

HOW BEST TO ALIGN THE FUNDING PROCESSES WITH THE VARIOUS BODIES INVOLVED IN RESOLVING FLOODING



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HOW BEST TO ALIGN THE FUNDING PROCESSES WITH THE VARIOUS BODIES INVOLVED IN RESOLVING FLOODING

Executive Summary

Objectives

The objectives of this research were to promote existing good practice of collaborative working between water and sewerage companies and their partners, to develop common guiding principles which will facilitate future collaboration, and to illustrate these principles with practical examples. Collaborative working between water and sewerage companies is in its infancy, but there are numerous examples available which demonstrate that collaboration can reduce the costs of infrastructure to individual partners, unlock investment that would otherwise not be feasible, and deliver multiple benefits to the public and the environment. As these collaborative approaches are fairly new there is a need to develop common and systematic approaches to:

- identify and prioritise collaborative funding opportunities;
- collaboratively identify the full set of costs and benefits to different partners;
- apportion benefits of investment to each partner and hence indicate a potential funding contribution, and;
- consider appropriate delivery mechanisms, and how to manage financial and delivery risks.

Conclusions

The guiding principles developed for this project build upon the existing good practice and will support a common and systematic approach to unlock collaborative opportunities. They are not intended to be prescriptive, but rather to suggest a logical process to progress collaborative opportunities. The guiding principles have been developed for use within the current investment cycle whilst providing approaches to help partners to plan future investment collaboratively. In addition, they have been designed to integrate into existing planning processes and funding cycles to enable partners to adopt them into their normal business practice. The stages of the guiding principles can easily be embedded into the standard project life cycle.

Recommendations

There are three primary recommendations arising from this research project:

1. water and sewerage companies and partners should implement the guiding principles outlined in this document to unlock collaborative opportunities during the current business plan period, and future business plans;

2. good practice and lessons learnt should be shared between water and sewerage companies and partners, to demonstrate that collaboration can save money, unlock investment, and deliver multiple benefits;
3. continued engagement with UK Government is required to clarify areas that remain difficult to resolve, such as definitions and responsibilities about flooding from sewers.

Benefits

This research will benefit water and sewerage companies and partners as they seek to identify, appraise and deliver collaborative opportunities. It helps determine how to assess the costs and benefits accruing to different organisations and hence consider a suitable funding contribution for a collaborative project.

**For further information, please contact UK Water Industry Research Limited,
8th Floor, 50 Broadway, London, SW1H 0RG quoting the report reference number**

Acronyms and abbreviations

AMP	Asset Management Plan
BeST	Benefits of SuDS Tool
CBA	Cost Benefit Analysis
CSO	Combined Sewer Overflow
ERDF	European Regional Development Fund
FCRM GiA	Flood and Coastal Erosion Grant in Aid
FRMP	Flood Risk Management Plan
IDB	Internal Drainage Board
LEP	Local Enterprise Partnership
LFRMS	Local Flood Risk Management Strategy
MTP	Medium Term Plan
NPV	Net Present Value
NRW	Natural Resources Wales
NWL	Northumbrian Water Limited
O&M	Operation and Maintenance
ODI	Outcome Delivery Incentive
OM	Outcome Measure (1, 2, 3, 4a, 4b, 4c)
PC	Performance Commitments
PF	Partnership Funding
PFRA	Preliminary Flood Risk Assessment
PLP	Property Level Protection
PR	Periodic Review
RFCC	Regional Flood and Coastal Committee
SEPA	Scottish Environmental Protection Agency
SFRA	Strategic Flood Risk Assessment

SWMP Surface Water Management Plan

TOTEX Total Expenditure

WaSCs Water and Sewerage Companies

WTP Willingness to Pay

Glossary

Asset Management Plan	A plan for managing water and sewerage company (WaSC) infrastructure and other assets in order to deliver an agreed standard of service. The Asset Management Plans inform the WaSCs business plans submitted to Ofwat every 5 years and which forms the basis by which price limits for customers are set. These plans identify the timescales and levels of investment required to maintain the serviceability of the assets and improve service where appropriate.
Benefit-Cost Ratio (BCR)	A ratio of the present benefits and costs of an option. A BCR of >1 indicates benefits are greater than costs.
Cost-benefit analysis	Analysis which quantifies in monetary terms the costs and benefits of a proposed scheme, including items which the market does not provide a readily available monetary value. Sometimes referred to as Benefit-Cost Analysis.
Combined Sewer Overflow	Combined sewer overflow is the discharge of untreated wastewater from a sewer system that carries both sewage and storm water (a combined sewerage system) during a rainfall event. The increased flow caused by the storm water runoff exceeds the sewerage system's capacity and the sewage is allowed to overflow into streams and rivers through CSO outfalls.
Flood and Coastal Erosion Risk Management Grant in Aid	Grant in Aid funding is provided by Defra to the Environment Agency to invest in flood risk management schemes.
Flood Risk Management Plan	A plan for the management of a significant flood risk. The plan must include details of – a) objectives set by the person preparing the plan for the purpose of managing the flood risk, and b) the proposed measures for achieving those objectives (including measures required by any provision of an Act or subordinate legislation).
Fluvial flooding	Occurs when water overtops the banks of the watercourse. This can occur because there is more water draining into the channel than it can hold, or because it is blocked.
Groundwater flooding	Caused when the water level held within underground rocks rises above the surface. Groundwater tends to respond to rainfall more slowly than water in rivers or on the surface. This slow response means that groundwater flooding can occur a long time after prolonged or heavy rainfall and can last for a long time (often several weeks or

months).

Local Flood Risk Management Strategy	A LFRMS is a Lead Local Flood Authority's strategy for how it will manage local flood risk. It sets out the objectives for managing flood risk, an understanding of local flood risk, and the measures to be taken to manage local flood risk.
Net Present Value	The discounted value of a range of costs and benefits. NPV is used to describe the difference between the present value of costs and benefits in future years.
Periodic Review	Ofwat requires WaSCs to periodically submit proposed business plans and price limits for customers. This 'periodic review' has taken place every five years since 1994.
Preliminary Flood Risk Assessment	<p>A PFRA is an assessment of floods that have taken place in the past and floods that could take place in the future.</p> <p>It considers flooding from surface water runoff, groundwater and ordinary watercourses.</p> <p>The PFRAs are used to identify areas that are at risk of significant flooding. These areas are called flood risk areas. Lead local flood authorities are responsible for and have prepared the PFRAs and identified the flood risk areas.</p>
Placemaking	An integrated approach to the planning and design of public and urban spaces.
Pluvial flooding	'Pluvial' flooding (or surface runoff flooding) is caused by rainfall and is that flooding which occurs due to water ponding on or flowing over the surface before it reaches a drain or watercourse.
Strategic Flood Risk Assessment	A SFRA provides information on areas at risk from all sources of flooding. The SFRA should form the basis for flood risk management decisions, and provides the basis from which to apply the Sequential Test and Exception Test.
Surface Water Management Plan	A plan which consider the risks of flooding from surface water, and develops options and an action plan to mitigate these impacts.

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1 Introduction

1.1 Project need

Water and sewerage companies, regulators, local government and communities together face significant challenges relating to water within urban environments. These include managing flood risk, reducing pollution, enhancing the environment, creating resilient communities and infrastructure, adapting to the impacts of climate change, managing ageing assets, and supporting economic growth. There is ever-increasing pressure to keep water bills down and improve efficiencies in public spending. Working in partnership will help organisations achieve better outcomes more effectively by aligning programmes, funding, and other resources or information available to them.

Many UK Water and Sewerage Companies (WaSCs) have already made a commitment to partnership working in their business plans. However, it can be challenging to agree how to align funding and priorities for investment. The complex institutional arrangements make it difficult for partners to pool resources, align programmes and address design standards. It is also difficult to make the necessary organisational and partnership cost-benefit arguments to justify investment in joint solutions. Defra's review of partnership funding policy in 2014 also identified the need to build capacity amongst practitioners to unlock funding (Defra, 2014). Furthermore, Defra's Statement of Obligations for PR14 explicitly recognised the importance of WaSCs in England working with partners to develop shared understanding of risks and the benefits of delivering integrated solutions (Defra, 2012b).

In order to ensure successful and cost-effective collaboration, WaSCs and their partners need to be able to make the right choices as to whether, when, where and how to pool resources with other organisations. To facilitate this some key questions need to be addressed, such as:

- What factors determine whether a scheme is suitable for collaborative delivery (including co-funding), and how can we identify those that are?
- How can different design standards, funding processes and organisational accountabilities be managed?
- How can costs and benefits be assessed fairly across multiple organisations?
- How can we ensure solutions are delivered and the benefits fully realised?

1.2 Project scope

This research project was commissioned to help WaSCs and their partners identify, appraise and deliver collaborative opportunities across England, Wales and Scotland. It seeks to raise awareness of existing good practice and lessons learnt via case studies and provide a collaboration platform for WaSCs and partners.

There is a range of scenarios where a WaSC may collaborate with other organisations to identify, appraise and deliver collaborative opportunities, and Figure 1 outlines the primary

opportunities. The focus is on managing flooding, but the principles will be applicable across the full range of opportunities shown.

Figure 1 Areas of opportunities for collaboration



Partners may include a diverse range of organisations including Lead Local Flood Authorities (County Councils and Unitary Authorities), highways authorities, local authorities (through their land drainage responsibilities), the Environment Agency (England), Natural Resources Wales (NRW), and internal drainage boards (IDBs)¹. Collectively these organisations are “Risk Management Authorities” under the Flood and Water Management Act 2010 which applies to England and Wales, or “responsible authorities” under the Flood Risk Management (Scotland) Act 2009². It may also include organisations such as Network Rail, Highways England or developers who are not Risk Management Authorities but who are seeking to collaboratively address flooding, pollution or resilience issues within a catchment, for example.

Other types of organisations (e.g. Local Enterprise Partnerships in England) often play a role in the collaborative funding of flooding resolution schemes; however, these are not the primary focus of this project. Typically, organisations in this wider field of interest are most likely to become involved in the type of schemes addressed by this project through a public sector organisation such as a local authority, and would not be the initiator. There is a significant body of research and guidance dealing separately with the wider field of funding and the engagement of other types of organisations (e.g. Defra, 2012 and Environment Agency, 2012).

¹ NB: IDBs were merged into the NRW in April 2015, so no longer exist in Wales. Similarly, there are no IDBs in Scotland

² <http://www.gov.scot/Topics/Environment/Water/Flooding/FRMAct>

The project focuses on how partners can appropriately contribute financially to fund collaborative schemes, but recognises the critical importance of sharing other resources (such as skills, contacts, data and information, and access to land) in facilitating partnership delivery.

The project scope has been developed through four stages, which are described below.

- **Stage 1: Clarification & inconsistencies.** This stage focused on evaluating definitions of flooding based on legislation, guidance and practice. Much of this work is under consideration by Water UK and is referenced in Section 4.2 of this report.
- **Stage 2: Partnership working good practice.** This stage captured examples of partnership working and reviewed these to develop an understanding of current practices. In addition, case studies covering a range of partnership funding scenarios were considered. The focus was to identify existing design standards, how benefits are appraised, what worked/did not work well, how these projects were financed, how costs and benefits were shared, how risks were apportioned, and how differences in design standards were managed.
- **Stage 3: Develop guiding principles for partnership projects.** The purpose was to enable project partners to evaluate the opportunities and benefits of aligning funding. The principles are not prescriptive, but provide a systematic approach for WaSC and partners to pursue collaborative opportunities.
- **Stage 4: Final reporting.** This stage has communicated the research findings. The outputs comprise:
 - Final report, including relevant appendices, and;
 - Dissemination seminar (Technology Transfer seminar) at project close, which was held in April 2016.

1.3 Target audience

This report has been written primarily for Risk Management Authorities/Responsible Authorities to raise awareness of existing good practice of collaborative working, and to provide common principles to unlock more collaborative opportunities between WaSCs and partners. It is written primarily from a WaSC perspective, but will be of use to partners to promote greater collaboration.

1.4 What is a partnership?

There are many different definitions of collaborative working. In this context the working definition of a partnership project is where two or more organisations work together to:

- develop a shared understanding of risks (e.g. flooding, pollution) through studies/investigations, sharing of data and information, and engagement across organisations, which will lead to identification and/or prioritisation of future collaborative schemes;

- develop the business case and/or design of investment in flooding or pollution for example, and;
- implement a flood risk management, pollution or resilience driven scheme, including a sharing of delivery risks, and obtaining benefits from the scheme.

Partnership working can encompass a broad range of activities and could include, for example: sharing of data and information, access to knowledge and expertise, sharing of resources to develop and design future investment, access to supply chain partners, monetary contributions, and sharing of delivery risks.

1.4.1 Project partners

Whilst this report focusses on WaSCs and public sector organisations with a delivery role in managing flooding, pollution, asset resilience, and supporting economic growth in England, Wales and Scotland there are a range of other sources of funding for collaborative projects (either through cash or in-kind contributions). These could include:

- Local Enterprise Partnerships (LEP) (England);
- businesses or other beneficiaries;
- developers;
- lottery funding;
- European Union funding;
- charitable sectors;
- local communities, and;
- Water Framework Directive and other catchment-based funding initiatives.

1.4.2 Starting assumptions for a partnership

The following are fundamental assumptions regarding the environment required to maximise the chances of partners successfully identifying, developing, appraising and delivering a collaborative scheme. Without these in place it is harder to deliver collaborative opportunities.

1. There is an existing local partnership arrangement in place, where there is genuine and mutual trust between partners, and an understanding of the common outcomes that can be delivered through collaboration. As part of this there is a genuine understanding of the potential mutual benefits to all organisations.
2. Data and information can be shared freely between partners. This should include flooding records, asset data, models, pollution data, anecdotal evidence and photos/videos, and information on future development and economic growth.

Furthermore there is a willingness to share information about how different organisations prioritise projects, and appraise benefits.

3. There is senior level buy-in from all partners. During stakeholder interviews senior level support was critical to setting the right foundations, which made it difficult to pursue collaborative working. South West Water hosted an MBA Student for their consultancy project which considered barriers to collaborative working, and identified that senior-level support was the biggest internal barrier for organisations³.
4. Partners work together throughout the project life cycle, including the subsequent operational stages. There is a greater chance of delivering a collaborative project if partners have collaborated from the outset, worked together to agree shared outcomes, understood risks, assessed options, and developed the respective business cases together. This could include, for example, commissioning a joint investigation of a flooding issue within a catchment where there are multiple sources of flood risk.

1.5 Structure of this report

This report sets out the findings of the project. The report structure is as follows:

- section 2 describes the methodology adopted for the project, including a summary of stakeholder consultation to date;
- section 3 provides an overview of the roles and responsibilities for flood risk management, and describes funding mechanisms for WaSCs and public sector organisations in England, Wales and Scotland;
- section 4 summarises the current practice, based on the research to date;
- section 5 describes the benefits associated with collaboration;
- section 6 considers the challenges or barriers associated with collaboration, and;
- section 7 describes the guiding principles for collaborative opportunities (stage 3).

This report is supplemented by a PDF non-technical summary, which describes the key outputs from the project.

³ Richard Behan, South West Water, *pers. comm.*

2 Methodology

2.1 Stages 1 & 2 – Current practice

Stages 1 and 2 of this project focussed on considering current practice for collaborative projects, and eliciting stakeholder requirements for the future stages of the project. For Stages 1 and 2 the approach has been to:

- undertake a targeted review of relevant literature and guidance on collaborative funding;
- identify case study examples of collaborative funding in practice, and;
- undertake targeted stakeholder engagement with water and sewerage companies, local authorities and regulators.

The relevant literature and guidance used to inform stages 1 and 2 of the research project are identified in Section 8, and a summary of all case study examples is provided in Appendix A. Details on the stakeholder engagement approaches are provided in Section 2.1.1.

2.1.1 Stakeholder engagement

During stages 1 and 2 of the project a series of structured interviews were undertaken with a range of stakeholders:

- to understand current practice in identifying and appraising collaborative opportunities;
- to identify differences and synergies with existing design standards, costing and the benefits appraisal methods used by partners;
- to identify examples of partnership working within the UK;
- to understand organisations' perceptions of the barriers and benefits associated with collaborative opportunities, and;
- to establish how the guiding principles can support successful delivery of collaborative projects.

Structured interviews were undertaken with the majority of UK WaSCs, the Environment Agency, Scottish Environment Protection Agency (SEPA), Welsh Government, Defra, NRW, and six local authorities⁴. In addition, representatives from the project team presented the project at the Regional Flood and Coastal Committee (RFCC) Chairs meeting in September 2015, and obtained useful feedback to inform the project.

⁴ The local authorities were selected based on those with experience of delivering co-funding schemes

2.2 Stage 3 – Development of guiding principles

During this stage a series of guiding principles have been developed to ensure organisations have a clear approach for identifying, appraising and delivering collaborative projects. The guiding principles were developed as a direct result of the findings from stages 1 and 2, and were designed to address some of the key challenges identified during stakeholder engagement. The guiding principles are not intended to be prescriptive, but rather to present a potential approach for partners to use to identify, develop, appraise and deliver collaborative opportunities. At a local level partners may approach collaborative opportunities differently to the guiding principles presented in this report.

The guiding principles are supported throughout by worked examples to demonstrate how the principles could be implemented, and case studies which showcase where WaSC and partners have already adopted some of the guiding principles.

It is intended that the guiding principles can easily be embedded into existing planning and funding processes. This has been done to enable partners to consider the collaborative workflow as part of planning processes and funding cycles, rather than creating a wholly new and separate process.

2.3 Stage 4 – Reporting and dissemination

This report is the main technical summary of the project. It is supplemented by a summary document which highlights the most salient findings from the research project.

In order to maximise the impact of this research project and ensure uptake by various organisations additional work will be required to disseminate the guiding principles. During the course of the project several activities were undertaken by the project team and the steering group to promote and raise awareness of the research project, including:

- presenting the project at the RFCC Chairs meeting⁵ in October 2015;
- presenting a workshop at the CIWEM Urban Drainage Group conference in November 2015;
- presenting at the Environment Agency's meeting of all Partnership and Strategic Overview team leaders in November 2015;
- attending the ADEPT flood and water management sub-group in December 2015, and;
- hosting a Technology Transfer workshop in London in April 2016.

Further dissemination and engagement by project partners will take place during 2016.

⁵ England only

3 Existing institutional arrangements

3.1 Roles and responsibilities for flood risk management

The roles and responsibilities for flood risk management in England, Wales and Scotland are set out in legislation, policy and guidance such as the Flood and Water Management Act (2010), Flood Risk Management (Scotland) Act (2009) and Water Industry Act (1991). There is already a significant existing body of evidence to describe the roles and responsibilities of different organisations with a role in resolving flooding. It is therefore not considered necessary for this project to repeat existing information, except to highlight the key roles and responsibilities. This helps to set the context and arrangement by which organisations may come together to jointly fund flood risk management schemes.

Figure 2 and Figure 3 highlight the roles and responsibilities for flood risk management in England, Wales and Scotland. Further information on these roles and responsibilities and background information about the relevant legislation, policy or guidance for the relevant jurisdictions is available at:

- England – “The national flood and coastal erosion risk management strategy for England” (Defra and the Environment Agency, 2011);
- Wales – “National Strategy for Flood and Coastal Erosion Risk Management in Wales” (Welsh Government 2011), and;
- Scotland – “Delivering Sustainable Flood Risk Management” (Scottish Government, 2011) and “Surface Water Management Planning Guidance” (Scottish Government, SEPA and Scottish Water, 2013).

It can be difficult to determine responsibility, particular in complex flooding situations or where there is an interaction across flooding sources/pathways. This can result in situations where no organisation takes responsibility for the resolution, or an opposite situation where an organisation bears the majority or all of the project costs. This can often arise in catchments with complex or long-standing flooding problems. Building genuine trust between partners, and ensuring regular dialogue should enable partners to be robust and transparent about how to work together when the responsibility remains unclear.

This is particularly the case with respect to flooding from the public sewer network, because of complexities about definitions of sewer flooding. Sewer flooding is not defined in the Water Industry Act 1991, which has led to different interpretations of sewer flooding. Furthermore, flooding from the public sewer network can occur because of operational problems in the network (e.g. blockages), or when the hydraulic capacity of the network is exceeded. The hydraulic capacity of the network can be exceeded for a variety of reasons, some of which may be considered outside of the statutory duty of the WaSCs under the Water Industry Act 1991. This could include scenarios where flooding from the public sewer network is caused wholly or partly by:

- high water levels at outfalls preventing egress from the public sewer network;

- watercourses which ingress into sewers, or;
- flows entering the sewer network which are outside the definitions of 'domestic sewerage purposes' under Section 117 the Water Industry Act 1991⁶ such as runoff entering the network from upstream land drainage.

The Water UK Surface Water Management Network has been undertaking some work to seek a common understanding of sewer flooding between WaSCs. This has included development of scenarios about the responsibility of WaSCs under some of the scenarios described above. The Water UK work should be referred to for further detail on this subject.

⁶ The duty extends to 'domestic sewage purposes' for any one or more of the following purposes: 1) the removal, from buildings on the premises and from land occupied with and appurtenant to the buildings, of the contents of lavatories, 2) the removal, from such buildings and from such land, of water which has been used for cooking or washing; and, 3) the removal, from such buildings and such land, of surface water

Figure 2 Roles and responsibilities for flood risk management delivery in England and Wales (NB: this is a simplified schematic)

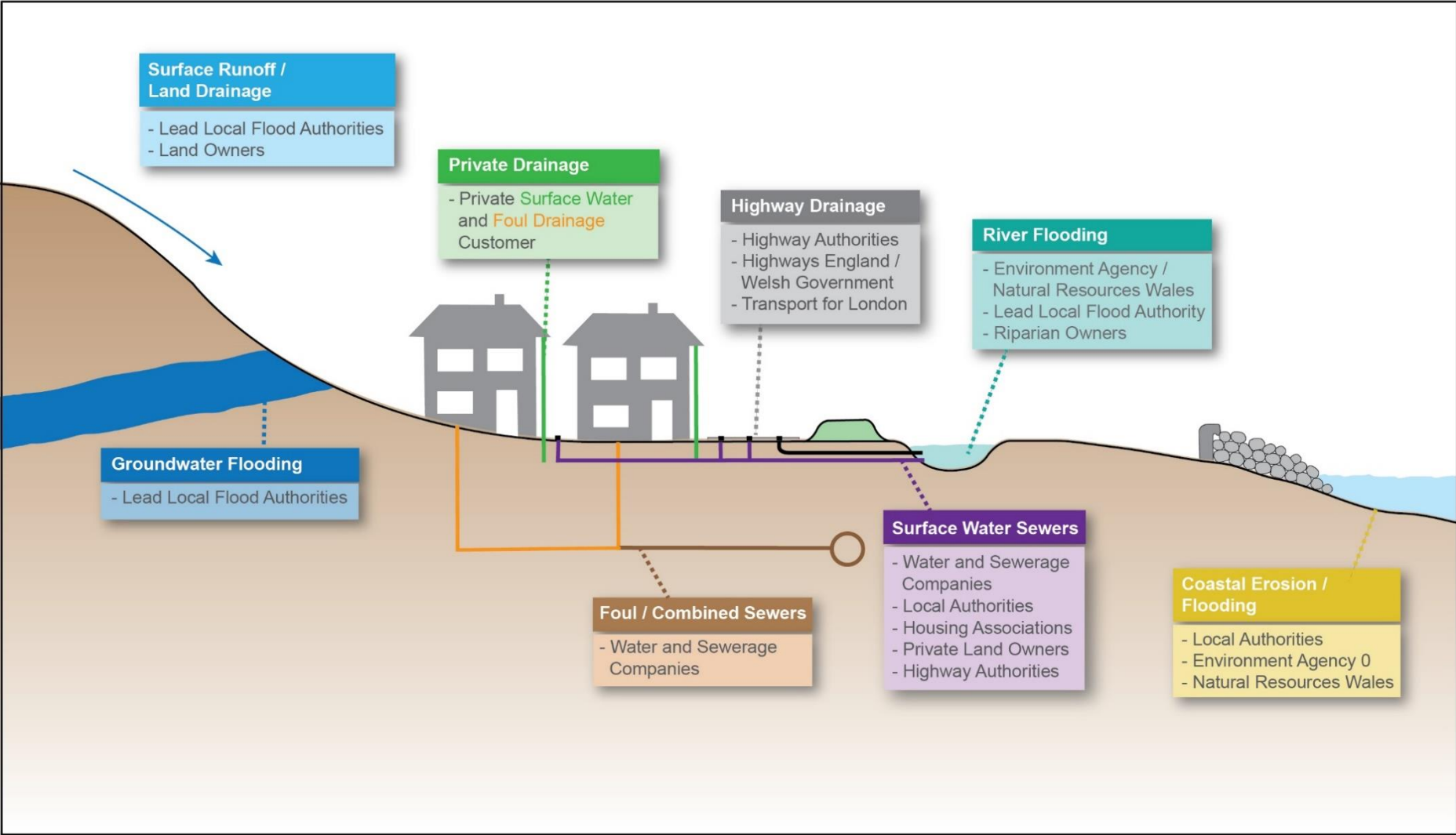
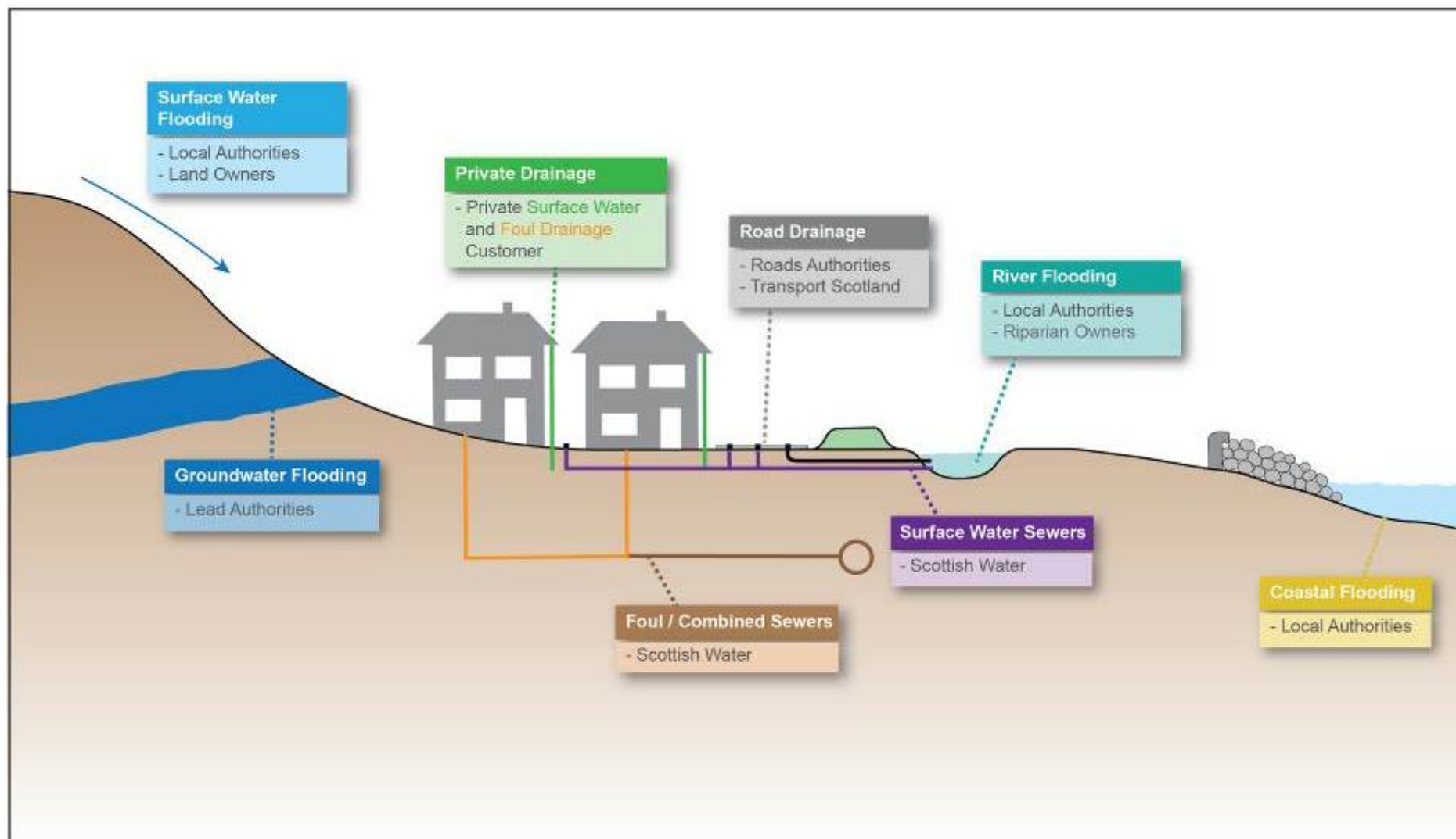


Figure 3 Roles and responsibilities for flood risk management delivery in Scotland (NB: this is a simplified schematic)



3.2 Investment drivers for organisations

For collaborative opportunities to be realised they need to link into at least one of the common drivers for investment highlighted in Table 1. Schemes which meet the individual organisations' investment drivers but do not meet any of the common drivers may be less likely to have potential for collaborative funding between WaSCs and public sector organisations, although partners will still work together to share knowledge and information even where no financial contribution could be made towards investment. Section 3.3 describes how WaSCs and public sector organisations develop and obtain funding for a scheme which meets one or more of these objectives.

Table 1 Drivers for investment for Risk Management Authorities / Responsible Authorities

Driver	Relevant to WaSC?	Relevant to local authorities?	Relevant to Environment Agency / NRW ⁷ ?	Relevant to Internal Drainage Boards?
Managing sewer flooding	✓			
Managing flood risk (fluvial, surface runoff, tidal, groundwater)	✓ ⁸	✓	✓	✓
Managing water quality (e.g. meeting Water Framework Directive / Bathing Water Directive)	✓	✓	✓	✓
Resilience of infrastructure to hazards	✓	✓	✓	✓
Protecting the environment (e.g. biodiversity and ecology)	✓	✓	✓	✓
Operational costs to maintain / operate infrastructure	✓	✓	✓	✓
Carbon footprint associated with construction and operational activities (e.g. pumping)	✓	✓	✓	✓
Creating capacity for growth or increases in flow due to future climate change	✓	✓	✓	
Customer satisfaction	✓	✓	✓	✓

⁷ This excludes SEPA who do not have a delivery role in implementing flood risk management infrastructure

⁸ WaSCs, as Risk Management Authorities, have a broader interest in flood risk management

Driver	Relevant to WaSC?	Relevant to local authorities?	Relevant to Environment Agency / NRW ⁷ ?	Relevant to Internal Drainage Boards?
Placemaking		✓		
Health & wellbeing		✓		
Economic growth		✓		
Development / regeneration	✓	✓		
Climate change adaptation (e.g. resilient / adaptive design)	✓	✓	✓	✓

3.3 Identifying and obtaining funding

3.3.1 Water and sewerage companies

A WaSC will use a number of principles to assess whether or not a collaborative opportunity can support delivery of their outcomes. These are not unique to WaSCs, and public sector organisations will use similar principles to determine whether to pursue a collaborative opportunity.

1. Outcomes are delivered in the most cost effective manner possible. In other words, the water company is either spending less or achieving more than it would by addressing the issue alone.
2. Outcomes can be clearly identified from any collaborative project. The WaSCs need to be confident that using a collaborative approach will deliver the outcomes that are required by regulators and in their Outcome Delivery Incentives (ODIs).
3. Expenditure should not be used to deliver outcomes which are solely the responsibility of other partners. It is difficult to determine responsibility in complex flooding situations or where there is an interaction across flooding sources because it can be challenging to fully understand the causes of flooding, and there are differing views about how responsibilities, outcomes and funding should be apportioned in these circumstances. In areas where responsibility is complex or unclear partners will need to work together to understand the issues and apportion funding for any investment. The contribution of the WaSC should be cost beneficial and proportional to the level of risk to its assets and customers. The WaSC is only likely to invest in a partnership if the return on investment⁹ will be greater than by working on a WaSC only funded scheme. This could include delivering more benefits for the same whole

⁹ This can be measured in several ways, including benefit-cost ratio, Net Present Value, or internal rate of return

life costs, delivering the same benefits for a lower whole life cost, or unlocking investment where it was previously not feasible (e.g. accessing different funding sources through partners).

3.3.1.1 England and Wales

At a planning level WaSCs in England and Wales operate on five yearly Asset Management Plan (AMP) cycles, which set out the investment each company will take to meet the objectives and outcomes stated in their business plans. The latest price review, which sets the investment each company will make from 2015-2020 (AMP6) represented a step change in the way business plans were prepared and regulated by Ofwat.

Companies were encouraged to engage their customers in the development of their business plans. The engagement was conducted via the creation of Customer Challenge Groups and robust customer research, ensuring that customers' wants and needs were reflected in the plans. The customer engagement process resulted in companies identifying a set of outcome measures which sit below the company's strategic direction statement and above their existing measures of service, serviceability and performance.

Within each outcome, the companies set and agreed Performance Commitments (PCs) with Ofwat. Each PC contains an Outcome Delivery Incentive (ODI), which may carry financial rewards, penalties or both. The PCs can also be reputational. The financial reward or penalty (the ODI) is applied depending on the companies' performance against their PCs.

Each WaSC has defined their own ODIs for the AMP and there is significant variation across the UK WaSCs. Nevertheless there are similarities¹⁰ in the overall nature of these ODIs. Of relevance to this project are ODIs related to managing sewer flooding, protecting the environment, customer satisfaction, avoidance of supply interruptions¹¹, and reduction in carbon footprint. Collaborative projects can help to meet these ODIs and projects which seek partnership funding will need to be able to demonstrate a contribution towards meeting these ODIs. Some companies' outcomes include measures of partnership working. They may also include named/mandated projects or schemes that must be delivered to time and budget.

At the same time as promoting outcomes for business planning, Ofwat encouraged water companies to consider total expenditure (totex) in their planning activities and to demonstrate that their proposed investment plans provided the right balance between capital and operational expenditure. The focus on totex means that water companies will seek to fully understand the whole life costs associated with working in partnership.

¹⁰ For example, both Severn Trent Water and Anglian Water have ODIs about partnership working

¹¹ The resilience of an asset to flooding could affect the risk of supply interruptions

All water company planned expenditure must be justified in terms of the contributions towards achieving outcomes. The companies are monitoring and measuring their performance to ensure they meet their agreed targets.

At an individual scheme level, WaSCs have information on the WTP and on the value of benefits to customers through their investment. This information, different for each WaSC¹², can be shared with scheme partners, where relevant, to inform decision-making and partnership working¹³. However, because WaSCs focus on meeting their outcomes there will be some flexibility to accommodate investment for reputational reasons, or to undertake investment that may not be cost-beneficial where it supports delivery of one or more outcomes.

3.3.1.2 Scotland

In Scotland, the Scottish Government regulates the sole WaSC, Scottish Water, through the Quality & Standards process (Figure 4). The Scottish Government defines the objectives for Scottish Water and this is key to their six-year investment programme. Scottish Water develops a business plan and subsequently delivers the investment priorities set by the Scottish Government, within the funding allowed by the Water Industry Commission for Scotland, who are the economic regulator. As the economic regulator, the Water Industry Commission for Scotland sets the charges, and reports on costs and performance. The latest investment cycle, which runs from 2015-2021, will result in a £3.5 billion investment by Scottish Water¹⁴.

¹² There is no national average for WaSCs to invest in reducing sewer flooding or pollution. Every WaSC has undertaken WTP surveys of their customers and the information is therefore specific to that WaSC region.

¹³ This may be subject to a data sharing agreement between partners

¹⁴ <http://www.scottishwater.co.uk/about-us/media-centre/latest-news/six-year-scottish-water-investment-announced>

Figure 4 Stakeholder relationships in the water industry in Scotland¹⁵



3.3.2 Public sector organisations

3.3.2.1 England

In England the Environment Agency, Internal Drainage Boards and local authorities¹⁶ are the primary public sector organisations with responsibility for managing flood risk, as Risk Management Authorities under the Flood and Water Management Act 2010¹⁷. The need for flood risk management schemes will be identified from a number of sources, including:

- Local Flood Risk Management Strategies (LFRMS);
- Strategic Flood Risk Assessments (SFRA), Preliminary Flood Risk Assessments (PFRA) Surface Water Management Plans (SWMP)¹⁸;
- Flood Risk Management Plans (FRMP);
- WaSC sewer flooding records or Sustainable Drainage Plans/Drainage Strategy Frameworks;

¹⁵ Taken from <http://www.scottishwater.co.uk/business/about-us/governance/water-industry-in-scotland>

¹⁶ Both Lead Local Flood Authorities and lower tier authorities (NB: this includes highways authorities)

¹⁷ <http://www.legislation.gov.uk/ukpga/2010/29/contents>

¹⁸ These are non-statutory and England only

- flood reports / incidents or flood investigations under Section 19 of the Flood and Water Management Act 2010, and/or;
- modelling studies which are discrete from SWMP or FRMP (e.g. river flood modelling).

Once the need for a flood risk management scheme has been identified public sector funding primarily comes from Flood and Coastal Erosion Risk Management Grant in Aid (FCRM GiA), RFCC Local Levy, and local authority capital/revenue funding.

With respect to FCRM GiA, funding is available to projects relating to all sources of flooding (except for sewer flooding) and is the largest funding source for flood risk management in England. Investment to alleviate sewer flooding alone cannot qualify for FCRM GiA. In circumstances where surface runoff (or other sources of flooding) contribute towards flooding from the sewer network the WaSC and partners should work together to understand the cause of flooding and confirm the proportion of flooding caused by flows other than from WaSC customers. Where the flooding from the sewer network is partially caused by non-WaSC customers there may be a case for WaSC and partners to apply for FCRM GiA.

To be eligible for FCRM GiA a flood risk management scheme must deliver against defined 'outcome measures', which are used to calculate how much funding a scheme will receive. There are four categories of 'outcome measures' which are used to calculate the amount of FCRM GiA that could be allocated to a scheme. These are listed below, alongside the payment rate associated with each outcome (Defra, 2011).

- OM1 - All benefits arising as a result of the investment, less those valued under the other outcome measures (payment rate of 5.56p per £1 of qualifying whole life benefit).
- OM2 - Households moved from one category of flood risk to a lower category¹⁹ (payment rates are 45p per £1 qualifying whole life benefit for 20% most deprived households, 30p per £1 whole life benefit for 21-40% most deprived households, and 20p per £1 for 60% least deprived households).
- OM3 - Households better protected against coastal erosion (payment rate same as OM2).
- OM4 - Statutory environmental obligations met through flood and coastal erosion risk management (£15,000 per ha of water-dependent habitat created or improved to help meet the objectives of the Water Framework Directive (WFD) (OM4a), £50,000 per ha of inter-tidal habitat created or improved to help meet the objectives

¹⁹ The flood risk bands are: Very Significant Risk (5% or greater annual chance of flooding (1 in 20)), Significant Risk (Greater than 1.3% (1 in 75) but less than 5% annual chance of flooding), Moderate Risk (Greater than 0.5% (1 in 200) but less than or equal to 1.3% annual chance of flooding, and Low Risk (0.5% or less annual chance of flooding)

of the WFD for areas protected under the EU Habitats or Birds Directive (OM4b), £80,000 per kilometre of river protected under the EU Habitats or Birds Directive improved to help meet the objectives of the WFD (OM4c).

The maximum amount of Grant in Aid funding available for each project will be based on the value of qualifying benefits under Outcome Measures 1, 2 and 3, plus the number of environmental outcomes achieved under Outcome Measure 4, each multiplied by the relevant payment rate. The total is then divided by the whole life costs of the project and expressed as a percentage score; the 'Raw OM Score'. This determines how much FCRM GiA may be available for project. Figure 5 illustrates this.

Figure 5 Calculating eligible FCRM GiA (NB: FDGiA is now known as FCRM GiA)

Eligible £ FDGiA = H + B + E	
H	= value of qualifying Household benefits x payment rate
B	= value of other whole-life Benefits x payment rate
E	= no. of Environmental outcomes x payment rates
PF Score %	= $\frac{\text{Eligible £ FDGiA}}{\text{Project whole life costs}}$

Where the Raw OM Score is less than 100% cost efficiencies or contributions from third party funders will be required to secure FCRM GiA. A score of 100% does not guarantee FCRM GiA because the overall availability of funding will be a consideration in allocating FCRM GiA to schemes.

To apply for, and obtain, FCRM GiA Risk Management Authorities must submit projects for inclusion in the flood and coastal erosion risk management investment programme, which currently runs from 2015-2021. The process is summarised below²⁰.

- Risk Management Authorities must submit a project proposal/project mandate, which gives details about the project need, objectives, cost, programme, and Outcome Measures forecast to be delivered. The Partnership Funding Calculator must be populated to identify the amount of potential FCRM GiA funding based on the qualifying benefit, and the scale of any potential partnership funding required. A successful application will be added to the investment programme, either on the 'development' programme, or the 'pipeline' programme²¹.

²⁰ Further information is available at: <https://www.gov.uk/government/collections/flood-and-coastal-defence-funding-for-risk-management-authorities>

²¹ The 'development' programme comprises projects with the full funding package in place and expected to start construction in future years subject to approval of the business case, and projects in development,

- A business case for the scheme will need to be completed and approved by the Environment Agency. The Environment Agency is now using the five-case business model, which includes the strategic case, economic case, financial case, management case and procurement case²². For a business case to be approved sufficient partnership funding must be in place and a suitable agreement signed by partners to meet any funding gap between what is available from FCRM GiA and the whole life costs of the scheme.
- Once the business case is approved funding for the construction can be released from FCRM GiA.

In addition to FCRM GiA the RFCC Local Levy²³ is an important contributor to funding for flood risk management in England. RFCCs have an important role in approving FCRM GiA funding. RFCC Local Levy funding can be used to support flood risk management projects that do not attract 100% national funding through FCRM GiA, thus enabling locally important projects to be undertaken to reduce the risk of flooding within the RFCC area. RFCC Local Levy funding can also be used to prioritise locally important projects that are not successful in applying for FCRM GiA funding.

Finally, in England, local authorities have capital and revenue budgets which could be used to fund flood risk management activities. This is particularly relevant where a flood risk management scheme can deliver multiple benefits that support local authorities' broader economic and social objectives. Local authority budgets are typically allocated annually and need to be utilised within the same financial year, although it is possible to capitalise a flood risk management scheme, for example, which will enable local authorities to carry funding over to subsequent financial years.

3.3.2.2 Wales

In Wales, flood risk management schemes will typically be identified by NRW Wales or local authorities. Flood risk management schemes will be identified through similar studies, plans and reports as those in England because England and Wales are currently subject to the same statutory framework for flood risk management (Flood Risk Regulations 2009²⁴ and the Flood and Water Management Act 2010). However, it is worth noting that flood risk management and coastal protection are matters that are wholly devolved to the National Assembly for Wales by Schedule 7 of the Government of Wales Act 2006.

expected to start construction in future years, subject to approval of a full business case and securing other funding contributions. The 'pipeline' programme is a list of projects that are likely to qualify for some government funding before 2021 and have been given an indicative allocation. However they have not yet identified sufficient contributions and/or do not have a sufficiently well-developed case to enter the development programme at this stage

²²https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469317/green_book_guidance_public_sector_business_cases_2015_update.pdf

²³ <https://www.gov.uk/government/collections/flood-and-coastal-erosion-risk-management-authorities>

²⁴ http://www.legislation.gov.uk/uksi/2009/3042/pdfs/ukxi_20093042_en.pdf

Funding for flood risk management from the public sector is primarily through Welsh Government, which issues grants to NRW and local authorities to deliver schemes. However, Welsh local authorities can also elect to use capital or revenue budgets to fund flood risk management schemes.

Historically, the Welsh Government has allocated approximately 1/3 of its budget to local authorities with the remaining 2/3 allocated to NRW, although in recent years a higher proportion has been allocated to local authorities to provide match funding for projects supported by the European Regional Development Fund (ERDF) (Welsh Government (2014)). Currently, there is no nationally consistent and prioritised method to identify how flood funding from the Welsh Government should be allocated across sources of flooding. Therefore, the Welsh Government consulted on proposals in 2014-2015 to develop a national flood and coastal investment programme to direct investment to the most appropriate areas (Welsh Government, 2014).

The consultation document provides an overview of how funding for flood risk and coastal erosion schemes is allocated. Flooding from the rivers and the coastline is managed by NRW and they have developed a 'Funded and Indicative Medium Term Plan for Flood Risk Management Wales', which runs from 2014/15 to 2023 (onwards). The Medium Term Plan is based on confirmed funding for year 1 projects, and indicative funding beyond that to reflect uncertainties in funding for future years²⁵. The Medium Term Plan has been developed based on priorities from the Communities at Risk Register, and the Welsh Government allocated an annual capital budget to deliver the programme of works (Welsh Government, 2014). The Medium Term Plan has been approved by Flood Risk Management Wales Committee, which also has overall responsibility for the programme²⁶. It is worth noting that the Flood Risk Management Wales Committee has the power to raise a levy to fund flood risks.²⁷

The National Strategy for Flood and Coastal Erosion Risk Management in Wales states that Flood Risk Management Wales Commitment "may need to exercise its levy raising powers in future" (Welsh Government, 2011).

Funding for local flood risk management (by local authorities) is currently made through individual applications to Welsh Government on a scheme by scheme basis. Discussion with Welsh Government during this project has also confirmed that local authority-led schemes will receive a maximum of 85% contribution from Welsh Government, with the remaining

²⁵ The Medium Term Plan is available at: <http://naturalresources.wales/flooding/managing-flood-risk/our-capital-investment-programme-for-rivers-and-the-coastline/?lang=en>

²⁶ Further information about the role of the Flood Risk Management Wales Committee is available at: <http://naturalresources.wales/about-us/our-chair-and-board/our-board-committees/flood-risk-management-wales-committee-frmw/?lang=en>

²⁷ The Environment (Wales) Bill (July 2015) will change how the Flood Risk Management Wales Committee operates, including advice to "Welsh Ministers on flood and coastal erosion risk and providing Welsh Ministers with regulatory powers to establish the membership requirements and proper proceedings of the Committee." More information is available here: <http://www.assembly.wales/research%20documents/15-030-environment/15-030.pdf>

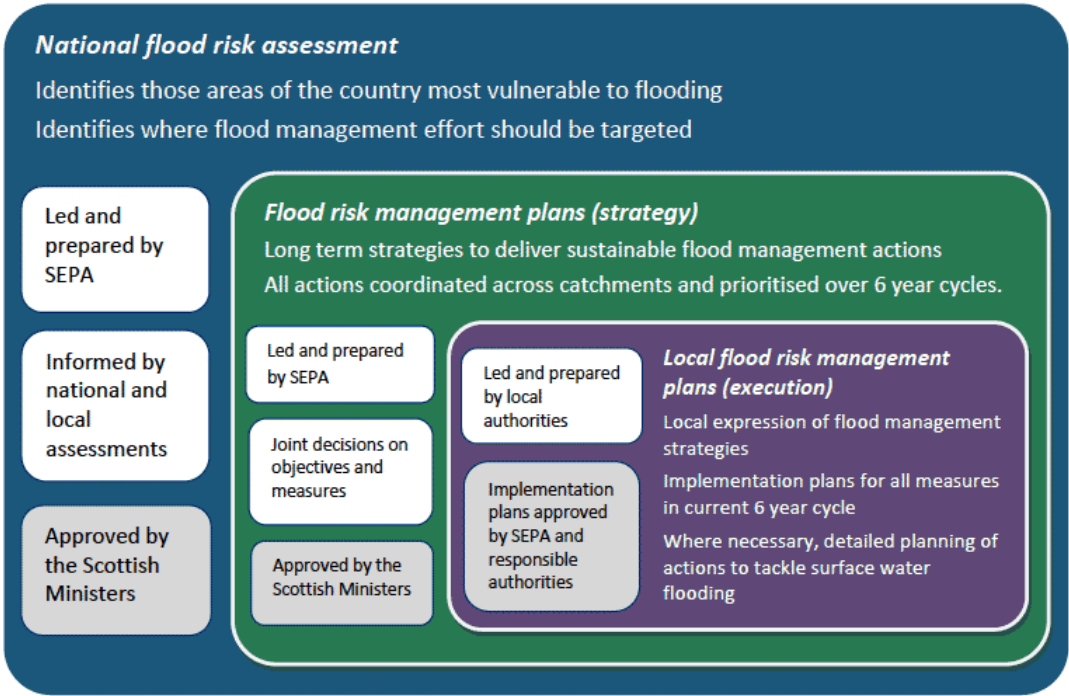
15% needing to be secured from local authorities or partners. Local authorities prioritise schemes based on local need and will submit applications to Welsh Government. These applications must be supported by a project appraisal report which considers the costs and benefits of schemes and whether there is sufficient justification for public expenditure. The process for preparing project appraisal reports is governed by Welsh guidance.

It is worth noting that from 2018 there is a separate programme of work “innovative finance” related solely to coastal work. This will use local authority borrowing powers to release £150 million in total, of which 75% of the repayment would be made by Welsh Government and the remaining 25% would need to come from local authorities, either directly or through partnership funding from third parties. Although coastal, the type of work included could offer benefits for surface water management, sewer flooding, and water company asset resilience.

3.3.2.3 Scotland

Local authorities are responsible for flood risk management in Scotland, including tidal flooding. To identify and prioritise flood risk management schemes in Scotland there is a flood risk management planning process, which is being implemented as a result of the Flood Risk Management (Scotland) Act 2009²⁸ which “establishes a flood risk management planning process for the assessment and sustainable management of flood risks with the aim of reducing the adverse consequences of flooding from all sources, including surface water flooding” (Scottish Government, Scottish Water, SEPA (2013)).

Figure 6 Flood risk management process in Scotland



²⁸ <http://www.legislation.gov.uk/asp/2009/6/section/79>

The Flood Risk Management (Scotland) Act 2009 requires that SEPA must produce Flood Risk Management Plans (Strategies) and that local authorities should produce local flood risk management plans. Collectively, these must set out the objectives for managing flood risk in Potentially Vulnerable Areas, and the measures to achieve these objectives.

With respect to urban drainage and surface water flood risk, the Flood Risk Management Plans (Strategies) and local flood risk management plans will identify the need for SWMPs to identify measures to manage the risk of surface water flooding. Figure 6 outlines the flood risk management planning process in further detail (Scottish Government, Scottish Water, SEPA (2013)).

Historically funding for local authority-led flood risk management has been allocated from two sources:

- annual local authority revenue budgets which are distributed by Scottish Government, although these funds are not ring-fenced, and;
- for schemes over £2m local authorities could apply for specific additional funding from Scottish Government for the scheme.

Historically there was no systematic or nationally prioritised approach to allocate funding for schemes over £2 million. As of the beginning of the 2015/16 financial year the allocation process is changing. First, the £2 million lower limit to apply for additional funding from Scottish Government has been removed, so that lower value schemes can successfully apply for additional funding.

Secondly, a national prioritisation process is being undertaken to identify which flood risk management schemes should be undertaken (SEPA, *pers. comm.*). The details of the national prioritisation process are still being developed, and further information will be available in due course. It is anticipated that the measures identified in local flood risk management plans and SWMPs will identify relevant schemes to inform the allocation of future funding.

4 Current practice for collaboration

4.1 Overview

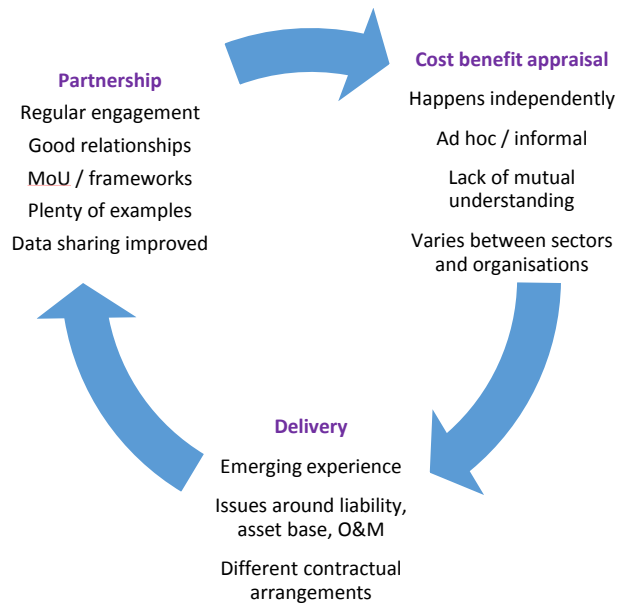
Stakeholder engagement and associated desk study work have demonstrated an encouraging trend in collaboration between WaSCs and partners, some of which are described in Section 7 of this report and in Appendix A. Consultation indicated a gradual progression towards earlier programme sharing and more proactive seeking out of joint opportunities. For the current AMP cycle some WaSCs have specific funding stream and outcomes associated with developing and delivering collaborative opportunities.

Figure 7 provides an overview of the current practice collaborative working at three key stages of a partnership project, including:

- partnership working to share data and information, and identify common interests or opportunities for collaborative working;

- cost-benefit analysis and options appraisal to develop schemes and appropriately apportion funding contributions between partners, and;
- delivery, which considers the mechanisms to deliver the infrastructure.

Figure 7 Overview of current collaborative practice



4.2 Current practice - Partnership

The Flood and Water Management Act 2010 and Flood Risk Management (Scotland) Act 2009 both require different organisations with a role in resolving flooding to co-operate. During the past five years there has been a considerable amount of work done in all jurisdictions on establishing partnering relationships between the risk management authorities, including setting up strategic partnerships, establishing terms of reference and memorandums of understanding, and other positive relationship building measures.

There is substantial evidence from the stakeholder consultation that partnership working is relatively well established between the majority of WaSCs and relevant public sector organisations. Indeed, stakeholders described an increasing recognition of the skills, expertise and access different organisations bring to collaborative projects. For example, local authorities can bring powers, duties and expertise which do not exist within WaSCs, such as power to undertake works on the public highway. Some challenges remain, particularly around sharing of information, but this is considered to be localised rather than systemic.

To describe the current practice for partnerships the following quotes from the Environment Agency document M305 (Environment Agency, 2012) are helpful:

'Collaboration is when people choose to work together to achieve something which they could not achieve by working alone'

'Collaboration turns into partnership when it involves more formal and substantial sharing of agreed risks, responsibilities and benefits'

There is an increasing trend towards 'partnership', and there are numerous examples of partners sharing programmes, risk and responsibilities. These are described in Section 7. However, there do remain some wider challenges to enable this type of partnership becoming standard practice. The stakeholder consultation process identified these challenges, which Section 6 describes. It is largely within the gift and responsibility of Risk Management Authorities/Responsible Authorities to overcome some of these barriers, although some may require regulatory or policy change/clarification.

4.3 Current practice - Cost-benefit analysis

There are well established appraisal methods to calculate the benefits of investment for some funding sources and partners such as Government funding (e.g. FCRM GiA or funding from Welsh or Scottish Governments) and WaSC funding. Equally for some funding sources a detailed cost-benefit appraisal may not be required, as funding may be justifiable on political priorities or meeting their drivers and objectives. For example, accessing LEP funding in England requires demonstrating how investing in flood risk management will unlock economic growth. This may be done through a monetised assessment of the local economic benefits²⁹, but is not subject to a formalised cost-benefit appraisal.

Fundamentally the basis of cost-benefit appraisal is consistent across different stakeholders, namely to deliver the best balance between outcomes delivered and cost. However, there are important differences in how projects are justified and benefits valued between organisations. Table 2 shows these differences.

Table 2 Summary description of economic appraisal for different funding types

Funding Type	Example funding sources	Summary description
WaSC	Five year business plan (England & Wales) Six year business plan (Scotland)	Basis of justification for investment: Identify the appropriate level of investment to achieve a level of service which aligns with customers' preferences, based on Willingness to Pay (WTP) with transfer payments explicit in the process. Approach: Cost-benefit appraisal, based on WTP data, either at a scheme or programme level. Some WaSCs are increasingly seeking to quantify the broader benefits of investment as part of the justification for collaborative schemes, such as

²⁹ Measured through Gross Value Added, for example

Funding Type	Example funding sources	Summary description
		reduced OPEX and creating future headroom for climate change/growth. Each WaSC will have a different approach for cost-benefit appraisal, and different rules for investment.
Local-based	Capital or revenue budgets	Basis of justification for investment: Protect local communities and support local economic growth. Approach: Tends to be less formalised based on local political priorities or strategies (e.g. SWMPs in England), but would still be expected to be cost-beneficial. There are hundreds of local authorities, and they will have different ways to prioritise investment.
National-grant based	FCRM GiA, Grants from Welsh Government, or Scottish Government	Basis of justification for investment: Value economic losses/benefits to the nation as a whole, based on social costs and benefits (not including transfer payments). Approach: Multi-Coloured Manual to quantify a range of national economic losses/benefits. This is used to compare the Whole Life Benefits of different intervention options.

Government funding across the UK is based on a calculation of ‘social costs and benefits’. In this context ‘social’ is used to define the costs and benefits falling on society as a whole (Environment Agency, 2004). The calculation of social costs and benefits distinguishes between impacts on society as a whole and transfer payments, and excludes the latter from the analysis. This is described in the flood and coastal erosion risk management appraisal guidance for England, which states that:

“An economic appraisal for national funding should consider only those benefits and costs accruing within the national boundaries, and treat localised effects, which are offset by gains or losses that occur elsewhere, as transfer payments” (Environment Agency, 2010).³⁰

A WaSC cost-benefit appraisal is typically underpinned by Willingness to Pay (WTP) calculations. WTP is a ‘measure of the net welfare change for each individual that is brought about by the project under consideration’ (Environment Agency, 2004). The welfare change is measured by an individual’s (or group’s) WTP for benefits compared to their willingness to accept the status quo (e.g. flooding). The WTP information collected by WaSCs informs both their business planning process, and decisions to invest on a project by project basis. In

³⁰ As an illustration if a supermarket is flooded then the physical damage to the shop and its stock are considered national losses as they cannot be transferred. However, the loss of trade to that supermarket is considered as a transfer payment because another supermarket would benefit from increased trade.

addition, in England and Wales the newly defined ODIs in AMP6 will also be a critical factor in determining whether a WaSC is willing to invest in a collaborative project.

The Environment Agency (2004) notes that a WTP approach and a 'social cost and benefit' approach are different ways of presenting the same information, and therefore can result in the same net valuation of benefits where properly carried out. In addition, to bring these approaches together would require careful planning and understanding of which benefits are being appraised and how they overlap. These different approaches to cost-benefit appraisal have not been set up to be compatible and as a result it is not easy to join them into an integrated cost-benefit appraisal under current approaches. As a result, the majority of collaborative examples to date have been appraised and justified independently. For example, a local authority undertakes its economic appraisal to justify funding from FCRM GiA and the WaSC undertakes its own cost-benefit analysis (CBA) to justify WaSC funding.

The different mechanisms for valuing benefits can create a number of challenges for collaboration especially related to transparency and the ability to apportion funding contributions. This is a critical aspect to unlocking collaborative projects because the value placed on different benefits, and the way in which this is calculated and built into the scheme appraisal and prioritisation process, is a deciding factor in which schemes get progressed.

A further important discussion point when undertaking cost-benefit appraisal is that of different valuations for the level of protection (or level of service) for investment in infrastructure. This is only of relevance for interventions which are not driven by regulatory standards set by Ofwat, such as investment in sewer flooding or asset resilience³¹. Investments driven by regulatory standards (e.g. Bathing Water interventions) need to meet an agreed level of service, and the optimal investment is therefore the option which delivers the standard for the lowest whole life cost.

Investment in sewer flooding or asset resilience will be driven mainly by customers' WTP for certain levels of service. With respect to sewer flooding or asset resilience investment, WaSCs may only have WTP data up to a certain level of service. For example, many WaSCs will only have WTP data for sewer flooding up to a 1 in 30 year level of service. This means they can only appraise benefits up to that level of service. An increasing number of WaSCs have collated data for more extreme flooding. Ofwat's Water 2020 consultation³² recognised that companies should use a more comprehensive set of evidence of customers' needs and requirements.

³¹ There is no statutory duty for a WaSC to provide a defined level of service for sewer flooding or asset resilience

³² Water 2020: Regulatory framework for wholesale markets and the 2019 price review (Ofwat, 2015)
<http://www.ofwat.gov.uk/consultation/water-2020-consultation/>

4.4 Current practice - Delivery

The delivery stage of the investment cycle focusses on the constructive stage of a collaborative scheme which include contractual agreements between partners, construction, adoption, and maintenance of schemes. The case studies collected have shown a range of emerging experience, and how financial contributions are arranged.

In the majority of examples to date a contribution has been made from, or to the WaSC, and a single organisation has taken on responsibility for delivery. For example, Wessex Water has provided a contribution to North Somerset Council to deliver schemes in Wrington and Weston-super-Mare. In contrast, Plymouth City Council secured FCRM GiA funding for improvement works on Millbay Tanks. At the time of that project South West Water could not apply for FCRM GiA directly so Plymouth City Council made an application on South West Water's behalf for South West Water to undertake rehabilitation to the tanks in order to meet the Local Flood Risk Management Strategy (LFRMS) objectives for this sub-catchment in Plymouth. Plymouth City Council undertook the Project Appraisal Report using evidence provided by South West Water. Once the FCRM GiA funding was secured Plymouth City Council set up a legal agreement with South West Water to enable transfer of the FCRM GiA. South West Water subsequently undertook the construction.

There are also emerging examples of more integrated delivery. In Herne Hill Southwark Council acted as the lead delivery body for the scheme, which was funded by FCRM GiA and Thames Water. Thames Water provided resources to support the construction phase of the scheme drawing on their "experience in delivering schemes of this nature to ensure value for money and a high quality output" (Environment Agency, 2014). Another example of more integrated delivery was the Fellgate flood alleviation scheme in South Tyneside. For this scheme Northumbrian Water and South Tyneside Council funded their component of the works independently, but used the same consultant/contractor partner to deliver the design and construction, resulting in cost savings of over £2m (approximately 36%) based on a traditional piped system. The different components of the scheme were constructed sequentially to reduce mobilisation and demobilisation costs. As experience of such collaboration increases there are some useful principles emerging from case studies, but some challenges remain, which are described in Section 6.

5 Benefits of collaboration

Table 3 summarises the benefits identified during stakeholder engagement.

Table 3 Benefits of collaboration identified by stakeholders

Grouping	Description
Better value for money (economy, efficiency, effectiveness)	This was the most commonly identified benefit from stakeholder interviews. A significant number of stakeholders identified the cost savings and efficiencies ³³ that can be made through partnership working and there were numerous case study examples provided to demonstrate this (e.g. Herne Hill, Clacton-on-Sea).
Better understanding of issues	Partnership working helps all organisations better understand the risks they are trying to resolve, because flooding rarely comes from an isolated source. This will result in more joined up solutions.
Unlock more/ different schemes	A number of organisations identified that partnership working can unlock schemes that would not be financially viable otherwise. For example, some WaSCs have properties with historic sewer flooding that are too complex or too expensive to resolve in isolation and a solution is only possible through partnership working. In addition many nationally funded schemes (e.g. FCRM GiA) depend on partner contributions to meet the justification for investment.
Better relationships	Once better relationships are established the true value of partnership working is unlocked because of mutual trust and understanding of drivers and constraints. Better relationships will help to overcome many of the cultural silos which exist across organisations. In addition, better relationships help to realise a lot of the in-kind benefits described above (e.g. better incident response).
Deliver wider benefits	Collaborative schemes can unlock a wider range of benefits than schemes in isolation. This is particularly the case because different partners have different drivers and by working together there is a greater chance of unlocking a wider set of benefits.
Communication, engagement and Public Relations	Customers/communities affected by flooding or pollution, for example, wish to see organisations with a responsibility working together. WaSCs have performance commitments related to customer satisfaction and partnership working will support this commitment. Furthermore, delivering collaborative infrastructure will reduce disruption to communities through single construction rather

³³ Partnership working can deliver better value for money it does require an increased level of effort and some additional exposure to uncertainty, especially at the early stages of a project life cycle.

Grouping	Description
	than multiple projects.
Bring forward delivery ³⁴	Partnership working may enable schemes to be delivered earlier than originally planned, because one organisation can achieve their desired outcomes by working with another partner who is already promoting a scheme. Furthermore, partnership working supports opportunities to align programmes of delivery.
Access to other funding sources	Some partners can more readily access certain funding sources, so partnership working opens up additional opportunities for funding through partners.
Access to wider resources	Partnership working brings a range of in-kind benefits, e.g. access to land, different skillsets, fast-track planning, alternative procurement routes. This was noted by a number of organisations.
Better financial and delivery risk management	Some partners are more suited to managing certain financial and delivery (construction) risk elements, and partnership working allows appropriate risk sharing.
Contributes to performance commitments	WaSCs are increasingly recognising the important role of partners in helping to deliver their performance commitments in AMP6. Indeed, some WaSCs have a performance commitment around partnership working.
Deliverability	Solutions that may not be possible, or may be technically/logistically challenging to deliver in isolation, could be unlocked through collaboration.

6 What are the challenges of collaboration?

The challenges and issues associated with collaborative schemes have been investigated through stakeholder consultation. Table 4 provides an overview of the barriers identified and considers the ability of this project to influence these. Further information on these challenges is provided in Appendix B.

The ability of this project to influence the barriers has been described in terms of the following hierarchy:

1. Effect change – reduce or remove the barrier by addressing the root cause(s).
2. Influence practice – provide examples, tools and other information to help parties change their working practices to mitigate the impact of the barrier.

³⁴ Stakeholders also identified that collaborative approaches can sometime slow down delivery

3. Raise awareness – provide information and explanation to clarify the issue and improve understanding between parties.

Table 4 Challenges of partnership working and ability for this project to influence them

Effect change	Influence practice	Raise awareness
Valuing non-monetary benefits	Aligning programmes and investment cycles	Commercial sensitivities
Delivery risks	Agreements and contracts	Political /senior management support
Methods to value benefits	Cultural / institutional barriers	Definitions / areas of responsibility*
Improve pro-active engagement / planning	Design standards	Local political priorities
Improve understanding drivers / resources / expectations	Different priorities	Joint modelling specification
	Financial risk	Relationships of organisations
	Limitations of funding sources	Third party asset issues*
	O&M	Agree future maintenance responsibilities and costs
	Terminology and Language	

*Those highlighted with an asterisk may require regulatory or policy change/clarification

7 Guiding principles

7.1 Introduction

Based on the findings from the stakeholder engagement and review of current practice, it was evident that the guiding principles (stage 3) should focus on developing:

- an approach which helps partners identify and prioritise collaborative opportunities³⁵, which will support aligned investment and reduce misunderstanding between partners;
- a collaborative approach to identify the full set of costs and benefits to different partners, recognising the differences in benefits appraisal and design standards between organisations;
- an approach to apportion benefits of investment to each partner and hence indicate the apportionment of benefits to guide discussions around equitable sharing of costs, and;

³⁵ The Environment Agency in England and the NRW in Wales are undertaking an assessment of 'Communities at risk', which will identify opportunities for schemes at a national level. This work may provide opportunities for WaSCs to identify collaborative opportunities

- guidance on different delivery mechanisms/models to implement schemes on the ground, how to manage financial/delivery risks associated with collaborative schemes, and how to approach long-term operation and maintenance.

The guiding principles outlined in this section of the report address these. These principles have been developed to work within the current investment cycle (e.g. AMP6, SR15), whilst providing approaches to help partners to plan future investment collaboratively.

Table 5 identifies how the work undertaken to develop the guiding principles will help to overcome or influence some of the challenges identified. The table only includes the challenges listed in Section 6 where the project can ‘effect change’ or ‘influence practice’.

Table 5 How the guiding principles will help to overcome some of the challenges

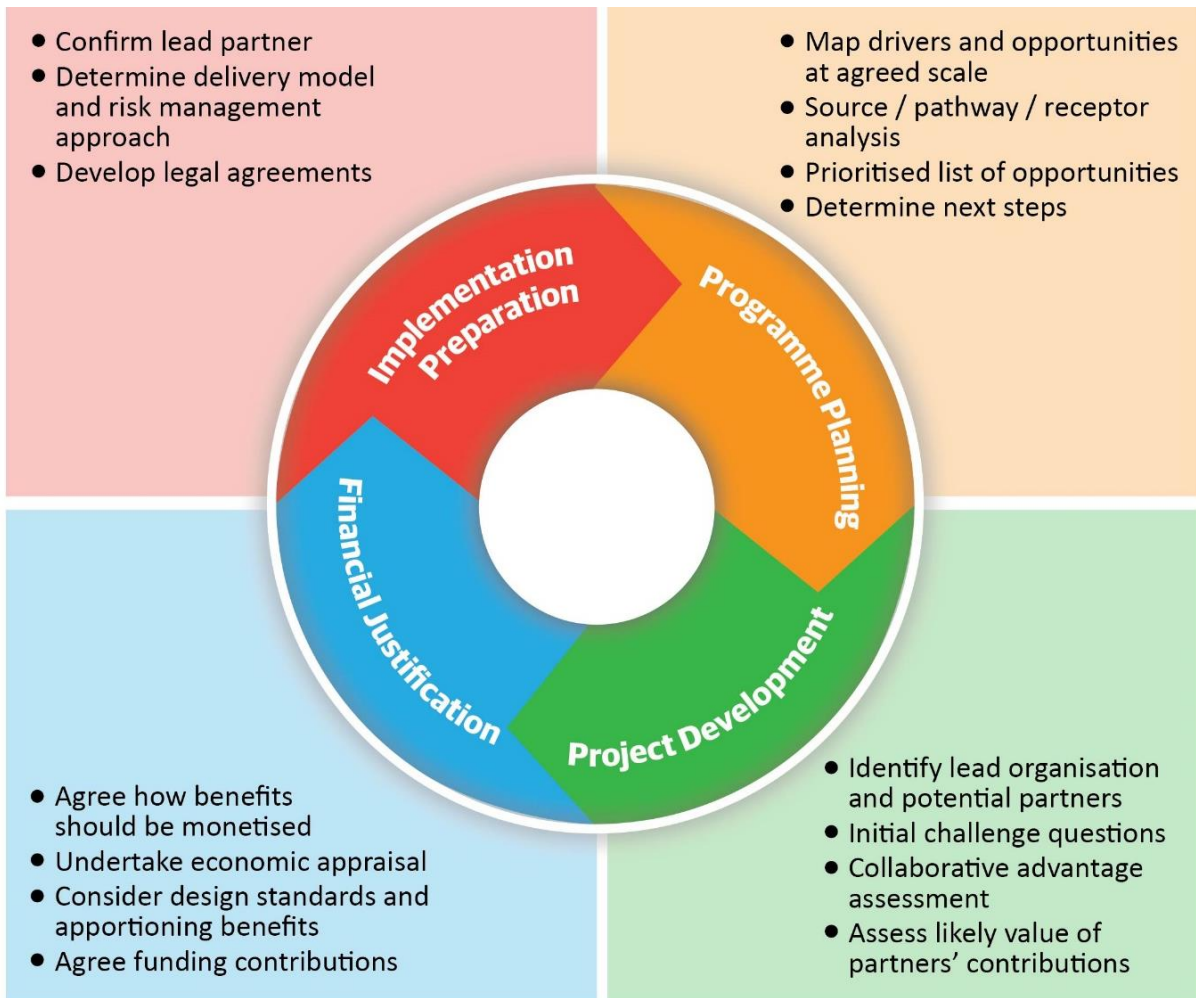
Focus of guiding principles	Challenges addressed by the application of guiding principles
An approach which helps partners identify and prioritise collaborative opportunities, which will support aligned investment and reduce misunderstanding between partners.	<ul style="list-style-type: none"> • Improve proactive engagement and planning • Improve understanding of partners’ drivers, resources and expectations • Aligning programmes and investment cycles • Cultural/institutional challenges • Different priorities • Terminology and language
A collaborative approach to identify the full set of costs and benefits to different partners, recognising the differences in benefits appraisal and design standards between organisations.	<ul style="list-style-type: none"> • Different design standards • Methods to value benefits • Valuing of non-monetary inputs • Limitations of funding sources/mechanisms
An approach to apportion benefits of investment to each partner and hence indicate the apportionment of benefits to guide discussions around equitable sharing of costs.	
Guidance on different delivery mechanisms to implement schemes on the ground, how to manage financial and delivery risks associated with collaborative schemes, and how to approach long-term operation and maintenance.	<ul style="list-style-type: none"> • Agreements and contracts • Limited understanding and management of delivery and financial risks • Operation and maintenance of schemes

7.2 Collaborative workflow

A structured collaborative workflow has been developed to help partners identify, appraise and deliver collaborative opportunities (see Figure 8). The collaborative workflow is not intended to be prescriptive, but rather to suggest a logical process (or framework) to progress collaborative opportunities. Within the structured workflow there are four main steps:

1. programme planning, which should be undertaken when partners are identifying shared objectives and outcomes and developing future investment priorities;
2. project development, which provides an initial filtering process to assess the benefits of pursuing a collaborative project;
3. financial justification, which describes how to assess and apportion benefits, consider issues of design standards, and hence secure a suitable funding contribution from partners and;
4. implementation preparation, which considers different models to manage the design, adoption and maintenance of co-funded schemes, and how risks should be apportioned.

Figure 8 Summary of collaborative workflow



The steps listed above support the main principles (see Figure 9). An example application has been provided which demonstrates one method to implement the guiding principles, and case studies have also been presented to identify where WaSCs and partners have implemented the guiding principles. Sections 7.3 to 7.6 include example applications and case studies.

Figure 9 Guiding principles, example approach and case studies



The collaborative workflow is tested on some hypothetical scenarios to illustrate how to apply the guiding principles. These are based on real-world scenarios, and presented in Appendix C.

7.2.1 Links to existing planning processes

The collaborative workflow has been designed to integrate into existing planning processes and funding cycles. It is not a new or separate process but a way for partners to consider the collaborative workflow as part of their planning processes and funding cycles. The level of effort required to support a collaborative project should be proportionate to the level of investment required. This is in accordance with existing best practice guidance, such as the FCERM Appraisal Guidance in England (Environment Agency, 2010).

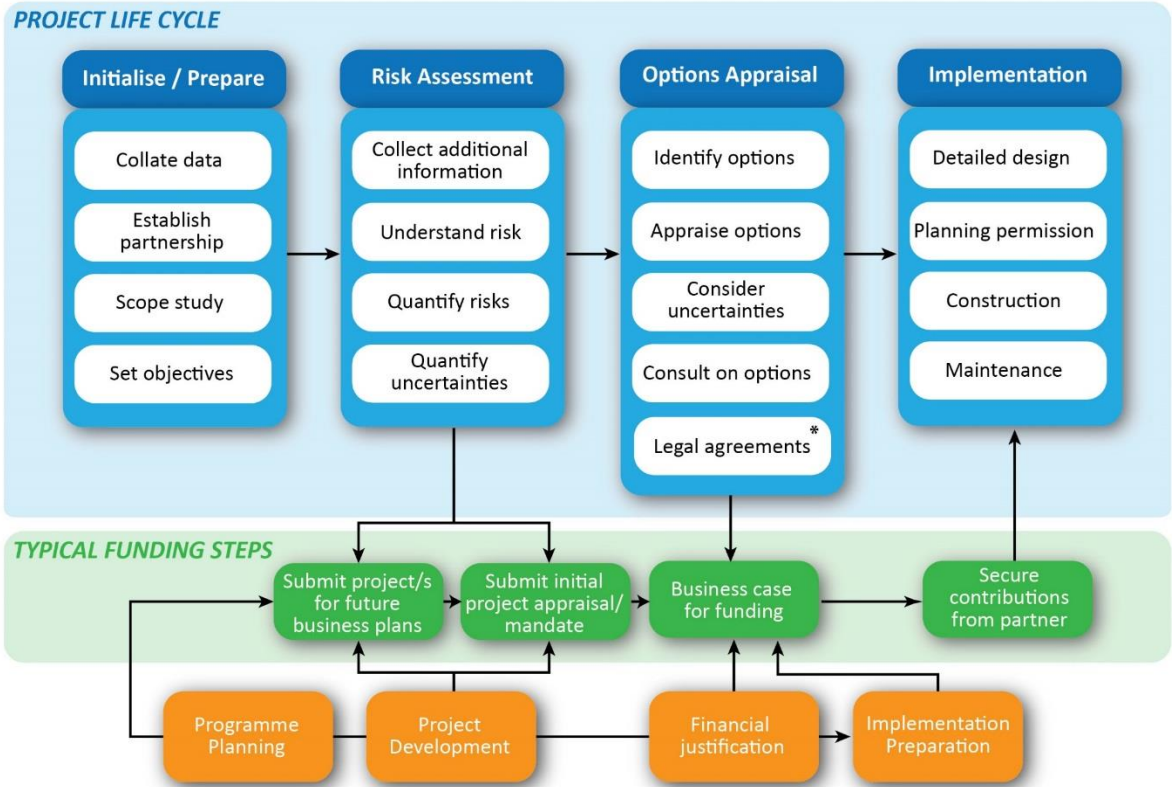
Figure 11 shows how the collaborative workflow (orange boxes) aligns with a typical project life cycle (green and blue boxes). The programme planning will use information in the initial stages, where partners have come together and shared data and information, to enable a joint discussion about common problems or opportunities within their administrative areas.

The project development phase should form an integral part of the standard risk assessment process. As part of the risk assessment partners will work together to understand the

sources, pathways and receptors of flooding, and assess the scale of risks (pollution or flooding). An understanding of these will enable partners to undertake the project level analysis to inform the collaborative advantage of pursuing a collaborative scheme.

The financial justification for a collaborative scheme should make use of information gained during the options appraisal. This will consider the costs and benefits of a range of different intervention types, which will allow partners to understand the total benefits and how they may be apportioned across partners. In addition, some partners may want to invest in options beyond that preferred by other partners and may be willing to contribute the additional costs of implementing such an option³⁶.

Figure 10 Programme planning (extract from main collaborative workflow)



* Implementation cannot start until legal agreements are in place

Finally, the implementation preparation phase of a collaborative scheme will occur as part of the development of the business case for funding, whereby the planning permission, legal agreements, and issues around adoption and maintenance are developed. These must be in place to secure approval for the business case.

³⁶ An example could be where a locally preferred option costs more than the nationally preferred option but partners are willing to invest the additional funding to pursue the locally preferred option.

7.3 Programme planning

This phase of the collaborative workflow is to help partner organisations identify and prioritise a range of potential projects that can be taken forward to the project development phase and included within future business plans or investment cycles.

7.3.1 Guiding principles

At an early stage of business planning³⁷ Risk Management Authorities/Responsible Authorities should bring together a wide range of data and knowledge to enable a shared discussion of the problems and challenges facing each organisation. This should include sharing the data at a sufficient level of granularity to enable partners to identify specific problems or challenges³⁸. Success is greater when appropriate data is shared. Data could be brought together in a GIS mapping environment to support visualisation, and include:

- flood history data, including properties, and roads and other infrastructure;
- flood risk mapping data (e.g. surface water flood maps) or flood model outputs;
- asset data (e.g. location of pumping stations, treatment works, culverts);
- data or analysis on headroom capacity within the wastewater network (foul, storm or combined sewers, where available);
- records of pollution incidents, information on failing bathing waters which may require investment under the Bathing Water Directive, and water bodies failing to meet good ecological status/potential under the Water Framework Directive, and;
- location of known/potential development within the 10 years, including details on likely development numbers (where known).

Using these data and knowledge partners should work together to identify current and future problems or opportunities at a common scale, such as a drainage catchment. This will enable partners to identify locations of common problems, or where there may be catchment opportunities such as new development.

³⁷ In England & Wales business planning for AMP7 will commence several years before the beginning of the AMP. Many WaSCs will be starting to consider their business plans for AMP7 as early as 2016. AMP7 will run from 2020-2025

³⁸ For practical reasons one organisation could take a lead role at this data gathering stage

Mapping locations of common problems in Yorkshire

Yorkshire Water and the Environment Agency have recently completed a mapping investigation of named schemes on the Environment Agency's investment programme with areas of known risks from Yorkshire Water's corporate risk model. This identified up to 640 forecast Medium Term Plan (MTP) schemes in Yorkshire over the next 6 years, of which 120 were identified as having a good potential for a collaborative approach. Sharing data in this manner enables partners to identify common problems and areas of interest.

For each area (e.g. drainage catchment) where there may be common problems partners could use the source, pathways and receptor model to identify their vested interest in resolving the problem or realising the opportunities.

- Source: Are our assets a source of floodwater or pollution?
- Pathway: Are our assets a pathway for floodwater, pollution, or affected by future growth in the catchment?
- Receptor: Do we have customers and communities at risk? Are our assets at risk? Is the environment affected?

Northumbrian Integrated Drainage Partnership

Northumbrian Water, in partnership with the 13 Lead Local Flood Authorities in the North East of England and the Environment Agency, have developed a strategic level risk based prioritisation methodology and produced a prioritised programme for the delivery of jointly funded integrated drainage studies up to 2020. Each study follows a three stage process, data collection, collation and analysis; options, costs and benefits; and delivery projects, and must demonstrate shared benefits before progressing to the next stage.

Stages 1 and 2 are jointly funded by Northumbrian Water (50%) and the Regional Flood and Coastal Committee (RFCC) / Local Authorities (50%) with the outputs from the studies providing a robust evidence base in support future business planning. Individual partner contributions to stage three (project delivery) are proportionate to the level of benefits received.

Once partners have identified a range of areas where there are complementary drivers a joint prioritisation process should be undertaken. It is for each local partnership to determine how areas should be prioritised, but the prioritisation could consider for example service impacts, receptors affected (numbers and severity), or legislative or regulatory drivers. Whilst prioritisation processes need to be robust there is an equally important role for partners to discuss and agree priorities, especially with regard to future opportunities.

The outputs from this step should be a prioritised list of areas to pursue a collaborative opportunity. As part of this process the opportunity to align programmes should be considered. Partnership may require some flexibility on the timing of future investment, and it is therefore important to understand the degree of flexibility within each partners

programme. In some cases one or more partner may need to amend their preferred programme to align with an inflexible programme of another partner (e.g. where delivering a legislative outcome).

Anglian Water shared RFCC resource

As part of the preparation for Periodic Review 2014 (PR14) Anglian Water jointly funded (with the 3 RFCCs) a secondee from the Environment Agency to develop the collaborative funding proposals for AMP6, strengthen links with Lead Local Flood Authorities, and support the submission for Grant in Aid funding.

“Really pleased that the level of partnership working on PR14 with Anglian Water has shown a lead to other RFCCs and water companies. This will deliver a more joined up programme of works between the risk management authorities to the benefit of all residents and businesses in the region.” (Feedback from the Chair of the Anglian Northern RFCC).

For the high priority areas the next steps will be to:

- commission a joint investigation into the problems or opportunities, and/or;
- undertake the project development phase of the collaborative workflow (described in Section 7.4, and/or;
- submit the project(s) for consideration into future business plans or investment cycles.

Example Approach: Programme planning

The example approach below shows a catchment with multiple drivers, and where partners could programme a joint investigation to consider existing flooding in the catchment, and the impacts of future development on the sewer network and wastewater treatment works. Mapping areas of existing problems and future proposals collaboratively is a good mechanism for understanding where partnership opportunities exist.

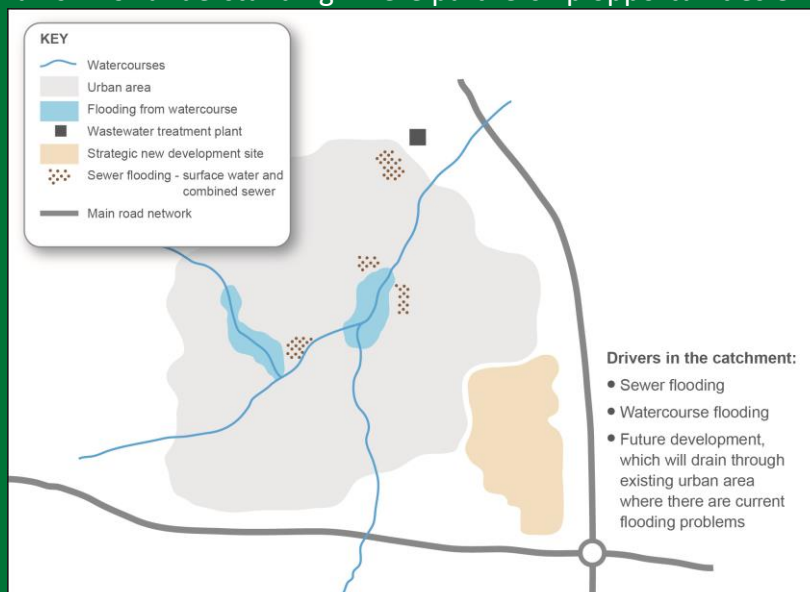


Figure 12 Project development (extract from main workflow)



7.4 Project development

The purpose of this analysis is to understand, at an early stage, the potential benefits of a collaborative scheme for each partner organisation. There will be some projects where there is insufficient benefit for a partner organisation to co-fund a scheme, and these should be screened out at this stage to avoid abortive work at a later stage. There will be situations where partners cannot justify capital or maintenance investment, but will still collaborate to share information and knowledge. This phase of the collaborative workflow could occur early on in the risk assessment phase of a project life cycle, or once the risk assessment is completed and the scale and nature of risks are well understood.

Whilst discussion of specific hydraulic modelling requirements is outside the scope of this report, it is important to recognise the complexities of different modelling approaches. Partners seeking to deliver a collaborative project should agree, at an early stage, what kind of modelling is available or needs to be developed to support decision-making. Integrated modelling approaches, which can more fully represent all sources and pathways of flooding, are increasingly being used in catchments where there are multiple issues such as sewer, pluvial and/or fluvial flooding. Figure 12 provides an extract from the collaborative workflow for the project development phase.

7.4.1 Identify lead organisation and potential partners

The first principle will be to identify a lead organisation and organisations who could contribute funding towards the project or scheme. The lead organisation should be selected through consideration of some or all of the following criteria:

- the dominant driver (i.e. main source of flood risk);
- available resource to manage the project, or;
- experience of delivery and access to supply chain for appraisal, design and build.

Whilst it is important to identify a lead organisation at this stage to ensure the project has appropriate leadership it should not be set in stone and should be kept under review throughout the project life cycle. Whilst at this stage the potential partners should be

identified this may be changed as a project progresses, in case additional partners are identified. Furthermore, there should be consideration for the project the need for wider stakeholder and political engagement.

Partners should consider other third party organisations or funding sources who may benefit from the proposed project. This could include funding from Local Enterprise Partnerships, contributions from other beneficiaries (e.g. businesses), developers, lottery funding, European Union funding, charitable sectors, local communities, Water Framework Directive and other catchment-based funding initiatives³⁹. This analysis should consider the potential timing and evidence base needed to secure funding from these sources, to understand the interactions with the project programme.

There is existing information about third party organisations who may contribute funding towards infrastructure, which should be examined (e.g. Defra, 2012, and CIRIA, 2015). It is worth noting that some funding sources are only available to specific partners. For example, WaSCs cannot directly access some lottery funds, which are available to local authorities. The ability to access different funding sources is one of the benefits of collaborative working.

Consideration of land ownership and land use is an important consideration at an early stage of any project, to ensure that access or availability of land informs the options development and project planning. Where a project partner owns land this is a potential benefit in-kind and part of the partners' contribution to the collaborative project.

³⁹ For example New Environmental Land Management Scheme (NELMS), Rural Development Programme for England (RPDE)

South West Water Integrated Urban Drainage Modelling (IUDM)

South West Water, in partnership with local authorities and the Environment Agency, have developed a number of IUDM pilot studies in catchments with complex and long standing flooding problems. These IUDM pilot studies helped to identify problems, clarify responsibilities of the agencies involved, and promote a better understanding of urban drainage flooding.

One of these catchments was Colebrook, Devon, which has suffered flooding over some years from overloaded combined sewers and surface water drainage systems. Schemes to address the flooding by individual statutory authorities had been considered, but these were either unaffordable or resulted in marginal benefits. However, through collaboration an integrated scheme was developed with contributions from South West Water, Plymouth City Council, FCRM GiA and RFCC local levy. The integrated scheme consisted of relocating and improving an existing CSO, rerouting of the combined sewer, addition of new surface water collection systems and provisions for managing highway runoff. The Colebrook scheme also provided increased main river culvert capacity. In this example, costs were apportioned based on which authority benefited from each asset. Assets required only for South West Water (e.g. CSO structures) were 100% funded by SWW, highway drainage system was 100% funded by Plymouth City Council and GiA was used to fund the new culvert only required for main river. Where some assets were installed for shared use, such as culverts that benefited all parties, then the cost was apportioned on the estimated flow from each source.

Dŵr Cymru Welsh Water accesses European funding to alleviate sewer flooding

Dŵr Cymru Welsh Water and Blaenau Gwent County Borough Council collaborated to reduce sewer flooding risk at properties in Excelsior Street, Ebbw Vale. Internal flooding was occurring at six properties and investigations identified that a land drain, which was draining a mountain, had been connected into the combined sewer. Welsh Water acted as the lead partner, delivering the scheme which was part funded by the European Regional Development Fund via Welsh Government. They were eligible for this funding as the stormwater entering the combined sewer and causing the sewer flooding was not Welsh Water's statutory responsibility (i.e. land drainage).

7.4.2 Challenge questions

The purpose of the challenge questions is for partners to understand any absolute constraints that may impact the ability to deliver a collaborative project. These could include questions about:

- the alignment of the project to an organisations outcomes, targets or plan/strategy;
- whether an organisation is wholly or partially responsible for the flooding (considering the source, pathway, receptor approach outlined in Section 7.3.1, or;
- whether the programme aligns with an organisation's business needs.

Example Approach: Initial challenge questions

The example below demonstrates the type of initial challenge questions organisations should address to consider whether a collaborative scheme should progress. In the example, all three core delivery partners would look to proceed with the collaborative scheme.

Challenge Question	WaSC	Local Authority	EA
Does the scheme align with one or more outcome?	Yes	Yes	Yes
Are we wholly / partially responsible for flooding?	Uncertain	Yes	Yes
Does the programme align to our business needs?	Uncertain	Yes	Yes
Pass or Fail Challenge Questions	Pass	Pass	Pass

Because partners have different business priorities and outcomes, each organisation may need to answer a different set of challenge questions. However, the intention is that partners will openly discuss the challenge questions to build trust and maximise opportunities to pursue a collaborative project. At this stage it may become evident that a partnership scheme with joint funding is not possible, but that should not rule out partnership working and in kind benefits such as sharing of information and models. These in kind benefits can be included within submissions for FCRM GiA, for example.

7.4.3 Collaborative advantage assessment

Following the initial challenge questions partners should undertake a further assessment to help decide whether it is advantageous to collaborate in delivering a project (i.e. the collaborative advantage), or whether through collaboration partners can deliver a project that would not be possible without partnering. This assessment should explore the advantages and potential constraints. The collaborative advantage assessment should determine whether or not to proceed. The questions each partner may need to consider will vary across organisations, but should include consideration of:

- the whole life costs (or total expenditure[totex]) of a collaborative scheme compared to investment undertaken in isolation;
- the need to partner in order to resolve a flooding problem (i.e. a problem one partner could or would not resolve in isolation);
- the importance of the project to organisations;
- whether the project will help to address one or more outcomes (e.g. properties protected from flooding), and;
- the delivery risks associated with partnering.

Example Approach: Collaborative advantage

This theoretical example indicates how each partner could make an initial assessment of the potential advantages of collaborating. They would answer a consistent set of questions internally to understand the value for their organisation of pursuing the project in partnership. Each question is scored from 1-5 and summed to assess whether it offers best value to pursue the partnership opportunity, i.e. the Collaborative Advantage. The scores can be converted to percentages and a score of >70% has been assumed as a “Go”. Partners could weight different criteria to reflect the importance to their business.

Questions	Excellent	Average	Poor
	5pts	3pts	1pt
Governance & Risks			
Do we have an existing relationship with potential partners?	Yes. Excellent relationship.	Yes. But don't thoroughly understand relationship.	Don't know and partnering/ relationships have been difficult.
Is the likely lead partner mature in terms of project management and governance?	Yes. Excellent maturity and qualifications.	Some experienced personnel and enthusiasm.	No experience or qualified personnel - no confidence in ability to deliver. Or, unknown ability.
Are there likely to be additional delivery risks associated with partnering (e.g. programme risks)?	Low/no delivery risks or flexible programme	Some delivery risks but not significant	Delivery risks very high which are unacceptable and/or cannot be mitigated
Will the scheme have a positive business impact (i.e. what is the risk of not partnering)?	Partnership working will have a significant positive business impact		Significant reputational damage if we do not partner
Are there any regulatory drivers which may constrain the ability to co-fund and co-deliver?	None		Yes, regulatory drivers are a significant constraint
Costs and Outcomes			
Will partnering enable us to resolve an issue at lower Whole Life Cost / Totex?	Up to 25% WLC or totex saving likely compared to delivering alone	5-10% WLC or totex saving compared to delivering alone	Unlikely to yield any financial cost saving
Will partnering enable us to resolve an issue we could or would not solve alone?	Yes, longstanding problem that we cannot address in isolation. Without partnering the project will not go ahead because non cost-beneficial	Cost benefit of delivering a scheme in isolation is marginal and could go ahead	No, we can resolve this in isolation
How important is this project to us as an organisation?	High priority, critical to deliver our business plan	Moderate priority	Low priority
Will partnering help to address one of more of our business outcomes?	Yes, supports multiple business outcomes	Yes, will support one business outcome	No, it does not support any business outcomes
Will partnering enable us to resolve an issue <u>sooner</u> than we could/would alone?	Yes, it brings forward delivery by several years	Yes, it brings forward delivery by approximately 1yr	No, it has no impact on our programme

Assuming that the collaborative advantage assessment is favourable for partner organisations the next step should be dependent on the likely value of each partners' contributions. For smaller projects it may be possible to move directly to the delivery phase of the project, rather than undertaking detailed benefit-cost and financial justification. This will depend on internal governance rules, but in some cases the evidence gained through the collaborative advantage assessment should be sufficient to justify a contribution towards a collaborative. Alternatively, for larger or more complex projects a further assessment is

recommended at the project development phase, to assess the initial benefits and likely value of partners' contributions. Section 7.4.4 outlines this.

Anglian Water pro-forma to test collaborative opportunities

As part of its performance commitment to deliver £8.4m of partnership schemes in AMP6 Anglian Water has developed a partnership funding application pro-forma to enable it to determine the likely benefits to Anglian Water of a partnership scheme, and the potential funding contribution that may be required. This enables Anglian Water to identify the benefits early on, and ensure it prioritises collaborative schemes where these will deliver the greatest net benefit to Anglian Water's customers and shareholders, and support delivery of its business plan. An extract from the pro forma is illustrated below.

love every drop anglianwater		AMP6 Partnership Funding Application for schemes in 2015-2020	
Project / scheme name			
Location			
Lead Local Flood Authority / IDB		Asset Owner / Manager	
Asset System name / number if known		Asset Reference number(s) / Asset Code	
Asset Type		National Grid-reference (10 digit)	
Does project follow on from a Strategy or previous appraisal	Yes/No	Shape file attached	Yes/No
Role	Name	Post Title	Contact details
Project Sponsor / Scheme Manager			Tel:
Form Author (if different from above)		Date	Email:

7.4.4 Assess likely value of partners' contributions

The purpose of this final step of the project development phase is to gain an understanding of the likely scale of benefits accruing to each partner organisation through a high level appraisal, which will indicate the potential range of contributions towards the project. This can be used to understand whether partners should move forward to the options appraisal stage of a collaborative project. Options appraisal is a time consuming and costly process, and this step is intended to help determine whether a funding contribution towards a collaborative project is likely to be viable.

At this stage of a project life cycle options are unlikely to have been developed in much detail⁴⁰, and partners may have to use judgement to estimate the likely scale of benefits. It is recommended that the anticipated core benefits (e.g. flood risk, reduction in sewer flooding, asset protection) are monetised using readily available information, whilst the wider benefits a future scheme may deliver should be described. These will inform the monetised assessment of these benefits as part of the next steps, and identify potential additional funding partners. Whilst organisations do have bespoke methods and corporate systems to calculate initial benefits it is important that partners can have an open and transparent discussion about how benefits have been quantified. This will help to build trust, and identify

⁴⁰ By this stage the risk assessment is likely to have been completed. There should therefore be a clear understanding of the sources, pathways and receptors of risk.

any further opportunities for synergy. The process for identifying benefits and hence a potential financial contribution will be an iterative process as the scheme and its costs develop.

Table 6 illustrates the types of benefits to consider for different types of collaborative projects. A range should be applied to the benefits and likely contributions to account for uncertainties of the estimates at this stage of the project life cycle. Discussions with third party funders (e.g. businesses, LEPs) should occur at this stage to understand at an early stage their willingness and ability to contribute financially towards the investment.

Table 6 High level appraisal of potential benefits

Type of collaborative project	Core benefits which can readily be monetised during a high level appraisal	Wider benefits which should be identified⁴¹
Sewer flooding linked to other sources of flooding (e.g. surface water, groundwater, watercourse)	<ul style="list-style-type: none"> • WaSC: Sewer flooding (internal or external) benefits • Public bodies: Reduction in flood risk from surface water / groundwater / fluvial / coastal 	<ul style="list-style-type: none"> • Amenity • Biodiversity & Ecology • Carbon reduction or sequestration • Disruption (to road/rail, businesses, electricity) • Economic growth (will the scheme unlock growth through new development and/or job creation) • Health • Reduced pumping or treatment costs of wastewater • Recreation • Improved reputation for partners seen to be cooperating to deliver better results for the public
Resilience of WaSC assets, where they are at risk of flooding or coastal erosion	<ul style="list-style-type: none"> • WaSC: Value of supply disruption (measured through customer WTP) • Public bodies: Reduction in flood risk from surface water / groundwater / fluvial / coastal 	
Managing pollution to the environment to meet legislative drivers	<ul style="list-style-type: none"> • Likely to be driven by regulatory requirements rather than purely monetised benefits⁴² 	
Creating capacity within wastewater networks and treatment plants to accommodate future development	<ul style="list-style-type: none"> • Likely to be driven by a least whole life cost approach to providing the necessary infrastructure 	

⁴¹ Monetising these wider benefits should be undertaken during a more comprehensive cost-benefit analysis, during the next steps of the project life cycle.

⁴² As a result the economic and financial justification should seek to deliver the regulated requirements at lowest whole life cost.

Example Approach: initial assessment of benefits and funding contributions

Within a catchment there are 10 properties that have suffered internal sewer flooding and 5 properties that have suffered external sewer flooding twice in the last 10 years. The cause of the flooding is under capacity within the sewer network, and land drainage ingress into the system. Further upstream there are 25 properties at risk of pluvial flooding, and have flooded twice in the last 10 years also. The local authority and WaSC have identified the opportunity to co-deliver a scheme by diverting some pluvial runoff through a nearby park and into a watercourse, and undertake some localised sewer upsizing.

To understand the total funding available to deliver the project a high level appraisal has been carried out. By populating the FCRM GiA calculator the local authority can calculate the maximum FCRM GiA that may be available based on the forecast Outcome Measures that may be delivered (e.g. Outcome Measures 1 and 2). At the same time the WaSC, using Willingness to Pay (WTP) data, can estimate the total value to their customers and hence how much funding could be available. The Water Company has assumed that the flooding to properties would reduce from a 1 in 5 to 1 in 20 year standard of protection at this stage, based on their understanding of the catchment and their network.

Through discussions internally the local authority has identified additional funding may be available. In addition, the local community have offered a small financial contribution towards the scheme. The initial analysis of benefits and likely contributions can be assessed to calculate the estimated total funding that may be available for the project. This can be used to assess whether there is likely to be sufficient funding in place to deliver the scheme.

Estimated funding contributions by partner - Mid Range

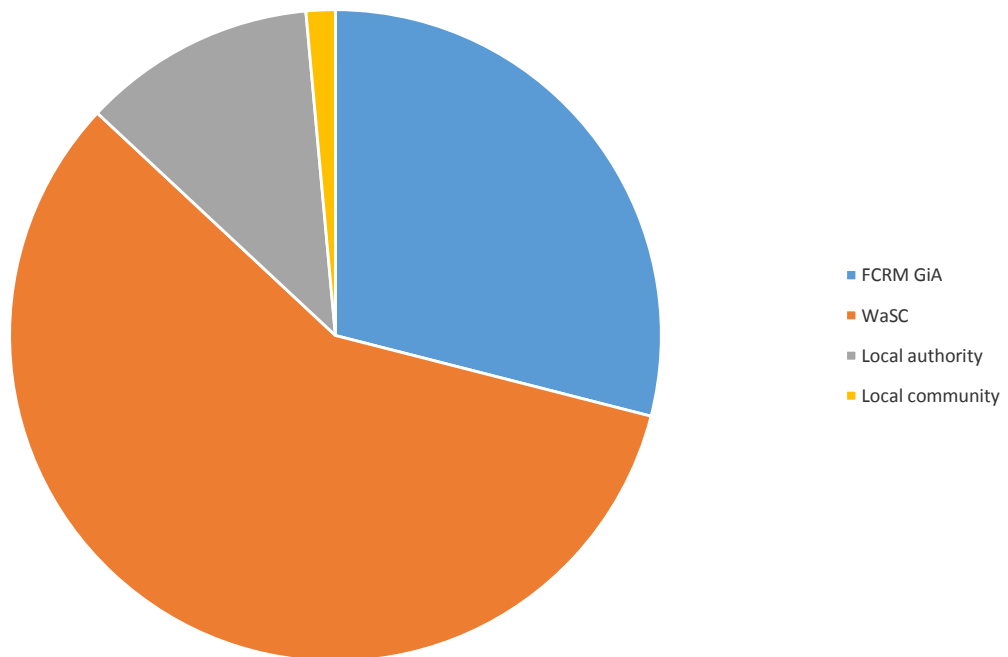
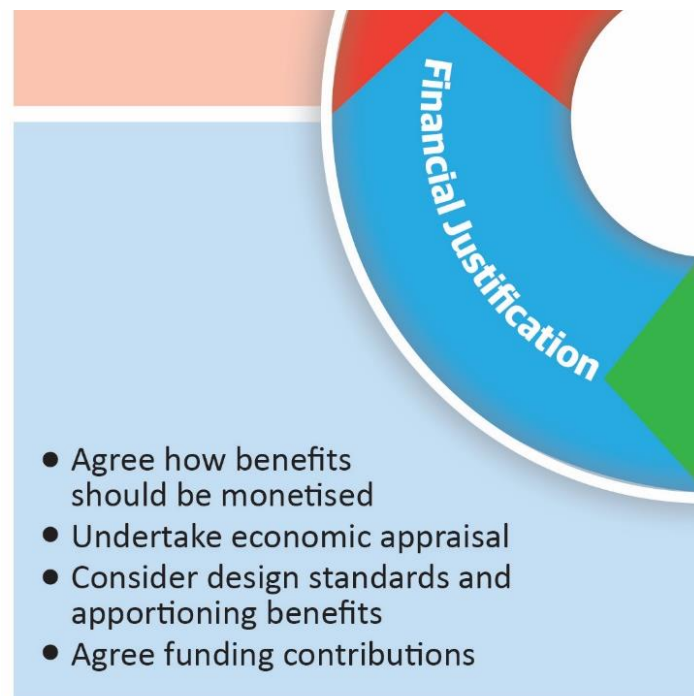


Figure 13 Cost-benefit appraisal (extracted from main collaborative workflow)



7.5 Financial justification

This phase of the collaborative workflow is to help partners understand how to appraise the costs and benefits of a partnership funded scheme, and how to determine an equitable funding contribution based on these. It is intended that the guiding principles outlined can be integrated into the standard appraisal processes undertaken by partners.

7.5.1 Agree approach and benefits to be included

At an early stage of the options appraisal process partners should define the nature of the benefits appraisal. This will be reflective of the catchment problem, and the evidence base needed to justify funding from different partners.

For example, to unlock funding from FCRM GiA in England a cost-benefit appraisal must be completed in accordance with the FCERM Appraisal Guidance (Environment Agency, 2010) and the government's 5 case business model (HM Treasury, 2013). Similarly, to access funding from a Local Enterprise Partnership (in England) will need to submit evidence about how investment will secure local economic benefits such as development and economic growth. With respect to WaSCs, the scope of the benefits appraisal will depend on the type of catchment problem being addressed and the link to the company ODIs. Table 7 provides an overview of this.

Table 7 WaSC benefit appraisal approach

Type of collaborative project	Appropriate benefits appraisal	Explanatory notes
Sewer flooding linked to other sources of flooding (e.g. surface water, groundwater, watercourse)	Cost-benefit appraisal (CBA)	CBA will be based on valuing the improved level of service to customers by reducing sewer flooding, which will be reflected in WTP data and each WaSC's ODIs for sewer flooding.
Resilience of WaSC assets, where they are at risk of flooding or coastal erosion	Cost-benefit appraisal (CBA)	CBA will be based on valuing the improved level of service by reducing disruption of supply (e.g. water supply or wastewater treatment), and the direct economic damage to WaSC infrastructure ⁴³ . This will be linked to WTP and each WaSC's ODIs for avoidance of supply interruptions, and the direct economic impacts of flooding to WaSC infrastructure.
Managing pollution to the environment to meet legislative drivers (e.g. Water Framework Directive, Bathing Water Directive)	Least Whole Life Cost (WLC)	This will consider the option which delivers the regulatory requirement for the least whole life cost.
Creating capacity within wastewater networks and treatment plants to accommodate future development	Least Whole Life Cost (WLC)	This will consider how to create sufficient capacity within the wastewater network for the least whole life cost.

⁴³ WTP data may not be available for all categories of risk (e.g. low probability / high consequence), and in addition there may be other drivers for investment such as health and safety, or PR, for example

Case study: Weston-super-Mare Integrated Urban Drainage Management

To meet the Bathing Water Directive Wessex Water were required to reduce spills to the bathing water from a major overflow in the catchment. To meet the immediate needs of the bathing water Wessex Water constructed an initial solution of 21,000 m³ of storage. However, to ensure the bathing water quality could continue to be met under climate change and future urbanisation Wessex Water pursued surface water separation as well. Due to significant development in Weston-super-Mare North Somerset Council were constructing a 'super pond' to accept runoff from proposed development. By working closely with partners, additional storage was provided at the super pond to allow Wessex Water to discharge 4,000 m³ of surface water during rainfall events. Wessex Water contributed to North Somerset Council for the design, construction, use of the land, and a commuted sum for the future maintenance. Through partnership Wessex Water realised cost savings, met bathing water standards, and helped provide biodiversity and amenity. Benefits.

Subsequently, partners should collectively agree which types of benefits should be considered, by whom, and whether they should be expressed in monetary terms. There are well established methods to monetise many of the economic benefits associated with flood risk management such as the FCERM Appraisal Guidance, and Water Company approaches to assess customers' WTP for improved levels of service.

Many of the wider social and environmental benefits are more difficult to quantify, although there is an increasing evidence base to support inclusion of these benefits in a robust way such as CIRIA's BeST tool (CIRIA, 2015), the handbook for economic valuation of environmental effects (Eftec, 2010), and the National Water Environment Benefits Survey (Environment Agency, 2014). Figure 14 illustrates the type of benefits that can be considered in economic appraisals.

When considering which benefits should be included within the economic appraisal it is also important for each partner to identify which benefits they can legitimately claim as part of their financial justification for the collaborative project. Individual partners will need to demonstrate economic justification for a collaborative project and will therefore need to understand the types of benefits they can include. Partners can only claim benefits which align to their objectives and business plans. For example, a WaSC cost benefit appraisal should only include benefits which align to improving levels of service to customers, which are expressed through their ODIs. Similarly, an economic appraisal for FCRM GiA in England can only include benefits that create a national loss, rather than local economic losses as described in Section 4.3.

Figure 14 Types of benefits that could be included in economic appraisal



As each partner will need to demonstrate the economic justification for a collaborative project this may create circumstances where two or more partners are claiming the same type of benefit. This is particularly likely in cases where a property is at risk of flooding from sewers and other sources of flooding, or where multiple partners are seeking to claim some of the wider social or environmental benefits from investment. Where an integrated project-level CBA was being undertaken partners would need to determine who could claim different benefits. Within a single CBA benefits cannot be double counted. As discussed in Section 4.3 partners have adopted different methodologies for the CBA. Because they have not been set up to be compatible it is logical and appropriate that partners continue to undertake individual CBA to justify their financial contributions to a collaborative project. It is therefore not considered a significant constraint for more than one partner to be claiming the same type of benefit within their individual cost-benefit appraisal.

Example Approach: Determine benefits to be claimed by partners

It is important to collectively define which benefits should be included within the economic appraisal, and which organisations can legitimately claim the benefits. For the worked example below there is a town which suffers from fluvial flooding, which affects people, property and the local road network. In addition, a water treatment works is vulnerable to flooding and there is an opportunity for the WaSC to develop a collaborative project with the Environment Agency and local authority. In this worked example the proposed solution is to raise the local river defences and create upstream attenuation.

Category	WaSC Benefit?	LA Benefit?	FCRM GiA Benefit?	Other partners
Property damage		✓	✓	
Damage to road network		✓	✓	
Disruption to road network		✓	✓	
Damage to water treatment works	✓			
Disruption to water treatment works	✓			
Disruption to local businesses		✓		LEP
Damages to vehicles			✓	
Loss of life			✓	
Emergency services costs			✓	
Development land unlocked		✓		
Amenity	Depends on WaSC ODI	✓		e.g. community groups, local wildlife trust
Health		✓		
Recreation		✓		
Biodiversity & ecology		✓	✓	

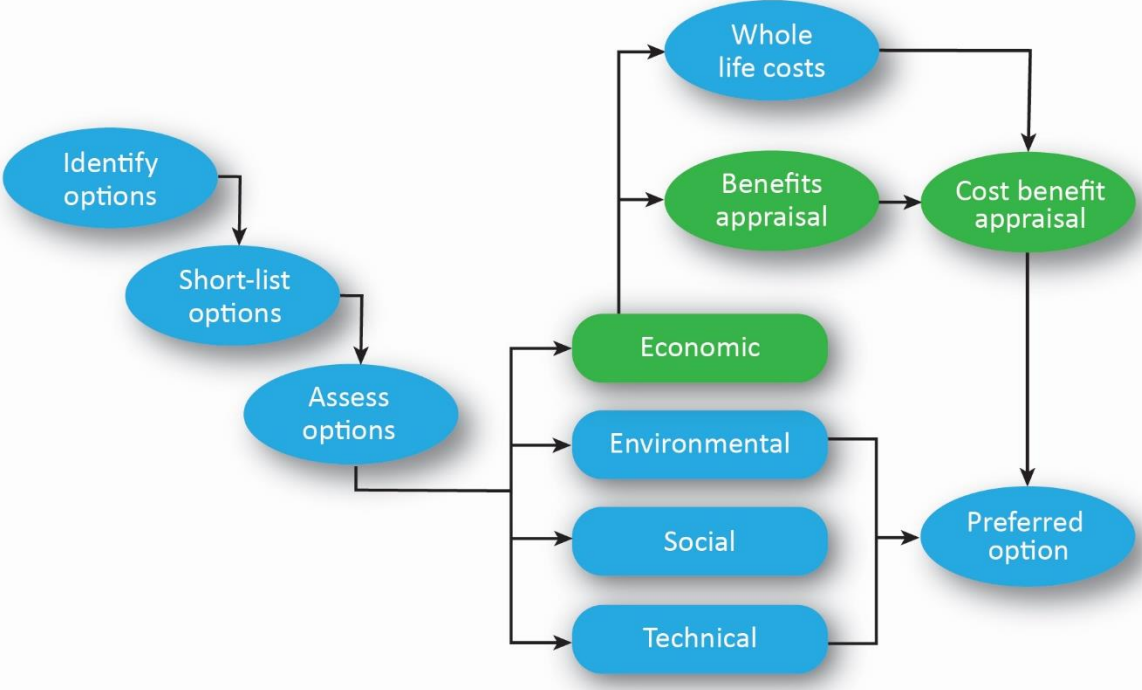
7.5.2 Undertake economic appraisal

Once project partners have agreed the approach and nature of benefits to be included, an economic appraisal will be undertaken as part of the options appraisal process. Figure 15 demonstrates a typical appraisal process⁴⁴. This report focusses on how partners should make the economic case for investing in a collaborative project, but recognises that the selection of the preferred option should be backed by an assessment of the social, environmental and technical constraints and opportunities. It is assumed that the appraisal

⁴⁴ Figure 15 is similar to the options appraisal process outlined in Defra's SWMP Technical Guidance (Defra, 2010)

process will commence with a clear understanding of the sources, pathways and receptors of flood or pollution risk both under current day and future⁴⁵ scenarios.

Figure 15 Options appraisal process (NB: options assessment is an iterative process)



For a collaborative project, any stages highlighted in blue in Figure 15 should be undertaken collaboratively. It is recommended that partners identify, short-list and undertake the majority of the options assessment collaboratively. Going through this process together will ensure a range of different perspectives and drivers are considered during options development, and will maximise opportunities for efficiencies during design and construction. One partner may take a lead role in undertaking activities, but ensure that all project partners are involved throughout. During the stakeholder interviews undertaken for this project one of the benefits of collaborative working was that different partners bring different skills and knowledge to the options development. For example, a local authority will understand their highway network and associated costs and access issues of working on the highway, and can use this knowledge to inform the options development process. A broad range of options should be considered, which offer different levels of protection, to inform an assessment of the optimal investment⁴⁶. Furthermore, during the options development partners should test options of a ‘non-partnership’ scheme, to enable them to assess the relative benefits of pursuing the collaborative scheme.

⁴⁵ Including climate change, development and urban creep

⁴⁶ A Do Nothing (walk away) and Do Minimum (maintain investment to delivery minimum legal requirement) should be part of this process.

It is also recommended that partners calculate the whole life costs (or totex) of the proposed option(s) collaboratively⁴⁷. This will maximise opportunities for programme or cost savings, and ensure that best practice and expertise from partners will be utilised.

Whilst a significant part of the options appraisal process can be undertaken collaboratively it is entirely appropriate that each partner considers and values the benefits their organisation will accrue individually through the collaborative project (and hence determine a suitable funding contribution). Organisations should undertake an assessment of the benefits to their organisation, in accordance with their approved cost-benefit appraisal techniques, as outlined in Section 4.3. However, in the interests of openness and transparency information should be shared between partners. It is feasible for partners to undertake an integrated cost-benefit appraisal where it is carefully designed, but it is not considered essential to unlock funding for partnership projects.

When assessing intervention options, and subsequently undertaking economic appraisal, consideration about the level of protection (or level of service) for different component parts of the network will need to be considered. A range of levels of protection should be tested through the options appraisal, which should help to determine a preferred option which balances the benefits to customers and communities, the whole life costs (or totex) of investment, and the affordability of investment (i.e. is there sufficient funding to pay for the scheme over the whole life).

One of the benefits of partnering is that it allows organisations to think differently about the most suitable mix of mitigation measures within a catchment to deliver this balance investment. With respect to a sewer/surface water flooding problem this could result in a combination of above and below ground infrastructure, each offering a different level of protection, but working in an integrated way to deliver the balance of benefits, costs and affordability. Partnering will help organisations move away from 'silo' thinking, and consider more creative solutions to reduce flooding or pollution risks. Design development reviews are important with partners to ensure that benefits and outcomes will be delivered through the proposed investment, which will unlock funding.

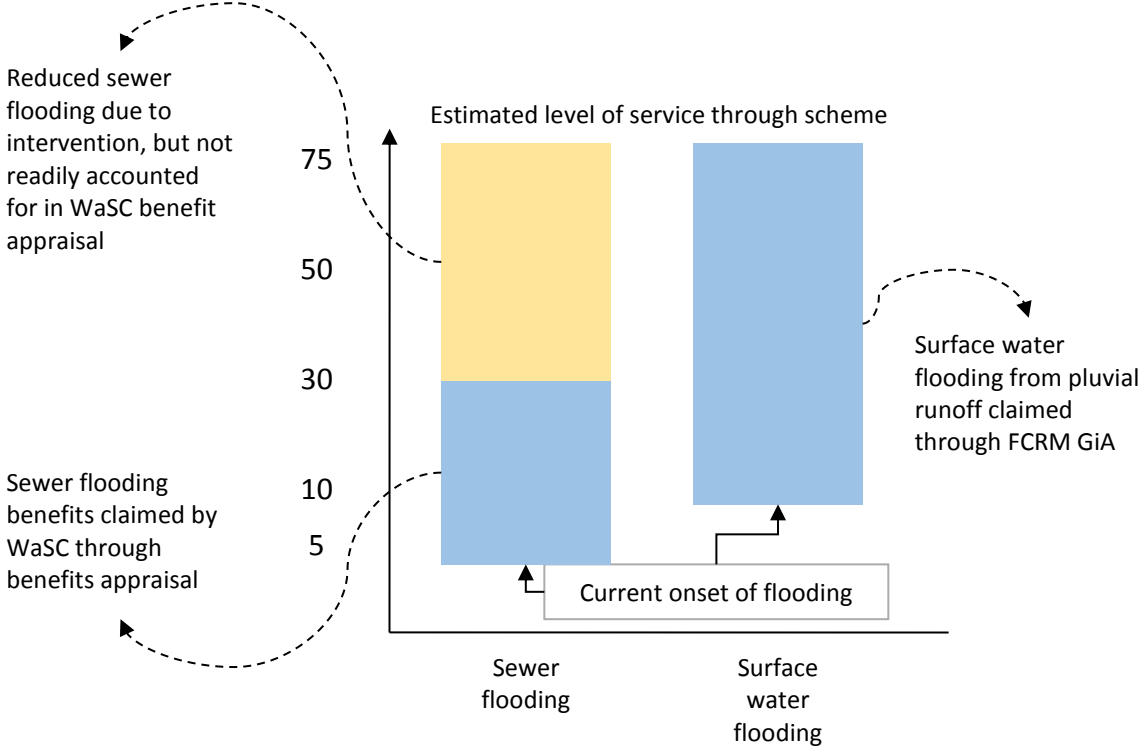
As outlined in Section 4.3, WaSC investment decisions (for non-regulatory investment) is based on customers' WTP, these data may only be available up to a certain level of service. Therefore, initially a WaSC should test the benefits of the collaborative projects within the limits of customers' WTP data, in order to identify the benefits of investment to its customers, and hence identify the optimal investment strategy. However, through a collaborative project WaSC customers may receive a higher level of service, for limited additional investment. Therefore, even though it may not be straight forward for a WaSC to value benefits beyond their customer WTP data, the opportunity to offer a higher level of service to customers through partnership should be a contributory factor in deciding how much funding to contribute towards a scheme. If, through limited additional investment, a

⁴⁷ This should include the costs of pursuing a scheme in isolation, as well as costs of a partnership scheme

much higher level of service can be provided to WaSC customers⁴⁸, this may support additional funding contribution from the WaSC because of the additional benefits provided to customers.

Figure 16 illustrates this, whereby a collaborative project will deliver reduced sewer and surface water flooding within a catchment. In this illustration sewer flooding will be reduced up to the 1 in 75 year level of service, but the WaSC only has data on customers' WTP up to the 1 in 30 year level of service. Therefore, as part of the benefits appraisal the WaSC can only quantify the benefit up to the 1 in 30 year level of service. Naturally, the additional benefits up to the 1 in 75 year level of service will benefit WaSC customers, and should inform part of the decision-making for investment, but there may be not a readily available mechanism to calculate these benefits. There is no regulatory constraint for WaSCs valuing a higher level of service, subject to this being informed by information on customers' WTP. Furthermore, the winter flooding of 2015/16 has highlighted the need to consider resilience of communities and customers once design standards of infrastructure is exceeded.

Figure 16 Consideration of design standards in appraisal of benefits



⁴⁸ Indeed, partnership project may unlock schemes which are more adaptable and resilient to future climate change, and this should be considered in the options appraisal

Case study: Killingworth & Longbenton

This project originated as an output from Northumbrian Water's (NWL) Tyneside Sustainable Sewerage Study, a pilot project which eventually led to the development and establishment of the Northumbria Integrated Drainage Partnership. The issues which identified this drainage area as high risk included widespread flooding from multiple sources, poor water quality in river and watercourses and significant growth pressures. Working in partnership with North Tyneside Council (NTC) and the Environment Agency (EA) the project confirmed the major factor impacting on the performance of the drainage system was the interaction between natural / man-made surface water features and the combined sewerage system. The proposed solution is to reduce these interactions by diverting surface water out of the combined sewer by means of a river diversion and the use of SuDS techniques such as attenuation basins, ponds, swales and wetlands. A benefits assessment using the CiRIA 'Benefits of SuDS Tool (BeST) indicates a benefits cost ratio of approximately 8:1. Whilst the scheme is fully funded (FDGiA 47%, NTC 10% and NWL 43%) the project team are continuing to actively seek contributions from other beneficiaries.

7.5.3 Apportion funding contributions by partner

As previously described, different CBA approaches cannot readily be merged into a single, integrated CBA for collaborative projects. As a result, each partner needs to understand the benefits accruing to its organisation, as outlined in Sections 7.5.1 and 7.5.2. With an understanding of the benefits accruing to different partners from a range of options, and an understanding of the whole life costs (or totex) of these options, the next step is to apportion funding contributions by partner. This is a complex process and the decision-making process will vary from organisation to organisation.

Nevertheless, there are some general principles which should enable partners to apportion suitable funding contributions towards the preferred option in any given catchment. These over-arching principles will need to be considered at a local partnership level because each WaSC has different outcomes, but they do provide a starting framework for discussion between partners.

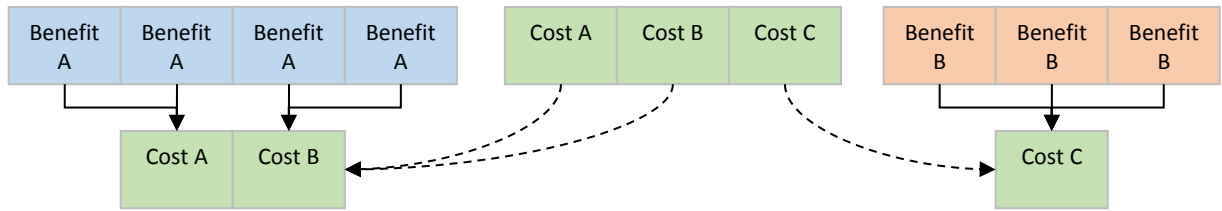
1. Partners will only contribute funding towards outcomes (i.e. benefits) they can legitimately claim. Each partner should understand the benefits it can claim which should encourage an open and transparent conversation with other partners about funding contributions over the whole life of a project.
2. It is recommended that partners determine their funding contribution primarily on valuing the benefits to the receptors (e.g. people, property and the environment) rather than apportioning contributions based on sources or pathways. This is because focussing on receptors:
 - ensures that a risk-based investment decision is made because an understanding of the probability **and** consequences of flooding are used to justify investment, and;

- focusses on the outcomes of investment, which creates a stronger link to the WaSC ODIs and government/public sector outcomes for investment⁴⁹.
3. The whole life funding contribution (or totex) from each partner should result in a positive return on investment. Organisations use different metrics to estimate the rate of return on investment, including (but not limited to) Benefit-Cost Ratio, Net Present Value, or Internal Rate of Return. For WaSCs, there is flexibility to invest in schemes that do not have a positive return on investment, in the context of delivering the specified outcomes they have agreed with Ofwat. In some cases there may be a need to invest in a given project irrespective of the return on investment.
 4. The affordability and timing of funding contributions should be considered. Whilst an investment may generate a positive return on investment the scale of proposed investment may be unaffordable either now or in the future for a partner. This forms part of the financial justification for investment.
 5. Partners' contributions should seek, as far as possible, to be equitable based on the benefits they accrue over the whole life of investment, and should include appropriate sharing of future risks for the project. It is recognised this is not always achievable because of funding constraints, and that organisations will use different thresholds and metrics for investment.
 6. Partners return on investment should be greater than delivering investment as a stand-alone project. Partners should always be able to benchmark the costs of collaborating against the costs of delivering a project individually. This can be measured in a range of ways including:
 - delivering more benefits for the same whole life costs (or totex);
 - delivering the same benefits for lower whole life cost, or;
 - unlocking investment where it was not feasible in isolation for technical or economic reasons.

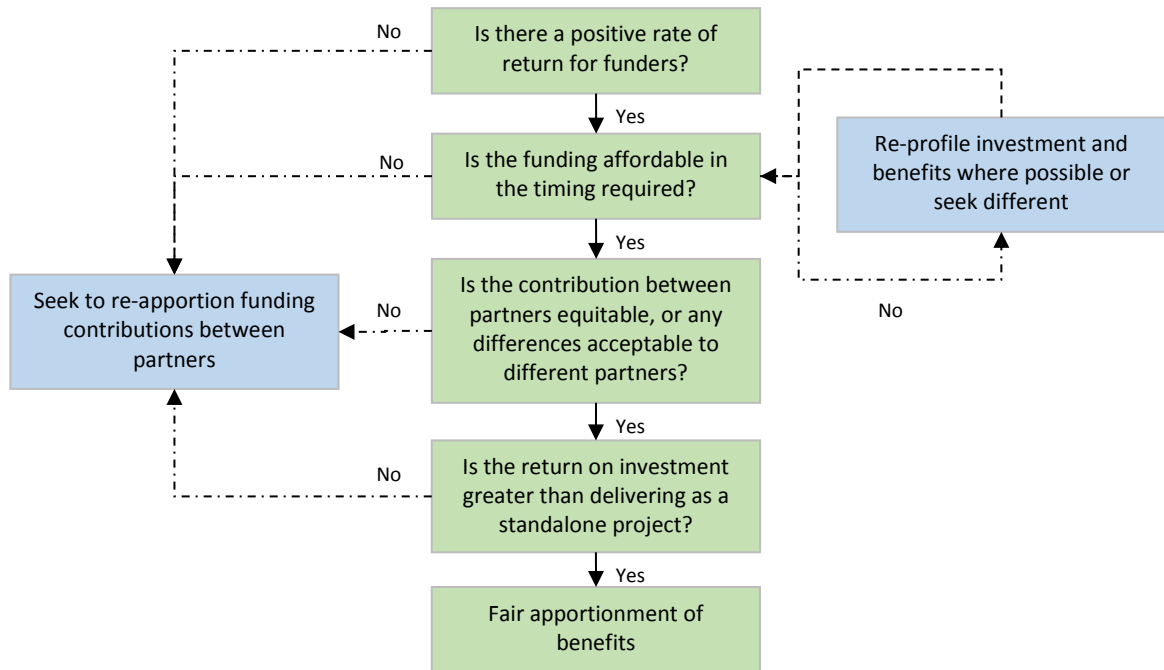
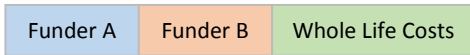
These principles are illustrated in Figure 17 which demonstrates how partners may choose to initially apportion the whole life costs (or totex) based on the predicted benefits to different partners (note that there may be more than two funders for a project). Following an initial assessment of the apportionment of funding contributions the key questions outlined in Figure 17 can be used to demonstrate that the funding from each partner is equitable, agreeable, and affordable.

⁴⁹ For example, the amount of FCRM GiA for a project is based on outcomes delivered (e.g. whole life benefit to UK Plc and properties protected)

Figure 17 Example of how to assess equitable apportionment of funding contributions



Legend:



Example Approach: Apportioning WaSC funding contributions to a scheme

Within a catchment there are 10 properties that have suffered internal sewer flooding and 5 properties that have suffered external sewer flooding twice in the last 10 years. The cause of the flooding is under capacity within the sewer network, and land drainage ingress into the system. Further upstream there are 25 properties at risk of pluvial flooding, and which have flooded twice in the last 10 years.

The WaSC has appraised a scheme to upsize the local sewer network which has totex of £2 million. It has a marginal benefit-cost ratio of 1:1, and is unlikely to be progressed. The option would reduce sewer flooding from a 1 in 5, to a 1 in 10. Further upstream the local authority would like to divert pluvial runoff through a local park and join a nearby watercourse. The scheme is estimated to cost £2.25 million with whole life benefits of £8 million, and would only attract funding from FCRM GiA and the local authority of £1.5 million, leaving a funding gap of £750k. The local authority proposals would partially reduce downstream sewer flooding to 5 properties, from a 1 in 5, to 1 in 10.

Working together, through a combination of upstream management of pluvial runoff, and some localised upgrade of the sewer network the whole life cost of the scheme is estimated to be £3.5 million, of which £1.6 million is available from FCRM GiA and the local authority. This leaves a funding gap of £1.9 million. The combined scheme would reduce sewer flooding up to a 1 in 20 year event.

The WaSC has four primary choices for investment:

- A. Do Nothing
- B. Pursue the scheme in isolation, which has a marginal BCR, and a cost of £2 million
- C. Contribute towards the local authority scheme only (£1 million)
- D. Contribute all or some of the joint scheme (up to £1.5 million)

Scenario B	Whole Life Costs (£K)	Whole Life Benefits (£K)	Benefit Cost Ratio	Net Present Value (£K)
National (FCRM GiA)	-	-	-	-
WaSC	£2,000	£2,020	1.01	-£506
Scenario C	Whole Life Costs (£K)	Whole Life Benefits (£K)	Benefit Cost Ratio	Net Present Value (£K)
FCRM GiA & LA	£1,500	£8,000	5.33	£5,730
WaSC	£750	£1,826	2.43	£1,047
Scenario D	Whole Life Costs (£K)	Whole Life Benefits (£K)	Benefit Cost Ratio	Net Present Value (£K)
National (FCRM GiA)	£1,600	£8,000	5.00	£5,730
WaSC	£1,900	£4,856	2.56	£3,044

Using WTP data and standard appraisal tools, the WaSC can calculate the costs and benefits of different intervention options, to estimate the benefit-cost ratio and NPV. In this case scenario D (contribute £1.9 million to the combined) generates the greatest NPV, but the benefit-cost ratio is similar to between scenarios C & D. Furthermore, the benefit-cost ratio to the WaSC is significantly lower than benefit-cost ratio for FCRM GiA and local authority contributions, where the benefits were calculated using avoided damages to UK PLC. Presenting data in this format can help partners determine the best investment choice, and how to fairly apportion costs based on the benefits accruing to different organisations.

7.5.4 Seek business case approval

Once partners have developed the economic justification and completed the options appraisal process for a collaborative project, approval of the business case for investment must be sought. Each WaSC will have its own internal governance and approval routes for investment, as will local authorities. Funding from Government sources such as FCRM GiA will need to go through independent assurance and approval. In England, the approval of funding to access FCRM GiA is illustrated in Table 8, and is dependent on the whole life cost of the project. In Wales and Scotland Government funding will need to be approved by the NRW and Scottish Government, respectively.

Table 8 Approval routes for FCRM GiA funding in England⁵⁰

Type of project	Value	Approval
Low value business case	<£100k	Area Flood and Coast Risk Manager
Small projects	<£2 million	National Project Assurance Service
Large projects	£2-10 million	National Project Assurance Board
Large projects	>£10 million	Large Projects Review Group

Figure 18 Delivery (extracted from main collaborative workflow)



⁵⁰ All projects must follow the 5 case business model. The extent of the business case depends on the total value. Further guidance is provided in Environment Agency (2015b)

7.6 Implementation preparation

The final phase of the collaborative workflow is related to the preparation activities for implementing the collaborative project. Given that every collaborative project will be unique, and will require different delivery mechanisms and negotiations the principles outlined in subsequent sections are provided to help partners ensure they consider the key questions and challenges. Figure 18 shows the key steps of the collaborative workflow. These key steps will need to be undertaken during preparation of the business case, and prior to moving towards the implementation phase of a project.

7.6.1 Determine delivery model

When considering a collaborative project the delivery model for construction and maintenance of the scheme should be agreed. This may result in a different lead partner than agreed earlier on in the project life cycle.

There are different delivery models available for the construction phase:

1. a WaSC makes a contribution to a partner organisation who then leads on the construction;
2. a partner organisation makes a contribution to the WaSC who then leads on the construction phase, or;
3. an integrated delivery model is used, whereby resources and skills are shared during the construction phase and where multiple organisations assume responsibility.

Integrated delivery approaches: Herne Hill

The **Herne Hill and Dulwich flood alleviation scheme** reduces flooding to 200 homes and businesses from surface water flooding and a further 80 properties from sewer flooding. It is a collaborative scheme between Southwark Council and Thames Water, with funding from these partners and FCRM GiA. The scheme involves building earth bunds to intercept and temporarily hold up to 51,000 m³ of water in Belair Park, Dulwich Sports Trust and Dulwich Park during severe storms.

For the scheme, Southwark Council acted as the lead partner, but used Thames Water's framework contractor for the construction of the project as they had undertaken the previous feasibility work. Thames Water provide resources to support the construction phase because of their significant experience in delivery infrastructure. In addition, during the appraisal of the scheme Southwark Council and Thames Water had shared information to enable an integrated model of the catchment to be built and used to support scheme design.

The preferred delivery model will depend on a number of factors, which partners should consider before determining the most appropriate approach. These are considered in the worked example below.

Example Approach: Determine delivery model

The example below illustrate key factors to when determining which type of delivery model for a collaborative project. Initially, partners should consider:

- who has access to a supply chain for the design and build of the project;
- which organisation has the skills, resource capacity and experience to manage the project, and;
- the primary purpose of the project.

The responses to these questions should help determine who should be the lead partner. Subsequently, there are questions partners could consider to identify whether an integrated delivery approach is required. An example approach is shown below.

Question	Answer
Will there be multiple asset owners?	Yes
Are financial contributions broadly equitable?	No
Are there efficiencies or savings through integrated delivery?	Yes
Is the site complex in terms of construction, access, or stakeholders?	Yes
Recommended approach	Integrated delivery

Beyond the construction phase of the project partners will need to agree who will adopt and maintain the infrastructure. For WaSCs there may be complications associated with investing in assets that do not become part of the company's asset base, or future maintenance requirements associated with assets that have been constructed in partnership.

Realising cost savings through partnership

In Leamington, Warwickshire, Severn Trent Water were able to realise significant cost savings through a collaborative scheme. A conventional solution that involved underground tank storage was not cost-beneficial. On the contrary, a partnership solution involving Sustainable Drainage Systems (SuDS) was considerably cheaper than the conventional option, even though Severn Trent Water paid a commuted sum to the local authority to adopt and maintain the SuDS.

Partners may determine that different components of a project are adopted and maintained by individual organisations. This approach may be used where there are above and below ground assets as part of a scheme, in which the WaSCs may adopt and maintain the below ground assets and a local authority may adopt and maintain the above ground assets. Alternatively, one organisation may adopt and maintain the scheme over its whole life.

Under these circumstances partner organisations would contribute towards a proportion of the whole life maintenance costs, either as annual payments or an upfront commuted sum.

Integrated delivery approaches: Fellgate flood alleviation scheme

Fellgate is an urban estate in Jarrow, South Tyneside that was at risk from sewer and surface water flooding. Northumbrian Water and South Tyneside Council have collaborated on a £4 million scheme, with funding from these organisations and RFCC local levy FCRM GiA and South Tyneside Homes.

The proposed scheme involved two phases of work to address the sewer and surface water flooding. Phase 1 was the sewer flooding works, involving the construction of two new detention basins and phase 2 works included the construction of further basins, permanent ponds, swales and bunds to manage surface water at source. For efficiency reasons Northumbrian Water and South Tyneside used the same consultant and contractor for the design and build of the scheme, which significantly reduced disruption to local residents and the mobilisation and demobilisation costs.

7.6.2 Agree risk management approach

Partnerships go through different stages, and degree of risk management will change as partners move into a delivery phase of the project. With respect to the risk management approach for design, construction and maintenance, there are a range of important risks to be identified and discussed, some of which are outlined below:

1. how partners should equitably share any cost over-runs⁵¹;
2. how contributions for future operation and maintenance costs will be paid for, either through commuted sums or periodic cash contributions;
3. how governance during design and construction should be established (NB: this is also covered in legal agreements);
4. how construction risks such as environmental or archaeological issues will be managed;
5. how changes during detailed design (e.g. for technical or economic reasons) will be managed, and/or;
6. how PR, public expectations and communications will be managed between partner organisations.

⁵¹ It should be noted that in England FCRM GiA is effectively capped based on the outcomes being delivered. Therefore, additional FCRM GiA would not be available as a funding source to contribute further funding if the out-turn costs of a scheme are higher than forecast (without a compensatory increase in benefits claimed)

7.6.3 Develop legal agreements

During this phase partners should enter into legal agreements to secure contributions and manage risks and liabilities. The legal agreements of entering into a partnership may be significant and time consuming, and legal advice will be required for each partner organisation on a project by project basis. Different stages of partnership working may require different types of legal agreements. A Memorandum of Understanding or data sharing protocol may be suitable during early stages of planning and understanding of risks, but as projects move towards delivery more detailed legally binding documents will probably be required. Whilst legal agreements will be bespoke to each project they may cover some or all of the following:

- payment terms, timescales and financial contributions over the whole life of the project including maintenance;
- obligations of the partners;
- working arrangements or personnel, including project management and governance;
- compensation claims;
- liability;
- confidentiality and intellectual property rights;
- change management and resolution of disputes;
- public availability of information;
- security of payment, including the consequences of default, and;
- securing access to the site for construction and maintenance.

It should also be noted that land ownership agreements may be required for use of third party land. This should also be considered at this stage of the project life cycle.

8 Conclusions and recommendations

8.1 Conclusions

This study has highlighted and celebrated the existing good practice in collaborative working between WaSCs and partners. Throughout the document, numerous case study examples have been presented to highlight this good practice.

Nevertheless, there are remaining challenges when WaSCs and partners seek to collaborate. The guiding principles developed for this project build upon the existing good practice and provide a common, logical and systematic way to unlock more collaborative opportunities. The guiding principles cover the range of scenarios where a WaSC may collaborate with other organisations to identify, appraise and deliver collaborative opportunities, including:

- flooding where the public sewer network is part of the source or pathway;
- resilience of WaSC assets where they are at risk of flooding or river/coastal erosion;
- managing pollution to the environment, or;
- creating capacity within wastewater networks and treatment plants to accommodate growth.

The guiding principles are not intended to be prescriptive, but rather enable partners to follow a common approach to progress collaborative opportunities. The guiding principles can be embedded within the existing project life cycle rather than create wholly new processes to enable partners to adopt them into their normal business practice, and are developed for use within the current investment cycle whilst providing approaches to help partners to plan future investment collaboratively.

8.2 Recommendations

There are three primary recommendations arising from this research project:

1. water and sewerage companies and partners should implement the guiding principles outlined in this document to unlock collaborative opportunities during the current business plan period, and future business plans;
2. good practice and lessons learnt should be shared between water and sewerage companies and partners, to demonstrate that collaboration can save money, unlock investment, and deliver multiple benefits;
3. continued engagement with UK Government is required to clarify areas that remain difficult to resolve, such as definitions and responsibilities about flooding from sewers.

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Appendix A Case study examples

Scheme name	Description	Value	Status	Partners	Driver(s)	Type of collaboration
Colebrook	Surface water management scheme with various elements.		Complete (March 2015)	Plymouth CC South West Water Environment Agency	Surface water flooding	Financial contributions from all three partners.
Millbay Tanks	Improve capacity within combined and highway drainage systems through management of saline infiltration. Manage interactions between surface water and tidal influences.	£550k	Complete (April 2015)	Plymouth CC South West Water Environment Agency	Surface water flooding Create capacity within sewerage network	Funding split 49/51% between FCERM GiA and SWW capital programme Plymouth CC acted as funding conduit for FCERM GiA application but did not contribute financially themselves.
Bourne Valley Park, Poole	External surface water flooding of six properties and two areas of highway in Alder Crescent, Poole, used to occur about once every two years. The flooding was due to inadequate capacity in the downstream surface water sewer.		Complete October 2007	Wessex Water Poole Borough Council Environment Agency Natural England Bourne Stream Partnership	Reduction in flood risk Improvement in amenity value of recreation ground	
Marissal Road, Bristol	Internal and external surface water flooding occurred every 5 years at 8 properties, with highway flooding occurring much more frequently. The highway flooding was due to a combination of lack of capacity in the public surface water sewer and inadequate highway drainage and gully provision. Further development was also planned in the area.			Wessex Water Bristol City Council	Reduction in flood risk Development Proposed solution will offer a saving of 20-30% compared to traditional solution	Storage pond constructed on Bristol City Council land.
Leybourne Avenue, Bournemouth	Reduction in flood risk to gardens from surface water manholes and fluvial flow from natural catchment.			Bournemouth Borough Council Wessex Water	Reduction in flood risk	Developed solution during regular surface water management meetings. Held public meetings.
Weston super Mare IUDM	Scheme to reduce spill frequency from combined sewer overflow to an average of 3 spills per bathing season.			Wessex Water Environment Agency North Somerset Council	Improve bathing water quality	Worked together to agree and provide additional storage within a super pond that was already being developed by the Environment Agency and North Somerset Council to allow Wessex water to discharge more surface water. Wessex Water contributed towards design, construction, use of land and a commuted sum for future maintenance of the above ground storage area.
Herne Hill & Dulwich Flood Alleviation	The scheme will protect over 200 homes and businesses from surface water flooding (to 1 in 75 year) and another 80 from sewer flooding (1 in 30 year). It also delivers environmental improvement for the 3 local parks within which the scheme is located and provides additional amenity for the enjoyment of the local community.	£4.28m		Southwark Council Thames Water Environment Agency	Reduction in flood risk to homes and businesses	FCERM GiA £1.7m, Local Authority £200k, TWUL over £2m Had to synchronise timescales of TWUL's sewer flooding projects with Southwark Council's surface water flooding project. Council lead on stakeholder engagement and TWUL provided early contractor involvement and site supervision.

Scheme name	Description	Value	Status	Partners	Driver(s)	Type of collaboration
Pinxton PLP, Derbyshire	Seventeen properties experienced recurrent internal flooding as a result of interaction of fluvial and surface water and from foul, combined and surface sewers. Scheme to use PLP.	£63,000	Complete	Environment Agency Derbyshire County Council Severn Trent Water Bolsover District Council Pinxton Parish Council	Reduction in flood risk Public health (reduction in internal property foul flooding)	FCERM GiA/Local Levy £43,000, Derbyshire County Council £14,000, Severn Trent Water £15,000, Bolsover District Council £2,000, Pinxton Parish Council £1,000, County Councillor (Member Community Leadership Scheme) £1,000. Community engagement to develop understanding of multiple sources of flooding among residents and to appease resident's concerns about need to investigate other solutions. Parish Council acted as a direct link between RMAs and the residents. All public meetings attended by all key stakeholders to demonstrate partnership approach. National Flood Forum attended community meetings to provide advice and impartial approach.
Rye Brook - Wrington	Reduction in flood risk (from multiple sources) to properties in Wrington, North Somerset. Protection to 70 properties, with most vulnerable moving from a 1 in 2 year or 1 in 5 year risk to 1 in 50 year risk.	£670k (whole life)		Environment Agency North Somerset Council Wessex Water	Flood risk reduction Benefits for the wider community	North Somerset Council £100k, Wessex Water £150k, Developer Contribution £32k, FCRM GiA £308k, Local Levy £80k. Strong supporting evidence on causes and impacts helped develop a shared understanding of the risks and benefits. Involvement of Ward Member and Parish Council in the project board.
Croston Flood Risk Management Scheme	Croston, Lancashire is located on the River Yarrow, just upstream from where it meets the Rivers Lostock and Douglas. This meeting of rivers combined with a series of culverted watercourses, drains, sewers and surface water runoff means that the area has experienced flooding several times. The preferred option is for an overflow channel.			Environment Agency United Utilities Lancashire CC Chorley BC Lower Yarrow flood action group	Flood risk reduction	Partnership working to develop the scheme, unclear whether contributions were made as part of this process.
Clacton	Project to combat coastal erosion and associated risk to infrastructure.	£37m		Tendring Hundred District Council Anglian Water	Interest from Anglian Water customers in preventative approach Risk of loss of sewer network (subsequent pollution to beach and bathing waters) Coastal protection Cost saving	Tendring Hundred District Council responsible for sea defences and received 70% of total required from Defra. Anglian Water contributed £3million (£23 million less than they would have required to do the work independently).
Louth	Scheme to reduce fluvial and sewer flooding. Sewer flooding scheme will deal with 17 properties which have internally flooded. Fluvial flood risk to 355 properties will be reduced.			Environment Agency Anglian Water	Reduction in fluvial and sewer flood risk More cost effective solution	Anglian water have agreed a contribution capped at £0.3m in AMP6.

