Public Document Pack

Officer Decision Making

Monday, 16th July, 2012
at 10.00 am

PLEASE NOTE TIME OF MEETING

Office of the Senior Manager, Planning, Sustainability and Transport

This meeting is not open to the public

Decision Maker

Senior Manager Planning, Sustainability and Transport

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AGENDA

Agendas and papers are available via the Council's website

1 APPROVAL OF THE SOUTHAMPTON COASTAL FLOOD AND EROSION RISK MANAGEMENT STRATEGY

Report of the Flood Risk Management Officer seeking approval for the adoption of the Southampton (Redbridge to Woodmill Lane) Coastal Flood & Erosion Risk Management Strategy ("The Strategy"), providing a a high level basis for decision making and action related to the management of the tidal river frontage over the next 100 years, attached.

Friday, 6 July 2012 HEAD OF LEGAL, HR AND DEMOCRATIC SERVICES

DECISION-MAKER:	SENIOR MANAGER PLANNING, SUSTAINABILITY & TRANPORT
SUBJECT:	APPROVAL OF THE SOUTHAMPTON COASTAL FLOOD AND EROSION RISK MANAGEMENT STRATEGY
DATE OF DECISION:	16 JULY 2012
REPORT OF:	FLOOD RISK MANAGEMENT OFFICER
STATEMENT OF CONFIDENTIALITY	
Not applicable	

BRIEF SUMMARY

The purpose of this report is to seek approval for the adoption of the Southampton (Redbridge to Woodmill Lane) Coastal Flood & Erosion Risk Management Strategy ("The Strategy"), which provides a high level basis for decision making and action related to the management of the tidal river frontage over the next 100 years. The Strategy outlines the preferred options for management of the shoreline and phased risk-based implementation options over 3 time periods: short-term (2015 to 2030); medium-term (2030 to 2060); and long-term (2060 to 2110). The options were determined following rigorous assessments against natural processes and environmental acceptability and economic and technical viability. Adoption of The Strategy will endorse the recommendations for long term sustainable management of this frontage, which the Council can promote and use to help deliver strategic flood defence for the city.

RECOMMENDATIONS:

(i) To adopt the Southampton (Redbridge to Woodmill lane) Coastal Flood & Erosion Risk Management Strategy.

(ii) To endorse development and implementation of the options within The Strategy that will need to be taken forward over the duration of the plan period.

(iii) To note that further reports will be brought for approval to proceed with individual projects once funding has been identified.

REASONS FOR REPORT RECOMMENDATIONS

1. To enable sustainable and strategic management of tidal flood risk over the next 100 years through a hierarchical approach where the North Solent Shoreline Management Plan (2010) forms the top tier policy, directly supported by The Strategy (See Figure 1, Appendix 1).

2. Endorsement of development and implementation of the options outlined in The Strategy will provide a mechanism for managing the risk on a phased approach allowing the City to adapt to sea level rise as the reality of the projected rise is realised in the future.

3. The Strategy will provide clarity and direction, to all interested parties, on the Council's preferred approach to managing tidal flood risk over the next 100 years.

4. Adoption of The Strategy will facilitate future applications for national funding towards management of tidal flood risk.

DETAIL (Including consultation carried out)

5. The need for a Flood & Coastal Erosion Risk Management Strategy in this area was identified in the North Solent Shoreline Management Plan (SMP) and included in the

action plan.

6. The North Solent SMP recommends a policy of 'Hold the Line' to protect the main City frontage over the coming century, with the exception of a 'No Active Intervention' policy at Redbridge on the River Test.

7. To support The Strategy development a series of studies were completed including: Defence Condition Assessment, Topographic survey, Flood modelling, desktop Contaminated Land Assessment, Strategic Environmental Assessment, Habitats Regulation Assessment, Water Framework Directive Assessment and Economic Assessment.

8. There are currently no formal flood defences within the frontage and tidal flooding poses a threat to major parts of the City. Tidal flood risk is set to increase significantly in the future under the range of sea level rise projections (see Figure 2 & Table 1, Appendix 1). By 2110 over 2700 residential properties (of which over 700 are within the most deprived 20% category), over 1300 commercial properties, and major infrastructure and services are at risk, totalling a present cash value of £1.25 billion under a 'Do Nothing' scenario.

9. The considerable variation in the current standard of protection against flooding, present day land uses, defence ownership, and defence types combine to provide constraints and opportunities when considering future flood risk management options. On this basis the frontage has been divided up into 11 sub-areas (termed Option Development Units (ODU's) – see Figure 2, Appendix 1). These ODU's provide the required flexibility for considering suitable and relevant flood risk management options for different areas of the frontage.

10. In order to manage and reduce the risk of tidal flooding, a number of strategic level options were considered:

    - **Baseline option** – **Do Nothing**.
    - **Option 1** – **Maintenance.** Scheduled maintenance of existing structures.
    - **Option 2** – **Improve Standard of Protection.** Provide at least a 1:200 year (0.5% AEP) standard of protection, with measures implemented on identified flood risk trigger points.
    - **Option 3** - **Improve Standard of Protection.** Provide at least a 1:500 (0.2% AEP) year standard of protection, with measures implemented on identified flood risk triggers points.

11. In order to facilitate the strategic level options, a suite of potential local level options were identified and appraised using the Flood and Coastal Erosion Risk Management – Appraisal Guidance (FCERM-AG) methodology. These local level options included:

    - Floodwall defences
    - Steel sheet piling frontline defences
    - Earth embankments
    - Land raising
    - Road raising
    - Demountable defences
    - Property level protection (flood resistance measures)
    - Tide gates/lock

12. The Strategy has worked to dovetail with other initiatives such as the City Centre Master Plan, City Centre Action Plan and redevelopment through liaison with the relevant departments and stakeholders. It has sought to capitalise on opportunities to incorporate strategic flood defences, in the form of raised land, into the redevelopment of sites.

