

United Utilities Water

DRAFT Drainage and Wastewater Management Plan 2023

Lune DWMP

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Contents

- Acronyms..... 3**
- 1. Introduction to the DWMP 4**
- 2. Background to the Lune catchment 6**
 - 2.1 Strategic Planning Group (SPG).....11
- 3. Risk identification 12**
 - 3.1 Risk Based Catchment Screening (RBCS) and Horizon Scan12
 - 3.2 Baseline Risk and Vulnerability Assessment (BRAVA) and Resilience.....14
- 4. Options development 34**
 - 4.1 Lune partnership options.....35
- 5. Options for the Lune 36**
 - 5.1 Options considered36
 - 5.2 Preferred options38
 - 5.3 Overview of Preferred Options in each TPU43
 - 5.3.1 Carnforth44
 - 5.3.2 Caton45
 - 5.3.3 High Bentham.....46
 - 5.3.4 Lancaster47
 - 5.3.5 Morecambe.....48
 - 5.3.6 Sedbergh49
 - 5.3.7 TPUs with population less than 2,000: *Greta and Rawthey* sub catchment50
 - 5.3.8 TPUs with population less than 2,000: *Keer* sub catchment51
 - 5.3.9 TPUs with population less than 2,000: *Lune - Rawthey to Greta* sub catchment.....52
 - 5.3.10TPUs with population less than 2,000: *Lune Upper* sub catchment53
 - 5.3.11TPUs with population less than 2,000: *Piling, Ridgy, Cocker and Conder* sub catchment.....54
 - 5.3.12TPUs with population less than 2,000: *Wenning* sub catchment55
- 6. Next steps..... 56**
- 7. References..... 57**

Acronyms

For a list of acronyms, refer to document C0003.

1. Introduction to the DWMP

The Drainage and Wastewater Management plan (DWMP) is a long-term plan setting out how we intend to maintain robust and resilient drainage and wastewater systems, now and in the future. This is the first time that we are developing the plan and we have taken a comprehensive approach as we recognise the importance of long-term planning.

The heart of the plan will be built around collaborative and innovative working whilst encompassing all activities relating to drainage, flooding and delivering a wastewater service that protects the environment. We have led on this plan, but have developed it in consultation with our partners as we will be delivering the DWMP in partnership with other organisations such as the Environment Agency and local councils.

By developing the DWMP, we have an opportunity to:

- provide a basis for more collaborative and integrated planning alongside stakeholders across the region to tackle shared and interrelated risks relating to drainage, flooding and protecting the environment;
- strengthen partnership working with all key stakeholders to drive integrated investment in the environment and communities;
- develop a plan that will help address the increasing environmental expectations from customers and stakeholders and work towards the ambitions set out in Defra’s 25-year plan;
- collectively explore innovative solutions such as Sustainable Drainage Systems (SuDS) and nature-based solutions to understand what is best for the North West; and
- embed Systems Thinking to better understand drainage and environmental interactions, and to maximise the potential for integrated solutions.

Throughout the DWMP process, we have engaged with stakeholders to share our data and findings, to ensure that the solutions delivered are co-created, drive efficiencies and will benefit the communities and environment that we live and work in.

The plan will be set out at three levels (Figure 1) to maximise the potential for partnership working and for effective engagement between regulators and stakeholders at both company-wide level and more locally.

Figure 1 Geographical scales applied for planning and collaboration within DWMP



The plan is made up of five main stages (Figure 2) which each contribute to developing the most sustainable and effective future for the North West. These stages include setting out the long-term ambition for the region, identifying risk and understanding the possible interventions and solutions that could be developed.

Figure 2 Five stages of the DWMP



Across the North West, there are 14 Strategic Planning Areas (SPAs) and the purpose of this document is to share local, place-based information.

We will share the results from the different stages of the DWMP and how the DWMP plans to make a difference in the Lune SPA.

2. Background to the Lune catchment

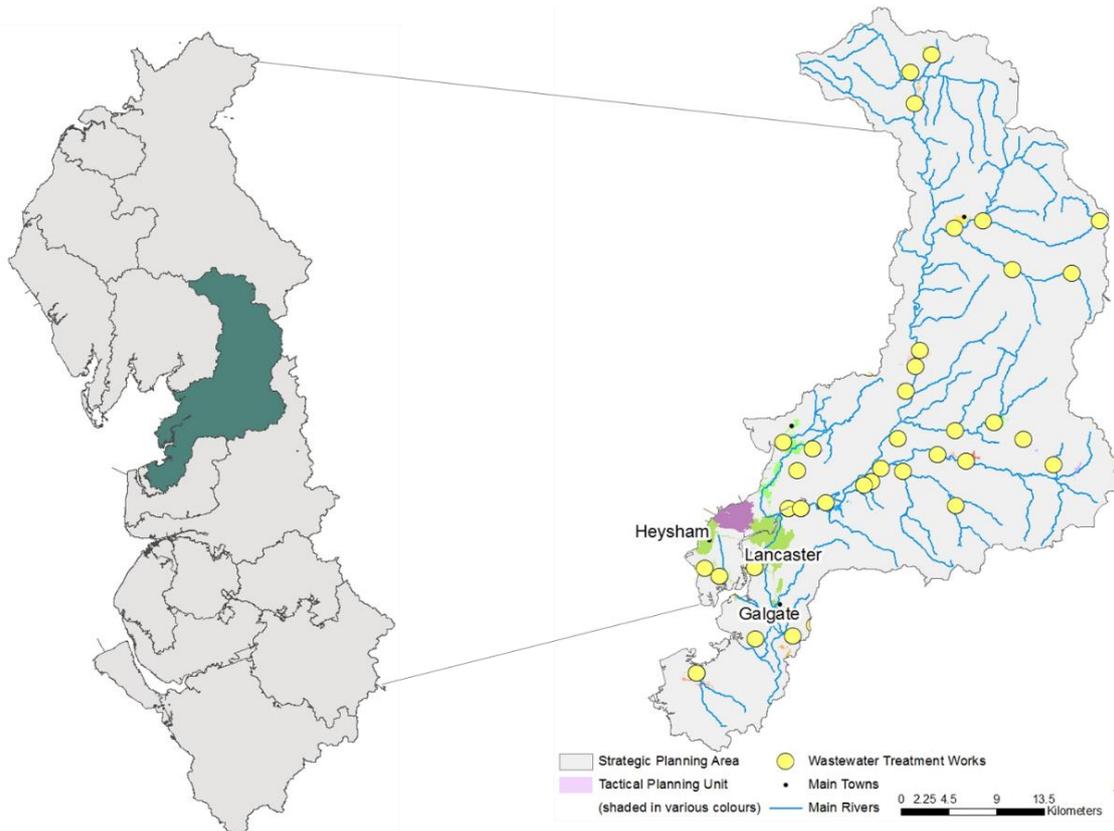
The Lune catchment area covers 1308.7km², from Tebay located in the North down to Clapham and Austwick in the south. It also stretches across to the coastal towns of Morecombe and Heysham ^[1]. The area mainly consists of rural areas located on the edges of the Yorkshire Dales National Park and the Forest of Bowland AONB, it does also have a number of urbanised areas such as Lancaster, Morecombe and Heysham found in the south west.

There are six main sub catchments:

- Greta and Rawthey – East of the catchment, this area mostly consists of the rural parts of the Yorkshire Dales National Park ^[2].
- Keer – West of the catchment, this is a smaller sub catchment that is located along the border between Lancashire and Cumbria. Within this area there are towns such as Carnforth and Bolton-le-Sands ^[3].
- Lune – Centre of the catchment, this sub catchment runs from the confluence of the river Rawthey and the river Lune that is south of Sedburgh near Lancaster ^[4].
- Lune Upper – North of the catchment, this area covers from between the Lake District National Park and the Yorkshire Dales National Park. Tebay can be found within the centre of this ^[5].
- Pilling Ridgy Cocker and Conder – South west of the catchment, incorporating both the Morecombe and Heysham coast along with the North West coast of Garstang ^[6].
- Wenning – South east of the catchment, includes the towns of High Bentham, Clapham and Wray ^[7].

There are 33 wastewater tactical planning units (TPU, also known as wastewater treatment work (WwTW) drainage catchments) within the Lune SPA. A TPU is the drainage catchment area encompassing all the sewers and wastewater assets e.g. pumping stations, which drain into the associated wastewater treatment works. The TPUs within the SPA vary in size from larger catchments such as Lancaster to smaller, rural catchments such as Caton. The TPUs are highlighted in Figure 3.

Figure 3 Map of the Lune SPA



There are numerous strategic management plans within the Lune that are owned by various other organisations. Within the Lune catchment, there are active management plans such as:

- The Environment Agency River Basin Management Plan (RBMP) and Flood Risk Management Plan (FRMP);
- Lead Local Flood Authority (LLFA) Surface Water Management Plans (SWMP);
- North West and North Wales Coastal Group Shoreline Management Plan (SMP); and
- Local council plans.

Each of these strategic plans focuses on managing particular risks and links to programmes of work. A high-level summary of these management plans is shown in Table 1.

The DWMP aims to collaborate, share best practice and to align with other strategic plans throughout the SPA. This will help to highlight common challenges, ambitions and goals where there are shared or interconnected risks and opportunities.

Table 1 Summary of stakeholder management plans.

Management plan	Overview	Key aspects for the Lune catchment
River Basin Management Plan (RBMP) ^[8] Owner: Environment Agency	A river basin district covers an entire river system, including river, lake, groundwater, estuarine and coastal water bodies. The RBMP aim is to improve the quality of our water environment to best support wildlife, agriculture, and businesses, and to boost regeneration and recreation.	The main reasons for not achieving good ecological status are physical modifications and pollution from rural areas. Future challenges predicted by the Environment Agency include invasive non-native species, physical modifications and pollution from a range of sources.
Flood Risk Management Plan (FRMP) ^[9] Owner: Environment Agency	The FRMP is a strategic plan, which reviews and develops measures to manage the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. The plan outlines flood risk areas, hazards, and sets out measures and objectives to manage flood risk.	Within the Lune catchment, there are approximately 18,000 people (11%) and 4,500 non-residential properties that are at risk of fluvial and coastal flooding. Approximately 30% of agricultural land and 12% of SSSI sites are at risk of flooding. There are flood mitigation measures throughout the catchment such as embankments and raised defences. The December 2015 floods affected numerous areas of the catchment such as Lancaster, Morecambe, Halton, Carnforth and Warton. Since the floods, a programme of recovery is in place. Future work will investigate potential options to provide further protection for Lancaster. Across the Lune catchment there are 39 measures from earlier plans to manage flood risk.

<p>Shoreline Management Plan (SMP) ^[10]</p> <p>Owner: North West and North Wales Coastal Group</p>	<p>The SMP is a non-statutory, high level policy document for coastal flood and erosion risk management planning that was formally adopted in August 2016. It provides a large-scale assessment of the risks associated with coastal processes and helps to reduce these risks to people and the environment by identifying the most sustainable policies for managing flood and coastal erosion risks in the short term (0–20 years), medium term (20–50 years) and long term (50–100 years).</p>	<p>The Wyre Estuary in terms of the SMP falls into the Lune SPA. The recommended policy is for managed realignment to allow realignment back to high land but in a more protective and managed way which would also be more conducive for potential habitat creation purposes.</p> <p>For the open coast section between Knott End-on-Sea, the long term plan is to continue providing protection against flood and erosion to property and infrastructure, however, as with other locations along the SMP2 frontage, it is going to become increasingly difficult to justify the long term affordability of the maintenance and improvements to current defences that would be required to continue to hold the line. Managed realignment was assessed as an alternative more sustainable policy to hold the line in some locations along the frontage.</p> <p>The long term plan for the Lune is to continue to protect infrastructure and the historic city of Lancaster, but other areas would not be defended, allowing occasional inundation and natural evolution.</p> <p>The section of coastline between Husham and Arnside includes the large port and nuclear power stations at Husham and the tourist town of Morecambe which will all justify continued protection into the long term.</p>
<p>Surface Water Management Plan (SWMP) ^[11]</p> <p>Owner: Lead Local Flood Authority (LLFA)</p>	<p>A SWMP is a plan which outlines the preferred surface water strategy for a location. Although owned and led by the LLFA, a SWMP is produced in collaboration with other drainage owners, water companies included.</p> <p>Partners work together to understand the surface water flood risk in an area and agree an approach to address these issues innovatively and in a cost-effective way, and where appropriate, in partnership.</p> <p>A SWMP is a long-term plan and should influence development.</p> <p>The decision on whether a SWMP is appropriate is down to the LLFA, generally they are produced for areas considered to experience a high flood risk.</p> <p>United Utilities Water (UJW) continues to work closely with LLFAs and supports the development of SWMPs where required, and the delivery of SWMPs where they are published. United Utilities continues to work closely with LLFAs and support the development of SWMP where required, and the delivery of SWMP where they are published.</p>	

<p>Catchment Based Approach (CaBA) Catchment Plan ^[8] ^[12]</p> <p>Owner: Living Lune Catchment Partnership</p>	<p>The aim of the partnership is to bring together stakeholders to create and deliver a focussed, sustainable and collaborative action plan to deliver benefits within the catchment.</p>	<p>The vision of the Living Lune catchment partnership is to create a healthy water environment within the Lune Catchment that will bring social and economic benefits for all.</p> <p>With the aim to:</p> <ul style="list-style-type: none"> • Conserve, protect, rehabilitate and improve the rivers, streams, watercourses and water impoundments of the catchments comprising the River Lune throughout its entire course and all its associated tributaries in Cumbria, Yorkshire and North Lancashire. • Advance education across the understanding of rivers, river corridors and catchments including economic or social activity, and the benefits of conservation, protection, rehabilitation and improvement of aquatic environments. <p>The catchment partnership focusses on key themes such as water quality, flooding, habitat and wildlife, and non-native species. Current challenges identified by the partnership include pollution from rural areas, agriculture, towns, cities and transport, and physical modifications. Future challenges include physical modifications, changes to the natural flow and water levels and pollution from agriculture.</p>
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2.1 Strategic Planning Group (SPG)

We appreciate that there are many organisations with formal roles and responsibilities relating to drainage, flooding and protection of the environment. By participating in the creation of a DWMP much more can be achieved compared to working on our plans in isolation.

Within DWMP, SPGs have been a key form of engagement with stakeholders across the region. SPGs have operated at a local, catchment scale to allow stakeholders to input into the identification of priority and shared risk locations, and develop an understanding of potential collaborative solutions to tackle shared risks. The SPGs have covered a wide range of issues including reducing flooding and improving water quality. A key driver is understanding where there may be potential to achieve multiple benefit through solutions.

Through the SPGs, we have been able to consult with strategic partners on the various stages of the DWMP (Figure 4) and share outputs as and when they become available. This has been a two-way process and stakeholders have had the opportunity to share information with us such as action plans, confirmed projects, priority areas and ambitions for the future which could be developed and delivered in partnership. We have been able to review and incorporate the information shared during the different stages of the DWMP process.

Within the Lune SPA we have engaged with stakeholders such as:

- The Environment Agency;
- Lancashire County Council; and
- The Lune Rivers Trust (host of the Lune Catchment Based Approach (CaBA) partnership).

More information on co-creation activity undertaken with the SPG can be found in Technical Appendix 2 - Stakeholder Engagement (TA2). The outputs from this activity in the Lune catchment are outlined in Section 4.

Figure 4 DWMP framework for engagement

A framework for engagement in the North West



3. Risk identification

A key component of the DWMP has been around risk identification. This has been a mixture of both historical risk and forecast risk. Activities to understand this were completed through the Risk Based Catchment Screening (RBCS) and Baseline Risk and Vulnerability Assessment (BRAVA) stages. We have also undertaken numerous additional assessments to understand wider resilience and catchment risks.

Further detail on the approaches can be found in Technical Appendix 4 - Risk Based Catchment Screening (TA4) and Technical Appendix 5 - Understanding Future Risk (TA5).

3.1 Risk Based Catchment Screening (RBCS) and Horizon Scan

The RBCS stage is a series of high-level assessments that are used to review and screen each TPU to determine whether a more detailed assessment is required during the Baseline Risk and Vulnerability Assessment (BRAVA) stage.

The assessments are designed to span the key aspects of a wastewater company's responsibilities: from the network, to the treatment works, to its interaction with the environment. Examples of the assessments considered are internal sewer flooding, storm overflow performance, and pollution incidents. The assessments typically used three to five years of historical data.

Additional assessments termed 'horizon scanning' were undertaken to understand wider exogenous factors and opportunities that could inform future investment e.g. major infrastructure projects, private septic tank locations and potential major infrastructure projects (HS2 etc). Areas with potential future developments were also considered and further information on projected growth areas can be found within the associated Local Plans.