Scheme name	Description	Value	Status	Partners	Driver(s)	Type of collaboration
Northumbrian Integrated drainage partnership	Strategic approach to developing pipeline, multiple benefit, multiple source of flooding projects.		Ongoing	Environment Agency, Northumbrian Water, all LLFAs in Northumbrian Water area	Develop and driver financially projects with multiple outcomes. Achieve efficiencies, share resources and minimise disruption (do work in community once).	Funding currently from Northumbrian Water and Local Authorities. FDGiA, local levy and other contributions will be sought for future projects. Regionally stakeholders agreed a risk-based approach to identify joint study areas.
Telford	Understand and alleviate flood risk from all sources. Solution included work to foul sewerage system and pumping station, increasing capacity of surface water sewer system, highway and land drainage improvements and use of SuDS in the upstream catchment.		Complete 2015	Severn Trent Water Telford and Wrekin Council	Reduction in flood risk	Funded from Severn Trent Water's sewer flooding investment programme, Telford and Wrekin Council funding and FDGiA.
Lubbersthorpe Brook, Leicester	Scheme to address combined (fluvial and sewer) flooding.			Environment Agency Severn Trent Water	Reduce costs and disruption of solution	
Lodge Hill Project, Birmingham	Investigate and reduce flood risk (from surface water and sewer flooding) to properties in Wesley Avenue and Alwold Road area of Selly Oak.		Was at feasibility stage in November 2014	Birmingham City Council Severn Trent Water Environment Agency	Reduce flood risk from multiple sources	Feasibility work jointly funded by the partners. Aim for joint working throughout the modelling and solution development stage of the project. Any proposed solution must fulfil the cost benefit criteria for FDGiA funding and Severn Trent Water's sewer flooding capital scheme funding criteria to progress beyond feasibility stage.
Llanelli	Manage surface water issues in Llanelli and Gowerton Catchment areas.	£15m to date and £25m over next 5 years	Facilitation group set up in Carmarthen shire	Dŵr Cymru Welsh Water	Llanelli	Manage surface water issues in Llanelli and Gowerton Catchment areas.
Excelsior Street sewer flooding scheme	Removal of point source land drainage connection to sewer.			Welsh Water and Blaenau Gwent County Borough Council	Internal sewer flooding at six properties	Delivered by Welsh Water and part funded via the European Regional Development Fund via Welsh Government Worked with the Local Authority and handed over some of their assets.
Milton Hill, Weston-super-Mare	Managing flooding on a steep urbanised catchment.		Part complete	Wessex Water and North Somerset Council	Property flooding and on DG5 register	Wessex led on modelling and appraisal and identified solutions to the problem (storage tanks which have been constructed). Storage tanks required highways enabling works which are being undertaken by North Somerset Council.
East Peckham FAS	Flood Alleviation Scheme.		Design to be complete in 2017	Environment Agency and Southern Water	Reduce flood risk and ingress of water in Southern Water systems and defend infrastructure	

Scheme name	Description	Value	Status	Partners	Driver(s)	Type of collaboration
Brunton Park Flood Alleviation Scheme	Integrated Flood Scheme in Newcastle to address multiple sources of flood risk (fluvial, drainage, surface water and foul) and deliver environmental enhancements.		Ongoing	Environment Agency, Northumbrian Water, Newcastle City Council	Provision of comprehensive solution and make project financially feasible.	Funding from Northumbrian Water, Newcastle City Council, FDGiA and local levy.
Felgate Flood Alleviation Scheme	Scheme to address sewer and surface water issues in an area affected in 2012. Integrated approach to remove surface water from sewer network through SuDS.			Northumbrian Water and South Tyneside Council		Multi sources of funding: Northumbrian Water, South Tyneside Council, FCRMGiA, Local Levy and other beneficiaries. Northumbrian Water dealt with direct sewer flooding up to their statutory design capacity while additional funding allowed scheme to deliver a 1 in 100 SoP.
Beverley (East Yorks) – Westward Pasture	Scheme to reduce required size of sewerage system by disconnecting water course from sewerage system.			Yorkshire Water East Riding of Yorkshire Council	Reduction in cost of building storage tank	Yorkshire Water needed to build storage tank up to 1 in 30 SoP. Working in partnership with East Riding of Yorkshire Council they reduced runoff into sewerage system and reduced size of storage tank. Savings meant Yorkshire Water could contribute to East Riding of Yorkshire Council for the upstream runoff work.
Killingworth and Longbenton, Northumbria	Removal of surface water from sewer network and reduce flood risk.	£8m	Start date for construction is 2017	Northumbrian Water, North Tyneside Council and Environment Agency	Reduce flood risk, environmental benefits	
Teignmouth Tidal Defence Scheme	Combining strengthening works to South West Water assets with tidal defence works.			South West Water and Environment Agency	Reduced cost by collaboration	Used a single contractor to help identify way to combine the works and the timescales for the project. Efficiency saving of £207k.
Godmanchester, Cambridgeshire	Scheme comprising 1.5km of flood defences including walls and embankments.					Funded by FDGiA with contribution from local councils. Anglian Water consulted with regards to the appropriate pumping stations to implement.
Greener Grangetown	Further information required.			Regulator, Welsh Water and Local Authority		

Appendix B Challenges of collaborative working

Grouping	Description	Ability to influence through this project
Insufficient valuing of non-monetary inputs	The value of contributions in kind is not always recognised. Parties are not always aware of the range of benefits that different types of organisations bring to the table. Financial contributions are only part of the benefit of partnership working but other forms of contribution are often overlooked.	Effect change This project will set out the benefits of collaborative solutions and clarify the particular skills, resources and powers that each type of organisation brings to the table to address the lack of awareness that lies behind this barrier.
Delivery risk	Organisations are usually accountable for delivery of specific outcomes against expenditure, often within a fixed period. Certain WaSC outcomes have fixed deadlines as well and the WaSCs would be at risk of fines if these were not met. Partnering poses issues around how adequate control can be maintained if delivery of part or all of a scheme is dependent upon another organisation.	Effect change This project will provide examples of good practice and templates for different types of agreement for managing delivery risk.
Different methods to value benefits	WaSCs and public sector organisations have different approaches to defining and valuing the benefits of a scheme, which can lead to misaligned expectations and difficulty in agreeing objectives. Cost benefit appraisal is key to justifying investment and affects how much (or whether) an organisation is prepared to invest.	Effect change This project will explain what benefits are important to parties and why, clarify the processes by which parties define and value benefits, and provide examples of good practice and tools for improving the alignment of these processes.
Lack of early / proactive engagement and planning	Early engagement is crucial to identifying opportunities in time for inclusion within partners' respective investment plans. Constrained resources, lack of up front funding and a lack of understanding of other parties' programmes/lead-in times all hinder proactive early engagement.	Effect change Whilst this project cannot change the relevant regulatory and institutional issues contributing to this barrier, it will clarify the relevant investment programmes and highlight the gateways for identifying and programming schemes to increase awareness and help ensure that parties engage at

Grouping	Description	Ability to influence through this project
Misunderstanding of partners drivers, resources or expectations	<p>Partners do not always fully understand or appreciate each other's responsibilities, capabilities, resources, drivers and limitations. This can lead to misunderstandings and unrealistic expectations.</p> <p>Failure to establish clear expectations up front can lead to misunderstandings and delivery problems. Parameters must be set out clearly so that each partner understands what is expected of themselves and the other partners involved.</p>	<p>the right times.</p> <p>Effect change This project will set out the relevant processes, responsibilities, drivers and constraints of the different types of organisations to raise awareness and minimise the risk of misunderstandings. It will also provide examples of good practice and templates for agreeing the inputs and objectives of partners, to minimise future misunderstandings.</p>
Aligning programmes and investment cycles	<p>WaSCs and flood risk management partners work to different investment cycles. This can cause problems with the alignment of programmes and budgets, although there are numerous examples of partners overcoming these challenges.</p> <p>Forward planning is needed to identify partnership funding opportunities in time for WaSCs to build these into their 5/6 year investment plans.</p> <p>Different investment programme periods and funding timetables can make it difficult to coordinate delivery of schemes. For example, certain WaSCs outcome requirements are time-bound and partnership funding may not be available in time if they are not included in partners' investment programmes enough in advance.</p>	<p>Influence practice Whilst this project cannot change the relevant regulatory and investment programmes, it will provide information and guidance which will facilitate the necessary working practices to overcome this barrier.</p>
Agreements and contracts	<p>Relates to the difficulties experienced in getting the necessary firm commitment from partners to enable schemes to be progressed with confidence.</p> <p>MoU and similar agreements are already in common use, but this remains an issue according to consultation.</p>	<p>Influence practice This project cannot force individual organisations to commit to any specific arrangements, but it will provide examples of good practice and templates for different types of agreement to support partnership funding commitments.</p>

Grouping	Description	Ability to influence through this project
Cultural or institutional barriers	<p>Cultural barriers include; resistance to new approaches (status quo bias), silo thinking, risk aversion, and a lack of empowerment at delivery level.</p> <p>Institutional arrangements such as inflexible policies and processes, internal bureaucracy and red tape can make it difficult to work across departments/practice areas as well as with external organisations. Regulatory systems (including funding streams and delivery mechanisms) are not set up to accommodate holistic approach.</p>	<p>Influence practice</p> <p>This project will set out the benefits of collaborative solutions and clarify the particular skills, resources and powers that each type of organisation brings to the table to help overcome the cultural resistance. It will also clarify the relevant processes by which parties prioritise and justify investment and identify ways of aligning these more effectively.</p>
Definitions of sewer flooding	<p>It is difficult to determine responsibility in complex flooding situations or where there is an interaction across flooding sources because it can be challenging to fully understand the causes of flooding, and there are differing views about how responsibilities, outcomes and funding should be apportioned in these circumstances. This affects which schemes are able to obtain public funding (e.g. FCERM GiA in England).</p>	<p>Raise awareness</p> <p>This project will set out the concerns around definitions and provide examples of how these are being worked around in practice, but is unable to influence the definitions themselves. The Water UK Surface Water Management Network has been undertaking some work to seek a common understanding of sewer flooding between WaSCs.</p>
Different design standards	<p>WaSCs and public sector organisations typically work to different design standards. This can make it difficult to work together as their different requirements affect the value placed by each on the benefits of a scheme, and hence how much (or whether) they are prepared to invest.</p>	<p>Influence practice</p> <p>This project will clarify the issue and explain the background to the perception, encouraging parties to open up negotiations beyond perceived limitations.</p>
Different priorities	<p>Different organisations have different priorities (areas and objectives) and these are not necessarily complementary. For partnership funding to be successful there needs to be a clear win-win solution.</p> <p>Organisations which focus solely on achieving their own priorities and impose that paradigm on others are unlikely to work successfully in partnership.</p>	<p>Influence practice</p> <p>This project will clarify the priorities of each type of organisation, and identify common ground to improve parties' mutual understanding.</p>

Grouping	Description	Ability to influence through this project
Financial risk	Public funding is typically capped, so the risk of overspend (and what happens to any underspend) needs to be managed appropriately. This needs to be agreed by all parties in advance.	<p>Influence practice</p> <p>This project will provide examples of good practice and set out different approaches to managing financial risk, including templates of different types of agreement where available.</p>
Limitations of funding sources / mechanisms	<p>Each funding stream carries its own set of constraints regarding when and how it can be used, and what on. These constraints have implications for the use of the funding streams in collaborative projects.</p> <p>For example, historically in Scotland there was until recently a minimum value requirement of £2m for formally defined flood alleviation schemes applying for public funding, which meant that smaller surface water schemes were unlikely to qualify. In England, FCERM GiA cannot be carried over to another year so programme delays may lead to that element of the funding being withdrawn, leaving a funding gap partway through delivery.</p> <p>The current system operates on the basis of separately funded surface water management functions (i.e. flows from within property curtilages, road drainage, and exceedance flows). A multi-functional, holistic approach to stormwater management is not easily accommodated within this established system.</p>	<p>Influence practice</p> <p>This project will clarify the funding mechanisms of the different types of organisation, highlighting any limitations of the application process and constraints regarding use of the funds, to ensure that parties are fully aware of the implications for collaborative schemes. This will help parties to maximise opportunities for accessing these funding streams and ensure they are used as effectively as possible within the current constraints.</p>
Operation and maintenance of schemes	The burden of long term maintenance liability can be a significant challenge for collaborative schemes, as ongoing maintenance costs are more difficult to fund than a one-off capital expenditure. Partners may not have the necessary skills, funding streams and/or powers to operate certain types of asset.	<p>Influence practice</p> <p>This project will provide examples of good practice and templates for adoption agreements where available.</p>

Grouping	Description	Ability to influence through this project
Terminology and language	WaSCs and public sector organisations use different terminology and language when talking about flood risk and drainage, as a result of their different design standards and responsibilities. This can lead to misunderstandings and mismatched expectations when developing schemes in partnership, particularly when defining and appraising anticipated benefits.	<p>Influence practice</p> <p>This project will identify the differences in terminology and provide a reference glossary to facilitate mutual understanding.</p>
Commercial sensitivities	<p>There are restrictions on the level of detail that WaSCs are prepared / corporately permitted to share with other parties, due to commercial sensitivities and tensions around regulatory issues.</p> <p>Restrictions and misunderstandings around data sharing can prevent early identification of opportunities.</p>	<p>Raise awareness</p> <p>This project cannot influence the commercially competitive nature of the UK water industry but it will explain the concerns of WaSCs and clarify what data can be provided to minimise future misunderstandings.</p>
Lack of political / senior management support	Support is needed at senior levels to empower delivery staff and facilitate partnership funding. A lack of engagement and support at senior levels can create and feed cultural and institutional barriers which inhibit partnership funding.	<p>Raise awareness</p> <p>This project will set out the benefits of collaborative solutions and clarify the particular skills, resources and powers that each type of organisation brings to the table, to raise awareness of the benefits of partnership working.</p>
Local political priorities	Local authorities are political organisations, and local political pressures can affect the prioritisation of flood alleviation schemes.	<p>Raise awareness</p> <p>This project will highlight the importance of taking a risk-based, prioritised approach to stormwater management to enable long term planning and ensure that the benefits of partnership funding can be fully realised.</p>
Joint modelling specification	It is important to recognise the complexities of different modelling approaches. Several WaSCs have identified the need for further guidance to support national modelling. Furthermore, the Local Flood Risk Research Framework	<p>Raise awareness</p> <p>This project has highlighted the need to develop joint and integrated modelling, where relevant, to support collaborative projects. There is no</p>

Grouping	Description	Ability to influence through this project
	(Environment Agency, 2015) identified the need for new guidance on integrated urban drainage modelling.	nationally consistent guidance to support this currently.
Relationships of organisations	Partnership funding requires strong relationships and mutual trust. If these are not present then partnering is unlikely to be successful. Partnership agreements and MoU can be useful but this is a particularly subjective factor which remains highly dependent on the personalities involved within each organisation and their individual relationships.	Raise awareness This project will set out the benefits of collaborative solutions and clarify the particular skills, resources and powers that each type of organisation brings to the table, to raise awareness of the benefits of partnership working.
Third party asset issues	WaSCs' ability to attract investment depends in part on their residual asset base, and have historically not been prepared/able to invest capital in assets which would be owned by third parties. The regulatory barriers to this are not necessarily insurmountable but cultural barriers remain.	Raise awareness This project will explain the issues around third party assets and clarify the implications for collaborative projects.

Appendix C Reference scenarios

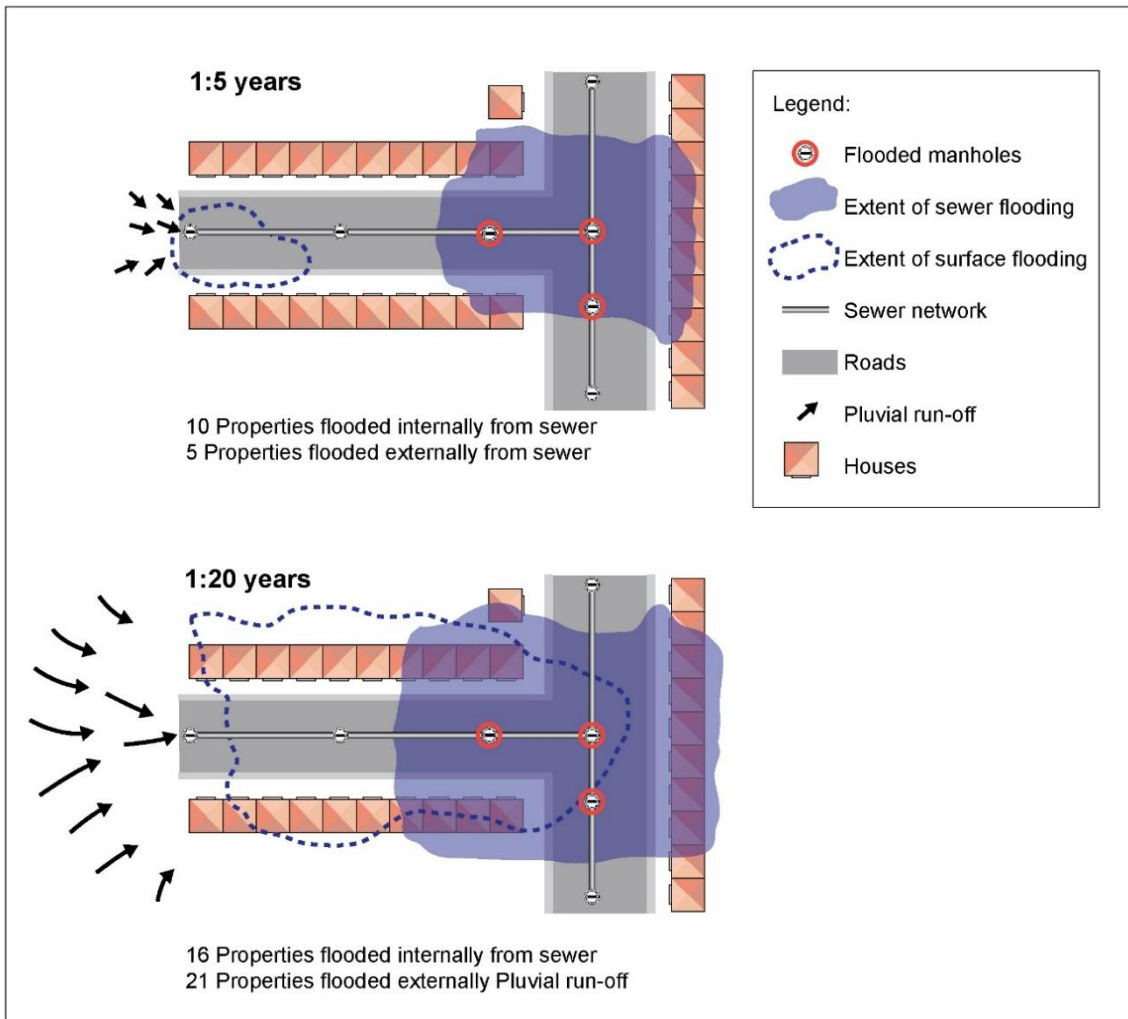
Scenario 1 – Combined sewer and pluvial flooding

Figure 19 outlines the baseline situation for this reference scenario. It illustrates that during a 1 in 5 year event (high frequency, low magnitude) 10 properties are flooded internally and five properties flooded externally due to exceedance from the sewer network. This is predominantly caused by incapacity in the local sewer network, but there is some pluvial runoff from the upstream parkland that is contributing flow directly into the sewer network.

During a more significant rainfall event (1 in 20 year or low frequency/high magnitude), there is greater exceedance from the sewer network, flooding 16 properties internally. The increase in exceedance from the sewer is partially caused by increased runoff from the upstream parkland overloading the sewer. In addition to the exceedance from the sewer network there is direct pluvial (or surface water) flooding because of runoff from the parkland, causing flooding to 21 properties. Some properties are at risk from both exceedance from the sewer network and pluvial flooding.

For the purpose of the scenario, the Water and Sewerage Company (WaSC) has an Outcome Delivery Incentive (ODI) related to sewer flooding due to hydraulic overloading of the network. It is also assumed that there is an integrated model of the catchment which can be used to understand how flooding occurs in the catchment for a range of rainfall events. The model has also been used to 'switch off' sources of flooding to understand how flooding is occurring within the catchment.

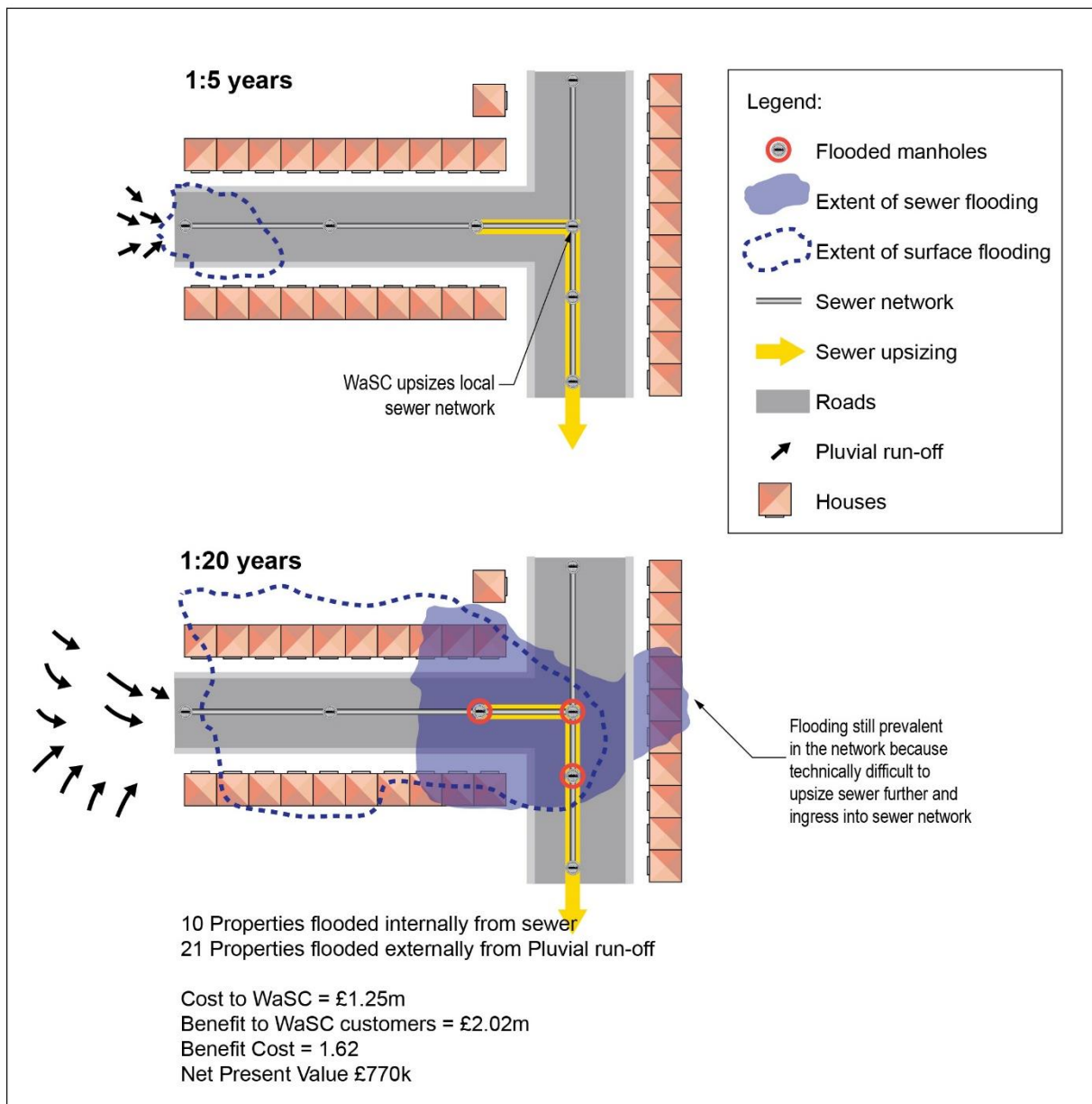
Figure 19 Baseline situation



The WaSC has appraised a scheme to reduce exceedance from the sewer network. Due to constraints downstream in the catchment only a limited amount of sewer upsizing can be achieved within the catchment. The WaSC option will reduce flooding to all properties for the 1 in 5 year event, but during the 1 in 20 year event there will still be 10 properties flooded due to exceedance from the sewer network. Furthermore, the pluvial runoff from the upstream park will continue, causing pluvial flooding and contributing to exceedance from the sewer network.

