts resulting from Zoning Objectives "RU" Rural and "RA" Residential Area in the Fingal Development Plan 2011-2017, and subsequent implementation through the Rush Kenure and Rush (Skerries Road) Local Area Plans if these lead to additional changes to the flow characteristics of Rush (Brook) Stream. However, given the small size and capacity of the stream, it is unlikely that in-combination effects would significantly change the regular pattern of freshwater input into the estuary beyond the limits of natural variation. Nevertheless, this would be assessed at the project stage as part of the project level appropriate assessment.

[27] Doogue *et al.* (2004) *Op.cit.*, p41.

3.5.9. Measures to avoid adverse effects

Scour protection should be installed at the downstream end of the culvert to prevent erosion of the intertidal habitats.

A review of the Fingal Development Plan 2011-2017, Rush Kenure Local Area Plan and the Rush (Skerries Road) Local Area Plan should be undertaken at the project stage as part of the project level appropriate assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

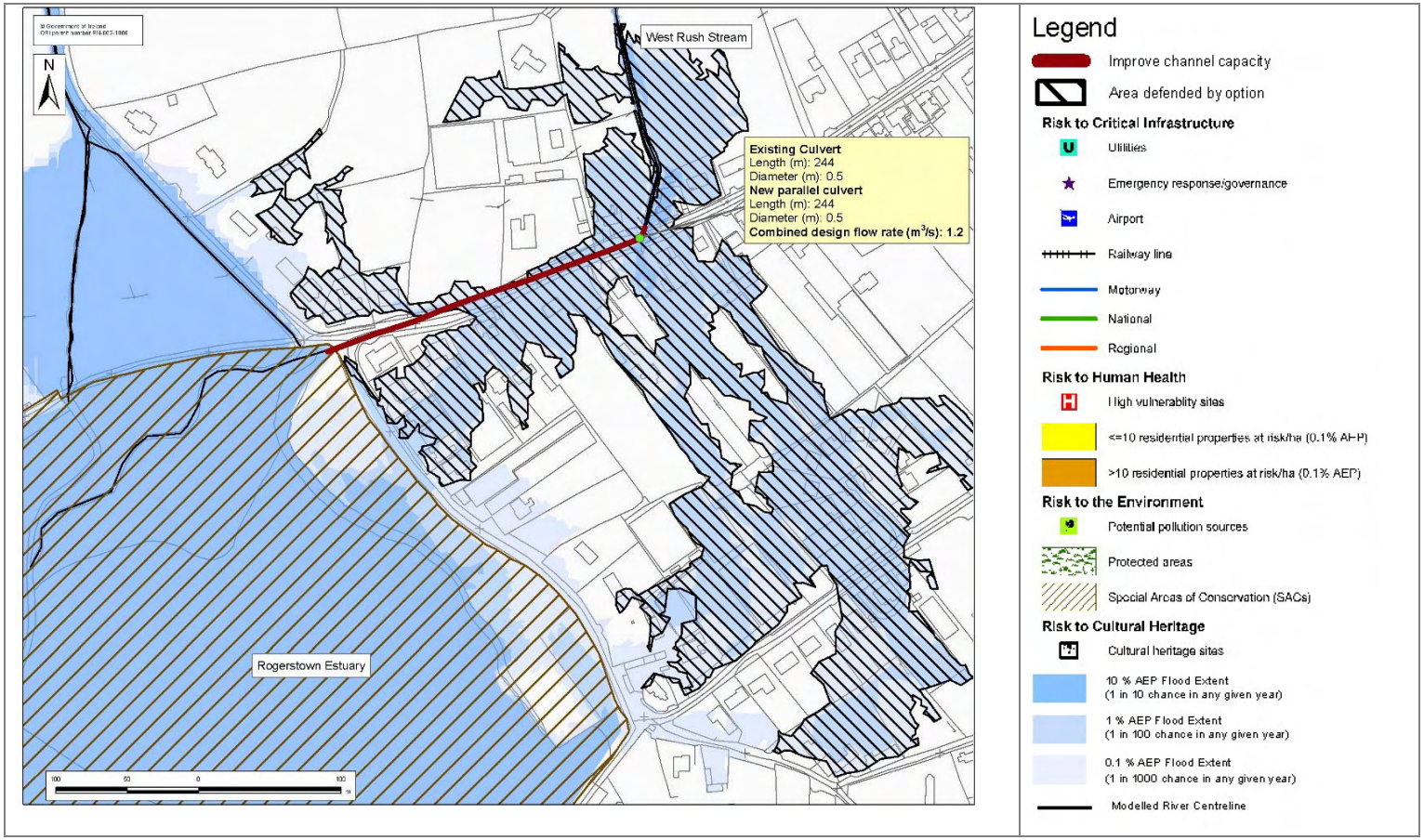

Figure 3-4: Location of Preferred Option for Rush APSR in relation to Rogerstown Estuary cSAC.

3.6. Broadmeadow Estuary/Swords SPA

3.6.1. Introduction

Broadmeadow Estuary/Swords SPA covers an area of 764ha and is a very good example of an estuarine system, comprising a range of intertidal mudflats and saltmarshes, as well as large beds of eel grass. The estuary is divided into two by a railway viaduct and is substantially separated from the sea by a large sand spit known as "The Island". The inner estuary is lagoonal in character and tidal exchange is limited, only the extreme inner part draining at low water. The outer part of the estuary empties almost completely at low water, exposing extensive intertidal flats, and there is a large bed of eelgrass in the northern section.

The Broadmeadow Estuary is an internationally important wetland[28], supporting up to three waterbird species in internationally important numbers[29], and a further 12 species in nationally important numbers (see section 3.6.4 for further details).

3.6.2. Potential risk to site resulting from FRMP

During construction of the preferred option for Malahide town centre within the Portmarnock and Malahide areas APSR, there is potential for disturbance to SPA bird species. In the long term, this option, combined with sea level rise, could contribute to coastal squeeze and a loss of intertidal habitat.

3.6.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the Natura 2000 Standard Data Form, are provided in Table 3-8.

Table 3-8: Broadmeadow/Swords SPA interest features

Broadmeadow/Swords SPA interest features
Birds listed on Annex 1 of Council Directive 79/409/EEC
Pluvialis squatarola Golden plover (wintering) *Philomachus pugnax* Ruff (staging) *Limosa lapponica* Bar-tailed godwit (wintering)
Regularly occurring migratory birds not listed on Annex 1 of Council Directive 79/409/EEC
Cygnus olor Mute swan (wintering) *Branta bernicla hrota* Light-bellied brent goose (wintering) *Tadorna tadorna* Shelduck (breeding & wintering) *Anas acuta* Pintail (wintering) *Aythya ferina* Pochard (wintering) *Bucephala clangula* Goldeneye (wintering) *Mergus mergus* Red-breasted merganser (wintering)

[28] Boland et al. (2008) *Op.cit.*
[29] Representing 1% or more of the relevant international population (see section 3.2.4).

Broadmeadow/Swords SPA interest features
Podiceps cristatus Great crested grebe (wintering)
Ardea cinerea Grey heron (breeding and wintering)
Haematopus ostralegus Oystercatcher (wintering)
Charadrius hiaticula Ringed plover (breeding & wintering)
Pluvialis squatarola Grey plover (wintering)
Vanellus vanellus Lapwing (breeding & wintering)
Calidris canutus Knot (wintering)
Calidris alpina Dunlin (wintering)
Calidris minuta Little stint (staging)
Limosa limosa Black-tailed godwit (breeding potential & wintering)
Numenius arquata Curlew (breeding & wintering)
Tringa erythropus Spotted redshank (staging)
Tringa totanus Redshank (breeding & wintering)
Tringa nebularia Greenshank (wintering)
Tringa ochropus Green sandpiper (staging)
Arenaria interpres Turnstone (wintering)

However, a revised list of Special Conservation Interests for the SPA have been proposed by NPWS (see section 3.2.3) as follows:

- The site is selected for: Light-bellied brent goose, Goldeneye, Black-tailed godwit.
- Additional Special Conservation Interests: Great crested grebe, Shelduck, Pintail, Red-breasted merganser, Oystercatcher, Golden plover, Grey plover, Knot, Dunlin, Bar-tailed godwit, Redshank, Wetland and Waterbirds.

