

Project Title: Oxford Flood Alleviation Scheme Strategic Outline Case



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Purpose of this document

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The main purpose of the Strategic Outline Case (SOC) is to establish the need for investment; to appraise the main options for service delivery; and to provide management with a recommended – or preferred – way forward for further analysis.

The SOC builds on earlier work, including the Oxford Flood Risk Management Strategy to make the case for change within the strategic case; preparing and appraising the long list of options within the economic case; and recommending a preferred way forward, together with indicative costs, for much further analysis within the Outline Business Case (OBC).

This SOC has been prepared in accordance with best practice guidance provided in HM Treasury's Green Book.

VERSION HISTORY

Version	Date Issued	Brief Summary of Change	Owner's Name
0.1	04.11.14	Format and early draft content of document	Emily Williamson
0.2	19.11.14	Comments from Project Assurance, Project Executive and Funding and Benefits Realisation Manager	Emily Williamson
0.3	19.11.14	Comments from SRO	Emily Williamson
0.4	20.11.14	Comments from Project Executive, NEAS	Emily Williamson
0.5	20.11.14	Completion of Management Case Executive Summary and amendments to Strategic Case	Emily Williamson
0.6	21.11.14	Comments from Project Executive	Emily Williamson
0.7	28.11.14	Comments from Programme Board	Emily Williamson
0.8	17.12.14	Comments from LPRG	Emily Williamson
0.9	18.12.14	Updated objectives and CSF's as per the Programme Board Workshop	Emily Williamson
0.10	20.01.15	Comments from Chief Executive	Emily Williamson
0.11	27.01.15	Comments from Director Operations South East	Emily Williamson
0.12	28.01.15	Comments from Director Operations South East	Emily Williamson
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Version	Date Issued	Brief Summary of Change	Owner's Name
		to Defra for initial comment	
0.14	20.03.15	Updated for comments from Executive Director FCRM and major changes to financial case following feedback from Defra Economist	Emily Williamson
0.15	17.04.15	Updated following comments from Executive Director FCRM and Defra	Emily Williamson
0.16	29.05.15	Updated following technical review comments from Defra	Richard Harding
0.17	29.06.15	Updated following Defra Network Executive Committee review	Richard Harding

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1 Overview of the SOC Production Process

The table below shows the systematic approach to the preparation of the SOC development phases of the business case:

Stages	Development Process	Deliverables
Phase 1 – scoping	Preparing the Strategic Outline Case (SOC)	Strategic case
Step 2	Making the case for change	
Action 2	Agree strategic context	
Action 3	Determine investment objectives, existing arrangements and business needs	
Action 4	Determine potential business scope and key service requirements	
Action 5	Determine benefits, risks, constraints and dependencies	
Step 3	Exploring the preferred way forward	Economic case – part 1
Action 6	Agree critical success factors (CSFs)	
Action 7	Determine long list options and SWOT analysis	
Action 8	Recommend preferred way forward, including other arrangements.	Outline commercial, financial and management cases
<i>Output</i>	<i>Strategic Outline Case (SOC)</i>	
<i>Outcome</i>	<i>Robust case for change</i>	
<i>Review point</i>	<i>Gateway 1 – business justification</i>	

2 Executive summary

2.1 Introduction

This Strategic Outline Case (SOC) seeks approval to develop means of reducing flooding in Oxford.

Oxford sits at the confluence of 7 rivers draining a catchment area of approximately 3000km². The floodplain narrows significantly immediately downstream of Oxford to only 300m wide which constraints flow and effectively acts as a throttle holding back water during times of high flows. This flooding has been exacerbated by historic development within the floodplain, which includes road and railway embankments that further restrict flow. Oxford also has an extensive network of braided watercourses that leave and rejoin the River Thames. All these constraints result in flood water flowing out of the channel and causing damage to property and infrastructure during periods of high flow.

The River Thames and its tributaries at Oxford have a large area of developed floodplain without flood defences. If nothing was done to manage flood risk over 4500 properties would be at risk in a flood with a 1 in 100 chance of occurring in any year (1% annual probability), rising to over 6000 should climate change happen as currently predicted. Critical infrastructure is also at risk. The risk to properties is currently managed through the Oxford Multi-Agency Flood Plan which includes ongoing weir operation and maintenance and regular debris clearance. Even with this existing ongoing work over 1800 properties remain at risk in the 1:100 year flood event, which would rise to nearly 2700 with climate change by 2080.

The presence of a gravel aquifer, and the high surface water and groundwater connectivity, leads to a risk of groundwater and sewer flooding, particularly in the areas of Osney, Grandpont and New Hinksey.

Oxford has experienced regular flooding over recent years including in 2000 (56 properties reported to the Environment Agency as having flooded internally), 2003 (123), 2007 (168), 2009, 2011, 2012 (14) and 2013/2014 (55) (Note - numbers of properties have been given where available). Schools and businesses are at risk. Critical infrastructure such as major arterial roads, the main railway line between Birmingham and London, an electrical substation and mains sewers are also at risk.

The current preferred way forward for achieving this is through the proposed Oxford Flood Alleviation Scheme. The estimated whole life cash cost, including inflation over the 100 year appraisal period is £125.7million for construction and £307.6million for the future maintenance. Without inflation the future maintenance liability is £95.7million or approximately £1million per year.

This is a partnership project being led by the Environment Agency, on behalf of a Sponsoring Group representing the following organisations:

- The Environment Agency
- Oxfordshire County Council
- Oxford City Council
- Vale of White Horse District Council
- University of Oxford
- Oxfordshire Local Enterprise Partnership
- Oxford Flood Alliance
- Thames Regional Flood and Coastal Committee
- Thames Water

This scheme is a major construction project being developed by the Environment Agency and its partners, to reduce flood risks and deliver wider social, economic and environmental benefits for communities in and around Oxford.

2.2 Strategic Case

The strategic context

The government enacted the Flood and Water Management Act in 2010, partly in response to the impacts of the severe flooding in July 2007, in which hundreds of thousands of people in England and Wales were affected (with 55,000 properties reported to have been internally flooded) and billions of pounds of damage were caused. The Act created new roles for Regional Flood and Coastal Committees and Lead Local Flood Authorities (LLFAs), as well as additional duties for the Environment Agency. In Oxford, it is Oxfordshire County Council that fulfils the role of LLFA. It is this remit that led to the creation of the Sponsoring Group in response to the repeated flooding in Oxford.

Defra has specific policies on reducing the threats of flooding and adapting to climate change. How schemes contribute towards delivering these policies is measured using a series of Outcome Measures. Outcomes monitored include economic benefits delivered, properties moved into a lower flood risk category and water framework habitat improved.

The Environment Agency and its partners also have duties under the EU's Water Framework Directive, 2000. This is to ensure that, in managing flood risks, a sustainable approach is taken to water resources and aquatic ecosystems, and wider environmental and social benefits to local communities are delivered.

The Thames Catchment Flood Management Plan (CFMP) provides the high level strategic context in which to promote the partnership scheme. Specifically in this area the CFMP states that "the actions recommended in the Oxford Flood Risk Management Strategy should be delivered". Oxfordshire County Council has the responsibility to produce a Flood Risk Management Plan (FRMP). This is now complete and the draft has been consulted on. The FRMP supports the Oxford Flood Alleviation Scheme proposals contained in this SOC.

The Oxford Flood Risk Management Strategy was approved in September 2010, following a public consultation, and describes the Environment Agency's preferred approach to managing flood risk in Oxford over 100 years. This provides a strategic plan for phased works to reduce flood risk and respond to the potential impacts of climate change.

The Environment Agency has completed the first phases of this strategy with local improvements. £2.5 million has been invested increasing the capacity of channels and structures and providing temporary defences. This work helped to avoid flooding up to 150 properties in the recent floods.

The second phase is to increase the flow capacity of the channels through and around Oxford and the third phase is upstream flood storage in support of the reduced effectiveness of the new channel if climate change materials as predicted.

At the time of the strategy these later phases were not economically preferred. A 5 year review of the options and updated the modelling has changed this thinking. The new modelling has shown that floods are becoming more frequent. The latest guidance on climate change has also been incorporated. This has meant that phase 2 of the strategy can now be promoted. This SOC explores the options for achieving the improved flow capacity.

The case for change

The objectives of the Oxford Flood Alleviation Scheme, developed by and with our partners (to be delivered by 2021, unless otherwise stated) are as follows:

- Reduce flood damages to at least 1000 homes and businesses currently at risk in Oxford;
- Reduce flood impacts on transport infrastructure and utilities in Oxford, particularly to Botley and Abingdon Roads, the railway line and the sewerage system;
- Safeguard Oxford's reputation as a thriving centre of commerce that is open for business;
- Create and maintain new recreational amenities, wildlife habitat and naturalised watercourses accessible from the centre of Oxford.

When sufficient information becomes available following the optioneering process being carried out as part of the detailed appraisal, there will be a further workshop with stakeholders to turn these into true SMART objectives to finalise the preferred option in the OBC.

The Oxford Local Enterprise Partnership (OxLEP) feels that the long term economic success of Oxford is dependent on it being able to grow and stay open for business. The OxLEP, launched by the Business Minister, Mark Prisk MP in March 2011 is responsible for championing and developing the Oxfordshire economy, working with businesses, academia and the public sector and bringing disparate initiatives together. The Oxford Flood Alleviation Scheme is a critical piece of enabling infrastructure that will keep key transport links clear, businesses open and a workforce able to concentrate on work rather than recovery of their property from flood damage.

On the basis of this analysis, a scheme to increase flood flow capacity in the floodplain is considered the best option. Engineering expertise, hydraulic modelling and input from environmental design, fisheries and geomorphology experts is critical to developing a feasible scheme. Given its scale, the scope of the project extends to creating new habitat, recreational opportunities and improved access.

2.3 Economic case

The long listed options

The Oxford Strategy reviewed over 100 options generated through a consultation with specialists and stakeholder groups. This review reinforced the principle that increased flood flow capacity is likely to provide the most effective and economically viable approach to reducing flood risk. Within the scope of increasing flood capacity, the following options have been evaluated as part of the long list:

- Option 1 – Do Nothing
- Option 2 – Do Minimum (Sustain)
- Option 3 – Channel Widening
- Option 4 – Removal of Control Structures
- Option 5 – Enhancement of Control Structures
- Option 6.1 – New Channel (Small)
- Option 6.2 – New Channel (Medium)
- Option 6.3 – New Channel (Large)
- Option 7 – Reduction of Existing Channel's Frictional Resistance
- Option 8 – Additional Culverting of Watercourses
- Option 9 – Enhanced Maintenance
- Option 10 – Reduce Downstream Flood Levels (within the Sandford Reach)
- Option 11 – Remove Localised Constrictions in the Watercourse

- Option 12 – Interim Measures (Oxford Flood Alliance local option)

The short list

The options from the long list above were assessed against the Investment Objectives and Critical Success Factors, and if these were satisfied, carried forward into the short list below for further economic appraisal. 'Do nothing' has been included as the baseline for value for money whilst 'Do Minimum (Sustain)' has been included as the existing condition.

- Option 1 – Do Nothing
- Option 2 – Do Minimum (Sustain)
- Option 6.1 – New Channel (Small)
- Option 6.2 – New Channel (Medium)
- Option 6.3 – New Channel (Large)
- Option 12 – Interim Measures

The preferred way forward

On the basis of the economic analysis of the shortlist, the preferred and recommended way forward (to be further assessed within the Outline Business Case) is to create a new channel, which will operate in combination with enlarged sections of existing channels. The preferred size of channel based on the economic appraisal is a medium-sized channel (with an approximately flow capacity of 40 cubic metres of water per second). Our initial modelling indicates that the medium size channel will reduce the flooding to the vast majority of the 1800 properties at risk in the 1:100 year flood event. Of these 1800 properties approximately 1200 would see their risk reduce to less than 1% per annum on opening. However, further appraisal is required in order to determine the optimum scale and arrangement of such a scheme. A strategic longer term view will also be considered which will involve the re-assessment of wider strategy options to inform when further intervention may be required. The Outline Business Case will demonstrate through separate options in the economic appraisal the impacts of delivering the channel in an adaptive (i.e. building a small channel and enlarging it later) or phased (building the channel in sections over an extended period) approach. It will also consider the impacts of this on finance availability and affordability to test whether either of these options provides a better delivery model.

The main benefits to stakeholders, customers and users are as follows:

- A reduction in the impact of flooding to residential and commercial properties and owners;
- A reduction in the damage caused by flooding of critical infrastructure, as well as reduced pressure on local services;
- Keeping Oxford open for business;
- The creation of wildlife habitat and other environmental benefits, along with Improvements in public access to nature / heritage & the strengthening of pedestrian / cycle connections.

Indicative economic analysis

The indicative costs and benefits of the scheme are as follows with the preferred way forward highlighted in blue:

	Option	PVd (£M) present value damages	PVb (£M) present value benefits	PVc (£M) present value costs	BCR benefit: cost ratio	ICBR incremental benefit: cost ratio (see note)
1	Do Nothing	1180.7	-	-	-	-
2	Do Minimum (Sustain)	333.4	847.4	19.8	42.9	-
12	Interim Measures	324.7	856.1	23.4	36.6	2.41
6.1	New Channel (Small)	189.8	991.0	109.7	9.1	1.58
6.2	New Channel (Medium)	149.9	1030.9	141.4	7.3	1.22
6.3	New Channel (Large)	139.9	1040.9	161.8	6.4	0.49

Note: PV damages and benefits are baselined against 2016 (the start date of the scheme), whilst costs are inflated to a 2018 baseline (year of most up to date price estimates). The incremental benefit:cost ratio is calculated by comparing the additional costs and benefits of an option against the preceding option. Options in this table are the short listed options from above.

2.4 Commercial case

Procurement Strategy / Required services

The detailed appraisal will demonstrate the technical aspects through the production of a technical Project Appraisal Report (PAR). This will be included in the development of the OBC, which is to be produced by in-house staff, with the technical appraisal procured through the Environment Agency's WEM (Water and Environment Management Framework). The services for the detailed appraisal and production of the Technical PAR are being procured through the Engineering and Related Services section of the framework (WEM lot 3). The tender process is now complete and a supplier has been appointed. This main contract is being supported by smaller contracts for early supplier engagement, as well as cost and programme management. In house staff from the Environment Agency are also providing further support, for instance in Project Management, Estates and Communications roles.

Potential for risk transfer and potential payment mechanisms

The main risks associated currently identified are as follows;

- Changes to outcome focused scope
- Ensuring an integrated approach
- Quality of new and existing data
- Funding, including public and private contributions
- Increased flood risk elsewhere
- Materials management
- Land and stakeholder issues
- Redbridge constraints (flow constrictions, landfill, infrastructure)
- Archaeology and heritage
- Groundwater
- Landfill pits
- Flooding

Some of these risks could be transferred contractually to the consultant or shared with other parties, as part of the award of a contract for appraisal through the Environment Agency's WEM framework.

Approaches to subsequent stages (detailed design and construction) following the approval of an OBC are yet to be agreed. This review will be led by the Environment Agency’s procurement team using the IUK routemap approach.

2.5 Financial case

Summary of financial appraisal

Early funding commitments from Oxfordshire County Council, Oxford City Council and the Thames Regional Flood and Coastal Committee (RFCC) have enabled the development of this Strategic Outline Case. Looking forward, there is continued local support for a scheme and these partners have also pledged to contribute towards the ongoing scheme development.

In July 2014, the Oxfordshire Local Enterprise Partnership (OxLEP) was successful in its bid for £26m Growth Deal money to support the scheme over the next 6 years. These contributions will be supplemented by a commitment of £14million from the Thames Regional Flood and Coastal Committee and £3million committed by local councils for the appraisal work.

Despite the contributions already known, the funding shortfall, particularly with regards to the maintenance is still significant. The Environment Agency is working closely with the Sponsoring Group, led by Oxfordshire County Council and OxLEP, to identify other possible contributors and develop a strategy through which they can be approached. This will build on lessons learnt from other Partnership Funding projects and capitalise on local knowledge and opportunities that already exist, for example OxLEP Local Growth Fund meetings.

Overall affordability

In order to assess the cash cost of the scheme, the real (baseline) cost of the scheme has been considered and then inflation has been factored in.

From the inflated cash estimate, the capital construction cost of the project, including optimism bias and inflation is £125.68million. Maintenance costs, including all costs associated with the existing wider Oxford system maintenance are added for the 100 year appraisal period to give the future costs of £307.45million. Due to the long appraisal period it may be easier to think about the future maintenance liability without inflation which is £95.7million or approximately £1million per year.

	Appraisal and Construction £million	Future costs £million	Total £million
Real	120.30	95.70	216
Present Value	108.85	32.55	141.4
Inflated Cash	125.68	307.45	433.13

The financing plan for the project will consider the costs for appraisal and construction separately to future costs estimated for activities such as regular maintenance and capital repair to structures.