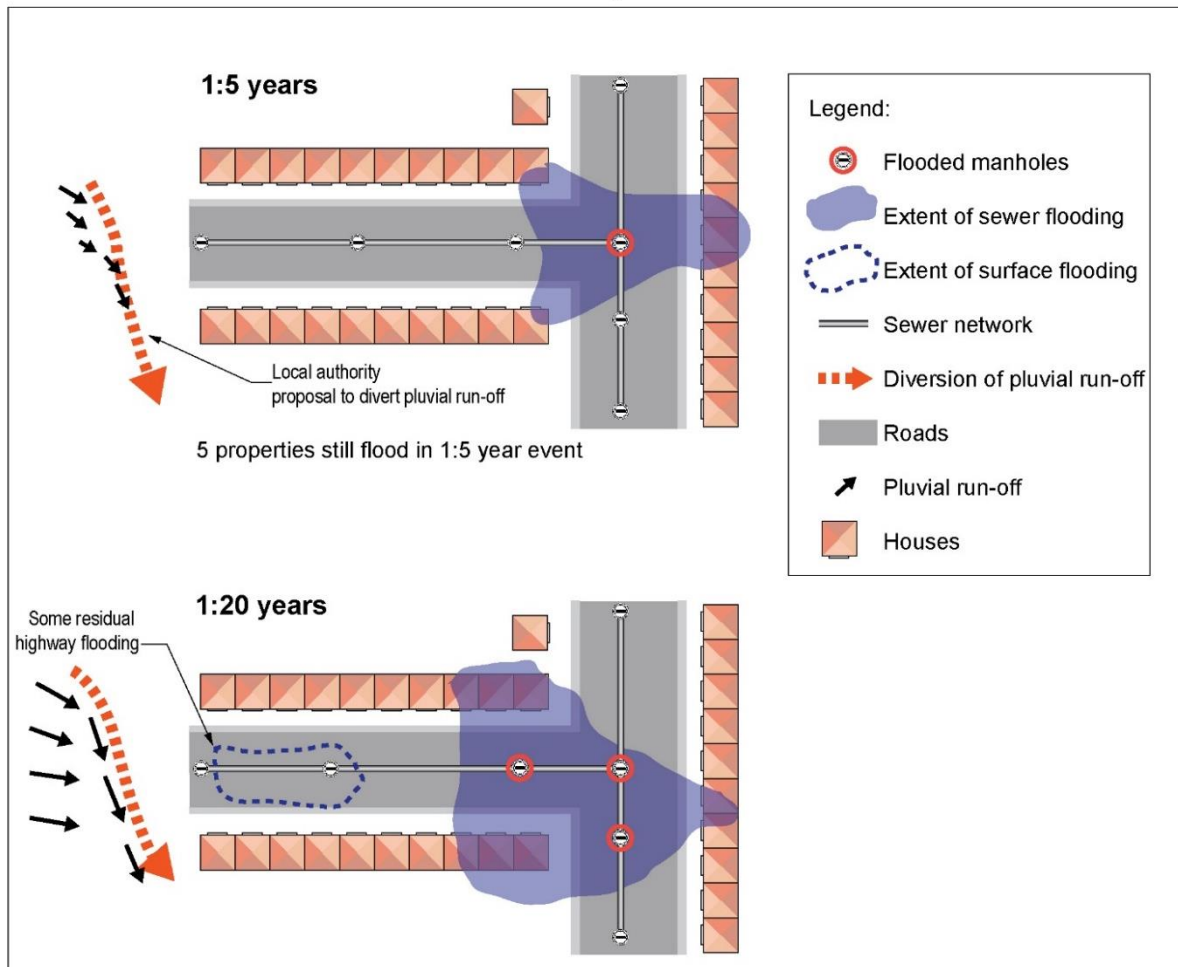
Under this option (option B) the WaSC total expenditure (totex) would be £1.25m, with the whole life benefits estimated to be £2m. This has both a positive benefit: cost ratio and Net Present Value, but does not meet the WaSC aspiration to provide a higher standard of protection to customers.

Figure 20 Option B impact of flooding in the catchment



Further upstream the local authority would like to divert pluvial runoff through a local park and join a nearby watercourse. This is estimated to cost £2.25 million with whole life benefits of £8 million, and would only attract funding from FCRM GiA and the local authority of £1.5 million, leaving a funding gap of £750k. The local authority proposals would partially reduce exceedance from the sewer network, but flooding will occur even during a 1 in 5 year event. The local authority is requesting that the WaSC contributes £750k (totex) to support the FCRM GiA application.

Figure 21 Option C impact of flooding in the catchment

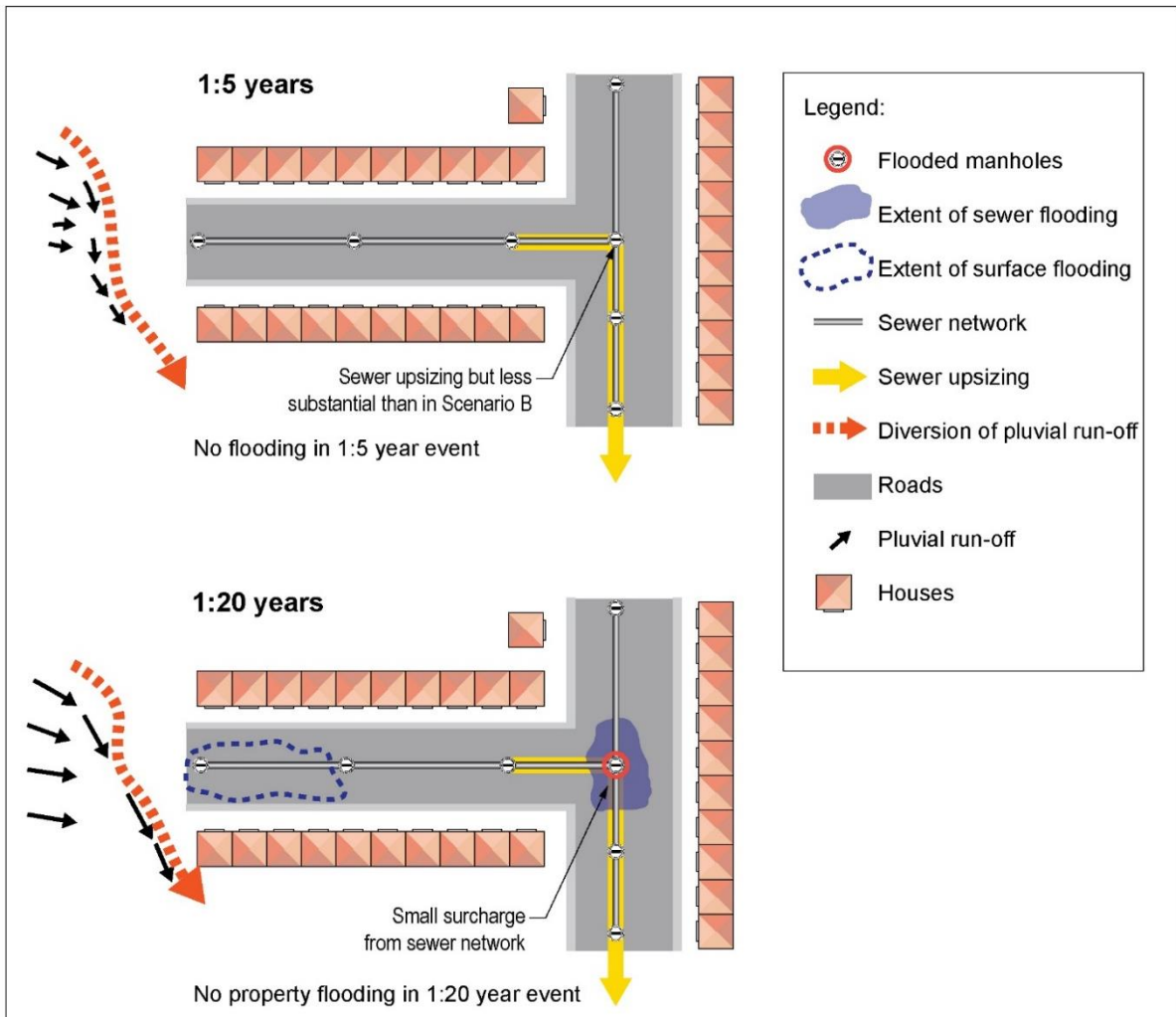


Finally, there is an integrated option (option D) which involves a combination of upstream management of pluvial runoff and some smaller scale upsizing of the sewer network (less substantial upgrade than scenario B). This resolves property flooding in the catchment up to a 1 in 50 year rainfall event, although there is anticipated to be some residual highway flooding for rainfall events of 1 in 20 year or higher.

Furthermore, under option D the WaSC will claim some of the multi-functional benefits (e.g. amenity, recreation) created through the management of upstream pluvial runoff within the parkland. This is linked to an ODI on improving the environment.

The whole life cost of the scheme is anticipated to be £3.5m, of which £1.9m is available through FCRM GiA and contributions from the local authority. The funding gap is £1.6 million.

Figure 22 Option D impact of flooding in the catchment



As a WaSC there are four primary choices for investment:

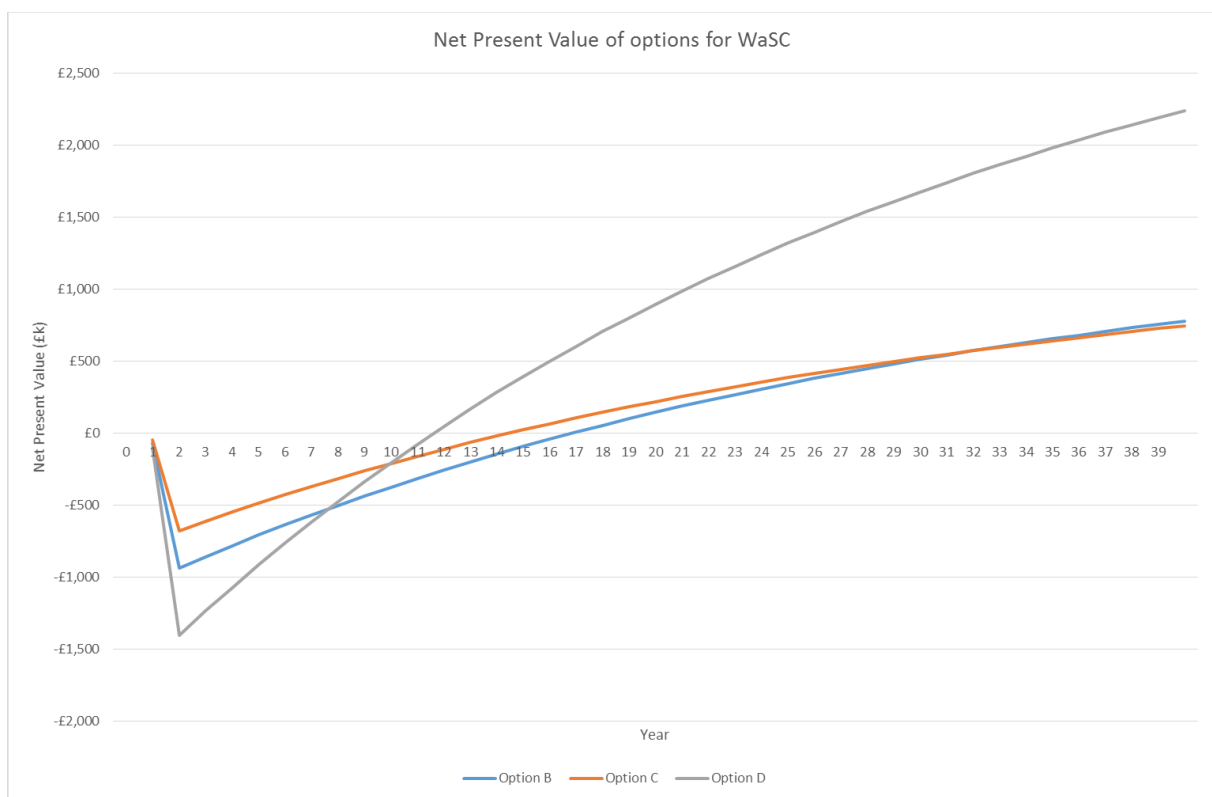
1. Do Nothing;
2. Pursue the scheme in isolation (option B);
3. Contribute towards the local authority led scheme (option C), or;
4. Contribute all of some of the funding towards the integrated scheme (option D).

Table 9 and Figure 23 present the whole life costs and benefits (to the WaSC). It assumes that under all scenarios the scheme is completed in year 2, and the benefits to the WaSC accrue over a 40 year period.

Table 9 Whole life costs and benefits of options

Options	Overall scheme costs	FCRM GiA & LA	Water Company details			
			Totex (£k)	Benefits (over 40 years) (£k)	Benefit: Cost Ratio	Net Present Value (£k)
B	£1,250k	-	£1,250k	£2,000	1.6	£777k
C	£2,250k	£1,500	£750k	£1,500	2.0	£744k
D	£3,500	£1,900	£1,600	£3,850	2.4	£2,239k

Figure 23 Net Present Value of scenarios

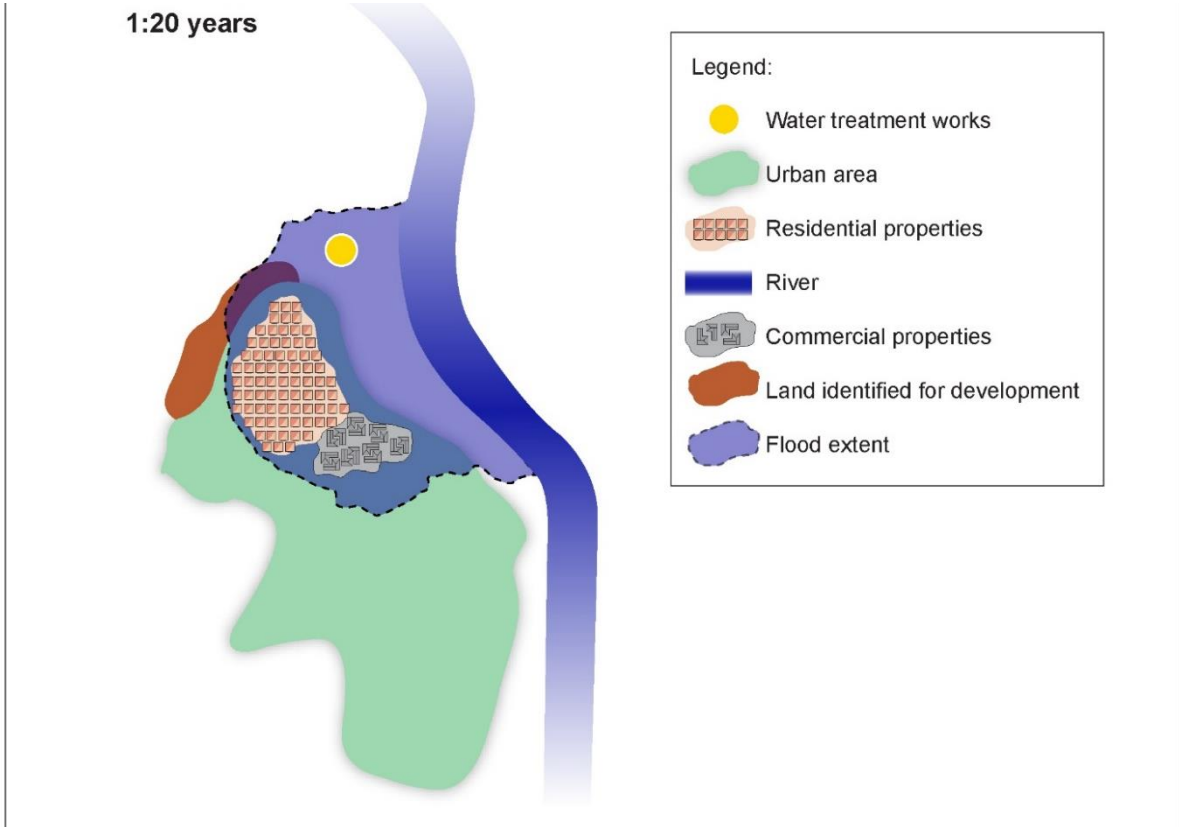


Option D provides the greatest Net Present Value to the WaSC and also alleviates flooding due to exceedance from the sewer network up to the 1 in 50 year return period. However, it also requires the greatest investment by the WaSC of the scenarios. Furthermore, the benefit: cost ratio to the WaSC is a maximum of 2.4:1, whereas the benefit: cost ratio for the FCRM GiA (and local authority) investment is 4.2:1, based on £8m benefit to UK Plc (based on calculation of national losses) and investment of £1.9m.

Scenario 2 – Asset resilience and fluvial flooding scenario

Figure 24 outlines the baseline situation for this reference scenario. It illustrates that during a 1 in 20 year flood event a river is overtopping its banks, resulting in flooding of an urban area and affecting residential (c.50 properties at risk) and commercial (c. 30 properties at risk). Under this scenario there is land earmarked for future development by the local authority, which is also at risk of flooding. Furthermore, the WaSC has a water treatment works at the edge of the urban area that serves more than 5,000 people, and is within the 1 in 20 year flood event envelope. There is some existing mitigation on site, but this only provides a 1 in 30 year level of protection and some remedial works are required to the existing mitigation measures. For the purposes of this scenario, the WaSC has an ODI about resilience to natural hazards and this site was identified as a location where there was a high risk of flooding during the business planning process.

Figure 24 Asset resilience and fluvial flooding scenario



In addition to the WaSC driver in the catchment the Environment Agency is investigating the feasibility of raising the embankment height of the river to provide a 1in100 year level of protection to residential and commercial properties within the urban area.

As a WaSC there are three primary choices for investment:

- B. Invest in existing defences and improve the level of protection to 1 in 50 year flood level;

- C. Build flood resilience at the water treatment works through flood bunds and moving relevant equipment above the 1 in100 year flood level, or;
- D. Contribute towards the Environment Agency-led scheme.

With respect to scenario D, the Environment Agency has identified the total scheme cost will be £2.65m, and that FCRM GiA and local authority contribution will equal £1.65m, leaving a funding gap of £1.0m. The Environment Agency have approach the WaSC for a £1m contribution towards the scheme. Table 10 and Figure 25 illustrate the whole life costs, benefits and assumptions.

Table 10 Whole life costs and benefits of scenarios

Option	Overall scheme costs (£k)	FCRM GiA and LA (£k)	Year of investment (year 0 is 2016)	Water company details			
				Totex (£k)	Whole Life Benefit (£k) ⁵²	Benefit: Cost Ratio	Net Present Value (£k)
B	£280k	-	2	£280k	£858k	3.05	£576k
C	£1,500k	-	2	£1,500k	£2,600k ⁵³	1.75	£1,114k ⁵⁴
D	£2,650	£1,650	7	£1,000k	£2,200k	2.25	£1,227k ⁵⁵

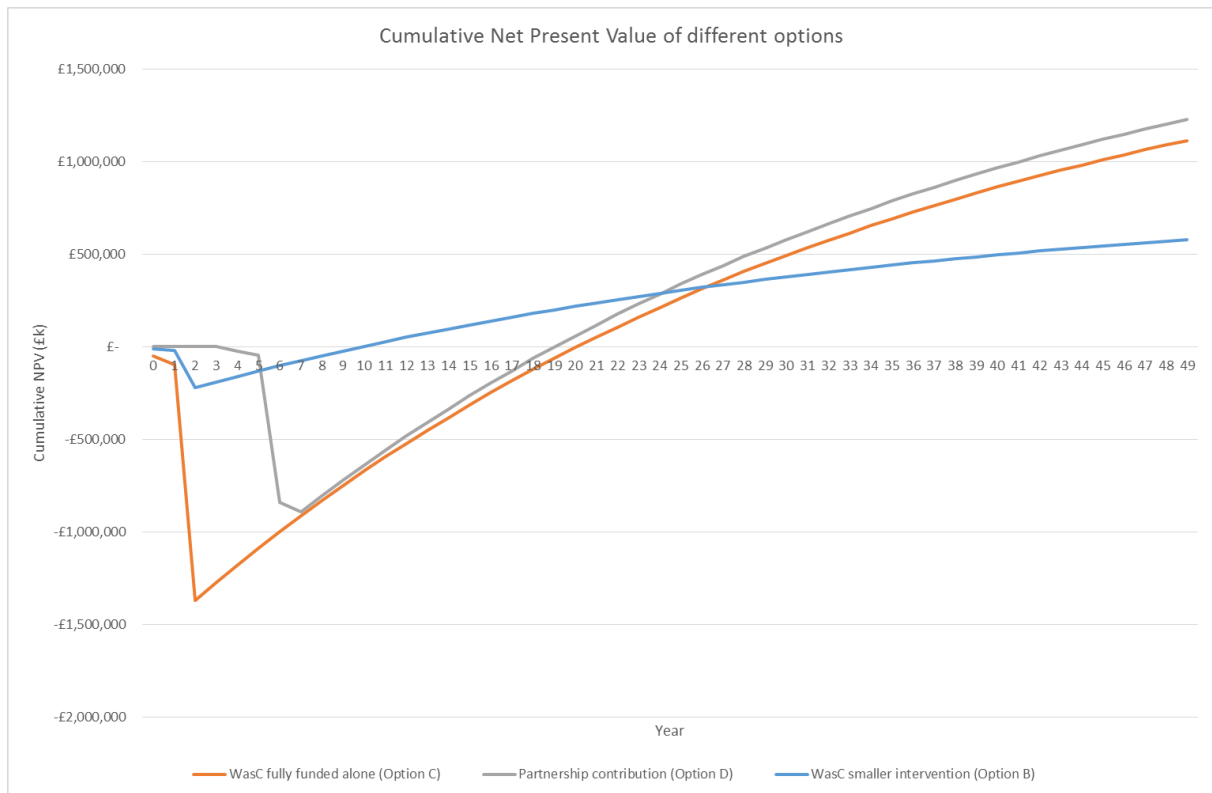
⁵² Measured as avoided impacts to customers, avoided compensation, and avoided damage to the works itself

⁵³ Whole Life Benefit greater because scheme is delivered in year 2, and the appraisal period in this example is fixed to 50 years

⁵⁴ Under scenarios B & C the WaSC would maintain the infrastructure on an annual basis

⁵⁵ Maintenance via a commuted sum to the Environment Agency (assumed to be in year 8)

Figure 25 Net Present Value of scenarios for WaSC



From the WaSC perspective scenario D offers the greatest Net Present Value for their investment. However, the preferred investment decision for the WaSC will be a balance of:

- costs and benefits (where the benefits are avoided customer disruption, avoided compensation and avoided damages to the treatment works);
- the importance of this scheme to meeting agreed outcomes with Ofwat;
- the affordability of the proposed investment (for example scenario B has a significant lower totex for the WaSC), and;
- the timing of investment (where scenario D is not forecast to be delivered until 2022, which is in the next AMP cycle and the programmes may not align).