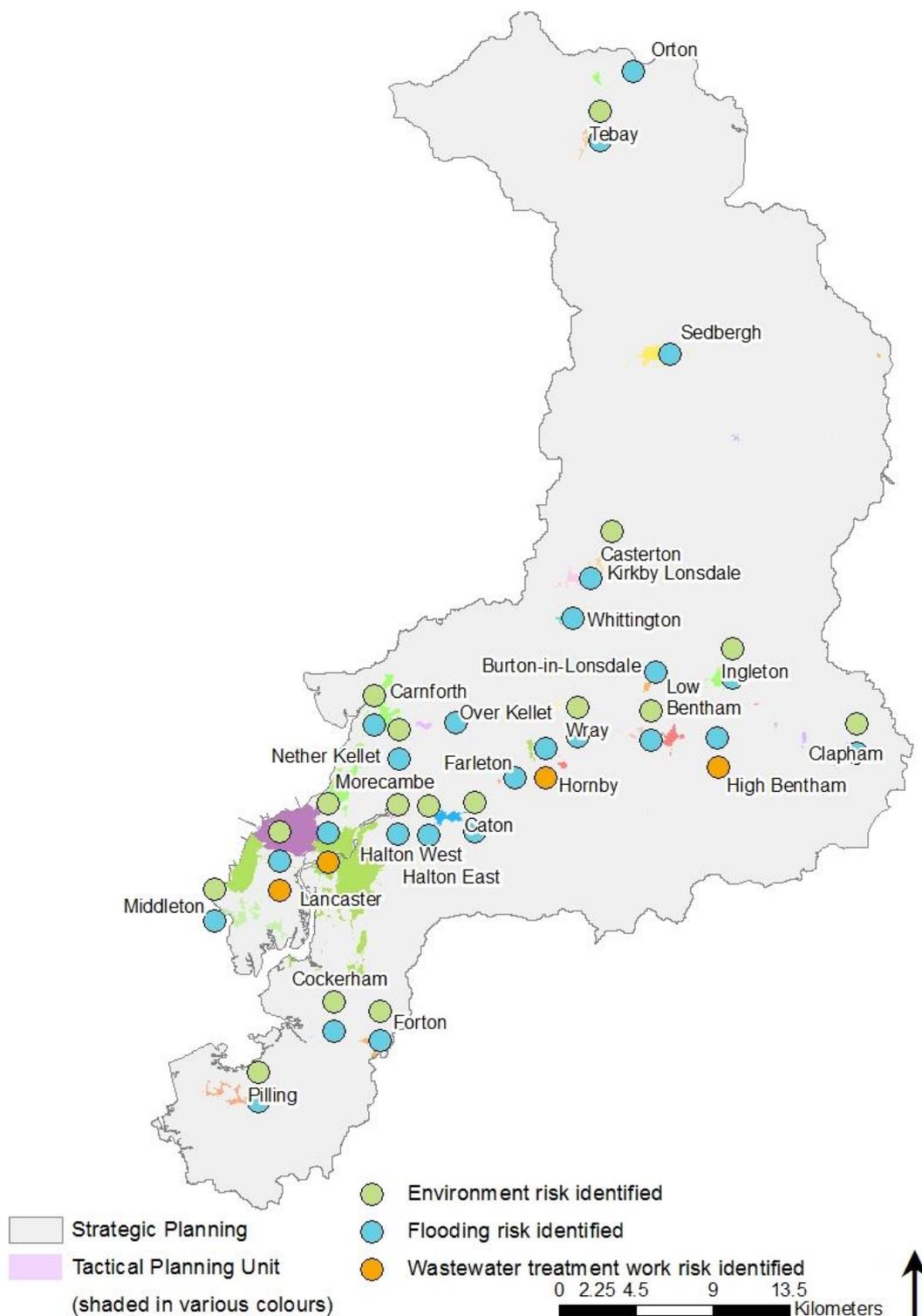
Within the Lune SPA, the RBCS stage identified 28 out of 33 TPUs that required further investigation and therefore passed onto the BRAVA stage (outlined in Section 3.2).

Figure 5 indicates which of the RBCS categories (environmental, flooding and wastewater treatment works capacity) have triggered within each TPU. There are numerous TPUs which did not trigger for RBCS across any of the categories and are therefore not shown in Figure 5. A list of these TPUs can be found in Table A.1 in the Appendix. Environmental and flooding categories are the most common within the Lune SPA, which is supported by the highest triggered RBCS assessments which are:

- Storm Overflow Assessment Framework - (17/33) – Environment; and
- External Sewer Flooding – (25/33) – Flooding.

Further detail on the approaches and assessment results can be found in TA4.

Figure 5 Map of the RBCS results for the Lune SPA. Risk categories indicate areas triggering further investigation following RBCS



3.2 Baseline Risk and Vulnerability Assessment (BRAVA) and Resilience

The TPUs that were identified during RBCS were then taken forward into BRAVA, which aims to assess the baseline and future position of system performance against the DWMP planning objectives, to understand where there may be issues. It is also to understand wider resilience issues that could also impact upon the DWMP planning objectives. This stage considers risk at 2020, 2030 and 2050 design horizons.

In addition to BRAVA, a range of resilience assessments were undertaken and will have been incorporated throughout the plan to allow us to expand our understanding of wider core risks, such as how the water quality of rivers may change as a result of climate change. We have also assessed risks such as fluvial and/or coastal flooding and fluvial and/or coastal erosion and land stability.

Further detail on the approaches and assessment results can be found in TA5 and Technical Appendix 6 – Resilience (TA6). The BRAVA and resilience results for the Lune catchment are outlined in Table 2 to Table 5.

Table 2 Environmental BRAVA results

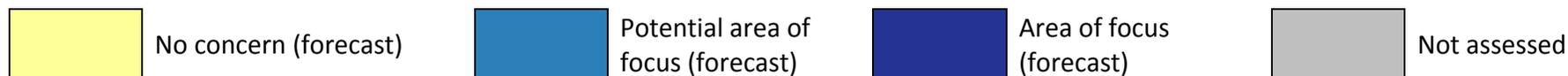
Tactical Planning Unit	Environmental					
	Pollution Assessment	Storm Overflow Performance		Bathing and Shellfish Spill Assessment		
	2020	2020	2050	2020	2030	2050
Burton-In-Lonsdale						
Carnforth						
Casterton						
Caton						
Clapham						
Cloughton						
Cockerham						
Dent						
Farleton						
Forton						
Halton East						
Halton West Lune						
High Bentham						
Hornby						
Ingleton						
Kirkby Lonsdale						
Lancaster						
Low Bentham						
Middleton						

BRAVA	
	No concern (forecast)
	Potential area of focus (forecast)
	Area of focus (forecast)
	Not Assessed / Not Applicable

Tactical Planning Unit	Environmental					
	Pollution Assessment	Storm Overflow Performance		Bathing and Shellfish Spill Assessment		
	2020	2020	2050	2020	2030	2050
Morecambe						
Nether Kellet						
Orton						
Over Kellet						
Pilling						
Sedbergh						
Tebay						
Whittington						
Wray						

Table 3 Flooding BRAVA results

Key



Tactical Planning Unit	Flooding												
	Internal Flooding Risk			External Flooding Risk			Sewer Collapse Risk	Risk of flooding in a storm (1:50yr)		Flooding of open spaces			Blockage Assessment
	2020	2030	2050	2020	2030	2050	2020	2020	2050	2020	2030	2050	2020
Burton-In-Lonsdale	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow
Carnforth	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Casterton	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Caton	Light Blue	Dark Blue	Dark Blue	Dark Blue	Light Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Clapham	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Cloughton	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Dark Blue
Cockerham	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Dent	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Light Blue
Farleton	Yellow	Yellow	Yellow	Yellow	Yellow	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Dark Blue
Forton	Light Blue	Light Blue	Light Blue	Yellow	Yellow	Dark Blue	Yellow	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Yellow
Halton East	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow
Halton West Lune	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
High Bentham	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Hornby	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow
Ingleton	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Light Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow
Kirkby Lonsdale	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Dark Blue	Yellow	Yellow	Yellow	Light Blue
Lancaster	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Dark Blue
Low Bentham	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow
Middleton	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Light Blue	Dark Blue	Dark Blue	Yellow

Flooding													
Tactical Planning Unit	Internal Flooding Risk			External Flooding Risk			Sewer Collapse Risk	Risk of flooding in a storm (1:50yr)		Flooding of open spaces			Blockage Assessment
	2020	2030	2050	2020	2030	2050	2020	2020	2050	2020	2030	2050	2020
Morecambe													
Nether Kellet													
Orton													
Over Kellet													
Pilling													
Sedbergh													
Tebay													
Whittington													
Wray													

Table 4 Wastewater treatment works BRAVA results

Tactical Planning Unit	Wastewater Treatment Works		
	Risk to wastewater treatment works (WwTW) capacity		
	2020	2030	2050
Burton-In-Lonsdale			
Carnforth			
Caton			
Cockerham			
Farleton			
Forton			
Halton East			
Halton West Lune			
High Bentham			
Hornby			
Ingleton			
Kirkby Lonsdale			
Lancaster			
Low Bentham			
Middleton			
Morecambe			
Nether Kellet			
Over Kellet			
Pilling			
Sedbergh			
Tebay			
Whittington			
Wray			

BRAVA	
	No concern (forecast)
	Potential area of focus (forecast)
	Area of focus (forecast)
	Not Assessed

Table 5 Environmental and flooding resilience results

Tactical Planning Unit	Resilience Assessment		
	Environmental		Flooding
	Potential for changes in the water quality of rivers as a result of climate change	Potential for changes in catchment contributions as a result of climate change	Outfall locking
	2050	2050	2020
Burton-In-Lonsdale			
Carnforth			
Casterton			
Caton			
Cloughton			
Cold Cotes			
Dent			
Farleton			
Forton			
Garsdale Head			
Halton East			
Halton West Lune			
High Bentham			
Hornby			
Ingleton			
Kirkby Lonsdale			
Lancaster			

Resilience	
	More resilient
	Less resilient
	Not Assessed

Tactical Planning Unit	Resilience Assessment		
	Environmental	Flooding	Outfall locking
	Potential for changes in the water quality of rivers as a result of climate change	Potential for changes in catchment contributions as a result of climate change	
	2050	2050	2020
Lea Yeat			
Low Bentham			
Orton			
Pilling			
Sedbergh			
Tebay			
Wray			

3.3 Problem characterisation

3.3.1 Complex catchments

Complex catchments were determined through problem characterisation using a combination of a complex and strategic catchment scores based on strategic need (largely derived from growth and climate forecast models) and modelled risks in each of the TPU (largely based on BRAVA). Within the Lune, two TPUs were identified to be 'complex' based on problem characterisation, these were:

- Lancaster; and
- Carnforth.

3.3.2 Strategic growth catchments

Through the various risk identification assessments, a number of locations were identified through opportunity workshops that require more strategic analysis. These are areas with high growth, a high number of risks and multiple potential scenarios. Different bespoke scenarios are applied to strategic catchments based on the needs and drivers of the catchments to understand the variability of risk as a first step for optioneering, so that the range of options developed can mitigate a range of different scenarios.

As a result of this assessment the following TPUs in the Lune SPA have been identified as having 'strategic growth':

- Lancaster.

Note: Water Industry National Environment Programme (WINEP) and storm overflows guidance are still being developed. This could lead to significant changes in preferred options and could result in large-scale, short and long-term investment needs. This will be fully reviewed between draft and final DWMP publication, in addition to other aspects such as nutrient neutrality, bathing waters and shellfish water expectations. Between draft and final DWMPs the impact of storm overflow requirements will also require optimising against the other needs and opportunities.

3.3.3 Lancaster

The Lancaster TPU is to the south west of the Lune SPA (Figure 6). The sewer network is over 600km long, and serves over 31,000 properties and a residential population of approximately 78,000 people. The watercourses in the area are all classed as 'moderate' under the Water Framework Directive (WFD) 2019.

The Lancaster TPU is considered both a strategic and complex catchment. It is of strategic interest due to significant growth, with a projected 21% increase in residential population by 2050. This could drive a significant amount of further development to meet housing need, and likely increase pressure on the network and wastewater treatment works. The Bailrigg garden village development to the south of Lancaster (Figure 6) could include up to 3,500 new residential properties^[13], driving a high number of new connections and increase the amount of wastewater needing treatment. Part of the challenge is determining if the TPU will be expanded to include the development with significant upgrades to the wastewater treatment works, or if a new wastewater treatment works and network will be built to serve the area. Regardless, this could lead to significant investment in both the network and wastewater treatment works to ensure protection of the environment and water quality.

Lancaster is also a complex catchment, with a number of storm overflows within the area, and uncertainty around medium and long term performance particularly with regards to meeting future new targets. Alongside this the BRAVA process identified risks for internal flooding, external flooding, pollution, sewer collapse, and blockages by 2050, with areas for further investigation highlighted in Figure 7. As the WINEP and storm overflows guidance are still being developed, this could lead to significant changes and investment to both wastewater treatment works and the drainage network.

Figure 6 Map of the Lancaster TPU, including the Bailrigg Garden Village development

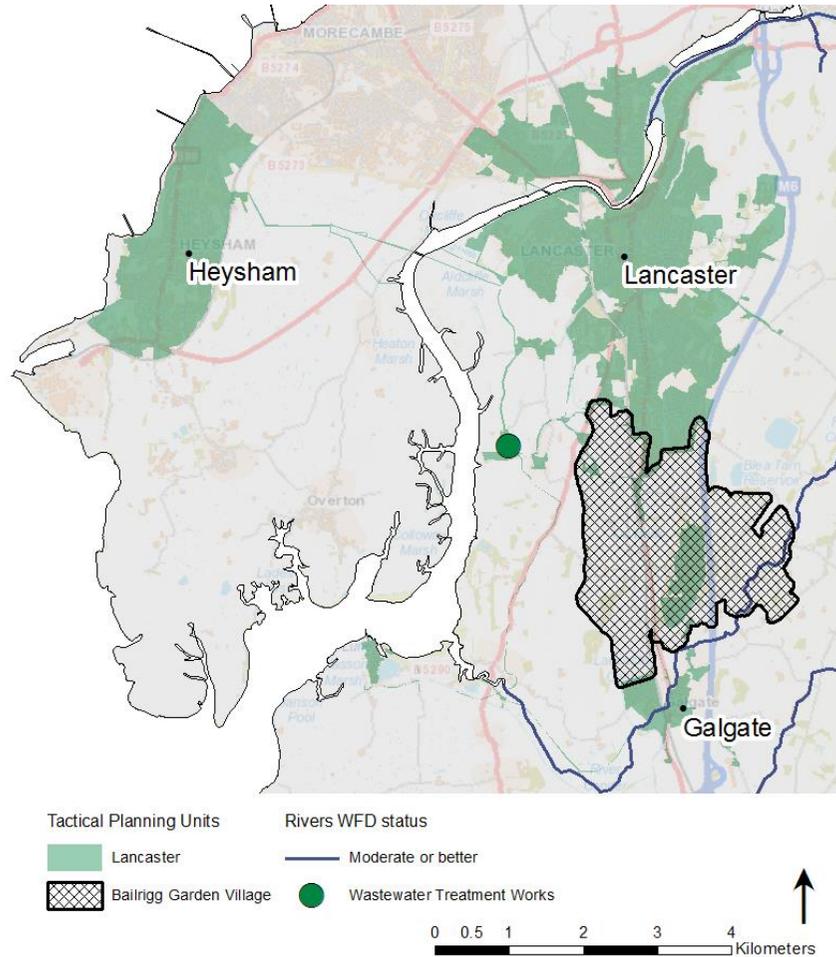
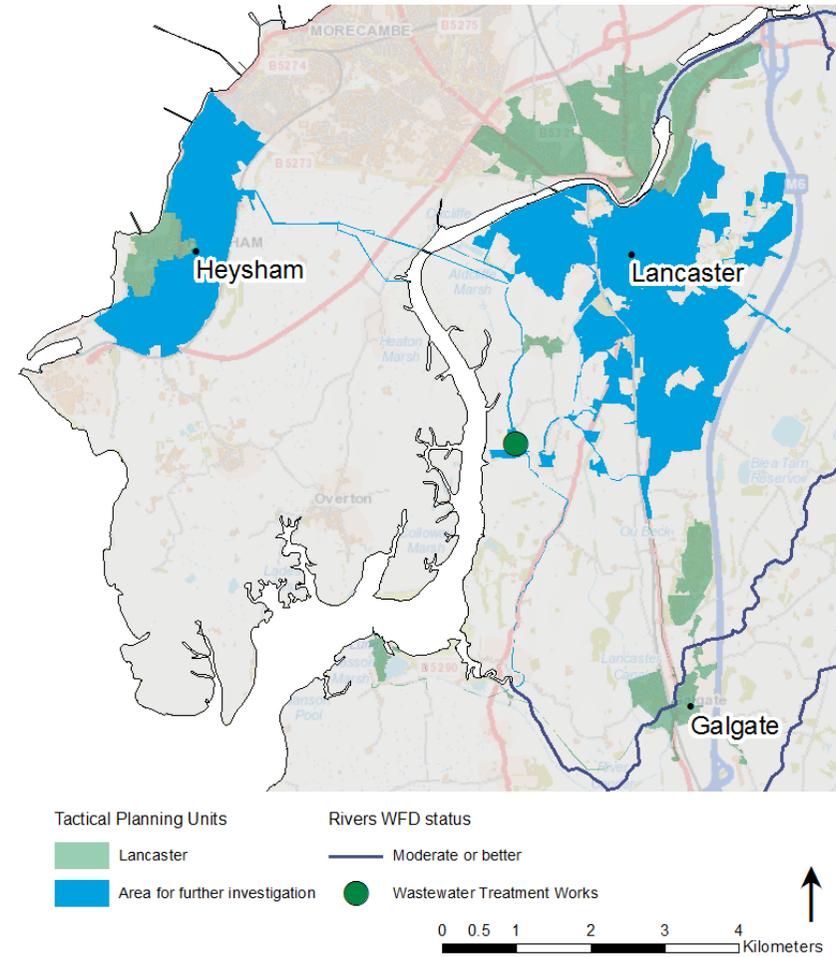