Under the Flood and Coastal Risk Management Partnership Funding policy, the Scheme is eligible for funding in part by Flood Risk Management Grant-in-Aid (FCRMGIA). The indicative amount is based on the current

assessment of outcomes that the preferred way forward delivers. Based on the current appraisal the indicative eligibility is £57.7million (PV) FCRMGIA contributions over its intended life span. This figure has been generated using the partnership funding calculator based on the outcomes the scheme if forecast to deliver.

In order to represent this contribution appropriately alongside the other inflated cash costs, the assumption has been made to remove the present value discount factor, from the programme baseline date of 2014/15 onwards, and inflate it at the same factors as all other costs. Using the assumptions the estimated cash FCRMGIA contribution is around £220.6million.

The project recognises that this approach is not consistent with principles of how the Environment Agency puts together the FCRMGIA programme and notes that there is a separate commission of work underway between Defra and the Environment Agency to address this. The finding of this work will further support the development of the Financial Case in the OBC stage.

In addition to the FCRMGIA, there is also a commitment from the Thames Regional Flood and Coastal Committee towards the appraisal and construction of the scheme. This is based on 10% of the PV cost of the project as a cash contribution, i.e. around £14million. This funding commitment has been profiled within their programme alongside the work to develop the 6 year investment programme.

The ability to deliver the Scheme is dependent upon obtaining significant contributions from third party funding. The table below shows the current balance sheet with regards to contributions known so far.

Contributions for the appraisal stage have already been secured from external parties including Oxfordshire County Council, Oxford City Council, and Oxfordshire Local Enterprise Partnership funding. The contributions of this nature are assumed to be cash amounts and as such are shown in the table below in relation to assumed cash profiles for whole life cost, FCRMGIA and local levy.

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Future costs	Total £million	Appraisal and Construction sub total	Future costs
Whole life Cost (Cash)	0.48	1.85	2.07	5.0	30.63	40.33	38.89	6.43	307.45	433.13	125.68	307.45
FCRMGIA (Cash)	0.34	0.10	1.05	2.22	10.54	24.01	25.35	2.77	154.24	220.62	66.38	154.24
Levy (Cash)	0.00	2.00	4.90	5.50	1.70	0.00	0.00	0.00	0.00	14.10	14.10	0
External Contributions required (Cash)	0.14	-0.25	-3.88	-2.72	18.39	16.32	13.54	3.66	153.21	198.41	45.20	153.21
Growth Deal Funding (SEP)	0.00	1.00	1.25	1.00	4.25	18.35	0.00	0.00	0.00	25.85	25.85	0
Local Council Contributions secured	0.20	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	0
Total cash known	0.54	4.10	8.20	9.72	16.49	42.36	25.35	2.77	154.24	263.77	109.53	154.24
Remaining shortfall (to WLC Cash profile)	-0.06	-2.25	-6.13	-4.72	14.14	-2.03	13.54	3.66	153.21	169.36	16.15	153.21
Potential account balance (-ve figure is surplus fund and assumes no interest earned)	-0.06	-2.31	-8.45	-13.17	0.97	-1.06	12.49	16.15	169.36			

To secure full funding for the project over its lifetime, contributions of approximately £169million need to be identified. Of this, around £16million is for the construction phase and around £153million is to cover future costs.

The organisations represented on the Sponsoring Group have signified their agreement to secure the funding for the scheme through a Memorandum of Understanding. The partners are aware the scheme

cannot go ahead without filling the funding gap and are working together to identify and approach contributors.

A funding group has been set up, which includes senior staff from Oxfordshire County Council and the Oxfordshire LEP, to lead discussions with potential contributors and utilise ongoing engagement opportunities with them. The lead role for negotiating third party contributions will sit with Oxfordshire County Council but the Environment Agency will ensure that adequate resources are available to support this work.

Further details on the specific opportunities being considered for investment and the approach to collaborative agreements can be found in Section 7. The Funding Strategy will focus on the opportunities to realise wider environmental, social and recreational benefits from the scheme. The risk of not securing the required funding is being closely considered.

Understanding how future maintenance will be paid for is vital to delivering Oxford Flood Alleviation Scheme. It is also important to note that the schemes life is likely to be less than 100 years due to the next intervention point (upstream storage) and this will change the figures further. A shorter appraisal period would result in a potentially significant reduction in future costs; this will be investigated in further detail during the OBC stage.

Based on the current estimate of whole life cash costs, future costs could be almost £308 million over the 100 year period. Securing third party commitment to help fund this amount for the full benefit period will be a difficult task and so we are exploring the option as to whether considering the future years as a series of epochs would be more suitable. This will be explored in more detail in the OBC but initial details are in the Financial Case.

It is recognised that upfront partnership funding for 100 years of maintenance is unlikely to be secured. The project is looking at how the flood channel land can be designated as public open space, subject to landowner agreement, to enable partners to provide long term commitments for benefit in kind adoption of maintenance responsibilities. This could then act as part of their contributions towards the scheme.

The future Financing Plan will also take into consideration how these maintenance costs are made up. More analysis is needed at OBC stage to understand the relevance of these costs to the work we already undertake on river maintenance within this system.

The financial case shows that there are already contributions of £43 million at this stage of the project's development. Securing the whole funding is a pre-requisite of submitting the Outline Business Case. An approved SOC will incentivise partnership funding contributions from private investors who are looking for a signal of support for the scheme from government.

2.6 Management case

Project management arrangements

The scheme is an integral part of the Thames RFCC 6 year programme, which comprises a portfolio of projects for the delivery of flood risk reduction across the Thames Valley.

The Oxford Flood Alleviation Scheme is a standalone project which is being managed through the Projects in a Controlled Environment (PRINCE2) project management approach. This uses a project manager and project board approach to managing delivery. These roles are filled by Environment Agency staff. Overall accountability for project delivery is with David Rooke, Executive Director Flood and Coastal Risk Management at the Environment Agency. He is formally designated as the Senior Responsible Owner.

In addition to the Project Board the Oxford Flood Alleviation Scheme reports into a Sponsoring Group and Programme Board. These groups comprise senior managers from each of the partner organisations. They have sufficient authority to make decisions on behalf of their organisations and are committed to working together, having signed a Memorandum of Understanding to develop the Outline Business Case and the scheme.

The value of the preferred way forwards for the Oxford Flood Alleviation Scheme exceeds both Environment Agency and Defra delegated limits. This means that it requires approval from HM Treasury. The route to securing the approval is set out in the Integrated Assurance and Approvals Plan.

As an integral part of the design and decision-making process, the likely environmental effects of each option will be assessed to ensure that the chosen option, methods of construction, operation and maintenance will maximise environmental gain and eliminate or reduce negative environmental impacts. The design of the preferred option will be developed to maximise positive environmental outcomes and eliminate or minimise negative environmental outcomes. This process will be documented very clearly in the Environmental Impact Assessment.

The outline design developed during the OBC stage will need to be sufficiently communicated to and discussed with all interested parties so that the future stages of work, consents and authorisations can be gained through the Town and Country Planning Act or national planning routes.

The Outline Business Case will explore the opportunity to establish long term management approaches, such as benefit in kind maintenance, and identify how the required performance will be maintained through a third party agreement. This would also act as a benefit in kind contribution to the scheme in the financial case. At this early stage it is thought this might be in the form of a 20 year maintenance agreement. Initial conversations with partners have supported this approach.

Gateway reviews arrangements

The impacts/risks associated with the project have been scored against the risk potential assessment (RPA) for projects. The RPA scores are attached at Appendix 8.2 with an overall medium risk being assigned, following medium classifications for both the complexity and consequential impact assessments.

Due to the value of the project HM Treasury approval is required. It will not feature on the Governments Major Projects Portfolio and external reviews will be managed by Defra.

An OGC Gateway 1 review was undertaken in parallel with the submission of this SOC. This was carried out between 28 and 30 April 2015. The Review Team found that it is likely that the project will achieve its objectives and can be delivered successfully giving the project an Amber rating with 9 recommendations to consider, which if addressed will provide greater delivery confidence. This is considered to be a good outcome at this stage of the project. The four key recommendations were early engagement with planning authorities, ensure an effective risk management regime is in place, prepare key project control documents and ensure a single point of contract is established to provide leadership and accountability. These were already being addressed before the review and an action plan has been developed to address all the recommendations.

The reviewers concluded that the scheme is being delivered using an exemplar and innovative partnership approach that not only covers funding but is also achieving public and political support.

Further reviews are planned in accordance with the high level programme.

The project's Sponsoring Group supports the submission of the SOC at this stage to signal support for the scheme and maintain momentum in securing further contributions. Approval of the SOC will set some political expectations with risks of nugatory spend if a funding package cannot be secured or put pressure on government departments to fill the shortfall. The need for continued local public and political support, and maintaining momentum on partnership funding agreements, are key to successful delivery. The Outline Business Case will develop the detailed costs, benefits, funding and procurement approach and provides the next milestone to judge proceeding to full business case.

Recommendation

The evidence and economic appraisal of strategic objectives and the intervention options available supports the recommendation to assess further the provision of a new flood relief channel to the west of Oxford.

Signed:

Date:

Senior Responsible Owner:

3 Introduction

3.1 Structure and content of the document

This SOC has been prepared using the agreed standards and format for business cases, as set out in the OGC Guidance document:

The approved format is the Five Case Model, which comprises the following key components:

- the strategic case. This sets out the strategic context and the case for change, together with the supporting investment objectives for the scheme
- the economic case. This demonstrates that the organisation has selected a preferred way forward, which best meets the existing and future needs of the service and is likely to optimise value for money (VFM)
- the commercial case. This outlines what any contractual arrangements for delivery of the scheme might look like
- the financial case. This highlights likely funding and affordability issues and how cash-flow and the balance sheet are to be treated for the scheme
- the management case. This demonstrates that the scheme is achievable and can be delivered successfully in accordance with accepted best practice.

The Oxford Flood Risk Management Strategy from 2010 (discussed in more detail below) covered some aspects of the strategic and economic case, albeit in a different format, and this work has been drawn out of the original Oxford Strategy Appraisal Report (StAR) and updated, rather than simply being appended to this business case.

Further information is provided within this SOC to address the three other business case elements, i.e. the financial case, the commercial case and the management case, although these elements are less developed at this stage. Further work has also been required to ensure this business case follows a logical sequence, which can be broadly characterised as follows:

- spending objectives or ‘must haves’;
- existing arrangements;
- what the problems are with the existing (business needs);
- what benefits the project is seeking to achieve;
- long list of options to achieve the objectives and benefits;
- short list of options with a high level economic analysis;
- recommendation of a preferred ‘way forward’, or set of options.

The first four points are largely covered in the strategic case, and the remaining points in the economic case of this SOC, although there are overlaps with other business case elements. The business case is being developed in line with the Green Book guidance.

3.2 Background

Oxford has developed on the River Thames and sits at the confluence of 7 rivers draining a catchment area of approximately 3000km² with its source in the Cotswold Hills to the north west. The floodplain narrows significantly immediately downstream of Oxford to only 300m wide which constrains flow and effectively acts as a throttle holding back water during times of high flows. The Thames is generally slow to respond and

flood events are long in duration due to this large catchment area. The hydraulic gradient through the system is also shallow, which slows the passage of water as it drains to Sandford Lock. This flooding has been exacerbated by historic development within the floodplain, which includes road and railway embankments. The constraining effect of the development on flows means that the channels and structures that bridge them do not have sufficient capacity to pass flood flows even for the more common-place flood events such as those experienced over the last few years. This leads to flood waters backing-up and spilling into vulnerable areas. Flood peaks on the Thames at Oxford are long and flat indicating that flood storage within the floodplain is already fully utilised during the rising part of the flood, becoming more pronounced as the flood magnitude increases.

Oxford also has an extensive network of braided watercourses that leave and rejoin the River Thames. The braided nature of the watercourses means implementing flood risk measures to one watercourse would still leave assets at risk of flooding from another watercourse and could exacerbate flooding in other 'at risk' areas. For example, isolated measures at Botley could increase the risk of flooding downstream at Grandpont and New Hinksey.

The River Thames and its tributaries at Oxford have a large area of developed floodplain without flood defences. If nothing was done to manage flood risk over 4500 properties would be at risk in a flood with a 1 in 100 chance of occurring in any year (1% annual probability), rising to over 6000 should climate change happen as currently predicted. The key areas of the City of Oxford affected are New Botley, Osney, New Osney, Grandpont, North Hinksey and New Hinksey. There is also flood risk associated with outlying areas such as Wolvercote, South Hinksey and Kennington. Critical infrastructure is also at risk and traffic disruption is a significant problem during flood events, especially on two of the main arterial routes into the city centre and the railway line which forms a key part of the freight network. Oxford is an important employment centre, internationally renowned seat of learning and a popular tourist destination. Disruption to major infrastructure severely impacts Oxford's ability to function during flooding, with significant effects on the local economy.

The risk to properties is currently managed through the Oxford Multi-Agency Flood Plan. Responsibilities include:

- Maintenance of channels
- Operation of flow control structures
- Monitoring of river levels
- Weather warnings feed through to inform Incident Room
- Flood Warnings
- Deploying temporary defences where necessary/possible
- Emergency response

Even with this existing ongoing work over 1800 properties remain at risk in a flood that has a 1 in 100 chance of occurring in any year. This is forecast to rise to nearly 2700 with climate change by 2080

Oxford has experienced regular flooding over recent years including in 2000 (56 properties reported to the Environment Agency as having flooded internally), 2003 (123), 2007 (168), 2009, 2011, 2012 (14) and 2013/2014 (55) (Note - numbers of properties have been given where available). Schools and businesses are at risk. Critical infrastructure such as major arterial roads, the main railway line between Birmingham and London, an electrical substation and mains sewers are also at risk. The hydrological review undertaken as part of the Oxford hydraulic model update has highlighted that the frequency and intensity of flooding appears to have increased (the Initial Assessment notes that the 1 in 100 chance event in 2010 should

already be considered a 1 in 48 chance event) highlighting the need for intervention as a priority. Floods in the study area are lengthy and typically last between 7 and 9 days.

The presence of a gravel aquifer, and the high surface water and groundwater connectivity, leads to a risk of groundwater and sewer flooding, particularly in the areas of Osney, Grandpont and New Hinksey. The River Thames interacts with the gravel aquifer and peak levels on the Thames are thought to correlate with groundwater flooding levels. The main geological features in the Study Area are formed from alluvial silts (typically 1m depth) overlying river terrace gravels (3-6m thickness). Beneath these strata, Oxford Clay is present down to bedrock. The river gravels provide an effective flow path for groundwater which is at a level of 1-2m below ground. There is good hydraulic continuity between groundwater and surface water as many of the watercourses break through the alluvial material into the gravel beneath. Groundwater inflows are already included within the base hydraulic model, but this connectivity will be reviewed in further detail during the OBC stage.

4 The Strategic Case

4.1 Introduction

The Strategic Case of the SOC provides an overview of the Environment Agency and its partner organisations; their business strategies relevant to this project and the case for change in Oxford. The purpose is to explain and revisit how the scope of the proposed scheme fits within the existing business strategies of the partners' organisations and provides a compelling case for change, in terms of the existing and future operational needs of their organisations.

The Environment Agency is seeking approval of this SOC to further develop the Oxford Flood Alleviation Scheme proposals in an Outline Business Case. The current estimated whole life cash cost, including inflation over the 100 year appraisal period is £125.7million for construction and £307.6million for the future maintenance. This Scheme is a major construction project to reduce flood risks and deliver wider social, environmental and economic benefits for communities in and around Oxford.

Defra has specific policies on reducing the threats of flooding and adapting to climate change. How schemes contribute towards delivering these policies is measured using a series of Outcome Measures. Outcomes monitored include economic benefits delivered, properties moved into a lower flood risk category and water framework habitat improved.

4.2 Part A: The strategic context

Organisational overview

The Oxford Flood Alleviation Scheme is a partnership project being led by the Environment Agency on behalf of a Sponsoring Group representing the following organisations:

- The Environment Agency
- Oxfordshire County Council

- Oxford City Council
- Vale of White Horse District Council
- University of Oxford
- Oxfordshire Local Enterprise Partnership
- Oxford Flood Alliance
- Thames Regional Flood and Coastal Committee
- Thames Water

Environment Agency

The Environment Agency is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs (DEFRA), with responsibilities relating to the protection and enhancement of the environment in England. It has a strategic overview of all sources of flooding and coastal erosion and advises on the planning and management of flood risks. It is responsible for the delivery of Flood and Coastal Erosion Risk Management (FCERM) activities, and it works in partnership with the Met Office to provide flood forecasts, flood mapping and warnings. It manages central government grants for capital projects carried out by all risk management authorities. Its funding varies year-on-year, but is approximately £1 billion nationally.

In response to the Pitt Review into the 2007 floods published in 2008, the government enacted the *Flood and Water Management Act* in 2010. This legislation clarified responsibilities for tackling local sources of flood risk, and created a new role for 'lead local flood authorities' (LLFAs). The Act also required that the Environment Agency develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England as part of its strategic overview role, which it published in May 2011, and which is explained further below.