13. The Strategy aims to deliver a minimum 1:200 year (0.5% AEP) standard of protection (Option 2) to the main part of the City where raised defence options have been chosen. The preferred Strategy options combine new floodwall defences, land raising integrated with regeneration, and property level flood resistance measures, all phased over time based on flood risk (see Figure 3 & Table 2, Appendix 1). In addition, continued maintenance and repairs by private owners is recommended to maintain the integrity of the existing quay walls.

14. The Strategy's robustness has been demonstrated through rigorous testing against changes to a range of parameters including: exclusion of developer contributions; accelerated sea level rise; increased option costs; and decreased option costs. The phased implementation of options at 2015, 2030 and 2060 provides a mechanism to deliver sustainable adaptive flood risk management. The Strategy has sufficient in-built adaptive capacity and flexibility to adapt to changes in climate, and ensure that decisions taken now will not lead to negative consequences in the future

15. The preferred options put forward by The Strategy are in keeping with the SMP policies for all areas, with the exception at Redbridge from 2060. Here it is recommended that the SMP policy of 'No Active Intervention' be replaced locally with 'Hold the Line' through implementation of raised flood defences to protect a significant residential area against flooding. This recommendation to amend the SMP policy is subject to Cabinet approval of the revised SMP in due course.

16. Through the environmental assessments, potential minor detrimental impacts linked to construction disturbance were highlighted; however these can be mitigated through sensitive construction methods and timing works to avoid bird breeding and fish migration periods. It is concluded that through delivering robust flood risk management measures The Strategy will provide significant positive social benefits in terms of health and wellbeing, reducing damages to property and assets, including significant areas which are currently deprived, and protecting historic assets and potentially contaminated soils.

17. The coastal squeeze impact from 'Holding the line' in The Strategy has been determined by the North Solent SMP (2010) and the habitat losses will be accounted for by the Regional Habitat Creation Programme being delivered by the Environment Agency. There is potential for up to 0.2 ha of intertidal habitat to be created behind the railway at Redbridge (ODU 11) under the SMP No Active Intervention policy; this will not be created under The Strategy preferred option of a floodwall at 2060. There is therefore a risk that there will be an adverse effect on intertidal habitat after 2060 and so this potential impact will need to be factored into the Regional Habitat Creation Programme in due course. Further detailed investigation of this potential impact will be required in a future revision of The Strategy to quantify and describe the impact in order to inform habitat compensation requirements.

18. The Strategy has a strong economic case and provides £238,882k Present Value benefits, for £18,157k Present Value costs leading to an overall benefit cost ratio of 13.2. A breakdown of the key economic aspects of implementing the preferred options is provided in Table 3 (Appendix 1).

19. The strategy proposes a 100-year schedule of phased capital investments and a maintenance programme to reduce the risks of tidal flooding (see Table 4, Appendix 1).

The key priority actions recommended for the next 5 years are presented below:

Activity	Date
Cell A – Northam to Town Depot intermediate height floodwall	
Commence detailed appraisal	2012/13
Approval	2013/14
Commence Construction	2015
Complete Construction	2016
Cell B – Upper Itchen property level flood resistance scheme	
Commence detailed appraisal	2012/13
Approval	2013/14
Commence Implementation	2014
Complete Implementation	2015

20. A number of stages of consultation were implemented throughout development of The Strategy. These included:

- Stage 1: Identification of key stakeholders and key issues
- Stage 2: Raise awareness and obtain initial feedback (undertaken through dissemination of a questionnaire)
- Stage 3: Liaison with stakeholders (internal and external) throughout development of The Strategy (undertaken through Client Steering Group meetings, Key Stakeholder workshops and individual stakeholder meetings)
- Stage 4: Formal 90 day public consultation on a draft version of The Strategy (included 4 public exhibition events held at various locations throughout the areas most at risk)
- Stage 5: Dissemination of the final version of The Strategy (this will be completed following approval through the website)

Details of The Strategy development were regularly updated on a dedicated webpage on the Council's main website and an external website managed by URS. The feedback received during the public consultation showed 99% agreement of The Strategy options for each ODU, however one respondent wanted option implementation brought forward at Redbridge to 2015.

21. Discussions with individual landowners along the River Itchen frontage (Flood Cell A – ODU's 3-6) are currently ongoing in order to determine their views on the implementation of an intermediate height floodwall within their land, and if agreeable, to determine the potential alignment(s) of the flood defence that could be accommodated and to develop a better understanding of the constraints on each site with existing operations that need to be taken into consideration for the design phase of the scheme.

22. A programme of community engagement is currently being developed with representatives from the Upper Itchen community (Flood Cell B – ODU 1) through involvement with the Coastal Communities Adapting to Climate Change (CCATCH – The Solent) project (part of the wider European funded Coastal Communities 2150 project being led by the Environment Agency). This project will help to co-ordinate and carry out engagement activities to raise awareness of the tidal flood risk within this area and to

assist with contacting those residents/homeowners in the highest risk areas that may qualify for property level protection measures to be funded by national funding.

ALTERNATIVE OPTIONS CONSIDERED AND REJECTED

23. The alternative would be to not adopt The Strategy. This option was rejected on the basis that it would not encourage sustainable and strategic management of tidal flood risk within this part of the City. As this risk increases with sea level rise in the future the lower lying areas of the frontage would become more frequently inundated which could have serious social, health & well-being, economic and environmental implications on a range of levels if it is not managed accordingly. This would have the potential to cause damage to existing assets and infrastructure totalling a present cash value of £1.25 billion over the next 100 years.

24. Failure to adopt The Strategy would prevent progressing towards gaining Environment Agency technical sign off and thus finalisation of the project. This would impact on Southampton City Council's reputational status and could have knock on effects for future funding bids, the ambition to provide a strategic direction for future development opportunities along the frontage and lower the confidence level from the Environment Agency that we are a competent authority in managing flood risk, which we have worked hard to built up over the past three years.