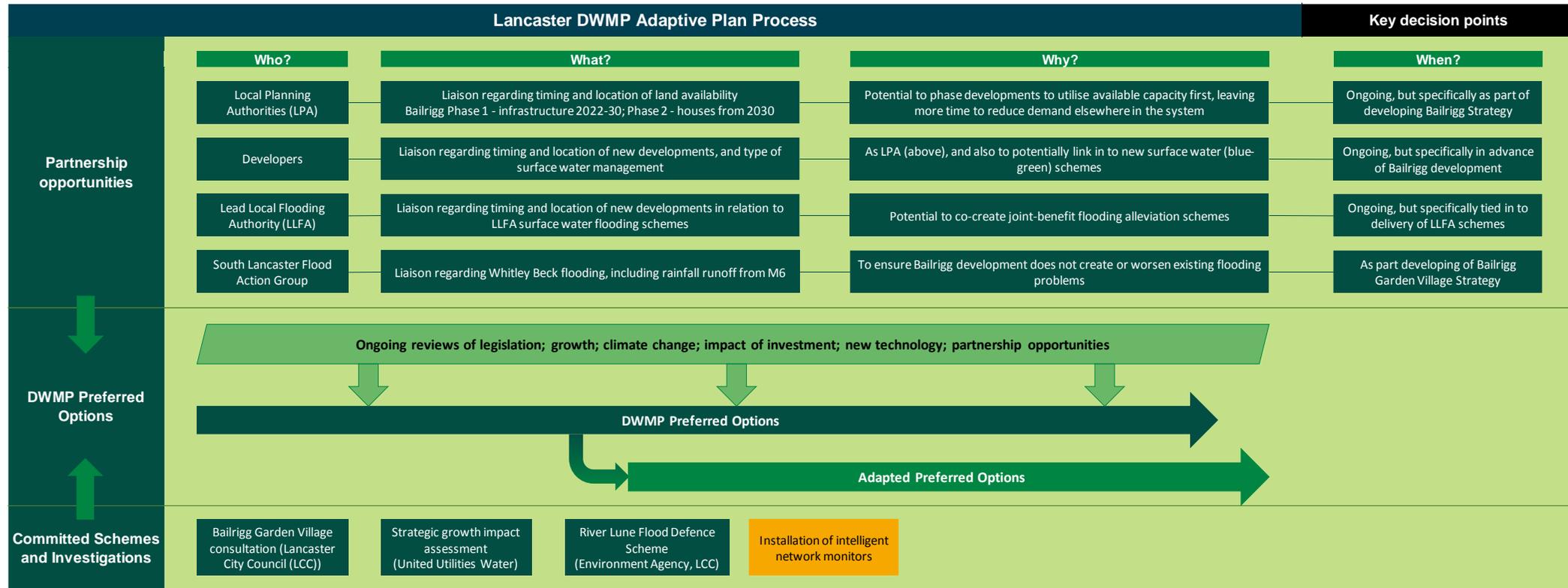
Figure 7 Map of the Lancaster TPU with areas for further investigation highlighted in blue



3.3.3.1 Lancaster adaptive plan

The first part of the adaptive plan process (Figure 8) highlights the importance of partnership working and regular data reviews.

Figure 8 Lancaster adaptive planning process



Partnership working

In a catchment where growth is a significant factor in future performance, it is key to maintain regular conversations with those stakeholders that have knowledge about future developments and can potentially influence their impact. Key organisations include:

- Local Planning Authority;
- The Environment Agency;
- Lead Local Flood Authorities; and
- Housing developers.

The DWMP plan for each TPU is developed based on a number of data sources. Some of these are prone to change over time, which means that original assessments can become out of date. As data from these sources change, it makes sense to re-evaluate the DWMP plan to check the impact on the plan. Examples of data that change over time are shown in Table 6.

Table 6 Examples of data that change over time and can impact upon the plan

Type of data or information	Possible impacts of changes
Government legislation	More or less stringent requirements or regulations, which may require different levels of investment, and policy changes that may drive better or worse incentives on demand.
Development growth projections	These will vary with time in line with economic conditions, changing demographics, or government policy. This can result in the number of new houses and businesses growing at a different rate than originally forecast.
Climate change projections	As more climate data becomes available, climate projections are modified, which may indicate changes to temperature and rainfall patterns.
Impact of investment	As new drainage schemes or new strategies are implemented, we will continue to evaluate their performance. If they turn out to be more or less successful than anticipated, this may allow the extent of another option type to be reduced or increased accordingly.
Development of new technology	Over time, new technology provides opportunities to address and resolve risks differently, or more efficiently.
Partnership opportunities	We will work closely with key stakeholders to address risks jointly. Over time, these stakeholders may see changes in their own risks and funding levels, which may present opportunities for greater collaboration.

Figure 9 shows the second part of the Lancaster adaptive plan, reflecting the different option types identified as being appropriate for Lancaster. Each line represents a different option type – e.g. schools education programme. The plan shows that each option type will be regularly reviewed in line with the method described in part one. This allows new information and opportunities to be used to adapt the plan by either increasing or reducing the extent of some option types.

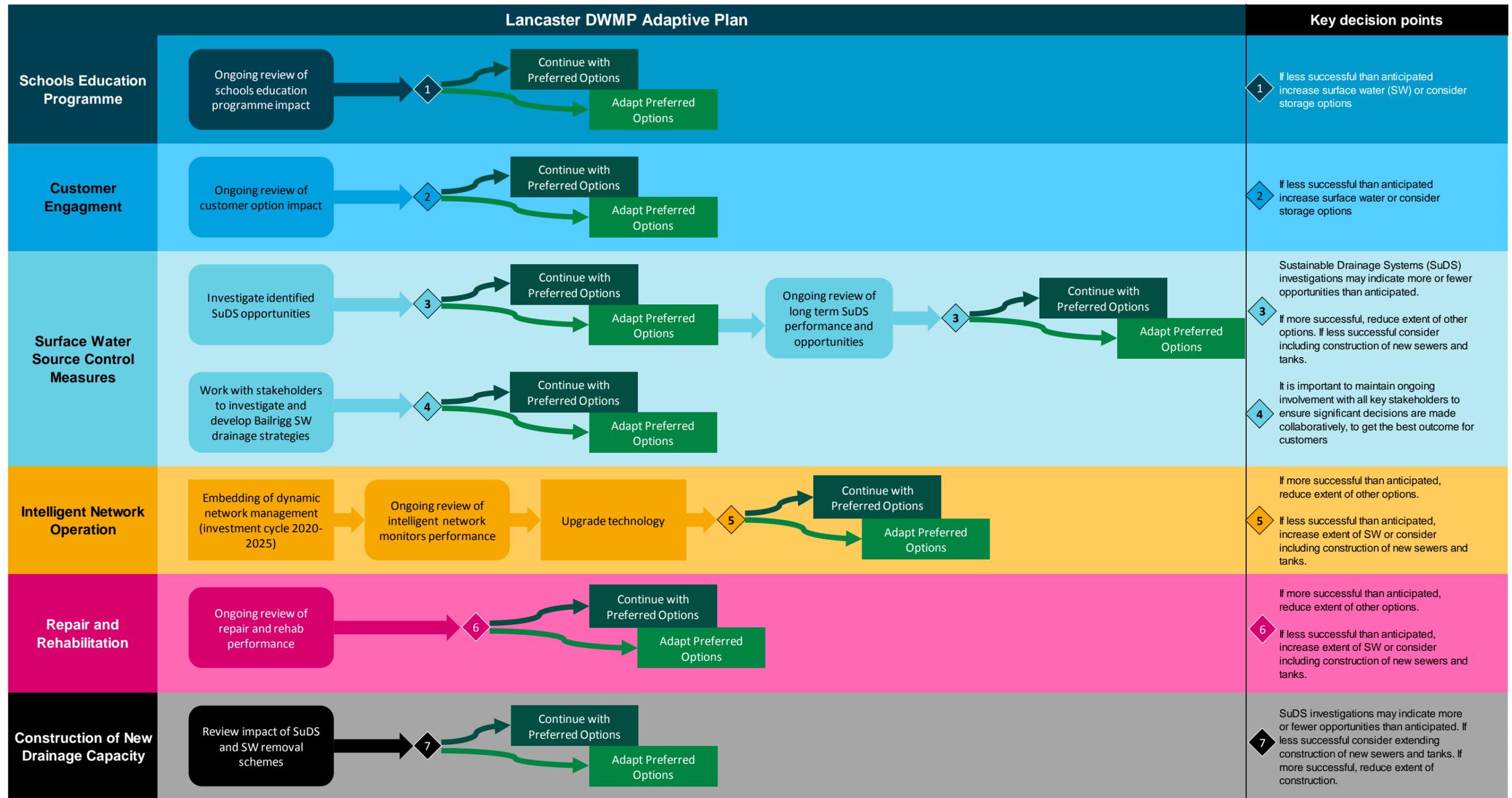
Within Lancaster, there are opportunities to carry out investigations before making final decisions on the final strategy. This means that we can properly evaluate options before committing to significant investment. These investigations will take into account things such as:

- Technical feasibility;
- Benefit of the work;
- Customer impact;
- Environmental impact; and
- Cost.

The adaptive plan below demonstrates multiple potential scenarios and pathways, and should be read in conjunction with the optimised DWMP plan for the relevant TPU (refer to Section 5.3).

The adaptive plan should be reviewed regularly in order to incorporate potential changes in key factors such as legislation, population growth and climate change, which could impact standards or targets, as highlighted above in Figure 8. The adaptive plan may contain potential investigations which are currently excluded from the optimised DWMP plan (refer to Section 5.3) until there is more certainty. It is therefore important that both the adaptive plan and the optimised plan are developed together.

Figure 9 Lancaster adaptive plan – Possible adaptive pathways as knowledge and opportunities change over time



3.3.4 Carnforth

The Carnforth TPU is to the west of the Lune SPA (Figure 10). The watercourses in the area are all classed as 'moderate' under the WFD 2019. The sewer network is approximately 180km long, and serves over 6,000 properties and a residential population of just under 15,000 people, which is projected to increase approximately 25% by 2050. This could drive further development to meet housing need, and possibly increase pressure on the network and wastewater treatment works.

The Carnforth TPU is a complex catchment, with a number of storm overflows within the area, and uncertainty around medium and long term performance particularly with regards to meeting future new targets. Alongside this the BRAVA process identified risks for internal flooding, external flooding, flooding of open spaces, pollution, sewer collapse, and blockages by 2050, with areas for further investigation highlighted in Figure 11. The WINEP and storm overflows guidance are still being developed. Against a backdrop of significant growth, it is anticipated that this could lead to significant changes and investment to both wastewater treatment works and the drainage network, to ensure protection of the environment and water quality.

Figure 10 Map of the Carnforth TPU

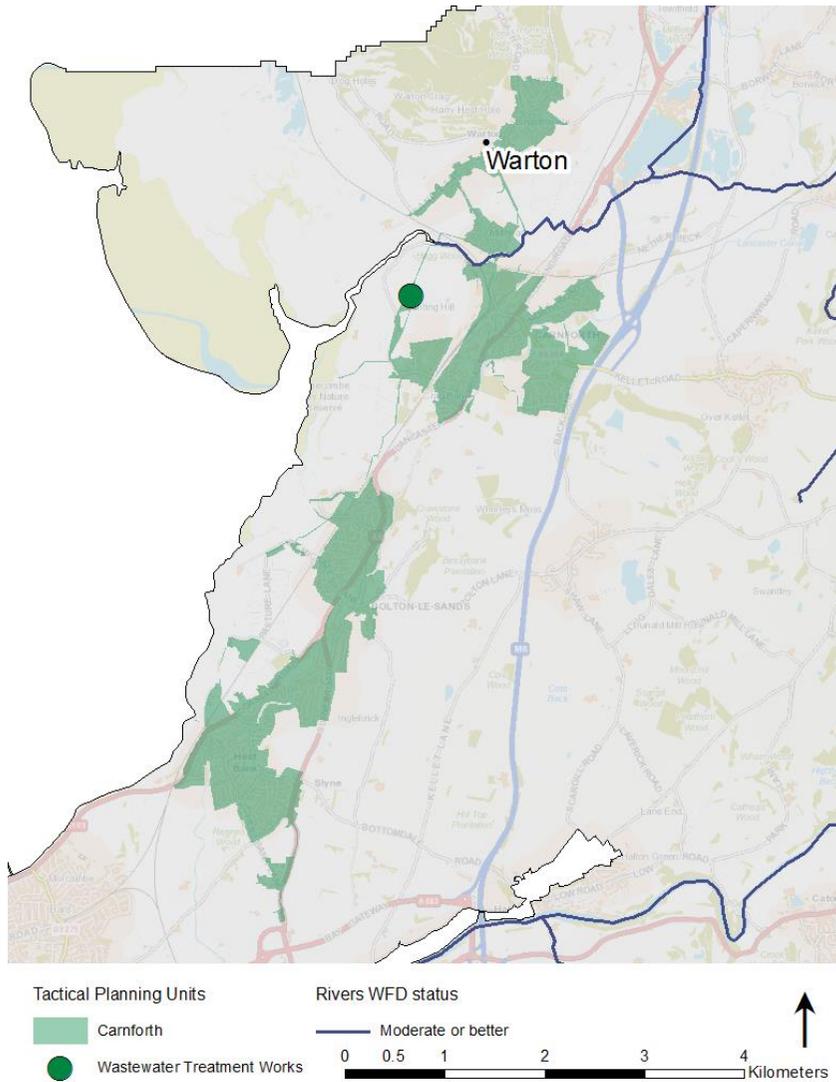
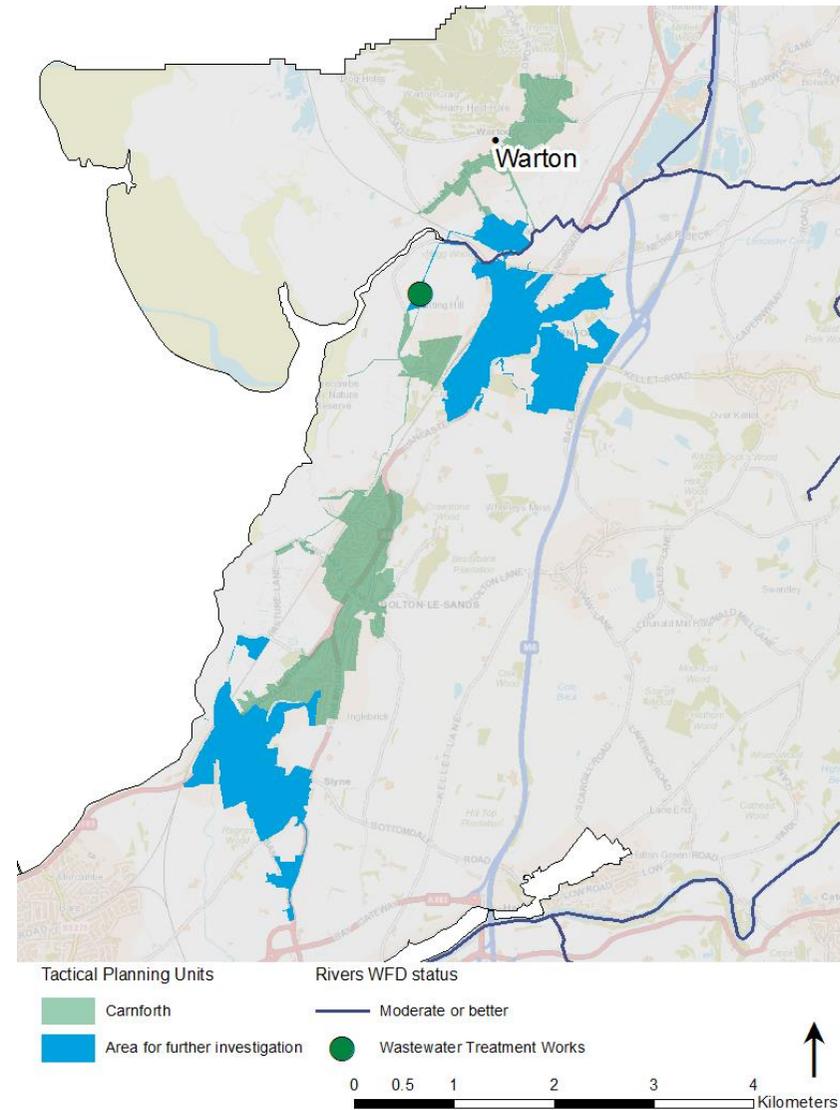


