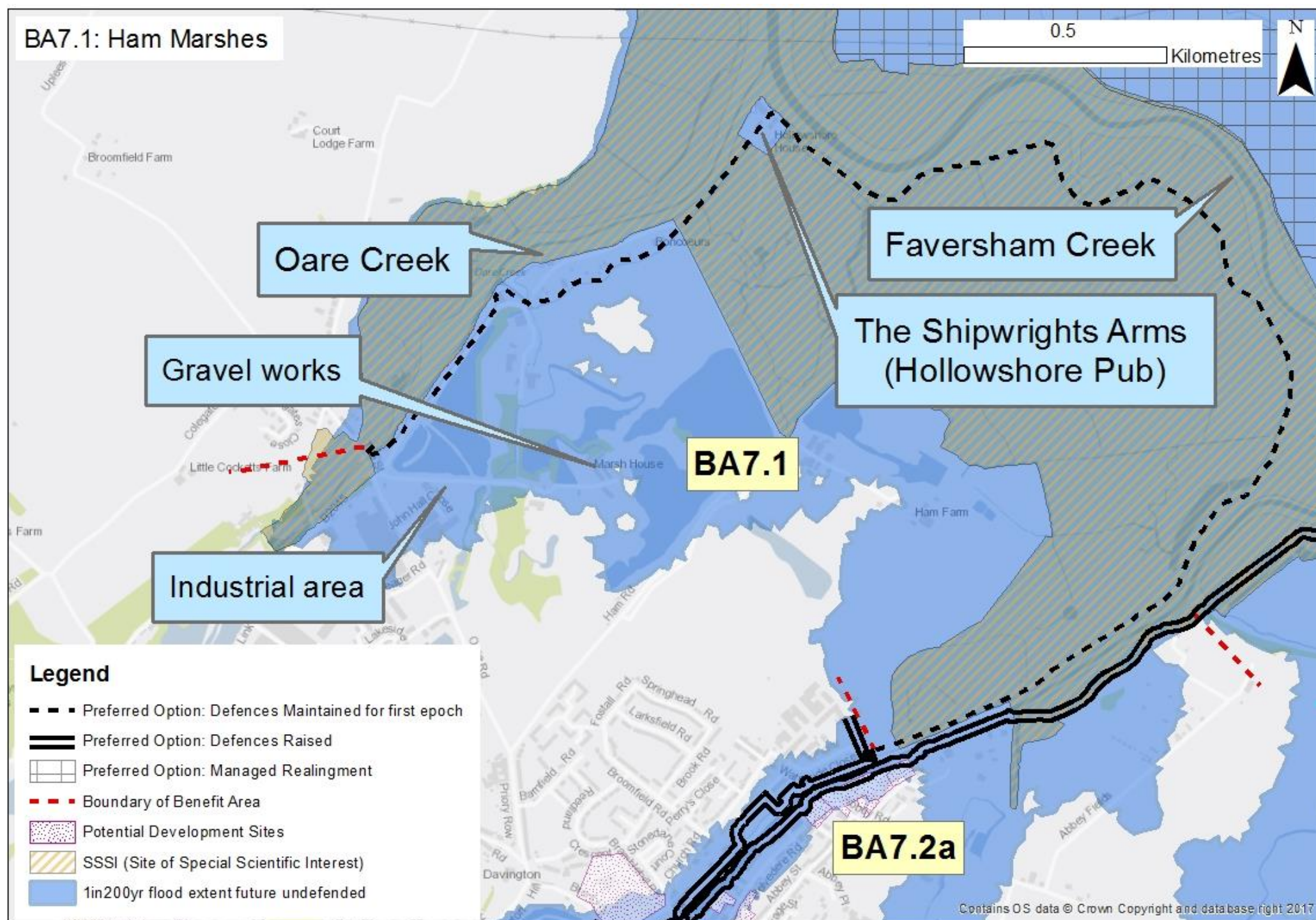


Benefit Area Name	7 - Faversham Creek
Benefit Unit Name	7.1 - Murston Pits to Faversham – Oare to Faversham
Frontage Length	4.8 km
Defence Structure Type	Embankment High ground
Min Standard of Protection (AEP%)	50%
Residual Life (years)	25

	0-20 years	20-50 years	50-100 years
SMP Policy	HTL	MR with localised HTL	MR with localised HTL
Aiming to comply with policy	No- suggest alternative considerations		
Comment	Localised HTL is recommended at Oare along industrial area on both sides of the creek up to the Hollowshore Pub (Shipwright Arms).		



Do Nothing Assets at Risk (Flooding)				
	50% AEP (undefended)		0.5% AEP (undefended)	
	Current Year	100 year	Current Year	100 Years
Residential	2	2	9	13
Commercial & Industrial	8	12	48	68
Agricultural (Ha)	143.1	160.3	164.2	177.1
Key Infrastructure	Gravel works, Ham Farm (Landfill taking Non-Biodegradable Wastes) Faversham Quarry Historic Landfill (inert)	Gravel works, Industrial Area, Ham Farm (Landfill taking Non-Biodegradable Wastes) Faversham Quarry Historic Landfill (inert)	Gravel works, Industrial Area, Ham Farm (Landfill taking Non-Biodegradable Wastes) Faversham Quarry Historic Landfill (inert)	Gravel works, Industrial Area, Ham Farm (Landfill taking Non-Biodegradable Wastes) Faversham Quarry Historic Landfill (inert)
Social and Environmental Considerations	The Shipwright arms (Hollowshore Pub),Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward and landward), Water vole habitat enhancement undertaken on Ham Marshes	The Shipwright arms (Hollowshore Pub),Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward and landward), Water vole habitat enhancement undertaken on Ham Marshes	The Shipwright arms (Hollowshore Pub),Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward and landward), Water vole habitat enhancement undertaken on Ham Marshes	The Shipwright arms (Hollowshore Pub),Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward and landward), Water vole habitat enhancement undertaken on Ham Marshes

Long List to Short List			
Potential Measures			
	Measures	Selected	Reasoning
Structural	Construct new embankment	Y	Take forward- embankments currently present
	Maintain embankment	Y	Take forward- embankments currently present
	Raise embankment (existing)	Y	Take forward- embankments currently present
	Raise embankment (upgrade)	Y	Take forward- embankments currently present
	Construct new wall	N	Exclude - limited benefits in constructing a wall where high ground and embankments are currently present. Also potentially environmentally damaging in SPA habitat
	Maintain wall	N	Exclude - no walls currently present
	Raise wall (existing)	N	Exclude - no walls currently present
	Raise wall (upgrade)	N	Exclude - no walls currently present
	Maintain rock revetment	N	Exclude - no rock revetment currently present
	Construct rock revetment	N	Exclude - limited benefits in constructing a revetment where high ground and embankments are currently present and will not significantly reduce flood risk. Also potentially environmentally damaging in SPA habitat
	Install demountable defences	N	Exclude - relatively costly option which is not the most efficient use of FDGiA funding compared to sustaining existing defences. It would require significant man resources to implement during a flood event. This would need to be discussed with Asset Owners at OBC stage.
	Install temporary defences	N	Exclude - significant resources to implement and potentially not the most efficient use of FDGiA funding compared to sustaining existing defences. This would need to be discussed with asset owners at OBC stage.
	Beach recharge (sand or shingle)	N	Exclude - not appropriate for this location
	Construct rock groynes	N	Exclude - not appropriate for this location
	Maintain rock groynes	N	Exclude - not appropriate for this location
	Construct timber structures	N	Exclude - not appropriate for this location
	Maintain timber structures	N	Exclude - not appropriate for this location
	Construct a tidal barrier	N	Exclude- likely to have significant environmental impacts, including on water quality (WFD), change in sedimentation in Estuary with wider impacts (environment, dredging, maintenance, navigation etc.). In addition likely to have significant costs.
Non-Structural	Implement monitoring	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Implement flood warning	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Land use planning	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Adaptation measures	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Development control	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Emergency response plans	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Monitoring for health and safety only	N	Not suitable as a single measure to implement the SMP policy.



Long List of Options					
	a) Do nothing	b) Ongoing maintenance of embankments	c) Maintain SOP (capital) embankments	d) Raise (sustain SOP) embankments	e) Raise (upgrade SOP) embankments
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	N	N	N	N	N
4 - WFD	N	N	Y	Y	Y
5 - Local Plans	-	-	-	-	-
Comment and decision on whether taken forward to shortlist	Y = baseline for the economics.	Y - as baseline. Following 30 years a do nothing scenario would occur due to failure of the defences.	Y= very low SOP and low residual life of defences. Capital maintenance required.	Y = low SOP of current defences, therefore increase SOP of defences with sea level rise.	Y = low SOP of current defences, therefore increase SOP of defences with sea level rise.

Long List of Options			
	f) Construct new setback embankments at identified managed realignment sites. Maintain SOP of existing embankments and walls along rest of creek	g) Construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments and walls along rest of creek	h) Construct new setback embankments at identified managed realignment sites. Raise (upgrade SOP) existing embankments and walls along rest of creek
To what extent does the option meet the objectives?			
1- Reduce Flood Risk	Y	Y	Y
2 - Natura 2000 sites	Y	Y	Y
3- Reduce maintenance	TBC*	TBC*	TBC*
4 - WFD	TBC	TBC	TBC
5 - Local Plans	-	-	-
Comment and decision on whether taken forward to shortlist	N= Defences have a low RL, therefore a risk of damage to assets under a maintain scenario along the areas where current defence line held.	Y= as above. Sustain required given existing SOP and contaminated land issues.	Y= as above.