RESOURCE IMPLICATIONS

Capital/Revenue

25. In order to implement The Strategy, funding will be required from various sources. The economic appraisal shows a strong business case for attracting public Flood Defence Grant in Aid (FDGiA) funding for the priority schemes (2015). Overall 66% of The Strategy cost (cash costs) will need to be directly funded by developers (land raising), the Community Infrastructure Levy (CIL) and any beneficiaries who are willing to contribute, although this cost will be phased over the next 50 years as and when the schemes/options need to be implemented and as funding becomes available (see below & Table 5, Appendix 1).

Economic summary of the capital costs for the Preferred Strategy

	Cell A	Cell B	Cell C	Total
Capital Costs - 2015				
Cash Costs (£k)	6,140	300	0	6,440
PV Costs (£k)	*5,350*	*261*	*0*	*5,611*
Capital Costs - 2030				
Cash Costs (£k)	9,410	520	150	10,080
PV Costs (£k)	*4,893*	*270*	*78*	*5241*
Capital Costs - 2060				
Cash Costs (£k)	14,430	3,000	1,080	18,510
PV Costs (£k)	*2,931*	*609*	*219*	*3,759*

The funding requirements for flood defence infrastructure have been fed into the CIL charging schedule during its development. It is anticipated that the remaining 34% funding required will be met by FDGiA over the 100 year period.

26. Implementation of the schemes to provide formal raised flood defences (other than land raising) will require revenue expenditure from Southampton City Council for future maintenance. This has an estimated Present Value cost of £2.1 million over the next 100 years. The first revenue expenditure would be required approximately 5 years after construction was complete (estimated to be 2020 at the earliest for the priority works on the Itchen frontage), and approximately every year thereafter for the duration of the residual life of the structure (or until it is replaced by land raising). A breakdown of the likely required revenue maintenance costs (cash costs) are outlined below:

Timescale	Maintenance cost
Year 10 – 20 (2020 – 2030)	£10,000/year
Year 21 – 50 (2031 – 2060)	£25,000/year
Year 51 – 100 (2061 – 2110)	£35,000/year

Property/Other

27. There are no immediate property implications arising from The Strategy. Should property implications be identified as implementation of The Strategy develops, these will be brought to members after consultation with relevant interested parties.

28. The Strategy has implications for Council owned land directly along the frontage, especially along the River Itchen which is at immediate risk from tidal flooding, where the flood risk needs to be managed in a strategic manner to prevent flooding to the immediate low lying areas but also to prevent flood flow paths to other parts of the city. The preferred option to raise the land along the frontage as part of any redevelopment proposals will include (and thus have implications for) Town Depot, Royal Pier and the Major Development Quarter. Liaison with the relevant City Development Managers has been ongoing throughout development of The Strategy.

29. There are no additional identified resource implications.

LEGAL IMPLICATIONS

Statutory Power to undertake the proposals in the report:

30. The statutory power to undertake proposals to manage flood and erosion risks are held by Southampton City Council under the Coast Protection Act 1949 and the Land Drainage Act 1991, although these are permissive powers only.

Other Legal Implications:

31. There are no additional identified legal implications.

POLICY FRAMEWORK IMPLICATIONS

32. The Strategy is consistent with and will inform the flood risk management elements/policies within the series of documents comprising the Local Development Framework and it will be a material consideration in determining relevant planning applications along this section of frontage in Southampton.

33. The draft City Centre Action Plan (CCAP) makes reference to The Strategy and 'Policy 13 – Flood resilience' will contribute towards delivery of the options outlined in The Strategy where development proposals within the City Centre are located along, or close to, the immediate river frontages.

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SUPPORTING DOCUMENTATION

Non-confidential appendices are in the Members' Rooms and can be accessed on-line

Appendices

1.	Southampton Coastal Strategy Decision Report - Figures & Tables

Documents In Members' Rooms

1.	Southampton Coastal Strategy Main Report http://intranet.southampton.gov.uk/economic-development/PlanningSustainability/sustainability.aspx

Integrated Impact Assessment

Do the implications/subject/recommendations in the report require an Integrated Impact Assessment to be carried out?	No

Other Background Documents

Title of Background Paper(s)	Relevant Paragraph of the Access to Information Procedure Rules / Schedule 12A allowing document to be Exempt/Confidential (if applicable)
1. Southampton Coastal Strategy Appendices	

Integrated Impact Assessment and Other Background documents available for inspection at:

Electronic copy: http://intranet.southampton.gov.uk/economic-development/PlanningSustainability/sustainability.aspx

Hard copy: Planning & Sustainability, 45 Castle Way, Southampton

WARDS/COMMUNITIES AFFECTED:	SWAYTHLING, PORTSWOOD, BEVOIS, BARGATE, FREEMANTLE, MILLBROOK & REDBRIDGE

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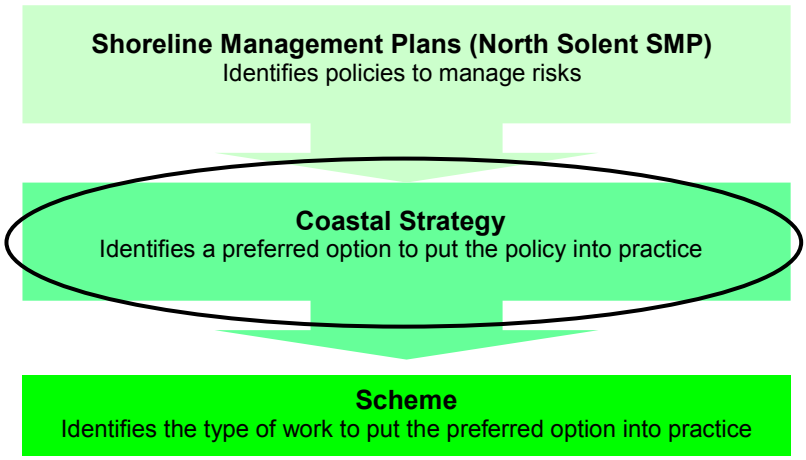
APPENDIX 1