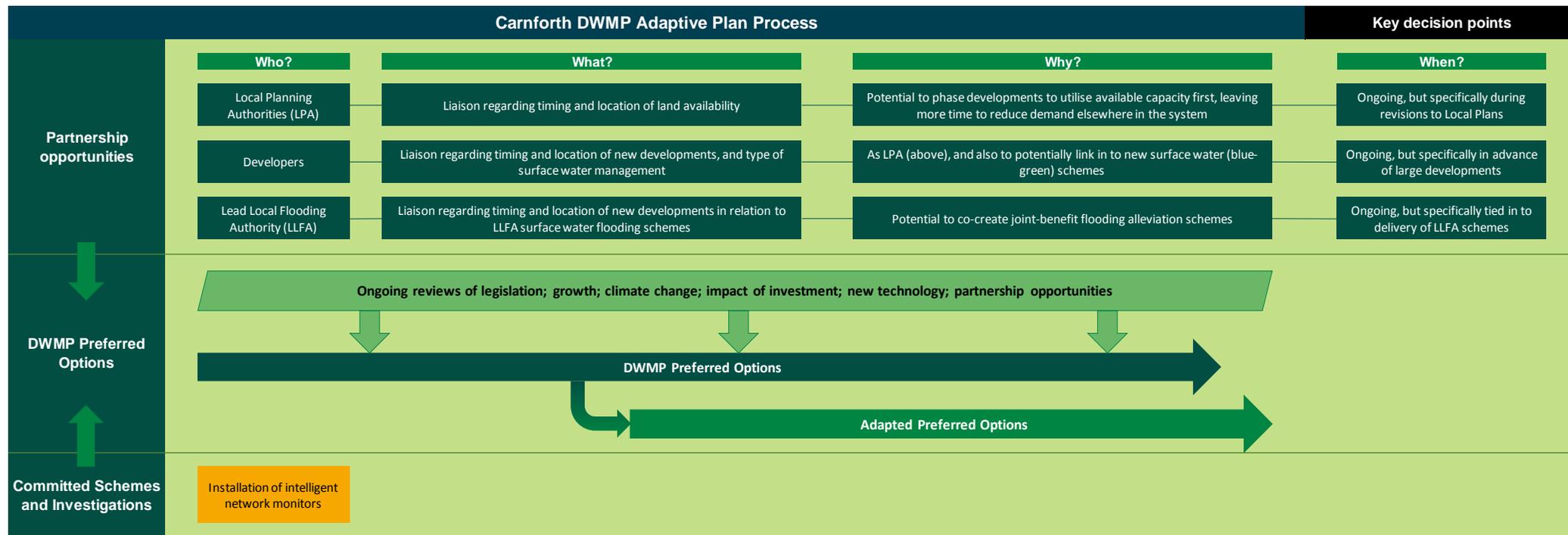
Figure 11 Map of the Carnforth TPU with areas for further investigation highlighted in blue



3.3.4.1 Carnforth adaptive plan

The first part of the adaptive plan process (Figure 12) highlights the importance of partnership working and regular data reviews.

Figure 10 Carnforth adaptive planning process



Partnership working

In a catchment where growth is a significant factor in future performance, it is key to maintain regular conversations with those stakeholders that have knowledge about future developments and can potentially influence their impact. Key organisations include:

- Local Planning Authority;
- Housing developers;
- Lead Local Flood Authority; and
- Regular data reviews.

The DWMP plan for each TPU is developed based on a number of data sources. Some of these are prone to change over time, which means that original assessments can become out of date. As data from these sources change, it makes sense to re-evaluate the DWMP plan to check the impact on the plan. Examples of data that change over time are shown in Table 7.

Table 7 Examples of data that change over time and can impact upon the plan

Type of data or information	Possible impacts of changes
Government legislation	More or less stringent requirements or regulations, which may require different levels of investment, and policy changes that may drive better or worse incentives on demand.
Development growth projections	These will vary with time in line with economic conditions, changing demographics, or government policy. This can result in the number of new houses and businesses growing at a different rate than originally forecast.
Climate change projections	As more climate data becomes available, climate projections are modified, which may indicate changes to temperature and rainfall patterns.
Impact of investment	As new drainage schemes or new strategies are implemented, we will continue to evaluate their performance. If they turn out to be more or less successful than anticipated, this may allow the extent of another option type to be reduced or increased accordingly.
Development of new technology	Over time, new technology provides opportunities to address and resolve risks differently, or more efficiently.
Partnership opportunities	We will work closely with key stakeholders to address risks jointly. Over time, these stakeholders may see changes in their own risks and funding levels, which may present opportunities for greater collaboration.

Figure 13 shows the second part of the Carnforth adaptive plan, reflecting the different option types identified as being appropriate for Carnforth. Each horizontal line represents a different option type – e.g. schools education programme. What the plan shows that each option type will be regularly reviewed in line with the method described in part one. This allows new information and opportunities to be used to adapt the plan by either increasing or reducing the extent of some option types.

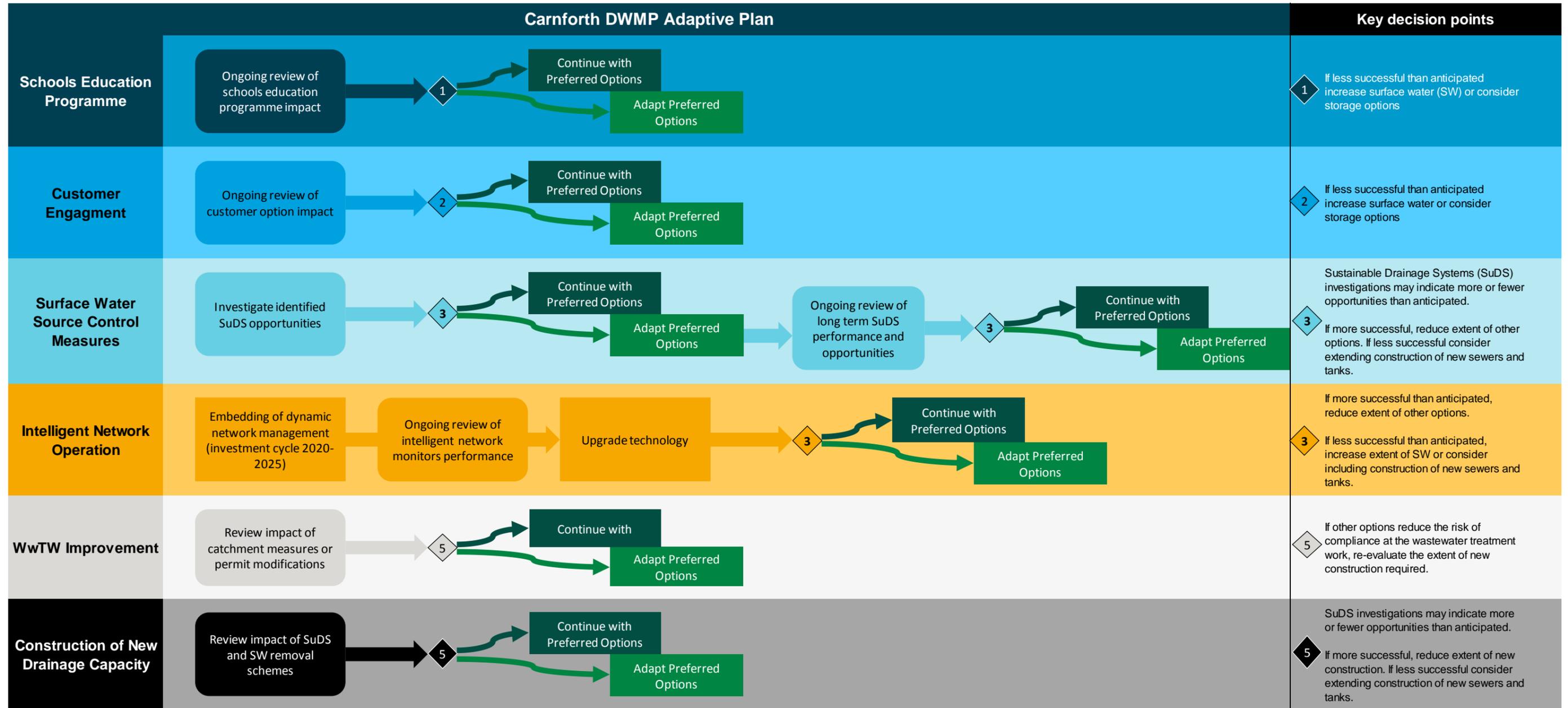
Within Carnforth, there are opportunities to carry out investigations before making final decisions on the final strategy. This means that we can properly evaluate options before committing to significant investment. These investigations will take into account things such as:

- Technical feasibility;
- Benefit of the work;
- Customer impact;
- Environmental impact; and
- Cost.

The adaptive plan below demonstrates multiple potential scenarios and pathways, and should be read in conjunction with the optimised DWMP plan for the relevant TPU (refer to Section 5.3).

The adaptive plan should be reviewed regularly in order to incorporate potential changes in key factors such as legislation, population growth and climate change, which could impact standards or targets, as highlighted above in Figure 12. The adaptive plan may contain potential investigations which are currently excluded from the optimised DWMP plan (refer to Section 5.3) until there is more certainty. It is therefore important that both the adaptive plan and the optimised plan are developed together.

Figure 11 Lancaster adaptive plan – Possible adaptive pathways as knowledge and opportunities change over time



4. Options development

The approach for options development is an iterative screening process to identify most appropriate solutions for issues in each TPU. These solutions were taken forward for a best value assessment which will select the preferred option (Figure 14).

An options hierarchy was then used which has been endorsed by customers and stakeholders from across the North West to select preferred solutions (Figure 15). The hierarchy covers a range of option types from behavioural, to blue-green solutions e.g. SuDS and traditional grey solutions e.g. storage tanks across benefits such as reducing demand, better system management and creating capacity.

A key element to this has been built around co-development, co-funding and co-delivery through partnerships and third parties (for instances where a specific skill set is required).

Figure 12 Options development process

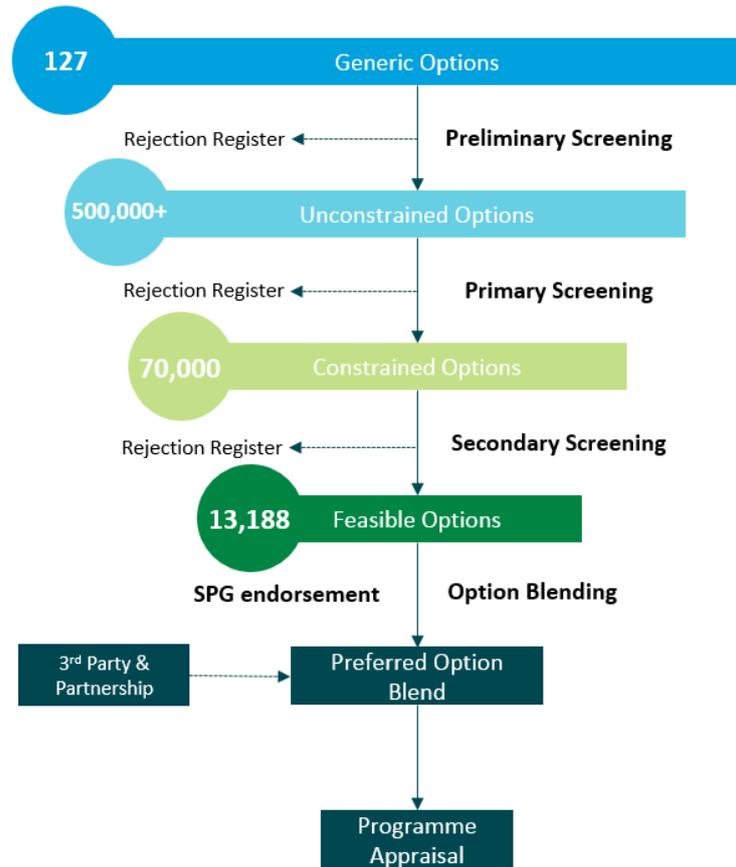
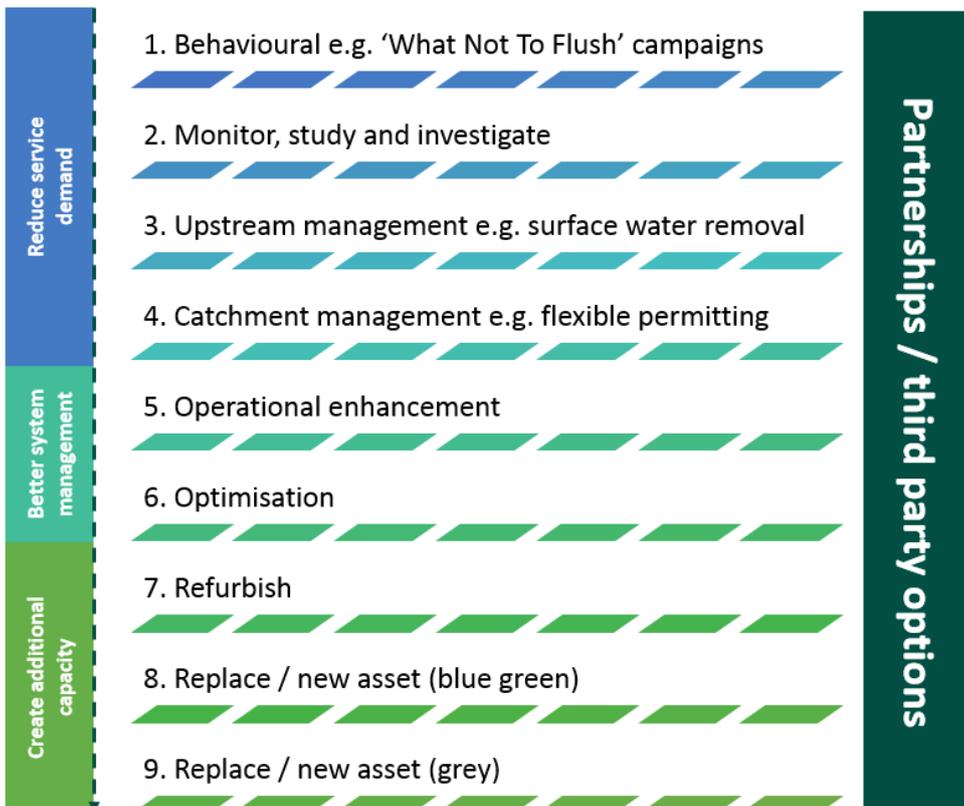


Figure 13 Options hierarchy



4.1 Lune partnership options

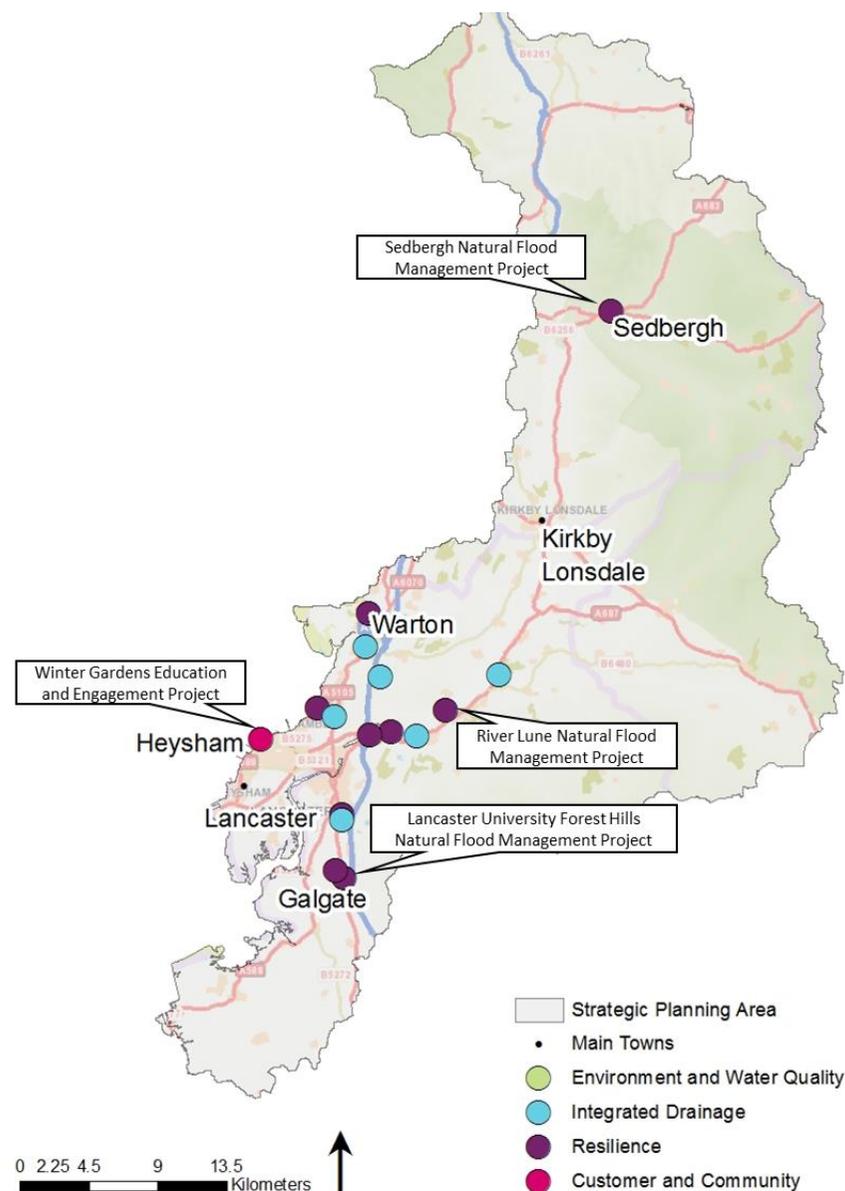
In order to identify and develop potential partnership options in the Lune SPA, through the SPG we have shared the results from the risk identification stages such as BRAVA. This was done through a series of workshops and the purpose was to identify areas of shared risk and partnership opportunities which have been reviewed against the wider DWMP options development process (refer to Section 5.2).