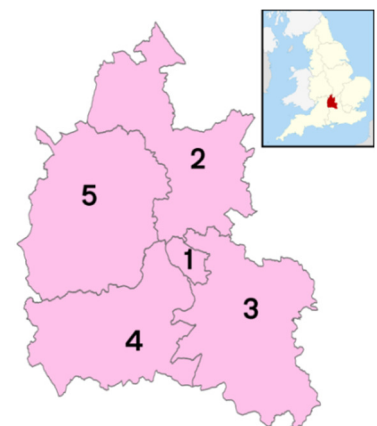
Oxfordshire County Council

Oxfordshire County Council is an elected body responsible for the most strategic local government services in the county. It provides a wide range of services, including education (schools, libraries and youth services), social services, highway maintenance, waste disposal, emergency planning, consumer protection and town and country planning for matters to do with minerals, waste, highways and education.^[3] This makes it one of the largest employers in Oxfordshire, with an annual budget of over £800 million. It is also designated Lead Local Flood Authority (LLFA) under the Floods and Water Management Act 2010. The council's key objectives and priorities for action are set out in their corporate plan / strategy, with these being summarised below;

- Create a world class economy for Oxfordshire.
- Have healthy and thriving communities.
- Look after our environment and respond to the threat of climate change.
- Reduce inequalities and break the cycle of deprivation.

District Councils

The county is divided into five local government districts shown on the map right: Oxford City (1), Cherwell (2), South Oxfordshire (3), Vale of White Horse (4) and West Oxfordshire (5), which deal with such matters as town and country planning, waste collection, and housing. The District Councils lead in reducing flood risks from development in the floodplain through the planning system and the management of drainage and small (ordinary) watercourses. The key objectives and priorities of each of these councils can be found in



their corporate plan and strategy.

University of Oxford

Oxford is a world-renowned collegiate university, consisting of the central University and colleges. The central University is composed of academic departments and research centres, administrative departments, libraries and museums. The 38 colleges are self-governing and financially independent institutions, which are related to the central University in a federal system. The University and colleges have a combined annual income of approximately £1.5 billion.

Oxfordshire Local Enterprise Partnership

The Oxfordshire Local Enterprise Partnership (OxLEP) was launched by the Business Minister, Mark Prisk MP, in March 2011. It is responsible for championing and developing the Oxfordshire economy, working with businesses, academia and the public sector and bringing disparate initiatives together. The OxLEP has received Growth Deal funding from the Government (the bid can be found in Appendix 7.2).

Oxford Flood Alliance

The Oxford Flood Alliance (OFA) is a voluntary community group set up after the severe floods of 2007. It suggests ways to reduce flood risk, based on local knowledge, and works as a 'critical friend' of the Environment Agency and other flood risk authorities. It receives support from fellow residents and elected representatives including MPs, Andrew Smith, of Oxford East and Nicola Blackwood, of Oxford West and Abingdon.

Thames Regional Flood and Coastal Committee

The Regional Flood and Coastal Committee (RFCC) is a committee established by the Environment Agency under the *Flood and Water Management Act 2010* that brings together members appointed by Lead Local Flood Authorities (LLFAs) and independent members with relevant experience to ensure there are coherent plans for managing flood risks across catchments, and to encourage efficient, targeted and risk-based investment that represents value for money and benefits local communities. It has a key role in balancing local priorities and in promoting the consideration of climate change impacts in local decision making. It provides a forum for raising and allocating Local Levy funding and sharing good practice.

Thames Water

Thames Water Utilities Ltd, known as Thames Water, is the private utility company responsible for the public water supply and waste water treatment in large parts of Greater London, the Thames Valley, Surrey, Gloucestershire, Wiltshire, Kent, and some other areas of the United Kingdom. Thames Water is the UK's largest water and wastewater services company, with 15 million customers. It is regulated under the Water Industry Act 1991. The name of the company reflects its role providing water to the drainage basin of the River Thames and not the source of its water, which is taken from a range of rivers and boreholes. Full details of their key aims and objectives can be found in their corporate plan. Aside from Oxford they aim to improve the sewer system, reducing the risk for 2,127 properties during the AMP6 period, and are planning major sewer flood relief work in west London; 14 investigations aimed at preventing rain infiltrating our sewers; and doing more to prevent blockages.

Business policies and strategies

DEFRA Policy

The Environment Agency and its partners work to high level policies set by DEFRA that are of relevance to this scheme:

- Reducing the Threats of Flooding and Coastal Change
- Adapting to Climate Change

- Protecting and improving people's enjoyment of the countryside
- Managing Freshwater Fisheries
- Improving Water Quality
- Maintaining secure water supplies, high standards of drinking water and effective sewerage services

These have all been recently updated during 2014 to incorporate all relevant legislation and best practice. They are integral to the scheme's objectives and the Environment Agency's Corporate Plan as set out below.

Environment Agency Corporate Plan

The Environment Agency's corporate plan (2014-16) is structured around 3 main business areas: flood and coastal risk management; water, land and biodiversity; and regulated business. Its work is based on the following priority areas;

- a changing climate
- increasing the resilience of people, property and businesses to the risks of flooding and coastal erosion
- protecting and improving water, land and biodiversity
- improving the way we work as a regulator to protect people and the environment and support sustainable growth
- working together and with others to create better places
- ensuring that we are fit for the future

National Flood and Coastal Erosion Risk Management (FCERM) Strategy

The National FCERM Strategy, dated September 2011, sets out a national framework for managing the risk of flooding. It helps organisations and communities to understand their different roles and responsibilities and is particularly relevant to Lead Local Flood Authorities (LLFAs) and Regional Flood and Coastal Committees (RFCCs), which have new duties under the Act. It promotes local decision-making and engagement, and encourages beneficiaries to invest in flood risk management.

Thames Catchment Flood Management Plan (CFMP)

The Thames CFMP published in 2009, established strategic flood risk management policies to deliver sustainable flood risk management in the non-tidal Thames catchment in the short and long term. The Environment Agency uses CFMPs to help target limited resources where the risks are greatest and where there can be the most impact in terms of reduction in flood risk.

The Thames CFMP covers Oxford, under sub-area 8 – “Heavily Populated Floodplain”, Policy Option 5: “*Areas of moderate to high flood risk where we can generally take further action to reduce flood risk*”. One of the proposed actions relevant to Oxford from Thames CFMP Policy Option 5 states that “*We will deliver the actions recommended in Flood Risk Management Strategy for Oxford once approved*”

The policy actions given in the Thames CFMP relevant to the scheme are:

- a) *Making space for water (Action UT1) through various interventions of different scales including engineered flood storage*
- b) *Conveyance in urban locations (Action UT6).*

Flood Risk Management Plans (FRMPs)

FRMPs are a requirement of the *Flood Risk Regulations (2009)* and cover flooding from rivers, the sea, surface water, groundwater and reservoirs. They focus on the reduction of potential adverse consequences

of flooding for human health, the environment, cultural heritage and economic activity. FRMPs are also required to look at reducing the likelihood of flooding through, for example, structural initiatives.

In developing FRMPs, the organisations involved must also take account of the European Commission's *Water Framework Directive*, 2000. This is to ensure that, in managing the risk of flooding, water resources and aquatic ecosystems are also managed sustainably, and wider environmental and social benefits are delivered to local communities.

The Oxford Flood Risk Management Strategy

The Oxford Flood Risk Management Strategy (hereafter called 'The Strategy') was approved in September 2010, following a public consultation. It sets out the preferred approach for managing the risk of flooding in Oxford and surrounding area.

The Strategy considered flood risk over 100 years, with capital work phased in response to climate change. The proposed Oxford Flood Alleviation Scheme is part of the longer-term strategy and following its implementation, though flood risk will be significantly reduced, the increasing flows that climate change is predicted to bring about mean that the risk is likely to return to similar levels towards the end of the appraisal period. Therefore there will be a future decision point at which further investment may be required.

The preferred option from the Strategy in the short-term was to continue the existing maintenance and operation of the Thames, its tributaries and all associated structures, as well as implementing a series of localised additional measures to allow flood flows to move more easily around Oxford. Other larger options were also identified, including the creation of a new channel, and these had the potential to significantly improve the flooding situation to many more properties. However, at the time these were not financially viable (whilst they had a good benefit:cost ratio, the incremental benefit:cost ratio whereby the value of additional costs against additional benefits are measured was significantly less than unity making additional investment uneconomic at the time). These larger options could not be economically justified at the time, but the Strategy findings showed that the effects of climate change (and associated increase in flood frequency) could change this in the medium-term. The Strategy recommended regular reviews of the larger options.

The Environment Agency has completed the first phases of this strategy with local improvements. £2.5 million has been spent on dredging channels, increasing the capacity of structures to convey flood water and providing temporary defences. This work helped to protect up to 150 properties in the recent floods.

Updated flood modelling completed in January 2014, and increased local interest to find solutions, following flooding experienced in 2013 and 2014, prompted us to begin a more formal review of the strategy recommendations in March 2014. This review included further community based local measures proposed by the Oxford Flood Alliance.

The costs were revised, and the flood risk benefits (damages avoided) were updated using new flood mapping and the latest guidance on climate change impacts, in order to further understand the case for a potential investment. Toward the end of 2013, it became clear that the case was now stronger for implementing the larger options from the strategy. (This has been explored further in Appendix 5.1).

Oxfordshire Local Flood Risk Management Strategy

Lead Local Flood Authorities (LLFAs) are required in the Floods and Water Management Act to produce a Local Flood Risk Management Strategy. These consider an assessment of local flood risk, from surface water

and groundwater; set out objectives for managing local flooding; list the costs and benefits of measures proposed to meet these objectives; and outline how the measures will be paid for.

Oxfordshire County Council as LLFA has the responsibility to produce a local Flood Risk Management Strategy (FRMS) for Oxfordshire. This is now complete and the draft has been consulted on. The FRMS supports the Oxford (and Abingdon) proposals.

Other key organisational drivers

Flood and Coastal Risk Management Grant-in-aid (FCRMGIA)

Defra sets high level strategic outcome measures for reducing flood risks and provides FCERM GIA funding to risk management authorities to deliver schemes to meet (and exceed) these targets. It also sets out guidance on the appraisal and prioritisation of capital schemes to reduce flood risk (the FCERM Appraisal Guidance), to ensure that limited resources are targeted most effectively.

The Investment Programme (6 year Capital FCERM GIA Settlement)

The Investment Programme (6 year Capital FCERM GIA Settlement) has just been agreed with Defra.

Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services

This biodiversity strategy published by DEFRA in 2011 builds on the *Natural Environment White Paper* and sets out the government's ambition to halt overall loss of England's biodiversity by 2020, support healthy well functioning ecosystems and establish coherent ecological networks, with more and better places for the benefit of wildlife and people.

UK Climate Projections 2009 (UKP09)

UKP09 are intended to give government and other organisations evidence to help them take informed, cost effective and timely decisions to prepare for the changing climate. Research suggests that wet and mild winters like the extremely wet weather we experienced over the winter of 2013/14 could become more common. In response to this, the Environment Agency appraises its projects in accordance with its latest guidance entitled "Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities".

Thames River Basin Management Plan (RBMP)

This plan has been prepared under the EU's Water Framework Directive, 2000, which requires all countries throughout the European Union to manage the water environment to consistent standards. Each country has to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
- Meet the requirements of Water Framework Directive Protected Areas
- Promote sustainable use of water as a natural resource;
- Conserve habitats and species that depend directly on water;
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants;
- Contribute to mitigating the effects of floods and droughts.

Part B: The case for change

Investment objectives

The investment objectives for this project have been developed in consultation with our partners, and agreed at a stakeholder workshop, the outputs of which have been approved by the Sponsoring Group. The objectives are to be delivered by 2021, unless otherwise stated and are as follows:

- Reduce flood damages to at least 1000 homes and businesses currently at risk in Oxford;
- Reduce flood impacts on transport infrastructure and utilities in Oxford, particularly to Botley and Abingdon Roads, the railway line and the sewerage system;
- Safeguard Oxford's reputation as a thriving centre of commerce that is open for business;
- Create and maintain new recreational amenities, wildlife habitat and naturalised watercourses accessible from the centre of Oxford.

When sufficient information becomes available following the optioneering process being carried out as part of the detailed appraisal, there will be a further workshop with stakeholders to turn these into true SMART objectives to finalise the preferred option in the OBC.

Business needs

The flooding in Oxfordshire in 2013/2014 saw 48 flood warnings issued; 168 properties flooded; 32 people evacuated; 45 roads closed; the main north/south rail line from London closed; 80 elderly and vulnerable clients provided with emergency transport; one rest centre opened; one school closed and; and 500 bridges in need of inspection following the event. Mains sewers were affected so residents could not flush their toilets. The full cost of the 2013/14 flooding in Oxford is still being calculated by the Environment Agency in collaboration with LLFAs and is expected shortly.

The Oxfordshire Local Enterprise Partnership's successful Growth Deal bid highlights that businesses on the Botley Road reported significant revenue losses as a result of being closed due to the floods.

Looking ahead, current projections (and the most recently developed flood model) indicate that these types of flood events are likely to become more frequent as the effects of climate change cause more frequent and severe storms. To offer an insight into what Oxford might be like in just a few decades if the status quo is maintained:

- The growth of Oxford's economy is likely to be constrained over the coming decades by increasingly frequent and damaging flood events, which prevent access into the city by road and rail, and cause a significant amount of damage year-on-year.
- Businesses looking to move into the area are being put off Oxford by these events, and existing businesses already in the area will look to move away.
- Currently occupied parts of the city will lose their value and become less sustainable, eventually causing significant residential areas to require redevelopment or relocation.
- Increasingly frequent flooding of Oxford's public open spaces will impact on protected habitats and recreational space.
- Increasingly frequent flooding of roads, sewers and industrial areas cause pollution of the watercourses, with a knock-on effect on our fish stocks and biodiversity, not just in Oxford, but in the catchment as a whole.

- Increasingly frequent flooding of historic areas and archaeology causes significant damage, and degradation of the unique heritage assets for which Oxford is world-renowned.

The area suffers from low in-channel flows under normal weather conditions. This causes problems for aquatic species and any scheme will need to ensure this situation is not worsened and ideally improved.

Initial findings from the British Geological Society/Environment Agency groundwater flood assessment has identified that between 80 and 330 properties are potentially at risk from groundwater flooding (at ground level) as well as fluvial flooding. These are mainly located in the Grandpont area of Oxford. There is also potential for groundwater flooding of basements and this occurred during the 2003 and 2007 flood events.

Oxford has a wealth of history and is renowned worldwide for its cultural heritage characterised by the historic colleges, punting on the Thames and views of the dreaming spires from Boars Hill. Tourism is an important industry all year round, and visitors are attracted from all over the world. Although flooding only directly affects a small number of the historical college buildings, they are all affected by the transport problems and perception of flooding. Many of the benefits (tourism, business, learning and research) that these internationally recognised institutions deliver to the local and national economy are more difficult to quantify in monetary terms.

Potential business scope and key service requirements

Improved flood flow capacity

On the basis of this analysis, and as reinforced by the Oxford Flood Risk Management Strategy, it is considered that the potential scope for the scheme is to improve flood flow capacity through the floodplain, allowing water to pass through and around Oxford more efficiently.

Increased capacity would allow flows to be more evenly distributed along this section of the Thames, thereby slightly reducing the flooded extent (and keeping flooding away from populated and vulnerable areas) compared to the existing situation. It would still allow the floodplain to perform its natural function, in that it would still flood. Detailed flood modelling, building on work done to-date, will be required to confirm the final details.

Materials management

In order to increase capacity, removal of material will be necessary in some shape or form. Initial calculations indicate c1million m³ of material will need excavating for the medium size channel. Some of the existing structures will probably need to be replaced to deliver the increased capacity. Initial studies indicate that the most constrained area of the floodplain is at Redbridge (approx. 5km south of Oxford City Centre, where there is a natural pinch-point in the system that has been exacerbated with the construction of roads and railway, and historic gravel pits that have been land-filled. Engineering and landscaping expertise is critical to developing a feasible scheme.

As materials management is a key risk to the scheme, accounting for approximately a third of overall costs, means of reducing this will be thoroughly investigated by the appraisal consultant during the Outline Business Case stage. Identifying means of managing and reducing the cost related to the disposal of excavated material will also be the primary focus of the ESE (early supplier engagement) contractor, who is being appointed to provide specialist input to the appraisal. Their activities will include, for example reviewing the findings of ground investigation works and identifying where material could be used more efficiently, feeding into decision made throughout the optioneering and design process. As the ESE contractor is yet to be appointed the exact details of how this will be achieved have yet to be determined.

Options will also require input from local planning authorities and these discussions are already underway via the planning sub-group.

The appraisal consultant will work with the ESE Contractor to develop outline designs that minimise the amount of materials taken from, or brought to site. They will also liaise with the Employer's Partnerships and Strategic Overview team and have discussions with relevant local authorities, landowners and commercial operators to produce a scoping study, building on work undertaken previously in the Strategy, to identify sites where materials may be disposed of, reused in landscaping or other environmental works (if suitable), or exploited as a mineral resource. The appraisal consultant will also identify and investigate all potential partnership opportunities and innovative remediation techniques to minimise costs and risks associated with land and existing landfill management and shall prepare an outline Materials Management Plan in accordance with the Contaminated Land: Applications In Real Environments (CL:AIRE) Code of Practice to document plans for reuse of material within the Oxford Flood Alleviation Scheme, including landform plans and cost estimates. They will also liaise closely with the Employer's Estates lead, to ensure land valuation and considerations associated with land-owners' access to their resources (such as gravels) are accurately addressed.