3.6.4. Ecological value of potentially affected features

The Broadmeadow Estuary is an internationally important waterbird site, ranked 17th in the list of 276 wetlands in the Republic of Ireland on the basis of its mean total waterbird count for the period 2002-2007[30]. During that period it supported a mean total of 14,042 waterbirds, three of which were present in internationally important numbers: Great-crested grebe, Light-bellied brent goose and Turnstone. However, this differs slightly from the list featured in the Broadmeadow Estuary SPA Site Synopsis and Natura 2000 Data Form, which lists internationally important populations of Light-bellied brent geese (956) and nationally important populations[31] of a further 12 waterfowl species including Red-breasted merganser (105), Oystercatcher (1493), Golden plover (1843), Greenshank (38), Shelduck (439), Pintail (58), Goldeneye (215), Grey plover (201), Knot (915), Dunlin (1594), Redshank (581) and Bar-tailed godwit (156). The Light-bellied brent goose population represents 4.8% of the all-Ireland total, the knot population 3.7%, Shelduck 3%, Pintail 2.9%, Red-breasted merganser 2.8% and Golden plover 2.7%. The lagoonal nature of the inner estuary increases the diversity of the waterfowl community by providing good conditions for diving ducks, and it is one of the few sites in eastern Ireland where substantial numbers of Goldeneye can be found. It also supports a regular flock of non-breeding Mute swans (Plate 3-1).

[30] Boland *et al.*. (2008) *Op.cit.*
[31] Based on average peaks for the 5-year period 1995/6-1999/2000 (given in parethenses),.

Plate 3-1: Mute swans on the Broadmeadow Estuary, January 2009

The small area at the western end of the estuary, from Seatown to Prospect Point is by far the most important part of the inner estuary in terms of numbers and diversity of foraging waterbirds[32]. This is the result of the diverse nature of the habitats in this area, including saltmarsh, creeks and channels, shallow water with small tidal influence and exposed mud-flats. The rest of the inner estuary is permanently submerged in deep water, has narrow stony shores, and is very disturbed by human recreational activities. Foraging birds in the outer estuary are fairly evenly distributed across the intertidal sand and mudflats at low water.

Saltmarshes provide important high tide roost sites, and the primary roosting areas are at the western end of the inner estuary, at the southern end of "The Island", and on a small peninsula, isolated by the railway, in the northern part of the outer estuary[33]. There is also a secondary roost near the dinghy clubs at Cave's Marsh, on the southern side of the estuary, and this is particularly used by Light-bellied brent geese,. Most of the rest of the southern shore is increasingly disturbed[34].

Some birds that feed in the outer estuary (especially Light-bellied brent geese, Redshank and Dunlin) fly up the estuary to roost in small area west of Prospect Point[35]. In recent winters, Light-bellied brent geese have also used agricultural fields adjacent to estuary, for feeding and roosting, as well as short grass playing fields and parks on the south side of the estuary.

[32] Merne, O.J. (2008) *Broadmeadow River Estuary (Swords/Malahide), Co.Dublin: Waterbirds in July and August 2008*. http://www.fingalbiodiversity.ie/resources/fingal_coast/2008%20Summer%20Waterbirds.pdf
[33] Visser, H., Coveney, J., Kelly, D., McManus, F., Pierce, S. & Dillon, D. (2004) *Ecological Study of the Coastal Habitats in County Fingal, Phase II – Birds.* Fingal County Council.. p 17
http://www.fingalbiodiversity.ie/resources/fingal_coast/2004%20Bird%20Habitats.pdf
[34] *Ibid.* p13
[35] Merne (2008) *Op.cit.*

3.6.5. Conservation objectives

The draft main conservation objective[36] for Broadmeadow Estuary/Swords SPA, based on the proposed list of Special Conservation Interests, is:

- To maintain the special conservation interests for this SPA at favourable conservation status: Light-Bellied brent goose, Goldeneye, Pintail, Red-breasted merganser, Great-crested grebe, Shelduck, Oystercatcher, Golden plover, Grey plover, Ringed plover, Knot, Dunlin. Black-tailed godwit, Bar-tailed godwit, Redshank, Wetland and Waterbirds.

3.6.6. Condition of site and management

The main problems and threats to the SPA and its birds are from recreational activities (especially water sports), water pollution and infilling. The inner estuary is heavily used for water sports, which causes disturbance to birds, and part of the outer estuary was taken for a new marina in the 1990s[37].

The enclosed nature of the inner estuary also makes it particularly vulnerable to pollution, which enters from Broadmeadow River and from sewage plants at Swords and Malahide.

3.6.7. Potential impact of scheme alone

Portmarnock and Malahide areas APSR: Malahide town centre

The application of the preferred option for Malahide town centre in the Portmarnock and Malahide areas APSR shown on Figure 3.5 would involve the construction of flood walls and the improvement of existing defences at The Green, on the north-east side of Malahide, and the construction of a demountable flood defence across the railway underpass on Bissets Strand, to the north-west of the town centre, in order to prevent the propagation of flood waters along the coast road eastwards into the town.

The proposed new defences, and those to be improved, are located along the boundary of Broadmeadow estuary SPA on the north-east side of the town and, therefore, there is the potential for disturbance to SPA bird species during the construction period.

The estuarine habitat present at the location of the preferred option comprises a small area of mudflat (c.0.35ha) confined between the current defences on the western side, a marina on the north side and a jetty on the south side. There is also a small concrete slipway that is used for the launching of small boats into this enclosed area at high tide. The mudflat between the jetty and the marina is unlikely to be used by large numbers of foraging birds, and those that are present are likely to be habituated to current levels of noise and human activity. Consequently, their response to additional activity may be limited. However, to the east of the jetty the mudflat continues unbroken to the mouth of the estuary and this is likely to accommodate greater numbers of foraging birds.

[36] Supplied by NPWS, October 2010.
[37] Information in the Natura 2000 Data Form.