Southampton Coastal Strategy Decision Report - Figures & Tables

Figure 1. Flood & Erosion Risk Management Framework



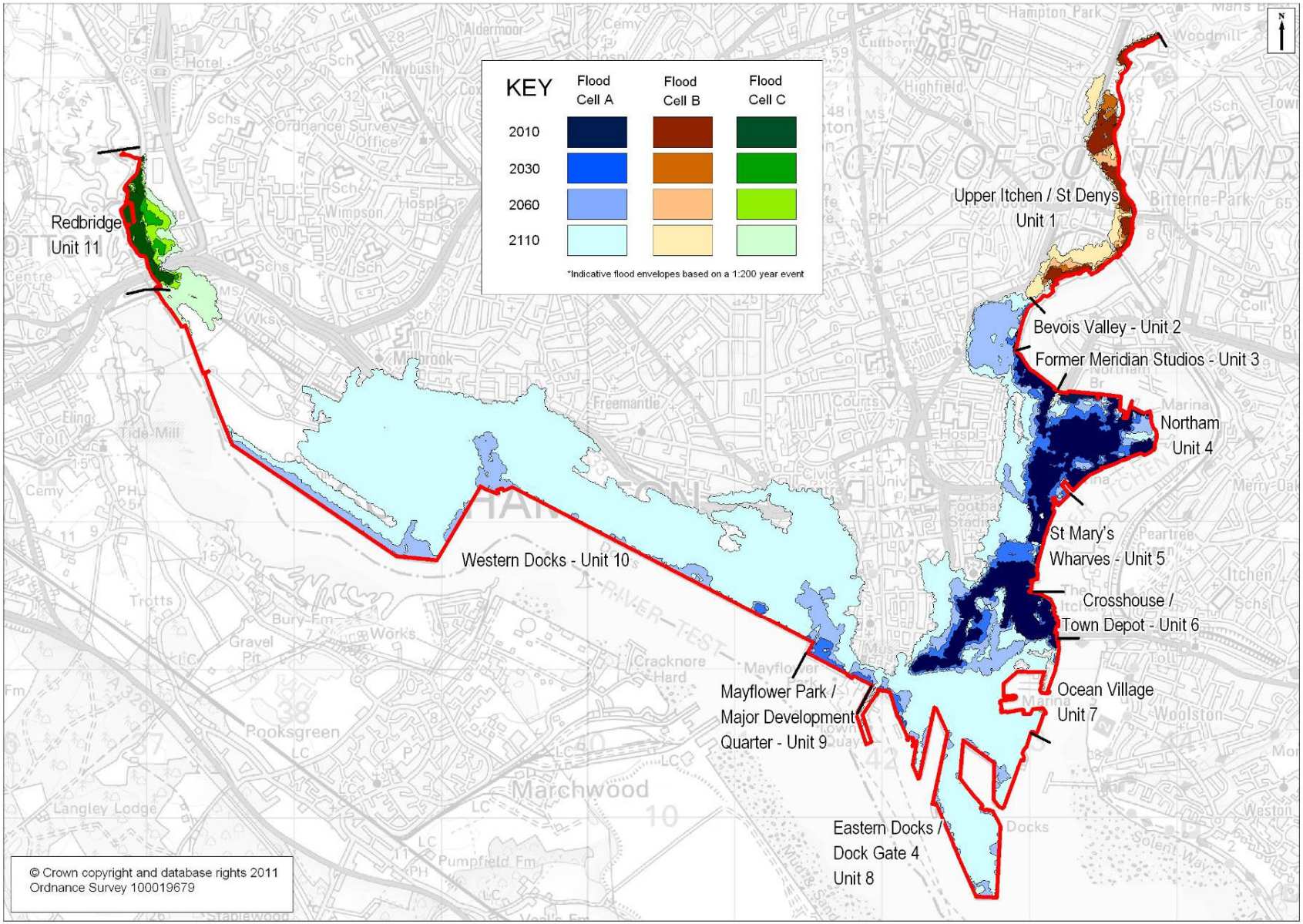


Figure 2. The growth of the three discrete Flood Cells (A, B, and C) created by a 1:200 year (0.5% Annual Exceedance Probability (AEP)) event at 2010, 2030, 2060 and 2110