Improved habitat creation and public amenity

The scheme will require landscape-scale intervention which, in turn, opens the scope up to creating water-dependent wildlife habitat and new recreational opportunities, such as improved access. To achieve a multi-functional scheme that maximises these opportunities, the team will need input from environmental design specialists and landscape architects.

Standard of protection

The standard of flood protection afforded by different options to improve flood flow capacity varies significantly, both in terms of the severity of flood event that can be protected against, and the duration of benefits when taking climate change effects on flows into account. Several scoping aspects have been considered:

- the flow rate through the floodplain system to which the option can be effective in preventing flood damages.
- the duration of benefits, given the increase in flows over time due to climate change;
- the extent of the area that can be afforded protection;

Early works

Network Rail are planning to carry out works in the study area with a proposed closure of the main railway line in mid 2016 to locally raise the tracks as part of their electrification programme. The Oxford Flood Alleviation Scheme may be further constrained by these works, which may alter the flow dynamics in the floodplain. Network Rail's works will need Flood Defence Consent and they are fully engaged with the Environment Agency, whilst at a project level regular meetings are being held to see how both projects can take advantage of this closure. The Sponsoring Group has confirmed that the project investigate options to work with Network Rail on securing a route for the flood alleviation scheme, which has the potential to reduce both disruption to the railway and the costs of the scheme.

The appraisal and design of a structural measure (new culverts or similar) is required to improve flood flow capacity under the railway line. Taking the opportunity to align our two projects could potentially offer significant project savings (on track closure for example) as well as causing less disruption to rail users, but also presents its own risks and constraints.

Main benefits criteria

At this initial stage, the following high-level strategic and operational benefits have been identified. These are shown in Table 4A. Primarily, these have been developed with partners to satisfy the scope for third party investment and demonstrate the potential for the scheme to deliver wider community benefits other than just reducing flood risk.

In developing the OBC, more detailed monitoring metrics and timescales for reviewing benefits will be further refined. Realisation of benefits will form a core part of partner engagement, particularly with the Local Enterprise Partnership, local councils, and environmental organisations.

Table 4A: investment objectives and benefits criteria

Investment objectives	Main benefits criteria by stakeholder group
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<p>Objective 1: Reduce flood damages to at least 1000 homes and businesses currently at risk in Oxford;</p>	<p>Residents: Reduction of financial and health costs associated with flooding, also reduced insurance premiums and excesses as well as access to insurance;</p> <p>Land and Property Owners: Reduced blight/increased property and land values;</p> <p>Business Owners: Reduction of flood costs, increased productivity and resilience, reduced insurance premiums, excesses and improved access to insurance; reduced reserve funding required; Reduced losses in man days</p> <p>Council Service Providers: Reduced pressure on services during flooding.</p> <p>NHS: Reduced health costs</p> <p>Local Councils: Avoid future cost of re- developing areas that are written off in the future; Reduced vulnerability classifications of some existing developed areas improves regeneration potential; improved public opinion;</p> <p>Emergency Services: Reduced pressure on services e.g. evacuation costs</p> <p>Environment Agency: Reduced dependency on demountable defences; Reduced incident management costs</p>
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<p>Objective 2:</p> <p>Reduce flood risk to infrastructure and utilities in Oxford</p>	<p>Residents: Reduced disruption and cost; improved provision of services;</p> <p>Businesses: Reduced loss from customers not being able to access the business; deliveries able to be made; increased productivity; fewer man days lost; improved provision of services;</p> <p>Emergency Services: Can function properly, reduced cost of providing emergency transport to vulnerable residents</p> <p>Network Rail and Rail Operators: Reduced impact due to line closures, reduced cost of repairs/maintenance</p> <p>Other public transport operators: Reduced impact on public transport routes in and out of the city; improved reliability;</p> <p>Highways Authority: Reduced cost of repairs/ maintenance</p> <p>Schools, Colleges and Universities: Reduced reputational damage; ability of students/pupils and teachers to get between sites and between campus and the city; able to receive food deliveries.</p> <p>Hospitals/NHS Trust: Reduced disruption and reputational damage for national and international patient services;</p> <p>Scottish and Southern Electric: Reduced impact on electrical sub-stations;</p> <p>Thames Water: Potential savings on upgrading the sewerage system; improved reputation locally; reduced restrictions on toilet use; reduced need for tankering and pumping;</p> <p>Other Utilities: Potential savings for telecommunications companies and other services</p> <p>Local Councils: Reduction of costs of clean-up following flooding; reduced reserve funds can be re-allocated; improved air quality due to reduction in stationary traffic caused by flooded roads;</p> <p>Commuters: Loss of earnings and productivity from not being able to use local or long-distance train routes;</p>
<p>Objective 3:</p> <p>Safeguard Oxford's reputation as a thriving centre of commerce that is open for business;</p>	<p>Businesses: Reduced loss from customers' perception that the city is inaccessible; Encourage inward investment into Oxford;</p> <p>Visitors: Reduces disruption and cancellation of plans by tourists/ visitors to Oxford;</p> <p>Local Councils: Increased tax revenue from more businesses moving into the area; helps fund future expansion of the city;</p>

<p>Objective 4: Create and maintain new recreational amenities, wildlife habitat and naturalised watercourses accessible from the centre of Oxford.</p>	<p>Residents: improved air quality, improved water quality; additional fishing, sport and recreational opportunities; potential screening of pylons; city is a more appealing place to live; increased security by designing out crime; increased property prices.</p> <p>Property/Land Owners: Potential to rationalise maintenance and management arrangements particularly for riparian owners;</p> <p>Businesses: Increased number and variety of visitors/tourism; opportunities for new social enterprise;</p> <p>Anglers: Improved fish stocks</p> <p>Local Councils: Helps meet strategic targets for creation of green space, potential to increase uptake of walking/cycling to help meet reduction in emissions targets; possible help towards cost of remediating contaminated land; reduction in anti-social behaviour;</p> <p>Visit Oxford: Increased number and variety of visitors/tourism;</p> <p>Schools/Colleges/Universities: Learning opportunities to support studies regarding ecosystems and soft engineering techniques;</p> <p>Environment Agency: Helps meet targets for WFD, habitat creation, potential to halt/slow progress of invasive species, potential to improve fish passage through this section of the Thames, improved support for the scheme, securing of environmental consents.</p> <p>Natural England: Potential benefit of improved watercourses and access between two nationally important environmental sites.</p> <p>NHS: Improved health and well-being of residents reduce cost of services</p> <p>Wildlife: Better and more varied habitats</p> <p>Redbridge/Seacourt Park and Ride: Increased use of parking facilities to access new recreational amenities</p>
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Dis-benefits of delivering the Oxford Flood Alleviation Scheme

- Disruption caused by construction, such as traffic movements;
- Altering some historic open spaces and flood meadows;
- Permanent loss of archaeology;
- Spending on the scheme cannot be used for other services;
- Loss of some land given over to increasing flow capacity;
- Property prices increase – people can't afford to live in Oxford – leads to increased commuting into the city;
- Those not benefitting from reduced flood risk may feel alienated;
- Reduced frequency of floodplain inundation (tbc) undermines conditions for protected species;
- Potential to worsen low-flow conditions

Main risks

The main business and service risks associated with the potential scope for this project are shown below, together with their counter measures.

At present, these risks are allowed for in the overall approval value being sought though the use of optimism bias, which is set at 38%. Optimism bias is an appropriate approach to costing risk at this stage, but has been set lower than the usual 60% at appraisal stage following a review by the project team as there is already a lot of information available from earlier work on the Oxford Strategy and our wider work across Oxford that helps reduce uncertainty. A key consideration in this is that the base cost figure in the economic and financial cases assumes all excavated material is disposed off-site to tip. This is a very conservative assumption as materials are expected to be re-used or in the case of sands and gravels have a commercial value.

Table 4B: risks and counter measures

Business risks:	
Main Risk	Mitigation
Funding shortfall – Inability to secure the remaining necessary funding from partner’s leads to abortive development work and/or expectation that central government will meet the shortfall.	The development costs of the project are being funded by local partners, who are fully aware that the scheme will not proceed without significant further contributions being found. A sub-group of the Sponsoring Group has been set up to develop the Funding Strategy. = Share (funding strategy is being developed by a funding group led by the Environment Agency, Oxfordshire County Council and Oxfordshire LEP).
Reputational damage – Failure to engage and/or meet the demands of stakeholders leads to bad publicity for the organisations promoting the project and undermines public confidence in our capabilities. There is a particular risk regarding any perceived downstream impacts of the scheme.	Downstream communities have already expressed their concerns. Environment Agency staff are fully briefed about the scheme and ensure that these messages are provided at public events such as Flood fairs, local flood groups and community action groups. We have also arranged initial meetings with local councillors and ensure that MPs are kept briefed. Briefings on the scheme are shared with staff across the Area and with partners to enable messages to be up to date and consistent. Once the SOC has been approved we will undertake public surgeries within these communities to explain the next stage of the project and answer any questions local residents may have. = Reduce

<p>Ineffective partnership working - Partner organisations may also have a regulatory role (e.g. planning authorities) that leads to changes to the design scope and increases in cost.</p>	<p>Our Council partners have been consulted during the development of the appraisal and design scope. Memorandums of Understanding and Collaborative Agreements have been developed to capture the joint working ethos. = Reduce</p>
<p>Service risks (design):</p>	
<p>Risk</p>	<p>Mitigation</p>
<p>Data – Existing data is being supplied and quality and any gaps require confirmation, to reduce delay.</p>	<p>Suppliers will be instructed to identify information gaps at an early stage to make early data requests and present options, should data be unavailable or of poor quality. A list of data sources has been compiled with a quality assessment for each source = Reduce</p>
<p>Land Issues – Disputes with landowners in securing the land and/or agreements to carry out the works and later maintenance cause delays and compensation costs. Ancient grazing rights are also a potential issue to be negotiated in the study area.</p>	<p>Early engagement with landowners is being led by the EA’s Estates officer, to ensure their concerns are taken account of early in the design process. = Reduce</p>
<p>Materials Management - The volume of material required to be taken off site cannot be transported in a sustainable and socially acceptable way. This could also be an opportunity to incorporate innovative landform design.</p>	<p>Consultant design to include sale and re-use of materials on site. This is specifically included in the appraisal scope and Project Proposal Questionnaire. Risk strategy = Transfer</p>
<p>Multi-functional amenity – There is an opportunity for the scheme to deliver wider benefits than just reducing flood risk, over and above those identified in the objectives.</p>	<p>Demonstrating an integrated approach to engineering, materials management, landscape and environmental issues within the project appraisal, will be an important criterion in evaluating the bids at all stages of the project. = Exploit</p>
<p>Groundwater - The preferred option could affect groundwater levels that are important for the ecological balance of Port Meadow SAC and Iffley Meadows SSSI. Some areas are affected by groundwater flooding as well as fluvial and this may undermine the benefits of reduced fluvial flood risk.</p>	<p>The project team have discussed the groundwater issues with the internal Groundwater team and Thames Water, and are getting their input to the scope, to ensure suitable groundwater modelling is done by the consultant. Risk strategy: = Transfer</p>

Sewer System - There is an opportunity to work with Thames Water to improving the situation for their sewer system, and the level to which groundwater issues need to be addressed through the project will depend partly on the partnership relations with them	Thames Water is on the Sponsoring Group. Risk Strategy = Enhance
Feasibility – The complex constraints in the study area mean that there is no feasible and economically viable route for improved flood flow capacity.	The ‘Redbridge Conveyance Briefing Note’ was produced with the Oxford FRM Strategy and proposed 3 viable routes for the FAS. Risk Strategy = Avoid
Early works with Network Rail – opportunity to make cost savings on the project by avoiding separate track closure, carrying out works to structures under the railway line at the same time as Network Rail do their track improvements. This would impose further risks that in fast-tracking this element of the appraisal, key environmental, landowner and other constraints are not taken into account. There is also a risk of abortive appraisal work,	Network Rail's contractor is providing feasibility information to help with decision making. = Enhance Strategy = Accept
Service risks (build):	
Risk	Mitigation
Landfill – It is likely that disused landfill sites to the north and south of Old Abingdon Road will need to be excavated. Excavating the pits may delay the project and make it unaffordable due to containment and/or disposal of potentially hazardous waste	Borehole surveys have already been carried out in known landfill areas. The scope for appraisal includes further Ground Investigation works as the design progresses. Risk strategy: = Reduce
Flood risk – could impact on the programme for construction, and earlier during Ground Investigation and survey work.	The team will consider appropriate methods for mitigating flood risk in the formulation of the programme for site survey and construction work. This will be a shared risk, with the advice of the CDM-C integral to decision-making. = Share
Archaeological risk – It is possible that sites of archaeological significance will be encountered and consent may be needed in order to carry out works (e.g. the Old Abingdon Road)	Early engagement with English Heritage has already undertaken in order to discuss the permissions required.
Service risks (operation):	

Risk	Mitigation
Improved flow capacity around Oxford and operation of new structures worsens the flood risk of properties downstream of the scheme	Detailed hydraulic modelling will be carried out by the consultant.

Dependencies and constraints

The project is subject to the following constraints and dependencies that will be carefully monitored and managed throughout the lifespan of the scheme:

Demonstrating economic and financial viability

The option selected must be economically viable, and must demonstrate an incremental benefit/cost ratio robustly greater than 1, when compared against the other options, in line with FCERM appraisal guidance on the 'decision-rule'. This is explored in more detail in the Economic Case

Full funding must be secured and committed for the delivery of the scheme before the submission of a Full Business Case can be approved. Oxfordshire County Council is leading on the development of the funding strategy. Further detail is given in the Financial Case.

Programme dependencies

Developed areas downstream of the scheme are also subject to flooding. This is being investigated, in part, through another project: the Abingdon Flood Alleviation Schemes. Any increase in flood peak downstream must be minimised to ensure the level of risk to homes and businesses downstream is not increased. The project at Abingdon is developing hydraulic modelling for the Thames between Sandford Lock and Mapledurham. This will be used in the Oxford appraisal to assess downstream effects.

In accordance with the agreed low flow protocol in Oxford, navigation and fish passes take priority in regards to flow. These and the abstraction licences along these reaches will need reviewing as part of the operational arrangement for the new channel.

Environmental conditions and designations

The study area has been subject to extensive gravel extraction over time. The resultant gravel pits have either filled with water to become lakes, or been restored as landfill. As a result, extensive areas of landfill are present in the study area. Any material excavated in these areas is likely to be contaminated and will need to be appropriately disposed of.

Two nationally/internationally designated environmental sites are present in the study area: Port Meadow Special Area of Conservation (SAC) (which as a Natural 2000 site and falls under the remit of the EU Habitats Directive); and Iffley Meadows Site of Special Scientific Interest (SSSI). These sites could be particularly sensitive to changes in groundwater levels or duration of flooding. Any works or impacts to these sites will require consent from the local planning authority who will take advice from Natural England. It should be noted that whilst within the wider study area Port Meadow SAC is some distance upstream of any proposed physical work so the risk is low, but Iffley Meadows SSSI is immediately adjacent to an area of proposed works so this will require careful consideration.

The study area contains an ancient Norman causeway at Old Abingdon Road, a Scheduled Ancient Monument (SAM). This structure acts as a key constraint on flow capacity through the flood plain. Consent must be gained from English Heritage for any works required to the SAM. There are also thought to be

extensive areas of buried archaeology in the area, particularly within the Thames gravels. Any excavation will need to be designed to minimise the damage to the archaeological deposits.

The small streams in the floodplain to the west of Oxford suffer from low-flows during dry weather. This leads to poor conditions for a range of aquatic species. The scheme in increasing flood flow capacity must not worsen the low-flow situation. In particular, any changes to the agreed 'Oxford Watercourses Low Flow Procedures, 2006' must be agreed in advance.

The River Thames corridor is an important feature in the landscape, and a focal point for recreation activities, including walking, cycling, boating and angling. There are also a 'protected views' of Oxford across the western floodplain that must be considered and designed into the preferred option.

The River Thames through Oxford is currently classified as having Moderate Ecological Status. As an option to improve flow capacity, dredging may be considered locally in some locations subject to understanding the full benefits and environmental and reputational risks.

Built constraints

The central portion of the western floodplain contains a very constrained and complex area of development including the Redbridge Park and Ride. There is also main road and rail infrastructure, and locally prized open spaces to be taken in to consideration in selecting a feasible option for the flood alleviation scheme. Any works required to increase capacity of structures under the railway line require consent from Network Rail to temporarily close the line, and must meet their technical standards for approval. Any works to the A34 require consent from the Highways Agency. Works to other roads (e.g. A423, A4074) require consent from the Oxfordshire Highways Authority.

The main arterial road into Oxford from the west, Botley Road, bridges the floodplain network of streams in several locations. It is likely that replacement of the bridges will not be viable economically, so the scheme must aim to work with these existing constraints.