The options shared were reviewed by the DWMP team and a second SPG workshop was held to gather additional information regarding potential partnership opportunities. This allowed us to understand timescales, likelihood of investment and potential organisations involved. An opportunities pipeline was consequently created using the outputs of this engagement. The pipeline includes opportunities at a range of different levels of maturity and confidence in development, as such these are not confirmed or necessarily funded schemes. However, they provide an indication of areas where we may be able to work collaboratively with partners in the future when more certainty is ascertained about need and funding. Examples of potential partnership locations are shown in Figure 16.

We have actively engaged with our SPGs to ensure that this is a collaborative process. Moving forwards, we are currently developing our Partnership Framework for the investment cycle 2025 – 2030 and beyond. The DWMP partnership opportunities pipeline will feed into this, forming an initial view of partners and opportunities. When developing the business plan, further engagement will be undertaken to where an opportunity is aligned to a 2025 – 2030 investment need. In addition to scheme specific collaboration opportunities, we recognise the need for more strategic partnerships and we will build on successes from historic partnerships in the North West.

For further information on our approach to partnership working, refer to TA2.

Figure 14 Overview of the potential partnership opportunities in the Lune SPA



5. Options for the Lune

5.1 Options considered

Following a number of iterative screening processes outlined in Section 4, a list of feasible options was developed for each TPU within the Lune catchment. Options can be categorised into a number of categories:

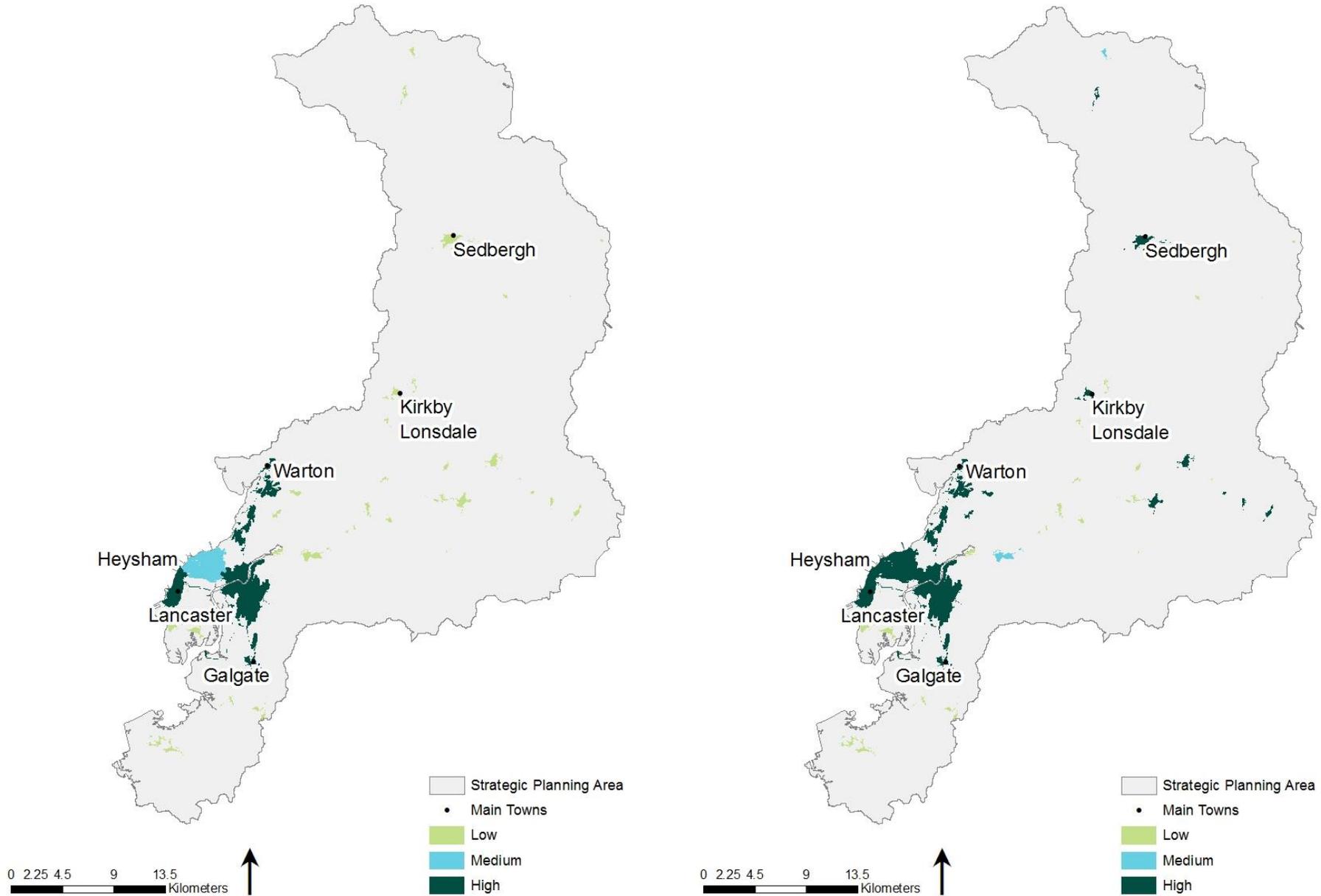
- Customer engagement;
- Monitor and investigate;
- Upstream management;
- Catchment management;
- Operational enhancement;
- Optimisation;
- Refurb/New asset (blue/green); and
- Refurb/New asset (grey).

Of these options a number can be considered regional options – those which could be implemented across the North West but may bring tangible benefits in some areas more than others. These can be investigated further ahead of investment cycle 2025 – 2030 where viable.

Across the Lune SPA customer engagement options (Figure 17) comprising of options to work with customers to reduce demand and increase awareness of ‘what not to flush’ have been identified as having the potential to deliver the highest benefit in Morecambe, Carnforth and Lancaster TPUs.

Sustainable Drainage System (SuDS) options have been assessed, these form a key part of the strategy to manage rainwater from entering the sewer system in Lancaster, Sedbergh and Tebay TPUs (Figure 17).

Figure 15 Maps show the benefit of implementing regional customer engagement (left) and sustainable drainage solutions (right) options across the Lune SPA



5.2 Preferred options

Note: Water Industry National Environment Programme (WINEP) and storm overflows guidance are still being developed. This could lead to significant changes in preferred options and could result in large-scale, short and long term investment needs. This will be fully reviewed between draft and final DWMP publication, in addition to other aspects such as nutrient neutrality, bathing waters and shellfish water expectations. Between draft and final DWMPs the impact of storm overflow requirements will also require optimising against the other needs and opportunities detailed in this section to assess synergy/conflict and best value.

The data below do not include planned investment in addressing storm overflows. The future standards for overflows are currently the subject of the Government’s Storm Overflow Discharge Reduction Plan Consultation, and the outcome is not yet determined, so it has not been possible to include these in the screening process described below.

A high-level regional assessment has been carried out to estimate the likely investment requirements to address all overflow risks, but due to the uncertainty described above, this has not been broken down by Strategic Planning Areas. This information can be found in the DWMP main document.

Utilising data collected at the various stages of developing the DWMP (BRAVA, partnership opportunities and the data in Figure 17), preferred options were selected using a decision support tool and following the hierarchy principles. We have also included in this plan high confidence schemes that we believe are likely to have secured investment.

In addition the partnership opportunities highlighted in Section 4.1 are considered key for delivery of the options set out below. These will be investigated in detail in preparation for the investment plan for the period 2025-2030.

The following colour schemes are used for all charts and graphs in this section to represent each option type (Figure 18).

Figure 16 Options types

Reduce Service Demand		Schools Education Programme
		Customer Engagement
		Surface Water Source Control Measures
		Modification of Permits
Better System Management		Intelligent Network Operation
		Enhanced Operational Maintenance
		Repair and Rehabilitation
Create Additional Capacity		New 'Green' WwTW Capacity (e.g. Reedbed)
		New 'Green' Overflow Treatment (e.g. Reedbed)
		Separation of Combined Sewers
		WwTW Transfers
		WwTW Improvement
		Construction of New Drainage Capacity

The first four option types are all grouped under the strategic heading of 'Reduce Service Demand', and are options that focus on either reducing the amount of wastewater that is produced, or preventing it from reaching the sewer network.

The second strategic group is 'Better System Management' and looks to try and manage and operate the existing assets in a more efficient or effective manner.

The final group is 'Create Additional Capacity'. This is about building new assets, for example storage tanks or new treatment work process units, where it is not possible or economical to reduce demand or improve operations any further.

Across the Lune SPA, the outcomes seen as a result of investment and benefit in each option type are shown in Figures 19, 20 and 21.

Figures 19 and 20 show how potential investment could be split between the three high-level option strategies – reduce demand, system management and new capacity – and then further sub-divides these into the individual option types.

Figure 19 shows potential options that could address environmental planning objectives, which incorporate:

- Wastewater treatment work permit compliance;
- WINEP compliance; and
- Pollution of watercourses.

Figure 20 shows potential options that could address flooding planning objectives, which incorporate:

- Internal flooding;
- External flooding;
- Highway and open space flooding; and
- 1 in 50-year flooding.

Note that the percentages shown in Figures 19 and 20 are the proportions of investment within each planning objective type (flooding and environmental), but the total values of flooding and environmental investment are not equal. This split can be seen in more detail for each TPU in Section 5.3.

Figure 21 shows how these options could contribute to addressing the planning objectives – environmental and flooding.

Figure 17 Lune Strategic Planning Area: Distribution of environmental investment by option type

This is an example of how investment in different options types may be used to address the environmental planning objectives. The vast majority of potential investment could be through improvements in wastewater treatment works. This chart does not show planned investment in improving overflow performance as these are not based on cost beneficial assessments.

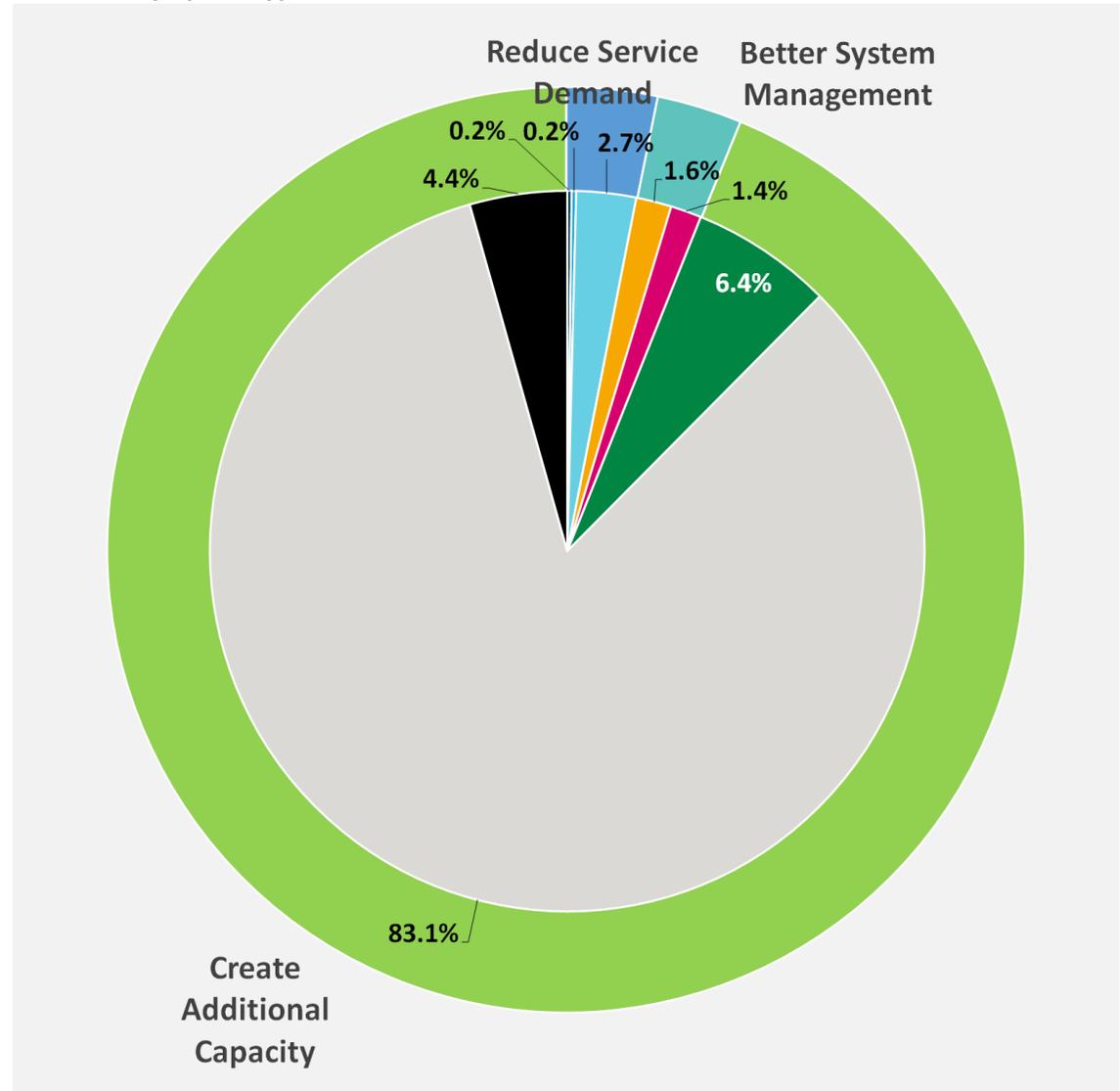


Figure 18 Lune Strategic Planning Area: Distribution of flooding investment by option type

This is an example of how different options types may be used to address flooding planning objectives. Almost half of the potential investment could be through a strategy to reduce demand on the sewer system, seen here through surface water source control measures such as SuDS and schools and engagement programmes.

Around 44% of potential investment could be in the construction of new drainage capacity and around 12% could be used to improve existing system management with options such as intelligent network operation and repair and rehabilitation.