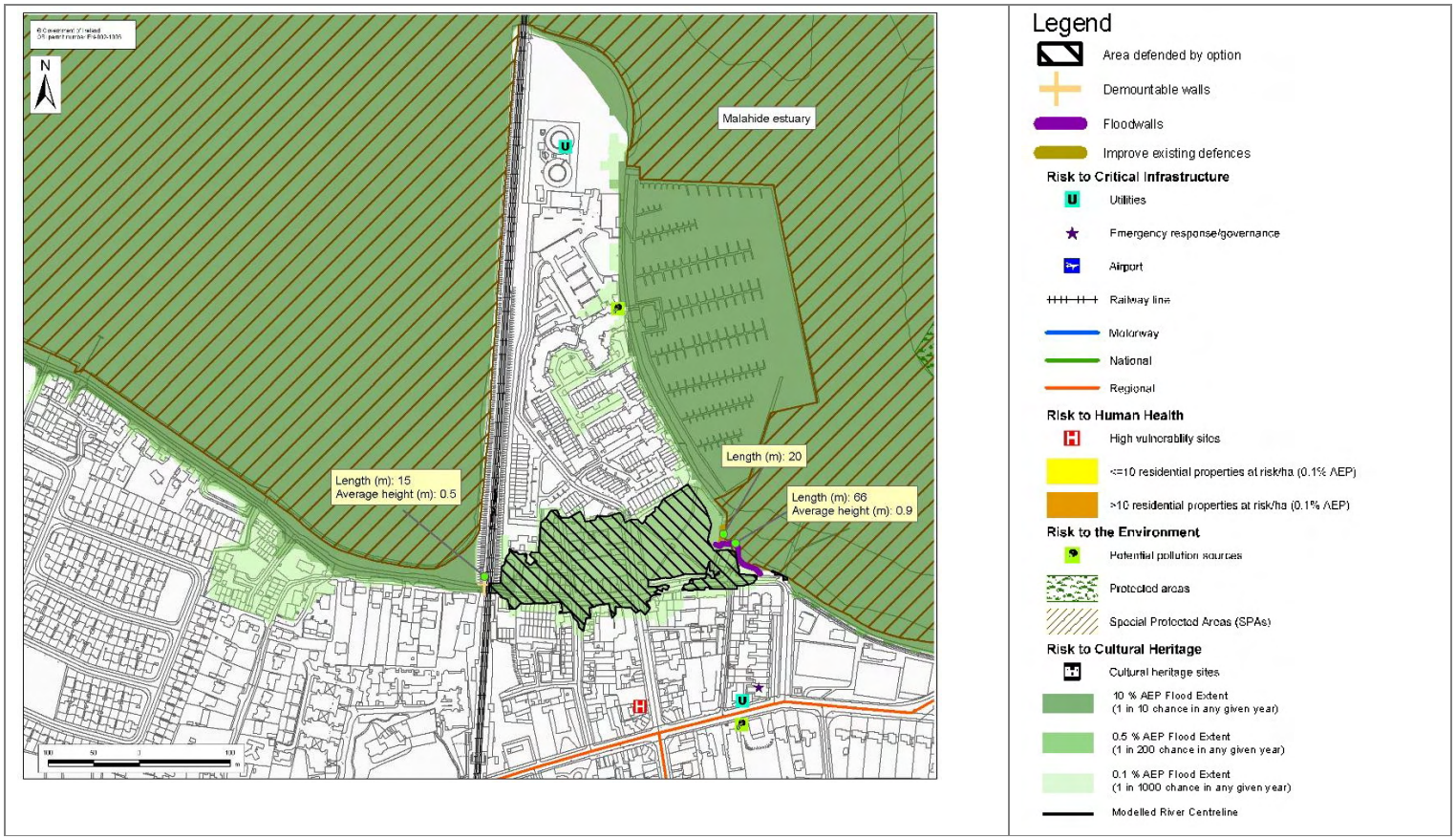

Figure 3-5: Location of the preferred option for Portmarnock and Malahide areas APSR: Malahide town centre, in relation to Broadmeadow Estuary/ Swords SPA.

A study by IECS (2007) on the Humber estuary concluded that birds become habituated to regular construction noise below 70dB. It is, therefore, not clear that the proposed construction activities will represent a significant increase in noise and activity levels in relation to the present conditions. It is very likely that birds will be displaced from the immediate vicinity of the active construction sites as a result of personnel and plant, but the effects on more distant birds are more difficult to assess. However, the birds may become habituated to the new activity within a number of days thus reducing the magnitude of the effect.

In the long term, this option, as a "hold the line" option in terms of coastal management, could contribute to coastal squeeze and a loss of intertidal habitat resulting from accelerated sea level rise. Nevertheless, considering the small area of intertidal habitat concerned, which covers approximately 0.05% of the total area of the SPA, and the small number of birds that are likely to be affected temporarily by the proposed works or, in the long term by coastal squeeze, it is considered that this option would not impact a significant proportion of the estuary's bird populations. Consequently, it is concluded that the application of the preferred option for Portmarnock and Malahide areas APSR: Malahide Town Centre would not adversely affect the integrity of the Broadmeadow Estuary/Swords SPA and its Special Conservation Interests.

3.6.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Sites in-combination with the FEM FRMP, including Fingal Development Plan 2011-2017 and Local area development plans. No significant adverse 'in combination' effects were identified at the strategic level, although there is potential for such impacts at a local level depending on the implementation of any relevant actions resulting from other plans. In the Fingal Development Plan 2011-2017, there is a mix of Zoning Objectives "RS" Residential, "TC" Town and District Centre and "OS" Open Space in the area of the proposed option and eastwards along the estuary. This may increase the likelihood of coastal squeeze along this stretch of the estuary shore, although there is some potential opportunity for realignment. However, it is concluded that any in-combination effects on the bird populations that are designated features of the Broadmeadow Estuary/Swords SPA, as a result of coastal squeeze of their intertidal habitats, are not likely to be significant but would be assessed at the project stage as part of the project level appropriate assessment.

3.6.9. Measures to avoid adverse effects

To further reduce any impact on bird populations, the works should be undertaken, as far as possible, between April and August to avoid the main migration and wintering period, and good practice construction methods should be used to reduce noise levels and visual disturbance.

A review of the Fingal Development Plan 2011-2017 and Local area development plans should be undertaken at the project stage as part of the project level appropriate assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

3.7. Baldoyle Bay cSAC

3.7.1. Introduction

Baldoyle Bay cSAC covers an area of 538.9ha and comprises a tidal estuary bay, formed by a sand spit that substantially separates and shelters it from the Irish Sea, as well as extensive intertidal flats beyond the shelter of the sand spit. The bay contains large areas of intertidal sands, grading to mud in the sheltered areas, and there are extensive cord grass swards, smaller areas of other saltmarsh types, and some beds of eel grass. Most of the dunes on the spit are now used as a golf course.

Baldoyle Bay receives freshwater input from the Sluice River, which enters at Portmarnock Bridge at the head of the estuary, and the Mayne River which enters approximately 1km downstream. The lower tidal section of the Mayne River and its adjoining brackish marshes are included in the cSAC. Both rivers drain an agricultural and suburban catchment.

3.7.2. Potential risk to site resulting from FRMP

As a result of construction of the preferred option for Portmarnock and Malahide areas APSR: Portmarnock, there is potential for loss of cSAC habitats beneath the increased footprint should it encroach into the designated site. In the long term, this option, combined with sea level rise, could result in coastal squeeze and a loss of intertidal cSAC habitats.

In addition, the construction of the preferred options for the Portmarnock and Malahide areas APSR: Portmarnock, and the St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR, could lead to a change in the pattern of freshwater flow into the estuary.

3.7.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the *Natura 2000* Standard Data Form, are provided in Table 3-9.

Table 3-9: Baldoyle Bay cSAC interest features

Baldoyle Bay cSAC interest features	
Habitat types listed in Annex I of Council Directive 92/43/EEC (* = priority habitat)	**Common name**
1140 Mudflats and sandflats not covered by sea water at low tide (Category B: good representativity)	Intertidal mudflats and sandflats
1310 *Salicorna* and other annuals colonizing mud and sand (Category C: significant representativity)	Pioneer saltmarshes
1330 Atlantic salt meadows (*Glauco-Puccinelliatelia maritimae*) (Category B: good representativity)	Atlantic salt meadows (or saltmarshes)
1410 Mediterranean salt meadows (*Juncetalia maritimi*) (Category B: good representativity)	Mediterranean salt meadows (or saltmarshes)
1320 *Spartina* swards (*Spartinion maritimae*) (Category D: non-significant presence)	Cord-grass swards (or saltmarshes)

3.7.4. Ecological value of potentially affected features

The main areas of saltmarsh on the estuary are those at Portmarnock, at the head of the estuary, and at the tip of Portmarnock Point, but there are also narrow strips of saltmarsh along other parts of estuary. The saltmarsh at Portmarnock is clearly divided into upper

saltmarsh, dominated by sea club rush *Juncus maritimus*, and a lower zone containing beds of sea purslane *Atriplex portulaoides* and parsley water dropwort *Oenanthe lachenalii*, the latter being indicative of percolating freshwater input[38]. There are also stands of common reed *Phragmites australis* near the Coast Road.

A habitat map, produced as a result of a survey undertaken in 2007-2008[39], shows that the saltmarsh habitats immediately adjacent to the proposed works comprise a cord-grass (*Spartina)* sward, east of the Sluice River channel, and mainly unspecified habitat west of the channel, although Atlantic salt meadow reaches the wall at two narrow points (approximately 15m or less in width).

The peninsula of Portmarnock Point was once covered in extensive sand dunes, but these have largely been replaced by two golf courses.

3.7.5. Conservation objectives

The draft conservation objectives for the Baldoyle Bay cSAC are:

- To maintain the Annex I habitats for which the cSAC has been selected, at favourable conservation status: Mudflats and sandflats not covered by sea water at low tide; *Salicorna* and other annuals colonizing mud and sand; Atlantic salt meadows (*Glauco-Puccinelliatelia maritimae*); Mediterranean salt meadows (*Juncetalia maritimi*);
- To maintain the extent, species richness and biodiversity of the entire site; and
- To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

3.7.6. Condition of site and management

A large proportion (36%) of the site is protected as a Nature Reserve and is not, therefore, significantly threatened.