The Scheme must secure local support and planning consent through appropriate communications and public liaison. It must also secure the necessary land acquisitions or agreement to utilise/maintain the land after implementation.

These constraints and dependencies will be carefully monitored and managed throughout the project lifecycle.

5 The Economic Case

5.1 Introduction

In accordance with the Capital Investment Manual and requirements of HM Treasury’s Green Book (A Guide to Investment Appraisal in the Public Sector), this section of the SOC documents the wide range of options that have been considered in response to the potential scope identified within the strategic case.

5.2 Critical success factors (CSFs)

The key CSFs for the Oxford Flood Alleviation Scheme have been agreed by the project partners through a series of workshop sessions and are displayed in the table below.

Critical Success Factors	Description
Strategic fit & business needs	<p>How well the option:</p> <ul style="list-style-type: none"> • Meets our partners strategic objectives; • Continues to deliver benefits over the next 100 years, allowing for climate change; • Is compatible with future schemes to adapt to climate change; • Demonstrates that it does not worsen flood risk downstream or elsewhere; • Helps to meet Water Framework Directive targets; • Delivers wider benefits to the local economy.
Potential value for money (VFM)	<p>How well the option:</p> <ul style="list-style-type: none"> • Achieves a viable cost benefit ratio and incremental benefit cost ratio, when compared with the other available options; • Deliveries efficiencies; • Minimizes future maintenance requirements where appropriate
Potential achievability	<p>How well the option:</p> <ul style="list-style-type: none"> • Fits with the study area’s constraints; • Mitigates for adverse effects on water levels and flows elsewhere; • Meets and exceeds requirements under the relevant legislation to secure necessary consents; • Generates and maintains political and stakeholder support even during low flow situations; • Follows a clear, timely and deliverable approval route; • Is integrated with related schemes in the area.
Supply-side capacity and capability	<p>How well the option:</p> <ul style="list-style-type: none"> • A clear delivery model is agreed; • Allows for the establishment of an integrated project team in accordance with the stage of the project; • Future maintenance and management is agreed and clearly understood.

Critical Success Factors	Description
Potential affordability	<p>How well the option:</p> <ul style="list-style-type: none"> • Delivers 'Outcome Measures' according to Defra's Partnership Funding rules; • Employs a joined-up funding strategy; • Designs in benefits to potential funding partners.

Table 5A: critical success factors

These CSFs have been used alongside the investment objectives for the project (detailed in table 402), to evaluate the long list of possible options. These CSF's need to be met for the scheme to succeed and deliver the projects objectives and benefits.

5.3 The long-listed options

The Oxford Flood Risk Management Strategy (hereafter called the Strategy) examined a long list of over 100 options, identified through consultation with internal specialists, consultants, flood action groups and local residents. The suggestions ranged from non-structural measures e.g. flood warning, to full engineering interventions such as raised flood defences. A Strategic Environmental Assessment (SEA) was also carried out at this time to feed into the options analysis.

This scheme and Strategic Outline Case specifically focuses on options to increase flow capacity, but it is acknowledged that some of the alternative approaches below, though ruled out as stand-alone options, may be needed to a lesser extent or at a later date to supplement this approach to deliver all the objectives set out above:

The options reviewed in the Strategy can be categorised into high level option types, as follows:

Option	Consideration	Taken Forward as a stand-alone option	Taken Forward in-combination with other options
Widening of the Thames	The River Thames would need to be widened significantly, e.g. to an estimated 40m at Botley Rd (currently 18m). Widening would require the purchase of approximately 80 properties. A widened Thames channel is unlikely to gain planning permission due to impact on landscape and amenity value.	✘	✘
Western floodplain (increasing flow capacity)	Maximising flows through the existing floodplain to the west of Oxford by widening existing sections of channel and interconnecting these with new sections of river channel. Some major constrictions to flow exist although technical solutions can be implemented to overcome these. Lowering surface water levels would lower groundwater levels reducing the risk of groundwater flooding.	✓	✓

Option	Consideration	Taken Forward as a stand-alone option	Taken Forward in-combination with other options
Raised flood defences	Widespread use as a stand-alone solution is not appropriate due to the high level of surface water–groundwater connectivity, leading to a high risk of flooding behind defences. The complex river system would require long lengths of defence (at high cost) to eliminate flooding from several rivers which dissect the key benefit areas of Botley, Osney, Grandpont and New Hinksey (see Key Plan 2.2).	x	✓
Water transfer	The large size of the catchment would lead to increased flood risk in the neighbouring catchment if flood water was transferred. Size and length of pipeline required would be cost prohibitive. Not environmentally acceptable and high uncertainty in achieving implementation.	x	x
Upstream Storage	Potential to significantly reduce flood risk if a large enough storage area can be identified in close enough proximity to Oxford.	x	✓
Flood proofing	Measures would not reduce the probability of flooding or disruption to transport infrastructure which seriously impacts Oxford. Resilience measures provide partial reduction in damage to properties as they normally require remodelling of residential houses (e.g. moving kitchens upstairs, raising electrics etc). Risk of groundwater flooding could make resistance measures technically non-viable unless fluvial levels can be lowered initially.	x	✓
Non-structural measures	Making improvements to non-structural measures (e.g. pre-planning, flood warning, development control) will not reduce the probability of flooding and is unlikely to significantly reduce the consequences without implementing structural measures initially.	x	✓

Table 5B: Flood risk management measures considered during the Strategy

Though not examined in the Strategy, a further long-term option might be to redevelop the most ‘at risk’ areas. This may also eventually be required depending on the severity of climate change effects, and could be delivered through the planning system over the next 100 years.

This initial option selection process confirmed that in order to significantly reduce flood risk in Oxford, structural measures would be required. Of the four main engineering interventions (increased flow capacity, defences, transfer and storage); defences and transfer were discounted on technical grounds. The other options; substantially increasing flow capacity and upstream storage were taken forward for further analysis.

Investigations into stand alone upstream storage areas showed that the volume required to reduce flood risk in Oxford was substantial (estimated in the order of 50million cubic metres - the equivalent of more than 5 Farmoor Reservoirs), due to the large volumes generated by the Thames catchment. None of the options identified could physically store this volume so it was concluded that upstream storage as a standalone option was not technically feasible. The Oxford Strategy recognised that a smaller upstream flood storage area might be required in the future should climate change materialize as expected. This option would be implemented in combination with the flood flow capacity improvement options.

It was identified that flow capacity improvements to the west and south west of Oxford required further investigation. The Thames floodplain does not extend to the east of the main river and therefore no technically viable eastern flow capacity improvement options exist.

Long list of options to improve flow capacity

The broad range of approaches to flood risk management reviewed within the StAR has resulted in the development of a subset of options to improve flow capacity through Oxford, as the one high level approach considered feasible as a stand-alone. Other options were discounted based on Stage 1 of the Strategy as explored above.

Option 1 – Do nothing

No new flood alleviation schemes would be promoted and no maintenance works carried out to channels or existing flow control structures. This includes cessation of all flood management activities with respect to operation, flood warning, maintenance and improvement activities within the study area. Increased blockage of channels through debris accumulation as a result of this regime has been included in this option. It is included as a baseline for comparison in the short list as a requirement of the FCERM Appraisal Guidance.

Option 2 – Do minimum (sustain)

Maintenance of existing flood defence assets until failure. Replacement of structures is assumed in year 60 (normal design life) to maintain the current standard of service throughout the 100 year appraisal period. This option forms the economic baseline against which the ‘do something’ options are appraised.

Option 3 - Channel widening

The widening of several channels, including the Thames, has been discounted due to a combination of physical constraints/land availability, adverse environmental impacts, high costs, and in the case of the Cherwell, a failure to reduce the impact of flooding. This option is discounted as a stand-alone option. However, channel widening is a feasible option for improving flood flow capacity on several watercourses in the study area, such as the Seacourt and the Hinksey Stream, in combination with new stretches of channel; it is therefore represented on the shortlist of options as a part of the new channel options (2.4.1, 2.4.2 and 2.4.3 below).

Option 4 – Removal of control structures

The removal of control structures has been discounted, as although flood flow capacity may be improved, the cost of removing these structures together with the potential failure of existing walls and bridges renders this option unfeasible. This option would also have adverse environmental impacts, result in a change to existing water levels and in the case of the Thames in a loss of navigation. Though this option could reduce the impact of flooding it fails to meet the other objectives and would not satisfy the critical success factors.

Option 5 – Enhancement of control structures

Enhancements to the majority of control structures in the study area would have no or negligible impacts on flood levels as the constraint is elsewhere in the system. It therefore fails to meet the investment objectives or strategic fit & business needs of the project.

Option 6 – New flood channels

Increasing flood flow capacity through the provision of new flood channels has been discounted in several areas due a lack of feasible routes, and in the case of extending any channel north of Botley Road, unfavourable economic and environmental cases. However there are feasible routes for a new flood channel through the western floodplain (further details of which can be found in the Economic Appraisal Report: Appendix 5.1, and the Strategy Technical Report: Appendix 5.2), which has the potential to provide significant improvements in terms of flood risk, environmental, recreational and economic benefit.

Three separate channel sizes were appraised as part of the Strategy in order to refine the economics and allow the varying standards of service to be considered. The following channel sizes were chosen based on achieving the optimal hydraulic gradient through the system from the downstream boundary with the Thames;

- **Option 6.1:** Small (18 m³/s)
- **Option 6.2:** Medium (38 m³/s)
- **Option 6.3:** Large (57 m³/s)

These options all have the potential to meet the investment objectives and critical success factors and therefore are all carried forward into the shortlist of options.

Option 7 – Reduction of existing channel's frictional resistance

Reduction of the existing channel's frictional resistance through hard engineering solutions has been discounted due the unacceptable levels of environmental impact and prohibitive costs. Though the impact of flooding may be reduced, the other investment objectives and critical success factors would not be satisfied.

Option 8 – Culverting

Although limited culverting may be appropriate, large scale culverting has been discounted due to high cost and high environmental impact. Though the impact of flooding may be reduced, the other investment objectives and critical success factors would not be satisfied.

Option 9 – Enhanced maintenance

Enhanced maintenance of the watercourses in the study area, consisting of silt removal, vegetation clearance and vegetation removal on all secondary watercourses, would lead to improved flood flow capacity through an enlarged cross section and reduced friction. This option was however discounted on the Thames, where regular maintenance is already undertaken, and the Cherwell where there would be little or no benefit. This option has the potential to meet the investment objectives which target a reduction in the impact of flooding in the short term, however due to the adverse environmental impacts and failure to achieve VFM this option has been discounted.

Option 10 – Reduce downstream flood levels (Sandford Reach)

The reduction of downstream flood levels has been discounted as modelling shows there to be little benefit in terms of reducing flood risk, apart from localised improvements upstream of Sandford. This option fails to meet any of the investment objectives or critical success factors.

Option 11 – Remove localised constrictions in the watercourse

The removal of localised constrictions in the watercourse has been discounted as a stand-alone option, as modelling shows insignificant improvements in flood risk. This option fails to meet the investment objectives or critical success factors. However, it may be possible to combine this with limited sections of new channel to realise some benefits. This is discussed further below.

Option 12 – Interim measures

Since the Strategy was completed, a series of further community-based options put forward by the Oxford Flood Alliance for reducing flood risk in Oxford have also been assessed. These options included combinations of swales, de-silting of watercourses, refurbishment of existing structures, and bunds.

To arrive at option 12, those options not discounted as unfeasible have been modelled individually and in combination; the subsequent economic analysis showed that the preferred option from the study, recommended for further appraisal, was a combination of swales at Redbridge, along Hinksey Stream and at Sandford. These measures could increase flow capacity and overcome some local constrictions in existing watercourses. They have the potential to meet some of the investment objectives which target a reduction in the impact of flooding in the short term (though the benefits are significantly less than the other ‘do something’ options), and the critical success factors, and therefore are carried through to the shortlist.

Table 5C and narrative below summarises the assessment of each option against the investment objectives and CSFs. Combinations of these options were reviewed under Table 5B. In both tables a question mark indicates insufficient information to make a decision at this stage.

Option:	1	2	3	4	5	6.1	6.2	6.3	7	8	9	10	11	12
Investment Objectives														
Reduce flood damages to at least 1000 homes and businesses currently at risk in Oxford.	X	X	X	X	X	?	✓	✓	X	X	X	X	X	X
Reduce flood risk to infrastructure and utilities in Oxford.	X	X	?	X	X	✓	✓	✓	?	?	?	X	X	?
Safeguard Oxford's reputation as a thriving centre of commerce that is open for business.	X	X	?	X	X	✓	✓	✓	X	X	?	X	X	X
Create and maintain new recreational amenities, wildlife habitat and naturalised watercourses accessible from the centre of Oxford.	X	X	X	X	X	✓	✓	✓	X	X	X	X	X	?

Table 5C: investment objectives

Option:	1	2	3	4	5	6.1	6.2	6.3	7	8	9	10	11	12
Critical Success Factors														
Strategic fit & business needs	X	X	X	X	X	✓	✓	✓	X	X	X	X	X	✓
Potential VFM	X	✓	X	X	X	✓	✓	✓	X	X	X	X	X	✓
Potential achievability	X	✓	X	?	?	✓	✓	✓	?	?	?	?	?	✓
Supply-side capacity and capability	?	✓	?	?	?	?	?	?	?	?	?	?	?	?
Potential affordability	?	✓	X	X	?	✓	✓	?	X	X	X	?	?	✓
Summary (short listed Y/N)	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	Y

Table 5C: summary assessment of service solutions options

5.4 Preferred way forward

Short list

The short listed options have been further evaluated as part of an Initial Assessment (Economic Appraisal Report: Appendix 5.1). The options that were discounted for failing to satisfy the investment objectives and critical success factors were excluded from this stage.

Phased delivery has been considered in the Strategy, with the leading option split into several reaches which were then appraised individually and in various combinations in order to identify whether it was economically justified to construct the lower reaches prior to the upstream reaches. This will need further development in order to fully assess the impact. Further details are in Section 4 of the Strategy Technical Report (Appendix 5.2).

As well as phased delivery, consideration should also be given to the construction of limited sections of the scheme to improve flow capacity in the most constrained areas. This will be explored further in the OBC and could form a fall-back position if funding is a limiting factor, along with phased delivery and the interim option proposed by the Oxford Flood Alliance. However this option must not increase flood risk to others and is unlikely to deliver wider benefits due to a lack of connectivity. In addition we will also look at whether we could begin with the construction of a small or medium channel and enlarge at a later date.

The options that are taken forward in the economic appraisal are as follows;

- Option 1 – Do nothing
- Option 2 – Do minimum sustain
- Option 6.1 – New channel (small)
- Option 6.2 – New channel (medium)
- Option 6.3 – New channel (large)
- Option 12 – Interim measures

The economics at this initial assessment stage are based on flood damages avoided rather than the wider environmental and other economic benefits resulting from objectives 4, 5 and 6 that will be quantified as part of the detailed appraisal. An ecosystem services approach will be incorporated as part of the multi-criteria analysis in order to capture these wider benefits as part of the Outline Business Case.

The various options for implementing a scheme would need to be assessed at the next stage, as phased delivery for example, could result in significant cost increases due to re-mobilisation costs. This is likely to result in a lower BCR / IBCR and therefore a less favourable partnership funding score, or even a non-viable scheme. Nevertheless, phased delivery could give funding partners greater time and flexibility to raise funds.

Economic appraisal

The economics of the short listed options above were originally assessed as part of the Strategy (and in the case of the interim measures; as part of Oxford Flood Alliance Options Initial Assessment). A review of the economics has since been carried out.

This Economic Appraisal (see Appendix 5.1) updates the strategy economics of the above options, and incorporates the 'Interim Measures' option as identified subsequently. It takes account of current climate change guidance, a revised assessment of the return periods of flood flows at Oxford and a new model of the Oxford Flood Plain. The modelling and hydrology were previously developed by Mott Macdonald and independently validated by Thomas MacKay. This updated work provides a greater degree of accuracy due to the more accurate modelling of flood routes through the Oxford Flood Plain and by making use of 5 years worth of additional data which increases the benefits in implementing the Oxford Flood Alleviation Scheme proposals. Black and Veatch's model runs for the Economic Appraisal use this model, the outputs of which have been validated by JBA. The Economic Appraisal was undertaken in accordance with the Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG) issued in March 2010. The options that had been discounted for failing to satisfy the investment objectives and CSFs were excluded from this stage.

Table 5D below summarises the findings of the economic assessment, each of the options have a 100 year appraisal and duration of benefits period. This will be refined during the Outline Business Case stage due to the impacts of climate change on the benefits and the need to review later interventions. The values below include an optimism bias figure of 38.4%, which was developed through a series of workshops attended by the project team and consultants. All excavated material is assumed disposed off site and has been included within the base cost.

The incremental benefit cost ratio (IBCR) provides comparison of the additional benefit and cost for each option when compared to the immediately less costly option preceding it. The Flood and Coastal Defence Project Appraisal Guidance criteria for investments dictates that in order to offer a standard of protection that remains less than 1 in 75 (as in the options assessed here) the incremental BCR must be greater than 1 in order to progress to a more costly option.