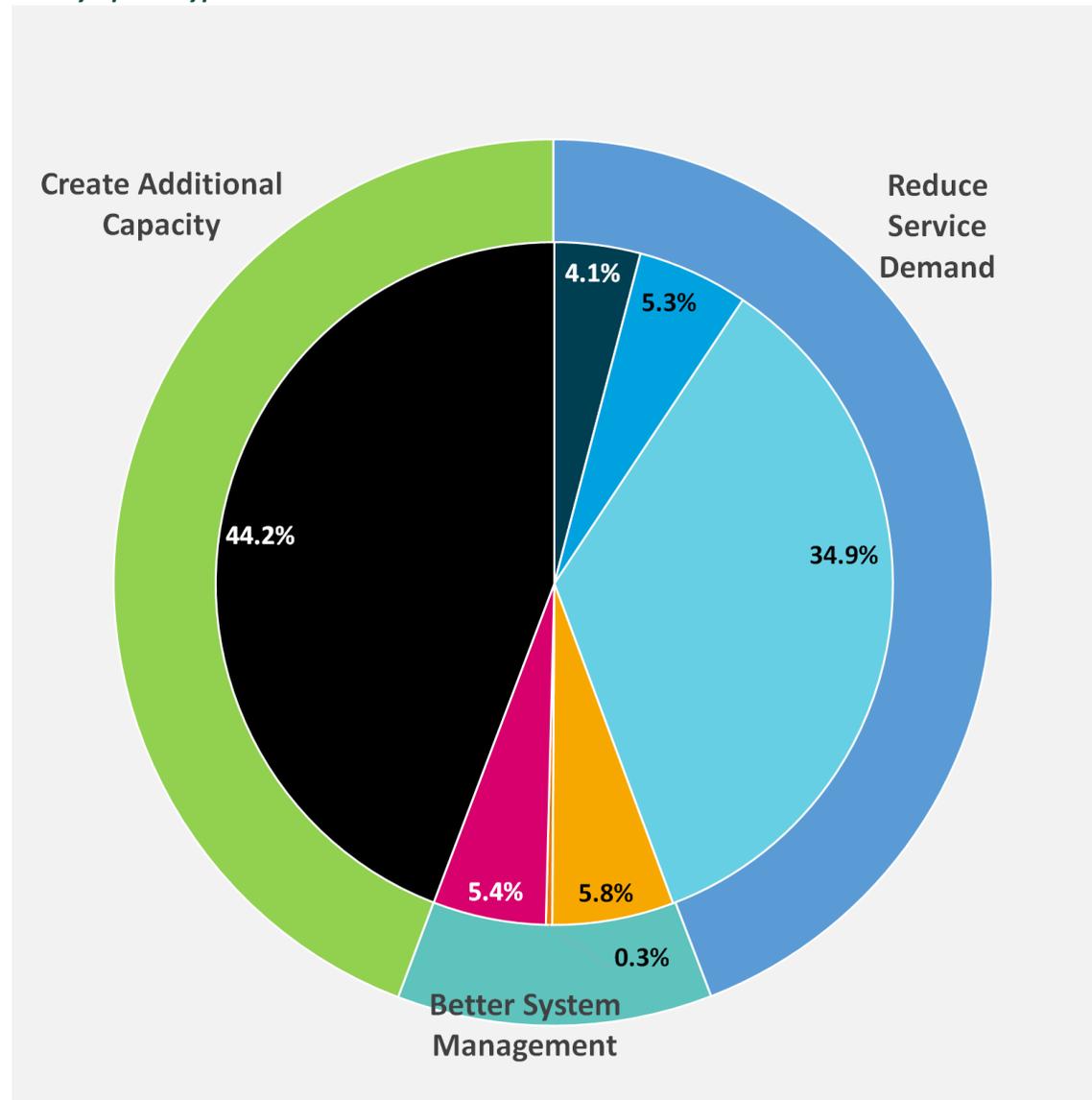
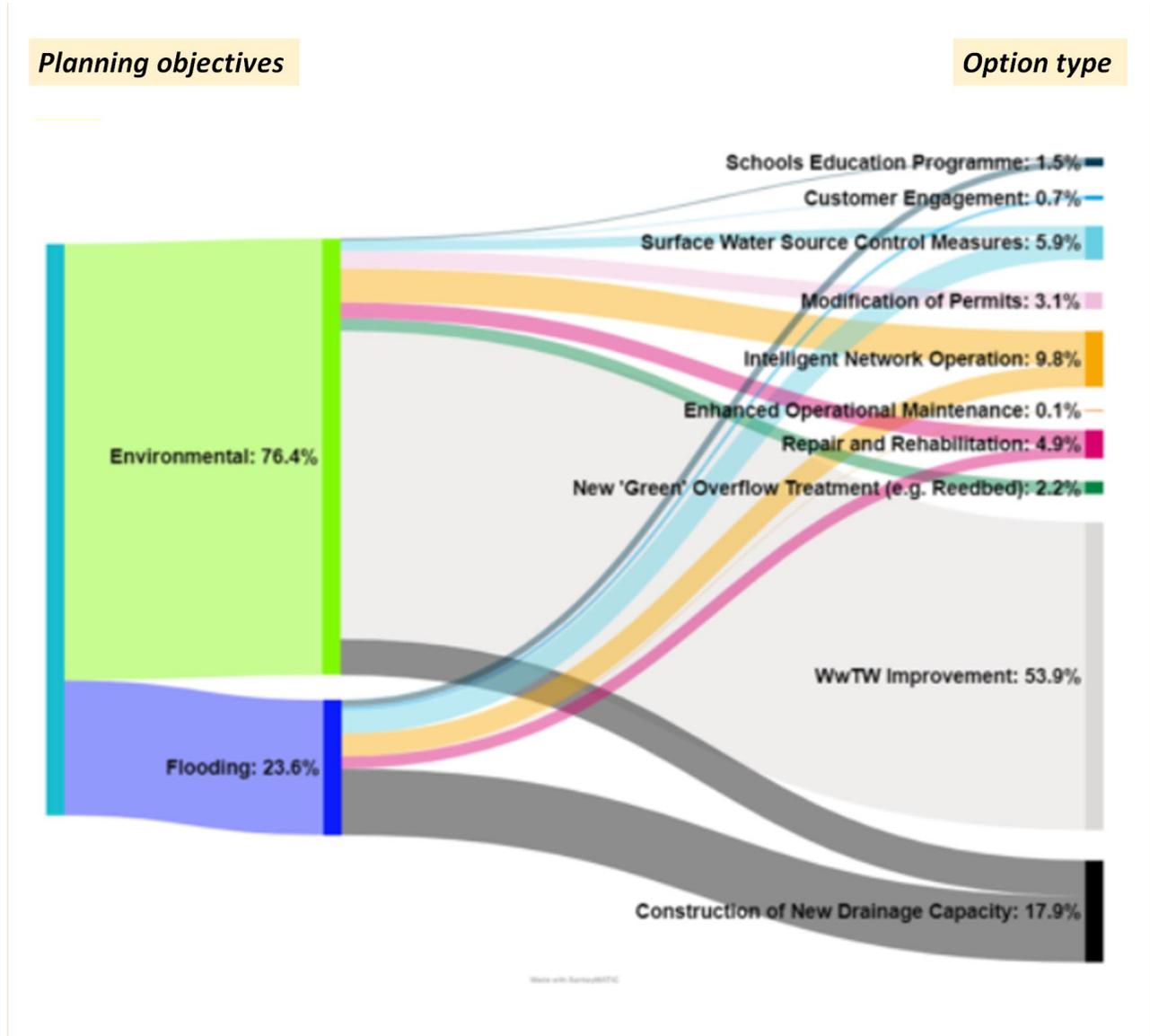
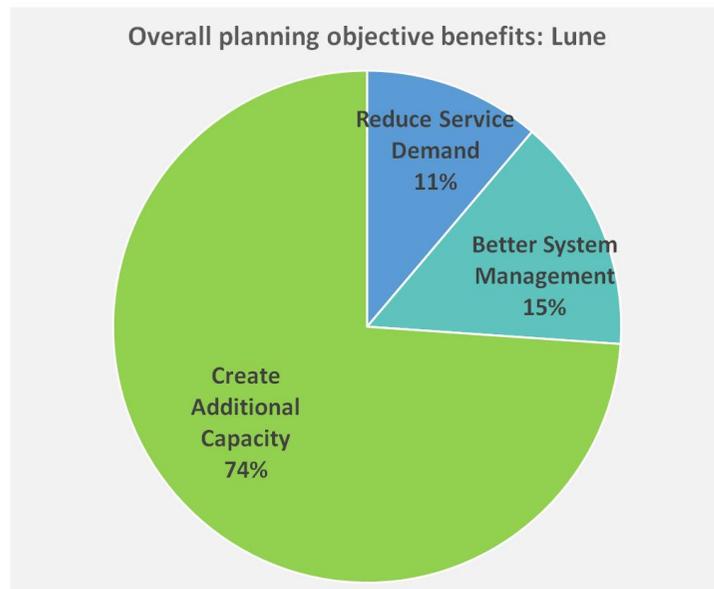


Figure 19 Distribution of benefit by option type within Lune SPA

This is an example of how different option types may be used to demonstrate potential benefits against different planning objectives within the Lune SPA.

United Utilities Water (Uuw) commitments to improving flooding performance could be met through the reduction of surface water flows, construction of new stormwater drainage capacity, and the installation of intelligent network, supported by schools and customer engagement programmes.

Environmental planning objectives could be met mainly through improvements to wastewater treatment works, repair and rehabilitation of existing network, construction of new drainage capacity, new 'green' overflow treatment, modification of permits and improved operational maintenance.

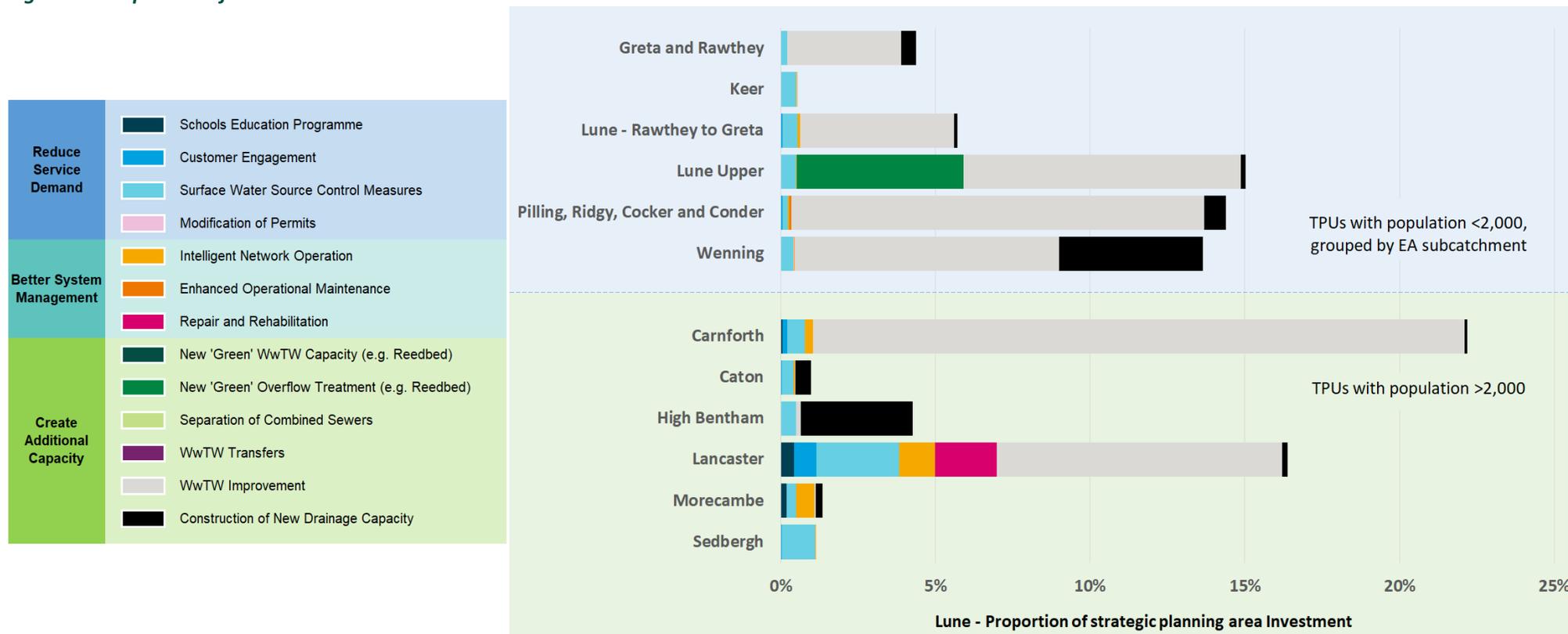


5.3 Overview of Preferred Options in each TPU

Figure 22 shows the proportion of Lune SPA potential investment in each TPU, split up by option type. Note that the smaller TPUs within the catchment (those with less than 2,000 population) have been reported together at the top of the chart, grouped by SPA sub catchment (Environment Agency Operational Catchment boundaries).

It can be seen that in the Lune SPA, the largest TPUs see the largest potential investment, which is split predominantly between wastewater treatment works improvements, surface water control, improved system management, and construction of new storm water storage tanks.

Figure 20 Proportion of investment seen in each TPU within the Lune SPA



The following sub-sections show how investment could be split between different types of options to bring benefits to each TPU over the short, medium and long term. Some options, such as construction of new storm water storage tanks, occur at a single point in time; however the benefit of reduced flooding could be seen long into the future. Other options such as schools education, are continual programmes that will help to encourage long-term sustainable behaviours, such as reduction in water use.

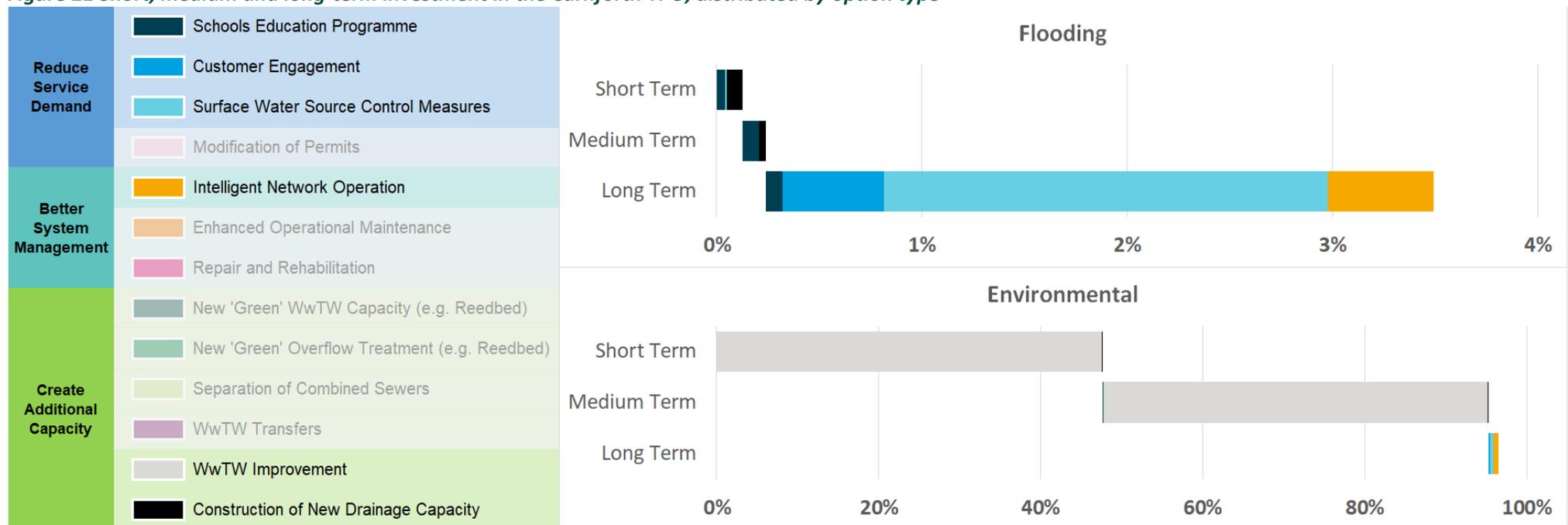
5.3.1 Carnforth

The results from the DWMP show that if we were to invest in Carnforth over the next 25 years, around 4% of the investment could be to address flooding risks, and around 96% of investment could be to address environmental risks (Figure 23).

In the short and medium term, potential investment could be through wastewater treatment works improvements.

In the longer term, there could be investment in customer engagement programmes, the installation of intelligent network monitoring systems and in surface water control measures (e.g., SuDS).

Figure 21 Short, medium and long-term investment in the Carnforth TPU, distributed by option type



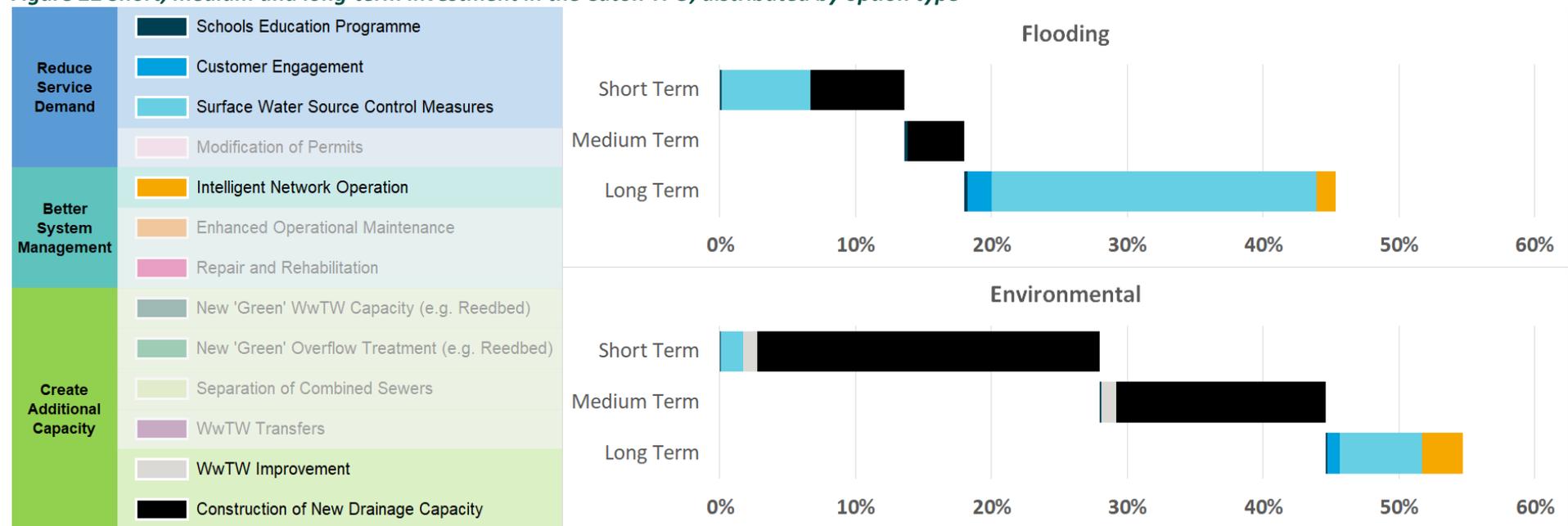
5.3.2 Caton

The results from the DWMP show that if we were to invest in Caton over the next 25 years, around 45% of the investment could be to address flooding risks, and around 55 % of investment could be to address environmental risks (Figure 24).