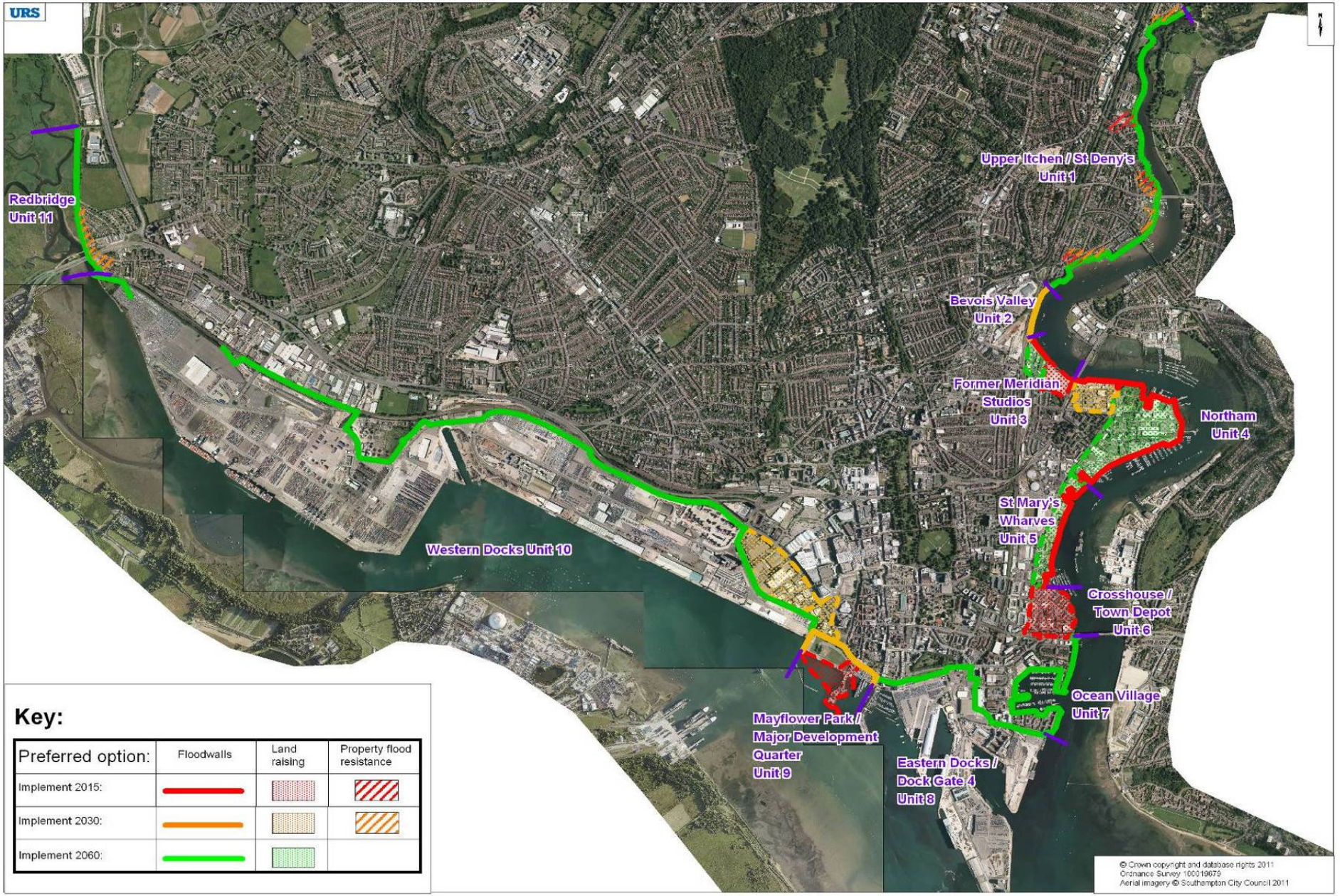


Figure 3. Map of the preferred Strategy options for the 11 "Option Development Units"

Table 1. Summary of baseline flood risk, flood cells and assets at risk of tidal flooding now and at 2110.

Parameter	Year	Upper Itchen / St Denys	Bevois Valley	Former Meridian Studios site	Northam	St Mary's Wharves	Crosshouse/ Town Depot	Ocean Village	Eastern Docks / Dock Gate 4	Mayflower Park / Major Development Quarter	Western Docks	Redbridge
		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11
Event return period when flooding begins to affect receptors	**2010**	1:20 year (5% AEP)	>1:200 year (<0.5% AEP)	1:50 year (2% AEP)	1:50 year (2% AEP)	1:50 year (2% AEP)	1:50 year (2% AEP)	>1:200 year (<0.5% AEP)	>1:200 year (<0.5% AEP)	>1:200 year (<0.5% AEP)	>1:200 year (<0.5% AEP)	1:100 year (1% AEP)
	2110	<1:1 year (100 % AEP)	1:5 year (20% AEP)	<1:1 year (100 % AEP)	<1:1 year (100 % AEP)	<1:1 year (100 % AEP)	<1:1 year (100 % AEP)	1:50 year (2% AEP)	1:10 year (10% AEP	1:10 year (10% AEP)	1:10 year (10% AEP	<1:1 year (100 % AEP)
Typical flood depth range from a 1:200 year (0.5% AEP) event in metres	**2010**	0.25 - 0.75	0	0.25 - 0.5	0.25 - 0.75	0.25 - 0.5	0.25 - 0.75	0	0	0	0	0
	2030	0.5 – 0.75	0	0.5 - 0.75	0.75 - 1	0.5 - 0.75	0.75 - 1	0	0.5 - 0.75 via 'back door'	0	0	0.25
	2060	0.75 - 1.25	0.5 - 0.75	0.75 - 1	1 - 1.25	0.5 - 1	0.75 - 1.25	0	1 - 1.75 via 'back door'	0.25 - 0.5	0	0.25 - 0.75
	2110	1.75 - 2	1.5 - 2	1.5 - 1.75	1.75 - 2.25	1.5 - 2	1.75 - 2	0.5 - 1	1.5 - 2	1 - 1.5	1 - 1.75	1 - 1.75
Flood cell extent (See Error! Reference source not found.Error! Reference source not found.**Figure 1)**	**2010**	B		A	A	A	A					
	2030	B		A	A	A	A		A			C
	2060	B	A	A	A	A	A		A	A		C
	2110	B	A	A	A	A	A	A	A	A	A	C
Assets at risk from a 1:200 year (0.5% AEP) event	**2010**	Portswood WTW. Railway and roads. 175 residential properties. 7 commercial properties.	None	654 Residential properties of which 240 Deprived. 499 commercial properties, road, aggregate wharves.				None	None	None	None	Railway and roads. 49 residential properties. 3 commercial properties.
	2110	Portswood WTW. Railway and roads. 585 residential properties. 52 commercial properties.	1924 Residential properties of which 568 Deprived. 1279 commercial properties. Aggregate Wharves. St Mary's Football Stadium, Southampton Central Station, Arterial Roads and mainline railways, West Quay, Ocean Village, ABP Port, Cruise Terminals, Millbrook WTW.									Railway and roads. 224 residential properties. 7 commercial properties.