\* Maintenance requirements currently unknown, as will depend on the MR sites taken forwards

Short List of Options
a) Do nothing
b) Do minimum
c) Maintain (capital) embankments
d) Raise (sustain) embankments
e) Raise (upgrade) embankments
f)* Construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments and walls along rest of creek (year 20)
g)* Construct new setback embankments at identified managed realignment sites. Raise (upgrade SOP) existing embankments and walls along rest of creek (year 20)

\*This MR option was screened out following consultation with environmental stakeholders - see 'Review of Managed Sites' report (October 2016) for further detail

Assessment of Short List					
Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments	d) Raise (sustain) embankments	e) Raise (upgrade) embankments
Description	Used as an economic baseline to compare the other options against.	Used as an economic baseline to compare the other options against.	Capital works are undertaken to maintain the current defences	Capital works are undertaken to improve the current defences	Capital works are undertaken to improve the current defences
Technical Issue	Defences have 25 years residual life. Designated habitat and therefore compensatory habitat is required. Ham Farm (Landfill taking Non-Biodegradable Wastes) and Faversham Quarry Historic Landfill (inert) potentially at risk.	Defences have 30 years residual life. Designated habitat and therefore compensatory habitat is required. Ham Farm (Landfill taking Non-Biodegradable Wastes) and Faversham Quarry Historic Landfill (inert) potentially at risk.	Current defences have 25 years residual life. Designated habitat and therefore compensatory habitat is required. Ham Farm (Landfill taking Non-Biodegradable Wastes) and Faversham Quarry Historic Landfill (inert) potentially at risk over time.	Current defences have 25 years residual life. Designated habitat and therefore compensatory habitat is required. Ham Farm (Landfill taking Non-Biodegradable Wastes) and Faversham Quarry Historic Landfill (inert) potentially at risk over time.	Current defences have 25 years residual life. Designated habitat and therefore compensatory habitat is required. Ham Farm (Landfill taking Non-Biodegradable Wastes) and Faversham Quarry Historic Landfill (inert) potentially at risk over time.
Assumptions/ Uncertainties	Assumes that all management is ceased.	Ongoing maintenance. Maintenance not sufficient to reduce risk of failure after year 30	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.	The SOP provided by the defences is increased to the required standard over time. This option has a phased approach so the defences are raised in line with sea level rise at two phases i.e. capital works are undertaken in epoch 1 and again in year 50. This option will maintain the required SOP provided by the defences by keeping pace with sea level rise.	The crest height and SOP provided by the defences is increased. The crest heights will be raised to the level required to provide the SOP in 100 years time, i.e. the SOP will be greater than required during the first epoch, but this will decline over time with sea level rise but will still provide at least the SOP that the defence was upgraded to.
SOP Provided (% AEP)	>50%	>50%	50%	5.0%	5.0%
Value of Economics					
PV Capital Costs	£ -	£ -	£ 2,083,707	£ 5,858,758	£ 7,824,558
PV Maintenance Costs	£ -	£ 75,625	£ 330,669	£ 323,526	£ 325,593
PV Other Costs	£ -	£ -	£ 185,119	£ 484,598	£ 583,092
Total Cost (including Optimism	£ -	£ 121,000	£ 4,159,192	£ 10,667,013	£ 13,973,188
Value of Benefits	£ -	£ 1,502,000	£ 400,898	£ 5,217,718	£ 5,478,491
Benefit Cost Ratio (BCR)	0.0	12.5	0.1	0.5	0.4
PF Score	0%	69%	1%	3%	2%
Further funding required to achieve 100% PF Score	£ -	£ 38,000	£ 4,128,085	£ 10,334,734	£ 13,626,421
Flood/ erosion impacts					
Number of Residential Properties at risk under 0.1% AEP	8	8	8	5	5

Number of Commercial properties at risk under 0.1% AEP	72	72	72	60	60
PV Value of Properties (Total including AAD, write-offs, vehicle damages and Emergency Services)	£ 5,300,890	£ 3,811,268	£ 4,953,200	£ 404,981	£ 147,892
Critical Infrastructure	Gravel works and Industrial Area at risk	Gravel works and Industrial Area at risk	Infrastructure at risk over time	Infrastructure at risk in larger events	Infrastructure at risk in larger events
PV Value of Impacts on road and rail	-	-	-	-	-
PV Value of Tourism and Recreation Impacts	-	-	-	-	-
PV Value of Agriculture Impacts	£469,870 Worst case scenario 27ha Grade 1 agricultural land flooded and 19ha Grade 3 flooded 137ha Grade 4 flooded	£ 457,267	£416,662 Worst case scenario 26ha Grade 1 agricultural land flooded and 19ha Grade 3 flooded 137ha Grade 4 flooded	£148,061 Worst case scenario 21ha Grade 1 agricultural land flooded and 19ha Grade 3 flooded and 133ha Grade 4 flooded	£144,378 Worst case scenario 19ha Grade 1 agricultural land flooded and 19ha Grade 3 flooded 130ha Grade 4 flooded
Stakeholders Feedback					
Statutory Stakeholders/ SEG	Potential large housing development in the area potential opportunity for further partnership funding?	Potential large housing development in the area - potential opportunity for further partnership funding?	Potential large housing development in the area - potential opportunity for further partnership funding?	Potential large housing development in the area - potential opportunity for further partnership funding?	Potential large housing development in the area - potential opportunity for further partnership funding?
Landowners	No specific comments	No specific comments	No specific comments	No specific comments	No specific comments
Technical Feasibility					
Site Specific	n/a	n/a	n/a	n/a	n/a
Strategy Wide	n/a	n/a	n/a	n/a	n/a
WFD (Water Framework Directive)					
Compliance assessment outcome	2 Return to natural processes but uncontrolled	2 Return to natural processes but uncontrolled	1 Heavily Modified Water Body (HMWB) maintained	1 HMWB maintained	1 HMWB maintained
HRA (Habitats Regulation Assessment)					
Impact on SPA/ Ramsar qualifying features	1  There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.  Coastal squeeze will lead to a loss of saltmarsh and mudflat habitat until at least yr. 25 when failing defences will allow estuarine habitats to begin to form. At this point, there will be impacts on the designated freshwater habitats and those qualifying feature species that use it.  The freshwater habitat across the Ham Marshes here is good breeding and overwintering habitat for a variety of waders and wildfowl, and the saltmarsh in front of the defences is	1  There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.  Coastal squeeze will lead to a loss of saltmarsh and mudflat habitat until at least yr. 30 when failing defences will allow estuarine habitats to begin to form. At this point, there will be impacts on the designated freshwater habitats and those qualifying feature species that use it.  The freshwater habitat across the Ham Marshes here is good breeding and overwintering habitat for a variety of waders and wildfowl, and the saltmarsh in front of the defences is of good quality.	1  There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.  Coastal squeeze will lead to a loss of intertidal habitat. However overtime the risk of overtopping will increase and there will be impacts on the designated freshwater habitats and those qualifying feature species that use the area as above  The freshwater habitat across the Ham Marshes here is good breeding and overwintering habitat for a variety of waders and wildfowl, and the saltmarsh in front of the defences is of good quality.	1  There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.  Coastal squeeze will lead to a loss of intertidal habitat, including some good quality saltmarsh	1  There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.  Coastal squeeze will lead to a loss of intertidal habitat, including some good quality saltmarsh

Impacts on freshwater habitats	1 Yes. Compensatory habitat would be required in advance of failure of the defence to compensate for the loss of freshwater grazing marsh once the defences fail.	1 Yes. Compensatory habitat would be required in advance of failure of the defence to compensate for the loss of freshwater grazing marsh once the defences fail.	1 Yes. Compensatory habitat would be required in advance of failure of the defence to compensate for the loss of freshwater grazing marsh overtime as the risk of overtopping increases.	3 No. Defences maintained so there is a reduced risk of overtopping.	3 No. Defences maintained so there is a reduced risk of overtopping.
Impacts on intertidal habitats	2 Yes, risk of coastal squeeze until defences are predicted to fail (from year 25). Development of tidal habitats once defences fail will begin to mitigate for coastal squeeze.  Although new saltmarsh and mudflat habitat would potentially develop, the rate, area and quality would effectively be unmanaged, so this would not be a favourable means of mitigating for coastal squeeze.	2 Yes, risk of coastal squeeze until defences are predicted to fail (from year 30). Development of tidal habitats once defences fail will begin to mitigate for coastal squeeze.  Although new saltmarsh and mudflat habitat would potentially develop, the rate, area and quality would effectively be unmanaged, so this would not be a favourable means of mitigating for coastal squeeze.	1 Yes, risk of coastal squeeze until defences begin to become more regularly overtopped and may lead to the development of tidal habitats which could begin to mitigate for coastal squeeze.  Although new saltmarsh and mudflat habitat would potentially develop, the rate, area and quality would effectively be unmanaged, so this would not be a favourable means of mitigating for coastal squeeze.	1 Yes, defences maintained so loss of high quality intertidal habitat through coastal squeeze.	1 Yes, defences maintained so loss of high quality intertidal habitat through coastal squeeze.
Habitat Connectivity	2 Slight negative impact on connectivity of saltmarsh/mudflat habitats due to loss of habitat from coastal squeeze before defences fail. However following the failure of defences there will be the loss of freshwater grazing marsh habitat, although estuarine habitat connectivity should begin to open up again.	2 Slight negative impact on connectivity of saltmarsh/mudflat habitats due to loss of habitat from coastal squeeze before defences fail. However following the failure of defences there will be the loss of freshwater grazing marsh habitat, although estuarine habitat connectivity should begin to open up again.	2 Slight negative impact on connectivity due to loss of habitat from coastal squeeze. However over time the defences will be at increased risk of overtopping which will cause the loss of freshwater grazing marsh habitat. Although estuarine habitat connectivity should begin to open up again.	2 Slight negative impact on connectivity due to loss of intertidal habitat from coastal squeeze.	2 Slight negative impact on connectivity due to loss of intertidal habitat from coastal squeeze.
<b>SEA (Strategic Environmental Assessment)</b>					
Historic Environment	2 Gradual loss of some listed buildings from flooding following the failure of the defences in year 25	2 Gradual loss of some listed buildings from flooding following the failure of the defences in year 30.	2 Potential loss of some listed buildings from flooding over time with increased risk of overtopping due to sea level rise	4 Reduced risk of flooding to listed buildings	5 Reduced risk of flooding to listed buildings immediately
Effects on population	1 Residential and commercial assets at risk with loss of livelihoods following the failure of the defences in year 25	1 Residential and commercial assets at risk with loss of livelihoods following the failure of the defences in year 30.	2 Residential and commercial assets at risk with loss of livelihoods overtime with increased risk of overtopping due to sea level rise	4 Reduced flood risk to residential and commercial assets	5 Reduced flood risk to residential and commercial assets immediately
Impact on plans/ programmes	1 Development site potentially at risk from flooding following the failure of the defences in year 25.	1 Development site potentially at risk from flooding following the failure of the defences in year 30.	2 Development site potentially at risk from flooding over time with increased risk of overtopping due to sea level rise	4 Development site at reduced risk from flooding over time	5 Development site at reduced risk from flooding immediately



Freshwater Biodiversity	<p>1</p> <p>Loss of freshwater habitat from saline intrusion due to overtopping and once the defences fail. This BA is a site of traditional grazing marsh with reedbed and saltmarsh dissected by freshwater and brackish dykes. Risk to the internationally important reserve for migratory, overwintering and breeding wetland birds. The saltmarsh supports a unique set of plants tolerant of the salty conditions including golden samphire, sea lavender, sea purslane, sea clover and thrift. Freshwater dykes contain frogbit, reedmace and water plantain.</p>	<p>1</p> <p>Loss of freshwater habitat from saline intrusion due to overtopping and once the defences fail. This BA is a site of traditional grazing marsh with reedbed and saltmarsh dissected by freshwater and brackish dykes. Risk to the internationally important reserve for migratory, overwintering and breeding wetland birds. The saltmarsh supports a unique set of plants tolerant of the salty conditions including golden samphire, sea lavender, sea purslane, sea clover and thrift. Freshwater dykes contain frogbit, reedmace and water plantain.</p>	<p>1</p> <p>Risk of loss of freshwater habitat from overtopping overtime. This BA is a site of traditional grazing marsh with reedbed and saltmarsh dissected by freshwater and brackish dykes. Risk to the internationally important reserve for migratory, overwintering and breeding wetland birds. The saltmarsh supports a unique set of plants tolerant of the salty conditions including golden samphire, sea lavender, sea purslane, sea clover and thrift. Freshwater dykes contain frogbit, reedmace and water plantain.</p>	<p>4</p> <p>Freshwater habitat at reduced risk as the defences are maintained.</p>	<p>5</p> <p>Freshwater habitat at reduced risk immediately as the defences are raised and maintained.</p>
Saline Biodiversity	<p>3</p> <p>Minimal coastal squeeze as the defences are at risk of failure in year 25. This will allow new intertidal habitat to develop.</p>	<p>3</p> <p>Minimal coastal squeeze as the defences are at risk of failure in year 30. This will allow new intertidal habitat to develop.</p>	<p>2</p> <p>Risk of coastal squeeze as the defences will remain in place, but overtime the risk of overtopping will increase with sea level rise, which may allow the uncontrolled development of intertidal habitat.</p>	<p>1</p> <p>Loss of habitat from coastal squeeze</p>	<p>1</p> <p>Loss of habitat from coastal squeeze</p>
Soil	<p>1</p> <p>Degradation of soils once the defences fail (year 25), including Grade 1 agricultural land.</p>	<p>1</p> <p>Degradation of soils once the defences fail (year 30), including Grade 1 agricultural land.</p>	<p>2</p> <p>Degradation of soils over time with increased risk of overtopping due to sea level rise, including Grade 1 agricultural land.</p>	<p>5</p> <p>Agricultural land at reduced risk</p>	<p>5</p> <p>Agricultural land at reduced risk</p>
Groundwater	<p>1</p> <p>Variable groundwater vulnerability within benefit area, aquifers at risk once the defences fail. Further investigations required.</p>	<p>1</p> <p>Variable groundwater vulnerability within benefit area, aquifers at risk once the defences fail. Further investigations required.</p>	<p>2</p> <p>Variable groundwater vulnerability within benefit area, aquifers at risk as the risk of overtopping increases with sea level rise. Further investigations required.</p>	<p>3</p> <p>No impact predicted</p>	<p>3</p> <p>No impact predicted</p>
Landscape (visual impact)	<p>4</p> <p>Change once the defences fail but reverting to natural processes</p>	<p>4</p> <p>Change once the defences fail but reverting to natural processes</p>	<p>3</p> <p>Gradual changes to landscape from overtopping.</p>	<p>2</p> <p>Visual impact on landscape depending on defence height</p>	<p>2</p> <p>Visual impact on landscape depending on defence height</p>
Carbon Storage	<p>3</p> <p>No impact</p>	<p>3</p> <p>No impact</p>	<p>2</p> <p>Some carbon cost during maintenance- negligible land use change</p>	<p>2</p> <p>Some carbon cost during phased construction and potential loss of intertidal habitat.</p>	<p>1</p> <p>Some carbon cost during significant construction works and loss of intertidal habitat.</p>
Ecosystem Services					
Qualitative Score from Ecosystem Services Assessment	-53	-53	-31	-4	-6



Comments	Major degradation in many ES (e.g. food, water regulation, natural hazard regulation, erosion regulation, cultural heritage, recreation and tourism, and conservation habitat) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Major degradation in many ES (e.g. food, water regulation, natural hazard regulation, erosion regulation, cultural heritage, recreation and tourism, and conservation habitat) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Moderate gradual degradation in various ES (e.g. food, natural hazard regulation, erosion regulation and recreation and tourism) outweigh limited enhancement opportunities (e.g. aesthetic value)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of degrading many ES (e.g. climate regulation, aesthetic value, conservation habitat and fisheries habitat)	Degradation in some ES (e.g. climate regulation, aesthetic value, conservation habitat and fishery habitat) outweigh the enhancement opportunities in some ES (e.g. natural hazard regulation and erosion regulation)
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	Y	Y	Y	Y	Y
4 - WFD	N	N	N	N	N
5 - Local Plans	N	N	N	Y	Y

Environmental Scores					
100 = best option, 0 = worst option					
Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments	d) Raise (sustain) embankments	e) Raise (upgrade) embankments
WFD (Water Framework Directive)					
Compliance assessment outcome	25	25	0	0	0
HRA (Habitats Regulation Assessment)					
Impact on SPA Ramsar qualifying features	0	0	0	0	0
Impacts on freshwater habitats	0	0	0	50	50
Impacts on intertidal habitats	25	25	0	0	0
Habitat Connectivity	25	25	25	25	25
SEA (Strategic Environmental Assessment)					
Historic Environment	25	25	25	75	100
Effects on population	0	0	25	75	100
Impact on plans/ programmes	0	0	25	75	100
Freshwater Biodiversity	0	0	0	75	100
Saline Biodiversity	50	50	25	0	0
Soil	0	0	25	100	100
Groundwater	0	0	25	50	50
Landscape (visual impact)	75	75	50	25	25
Carbon Storage	50	50	25	25	0
Total	275	275	250	575	650

Summary of Results					
Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments	d) Raise (sustain) embankments	e) Raise (upgrade) embankments
Costs	£ -	£ 121,000	£ 4,159,192	£ 10,667,013	£ 13,973,188
Benefits	£ -	£ 1,502,000	£ 400,898	£ 5,217,718	£ 5,478,491
NPV	£ -	£ 1,382,000	£ 3,758,193	£ 5,449,295	£ 8,494,697
BCR	0.0	12.5	0.1	0.5	0.4
Environmental Scoring	275	275	250	575	650

Preferred Option Decision Making		
DLO	Leading Option at DLO Stage	Justification for Leading Option
DLO1 - Economic Assessment	Do minimum -ongoing maintenance until Year 30, followed by NAI.	The current defences have a 30 year median residual life if maintenance continues and have a positive BCR if maintained until residual life fails, enabling HTL policy in the short term.
DLO2 - Economic Sensitivities		
DLO3 - Review of Compensatory Intertidal Habitat Requirements		
DLO4 - Review of Compensatory Freshwater Habitat Requirements	Ongoing maintenance until year 30, followed by NAI. Freshwater compensation required by year 30 (capital works in year 25).	The current defences have a 30-year median residual life and have a positive BCR if maintained until residual life fails, enabling HTL policy in the short term. After this there is a legal requirement to compensate for the loss of SPA habitat.
DLO5 - Modelling of Leading Options		
DLO6 - Consultation Phase		

Preferred Option Name
Ongoing maintenance until year 30, followed by No Active Intervention (NAI). Freshwater compensation required by year 30 (capital works in year 25).

Preferred Option
Maintenance (patch and repair) of the current defences (earth embankments) for the first 30 years. After this all maintenance will be ceased which will increase the risk of failure of the defences which would result in the inundation of the designated freshwater habitat. Therefore, compensatory freshwater habitat will need to be developed by year 25 to allow it to be in place prior to failure of the defences from year 30.

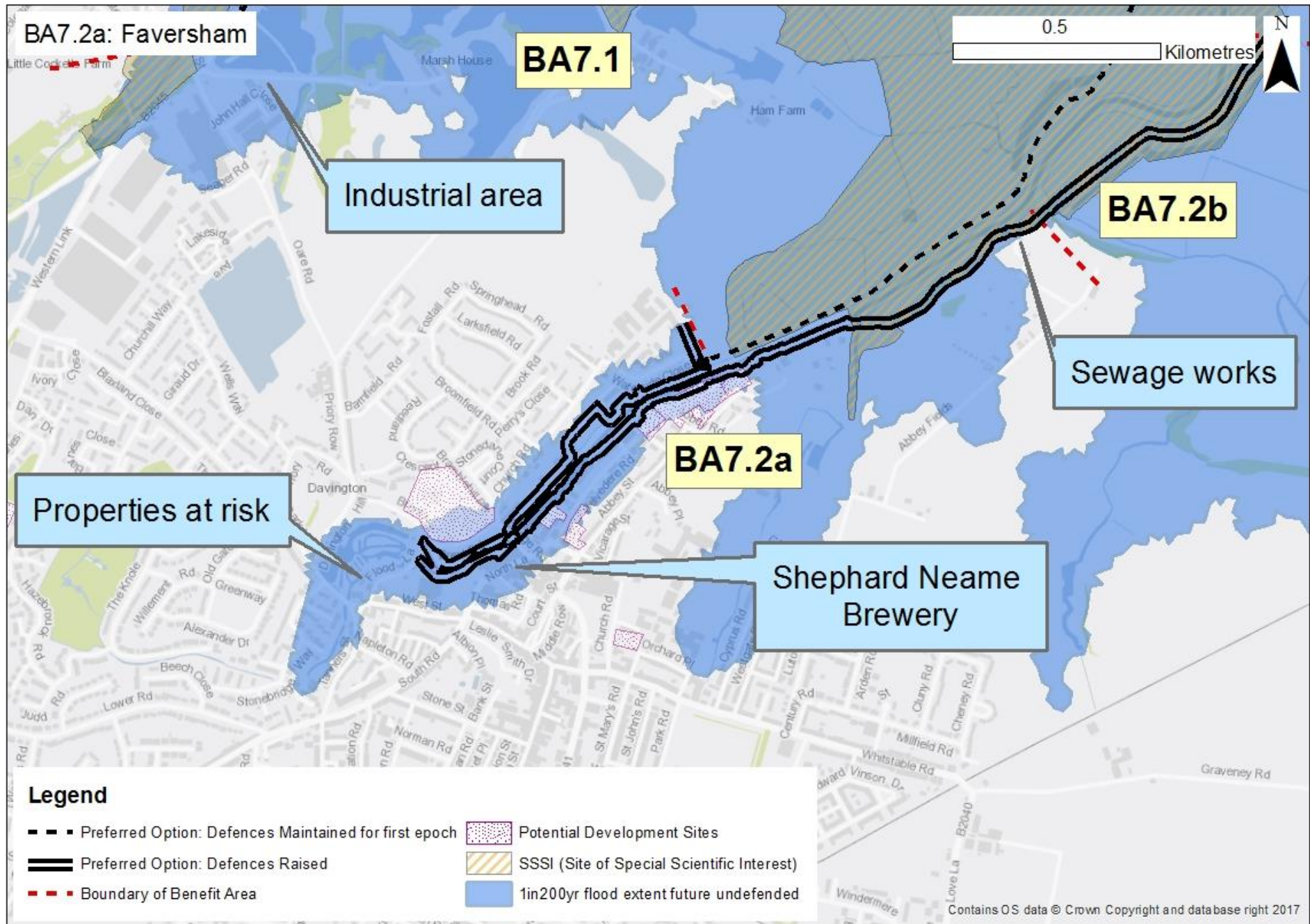
Justification
Due to the limited assets at risk in the area, there were no short listed options with BCRs above one. The current defences have a 30 year median residual life if patch and repair maintenance continues and have a BCR above one if maintained until the end of their residual life, enabling HTL policy in the short term.

Preferred Option Costs														
<table><tr><th colspan="2">Cost</th><th>Benefits</th><th>BCR</th><th>PF Score</th></tr><tr><td>£</td><td>165,293</td><td>£ 1,502,226</td><td>9.1</td><td>55%</td></tr></table>					Cost		Benefits	BCR	PF Score	£	165,293	£ 1,502,226	9.1	55%
Cost		Benefits	BCR	PF Score										
£	165,293	£ 1,502,226	9.1	55%										

Impacts on freshwater designated habitat					
Ramsar and SPA habitat at risk from Year 30. Cost effectiveness analysis shows preferred management approach: Provide compensation by year 30.					
<table><tr><th>Cost of providing compensation for impacts</th><th>Cost of holding the line with SLR</th></tr><tr><td>£ 2,335,259</td><td>£ 4,159,192</td></tr></table>	Cost of providing compensation for impacts	Cost of holding the line with SLR	£ 2,335,259	£ 4,159,192	
Cost of providing compensation for impacts	Cost of holding the line with SLR				
£ 2,335,259	£ 4,159,192				

Benefit Area Name	7 - Faversham Creek
Benefit Unit Name	7.2a - Faversham to Nagden (Front Brents and Town)
Frontage Length	2.2 km
Defence Structure Type	High ground, Sea Wall and Embankment
Min Standard of Protection (AEP%)	50%
Residual Life (years)	25

	0-20 years	20-50 years	50-100 years
SMP Policy	HTL	HTL	HTL
Aiming to comply with policy	Agree with SMP		
Comment	Agree with SMP		



Do Nothing Assets at Risk (Flooding)				
	50% AEP (undefended)		0.5% AEP (undefended)	
	Current Year	100 year	Current Year	100 Years
Residential	19	79	144	310
Commercial & Industrial	3	12	17	48
Agricultural (Ha)	3.3	9	15.6	24.3
Key Infrastructure	None	South Road	South Road	South Road
Social and Environmental Considerations	Natural England Coastal Path (Saxon Shore Way). The Swale SPA and SSSI (seaward and landward)	Natural England Coastal Path (Saxon Shore Way) The Swale SPA and SSSI (seaward and landward)	Natural England Coastal Path (Saxon Shore Way) The Swale SPA and SSSI (seaward and landward)	Natural England Coastal Path (Saxon Shore Way) The Swale SPA and SSSI (seaward and landward)



Long List to Short List			
Potential Measures			
	Measures	Selected	Reasoning
Structural	Construct new embankment	Y	Take forward- embankments currently present
	Maintain embankment	Y	Take forward- embankments currently present
	Raise embankment (sustain)	Y	Take forward- embankments currently present
	Raise embankment (upgrade)	Y	Take forward- embankments currently present
	Construct new wall	Y	Take forward- walls currently present
	Maintain wall	Y	Take forward- walls currently present
	Raise wall (sustain)	Y	Take forward- walls currently present
	Raise wall (upgrade)	Y	Take forward- walls currently present
	Maintain rock revetment	N	Exclude - no rock revetment currently present
	Construct rock revetment	N	Exclude - limited benefits in constructing a revetment where high ground, walls and embankments are currently present and will not significantly reduce flood risk. Also potentially environmentally damaging in SPA habitat
	Install demountable defences	Y	Take forward - public access and interaction with the river front is required. However potential increased cost compared to existing defences needs further consideration.
	Install temporary defences	N	Exclude - no significant assets at risk to warrant installation of temporary defences (significant resources to implement)
	Beach recharge (sand or shingle)	N	Exclude - not appropriate for this location
	Construct rock groynes	N	Exclude - not appropriate for this location
	Maintain rock groynes	N	Exclude - not appropriate for this location
Non-Structural	Construct timber structures	N	Exclude - not appropriate for this location
	Maintain timber structures	N	Exclude - not appropriate for this location
	Construct a tidal barrier	N	Exclude- likely to have significant environmental impacts, including on water quality (WFD), change in sedimentation in Estuary with wider impacts (environment, dredging, maintenance, navigation etc.). In addition likely to have significant costs.
	Implement monitoring	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Implement flood warning system	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Land use planning	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Adaptation measures	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
Non-Structural	Development control	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Emergency response plans	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Monitoring for health and safety	N	Not suitable as a single measure to implement the SMP policy.

Long List of Options					
	a) Do nothing	b) Ongoing maintenance of embankments and walls	c) Maintain SOP (capital) embankments and walls.	d) Raise (sustain SOP) embankments and walls.	e) Raise (upgrade SOP) embankments and walls.
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	N	N	N	N	N
4 - WFD	N	Y	Y	Y	Y
5 - Local Plans	N	Y	Y	Y	Y
Comment and decision on whether taken forward to shortlist	Y = baseline for the economics.	Y - as baseline. Following 30 years a Do nothing scenario would occur due to failure of the defences.	Y = SOP and residual life of defences is very low. Therefore capital maintenance needed.	Y = SOP very low, therefore increase SOP of defences with sea level rise. Will help support the development works at Front Brents	Y = SOP very low, therefore increase SOP of defences with sea level rise. Will help support the development works at Front Brents

Short List of Options	
a) Do nothing	
b) Do minimum	
c) Maintain (capital) embankments and walls.	
d) Raise (sustain) embankments and walls.	
e) Raise (upgrade) embankments and walls.	

Assessment of Short List					
Option	a) Do nothing	b) Do Minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.	e) Raise (upgrade) embankments and walls.
Description	Used as an economic baseline to compare the other options against.	Used as an economic baseline to compare the other options against.	Capital works are undertaken to maintain the current defences	Capital works are undertaken to improve the current defences	Capital works are undertaken to improve the current defences
Technical Issue	Defences have 25 years residual life. No designated habitat at risk. Potential risk to development sites. No landfill in the area.	Defences have 30 years residual life. No designated habitat at risk. Potential risk to development sites. No landfill in the area.	Defences have 25 years residual life. No designated habitat at risk. Potential risk to development sites. No landfill in the area.	Defences have 25 years residual life. No designated habitat at risk. Potential risk to development sites. No landfill in the area.	Defences have 25 years residual life. No designated habitat at risk. Potential risk to development sites. No landfill in the area.
Assumptions/ Uncertainties	Assumes that all management is ceased.	Ongoing maintenance. Maintenance not sufficient to reduce risk of failure after year 30	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.	The SOP provided by the defences is increased to the required standard over time. This option has a phased approach so the defences are raised in line with sea level rise at two phases i.e. capital works are undertaken in epoch 1 and again in year 50. This option will maintain the required SOP provided by the defences by keeping pace with sea level rise.	The crest height and SOP provided by the defences is increased. The crest heights will be raised to the level required to provide the SOP in 100 years time, i.e. the SOP will be greater than required during the first epoch, but this will decline over time with sea level rise but will still provide at least the SOP that the defence was upgraded to.
SOP Provided (% AEP)	>50%	>50%	50%	0.5%	0.5%
Value of Economics					
PV Capital Costs	£ -	£ -	£ 654,686	£ 2,961,784	£ 5,068,835
PV Maintenance Costs	£ -	£ 95,625	£ 139,724	£ 183,188	£ 302,310
PV Other Costs	£ -	£ -	£ 68,709	£ 301,744	£ 414,775
Total Cost (including Optimism Bias)	£ -	£ 153,000	£ 1,380,990	£ 5,514,745	£ 9,257,471
Value of Benefits	£ -	£ 152,000	-£ 490,236	£ 12,235,301	£ 12,559,377
Benefit Cost Ratio (BCR)	0.0	1.0	N/A - increases flood risk	2.2	1.4
PF Score	0%	6%	N/A - increases flood risk	20%	12%
Further funding required to achieve 100% PF Score	£ -	£ 145,000	N/A - increases flood risk	£ 4,435,683	£ 8,160,405
Flood/ erosion impacts					
Number of Residential Properties at risk under 0.1% AEP	366	366	339	0	0
Number of Commercial properties at risk under 0.1% AEP	73	73	66	0	0
PV Value of Properties (Total including AAD, write-offs, vehicle damages and Emergency Services)	£ 11,468,671	£ 11,494,886	£ 12,927,654	£ 312,198.18	£ -
Critical Infrastructure	Sewage works	Sewage works	Sewage works	No assets at risk	No assets at risk
PV Value of Impacts on road and rail	£1,006,996 Road: B2040 Rail: Faversham to Whitstable	£ 828,925	£34,416 B2040	£1,911 B2040	-
PV Value of Tourism and Recreation Impacts	£ -	£ -	£ -	£ -	£ -

PV Value of Agriculture Impacts	£91,304.35 Worst case scenario 22ha	£ 91,324	£95,136.99 Worst case scenario 21ha	£17,560.42 Worst case scenario	£7,593.60 Worst case scenario
<b>Stakeholders Feedback</b>					
Statutory Stakeholders/ SEG	Defences need to maintained to protect habitat improvement works that have been made in the area	Defences need to maintained to protect habitat improvement works that have been made in the area	HTL option preferred to protect the recent freshwater habitat improvement works that have been made in the area	HTL option preferred to protect the recent freshwater habitat improvement works that have been made in the area	HTL option preferred to protect the recent freshwater habitat improvement works that have been made in the area
Landowners	No specific comments	No specific comments	No specific comments	No specific comments	No specific comments
<b>Technical Feasibility</b>					
Site Specific	n/a	n/a	n/a	n/a	n/a
Strategy Wide	n/a	n/a	n/a	n/a	n/a
<b>WFD (Water Framework Directive)</b>					
Compliance assessment outcome	2 Some return to natural processes but uncontrolled	2 Some return to natural processes but uncontrolled	1 Heavily Modified Water Body (HMWB) maintained	1 HMWB maintained	1 HMWB maintained
<b>HRA (Habitats Regulation Assessment)</b>					
Impact on SPA/ Ramsar qualifying features	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. It is noted that there is some designated habitat in the northern end of the site, but works would be undertaken to avoid adverse impacts.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. It is noted that there is some designated habitat in the northern end of the site, but works would be undertaken to avoid adverse impacts.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. It is noted that there is some designated habitat in the northern end of the site, but works would be undertaken to avoid adverse impacts.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. It is noted that there is some designated habitat in the northern end of the site, but works would be undertaken to avoid adverse impacts.	3 These options are not likely to have significant effects on any Natura 2000 sites and their constituent qualifying features. It is noted that there is some designated habitat in the northern end of the site, but works would be undertaken to avoid adverse impacts.
Impacts on freshwater habitats	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.
Impacts on intertidal habitats	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.	3 Limited designated habitat in the BA. Works would be undertaken to avoid adverse impacts.
Habitat Connectivity	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.	3 No impacts, either beneficial or adverse.
<b>SEA (Strategic Environmental Assessment)</b>					
Historic Environment	1 Historic environment and Listed Buildings at risk following the failure of the defences in year 25	1 Historic environment and Listed Buildings at risk following the failure of the defences in year 30	2 Historic environment and Listed Buildings at risk over time with increased risk of overtopping due to sea level rise	4 Protection of Historic environment	5 Protection of Historic environment immediately
Effects on population	1 Population at risk from flooding following the failure of the defences in year 25. Significant impact in urban environment	1 Population at risk from flooding following the failure of the defences in year 30. Significant impact in urban environment	2 Population at risk from flooding over time with increased risk of overtopping due to sea level rise. Significant impact in urban environment	4 Reduced risk of flooding	5 Reduced risk of flooding immediately



Impact on plans/ programmes	1 Development site potentially at risk from flooding following the failure of the defences in year 25	1 Development site potentially at risk from flooding following the failure of the defences in year 30	2 Development site potentially at risk from flooding over time with increased risk of overtopping due to sea level rise	4 Development site at reduced risk from flooding over time	5 Development site at reduced risk from flooding immediately
Freshwater Biodiversity	1 Small amount of freshwater grazing marsh lost to saline intrusion following the failure of the defences in year 25. The Swale and Faversham Creek is representative of the estuarine habitats found on the north Kent coast. Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. The Swale, including most of the creek beyond Iron Wharf/Brents Boatyard is within the designated Site of Special Scientific Interest (SSSI). This is also designated a Ramsar site and a Special Protection Area (SPA)	1 Small amount of freshwater grazing marsh lost to saline intrusion following the failure of the defences in year 30. The Swale and Faversham Creek is representative of the estuarine habitats found on the north Kent coast. Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. The Swale, including most of the creek beyond Iron Wharf/Brents Boatyard is within the designated Site of Special Scientific Interest (SSSI). This is also designated a Ramsar site and a Special Protection Area (SPA)	2 Small amount of freshwater grazing marsh lost to saline intrusion over time with increased risk of overtopping due to sea level rise	4 Negligible impact	5 Negligible impact as defences raised immediately
Saline Biodiversity	2 Defences at risk of failure, therefore potential for creation of intertidal habitat. However due to the urban environment this might be limited in this BA.	2 Defences at risk of failure, therefore potential for creation of intertidal habitat. However due to the urban environment this might be limited in this BA.	1 No opportunity for the creation of new intertidal habitats due to urban location. Also gradual loss of habitat from coastal squeeze	1 No opportunity for the creation of new intertidal habitats due to urban location. Also gradual loss of habitat from coastal squeeze	1 No opportunity for the creation of new intertidal habitats due to urban location. Also gradual loss of habitat from coastal squeeze
Soil	1 Agricultural land at risk of salinization following the failure of defences in year 25 (including Grade 1 agricultral land).	1 Agricultural land at risk of salinization following the failure of defences in year 25 (including Grade 1 agricultral land).	2 Agricultural land at increased risk of salinization overtime as sea levels rise (including Grade 1 agricultral land).	3 Agricultural land protected against inundation	3 Agricultural land protected against inundation
Groundwater	2 Variable groundwater vulnerability within benefit area, but aquifers at imminent risk following the failure of the defences. Further studies required at the project level	2 Variable groundwater vulnerability within benefit area, but aquifers at imminent risk following the failure of the defences. Further studies required at the project level	2 Variable groundwater vulnerability within benefit area, but aquifers at risk overtime as sea levels rise. Further studies required at the project level	5 No impacts predicted as the defences are maintained	5 No impacts predicted as the defences are maintained

Landscape (visual impact)	3 Change but reverting to natural processes. However there may be some negative impacts on the urban environment.	3 Change but reverting to natural processes. However there may be some negative impacts on the urban environment.	3 Change but giving back to natural processes over time. However there may be some negative impacts on the urban environment.	2 Potential visual impact dependent on height of defences	2 Potential significant visual impact dependent on height of defences
Carbon Storage	2 Potential loss of carbon storage due to inundation of freshwater areas.	2 Potential loss of carbon storage due to inundation of freshwater areas.	2 Carbon cost during construction	2 carbon cost during construction	2 carbon cost during construction
Ecosystem Services					
Qualitative Score from Ecosystem Services Assessment	-35	-35	-24	-1	-3
Comments	Major degradation in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage, recreation and tourism, and conservation habitat)outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Major degradation in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage, recreation and tourism, and conservation habitat)outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Moderate gradual degradation in many ES (e.g. natural hazard regulation, erosion regulation, cultural heritage and recreation and tourism) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of degrading other ES (e.g. climate regulation, aesthetic value and conservation habitat)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of degrading other ES (e.g. climate regulation, aesthetic value and conservation habitat)
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	Y	Y	Y	Y	Y
4 - WFD	N	N	N	N	N
5 - Local Plans	N	N	N	Y	Y

Environmental Scores					
100 = best option, 0 = worst option					
Option	a) Do nothing	b) Do Minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.	e) Raise (upgrade) embankments and walls.
WFD (Water Framework Directive)					
Compliance assessment outcome	25	25	0	0	0
HRA (Habitats Regulation Assessment)					
Impact on SPA/ Ramsar qualifying	50	50	50	50	50
Impacts on freshwater habitats	50	50	50	50	50
Impacts on intertidal habitats	50	50	50	50	50
Habitat Connectivity	50	50	50	50	50
SEA (Strategic Environmental Assessment)					
Historic Environment	0	0	25	75	100
Effects on population	0	0	25	75	100
Impact on plans/ programmes	0	0	25	75	100
Freshwater Biodiversity	0	0	25	75	100
Saline Biodiversity	25	25	0	0	0
Soil	0	0	25	50	50
Groundwater	25	25	25	100	100
Landscape (visual impact)	50	50	50	25	25
Carbon Storage	25	25	25	25	25
Total	350	350	425	700	800

Summary of Results					
Option	a) Do nothing	b) Do Minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.	e) Raise (upgrade) embankments and walls.
Costs	£ -	£ 153,000	£ 1,380,990	£ 5,514,745	£ 9,257,471
Benefits	£ -	£ 152,000	-£ 490,236	£ 12,235,301	£ 12,559,377
NPV	£ -	-£ 1,000	-£ 1,871,226	£ 6,720,556	£ 3,301,906
BCR	0.0	1.0	N/A - increases flood risk	2.2	1.4
Environmental Scoring	350	350	425	700	800

Preferred Option Decision Making		
DLO	Leading Option at DLO Stage	Justification for Leading Option
DLO1 - Economic Assessment	Raise (sustain) embankments and walls.	Sustain option has the highest BCR and second environmental ranking.
DLO2 - Economic Sensitivities		
DLO3 - Review of Compensatory Intertidal Habitat Requirements		
DLO4 - Review of Compensatory		
DLO5 - Modelling of Leading		
DLO6 - Consultation Phase		

Preferred Option Name
Raise (sustain) embankments and walls.

Preferred Option
This option involves improving the current SoP provided by the defences to 0.5% AEP with sea level rise; in year 8 to 4.8m AOD and then in year 50 to 6.0m AOD to continue to provide protection in line with sea level rise.

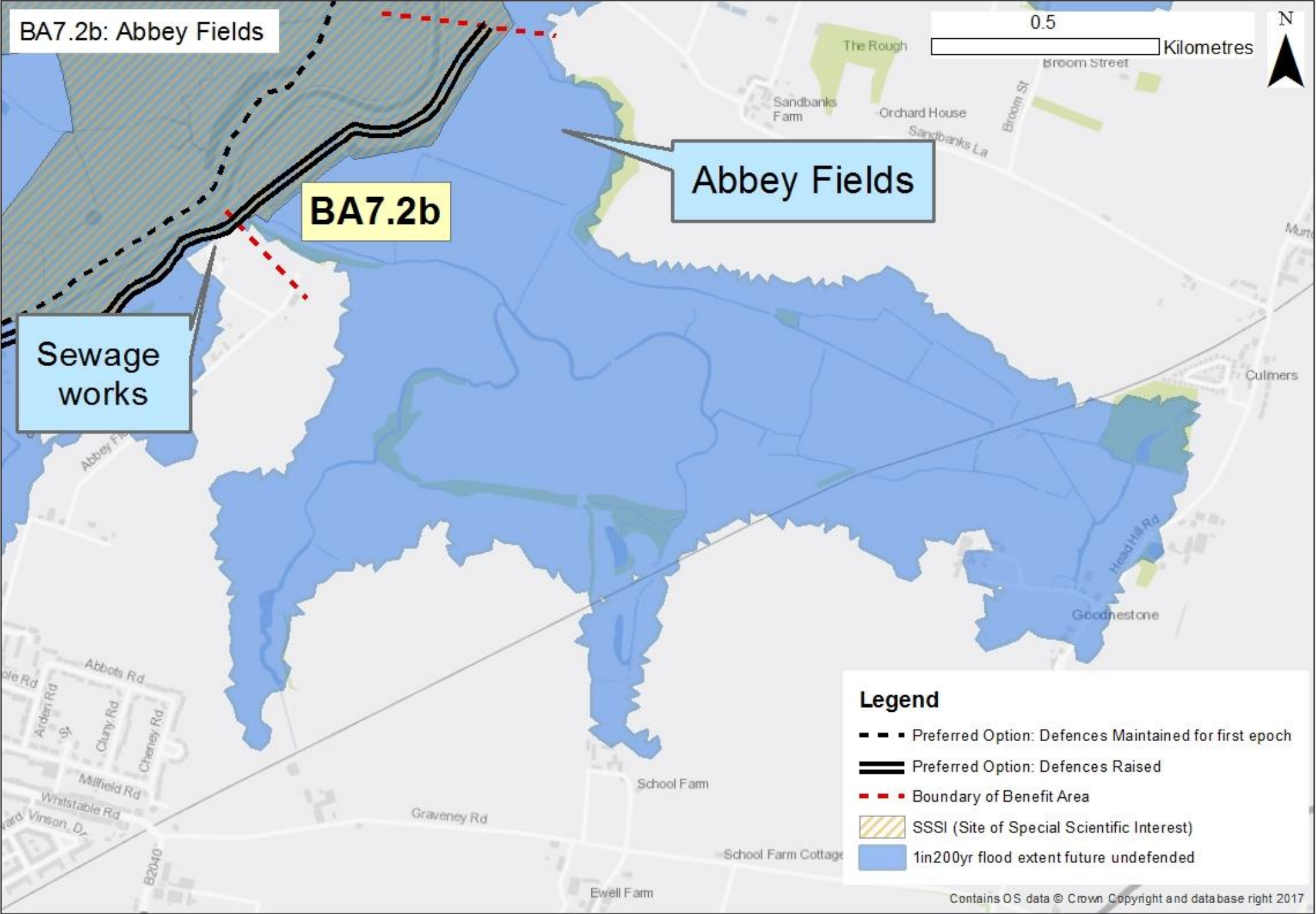
Justification
The sustain option has the highest BCR and NPV value and second highest environmental ranking.

Preferred Option Costs											
<table><tr><th>Cost</th><th>Benefits</th><th>BCR</th><th>PF Score</th></tr><tr><td>£ 5,866,545</td><td>£ 12,235,301</td><td>2.08</td><td>18%</td></tr></table>				Cost	Benefits	BCR	PF Score	£ 5,866,545	£ 12,235,301	2.08	18%
Cost	Benefits	BCR	PF Score								
£ 5,866,545	£ 12,235,301	2.08	18%								



Benefit Area Name	7 - Faversham Creek
Benefit Unit Name	7.2b - Faversham to Nagden (Abbey Fields)
Frontage Length	1.2 km
Defence Structure Type	High ground, Sea Wall and Embankment
Min Standard of Protection (AEP%)	50%
Residual Life (years)	25

	0-20 years	20-50 years	50-100 years
SMP Policy	HTL	HTL	HTL
Aiming to comply with policy	No- suggest alternative considerations		
Comment	Agree with SMP, however a possible MR could be considered in the eastern boundary of creek.		



Do Nothing Assets at Risk (Flooding)				
	50% AEP (undefended)		0.5% AEP (undefended)	
	Current Year	100 year	Current Year	100 Years
Residential	1	6	7	10
Commercial & Industrial	0	0	0	1
Agricultural (Ha)	110.6	130.2	133.9	155.4
Key Infrastructure	None	None	None	None
Social and Environmental Considerations	Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward), agricultural land (Grade 1 and 2)	Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward), agricultural land (Grade 1 and 2)	Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward), agricultural land (Grade 1 and 2)	Natural England Coastal Path (Saxon Shore Way), The Swale SPA and SSSI (seaward), agricultural land (Grade 1 and 2)

Long List to Short List			
Potential Measures			
	Measures	Selected	Reasoning
Structural	Construct new embankment	Y	Take forward- embankments currently present
	Maintain embankment	Y	Take forward- embankments currently present
	Raise embankment (sustain)	Y	Take forward- embankments currently present
	Raise embankment (upgrade)	Y	Take forward- embankments currently present
	Construct new wall	Y	Take forward- walls currently present
	Maintain wall	Y	Take forward- walls currently present
	Raise wall (sustain)	Y	Take forward- walls currently present
	Raise wall (upgrade)	Y	Take forward- walls currently present
	Maintain rock revetment	N	Exclude - no rock revetment currently present
	Construct rock revetment	N	Exclude - limited benefits in constructing a revetment where high ground, walls and embankments are currently present and will not significantly reduce flood risk. Also
	Install demountable defences	N	Exclude - relatively costly option which is not the most efficient use of FDGiA funding compared to sustaining existing defences. It would require significant man resources to
	Install temporary defences	N	Exclude - no significant assets at risk to warrant installation of temporary defences (significant resources to implement)
	Beach recharge (sand or shingle)	N	Exclude - not appropriate for this location
	Construct rock groynes	N	Exclude - not appropriate for this location
	Maintain rock groynes	N	Exclude - not appropriate for this location
	Construct timber structures	N	Exclude - not appropriate for this location
	Maintain timber structures	N	Exclude - not appropriate for this location
	Construct a tidal barrier	N	Exclude- likely to have significant environmental impacts, including on water quality (WFD), change in sedimentation in Estuary with wider impacts (environment, dredging, maintenance, navigation etc.). In addition likely to have significant costs.
Non-Structural	Implement monitoring	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Implement flood warning system	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Land use planning	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Adaptation measures	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Development control	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Emergency response plans	N	Not suitable as a single measure to implement the SMP policy. May be combined with structural measures
	Monitoring for health and safety only	N	Not suitable as a single measure to implement the SMP policy.

Long List of Options					
	a) Do nothing	b) Ongoing maintenance of embankments and walls.	c) Maintain SOP (capital) embankments and walls.	d) Raise (sustain SOP) embankments and walls.	e) Raise (upgrade SOP) embankments and walls.
To what extent does the option meet the objectives?					
1- Reduce Flood Risk	N	N	Y	Y	Y
2 - Natura 2000 sites	N	N	N	N	N
3- Reduce maintenance	N	N	N	N	N
4 - WFD	N	Y	Y	Y	Y
5 - Local Plans	-	-	-	-	-
Comment and decision on whether taken forward to shortlist	Y = baseline (min SOP=2, RL=25)	Y - as baseline. Following 30 years a Do nothing scenario would occur due to failure of the defences.	Y = SOP of defences is very low. Therefore capital maintenance needed.	Y = SOP very low, therefore increase SOP of defences with sea level rise	N= limited benefits that would warrant significant increase in defence heights

Long List of Options			
	f) Construct new setback embankments at identified managed realignment sites. Maintain SOP of existing embankments and walls along rest of creek	g) Construct new setback embankments at identified managed realignment sites. Raise (sustain SOP) existing embankments and walls along rest of creek	h) Construct new setback embankments at identified managed realignment sites. Raise (upgrade SOP) existing embankments and walls along rest of creek
To what extent does the option meet the objectives?			
1- Reduce Flood Risk	Y	Y	Y
2 - Natura 2000 sites	Y	Y	Y
3- Reduce maintenance	Y*	Y*	Y*
4 - WFD	TBC	TBC	TBC
5 - Local Plans	-	-	-
Comment and decision on whether taken forward to shortlist	Y = potential realignment site needs consideration at short list stage for compensation requirements. MR from year 20 as the defences may have a high RL.	Y = potential realignment site needs consideration at short list stage for compensation requirements. MR from year 20 as the defences may have a high RL.	N= limited benefits that would warrant significant increase in defence heights

\* Assumed that the MR sites will have natural topography

Short List of Options
a) Do nothing
b) Do Minimum
c) Maintain (capital) embankments and walls.
d) Raise (sustain) embankments and walls.
e) * Construct new setback embankments at identified managed realignment sites (from year 20). Maintain embankments and walls along rest of creek
f) * Construct new setback embankments at identified managed realignment sites (from year 20). Raise (sustain) embankments and walls along rest of creek

\*This MR option was screened out following consultation with environmental stakeholders - see 'Review of Managed Sites' report (October 2016) for further detail

Assessment of Short List				
Option	a) Do nothing	b) Do Minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.
Description	Used as an economic baseline to compare the other options against.	Used as an economic baseline to compare the other options against.	Capital works are undertaken to maintain the current defences	Capital works are undertaken to improve the current defences
Technical Issue	Defences have 25 years residual life.	Defences have 25 years residual life.	Current defences have 25 years residual life.	Current defences have 25 years residual life.
Assumptions/ Uncertainties	Assumes that all management is ceased.	Ongoing maintenance. Maintenance not sufficient to reduce risk of failure after year 30	The crest height of the defences remains the same as currently in place i.e. is not increased. Over time this will lead to a reduction in the SOP as the sea level rises.	The SOP provided by the defences is increased to the required standard over time. This option has a phased approach so the defences are raised in line with sea level rise at two phases i.e. capital works are undertaken in epoch 1 and again in year 50. This option will maintain the required SOP provided by the defences by keeping pace with sea level rise.
SOP Provided (% AEP)	>50%	>50%	50%	0.1%
Value of Economics				
PV Capital Costs	£ -	£ -	£ 437,386	£ 1,039,342
PV Maintenance Costs	£ -	£ 38,125	£ 58,115	£ 60,148
PV Other Costs	£ -	£ -	£ 45,903	£ 117,436
Total Cost (including Optimism Bias) (PV)	£ -	£ 61,000	£ 866,247	£ 1,947,080
Value of Benefits	£ -	£ 181,000	£ 1,420,849	£ 1,420,849
Benefit Cost Ratio (BCR)	0.0	3.0	1.6	0.7
PF Score	0%	16%	18%	8%
Further funding required to achieve 100% PF Score	£ -	£ 51,000	£ 713,100	£ 1,793,933
Flood/ erosion impacts				
Number of Residential Properties at risk under 0.1% AEP	14	14	0	0
Number of Commercial properties at risk under 0.1% AEP	5	5	0	0
PV Value of Properties (Total including AAD, write-offs, vehicle damages and Emergency Services)	£ 746,327	£ 679,516	£ -	£ -
Critical Infrastructure	No assets at risk	No assets at risk	No assets at risk	No assets at risk
PV Value of Impacts on road and rail	£ -	£ -	£ -	£ -
PV Value of Tourism and Recreation Impacts	£ -	£ -	£ -	£ -
PV Value of Agriculture Impacts	£725,117 Worst case scenario 67ha Grade 1 acricultural land flooded and 101ha Grade 3 flooded	£ 611,210	£50,595 Worst case scenario 6ha Grade 1 agricultural land flooded and 21ha Grade 3 flooded	£50,595 Worst case scenario 6ha Grade 1 agricultural land flooded and 21ha Grade 3 flooded
Stakeholders Feedback				
Statutory Stakeholders/ SEG	No specific comments	No specific comments	No specific comments	No specific comments
Landowners	No specific comments	No specific comments	No specific comments	No specific comments
Technical Feasibility				
Site Specific	n/a	n/a	n/a	n/a
Strategy Wide	n/a	n/a	n/a	n/a
WFD (Water Framework Directive)				
Compliance assessment outcome	2 Some return to natural processes but uncontrolled	3 Some return to natural processes but uncontrolled	1 Heavily Modified Water Body (HMWB) maintained	1 Heavily Modified Water Body (HMWB) maintained



HRA (Habitats Regulation Assessment)				
Impact on SPA/ Ramsar qualifying features	<div>2</div> <div>There are potential minor effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.</div> <div>Coastal squeeze will lead to a loss of mudflat and small areas of saltmarsh habitat until at least yr. 25 when failing defences will allow these habitats to begin to form behind the existing defences.</div>	<div>2</div> <div>There are potential minor effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.</div> <div>Coastal squeeze will lead to a loss of mudflat and small areas of saltmarsh habitat until at least yr. 30 when failing defences will allow these habitats to begin to form behind the existing defences.</div>	<div>2</div> <div>There are potential minor effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.</div> <div>Coastal squeeze will lead to a loss of mudflat and small areas of saltmarsh habitat. However overtime the risk of overtopping will increase and saltmarsh and mudflat habitats could begin to form behind the existing defences.</div>	<div>2</div> <div>There are potential significant effects on the intertidal Swale SPA and constituent qualifying features due to coastal squeeze.</div> <div>Coastal squeeze will lead to a loss of mudflat and small areas of saltmarsh habitat.</div>
Impacts on freshwater habitats	<div>3</div> <div>n/a - no designated freshwater habitats in the BA</div>	<div>3</div> <div>n/a - no designated freshwater habitats in the BA</div>	<div>3</div> <div>n/a - no designated freshwater habitats in the BA</div>	<div>3</div> <div>n/a - no designated freshwater habitats in the BA</div>
Impacts on intertidal habitats	<div>2</div> <div>Coastal squeeze of the designated intertidal habitats until the defences fail in year 25</div>	<div>2</div> <div>Coastal squeeze of the designated intertidal habitats until the defences fail in year 30</div>	<div>2</div> <div>Coastal squeeze of the designated intertidal habitats however overtime there will be an increased risk of overtopping which may allow some intertidal habitat to develop behind the defences</div>	<div>1</div> <div>Potential loss of intertidal habitat through coastal squeeze.</div>
Habitat Connectivity	<div>2</div> <div>Slight negative impact on connectivity due to loss of habitat from coastal squeeze.</div>	<div>2</div> <div>Slight negative impact on connectivity due to loss of habitat from coastal squeeze.</div>	<div>2</div> <div>Slight negative impact on connectivity due to loss of habitat from coastal squeeze.</div>	<div>2</div> <div>Slight negative impact on connectivity due to loss of habitat from coastal squeeze.</div>
SEA (Strategic Environmental Assessment)				
Historic Environment	<div>3</div> <div>No observable historic assets at risk</div>	<div>3</div> <div>No observable historic assets at risk</div>	<div>3</div> <div>No observable historic assets at risk</div>	<div>3</div> <div>No observable historic assets at risk</div>
Effects on population	<div>1</div> <div>Risk from flooding to homes, livelihoods and amenity following the failure of the defences in year 25</div>	<div>1</div> <div>Risk from flooding to homes, livelihoods and amenity following the failure of the defences in year 30</div>	<div>2</div> <div>Risk from flooding to homes, livelihoods and amenity over time with increased risk of overtopping due to sea level rise</div>	<div>5</div> <div>Reduced risk from flooding on livelihoods and amenity</div>
Impact on plans/ programmes	<div>3</div> <div>Benefit area does not coincide with proposed development sites</div>	<div>3</div> <div>Benefit area does not coincide with proposed development sites</div>	<div>3</div> <div>Benefit area does not coincide with proposed development sites</div>	<div>3</div> <div>Benefit area does not coincide with proposed development sites</div>
Freshwater Biodiversity	<div>1</div> <div>Significant impacts on freshwater biodiversity following the failure of the defences. The Swale and Faversham Creek area includes the largest remaining areas of freshwater grazing marsh in Kent and is representative of the estuarine habitats found on the north Kent coast.</div>	<div>1</div> <div>Significant impacts on freshwater biodiversity following the failure of the defences. The Swale and Faversham Creek area includes the largest remaining areas of freshwater grazing marsh in Kent and is representative of the estuarine habitats found on the north Kent coast.</div>	<div>2</div> <div>Change in freshwater biodiversity gradually over time with increased risk of overtopping due to sea level rise</div>	<div>5</div> <div>Freshwater biodiversity at reduced risk from saline intrusion</div>

Saline Biodiversity	3 Loss of intertidal habitat due to coastal squeeze until defences fail in year 25 Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. There are also outstanding groupings of plants and invertebrates across the marshes.	3 Loss of intertidal habitat due to coastal squeeze until defences fail in year 30 Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. There are also outstanding groupings of plants and invertebrates across the marshes.	2 Loss of intertidal habitat due to coastal squeeze, although the effects may be mitigated overtime due to the increased risk of overtopping with sea level rise. Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. There are also outstanding groupings of plants and invertebrates across the marshes.	1 Loss of intertidal habitat due to coastal squeeze. Faversham Creek supports the most extensive area of salt marsh in the South Swale. The marshes are particularly notable for the internationally important numbers of wintering and passage wildfowl and waders, and there are also important breeding populations of a number of bird species. There are also outstanding groupings of plants and invertebrates across the marshes.
Soil	1 Degradation of soils following the failure of the defences in year 25 (including Grade 1 agricultural land).	1 Degradation of soils following the failure of the defences in year 30 (including Grade 1 agricultural land).	2 Gradual degradation of soils over time with increased risk of overtopping due to sea level rise (including Grade 1 agricultural land)	5 Agricultural land protected
Groundwater	1 Variable groundwater vulnerability within benefit area. Aquifer likely to be impacted following the failure of the defences in year 25. Sewage works at risk from flooding after the defences have fail in year 25	1 Variable groundwater vulnerability within benefit area. Aquifer likely to be impacted following the failure of the defences in year 30. Sewage works at risk from flooding after the defences have fail in year 30	2 Variable groundwater vulnerability within benefit area, aquifer may be impacted over time with increased risk of overtopping due to sea level rise. Sewage works at risk from flooding over time over time with increased risk of overtopping due to sea level rise	5 No impacts - aquifer and sewage works protected.
Landscape (visual impact)	3 Change but reverting to natural processes	3 Change but reverting to natural processes	3 Gradual change but reverting to natural processes	2 Potential visual impact depending on defence heights
Carbon Storage	3 No impact	3 No impact	2 Some carbon cost through construction	2 Some carbon cost through construction
Ecosystem Services				
Qualitative Score from Ecosystem Services Assessment	-24	-24	-20	0
Comments	Degradation in various ES (e.g. food, water regulation, natural hazard regulation and erosion regulation) outweigh various enhancement opportunities (e.g. climate regulation, aesthetic value, conservation habitat and fishery habitat)	Degradation in various ES (e.g. food, water regulation, natural hazard regulation and erosion regulation) outweigh various enhancement opportunities (e.g. climate regulation, aesthetic value, conservation habitat and fishery habitat)	Degradation in various ES (e.g. food, water regulation, natural hazard regulation and erosion regulation) outweigh limited enhancement opportunities (e.g. aesthetic value and fishery habitat)	Balance of opportunities for enhancing some ES (e.g. natural hazard regulation and erosion regulation) with risks of other ES (e.g. air quality, aesthetic value and fisheries habitat)

To what extent does the option meet the objectives?				
1- Reduce Flood Risk	N	N	Y	Y
2 - Natura 2000 sites	N	N	N	N
3- Reduce maintenance	Y	Y	Y	Y
4 - WFD	N	N	N	N
5 - Local Plans	Y	Y	Y	Y

Environmental Scores				
100 = best option, 0 = worst option				
Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.
WFD (Water Framework Directive)				
Compliance assessment outcome	25	25	0	0
HRA (Habitats Regulation Assessment)				
Impact on SPA/ Ramsar qualifying features	25	25	25	25
Impacts on freshwater habitats	50	50	50	50
Impacts on intertidal habitats	25	25	25	0
Habitat Connectivity	25	25	25	25
SEA (Strategic Environmental Assessment)				
Historic Environment	50	50	50	50
Effects on population	0	0	25	100
Impact on plans/ programmes	50	50	50	50
Freshwater Biodiversity	0	0	25	100
Saline Biodiversity	50	50	25	0
Soil	0	0	25	100
Groundwater	0	0	25	100
Landscape (visual impact)	50	50	50	25
Carbon Storage	50	50	25	25
Total	400	400	425	650

Summary of Results				
Option	a) Do nothing	b) Do minimum	c) Maintain (capital) embankments and walls.	d) Raise (sustain) embankments and walls.
Costs	£ -	£ 61,000	£ 866,247	£ 1,947,080
Benefits	£ -	£ 181,000	£ 1,420,849	£ 1,420,849
NPV	£ -	£ 120,000	£ 554,603	-£ 526,230
BCR	0.0	3.0	1.6	0.7
Environmental Scoring	400	400	425	650

Preferred Option Decision Making		
DLO	Leading Option at DLO Stage	Justification for Leading Option
DLO1 - Economic Assessment	b) Maintain (capital) embankments and walls.	This option has the highest BCR.
DLO2 - Economic Sensitivities	Maintain defences until year 20. Raise (sustain) embankments and walls from year 20.	Delayed sustain option has highest BCR and better environmental scoring compared to the Maintain option.
DLO3 - Review of Compensatory Intertidal Habitat Requirements		
DLO4 - Review of Compensatory Freshwater Habitat Requirements		
DLO5 - Modelling of Leading Options		
DLO6 - Consultation Phase		

Preferred Option Name
Maintain defences until year 20. Raise (sustain) embankments and walls from year 20.

Preferred Option
Maintenance of the current defences for the first 20 years. Following this the defences will be raised to 5.7m AOD and then raised again in year 50 to 6.4m AOD to ensure a 0.1% SoP with sea level rise.

Justification
Maintain (capital) option has the highest benefits following the Do Minimum and an IBCR greater than 1. However, the land will still be flooded under a 50% AEP. An additional £330k would enable protection to a 0.1% AEP. Under local choices, the Sustain Option will be preferred and would require an additional £330k funding over 100 years.

Preferred Option Costs														
<table><tr><th>Cost</th><th>Benefits</th><th>BCR</th><th colspan="2">PF Score</th></tr><tr><td>£ 1,236,077</td><td>£ 1,420,849</td><td>1.15</td><td colspan="2">12%</td></tr></table>					Cost	Benefits	BCR	PF Score		£ 1,236,077	£ 1,420,849	1.15	12%	
Cost	Benefits	BCR	PF Score											
£ 1,236,077	£ 1,420,849	1.15	12%											