In the short and medium term, potential investment could be through the construction of new drainage capacity and surface water control measures (e.g., SuDS).

In the longer term, we could continue the investment in surface water control measures (e.g. SuDS), customer engagement programmes, and the installation of intelligent network monitoring systems.

Figure 22 Short, medium and long-term investment in the Caton TPU, distributed by option type



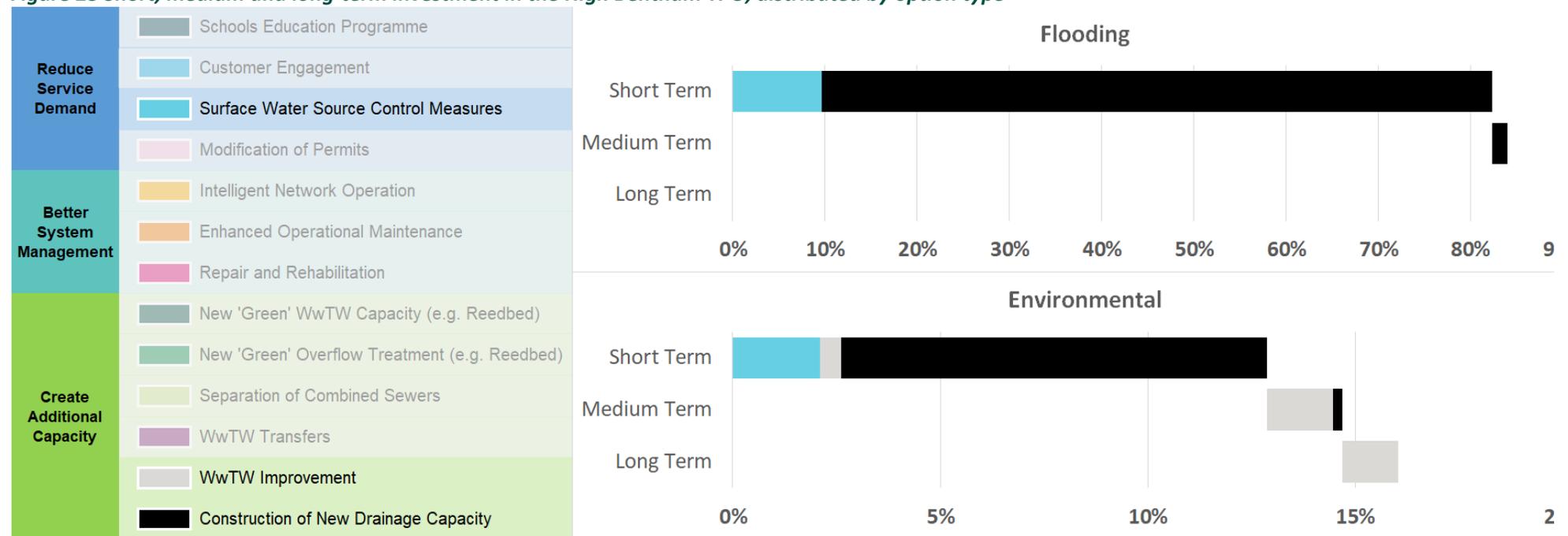
5.3.3 High Bentham

The results from the DWMP show that if we were to invest in High Bentham over the next 25 years, around 84% of the investment could be to address flooding risks, and around 16 % of investment could be to address environmental risks (Figure 25).

In the short and medium term, potential investment could be through the construction of new drainage capacity, improvements at the wastewater treatment works, and surface water control measures (e.g. SuDS).

In the longer term, we could continue to invest in wastewater treatment improvements.

Figure 23 Short, medium and long-term investment in the High Bentham TPU, distributed by option type



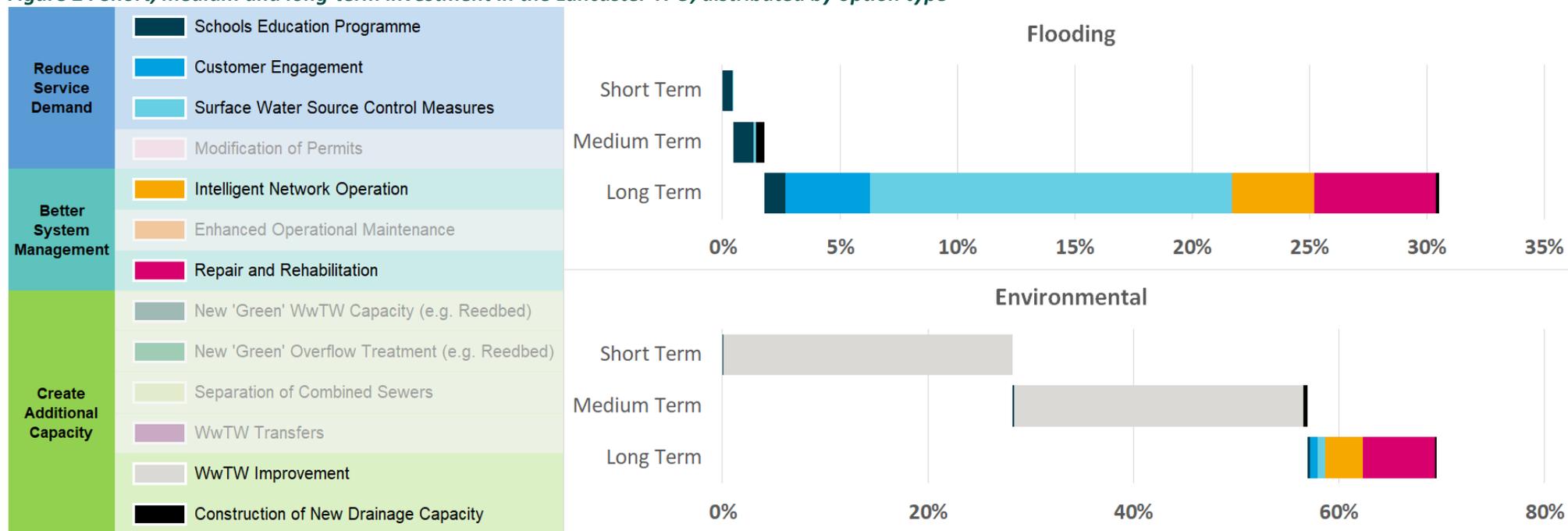
5.3.4 Lancaster

The results from the DWMP show that if we were to invest in Lancaster over the next 25 years, around 31% of the investment could be to address flooding risks, and around 69 % of investment could be to address environmental risks (Figure 26).

In the short and medium term, potential investment could be through wastewater treatment works improvements, plus the construction of new drainage capacity, and customer engagement.

In the longer term, we could invest in surface water control measures (e.g. SuDS), the repair and rehabilitation of exiting network, customer engagement and school education programmes.

Figure 24 Short, medium and long-term investment in the Lancaster TPU, distributed by option type



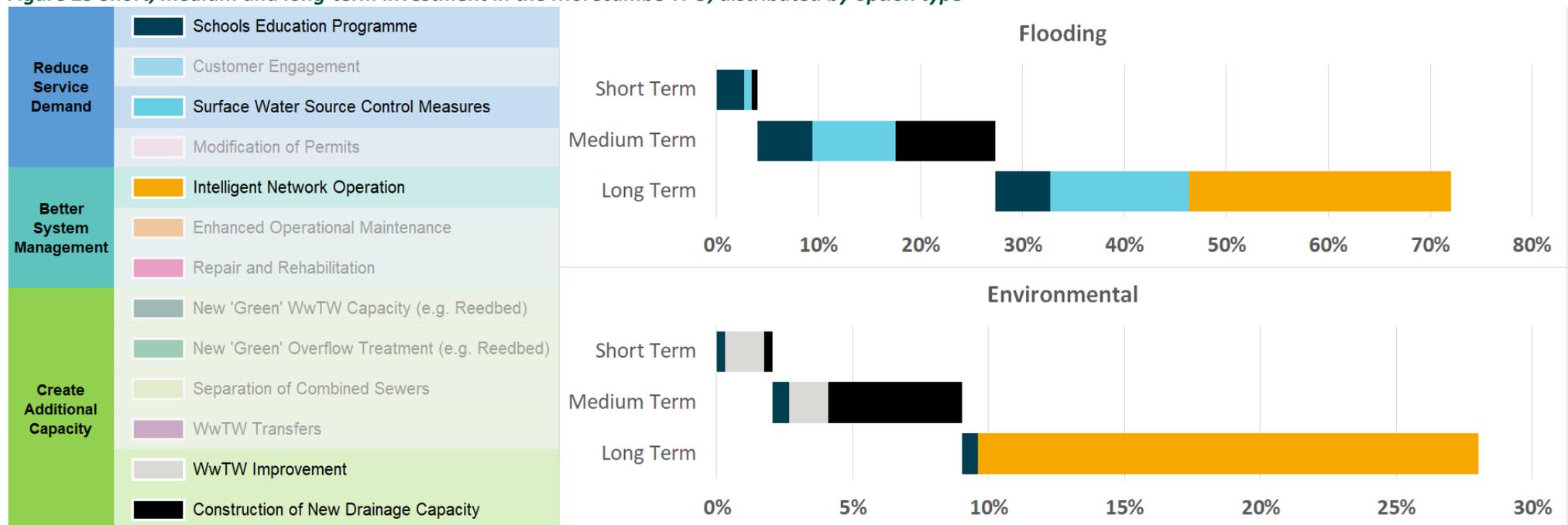
5.3.5 Morecambe

The results from the DWMP show that if we were to invest in Morecambe over the next 25 years, around 72% of the investment could be to address flooding risks, and around 28% of investment could be to address environmental risks (Figure 27).

In the short and medium term, potential investment could be through the construction of new drainage capacity, wastewater treatment works improvements, customer engagement and surface water control measures (e.g. SuDS).

In the longer term, we could continue to invest in surface water control measures and the installation of intelligent network operation.

Figure 25 Short, medium and long-term investment in the Morecambe TPU, distributed by option type



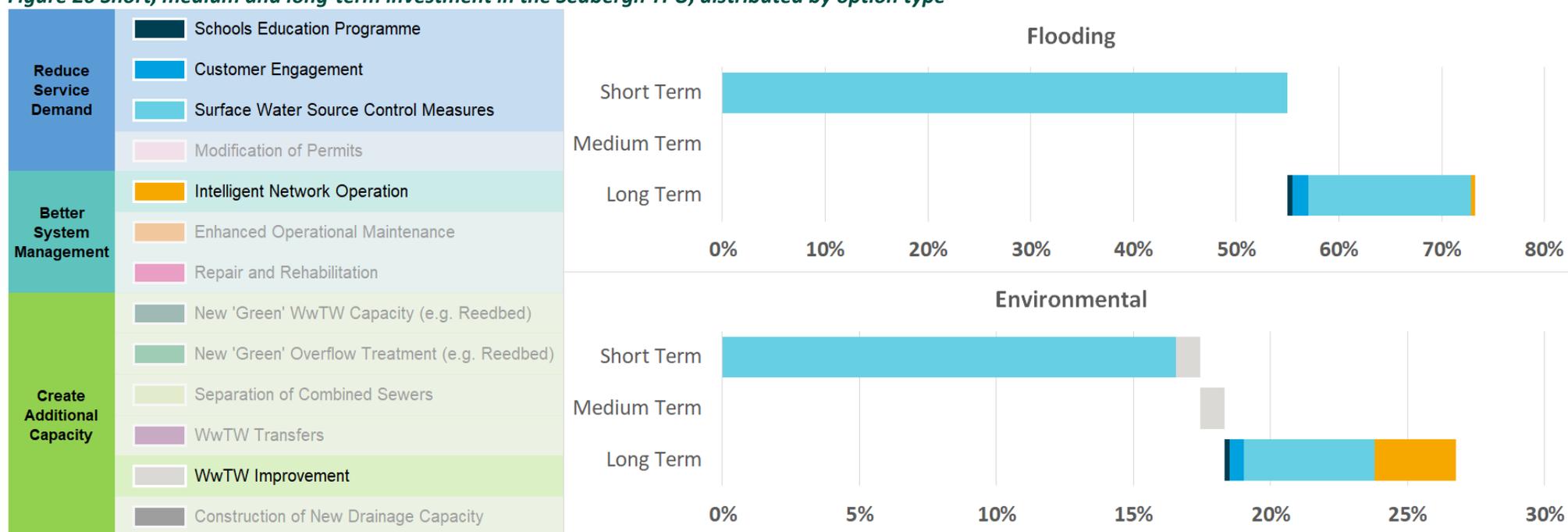
5.3.6 Sedbergh

The results from the DWMP show that if we were to invest in Sedbergh over the next 25 years, around 73% of the investment could be to address flooding risks, and around 27% of investment could be to address environmental risks (Figure 28).

In the short and medium term, potential investment could be through surface water control measures (e.g. SuDS), with additional investment in wastewater treatment works improvements.

In the longer term, we could continue to invest in surface water control measures and installation of intelligent network operation.

Figure 26 Short, medium and long-term investment in the Sedbergh TPU, distributed by option type



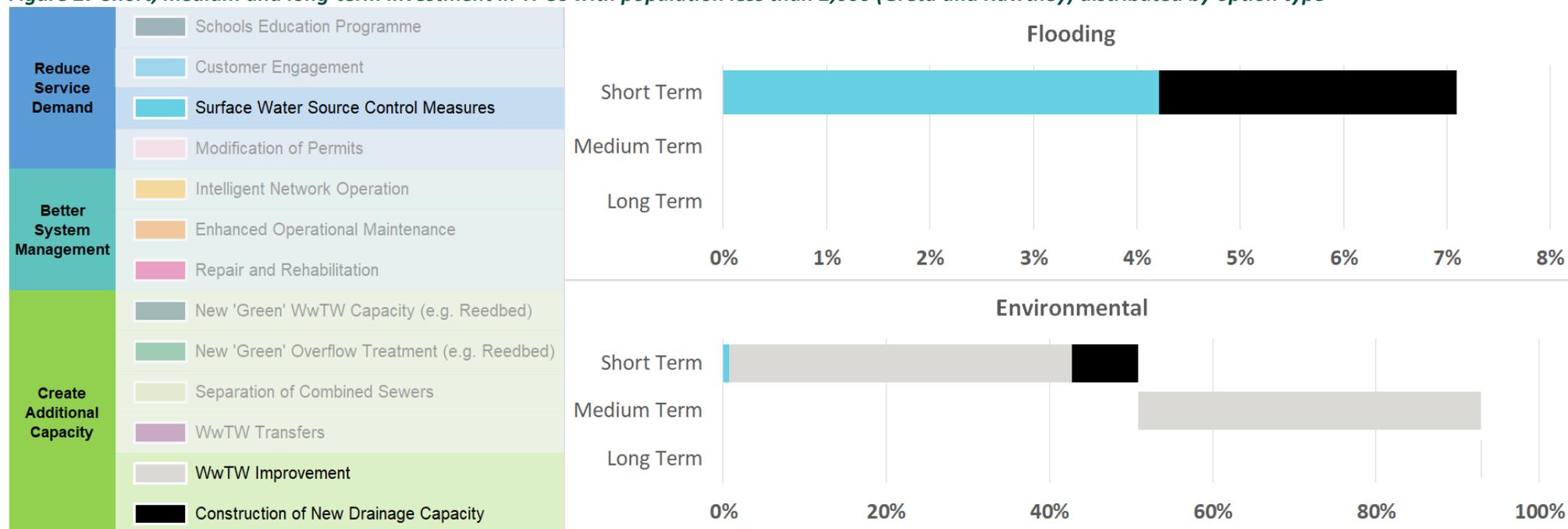
5.3.7 TPUs with population less than 2,000: Greta and Rawthey sub catchment

The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Burton-In-Lonsdale
- Cold Cotes
- Dent
- Garsdale Head
- Ingleton
- Lea Yeat

In the short and medium term, potential investment could be through surface water control measures (e.g. SuDS) and in improvements at wastewater treatment works (Figure 29).