Present Value damages and benefits shown below are baselined against 2016 (the start date of the scheme), whilst costs are inflated to a 2018 baseline (the year from which we have most up to date price estimates). This disparity will be corrected during the OBC stage, but makes no difference to the business decision required at this stage.

Options	Damages (£M)								Benefits (£M)	
	Commercial Property	Residential Property	Risk to Life	School Disruption	Rail	Traffic	Agriculture	Income Loss	Flood Warning	Total (£M)
1	189.6	768.3	156.9	3.3	9.5	41.5	11.2	0.5	0.0	1180.7
2	27.7	191.3	82.6	0.1	6.6	14.6	10.1	0.2	0.0	333.4
12	27.7	184.1	81.7	0.1	6.4	14.2	10.1	0.2	0.0	324.7
6.1	18.0	81.5	67.9	0.0	3.8	8.4	10.0	0.2	0.0	189.8
6.2	13.1	53.4	63.8	0.0	3.0	6.7	9.6	0.2	0.0	149.9
6.3	12.0	46.2	62.8	0.0	2.9	6.3	9.6	0.2	0.0	139.9

Table 5C.1: summary of benefits

Present Value damages (PVd) and Present Value costs (PVC) have been calculated as part of the assessment, with Present Value benefits (PVb) derived from the do nothing damages, less the damages for each option, as highlighted in the table above.

	Option	PVd (£M)	PVb (£M)	PVc (£M)	BCR	IBCR
1	Do nothing	1180.7	-	-	-	-
2	Do minimum sustain	333.4	847.4	19.8	42.9	-
12	Interim measures	324.7	856.1	23.4	36.6	2.41
6.1	New channel (small)	189.8	991.0	109.7	9.1	1.58
6.2	New channel (medium)	149.9	1030.9	141.4	7.3	1.22
6.3	New channel (large)	139.9	1040.9	161.8	6.4	0.49

Table 5D: summary of short listed options

Note: the incremental benefit:cost ratio is calculated by comparing the additional costs and benefits of an option against the preceding option. Options in this table are the short listed options.

All of the options except the large channel have an IBCR greater than 1 and are therefore considered viable.

Sensitivity tests have been carried out in order to assess how robust the IBCR is for each of the options. These tests are reasonable at this stage as we simply test the projects viability under various scenario's, but as we move forward in to the OBC stage they will be made more specific and measurable and will include a full review of the other climate change scenarios such as low, high and high++. A milestone will be agreed

with the Programme Board to review the options in advance of the OBC production after these sensitivity tests are completed.

The sensitivity tests carried out at this stage were:

- There is a 20% uplift in cost,
- There is a 20% decrease in costs and
- There is no increase in flood flows after the 2020's

The Environment Agency's climate change guidance (2014) has been incorporated in to the economic appraisal of all the shortlisted options. This guidance applies three epoch changes in base river flows so that by 2070 base flows have increased by a factor of 1.25. The 'no increase in flood flows after the 2020's' scenario was included as a simple sensitivity test as it was considered a reasonable test to see if the outcome changes if the impacts that are anticipated from climate change are not realised i.e. damages avoided do not increase. It was appropriate to use the results at this stage of the project to test the overall project viability.

Table 5E below gives the BCR and IBCR for each of the options when subjected to these sensitivity tests.

	Option	Original		20% cost increase		20% cost decrease		No increase in flows after 2020's	
		BCR	iBCR	BCR	iBCR	BCR	iBCR	BCR	iBCR
1	Do nothing	-	-	-	-	-	-	-	-
2	Do minimum sustain	42.9	-	35.7	-	53.5	-	24.5	-
12	Interim measures	36.6	2.41	30.5	2.0	18.7	45.7	21.2	3.3
6.1	New channel (small)	9.1	1.58	7.6	1.32	11.3	1.95	5.7	1.45
6.2	New channel (medium)	7.3	1.22	6.1	1.02	9.1	1.57	4.6	0.85
6.3	New channel (large)	6.4	0.49	5.4	0.41	8.0	0.61	4.1	0.54

Table 5E: sensitivity tests

Note: the incremental benefit:cost ratio is calculated by comparing the additional costs and benefits of an option against the preceding option. Options in this table are the short listed options.

In the 20% uplift in costs scenario, the IBCR of all the options, bar the large channel option remain above 1 and are therefore viable.

In the 20% decrease in costs scenario the IBCR of all the options improve, however the IBCR of the large channel option remains below 1.

In the scenario that there is no increase in flood flows after the 2020's, the IBCR of the medium channel option falls below 1 in addition to the large channel. However the other options, including the small channel retain an IBCR of greater than 1. This test gives an understanding of what happens if the climate change predictions used are over estimates.

The preferred way forward

On the basis of the economic analysis carried out, all of the shortlisted options, apart from the large channel meet the FCDPAG-AG criteria for investment. The preferred way forward and option recommended for further appraisal within the Outline Business Case is a new channel (in combination with the enlargement of existing channels), as it has the potential to result in the largest benefits, both economic and non-economic. Our initial modelling indicates that the medium size channel will reduce the flooding to the vast majority of the 1800 properties at risk in the 1:100 year flood event. Of these 1800 properties approximately 1200 would see their risk reduce to less than 1% per annum on opening. It has been proved that this option is viable, though further analysis is required within the OBC to identify the optimum scale and arrangement of such a scheme and to review in detail some of the benefits that have not been calculated at this stage (Appendix 5.1 Economic Appraisal Report, section 4 details this further). A strategic longer term view will need to be considered which will involve the re-assessment of wider strategy options to inform when further intervention may be required. The Outline Business Case will demonstrate through separate options in the economic appraisal the impacts of delivering the channel in an adaptive (i.e. building a small channel and enlarging it later) or phased (building the channel in sections over an extended period) approach. It will also consider the impacts of this on finance availability and affordability to test whether either of these options provides a better delivery model. Benefits will be re-calculated as part of this analysis because the existing situation will develop along with the refinement of the options. For example work being undertaken by Network Rail may impact on the benefits of the scheme, however due to the likelihood their work will only protect against lower order events it is anticipated to have a minimal impact.

Table 5F below gives the Net Present Values (NPV) of the 3 different sized channels that were considered in the Initial Assessment.

	Benefits (£M)	Costs (£M)	NPV (£M)
Small	991	108.7	882.3
Medium	1030.9	141.4	889.5
Large	1040.9	161.8	879.1

Table 5F: net present values

The Net Present Values for each of these initial options show relatively little variation, though the medium sized channel produces the highest NPV.

The majority of benefits of the scheme come from Outcome Measure 1 (OM1), those benefits that can be measured in economic terms so as to determine a ratio for the present value benefits (PVb) compared to the present value costs (PVC). A full breakdown of how these benefits have been calculated can be found in Appendix 5.1 (Economic Appraisal Report). Benefits from Outcome Measure 2 (OM2) (properties moved into a reduced flood risk band) also contribute, but are heavily outweighed by the OM1 benefits.

Full details on the number of properties benefitting from the initial sizes used to assess the viability of the scheme to provide a new channel can be found in Appendix 5.1 (Economic Appraisal Report). The FCERM

Appraisal Guidance states that Outcome Measure 2 (OM2) (properties moved into a reduced flood risk band) is based on the difference in flood risk between the existing situation now, and the situation with the scheme in place at the end of the 100 year appraisal period.

At the end of the scheme's design life, climate change projections show that much of the benefit of a scheme will have been lost due to the significantly increased frequency of flooding, though without a scheme there would be far more properties at risk in 100 years. Even with a scheme in place, some of the options still indicate that the level of flood risk is worse in 100 years than it is now. That being the case, at the end of the 100 year appraisal period:

- small sized channel results in 100 properties being at increased risk of flooding;
- medium sized channel results in 230 properties being at reduced risk of flooding;
- large sized channel results in 343 properties being at reduced risk of flooding.

Any design could be future proofed by taking a strategic longer term view, which will most likely involve a re-assessment of wider strategy options to inform a future decision point required as further climate change effects are realised such as possibly enlarging the channel, constructing the channel in sections using a staged approach or through the introduction of supplementary upstream flood storage.

If a larger channel were to be constructed at this stage, this is likely to delay the need for any future investment to combat the effects of climate change. Equally the smaller the channel constructed at this stage, the sooner future investment will be required, if climate change manifests as expected.

The purpose of the Strategic Outline Case is to confirm the viability of the scheme and as such wider environmental benefits were not assigned a monetary value within the Initial Assessment. It is possible that wider environmental or other economic issues, such as the re-use of materials will have an impact on the deliverability or affordability of the preferred scheme and this will be investigated during the Outline Business Case Stage using an ecosystems approach. The current cost build up assumes a precautionary approach. Materials management costs, which currently account for around a third of overall constructions costs could be significantly reduced as all materials are currently assumed to be disposed of offsite. An optimism bias figure of 38.4% is also currently being applied to take account of the uncertainty in how the various elements of the scheme have currently been costed. Optimism bias is an appropriate approach to costing risk at this stage, but has been set lower than the usual 60% at appraisal stage following a review by the project team as there is already a lot of information available from earlier work on the Oxford Strategy and our wider work across Oxford that helps reduce uncertainty. A key consideration in this is that the base cost figure in the economic and financial cases assumes all excavated material is disposed off-site to tip. This is a very conservative assumption as materials are expected to be re-used or in the case of sands and gravels have a commercial value. There is therefore significant scope for reducing costs as the scheme is further developed during the Outline Business Case stage. A summary appraisal programme for the key work streams can be found in Appendix 5.3.

Due to the likely benefit:cost ratio of the scheme, a large proportion of the funding would need to be funded by partners as detailed in the Financial Case.

6 The Commercial Case

6.1 Introduction

This section of the SOC outlines the proposed deal in relation to the preferred way forward outlined in the economic case.

The overall approach to the appraisal of this project will be under the Environment Agency Water & Environment Management Framework (WEM). The approach to both detailed design and construction (delivery stage) is to be agreed during the OBC stage.

A staged procurement process is required to give the flexibility needed on the project. This is a result of a staged approvals process through Defra and HMT (the understanding of which is still being developed in an Integrated Approvals and Assurance Plan).

Our approach will make use of the most appropriate elements of the Government Construction Strategy and Environment Agency's Sustainable Engineering Procurement Strategy 2011 to 2020. The key elements to this approach include:

- A focus on outcomes (incl. outcome focused scopes and design & build where appropriate);
- Appropriate risk identification, and risk allocation within the supply chain.

The detailed appraisal will demonstrate the technical aspects through the production of a technical Project Appraisal Report (PAR). This will be included in the development of the OBC, which is to be produced by in-house staff, with the technical appraisal procured through the Environment Agency's WEM (Water and Environment Management Framework). The services for the detailed appraisal and production of the Technical PAR are being procured through the Engineering and Related Services section of the framework (WEM lot 3). The tender process is now complete and a supplier has been appointed. This main contract is being supported by smaller contracts for early supplier engagement, as well as cost and programme management. In house staff from the Environment Agency are also providing further support, for instance in Project Management, Estates and Communications.

The project team will look to employ the most appropriate procurement approach for the detailed design and construction works. A design and build approach may be the most efficient delivery model for the channel improvements. A decision on post OBC / technical PAR packaging and delivery route (i.e. traditional or design and build) will be taken during the OBC stage, when there is a better understanding of the preferred scheme.

Note: the detailed consideration of the commercial case takes place at OBC stage at which point opportunities will be explored to close the cost gap through efficiencies / value management in strategic design, e.g. through the management, disposal or re-use of earth works and opportunities through adapting the size of the channel over time to reduce costs. Hence, the SOC contains an outline of the proposed approach based on an initial, less detailed review. The IUK Infrastructure Route Map will be followed by the Project Team and our partners for the Oxford Flood Alleviation Scheme; with workshops planned during

summer 2015 when options for the delivery model will be explored in detail. This workshop will draw on the similar work being undertaken on the River Thames Scheme due to the project similarities and will include for consideration areas such as:

- Commercial approach to reflect the wider environment in which each partner organisation operates.
- Awareness of the need for efficiency and wider market knowledge.
- Further aligning the proposed scheme benefits against each partner.

A milestone will be agreed with the Programme Board to review the commercial approach during the OBC after the IUK routemap has been completed.

6.2 Required services

The services required for the Oxford Flood Alleviation Scheme during the OBC stage broadly consist of a range of professional engineering and environmental design services for the development and enabling works under a New Engineering Contract (NEC) contract, and design and construction services under an NEC contract. The NEC is a formalised system which guides the drafting of documents on civil engineering and construction projects for the purpose of obtaining tenders, awarding, and administering contracts. They legally define the responsibilities of the parties involved.

Additional services to assist in cost management and programming will also be required, and it is anticipated that these will be provided by the Environment Agency's National Cost Management Framework. This is the internal framework through which suppliers providing Project Level and Strategic Cost Management services can be procured.

Early supplier engagement will be an important element of the next stage of appraisal, and this will be under an NEC contract procured through the Asset Delivery section of the WEM Framework (WEM lot 4).

Project Management, Estates, Communications and Environmental services will also be required, to be supplied by Environment Agency staff.

We will examine through the OBC, the most efficient way of delivering the scheme. The OBC will be produced in-house with the services described above providing the technical information needed to produce it. The work involved in developing this technical information will include the identification of a preferred option and the development of an outline design.

6.3 Risk allocation

This section provides an initial assessment of how the associated risks might be apportioned between the *Employer* and the *Consultant* and details who will be responsible for managing the risk up to the end of the OBC stage. This will be subject to ongoing review as the project progresses.

Outcome focused scope

The Sponsors' group will be advised of the potential consequences of scope changes during the OBC phase. The Environment Agency will own the risk for change of scope that results if a Public Inquiry is required.

Integrated approach

Demonstrating an integrated approach to engineering, materials management, landscape and environmental issues within the project appraisal will be an important criterion in evaluating the consultant

bids. If the team fails to integrate this will compromise the delivery of wider benefits as identified in objectives 4 and 5, interdisciplinary working within the consultant team is a *consultant* owned risk.

Data

The Environment Agency takes the risk of the quality of existing data only but has set out an assessment of the quality of the resources provided to the consultant. The supplier will identify information gaps and procure additional data to deliver the project appraisal, in line with their proposed methodology where data gaps exist.

Funding

The Funding Strategy is being developed by the Environment Agency and its partners at Oxfordshire County Council, it is an *employer* owned risk.

Downstream impacts

The designer must allow for mitigation measures if necessary to ensure that flood risk to homes and businesses upstream or downstream of the scheme is not increased. Risk management is with the *consultant*.

Materials management

We will need practical and useable solutions in the appraisal that make maximum use of the opportunities to reduce project cost and manage the key risks. This is specifically included in the appraisal scope and Project Proposal Questionnaire. Risk is with the *consultant* but, but significant input is required from the contractor appointed through early supplier engagement as per the agreed Procurement Strategy.

Land and stakeholder issues

The eventual ownership and maintenance responsibility for the channel is still to be agreed. This issue is to be managed by the *employer* in collaboration with the Sponsors Group and stakeholders, but will require consultation material to be prepared by the *consultant*.

Redbridge constraints

The risk will lie primarily with the *consultant*, but the *employer* will need to appropriately manage the interaction with the contractor brought in through early supplier engagement, whose input is likely to be significant.

Archaeology and heritage

Early discussions have already been held with English Heritage through NEAS to establish the conditions needing to be met to secure permission. The *consultant* will take the risk management for this and liaison with English Heritage through appraisal but will be lead by the Environment Agency.

Groundwater

The project team have discussed the groundwater issues with the Environment Agency's internal Groundwater Resources team, and are getting their input to the scope. Risk for partner relations with Thames Water lie with the *employer*. Risk relating to standards of protection offered and impacts on designated environmental sites will be a *consultant* design risk.

Landfill pits

Design risk relating to containment and/or disposal of potentially hazardous waste will be managed by the consultant.

Flooding

Risk of delay to the programme caused by flooding will be a shared risk, with the advice of the CDM-C and Early Supplier Engagement contractor being integral to decision-making.

The general principle is to ensure that risks should be passed to ‘the party best able to manage them’, subject to value for money (VFM).

Table 6A below outlines the potential allocation of risk.

Risk Category	Potential allocation		
	Public	Private	Shared
1. Design risk		✓	
2. Construction and development risk		✓	✓
3. Transition and implementation risk			✓
4. Availability and performance risk			✓
5. Operating risk	✓		
6. Variability of revenue risks	✓		
7. Termination risks	✓		
8. Technology and obsolescence risks			✓
9. Control risks	✓		
10. Residual value risks	✓		
11. Financing risks	✓		
12. Legislative risks			✓
13. Other project risks	✓		

Table 6A: risk transfer matrix

Proposed contract lengths

The contract for the Outline Business Case (OBC) is expected to last around 18 months and was awarded in April 2015. The contract for Full Business Case (included detailed design) is expected to last around 18 months. Contract award for the detailed design is currently planned for September 2016.