Table 2. Local level long list options, short list options and elements of preferred local options for each Unit.

Flood Cell	Area (Unit)	Option	Short-listed	Comment	Element of preferred local option?
B	Upper Itchen / St Denys (1)	Raise Priory Road	No	Rejected - significant lengths of private residential ownership of much of this frontage, and the relatively low economic benefits generated behind the frontline of properties.	
		Wholesale re-development / land raising -	No	Rejected - many residential properties along the frontage would need to be demolished and redeveloped which would not be socially acceptable.	
		Steel sheet pile front line defences.	**Yes**	Many residential properties and commercial assets along the frontage are at high risk of flooding over The Strategy period so a detailed appraisal of a frontline defence option was undertaken.	No – technically very difficult, expensive and access / aesthetic issues.
		Floodwall defences.	**Yes**	Many residential properties and commercial assets along the frontage are at high risk of flooding over The Strategy period so a detailed appraisal of a floodwall defence option was undertaken.	**Yes** – from 2060 for strategic options 2 & 3 when flood resistance not viable as risk increases.
		Community and property level flood resistance / resilience / adaptation including warnings / incident response / advice.	**Yes**	The flood envelope is relatively narrow and it is mainly waterfront properties at risk of flooding. Due to long stretches of private frontages where waterfront access and riverside views are an important factor for many residents this option (where the risks are managed and adapted to) was appraised in detail.	**Yes** – from 2015 to 2060 to reduce flood consequences to vulnerable properties for strategic options 2 & 3.
A	Bevois Valley (2)	Community and property level flood resistance / resilience / adaptation.	No	Rejected – as this unit is part of a continuous flood cell and the depths associated with future flood events are significant by 2060 so this option was rejected for detailed appraisal.	
		Land raising through redevelopment	No	Rejected due to the presence of the railway line at the frontline, and the operational / technical issues of land raising along a railway line.	
		Steel sheet pile front line defences.	**Yes**	A number of receptors and assets are at high risk of flooding and area also part of a larger continuous flood cell	**Yes** - for strategic options 2 & 3.
A	Former Meridian Studios Site (3)	Earth Embankment defences	No	Rejected - impractical due to current land use requirements and the significant land take required	
		Floodwall front line defences	**Yes**	Number of receptors and assets are at high risk of flooding over The Strategy period and area part of a larger continuous flood cell with flow paths through to adjacent areas.	**Yes** - from 2015 to 2060 for strategic option 2 & 3.
		Land raising through redevelopment	**Yes**	Strong potential for land raising as part of the site is currently cleared and awaiting re-development.	**Yes** - from 2015 to 2060 for strategic option 2 and 3.
A	Northam Bridge to Belve-dere Wharf (4)	Community and property level flood resistance / resilience / adaptation	No	Rejected - flood depths become large and the flood extent significant so resistance, resilience and adaptation would not be sufficient to mitigate the risks. The economic benefits of defending this frontage are also large and area is also part of a larger continuous flood cell.	
		Earth Embankment defences.	No	Rejected - significant land take required and area is highly developed, with industrial and residential land uses. Also detrimental to operational requirements of the quays.	
		Steel sheet pile front line defences.	**Yes**	A number of receptors and assets are at high risk of flooding over The Strategy period and area also part of a larger continuous flood cell.	No – ruled out through high cost, technical difficulties, and operational impingement grounds
		Floodwall front line defences	**Yes**	A number of receptors and assets are at high risk of flooding over The Strategy period and area also part of a larger continuous flood cell.	**Yes** - from 2015 to 2060 for strategic option 2 & 3.

Flood Cell	Area (Unit)	Option	Short-listed	Comment	Element of preferred local option?
		Land raising	**Yes**	Potential operational difficulties of implementing a front line defence option, and potential for re-development.	**Yes** – from 2060 for strategic options 2 & 3.
A	St Mary's Wharves (5)	Community and property level flood resistance / resilience / adaptation	No	Rejected - flood depths become large and the flood extent significant and resistance, resilience and adaptation cannot adequately mitigate the risks. The unit is also part of a larger continuous flood cell.	
		Earth Embankment defences	No	Rejected - highly developed, industrial and residential land uses. Also would hinder the operational requirements of the quays and requires significant land take.	
		Road raising at the rear of the Wharves	No	Rejected - due to the levels required to provide protection, the limited space due to dense industrial land use and the access requirements for plant to the wharves.	
		Steel sheet pile front line defences.	**Yes**	This option was appraised in detail as there are a number of receptors and assets at high risk of flooding, over The Strategy period and unit is also part of a larger continuous flood cell.	No – ruled out through high cost, technical difficulties, and operational impingement grounds
		Floodwall front line defences.	**Yes**	A high number of receptors and assets at high risk of flooding, over The Strategy period. This option is also a lower cost option than the sheet pile option and unit also part of a larger continuous flood cell.	**Yes** - from 2015 to 2060 for strategic option 2 & 3.
		Land raising.	**Yes**	Potential operational difficulties of implementing a front line defence option, and the potential for re-development in this unit.	**Yes** – from 2060 for strategic options 2 & 3.
A	Cross-house/ Town Depot (6)	Steel sheet pile front line defences.	**Yes**	A number of receptors and assets at high risk of flooding over The Strategy period and unit is also part of a larger continuous flood cell.	No - less cost effective and more technically difficult than a wall
		Floodwall front line defences.	**Yes**	A number of receptors and assets at high risk of flooding over The Strategy period. This is also a lower cost option than the sheet pile option and unit is also part of a larger continuous flood cell.	Only if land raising not undertaken from 2015
		Land raising through redevelopment.	**Yes**	This site is earmarked for redevelopment. This is also the most technically robust defence type to protect against flooding.	**Yes** - from 2015 for strategic options 2, & 3.
A	Ocean Village (7)	Road raising.	No	Rejected - this option does not provide protection to the key receptors in Ocean village.	
		Steel sheet pile front line defences.	No	There is a flood risk mainly 'via the back door' from other areas (i.e. the Port and Town Depot) so this option as a stand alone solution.	
		Defend front line with tide gate / lock across entrance to marina and defences along perimeter of ABP land and demountable defences / ramps on access points.	**Yes**	A number of receptors and assets are at high risk of flooding, over The Strategy period. Also this is part of a larger continuous flood cell with flow paths through to the City Centre.	No - prohibitively expensive
		Raise quay walls with floodwall defences along perimeter of ABP land and demountable defences / ramps on access points.	**Yes**	As above but more cost effective than the option with a tide gate on the Marina entrance.	**Yes** - from 2060 for strategic options 2 & 3.
A	Eastern Docks / Dock Gate 4 (8)	Front line floodwall defences	No	Rejected - due to operational requirements of the Port.	
		Raise Canute / Platform Road.	No	Rejected - this option is technically very challenging, given access requirements and tight urban fabric.	
		Demountable defences along roads	No	Rejected - operationally intensive to use long stretches of demountable defences and requires ongoing maintenance and operation. There is also a high risk of failure with this option.	

Flood Cell	Area (Unit)	Option	Short-listed	Comment	Element of preferred local option?
		ABP boundary flood wall with demountables / ramps across access points.	**Yes**	The Port boundary provides a potential defence corridor and this option would provide protection to a large number of receptors behind the Port. This option would also not impinge on Port operations.	**Yes** - from 2060 for strategic options 2 & 3.
A	Mayflower Park / Major Develop-ment Quarter (9)	Road raising.	No	Rejected - technically challenging and expensive given access requirements.	
		Front line steel sheet pile defences	**Yes**	The site is earmarked for redevelopment so there is the opportunity to implement new front line defences.	No – less cost effective than other options.
		Land raising through redevelopment	**Yes**	This is a relatively cost effective solution which could be integrated into the park and any redevelopment.	**Yes** – from 2015 for strategic options 2 & 3.
		Earth Embankment defences.	**Yes**	This option is technically feasible and there is room to implement an embankment.	No – significant land take required.
		Floodwall at rear of park and along the port boundary with demountable defences / ramps on access points.	**Yes**	This could be constructed to provide robust flood protection to the Major Development Quarter.	Only if land raising doesn't occur. From 2030 for strategic options 2 & 3.
		Construct elevated service road as flood defence.	No	Rejected – due to the operational requirements of the Port and ABP is not currently exploring this option.	
A	Western Docks (10)	Front line floodwall	No	Rejected - This is a high cost option and logistically very difficult. Access requirements are also a key issue.	
		Raise road at rear of the Port	No	Rejected - this is a high cost and logistically very difficult. Key infrastructure (Millbrook WTW) will also not be protected.	
		Upgrade railway line at rear to act as a defence	No	Rejected - this is a high cost option and very disruptive for a working Port. ABP is also currently not exploring this option.	
		Raise entire Port area	No	Rejected - ABP is currently not exploring this option so this was ruled out for detailed appraisal	
		Raise the service road through the Port.	No	Rejected - ABP is currently not exploring this option so this was ruled out for detailed appraisal	
		Floodwall along ABP boundary with ramps / demountables on access points.	**Yes**	This option would provide flood protection to the receptors at risk behind the Port with minimal disruption to port operations and maintaining access to the Port.	**Yes** – all other options ruled out by ABP due to operational requirements.
C	Redbridge (11)	Steel sheet pile front line defences along the river channel.	No	Rejected – potential significant detrimental environmental impacts of this option on the designated site of the lower Test Valley.	
		Earth embankment defences alongside railway	**Yes**	The railway provides a useful feature to utilise as a defence corridor. This option would generate maximum benefits as the greatest number of receptors would be protected and is more environmentally sympathetic.	No - environmentally detrimental, technically challenging in places and land take issues
		Steel sheet pile defences along the railway line.	**Yes**	High number of residential properties and commercial assets are at high risk of flooding over The Strategy period and the railway provides a useful defence corridor.	No – environmentally detrimental and costly
		Floodwall along the railway line.	**Yes**	High number of residential properties and commercial assets are at high risk of flooding over The Strategy period and the railway provides a useful defence corridor.	**Yes** – from 2060 for strategic options 2 & 3 when risk becomes more significant

Flood Cell	Area (Unit)	Option	Short-listed	Comment	Element of preferred local option?
		Community and property level flood resistance / resilience / adaptation including warnings / incident response / advice.	**Yes**	Due to the SMP policy of No Active Intervention, with a significant flood risk over The Strategy period this option where the risks are managed and adapted to, was appraised in detail.	**Yes** – from 2030 for strategic options 2 & 3 to reduce flood consequences to vulnerable properties

Table 3. Economic summary of Preferred Strategy

	Cell A	Cell B	Cell C	Total
Standard of Protection	1:200	1:200	1:200	
PV Costs (£k)				
Capital	13,757	1,826	476	16,059
Non-capital	1,387	511	199	2,098
Total PV Costs (£k)	15,144	2,337	675	18,157
PV Benefits (£k)	209,006	23,746	6,131	238,882
Average Benefit/Cost Ratio	13.8	10.2	9.1	13.2
Cash Costs (£k)				
Capital	29,980	3,820	1,230	35,030
Non-capital	2,384	1,372	729	4,485
Total Cash Costs (£k)	32,364	5,192	1,959	39,515

Table 4. Implementation timetable for schemes resulting from The Strategy

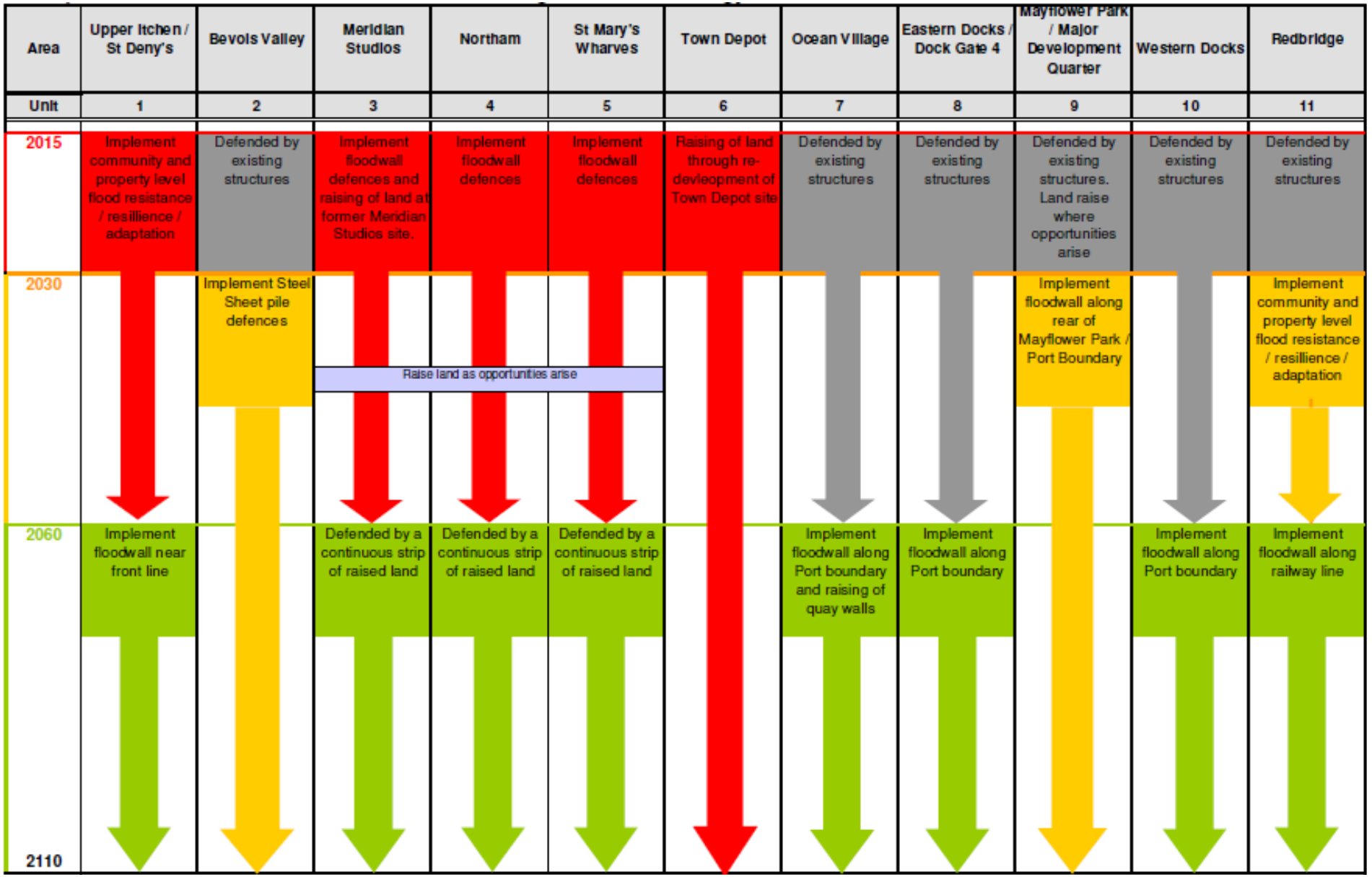


Table 5. Estimated funding Strategy and potential breakdown of contributions to implement the preferred options (present cash costs for capital schemes)

	Area	Upper Itchen / St Denys	Bevois Valley	Meridian Studios	Northam	St Mary's Wharves	Crosshouse / Town Depot	Ocean Village	Eastern Docks / Dock Gate 4	Mayflower Park / Major Development Quarter	Western Docks	Redbridge	Total
	Option Development Unit	1	2	3	4	5	6	7	8	9	10	11	
2015	Scheme	Flood resistance scheme		Floodwall + Raised land	Floodwall	Floodwall	Land Raising						
	Total Cost	£300,000		£1,240,000	£1,730,000	£870,000	£2,300,000						
	FDGiA	£300,000		£420,000	£1,730,000	£870,000							£3,320,000
	Developer/ CIL/ Other			£820,000			£2,300,000						£3,120,000
2030	Scheme	Flood resistance scheme	Steel sheet pile defence		Land raising	Land raising				Floodwall		Flood resistance scheme	
	Cost	£520,000	£2,380,000		£5,200,000	£940,000				£890,000		£150,000	
	FDGiA	£420,000								£890,000		£100,000	£1,410,000
	Developer / CIL/ Other	£100,000	£2,380,000		£5,200,000	£940,000						£50,000	£8,670,000
2060	Scheme	Floodwall		Land raising	Land raising	Land raising		Floodwall	Floodwall along ABP boundary		Floodwall with access provisions	Floodwall along railway	
	Total Cost	£3,000,000		£820,000	£5,200,000	£940,000		£1,280,000	£1,510,000		£4,680,000	£1,080,000	
	FDGiA	£2,000,000						£800,000	£1,000,000		£3,000,000	£500,000	£7,300,000
	Developer / CIL /Other	£1,000,000		£820,000	£5,200,000	£940,000		£480,000	£510,000		£1,680,000	£580,000	£11,210,000

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