Figure 27 Short, medium and long-term investment in TPUs with population less than 2,000 (Greta and Rawthey) distributed by option type



5.3.8 TPUs with population less than 2,000: Keer sub catchment

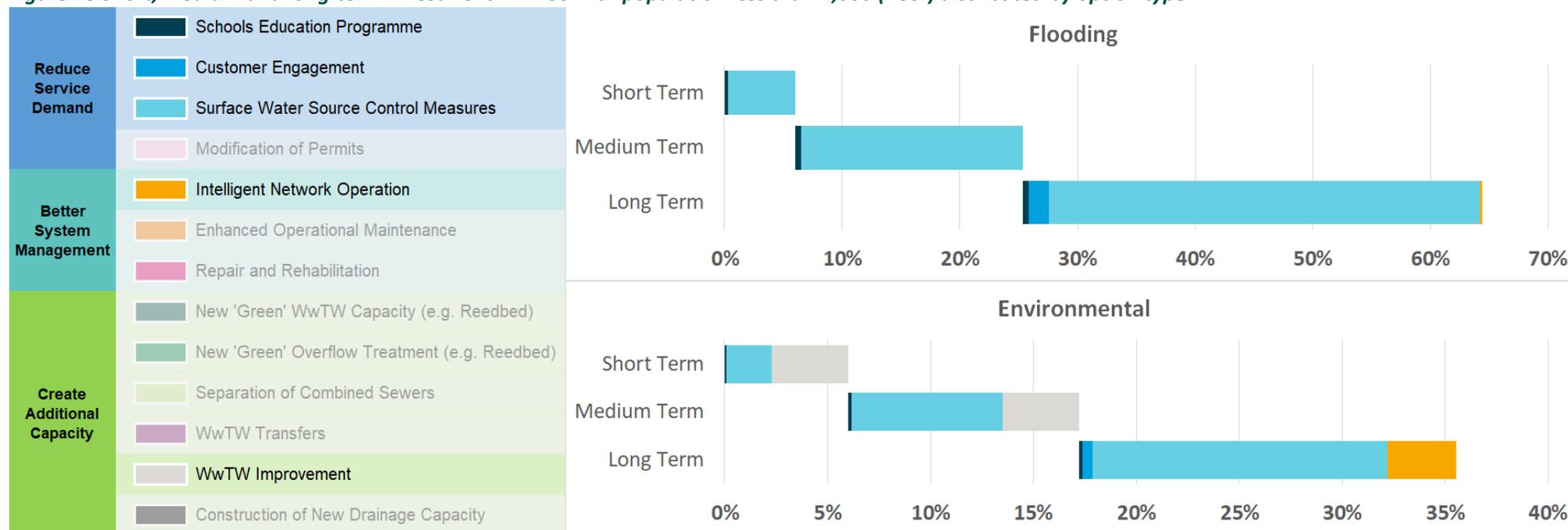
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Nether Kellet
- Over Kellet

In the short and medium term, potential investment could be through surface water control measures (e.g. SuDS) and in improvements at wastewater treatment works (Figure 30).

In the longer term, investment could continue in surface water control measures (e.g., SuDS) and also, in the installation of intelligent network operations.

Figure 28 Short, medium and long-term investment in TPUs with population less than 2,000 (Keer) distributed by option type



5.3.9 TPUs with population less than 2,000: Lune - Rawthey to Greta sub catchment

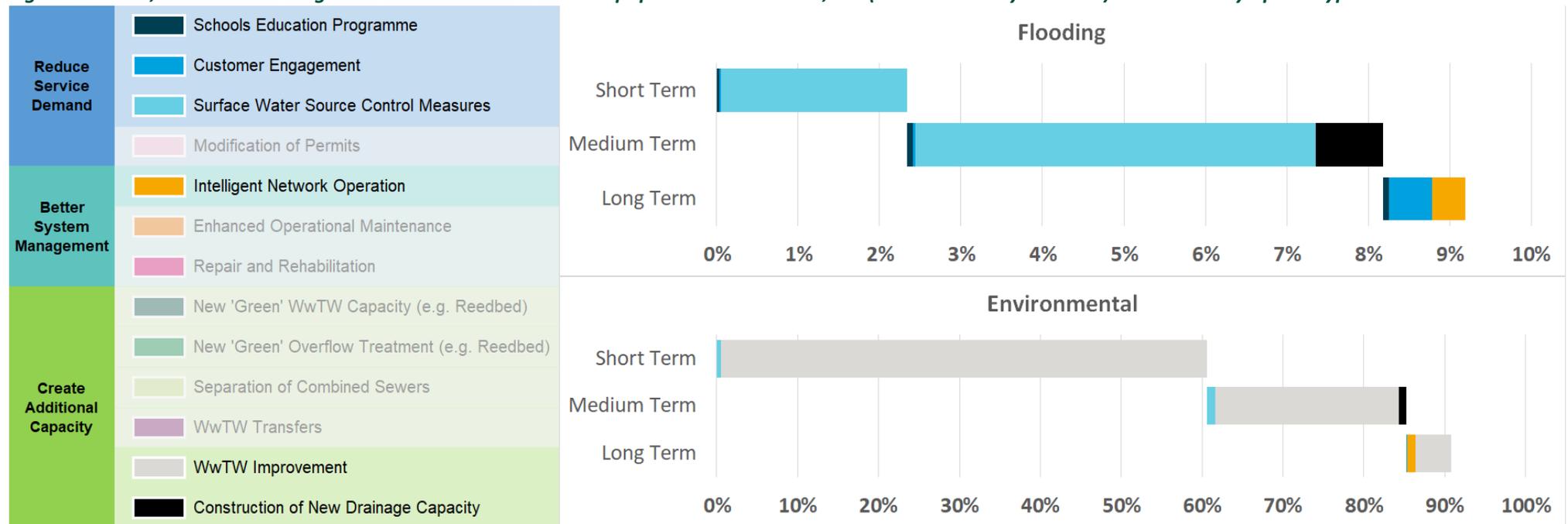
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Casterton
- Claughton
- Farleton
- Halton East
- Halton West Lune
- Kirkby Lonsdale
- Whittington

In the short and medium term, potential investment could be through improvements at wastewater treatment works, and surface water control measures (e.g. SuDS, Figure 31).

In the longer term, investment could continue in wastewater treatment works improvements, in the installation of intelligent network operations, and customer engagement programmes.

Figure 29 Short, medium and long-term investment in TPUs with population less than 2,000 (Lune - Rawthey to Greta) distributed by option type



5.3.10 TPUs with population less than 2,000: Lune Upper sub catchment

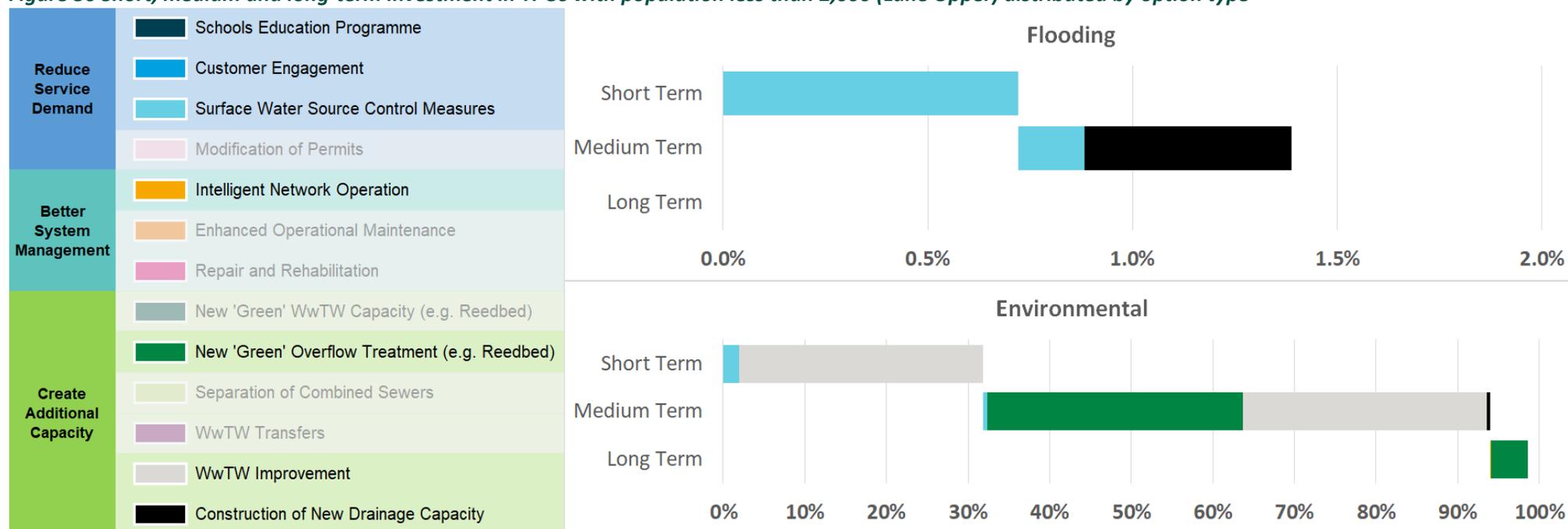
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Orton
- Tebay

In the short and medium term to address flooding, potential investment could be through surface water control measures (e.g. SuDS) and the construction of new storm water drainage capacity. Environmental risks will be addressed through investment in the wastewater treatment works improvements and new green overflow treatment (e.g. reed beds, Figure 32).

In the longer term, investment could continue in new green overflow treatment.

Figure 30 Short, medium and long-term investment in TPUs with population less than 2,000 (Lune Upper) distributed by option type



5.3.11 TPUs with population less than 2,000: Piling, Ridgy, Cocker and Conder sub catchment

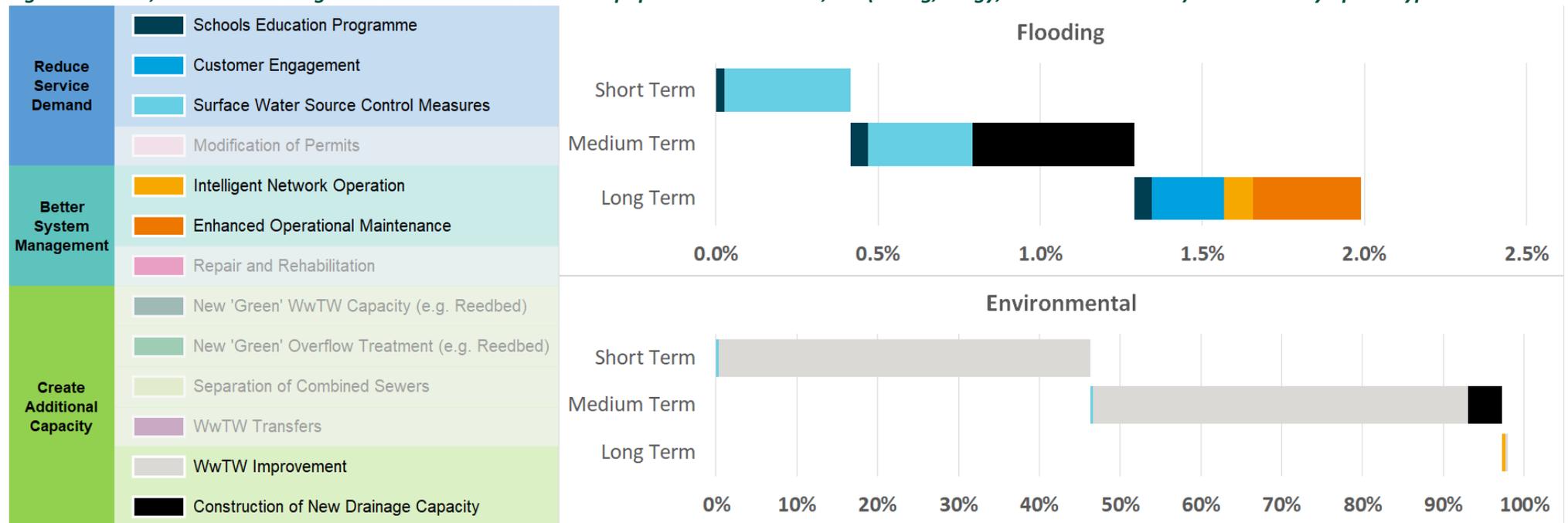
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Cockerham
- Forton
- Middleton
- Pilling

In the short and medium term, potential investment could be mainly surface water control measures (e.g. SuDS), in wastewater treatment works improvements, and the construction of new drainage capacity (Figure 33).

In the longer term, investment could continue in the installation of intelligent network operations, schools and customer engagement, and enhanced operational maintenance.

Figure 31 Short, medium and long-term investment in TPUs with population less than 2,000 (Pilling, Ridgy, Cocker and Conder) distributed by option type



5.3.12 TPUs with population less than 2,000: *Wenning* sub catchment

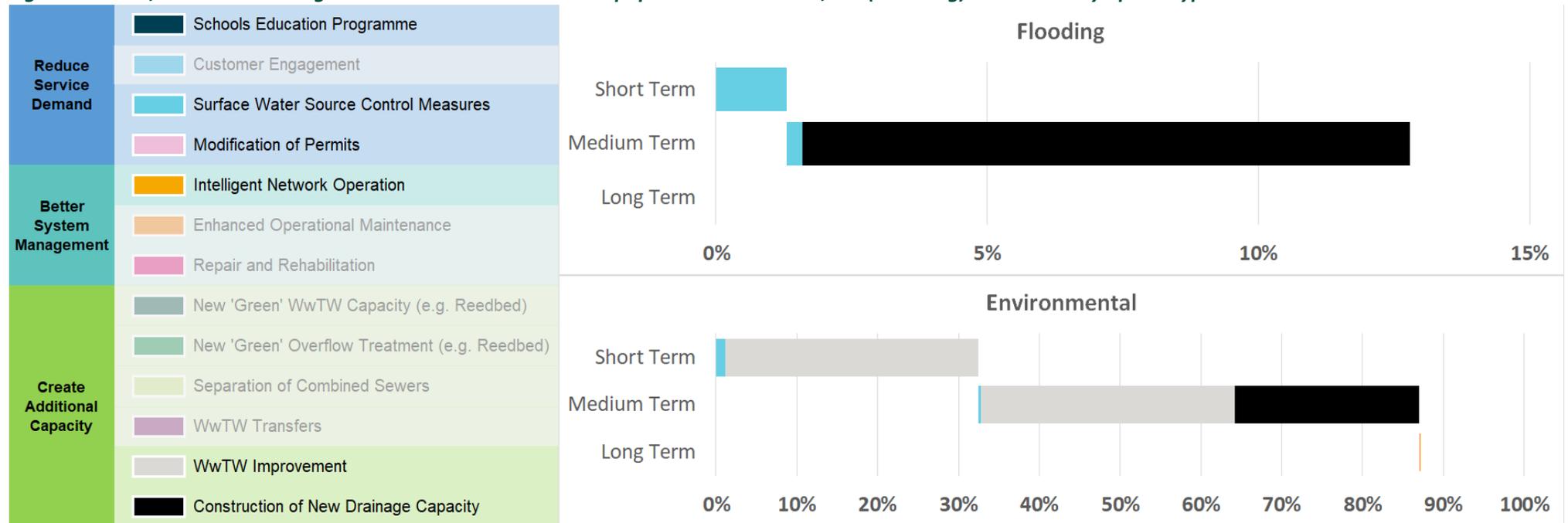
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Clapham
- Low Gill
- Hornby
- Wray
- Low Bentham

In the short and medium term, potential investment could be mainly through wastewater treatment works improvements and the construction of new drainage capacity, and also in surface water control measures (e.g. SuDS, Figure 34).

In the longer term, investment could continue in the installation of intelligent network operations.

Figure 32 Short, medium and long-term investment in TPUs with population less than 2,000 (*Wenning*) distributed by option type



6. Next steps

The DWMP is inherently not a static plan so we will continue to work with stakeholders to develop partnership options and strategies which will make a difference within the Lune SPA.

We are currently at draft publication (Figure 35) and between now and final publication in March 2023, we will reflect on updated guidance such as WINEP and storm overflows, and incorporate the feedback that we receive to ensure that the DWMP can build the best foundation to allow the North West to thrive in years to come.

Figure 33 Timeline between draft and final publication



We welcome your feedback on our draft publication of our first DWMP. Please get in touch using our mailbox:

DWMPConsultation@uuplc.co.uk

7. References

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- [6] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3363>
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- [11] <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>
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8. Appendix

Table A.1 List of TPUs which did not trigger for RBCS across environment, flooding or wastewater treatment works categories

Tactical Planning Unit	Environment	Flooding	Wastewater Treatment Works
Cold Cotes	Did not proceed through RBCS	Did not proceed through RBCS	Did not proceed through RBCS
Garsdale Head	Did not proceed through RBCS	Did not proceed through RBCS	Did not proceed through RBCS
Lea Yeat	Did not proceed through RBCS	Did not proceed through RBCS	Did not proceed through RBCS
Low Gill	Did not proceed through RBCS	Did not proceed through RBCS	Did not proceed through RBCS
Yew Tree Cottage (Melling)	Did not proceed through RBCS	Did not proceed through RBCS	Did not proceed through RBCS

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