Procurement strategy and implementation timescales

For the procurement strategy see Appendix 6.1.

Subject to agreement of the SOC, it is anticipated that the implementation milestones, to be agreed for the scheme with the service provider, will be as follows;

- April 2015: start of detailed appraisal and development of OBC.
- September 2016: start of detailed design and development of FBC.
- April 2018: start of construction.

Strategic Opportunities

The Oxford Flood Alleviation Scheme project team is working with Network Rail in order to assess the possibility of providing cost savings to the scheme through making use of a planned line closure in summer 2016. A feasibility report is being produced by Network Rail and their consultants through a Development Services Agreement. This report will identify options for increasing the conveyance capacity through the main railway embankment which runs through Oxford, for the benefit of the Oxford Flood Alleviation Scheme, that are also feasible in terms of the programme and construction period Network Rail are working to for their own track raising project.

Any additional capacity options identified through the feasibility report will have to be appraised in order to assess how they will link up with the main scheme. This will most likely be carried out as an advanced piece of work by the consultant carrying out the detailed appraisal for the Oxford Flood Alleviation Scheme, under a compensation event.

The most likely route for the design and construction of any of the options identified would be through Network Rail, their consultants and contractors via a Development Service Agreement or similar process. In order to meet the tight timescales of Network Rail's programme it may be necessary to carry out some design work in parallel with Network Rail's planned measures, before the impact of the options on the Oxford Flood Alleviation Scheme can be assessed.

A decision will be required from the Programme Board / Sponsoring Group by the end of July 2015 on whether to design and construct any options from the feasibility study. The agreement would also need to be in place by this time, as would a commitment to fund the work. There is a potential opportunity to avoid incurring the costs of closing the line at a later date should it be realised that a new culvert or opening is needed, once the detailed appraisal is further developed. However there is also the risk that substantial costs will be incurred related to installing a new culvert or opening which is insufficient in capacity, in the wrong location, or simply not needed.

7 The Financial Case

The purpose of this section is to set out the indicative financial implications of the preferred option (as set out in the economic case) and the proposed deal (as described in the commercial case). Note: detailed analysis of the financial case including affordability takes place at OBC stage.

This section also outlines the approach being taken with Partners to secure full funding for the scheme. The Sponsoring Group has committed to find the necessary additional funding for this scheme. It has instigated the creation of a Funding Sub-Group, led by senior officers at Oxfordshire County Council, the Environment Agency and the Oxfordshire Local Enterprise Partnership. The sub-group will develop the Funding Strategy in the following stages of the appraisal, with input from specialist consultants as required.

7.1 Impact on the organisation's income and expenditure account

In order to assess the cash cost of the scheme, the real (baseline) cost of the scheme has been considered and then inflation has been factored in. The inflation estimate is based on the government recommended GDP deflator forecasts published by the Treasury for the years 2014/15 up to 2019/20 and thereafter assuming 2% per annum to the end of the appraisal period.

The table below shows the variation in costs between the real profile, the discounted present value cost used in the economic case and the cash profile considering inflation.

In the real cost profile, the baseline date is assumed to be 2016/17, as the start of the project, and includes consideration of an inflated construction cost from 2018/19 onwards. Because of these factors, figures in the early years of the PV and Inflated cash profiles have been reduced accordingly.

Profile Type	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Future costs	Total £million
Real	0.5	1.9	2.1	5.0	30.0	38.5	36.4	5.9	95.7	216.00
Present Value	0.5	2.0	2.1	4.8	28.0	34.7	31.7	5.0	32.5	141.40
Inflated Cash	0.48	1.85	2.07	5.0	30.63	40.33	38.89	6.43	307.45	433.13

Table 7A – Financial profiles (£million)

The whole life cost of the project, over 100 years, including inflation is estimated at just over £433million.

The financing plan for the project will consider the costs for appraisal and construction separately to future costs estimated for activities such as regular maintenance and capital repair to structures. The table below shows the split of these figures in the three different profiles. Appraisal and construction costs are considered to be everything up to and including the 2021/22 financial year.

	Appraisal and Construction £million	Future costs £million	Total £million
Real	120.30	95.70	216
Present Value	108.85	32.55	141.4
Inflated Cash	125.68	307.45	433.13

Table 7B Split between appraisal, construction and future costs in estimated profiles

This shows that the anticipated capital construction cost of the project, including optimism bias and inflation is £125.68million. Maintenance costs, including all costs associated with the existing wider Oxford system maintenance are added for the 100 year appraisal period to give the future costs of £307.45million. Due to the long appraisal period it may be easier to think about the future maintenance liability without inflation which is £95.7million or approximately £1million per year.

How this expenditure is expected to vary over the life of the project is shown in table 7C. The £125.8 million is split over the appraisal and construction period annually, and the £307.45million is shown as a lump sum in future years. It also shows the main project deliverables in each year which have been used to develop this more realistic expenditure profile. This profile considers the package of work delivered by in house Environment Agency resources and the consultant appointed under the Water and Environment Management (WEM) Framework outlined in the Commercial Case.

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Future	Total £million	
Total (£m)	0.48	1.85	2.07	5.0	30.6	40.33	38.89	6.43	307.45	433.13	
Outline timetable of key deliverables	Strategic Outline Case										
		Outline Business Case									
		Environment Agency FSoD approvals									
			Full Business Case								
		Site investigation									
		Environmental surveys									
			Archaeological works								
		Topographic Surveys									
				Lands costs & legal fees							
					Construction						
						Landscaping					
								Future maintenance			

Table 7C - Annual breakdown of expected cash profile showing project deliverables

Under the Flood and Coastal Risk Management Partnership Funding policy, the Scheme is eligible for funding in part by Flood Risk Management Grant-in-Aid (FCRMGIA). The indicative amount is based on the current assessment of outcomes that the preferred way forward delivers. Based on the current appraisal the indicative eligibility is £57.7million (PV) FCRMGIA contributions over its intended life span. This figure has been generated using the partnership funding calculator based on the outcomes the scheme if forecast to deliver. A copy of the partnership funding calculator can be found in appendix 7.1.

An indicative allocation of FCRMGIA funding has been included in the FCRMGIA 6 year investment programme, announced in December 2014. This indicative allocation is subject to business case approval and based on current calculations of the benefits. It is also dependant on the project securing contributions to meet the full cost of the scheme.

In order to represent this contribution appropriately alongside the other inflated cash costs, the assumption has been made to remove the present value discount factor, from the programme baseline date of 2014/15 onwards, and inflate it at the same factors as all other costs. Using the assumptions the estimated cash FCRMGIA contribution is around £220.6million.

The project recognises that this approach is not consistent with principles of how the Environment Agency puts together the FCRMGIA programme and notes that there is a separate commission of work underway between Defra and the Environment Agency to address this. The finding of this work will further support the development of the Financial Case in the OBC stage.

In addition to the FCRMGIA, there is also a commitment from the Thames Regional Flood and Coastal Committee towards the appraisal and construction of the scheme. This is based on 10% of the PV cost of the project as a cash contribution, i.e. around £14million. This funding commitment has been profiled within their programme alongside the work to develop the 6 year investment programme.

Although this funding stream does have an initial profile over the next 6 years, it will be used to supplement partner contributions. There is an element of flexibility within financial years during the early stages of the project and regular communication with the Environment Agency Area Programme Team is used to manage this funding source.

Overall affordability

The ability to deliver the Scheme is dependent upon obtaining significant contributions from third party funding. Table 7D shows the current balance sheet with regards to contributions known so far – this table uses the whole life cash costs as its reference point.

Contributions for the appraisal stage have already been secured from external parties including Oxfordshire County Council, Oxford City Council, and Oxfordshire Local Enterprise Partnership funding. The contributions of this nature are assumed to be cash amounts and as such are shown in the table below in relation to assumed cash profiles for whole life cost, FCRMGIA and local levy.

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Future costs	Total £million	Appraisal and Construction sub total	Future costs
Whole life Cost (Cash)	0.48	1.85	2.07	5.0	30.63	40.33	38.89	6.43	307.45	433.13	125.68	307.45
FCRMGIA (Cash)	0.34	0.10	1.05	2.22	10.54	24.01	25.35	2.77	154.24	220.62	66.38	154.24
Levy (Cash)	0.00	2.00	4.90	5.50	1.70	0.00	0.00	0.00	0.00	14.10	14.10	0
External Contributions required (Cash)	0.14	-0.25	-3.88	-2.72	18.39	16.32	13.54	3.66	153.21	198.41	45.20	153.21
Growth Deal Funding (SEP)	0.00	1.00	1.25	1.00	4.25	18.35	0.00	0.00	0.00	25.85	25.85	0
Local Council Contributions secured	0.20	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	3.20	3.20	0
Total cash known	0.54	4.10	8.20	9.72	16.49	42.36	25.35	2.77	154.24	263.77	109.53	154.24
Remaining shortfall (to WLC Cash profile)	-0.06	-2.25	-6.13	-4.72	14.14	-2.03	13.54	3.66	153.21	169.36	16.15	153.21
Potential account balance (-ve figure is surplus fund and assumes no interest earned)	-0.06	-2.31	-8.45	-13.17	0.97	-1.06	12.49	16.15	169.36			

Table 7D – Breakdown of contributions need and already known over the life of the project

To secure full funding for the project over its lifetime, contributions of approximately £169million need to be identified. Of this, around £16million is for the construction phase and around £153million is to cover future costs.

The above table also shows that already there is a mismatch between contributions available and need. This is in part due to the early profiling commitment we had to make as part of the Growth Deal bid but is something which is being managed as part of the day to day finances. On behalf of the partners, Oxfordshire County Council have agreed to act as the account holder for third party contributions and have put their own financial processes in place to be able to carry forward balances. An indication of how this account balance might look is also shown in the table. Regular review of this with partners will enable the contributions to be managed appropriately.

A balance also allows some flexibility in managing risks, in particular the potential earlier cost which might arise from working with Network Rail. This work is outlined in the Commercial Case section 6.3.3.

Initial conversations with prospective partners have been based on the real cost profile and primarily the anticipated cost for appraisal and construction. Managing the impact on contributions due to inflation is a large factor in a scheme of this size. The Funding Strategy will focus separately on the shortfalls for construction and future costs. Where possible, third party contributions will be encouraged as commuted sums in order to offset some of the inflation increases.

The organisations represented on the Sponsoring Group have signified their agreement to secure the funding for the scheme through a Memorandum of Understanding. The partners are aware the scheme cannot go ahead without filling the funding gap and are working together to identify and approach contributors.

A funding group has been set up, which includes senior staff from Oxfordshire County Council and the Oxfordshire LEP, to lead discussions with potential contributors and utilise ongoing engagement opportunities with them. The lead role for negotiating third party contributions will sit with Oxfordshire County Council but the Environment Agency will ensure that adequate resources are available to support this work.

As part of the funding strategy, local council partners have agreed that their initial focus is on meeting the shortfall to achieve construction. The opportunities being pursued so far to reduce or meet this gap are:

- A potential contribution from Thames Water linked to their Oxford Drainage Strategy project
- Potential contributions from Oxford University and some specific colleges based on their ownership of land and the reduced flood risk benefits that may realise
- Potential use of Community Infrastructure Levy, within Oxford City itself and from the surrounding Districts whose residents might commute into Oxford by car or from it on a train
- Contributions from local private businesses. This could be in association with local business initiatives and supported with recent tax implications announced in the Chancellors Autumn Statement (Dec 2014)
- Opportunities with Network Rail to bring efficiencies into the programme through working together

Other ideas that will be explored during the development of the Funding Strategy include:

- How to utilise opportunities around materials management to reduce overall costs (considering the link to Oxfordshire County Council Gravel Strategy, and LEP growth plans)
- Contributions from environmental stakeholders
- Potential for community contributions and crowd funding linked to the extensive network of community and drawing experience from other initiatives where contributions of this type have happened locally
- Potential to utilise funding sources such as the Heritage Lottery fund
- How the establishment of an organisation such as a Land Trust could identify opportunities for investment
- The opportunities for contributions in kind or maintenance agreements from landowners and environmental stakeholders

Other sources of funding are likely to be dependent on the wider environmental, social and recreational benefits that the scheme can offer. Local partners will play an important role in supporting the local economic analysis. Through the WEM Consultant there are plans to use the Frontier Toolkit to quantify the benefits the scheme can bring to the commercial landscape of Oxford. This toolkit was developed from the findings of a recent Defra/EA research study into the benefits of flood risk management interventions on the local economy. Application of this approach will need to align closely with other Oxfordshire Growth Plans and ambitions for the future. Oxfordshire County Council and the Local Enterprise Partnership have already earmarked resource to help support this work.

Use of techniques such as the Frontier Toolkit and Ecosystems Services Approach will help to identify the beneficiaries from the Scheme, and explore whether a mechanism can be implemented to derive an income from them – either a lump sum contribution or ongoing payments. Beneficiaries may include developers, landowners, businesses, marina developments, navigation users, holder of moorings rights, infrastructure owners, insurers and individual property owners.

Partners are working together to develop visual tools to explain and help sell the scheme to potential investors. This will encompass the Sponsoring Group “vision” and highlight the wider benefits the scheme could bring.

At present Oxfordshire County Council have agreed to act as the accounting body for the scheme but this will need to be reviewed depending on how the complexity of investors might change. If there are a number of investors, then the administration for holding the contributions may need to sit independently to any of the main partners. This could lead to charitable status, or tax implications etc. The detailed financial model will be explored as part of the financial case in the Outline Business Case.

It is important to have flexibility and security in funding to allow a construction programme to be structured that delivers best value and greatest efficiency. The project will look to utilise best practice from other flood schemes and local major highways projects delivered by Oxfordshire County Council to highlight further opportunities for cost reductions. If necessary a phased adaptive approach will be adopted within the partnership funding strategy to deliver the best value and greatest efficiency.

The risk of not securing funding carries huge implications for the project. If contributions are not formally identified by Outline Business Case submission then the project will not gain approval. The legal agreements for contributions need to be signed in advance of Full Business Case approval.

Collaborative agreements will be used to secure the contributions from third parties. We have proposed a staged approach to establishing these agreements linked to major project milestones. This will allow more complex financial practices to be developed for holding contributions for construction and maintenance, without jeopardising the ability to secure early contributions from local councils and the Local Enterprise Partnership for the appraisal stages.

The stages in the process, and associated activities, have been identified as:

- 1) Contributions to cover the cost of appraisal work up to approval of this SOC;
Agreement in place by March 2015 for Oxfordshire County Council contribution
- 2) Contributions to cover the cost of detailed appraisal and outline design up to approval of the OBC;
Agreement proposed to be in place by July 2015 to manage contributions from Oxfordshire County Council, Oxford City Council and the Oxfordshire Local Enterprise Partnership.
- 3) Contribution to cover detailed design up to FBC and construction works;
Identification and negotiation with potential third party contributors to begin April 2015 and is ongoing during the appraisal stages. A full construction financing plan with written confirmation of commitment from third parties will need to be in place prior to OBC submission in December 2016. Full Legal agreements to ensure payment of contributions needs to be in place by April 2018, when the final tender price is confirmed.
- 4) Maintenance of the works for the life of the scheme.
Potential funders and administrative arrangements to be established as soon as practicable (consideration ongoing from May 2015). As a minimum, the principles for contributions need to be set out prior to OBC submission in December 2016 and final agreements in place prior to FBC submission in April 2018.

Understanding how future maintenance will be paid for is vital to delivering Oxford Flood Alleviation Scheme. It is also important to note that the schemes life is likely to be less than 100 years due to the next intervention point (upstream storage) and this will change the figures further. A shorter appraisal period would result in a potentially significant reduction in future costs; this will be investigated in further detail during the OBC stage.

Based on the current estimate of whole life cash costs, future costs could be almost £308million over the 100 year period. Securing third party commitment to help fund this amount for the full benefit period will be a difficult task and so we are exploring the option as to whether considering the future years as a series of time periods would be more suitable. This will be explored in more detail in the OBC but table 7E shows the variation in need in roughly 20 year blocks over the 100 year benefits period.

		Future cost estimates				
Appraisal and Construction sub total	Future costs	5 to 20yrs	20 to 40yrs	40 to 60yrs	60 to 80yrs	80 to 100yrs
125.68	307.45	18.08	36.28	53.92	80.12	119.05

Table 7E – Breakdown of the inflated cash cost for future maintenance over appraisal period (£million)

As this figure is better refined, more detailed focus will need to be made by partners on the arrangements that could be put in place to manage this funding. Partners could commit to a regular contribution on an annual basis over the scheme life or make a one off contribution that would be held in trust until needed. This will all need to be considered as part of the financial model and used by partners to make some decisions as to how the financial body which manages the money will need to be set up. The Funding Sub-group have begun looking at other parts of the country where different administrative arrangements, such as Land Trusts have been put in place to manage this sort of situation. This will be explored in more detail during the OBC and FBC stages.

It is recognised that upfront partnership funding for 100 years of maintenance is unlikely to be secured. The project is looking at how the flood channel land can be designated as public open space, subject to landowner agreement, to enable partners to provide long term commitments for benefit in kind adoption of maintenance responsibilities. This could then act as part of their contributions towards the scheme.