Pollution of the estuary occurs from a number of sources, especially sewage from rivers and sewage works. There are also some problems caused by bait digging, and spread of cord-grass *Spartina* may be an issue for some intertidal habitats.

In the past, developments have been proposed for the area near the Mayne River, which is outside the nature reserve, and this area is still considered under threat.

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[38] Doogue *et al.* (2004), *Op.cit.* p51.

[39] McCorry, M. & Ryle, T. (2009) *Saltmarsh Monitoring Project 2007-2008, Volume 2, Final Report.* A Report for Research Branch, National Parks and Wildlife Service. Environment, Heritage and Local Government, Dublin. http://www.npws.ie/publications/archive/McCorry_&_Ryle_2009_Saltmarsh_survey_V2-20.pdf (Accessed 07/09/2011)

3.7.7. Potential impact of scheme alone

Portmarnock and Malahide areas APSR: Portmarnock

The application of the preferred option for the Portmarnock and Malahide areas APSR shown in Figure 3.6 would involve strengthening and raising 0.5km of existing walls which run alongside the R106 at Strand Road. It also involves replacing the flapped gates on the Sluice River at Portmarnock Bridge, to prevent the propagation of high tides upstream of this bridge, and the construction of 120m of flood embankments on the left bank of the Sluice River upstream of Portmarnock Bridge.

Hydraulic modelling indicates that there is no impact on water levels upstream or downstream of Strand Road. The construction of the flood embankment along the left bank of the Sluice River prevents an existing overland flow path (westwards through Hazel Grove and across the R106), but this would not be considered a principal overland flow route, and there are no areas of significant natural floodplain storage affected by this option.

These works would take place on the boundary of Baldoyle Bay cSAC, but the raised wall would be constructed on the line of the existing wall and would not encroach on the cSAC saltmarsh habitat. However, there is potential for temporary damage to saltmarsh during construction, affecting approximately 1,500m^2 or 0.16ha of saltmarsh comprising a 5m strip along a 300m length of wall. Nevertheless, considering that there are 37.73ha of saltmarsh in Baldoyle Bay[40], the potentially affected area constitutes only 0.4% of the whole. In addition, only a very small proportion of the potentially affected area of saltmarsh comprises an Annex 1 habitat (Atlantic salt meadow) subject to the specific conservation objectives for the site. However, measures would be put in place to minimise the temporary damage caused to the saltmarsh, to avoid the Atlantic salt meadow, and to facilitate the saltmarsh recovery after completion of the works. Consequently, it is concluded that, although this option would potentially have some temporary adverse impact on saltmarsh in the Baldoyle Bay cSAC, the extent, species richness and biodiversity of the entire site would be maintained, and would not be adversely affected in the long term.

The construction of the fluvial flood defence embankment will result, during a 0.5% AEP flood event, in freshwater that previously flooded the area upstream of Portmarnock Bridge entering the estuary directly, thus resulting in a temporary change to the pattern of freshwater input into the estuary. However, estuarine organisms have wide salinity tolerances and exist in a naturally variable environment. Consequently, they are only affected by changes in freshwater input that are beyond their normal range of variability for a prolonged period of time. As the predicted change to river flow would only occur in an extreme and temporary event, at the rate of 1 in 200 years, it is considered that there will be no effect on the regular pattern of freshwater inflow beyond levels of natural variability.

Consequently, it is concluded that the application of the preferred option for Portmarnock and Malahide areas APSR would not adversely affect the integrity of the Baldoyle Bay cSAC, as it

[40] Calculated on the basis of figures given in the Natura 2000 Standard Data Form for Baldoyle Bay SAC.

will not change the ecological structure and function of the site as a whole, nor the habitats for which it was classified.

St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR

The application of the preferred option for St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR shown in Figure 3-7 would involve the construction of a flood defence embankment north of the R123 on the Mayne River tributary, the construction of embankments and walls along the left bank of the Mayne River and tributary at Balgriffin, and the removal of an unused bridge structure north of the R123.

Modelling results indicate that this option will have some localised impact on water levels upstream and downstream of the proposed location. Upstream, water levels would be lowered by an average of 0.12m along a 120m stretch of the channel, and downstream they would be raised by an average of 0.16m along 430m of river channel. The results of the modelling also indicate that existing overland flood flow paths are modified with this option, but there are no areas of significant natural floodplain storage affected, although some reduction in floodplain storage does occur.

The implementation of the proposed option for the APSR has the potential for a localised effect on Baldoyle Bay cSAC, approximately 1.5km downstream, as a result of a potential change in the pattern of freshwater flow into the estuary. Increased water flow through the channel and the introduction of new flood embankments and a floodwall is likely to change the pattern of flow downstream of the APSR during a 1% AEP flood event, and possibly during a 10% AEP flood event. However, any effects are expected to be localised and it is concluded that the preferred option for St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR is unlikely to have an adverse effect on the integrity of Baldoyle Bay cSAC.

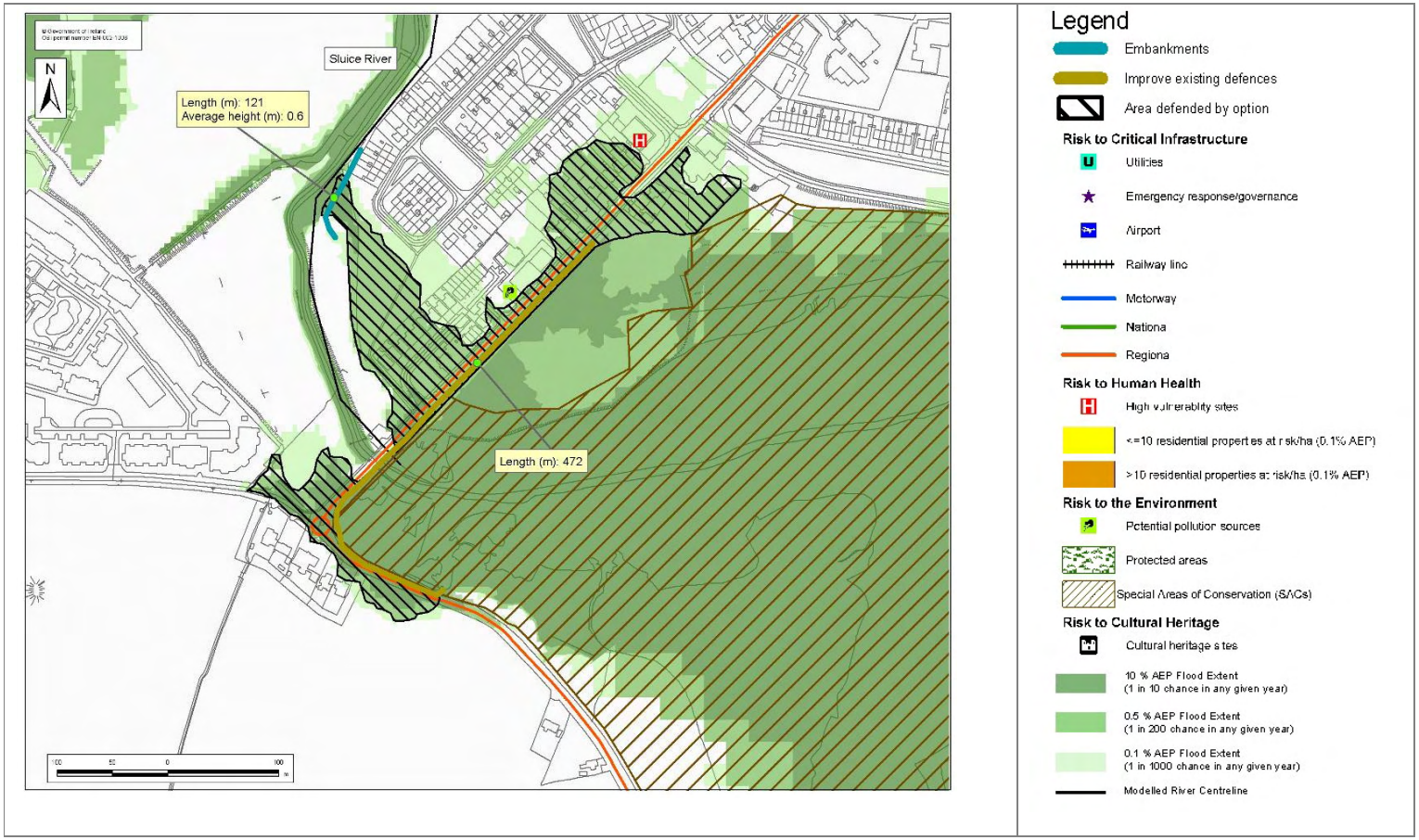

Figure 3-6: Location of the preferred option for Portmarnock and Malahide areas APSR: Portmarnock, in relation to Baldoyle Bay cSAC.

3.7.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Sites in-combination with the FEM FRMP, including Fingal Development Plan 2011-2017 and Local area development plans. No significant adverse 'in combination' effects were identified at the strategic level, although there is potential for such impacts at a local level depending on the implementation of any relevant actions resulting from Zoning Objective "RA" Residential Area in the Fingal Development Plan 2011-2017, and the Portmarnock Local Area Plan 2006. However, this potential for an in-combination effect would need to be assessed at the project stage as part of the project level appropriate assessment

3.7.9. Measures to avoid adverse effects

In order to avoid adverse effects on the saltmarsh interest features of the cSAC, measures would be taken during the detailed design and construction phases of the scheme to ensure that the works on the new flood embankment at Portmarnock are undertaken from the road or from a temporary removable track or working platform laid along the saltmarsh. Particular emphasis would be placed on minimising any effect on the small areas of Atlantic salt meadow which may be present in the working area, and the specifications of the material to be used in raising the wall will be screened to ensure no adverse chemical effects on the saltmarsh or other wildlife present in the cSAC.

A review of the Fingal Development Plan 2011-2017 and Local area development plans should be undertaken at the project stage as part of the project level appropriate assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

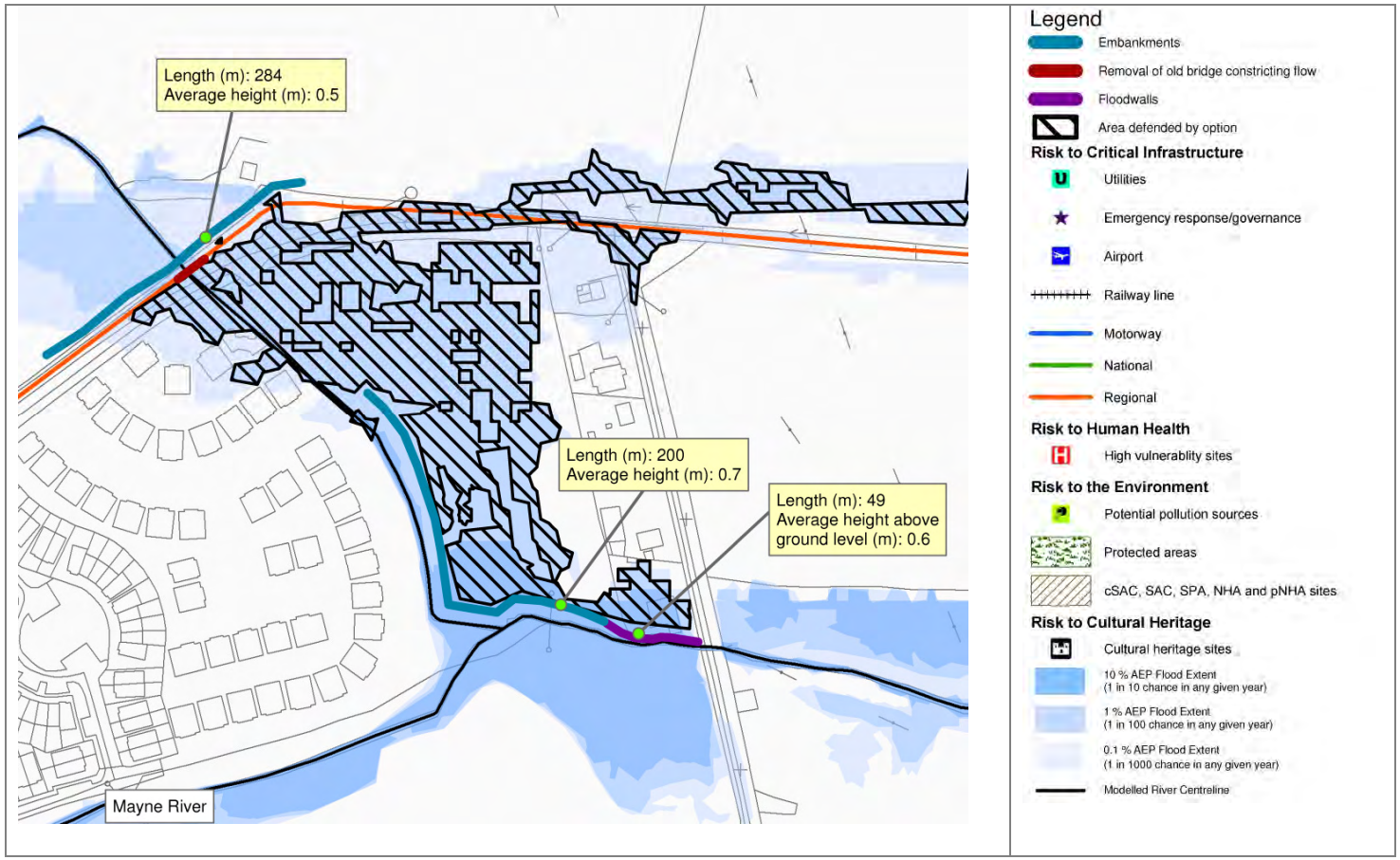

Figure 3-7: Location of the preferred option for St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR.

3.8. Baldoyle Bay SPA

3.8.1. Introduction

Baldoyle Bay SPA covers an area 262.77ha comprising a tidal estuary bay formed by a sand spit that substantially separates it from the Irish Sea. It is smaller than the cSAC as it does not include the intertidal flats on the open coast beyond the shelter of the sand spit. The bay contains large areas of intertidal sands, grading to mud in the sheltered areas, and there are extensive cord grass swards, smaller areas of other saltmarsh types, and some beds of eel grass. The bay supports internationally important wintering populations of Light-bellied brent geese, and nationally important populations of a further seven waterfowl species: Great crested grebe, Shelduck, Pintail, Ringed plover, Golden plover, Grey plover and Bar-tailed godwit. There are also smaller populations of several other species.

3.8.2. Potential risk to site resulting from FRMP

As a result of construction of the preferred option for Portmarnock and Malahide areas APSR: Portmarnock, there is potential for temporary disturbance (e.g. noise, line of sight etc) to birds of the SPA during the construction period. There is also potential for loss of habitats should the raised embankment encroach into the designated site. In the long term, this option, combined with sea level rise, could result in coastal squeeze and a loss of intertidal bird habitats.

In addition, there is potential for the preferred options for Portmarnock and Malahide areas APSR: Portmarnock and St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR to result in changes to the pattern of freshwater flow into the estuary. There is the potential for this change in freshwater input during flood events to affect the birds which are a designated feature of the SPA, through changes to their habitats.

3.8.3. Interest features potentially exposed to risk

Full details of the interest features for which the site is identified, as listed in the Natura 2000 Standard Data Form, are provided in Table 3-10.

Table 3-10: Baldoyle Bay SPA interest features

Baldoyle Bay SPA interest features
Birds listed on Annex 1 of Council Directive 79/409/EEC
Pluvialis squatarola Golden plover (wintering) *Limosa lapponica* Bar-tailed godwit (wintering)
Regularly occurring migratory birds not listed on Annex 1 of Council Directive 79/409/EEC
Branta bernicla hrota Pale-bellied Brent goose (wintering) *Tadorna tadorna* Shelduck (breeding & wintering) *Anas crecca* Teal (wintering) *Anas platyrhyncos* Mallard (breeding and wintering) *Anas acuta* Pintail (wintering) *Mergus serrator* Red-breasted merganser (wintering) *Podiceps cristatus* Great crested grebe (wintering) *Haematopus ostralegus* Oystercatcher (wintering) *Charadrius hiaticula* Ringed plover (breeding & wintering)

Baldoyle Bay SPA interest features
Pluvialis squatarola Grey plover (wintering) *Vanellus vanellus* Lapwing (wintering) *Calidris canutus* Knot (wintering) *Calidris alpina* Dunlin (wintering) *Caldris alba* Sanderling (wintering) *Limosa limosa* Black-tailed godwit (wintering) *Numenius arquata* Curlew (wintering) *Tringa totanus* Redshank (wintering) *Tringa nebularia* Greenshank (wintering) *Arenaria interpres* Turnstone (wintering)

However, a revised list of Special Conservation Interests for the SPA have been proposed by NPWS (see section 3.2.3) as follows:

- The site is selected for:
    - Light-bellied brent goose;
    - Ringed plover; and
    - Bar-tailed godwit.
- Additional Special Conservation Interests:
    - Shelduck;
    - Golden plover;
    - Grey plover; and
    - Wetland and Waterbirds.

3.8.4. Ecology on site of potentially affected features

Baldoyle Bay is an internationally important waterbird site, ranked 42nd in the list of 276 wetlands in the Republic of Ireland in terms of its mean total waterbird count for the period 2002-2007[41]. Although it supports a mean total of only 5,284 waterbirds, Light-bellied brent goose is present in internationally important numbers (726)[42], and a further five species are present in nationally important numbers. The most recently available data[43] list the nationally important populations as Shelduck, Pintail, Grey plover Black-tailed godwit and Bar-tailed godwit. However, this list differs slightly from that published in the SPA Site Synopsis and the Natura 2000 Standard Data Form (based on average peaks for the 5-year period 1995/6-

[41] Boland et al. (2008) *Op.cit.*
[42] Numbers from 1995/6-1999/2000
[43] Boland et al. (2008) *Op.cit.*

1999/2000):[44]: Great crested grebe (42), Shelduck (147), Pintail (22), Ringed plover (221), Golden plover (1810), Grey plover (200) and Bar-tailed godwit (353).

Portmarnock Point is the main roosting area, although some of it is outside the SPA, and birds also use the saltmarshes which fringe other parts of the estuary. It is also used as a late summer roost of up to 150 Arctic and Common terns and 15-20 Roseate terns[45].

Fields on the western side of the head of the estuary used to be important for up to 200 feeding Light-bellied brent geese and, occasionally, 1,500 roosting Golden plover, but the fields are are gradually being lost to development[46]. However, a large area of amenity grassland in Seagrange Park, Baldoyle, regularly supports internationally important numbers of Light-bellied brent geese and, in wet weather, internationally important numbers of Black-tailed godwits[47].

3.8.5. Conservation objectives

The draft main conservation objective for Baldoyle Bay SPA, based on the proposed list of Special Conservation Interests, is:

- To maintain the special conservation interests for this SPA at favourable conservation status: Light-bellied brent goose, Ringed plover, Bar-tailed godwit, Shelduck, Golden plover, Grey plover, Wetland and Waterbirds.

3.8.6. Condition of site and management

According to the Natura 2000 Standard Data Form, the present condition and vulnerability of the site is as follows:

- A significant part of the site is protected as a Nature Reserve;
- Pollution occurs from a number of sources, especially sewage;
- There are some problem caused by bait digging;
- The spread of cord-grass *Spartina* may be an issue for other intertidal habitats; and
- Disturbance from walkers and dogs is a problem.

In addition, as mentioned above, fields on the western side of the head of the estuary, which were important for Light-bellied brent geese and Golden plover, are now gradually being lost to development.

[44] Figures are average peaks for the 5-year period 1995/6-1999/2000 taken from the site synopsis.
[45] Visser et al. (2004) *Op.cit.* p13
[46] *Ibid.*, p13
[47] *Ibid.*.

3.8.7. Potential impact of scheme alone

Portmarnock and Malahide areas APSR: Portmarnock

The application of the preferred option for Portmarnock and Malahide areas APSR: Portmarnock, shown on Figure 3.8, would involve strengthening and raising 0.5km of existing walls which run alongside the R106 at Strand Road, to provide sufficient flood defence function up to the 0.5% AEP tidal event. It also involves replacing the flapped gates on the Sluice River at Portmarnock Bridge, to prevent the propagation of high tides upstream of this bridge, and the construction of 120m of flood embankments on the left bank of the Sluice River upstream of Portmarnock Bridge to provide protection up to the 1% AEP fluvial event and 0.5% AEP tidal event. Full details are given in Section 3.7.7.

These works would take place on the boundary of Baldoyle Bay estuary and SPA. Works to raise the wall are likely to cause temporary disturbance (e.g. noise, line of sight etc) to birds of the SPA during the construction period, although the degree of disturbance will depend on the timing and methodology of the construction works. Although the raised wall would be constructed on the line of the existing wall, and would not result in a loss of habitat by encroaching into the designated site, there is potential for damage to the saltmarsh during construction, affecting approximately 1500m^2 or 0.16ha of saltmarsh, comprising an approximately 5m strip along a 300m length of wall. In the long term, this option, combined with sea level rise, could result in coastal squeeze and a loss of intertidal bird habitats.

However, given the presence of the R106 Strand Road and Coast Road running close to the estuary shore, and the activity and noise levels associated with the road, it is likely that the narrow strip of saltmarsh and estuarine channel adjacent to the road, which would be lost under the footprint of the new upstream walls, is little used by foraging or roosting birds (see Section 3.8.4). Nevertheless, potential disturbance to the SPA bird populations would be reduced to a minimum by undertaking the works, as far as possible, between April and August to avoid the main migration and wintering period, and by using good construction practices to reduce noise levels.

In addition, the construction of the fluvial flood defence embankment will result, during a 0.5% AEP flood event, in freshwater that previously flooded the area upstream of Portmarnock Bridge entering the estuary directly, thus resulting in a temporary change to the pattern of freshwater input into the estuary. However, estuarine organisms have wide salinity tolerances and exist in a naturally variable environment. Consequently, they are only affected by changes in freshwater input that are beyond their normal range of variability for a prolonged period of time. As the predicted change to river flow would only occur in an extreme and temporary event, at the rate of 1 in 200 years, it is considered that it would have no effect on the regular pattern of freshwater inflow beyond levels of natural variability, and would be unlikely to damage the habitat and food supplies of the SPA bird populations.

It is, therefore, concluded that the application of the preferred option for Portmarnock and Malahide areas APSR will not impact a significant proportion of the estuary's bird populations and, therefore, will not adversely affect the integrity of the Baldoyle Bay SPA and its Special Conservation Interests.

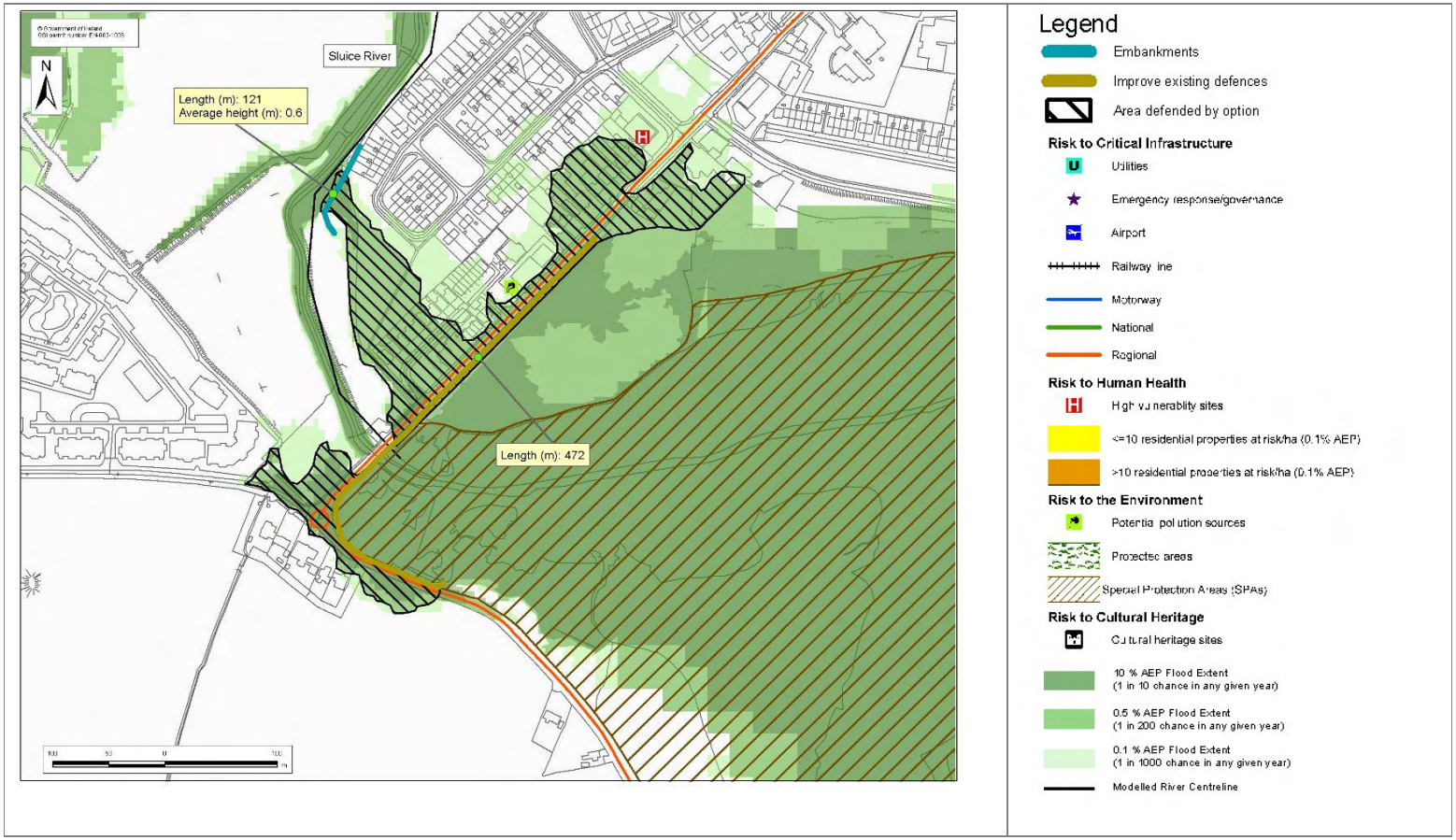

Figure 3-8: Location of the preferred option for Portmarnock and Malahide areas APSR: Portmarnock, in relation to Baldoyle Bay SPA.

St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR

Details of the preferred option are described in Section 3.7.7. The implementation of the proposed option for this APSR has the potential for a localised effect on Baldoyle Bay SPA as a result of a potential change in the pattern of freshwater flow into the estuary. Increased water flow through the channel and the introduction of new flood embankments and a floodwall is likely to change the pattern of flow downstream of the APSR during a 1% AEP flood event (1 in 100 chance in any given year), and possibly during a 10% AEP flood event (1 in 10 chance). However, any effects are expected to be localised and it is concluded that the preferred option for St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR is unlikely to have an adverse effect on the integrity of the Baldoyle Bay SPA and its Special Conservation Interests.

3.8.8. Potential impact of scheme in-combination

A number of other plans and strategies were examined that could potentially affect the European Sites in-combination with the FEM FRMP, including Fingal Development Plan 2011-2017, the Portmarnock Local Area Plan 2006 and Draft Portmarnock Urban Centre Strategy 2009.

Portmarnock and Malahide areas APSR:

No significant adverse 'in combination' effects were identified at the strategic level, although there is potential for such impacts at a local level depending on the implementation of any relevant actions resulting from Zoning Objective "RA" Residential Area in the Fingal Development Plan 2011-2017. The Portmarnock Local Area Plan 2006 has identified an area adjoining the west bank of Baldoyle Bay close to the location of the proposed works, as a Village Expansion Zone. This could lead to increased disturbance, during construction, of the birds that are designated features of the Baldoyle Bay SPA, and increase the potential for coastal squeeze on their habitats. This would, therefore, be assessed at the project stage as part of the project level Appropriate Assessment

St. Margaret's, Dublin Airport, Belcamp & Balgriffin areas APSR

No significant adverse 'in combination' effects were identified at the strategic level, although there is potential for such impacts at a local level depending on the implementation of any relevant actions resulting from Zoning Objective "RA" Residential Area for Balgriffin in the Fingal Development Plan 2011-2017. This would, therefore, be assessed at the project stage as part of the project level Appropriate Assessment

3.8.9. Measures to avoid adverse effects

To further reduce any impact on bird populations, the works should be undertaken, as far as possible, between April and August to avoid the main migration and wintering period, and any piling work should be undertaken using a non-percussive piling technique to reduce noise levels.

The potential for intertidal habitat creation in the estuary should be investigated in order to replace any habitat that may be lost through coastal squeeze. In addition, the specifications of the material to be used in raising the wall will be screened to ensure no adverse chemical effects on the benthic invertebrates and other fauna and flora of the estuary which comprise the food resources of the SPA bird populations.

A review of the Fingal Development Plan 2011-2017 and Local area development plans should be undertaken at the project stage as part of the project level Appropriate Assessment, in order to determine whether any in-combination effects are likely and whether further measures are required to avoid adverse effects.

3.9. Potential in-combination effect between SPAs

The potential exists for an in-combination effect on birds as a result of multiple and simultaneous disturbances at all the construction project locations and SPAs. However, each construction project is small in scale relative to the size of the SPA on which it is located, and only one such project is envisaged for each site. In addition, it is proposed that construction works should be undertaken outside the main migration and wintering period to avoid the disturbance of large numbers of birds. Consequently, it is expected that any birds disturbed by the works are likely to be in small numbers and be displaced within the SPA rather than between SPAs, so that any such in-combination effect is unlikely.

3.10. Summary and Conclusions

Following the Screening for Appropriate Assessment stage (stage 1), this Statement for Appropriate Assessment has been prepared considering the likely effects of the implementation of the preferred options for the APSRs identified in the draft Fingal East Meath FRMP, alone and in-combination, on the integrity of seven European Sites: Boyne Estuary SPA, River Nanny Estuary and Shore SPA, Rogerstown Estuary SPA and cSAC, Broadmeadow/Swords Estuary SPA, Baldoyle Bay cSAC and SPA. None of the preferred options for the Study Area and Assessment Units were identified as having potential for a significant effect.

It is concluded that the preferred options for the APSRs are not likely to adversely affect the integrity of any site provided the following mitigation measures are applied:

- **River Nanny Estuary and Shore SPA** and **Boyne Estuary SPA** - the timing of the proposed works on the River Nanny Estuary to take place between April and August to avoid the main bird migration and wintering period; the reduction of noise by using appropriate construction methods; and the setting back of the flood defences and road, or the creation of new intertidal habitat to mitigate for habitat likely to be lost through coastal squeeze.
- **Rogerstown Estuary SPA and cSAC** - the timing of the proposed works to take place between April and August to avoid the main bird migration and wintering period, and measures to minimise construction noise; scour protection to be installed at the outlet of the culvert.
- **Broadmeadow/Swords Estuary SPA** - the timing of the proposed works to take place between April and August to avoid the main bird migration and wintering period, and measures to minimise construction noise.
- **Baldoyle Bay cSAC and SPA** - minimising the footprint of the proposed works at the detailed design and construction phases of the scheme, to avoid or minimise effects on the intertidal zone of the estuary; the timing of the proposed works; the reduction of noise by using, appropriate construction methods; minimising the use of construction materials that may have a contaminant effect on the estuary; and

the creation of new intertidal habitat to replace any habitat that may be lost through coastal squeeze.

However, site specific assessments should be undertaken at the project stage to confirm that the Plan will have no adverse effect on the integrity of the European Sites and that mitigation measures are appropriate.

Individual schemes or projects will be designed to incorporate standard and specific mitigation measures, and the construction phase will follow good site practices, with the aim of ensuring that there are no adverse effects on the integrity of the European Sites, following discussions with NPWS. These measures will be described in the individual scheme or project appropriate assessments.

Glossary of terms

Alluvial Found on or in deposits of sand, silt, clay, gravel, or other matter deposited by flowing water, as in a riverbed or floodplain.

Analysis Unit These cover large spatial scale and are large sub-catchments or areas of tidal influence.

AEP (Annual exceedence probability) Historically, the likelihood of a flood event was described in terms of its return period. For example, a 1 in 100 year event could be expected to be equalled or exceeded on average once every 100 years. However, there is a tendency for this definition to be misunderstood. There is an expectation that if such an event occurs, it will not be repeated for another 100 years. However, this is not the case; to try to avoid the misunderstanding, flood events are expressed in terms of the chance of them occurring in any year. This can be stated in two ways, namely a percentage or a probability. Taking the above example, we would say that this event has a one per cent, or 1 in 100, chance of being equalled or exceeded in any year.

Areas of Potential Significant Risk (APSR) are existing urban areas with high degrees of flood risk and hence economic damage.

Assessment Unit Define the spatial scale at which flood risk management options are assessed. Assessment Units are defined on four spatial scales ranging in size from largest to smallest as follows: catchment scale, Analysis Unit (AU) scale, Areas of Potential Significant Risk (APSR) and Individual Risk Receptors (IRR).

Biodiversity Biological diversity, the number and abundance of species present.

Birds Directive European Community Directive 79/409/EEC on the conservation of wild birds. The Directive is implemented in Ireland through The Wildlife Act 1976, as amended. It establishes a comprehensive system for the protection of all wild birds.

Catchment A surface water catchment is the total area of land that drains into a watercourse.

Catchment Flood Risk Management Plan (CFRMP) is a large-scale strategic planning framework for the integrated management of flood risks to people and the developed and natural environment in a sustainable manner.

Coastal squeeze The term 'coastal squeeze' is applied to the situation where the extent of coastal habitats is diminishing as it is 'squeezed' between fixed landward boundaries (artificial or otherwise) and the rising sea level.

Conservation objectives These are goals or broad targets describing the desired state of a habitat, species population or conservation site.

Estuary A semi-enclosed coastal body of water with one or more rivers or streams flowing into it, and with an open connection to the sea.

Estuarine Formed in, found in or pertaining to estuaries.

EU Directive Legislation issued by the European Union that is binding on Member States in terms of the result to be achieved, but leaves choice as to methods.

Favourable conservation status The status of natural habitats and species whose natural range, areas covered and populations are stable or increasing, and are likely to continue as such for the foreseeable future.

Flood Defence A structure (or system of structures) for the alleviation of flooding from rivers or the sea.

Flood event An occurrence of flooding.

Flood Risk The level of flood risk is the product of the frequency or likelihood of flood events and their consequences (such as loss, damage, harm, distress and disruption).

Flood Risk Management The activity of understanding the probability and consequences of flooding, and seeking to modify these factors to reduce flood risk to people, property and the environment. This should take account of other water level management and environmental requirements, and opportunities and constraints. It is not just the application of physical flood defence measures.

Flood Risk Management Measure Structural and non-structural interventions that modify flooding and flood risk either through changing the frequency of flooding, or by changing the extent and consequences of flooding, or by reducing the vulnerability of those exposed to flood risks.

Flood Risk Management Option Can be either a single flood risk management measure in isolation or a combination of more than one measure to manage flood risk.

Flood Warning To alert people of the danger to life and property within a community.

Floodplain Any area of land over which water flows or is stored during a flood event or would flow but for the presence of flood defences.

Fluvial Pertaining to a watercourse (river, stream or lake).

Geomorphology The science concerned with understanding the form of the Earth's land surface and the processes by which it is shaped, both at the present day as well as in the past.

Groundwater Water occurring below ground in natural formations (typically rocks, gravels and sands). The subsurface water in the zone of saturation, including water below the water table and water occupying cavities, pores and openings in underlying soils and rocks.

Habitat The place where an organism or species normally lives and is characterised by its physical characteristics and/or dominant type of vegetation.

Habitats Directive European Community Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna. Known as the 'Habitats Directive', and is implemented in Ireland through Regulation 15 of the European Union (Natural Habitats) Regulations, SI 94/1997, as amended, and Circular letters SEA 1/08 and NPWS 1/08 . It establishes a system to protect certain fauna, flora and habitats deemed to be of European conservation importance.

In-combination This refers to the assessment of the effects of more than one scheme acting together.

Individual Risk Receptors Essential infrastructure assets such as a motorway or potentially significant environmentally polluting sites.

Intertidal This refers to habitats that exist between high tide and low tide levels.

Land Management Various activities relating to the practice of agriculture, forestry, etc.

Land Use Various designations of activities, developments, cropping types, etc, for which land is used.

Local Authority Development Plans Development plans are the blueprint for the planning and development of within a local authority area. Each plan sets out the overall planning policies of the local authority, and consists of a written statement and a series of maps.

Natura 2000 European network of protected sites which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. The *Natura 2000* network will include two types of area. Areas may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive. Some very important areas may become both SAC and SPA.

Ramsar site Wetland site of international importance designated under the Ramsar Convention on Wetlands of International Importance 1971, primarily because of its importance for waterfowl.

Special Area for Conservation (SAC), Candidate Special Area for Conservation (cSAC) SACs are internationally important sites, protected for their habitats and non-bird species. They are designated, as required, under the EC Habitats Directive. A cSAC is a candidate site, but is afforded the same status as if it were confirmed.

Special Protection Area (SPA) SPAs are sites of international importance for breeding, feeding and roosting habitat for bird species. They are designated, as required, under the EC Birds Directive.

Species richness A measure of the number of species in a particular area.

Strategic Environmental Assessment (SEA) Assessment under EU Directive 2001/41/EC. SEA is a multi-staged process, designed to enable the integration of environmental considerations at key stages of the plan development process and maximise the potential for environmental impacts to be minimised.

Surface Water Water in rivers, estuaries, ponds and lakes.

The Office of Public Works (OPW) The lead agency with responsibility for flood risk management in Ireland.

Tidal Related to the sea and its tide.

Waders Also known as shorebirds. Birds that feed in intertidal habitats, especially mud and sand flats, and shallow freshwater habitats. Typical species are curlew, oystercatcher and redshank.

Waterfowl Ducks, geese, waders and other water birds such as moorhens, coots, grebes and herons.

Wetland Wetlands are areas of marsh, fen, peatland or water, with water that is fresh, brackish or salt, including shallow areas of sea.

Wildfowl Ducks, geese and waders.

Appendix A. Letter from DEHLG in response to Screening Assessment (Stage 1)

6th May 2011

Anne Marie Conibear,
Project Manager,
Tramway House
32 Dartry Road
Dublin 6

Your Ref: Y8122/2.3/258 AMC
Our Ref: G2010/633
Re: Fingal – East Meath FRAMS: Appropriate Assessment

A Chara,

I refer to the Appropriate Assessment (AA) for the Fingal – East Meath Flood Risk Assessment and Management Study (FEM-FRAMS) as forwarded to this office on the 8th April 2011. Please find attached nature conservation observations on the Appropriate Assessment and the draft Plan.

This office agrees with the conclusion of the AA screening that the Plan should be subjected to a stage 2 AA. It is recommended that the Local Authorities are consulted about future and current projects that should be considered for cumulative impacts.

Regarding the draft Plan we note that on page two it is stated that the outputs from the study shall be in compliance with the EU Floods Directive and Water Framework Directive. It is recommended that the Habitats Directive is also included.

We also note a couple of probable errors. Regarding the list of abbreviations in the draft Plan the abbreviation FFWS has been omitted. Regarding the list of estuaries on pages xii and 10 the Nanny Estuary has been omitted.

Please forward a copy of the stage 2 AA and SEA when completed

Kindly forward any further information received, or in the event of a decision being made a copy of same should be forwarded to the following address as soon as it issues:

The Manager,
Development Applications Unit,
Department of Tourism, Culture and Sport,
Newtown Road,
Wexford

Alternatively, documentation associated with the above can be referred electronically to the DAU at the following address:

manager.dau@environ.ie

In addition, please acknowledge receipt of these observations by return.

Is mise le meas,

David Tuohy,
Development Applications Unit
Tel: (053) 911 7380
E-mail: david.tuohy@environ.ie