The Financing plan will also take into consideration how these maintenance costs are made up. More analysis is needed at OBC stage to understand the relevance of these costs to the work we already undertake on river maintenance within this system.

Costs and efficiencies

The purpose of the Initial Assessment used in support of the SOC was to demonstrate a scheme was viable and help partners address funding shortfalls. Costs currently assume all excavated materials are disposed off site to tip, whilst also including a 38% optimism bias. If costs can be reduced this will enhance the economic case and reduce the contributions required. Materials management is a key component in addressing this issue and is a key part of our supplier's scope of works (see section 4.3 for further details). In addition, this will require us to work closely with the local authorities and is already part of the planning sub-groups terms of reference. Other areas already highlighted as offering efficiencies is the proposed advance Network Rail works, land agreements and long term maintenance options.

The financial case shows that there are already contributions of £43 million at this stage of the project's development. Securing the whole funding is a pre-requisite of submitting the Outline Business Case. An approved SOC will incentivise partnership funding contributions from private investors who are looking for a signal of support for the scheme from government.

8 The Management Case

8.1 Introduction

This section of the SOC addresses the 'achievability' of the scheme. Its purpose is to set out the actions that will be required to ensure the successful delivery of the scheme in accordance with best practice. This section should be read in conjunction with the Integrated and Assurance Plan.

The management case will be developed over time to include many key strategies such as programme management strategy (under development) programme governance and assurance plan (developed); resource management strategy (under development); stakeholder engagement and communications strategy (under development); configuration management strategy (under development); benefits realisation plan (under development) and **benefits map** and risk management strategy (under development).

8.2 Programme management arrangements

The scheme is an integral part of the indicative Thames RFCC 6 year programme, which comprises a portfolio of projects for the delivery of flood risk reduction across the Thames Region.

Oxford Flood Alleviation Scheme is a standalone project, but the Sponsoring Group and Programme Board jointly review the proposals for Oxford Flood Alleviation Scheme and Abingdon Flood Alleviation Scheme which is a market town 8km downstream of Oxford. Although both are separate projects and will be developed independently from one another they have synergies which are best reviewed in parallel.

The Oxford Flood Alleviation Scheme project team are working closely with project teams from across the Environment Agency and others who are managing major projects/programmes (e.g. Thames Estuary Phase 1 (TEP1), River Thames Scheme (Datchet to Teddington), Boston Barrier) to ensure we capture lessons learnt and good practice. Many of the approaches already agreed on Oxford Flood Alleviation Scheme have come from this cross sharing of ideas and information.

8.3 Project management arrangements

The project will be managed in accordance with Prince2 methodology. Prince2 is an approach already well embedded within the Environment Agency and is used throughout our supply chain. Although the project is large Prince2 is designed to be readably adaptable for any size project.

The governance structure for the scheme is illustrated below (see figure 8A). This governance and assurance relies on a Sponsoring Group, Programme Board and Project Boards as detailed below:

Oxford and Abingdon Scheme – Governance Structure (06/05/2015)

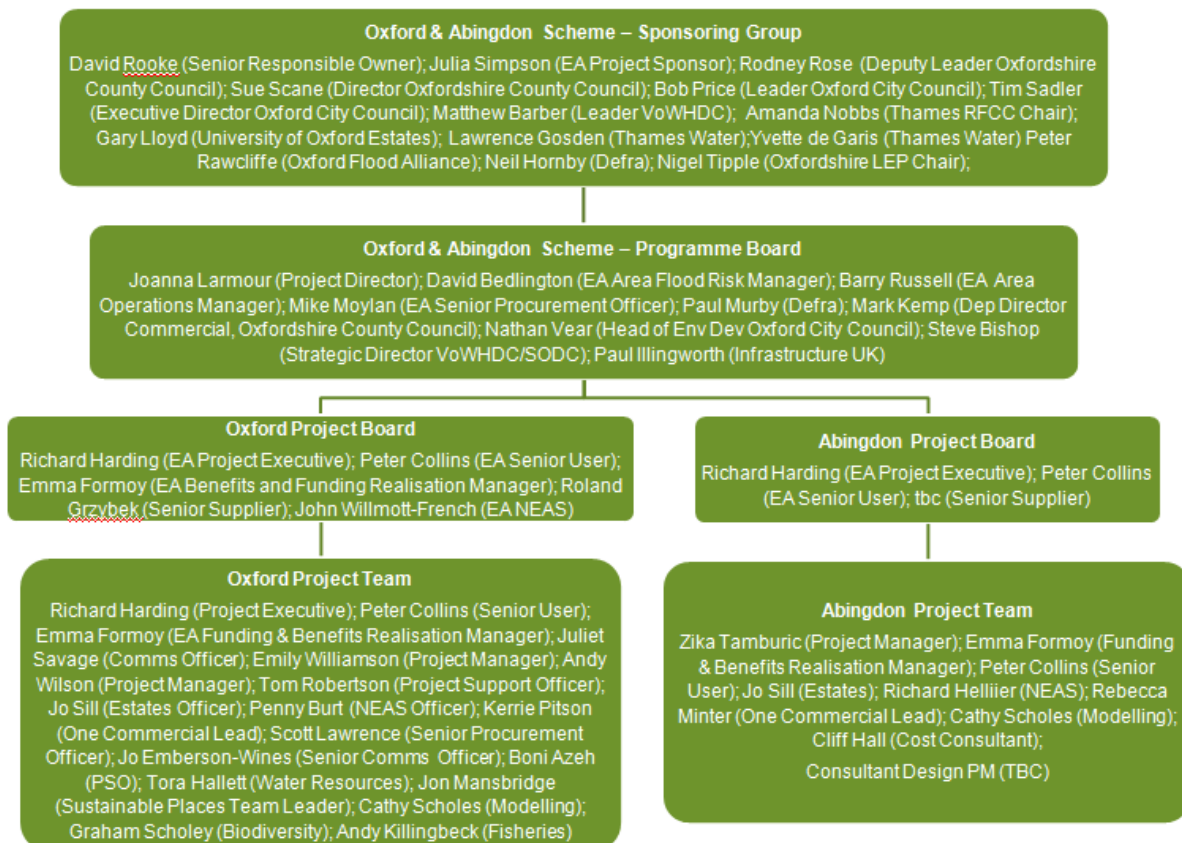


Fig 8A Outline governance structure

Project roles and responsibilities

A Sponsoring Group and Programme Board have already been set up. They consider projects that cover both Oxford and Abingdon, but these projects are hydraulically independent and will be delivered separately and independently of one another.

The Sponsoring Group was set up following recent flooding in Oxford during winter 2013-2014. A Flood Summit was hosted by Oxfordshire County Council in March 2014 at which around 40 politicians and representatives of local and national agencies came together to consider reducing the long-term risks of flooding in Oxfordshire. There was strong local demand and potential funding sources identified for a scheme to be delivered as soon as possible.

The Sponsoring Group comprises senior managers (who have responsibility for setting the strategic direction of their respective organisations and are responsible for the investment decision; defining business direction and ensuring the strategic fit of the project within their respective organisation. They have sufficient delegated authority to make decisions on behalf of their organisation.

The Sponsoring Group have the following responsibilities:

- Confirming the strategic direction against which the project is to deliver.
- Resolving strategic and directional issues.

- Securing and approving (internal and external) partnership funding for the project.
- Aligning the strategic direction of the project with that of the organisations corporate plan and political environment.
- Engaging local support and political will to drive and progress the project.
- Endorsing partnership and collaborative working to deliver the project.
- Endorsing and supporting the project through the approval gateways.
- Championing the project: leading by example' communicating the benefits to all stakeholders and gaining wider political support.
- Providing continued commitment and endorsement in support of the project objectives at executive and community events.
- Confirming successful delivery and sign-off of the project.

Partners in the Sponsoring Group have signed a Memorandum of Understanding which outlines their intent to work together to achieve the shared vision and objectives, identify opportunities to secure full funding for the scheme and establish efficient working practices to deliver the Scheme as quickly as possible whilst driving down the costs and maximising efficiency savings

The composition of the Sponsoring Group is:

- Environment Agency Area Manager
- Local Council Senior Executives / Directors/Leaders
- Chair of the Thames Regional Flood and Coastal Committee
- Key stakeholders including University of Oxford, Thames Water and Oxford Flood Alliance
- Defra.

The Sponsoring Group meet approximately every three months. In between key issues will be dealt with by correspondence.

The Programme Board is the main decision making board and its purpose is to drive the project forward and deliver the outcomes and benefits within the tolerances set by the Sponsoring Group.

The Programme Board will have the following responsibilities:

- Resolving strategic and directional issues, which need the input and agreement of senior stakeholders to ensure progress on the project
- Ensuring the project delivers within the agreed parameter (cost; organisational impact; expected/actual benefits realisation etc).
- Defining an acceptable risk profile and risk thresholds for the project.
- Providing assurance through the project lifecycle.

The composition of the Programme Board is:

- Senior Environment Agency Officers (including Area FCRM and Operations Managers, and senior NCPMS, NEAS, Procurement and Business Team Managers).
- Senior local council officers
- Defra
- Infrastructure UK

The Oxford Flood Alleviation Scheme Project Board manages project issues and risks at a project level within tolerances set by the Programme Board and comprises the Environment Agency Project Executive, Senior User and external Senior Supplier. It meets by exception only.

All of the groups defined above have terms of reference in place.

Outline project plan

A number of project plans have been developed, all with the emphasis on the initial approvals process and key milestones depending on the audience. They will be developed in further detail once the consultant is on board to undertake the full appraisal during the OBC stage. The project plan is a living document and is re-visited and updated when changes are required and is included within the Integrated Assurance and Approvals Plan.

Key milestones are listed in the table below. Those beyond SOC/Business Case approval are subject to change as the delivery model is better defined as we look at alternate procurement and commercial models to help meet our efficiency targets and implement the Governments Infrastructure IUK Route map.

Milestone	Date	Value
Initial Business Case	06/08/14	£902k
Risk Potential Assessment (initial)	28/08/14	£140m pv
Financial Scheme of Delegation Approval for OBC stage	Apr 15	£4.2m
SOC approval	July 15	
Technical PAR (if required)	Sept 16	
Contract Award (assuming design and build)	tbc	
OBC approval	Dec 16	
FBC approval	Apr 18	

Table 8A: key milestones

Resource requirements

All projects require the use of both internal and supply chain specialists. Some are used continuously whilst others are used for ad-hoc or specialist pieces of work. As the project is pre SOC the number of external specialists has been kept to a minimum in preparation of the Initial Assessment and supporting documents.

A full time Project Director, Joanna Larmour was appointed in March 2014. She chairs the Programme Board and is supported by a Project Executive, Funding and Benefits Realisation Manager, Communications Officer and Project Manager and Assurance Manager. Other internal specialists such as Modelling, Legal and Estates, Commercial and Procurement and Environmental supplement the full time project team whilst we also utilise the skills and experience of the River Thames Scheme taking advice from their Project Director. These resources will be expanded subject to approval of the SOC.

Use of specialist advisers

As detailed above external specialists have been kept to a minimum at this stage but include the following. These resources will be expanded subject to approval of the SOC.

Specialist Area	Adviser
Technical including hydraulic modelling	Black & Veatch
Programming, construction and financial	Turner and Townsend (T&T lead is an ex-NCF contractor)

Specialist Area	Adviser
Site investigation	Fugro

Table 8B: special advisers

Assessment of Environmental Impacts

As an integral part of the design and decision-making process, the likely environmental effects of each option will be assessed to ensure that the chosen option, methods of construction, operation and maintenance will maximise environmental gain and eliminate or reduce negative environmental impacts. The design of the preferred option will be developed to maximise positive environmental outcomes and eliminate or minimise negative environmental outcomes. This process must be documented very clearly in the Environmental Impact Assessment, using a sound evidence base and iterative process to justify the outline designs, ensuring they are acceptable in principle to all consenting bodies, statutory consultees and by landowners/operators.

For the purposes of any environmental assessment work, all elements of scheme shall be treated as one project. To progress any element individually, a cumulative effects assessment will form part of the assessment being undertaken. The following products are included in the scope of the appraisal:

- A draft Water Framework Directive Assessment
- A draft Habitats Regulations Assessment
- A Screening Opinion from the relevant planning authorities
- Preliminary Environmental Information for the next stage of the Environmental Impact Assessment

Planning and consents

The outline design developed during the OBC stage will need to be sufficiently communicated to and discussed with all interested parties so that the future stages of work, consents and authorisations can be gained through the Town and Country Planning Act or Minerals and Waste Act. In order to achieve this, through the detailed appraisal process the appraisal consultant will ensure that.

- The formal consultation undertaken throughout the appraisal processes is sufficient to satisfy the planning consents
- There is a reasonable level of support from non-statutory consultees
- There is support in principle from landowners and operators directly affected by the Oxford Flood Alleviation Scheme;
- There is support and acceptance by statutory consultees for the scheme

As part of this work the appraisal consultant will provide support to the Environment Agency in defining the approach to stakeholder engagement and use this information and existing stakeholder analysis to produce external and internal engagement plans, updating them in partnership with the project team and Oxford Flood Alleviation Scheme communications lead.

The appraisal consultant will also be responsible for leading, preparing and organising meetings and engagement with statutory consultees and those organisations from which consents and authorisations are needed, to achieve their formal support for the preferred option and outline designs, and achieve any necessary consents and authorisations for the appraisal stage of the project.

Statutory consultees will include but not be limited to: Natural England, Historic England, Local Planning Authorities (Oxfordshire County Council, Oxford City Council, Vale of the White Horse District Council and South Oxfordshire District Council). It is likely that planning consent for the Oxford Flood Alleviation Scheme will be sought through either the Town and Country Planning Act (TCPA), Minerals and Waste Act or a combination of both. There is a possibility that this may lead to a Public Inquiry.

Pre-application meetings will be held with each local authority to determine the scope of planning applications to ensure the outline designs and planning process is robust. These meetings will include discussion on issues such as: how cross boundary issues should be coordinated, the depth and breadth of application content and the supporting information required.

A Consents and Authorisations register will be developed by the appraisal consultant during the start up phase of the detailed appraisal, as a plan of all consenting requirements needed to facilitate the Oxford Flood Alleviation Scheme until construction is completed.

Formal consultation is to be led by the appraisal consultant, their approach to which will be defined at each project stage to achieve, in principle, the support and acceptance of statutory consultees and landowners/operators directly affected by the Oxford Flood Alleviation Scheme. It is expected that this consultation will include for example; public exhibitions, online technology, newsletters and workshops.

The appraisal consultant will also advise on the submission of planning applications as appropriate, in order to secure permissions where possible for all elements of the work that are suitably developed. Where these are covered by the Environment Agency's permitted development rights, approval in principle will be sought for those elements not requiring formal consent.

Management of future maintenance activities

As highlighted in financial case, the cost of maintaining not only the proposed new asset, but also the existing assets in Oxford carries huge significance over the life of the project. In developing a financing plan to cover these costs, consideration will need to be given to whether new local management arrangements would be the most appropriate way in which to do this. Early conversations with partners have raised options of a Land Trust or Internal Drainage Board being established.

The Outline Business Case will explore the opportunity to establish long term management approaches, such as benefit in kind maintenance, and identify how the required performance will be maintained through a third party agreement. This would also act as a benefit in kind contribution to the scheme in the financial case. At this early stage it is thought this might be in the form of a 20 year maintenance agreement. Initial conversations with partners have supported this approach.

Gateway review arrangements

The impacts/risks associated with the project have been scored against the risk potential assessment (RPA) for projects. The RPA scores are attached at Appendix 8.2 with an overall medium risk being assigned, following medium classifications for both the complexity and consequential impact assessments.

Due to the value of the project HM Treasury approval is required. It will not feature on the Governments Major Projects Portfolio and external reviews will be managed by Defra.

An OGC Gateway 1 review was undertaken in parallel with the submission of this SOC. This was carried out between 28 and 30 April 2015. The Review Team found that it is likely that the project will achieve its objectives and can be delivered successfully giving the project an Amber rating with 9 recommendations to consider, which if addressed will provide greater delivery confidence. This is considered to be a good outcome at this stage of the project. The four key recommendations were early engagement with planning

authorities, ensure an effective risk management regime is in place, prepare key project control documents and ensure a single point of contract is established to provide leadership and accountability. These were already being addressed before the review and an action plan has been developed to address all the recommendations.

The reviewers concluded that the scheme is being delivered using an exemplar and innovative partnership approach that not only covers funding but is also achieving public and political support. Further reviews are planned in accordance with the high level programme.

The project's Sponsoring Group supports the submission of the SOC at this stage to signal support for the scheme and maintain momentum in securing further contributions. Approval of the SOC will set some political expectations with risks of nugatory spend if a funding package cannot be secured or put pressure on government departments to fill the shortfall. The need for continued local public and political support, and maintaining momentum on partnership funding agreements, are key to successful delivery. The Outline Business Case will develop the detailed costs, benefits, funding and procurement approach and provides the next milestone to judge proceeding to full business case.

Signed:

Date:

Senior Responsible Owner: