Notice

Document History

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GLOSSARY OF TERMS

Term	*Meaning / Definition*
BBC	Blackpool Borough Council
CAPEX	Capital Expenditures
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
CSO	Combined Sewer Overflow
DEFRA	Department of Food Environment and Rural Affairs
EA	Environment Agency
EU	European Union
FBC	Fylde Borough Council
FWMA	Floods and Water Management Act
FPWMG	Fylde Peninsula Water Management Group
INTERREG	EU-funded programme
LCC	Lancashire County Council
LIFE	EU-funded programme
LLFA	Local Lead Flood Authority
OPEX	Operational Expenditures
SAB	SUDS Approval Body
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SUDS	SUstainable Drainage Systems
UU	United Utilities
WBC	Wyre Borough Council
WWTP	Wastewater Treatment Plant (aka sewage treatment works)

1 Introduction

1.1 Fylde coast beaches

Beaches on the Fylde coast have a long association with tourism and a history of being visited by the public. As well as the beaches, the area provides a resource for popular public amenity use including watersports and swimming. However, local population centres and large diffuse pollution sources put pressure on water quality, and have led to designated Bathing Water beaches in the area failing to meet the required European standards.

There are eight designated bathing waters on the Fylde Peninsula, four of which are at risk of failing the revised bathing water directive.

Poor performance in the past culminated in a judgement against the United Kingdom in 1993 for repeated failure to meet the requirements of the EU Bathing Water Quality Directive (Council Directive 76/160/EEC). A major programme of works was implemented by North West Water (now part of United Utilities who contribute to the Fylde Peninsula Water Management Group), resulting in over £600 million being invested to reduce the hydraulic and bacterial loads entering the coastal waters. The significant improvement in water quality that was achieved was consequently praised by the European Commissioner in 2001.

1.2 Surface water

Surface water runoff from urban areas has been regarded as a significant source of pollution for some time, potentially leading to bathing water issues. The bacterial load in the runoff is typically from surface water discharges from combined sewer overflows (CSOs). The surface water, or storm water runoff, mixes with sewage in the sewers from the local population.

The majority of sewers in the area covered by the Fylde Peninsula Water Management Group (FPWMG) are combined systems, predominantly in urban areas, resulting in large volumes of rainwater finding its way into the sewer network. The combined pressures of population growth, urban creep and more intense storm events are likely to increase the load on existing infrastructure, leading to more frequent CSO events as a result. There is a need to reduce the impact of these events in order to improve water quality standards in receiving waters and to minimise the risk of serious damage and inconvenience to the public.

A significant contribution to the improved bathing water quality was from the construction of twin 60,000m^3 storage tanks to intercept the combined sewer flows and reduce immediate discharge. The sewage is then passed for treatment at a wastewater treatment works (WwTW) before the treated effluent is discharged to the water courses that lead to the bathing water. This investment and construction led to the three Bathing Waters at Blackpool (North, Central and South) passing the Bathing Water Standards the first season after construction, and all beaches along the Fylde coast passing the following year.

In addition to bacteria contributed through storm water discharges, there are two significant estuaries that flow into the Fylde coast – the Ribble to the South, and the Wyre to the North. Both these rivers carry bacteria from a variety of catchment sources, where they can present a significant pressure on bathing water quality. This is particularly the case following rainfall events, when bacterial deposits on the surface of urban hard standing and agricultural areas can be mobilised and transported to the Bathing Water.

1.3 Fylde Peninsula Water Management Group

Despite the improvement resulting from investment, deterioration of bathing water quality continues to be an issue, especially in the view of the revised Bathing Water Directive, which has more stringent standards. The concerted effort required to improve the quality of Bathing Waters along the Fylde coast continues today. The FPWMG (comprising the Environment Agency, United Utilities, Blackpool Council, Wyre and Fylde Borough Councils, Lancashire County Council and Keep Britain Tidy) was created to provide a sustainable and integrated approach to managing coastal protection, water quality and surface water drainage.

At the same time United Utilities (UU) is currently undertaking a Flow Separation Project, aimed at developing an additional surface water network, which is expected to take pressure off the existing combined sewers, by diverting some flows into the new sewers. However, a number of CSOs will remain and so a strategy is required for the Fylde Peninsula to manage flood and pollution risks, whilst enabling future developments in the area. The actual measure of Bathing Water compliance is percentile standards of bacteria counts from a number of samples per season. However, UU took a design standard for discharges to these bathing waters, which is to have no more than three spills per bathing season over a rolling average. There is not normally a limit on the volume of discharge in this design standard although it is used as a comparator when considering the impact of intervention options.

1.4 Sustainable drainage systems (SUDS)

Potential methods for dealing with surface water at source (either at new developments or by retrofitting) include sustainable drainage systems (SUDS). These systems utilise natural features like porous pavements, filter trenches, grassed ditches, bioretention areas and ponds to enable either complete infiltration of surface water into the ground or to significantly reduce peak flows entering sewer systems by attenuating flows before final discharge.

SUDS have usually been used in the past to mitigate flood risk and deal with capacity problems of surface water drainage systems. In recent years there is a growing evidence to support the use of SUDS for pollution mitigation, especially in Scotland, which is leading the way within the UK in utilising SUDS for pollution control. This is achieved through either:

- Redirection of surface water from large impervious areas to open spaces to reduce peak flows and the volume of surface water coinciding with foul water flows in combined sewer systems (and a subsequent reduction of CSO spillages); or
- Capturing surface water at CSO for attenuation and treatment.

It was agreed at the onset of the project that the second option is not feasible due to the lack of space around the CSOs, so only the first option was put forward for evaluation. There are several small surface water discharges along the Fylde Peninsula; however, with water quality considerations it is the CSOs that would typically have the biggest influence. Following the works already completed by UU, three of the 11 CSOs in Blackpool are still deemed to have unsatisfactory intermittent discharges. These CSOs are from the pumping stations at Chatsworth Avenue, Anchorsholme and Manchester Square. It appears that the latter two outfalls from the CSOs are the main contributors of the flows. The locations of these two outfalls are presented in Figure 1-1.

Major barriers for the greater uptake of SUDS typically arise from uncertainties around their adoption and long term maintenance. The new Floods and Water Management Act (2010) and National Standards for SUDS (due to be issued later in 2012) have been developed to remove these barriers and clarify responsibilities and standards for SUDS design and adoption. These legislative changes have opened the way for a much greater uptake of SUDS and some new initiatives have emerged to trial SUDS on a larger scale (London SUDS retrofit projects, Bourne partnership, etc.).

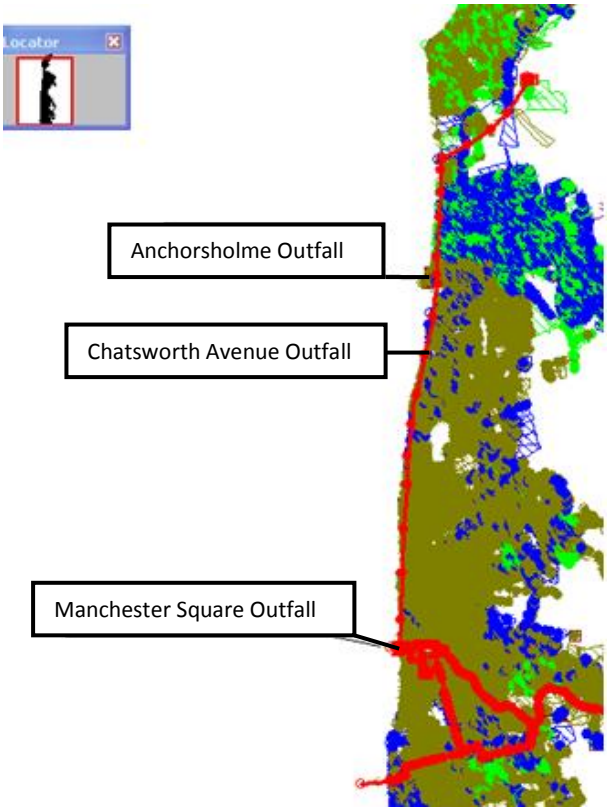

Figure 1-1 Locations of two major outfalls

The effectiveness of SUDS to deal with both flood and pollution risk mitigation has been recognised at a national level. The Schedule 3 of the Flood and Water Management Act, which is coming into the effect in 2013, legislates that all new developments would require SUDS to be considered as a first option for surface water drainage of the site. However, that would not be sufficient as in order to deal with current CSO spillages, the opportunities to retrofit SUDS on existing sites and SUDS implementation on redevelopment sites before 2013 need to be investigated.

1.5 SUDS study brief and outline

The FPWMG commissioned this project to consider how the retrofitting of SUDS could be implemented on the Peninsula to reduce the impacts of urban drainage flooding and CSO spillages across the Fylde coast. In order to achieve this, the project objectives are to:

- identify locations at which SUDS could be employed and shortlist them based on their greatest likely impact in addressing CSO spillages;
- link with the UU Flow Separation Project to find synergies;
- collaborate with FPWMG and Council's planners to select the most appropriate sites for SUDS implementation and proceed with SUDS design at these sites looking towards developing and promoting exemplar sites;
- propose a monitoring programme for designed sites to assess SUDS performance in order to provide an evidence base to inform future strategies for the Peninsula;
- propose an approach for future proofing new development, including investigating the need to draft Supplementary Planning Documents (SPD), to make sure that the recommendations of the project are embedded into planning; and

- provide support and training to Council planners to implement recommendations from the project.

The project has been organised into three distinct tasks:

- Task 1 - Investigate the potential for SUDS retrofitting across the Fylde Peninsula and shortlist sites for selection by the FPWMG;
- Task 2 (not taken forward) - Design SUDS for installation at selected sites; including a monitoring plan to assess potential flow reductions;
- Task 3 - Develop an approach for strengthening the adoption of sustainable drainage across the three local authorities and a strategy for future proofing.

2 Task 1: Potential for SUDS Retrofitting

2.1 Background

A key objective of the Fylde Peninsula SUDS study is to identify how the use of SUDS could mitigate the impact of hydraulic discharges on receiving water quality. To help meet this objective a Geographical Information System (GIS) has been developed.

The methodology was based on using available data (a list of which is presented in Appendix A) to screen all potential sites in the study area for their suitability for SUDS. A manual check was performed to validate the outputs of the screening process.

The screening process was applied to the study area of the Fylde Peninsula and a 5km buffer around this. A logical approach is adopted to ensure that all sites are ranked consistently and hence avoid any preconceived solutions. Once ranked, the sites were examined in more detail as to the site specific issues and constraints to try and identify exemplar sites for the trial implementation of retro-fitted SUDS. The SUDS would reduce the peak flows and volume of water entering the combined sewer system, and with less surface water entering the combined sewer system, the frequency of polluting spills from CSO outfalls should reduce, leading to an improvement in receiving water quality.

UU had indicated that surface water removal studies in the area were being completed. At the time of preparing the approach, these data sets were not available for review, but might be available by the time of issuing the Final Report.

2.2 Available data

Datasets were made available by the members of the FPWMG, including Blackpool, Fylde and Wyre Borough Councils, the Environment Agency and UU. Key datasets included MasterMap coverage of the study area, the location of Main Rivers, Flood Zone outlines and land ownership data. A full list of data and the sources provided can be found in Appendix A.

2.3 Screening criteria

2.3.1 Contributing area

Criteria: Impermeable areas create greater runoff than permeable ones.
The size of any site is a primary consideration as larger sites offer greater opportunity for reducing flows. Buildings and paved surfaces were identified from MasterMap data, and ranked according to their size with larger areas scoring higher than smaller areas. Figure 2-1 gives an example of the output.

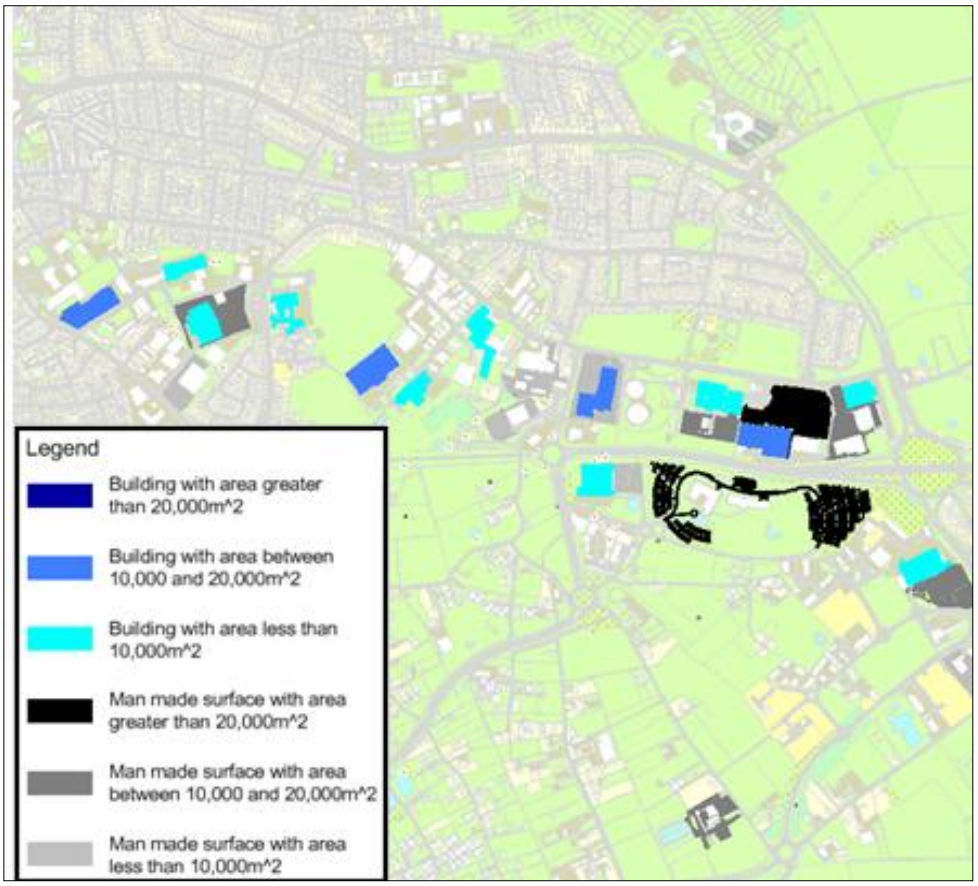

Figure 2-1 Contributing areas (example)

Major roads and network of streets are cumulatively major contributors to the total paved area across the Peninsula. However, it was decided that it would be impractical to implement SUDS on (and around) these pavements to get the same level of flow reduction possible from large buildings/car park areas. For that reason roads and streets were not taken into account in isolation, unless they provide access roads to the car parks/buildings. For a similar reasons, buildings and man-made areas with a total area less than 5,000m2 were not considered in the screening process. This should not preclude local initiatives on smaller areas as any reduction overall will be beneficial.

2.3.2 Screening factors

The Environment Agency provided a number of datasets which were used to shortlist sites that may be suitable as exemplar SUDS application sites. A georeferenced schematic of the sewer model received from UU was also extracted and considered during the screening process. The criteria that were used and the classification factors that were applied are listed in the following sections, whilst the values used are listed in Table 2-1.

Table 2-1 Screening criteria and scores applied

Category	Scoring Criteria											
	Area						Distance					
	250-500m^2	500-1000m^2	>1000m^2	5-10,000m^2	10-20,000m^2	>20, 000m^2	< 5m	5-10m	10-20m	20-50m	50-100m	In floodplain
Building area				10	20	40						
Man-made surface area				10	20	40						
Open spaces	5	10	20									
Distance from combined sewer network							40	20	10	5	0	
Distance from Main River							10	5	3	1	0	
Distance to small (250-500m^2) open area							5	3	1	0	0	
Distance to medium (500-1000m^2) open area							10	5	3	1	0	
Distance to large (>1000m^2) open area							20	10	5	3	1	
In floodplain												-999

2.3.3 Proximity to combined sewer network

Criteria: Surface water disposal and reduction

The location of combined sewer pipes was extracted from the combined sewer network details. Buildings and paved areas were awarded a higher score where close to a combined sewer pipe, as this would highlight that they are likely to connect to this system. The preference was to identify sites with combined sewers rather than those with sewers that already separate the storm and foul sewage as these would give the greatest benefit in reducing the flows to CSOs.

2.3.4 Proximity to open spaces

Criteria: Available land for SUDS

Open spaces were banded by size, and then buffers were created radiating out from these areas. Closeness to a large open area scored higher than closeness to a small open area, and the smaller the distance to the area, the higher the score. This reflects the potential for SUDS that these sites have, with larger sites able to handle larger SUDS than small open areas and therefore potentially being of more interest. In addition, an open space close to a building or man-made surface could be easier and cheaper to connect to than one further away. This was therefore also considered in the scores applied.

2.3.5 Proximity to a Main River

Criteria: Disposal route (major)

Buffers were applied to main rivers, with higher scores being awarded for closeness to the watercourse. This is because SUDS could discharge to a watercourse and it is likely to be cheaper and more efficient to discharge to a nearby watercourse than one further away. The assumption was that there would be adequate capacity in the main rivers to accept the additional flows. Scores for proximity to a main river are the same as for a medium sized open area as they are considered to have similar functionality. Figure 2-2 presents example of how the buffer zones around a main river can be represented together with the areas of river flooding taken from the Environment Agency maps.

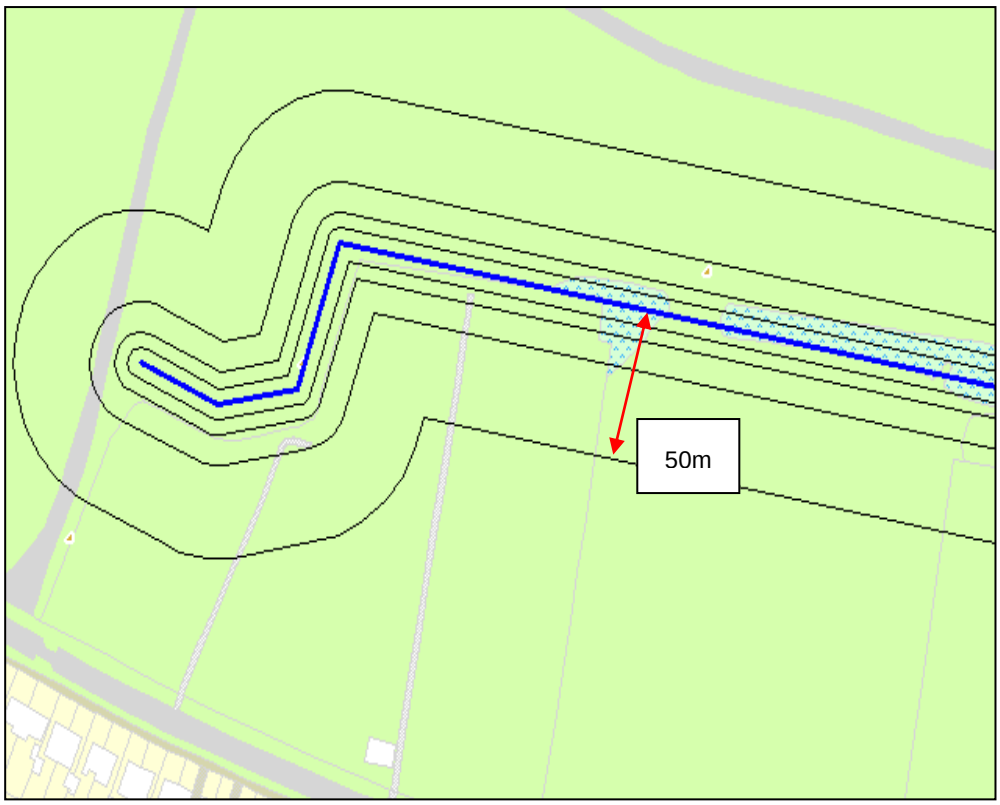

Figure 2-2 Proximity to Main River (example)

2.3.6 Location in a floodplain

Criteria: Suitability of sites

As well as scoring positive points for the categories above, buildings and man-made surfaces were also screened for their location in relation to the 100 year floodplain (Flood Zone 3). As SUDS are not permitted at ground level in the floodplain, any site which was located in the floodplain was assigned a large negative score which will significantly limit the likelihood of further consideration.

2.4 Factors not included at the screening stage

A number of further factors which could affect the suitability of sites were not included in the screening process. These included underlying geology and groundwater flooding risk. This is because the datasets available did not have a suitable resolution to provide useful differentiation for the purpose of screening. However, this information would provide valuable criteria in selecting final sites for SUDS design. Land ownership (whether the site was owned by a member of the FPWMG) was also not considered at the screening stage, but is considered at the later selection stage.

2.5 Ranking of sites

2.5.1 Initial output

The scores generated from the process above were summed and the combined totals for each site ranked according to the largest score (i.e. sites with the greatest potential) being ranked first.

2.5.2 Manual check

Once the rankings had been generated, the sites underwent a manual check. This was to identify any assets that should not have been identified (such as a site that scored highly but was found to be close to a railway line and so impractical to implement SUDS), locations where several assets were adjacent and should be considered together, and

locations that were outside the study area or in areas unlikely to impact CSO spills. An example of this is given in Figure 2-3 which shows a railway line in Preston. It also allowed for checking of any physical obstacles to disconnection in the form of roads or railways. These factors were used to check the sensitivity of the output to give confidence to the screening approach.

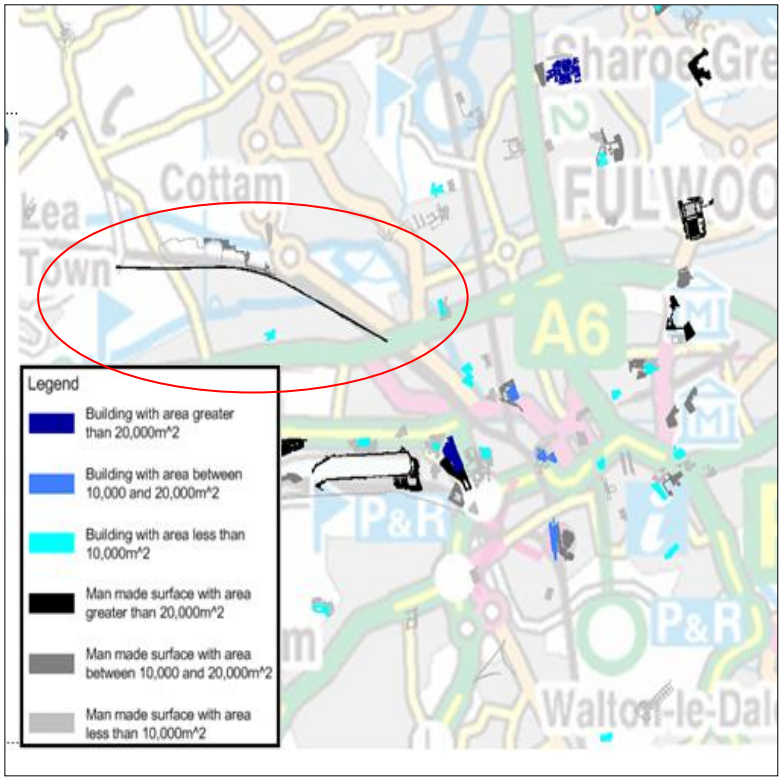

Figure 2-3 Manual check of sites (example)

2.6 Selection criteria

To aid selection of the site for which a SUDS system will be designed, some additional information was considered that was not included in the higher level screening. Surface water flooding maps (30 year return period) were displayed alongside the locations detailed in the DG5 flooding register and the locations of non-Main Rivers, which may be suitable for receiving discharges from SUDS systems. It was felt that these datasets added additional information which may be useful when considering which site is to be picked from those shortlisted; however, the inclusion of these additional parameters in the screening process could confuse the outcomes generated by the GIS.

2.7 Top GIS scored sites

Based on the scores in Table 2-1, the top ten sites proposed by the screening process were as follows:

1. The car park east of Blackpool South Pier;
2. The Tesco supermarket at Sandham's Green;
3. Mowbray Drive Industrial Estate;
4. Blackpool Airport;
5. South Pier area;
6. The man made space adjacent Blackpool central pier;

7. The building South of Central pier at the football club;
8. Norbreck Castle Hotel car park, Queens Promenade;
9. Norbreck Castle Hotel, Queens Promenade; and
10. The man made space adjacent to Blackpool central pier.

A map has been produced for each of the shortlisted sites that shows the site in relation to others in the vicinity and the selection criteria listed in Section 2.6. An example of one of these maps, for the car parks in the centre of Blackpool, is shown below in Figure 2-4. A comprehensive list of all shortlisted sites can be found in Appendix B. Appendix C contains individual maps of all the sites on Figure 2-4.

The Councils also provided a list of existing SUDS sites, so that the potential of extending the existing SUDS systems could be explored:

- **Wyre:**
  - A SUDS system that is constructed at the Swan Drive, which utilises a balancing pond with a hydrobrake flow control. The SUDS system has been in place for 15 years.
  - Rainwater harvesting proposals on a number of Council's buildings across the Peninsula.
  - Marine Hall Gardens has recently constructed a soakaway which has proved effective. It is a rare situation as the opportunities for infiltration in Wyre are limited due to soil conditions.
- **Fylde:**
  - It was indicated that there is an area of permeable pavement around industrial units around the Peel Industrial area.
- **Blackpool:**
  - A SUDS scheme around Moor Park is an exemplar site. The SUDS scheme is almost totally above-ground solution. Car parks and swale system were designed together, to form a series of arcs, centred on the building. Very little underground drainage is used, with kerbs omitted and rainwater pipes discharging directly into a series of swales.
  - Area along the 'Central corridor' which is outside the football ground and has permeable paving with a system to irrigate trees.
  - A similar system to that one is constructed around the St John's Square.
  - The Solaris Centre has a rainwater harvesting system and recycled water is used for toilet flushing.

Figure 2-4 Example map showing shortlisted sites

2.8 Top redevelopment sites

In addition to the proposed retrofitting sites, redevelopment sites which were proposed for 2012-2013 have been reviewed to assess the opportunity to implement SUDS on these sites. Planners in all three Councils were consulted to enquire about these potential sites and the Councils have advised that generally there is an embargo on future new developments due to the lack of capacity in sewers in the area. However, the Councils did identify some sites which are currently being considered for redevelopment. There are four that have been identified as suitable for consideration, as follows:

- Fylde Borough Council town hall – a significant proportion of the site is roofing and tarmac car park. The site is currently undergoing renovation and the car park area has a potential to drain to green space and vegetated sand dune. The Council is currently spending £3,200 annually to discharge surface water to public sewer.
- Tesco car park in Blackpool - (adjacent B&Q is on a separate system of drainage with surface water going to balancing pond before discharge to a local watercourse). The whole site is either roofing or tarmac car park.
- Pontins Blackpool Holiday Centre, Clifton Drive North (which provides a good opportunity to install SUDS on number of small untis); and
- Blackpool airport (already identified as a good potential site for SUDS in the screening process) is currently developing a Masterplan and would provide a good opportunity to implement SUDS.

A complete list of other redevelopment sites has been presented in Appendix D.

2.9 List of shortlisted sites for final selection

The FPWMG was presented with the list of the top GIS scored sites (Section 2.7) and list of most likely redevelopment sites (Section 2.8) for their final consideration and selection. In order to assist selection, a list of criteria was added for each site that included site ownership, types of SUDS suitable for the site, with indicative capital (CAPEX) and operational costs (OPEX) as presented in Appendices B and C

2.10 SUDS types and costing

Based on the project objectives, the selection of types of SUDS should be prioritised on their ability to contribute to bathing water quality improvements. There are two elements with this:

- a reduction in peak flow; as well as
- a reduction in the total flow (volume) to sewer.

A peak flow reduction, not only reduces potential flash flooding on the development site itself, but also reduces peak flows in combined sewer systems downstream; this in turn contributes towards reducing the number and severity of CSO operation and spillages.

However, in order to reduce load on the treatment work system and free capacity in the system for future developments, reduction in peak and volume of flow is equally relevant. Consequently infiltration capacity of the underlying soil where SUDS would be installed should also be a key consideration. Furthermore, the reduction in flow volumes will contribute to the reduction in charges of disposal of surface water to the public sewer system and consequently could reduce the water bills for the consumer installing SUDS.

The following section discusses the types of SUDS which could be installed on sites considered within this project.

2.10.1 Suitable SUDS features for proposed sites

Based on the land use assessment of the areas around the sites and endeavouring to maximise retrofit potential, the most likely SUDS features on shortlisted sites will include permeable pavements, filter drains and bioretention, especially in the form of street planters. Green roofs are not actively encouraged on the Fylde Peninsula, but could be viable alternative for future redevelopments. Less likely SUDS for the area are in form of swales and ponds due to space constraints. Water butts and disconnection planters were suggested for implementation at larger residential areas. The following sections detail these proposals and their applicability across the Fylde Peninsula.

Permeable pavements and filter drains

Roads and streets are large surface areas that contribute to surface water flows in the catchment. Retrofitting SUDS on roads and streets could have a significant impact on water quality, not only in terms of reducing CSO spillages, but also by reducing urban diffuse pollution; especially suspended solids, heavy metals and hydrocarbons. However, it was concluded at the onset of this study that it will be difficult and disruptive to retrofit SUDS on existing roads and streets to such extent as to make a significant difference in flow reduction. Redevelopment opportunities should be used to slowly introduce more SUDS schemes for roads and streets. This should also form part of a strategy for future proofing.

The next large area of opportunities lies in retrofitting SUDS at car parks, as there are large car parks located across the catchment, especially adjacent to supermarkets, retail and commercial parks, large government buildings, schools and hospitals. Especially suitable are car parks which are situated on sand dunes, where complete disconnection of flows from the public sewers and their diversion to the underlying sand would save money (in surface water charges) for the property owners. The most suitable types of SUDS for these areas are porous pavements for car parks or, if these pavements are not suitable due to the high load requirements, a combination of filter drains and recharge beds with attenuation and infiltration capacity below tarmac areas (e.g. Figure 2-5).

Figure 2-5 Examples of porous pavements and filter drains

For large roof areas, the potential for rainwater harvesting in combination with disconnection of roof runoff and redirection for attenuation and infiltration within the reservoir (recharge beds) located below the adjacent porous/tarmac pavements or in adjacent grassed depressions (swales) and filter drains should be considered.

Bioretention/Street planters

In addition to the permeable pavements, the use of bioretention areas and street planters is suitable, especially in more densely populated urban areas. A number of different types of these systems exist, including prefabricated elements. Some of these elements are designed to utilise infiltration to the underlying soil and the transpiration of the plants, but if the soil is not suitable for infiltration, they could still provide attenuation of the flows and therefore reduce the peak flows reaching the sewers and eventually the CSOs downstream.

Although these systems involve disruption of roads during construction, street planters will be ideal SUDS features in Blackpool, provided suitable planting is selected (e.g. Figure 2-6). Street trees in Blackpool centre are completely absent due to historic urban development behind the sea front. There is evidence also that trees don't grow well in the salty conditions. However, Tamarist trees survive in St Anne's, as an example of salt-friendly tree species. Central Corridor in Blackpool also demonstrates those species that grow and those that don't and these examples should be used if street planters are to be implemented on a wider scale in Blackpool. It would not only add to the flow reduction and contribute to improving water quality, but would also add to the regeneration of the town centre. More about that proposal will be presented in Chapter 4 which details a strategy for future proofing.

Figure 2-6 Examples of bioretention street planters

Green roofs

Following the meeting with Councils' planners, it appears that the Councils are not actively promoting the use of green roofs (e.g. Figure 2-7), but are open to their use on suitable sites. Therefore the opportunity to explore their retrofit potential on selected sites will be taken to maximise potential for flow and volume reduction, depending on the structural capability of the proposed buildings to sustain any additional load and maintenance arrangements.

In addition, it has been agreed that potential Supplementary Planning Guidance, which could be developed in future to support SUDS use on the Peninsula (and which will be explained later in Chapter 4), should explore the opportunity to include them as a regular feature for future developments or redevelopments. Green roofs could be of particular interest in areas which are prone to occasional flooding, as SUDS which are installed on the ground in these areas will not be functional.

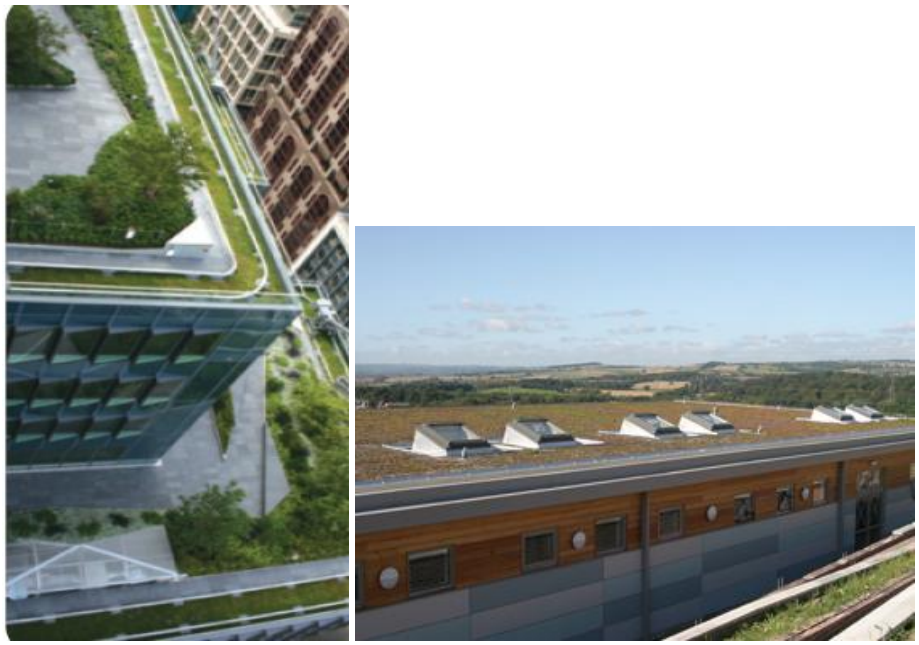

Figure 2-7 Examples of green roofs

Swales and ponds

The last group of less likely applicable SUDS on shortlisted sites due to space constraints includes swales and ponds (Figure 2-8). Although swales are less costly SUDS option, a limited number of locations have adequate space for their use. If costs are driving the selection criteria, it is worth considering these sites for selection.

In addition to that, for redevelopments, and opportunity to utilise a combination of porous pavements, channels, swales and ponds could be explored to maximise potential of SUDS, provide green corridors through the development and enable multifunctional spaces. These areas could also be designed to provide overland flow routes for exceedance rainfall events, contributing towards a strategy for resilient cities and climate adaptation.

Figure 2-8 Examples of swales and ponds

Water butts and disconnection planters

Current Environment Agency policy states that water butts and other rainwater harvesting tanks (Figure 2-9) do not contribute to reduction in peak flows, based on the assumption that they might be full when peak rainfall arrives. However, no evidence exists to support this assessment. In that respect, a London SUDS retrofit project is currently trialling installation of water butts and disconnection planters in number of residential streets in Kensington and Chelsea to monitor their effect on flow reduction.

Fylde Council has recently received approved funding from the Environment Agency and UU for a project installing water butts in a large residential area in Fairhaven. This project could also present an opportunity for monitoring to support future evidence in their effectiveness in peak flow reduction and inform future proofing strategy. If proven effective, these systems could be installed on a wider scale, particularly on large residential estates operated and managed by the Councils.

Figure 2-9 Examples of water butts and disconnection planters

2.10.2 SUDS costs

Costs for a SUDS system can include: land purchase, planning, design costs (site investigation, risk contingency), installation, operation, and maintenance costs. Some assumptions with these aspects of SUDS costs are outlined as follows:

- **Land purchase:** It is assumed that the land purchase for SUDS systems will not be necessary, as the SUDS installation would be proposed either on Councils' owned lands, or on private land where SUDS retrofit has been agreed and installed in cooperation with the owners1.
- **Planning:** It is assumed that all of the schemes will require good collaboration with the residents in the local vicinity of the works. Good communication is required to ensure the uptake and acceptance of schemes. This is common to all types of SUDS and hence not a differentiator for selection.
- **Design costs:** It is assumed that the design, including site investigation and risk contingency will be similar for all types of SUDS. This is a very general assumption, but at this high level assessment it was prudent to introduce this assumption. It was therefore not used as a differentiator for selection.

Therefore, only broad comparisons of installation and operation and maintenance costs for SUDS have been provided as criteria for SUDS selection. Comments in relation to these are as follows.

Installation costs

Installation costs usually include:

- Earth works (excavation, re-profiling and erosion and sediment control);
- Materials;
- Labour and equipment;
- Planting and landscaping.

The cost of constructing a SUDS scheme is inherently variable and will depend heavily on the size of the contributing catchment area. Additional influencing factors on costs include:

- Soil type (higher excavation costs in rocky soils);
- Groundwater (sensitive groundwater area zones may require expensive liners);
- Design criteria and features;
- Access and space;
- Location (varying labour costs and rainfall characteristics will affect design);
- Runoff control requirements;
- Clashes and diversion of other services.

In general the total volume or area of a system is likely to be a strong predictor of cost; however economies of scale will affect construction costs. In addition, SUDS retrofit would incur additional costs of redirecting existing drainage elements into the newly proposed SUDS.

Sewers in the Fylde Peninsula are generally combined sewers and a lot of buildings were built before building regulations were in place. Installation of SUDS retrofit would require not only redirection of existing external drainage pipes into the SUDS, but also reconnection work within the building to separate surface and foul drainage. That could be in some cases costly and disruptive, depending on complexity of the existing system.

[1] *The involvement of private owners in planning of SUDS could bring benefits of potential additional funding for SUDS, if the owners recognise financial or environmental benefits of installing them in a long run. This is discussed in Chapter 4.*

In order to assist in selection process, a list of indicative construction costs per unit storage volume is presented in Table 2-2.

Table 2-3 Indicative SUDS installation costs

Type of SUDS	Unit description	Unit	Unit cost (£)	Relative level of costs
Permeable paving	Porous pavement with storage reservoir below (depth of reservoir adjusted to allow for m^3 storage to allow comparison with other types)	per m^2 /m^3	40+110 = 150	High
Filter drain	1m x 0.5m with 100mm perforated pipe, 30% voids	per m^3	140	High
Rainwater harvesting	Bespoke systems	per m^2	varies	High
Street planter	No 1 per 50m of road. 1.2m x 0.8m x 5m	per m^3	80	Medium
Green roof	Typical specification	per m^2	50	Medium
Pond	Retention or detention pond	per m^3	40	Medium
Swale	Typical 2m width (depth to allow for 1 m^3 storage for comparison with other types)	per m^2/m^3	20	Low

General comments in relation to the SUDS costs are:

- These costs are generally based on the CIRIA Guidance (The SUDS Manual, C697, 2007) which itself was based on the work undertaken by HR Wallingford in 2004 for the DTI on whole life costing of SUDS. The upper range of the estimates has been taken here as a conservative approach. Those costs are **only for SUDS installation** and do not take into account costs of redirection and adjustment of existing external and internal drainage to suit new drainage arrangements.
- It is assumed that all the ground levels within the development will allow gravity connection from the buildings and hard standings into pipes, swales, filter drains and street planters.
- It is assumed that there are no groundwater or geotechnical issues with the location of the swales, filter drains or street planters.
- It is assumed that there are no costs associated with clashes with utilities when locating swales, filter drains and street planters.
- Street planters are not contained within the SUDS Manual so the costs cost per unit estimate is based on previous Atkins work on SUDS design on regeneration plots in Llangefni and park-and-ride site in Taunton.
- No costs are taken into account for road gullies as we assume these will be covered by the Highway infrastructure cost estimates.
- No costs are taken into account for the redirection of flows towards SUDS features as it is assumed that it will be similar for all types of SUDS.

Operation and maintenance costs

SUDS require ongoing maintenance in order to ensure their operation and minimise risks to long term performance. Activities include:

- Inspection and monitoring;
- Maintenance (could include regular, irregular and remedial).

Costs will comprise:

- Labour and equipment;
- Materials;
- Planting (additional/ replacement);
- Disposal (sediments and vegetation).

By way of source documents, reference was made to the Cambridge SUDS Design and Adoption Guide (2009), which specifies activities required for regular, periodic and replacement maintenance and gives an indication of the level of costs per activity Table 2-4 summarises types and gives a high level assessment of costs. An assessment of costs for SUDS elements which do not feature in the Guide has been provided from Atkins experience.

Regular monthly maintenance is similar for all SUDS features and includes litter picking and general inspection. Swales will require regular grass cutting.

Table 2-4 Indicative SUDS maintenance frequency (costs)

Type of SUDS	**Activity**	**Periodic maintenance * (Frequency of costs)**
Permeable paving	Surface sweeping and reinstatement of potential misplaced blocks	(1 year) Low
Filter drain	Removal and replacement of top gravel and geotextile layer	(5 years) Medium
Rainwater harvesting	Cleaning and filter replacement	(1 year) Medium
Street planter	Reinstatement of vegetation and desilting	(1 year) Medium
Green roof	Reinstatement of vegetation and replacement of geotextile	(5 years) High
Pond *	Reinstatement of vegetation and desilting	(5 years) High
Swale	Reinstatement of vegetation, desilting and reprofiling (if required)	(1 year) Low

* In order to compare it with the installation costs, maintenance costs are also assessed based on a consideration of likely costs per unit area

2.11 Final selection of sites for design and monitoring

Based on discussions with UU, retrofitting SUDS on a few of the proposed sites would not make a significant difference in flow reduction to affect the operation and spillage volumes of CSOs, and subsequently significantly contribute to the improvement of bathing water quality. This is because the sites will not actually reduce the total volume discharged to the tunnel system. The view from the modelling and operational experience is that the most benefit is to be gained by removing contributing area completely. The problem is that very large areas are needed to have a positive impact on the actual spill frequency. UU are aware that each

removal of contributing area does help and is to be followed through; however it may not have an immediate discernible impact and hence is harder to justify on a cost benefit basis.

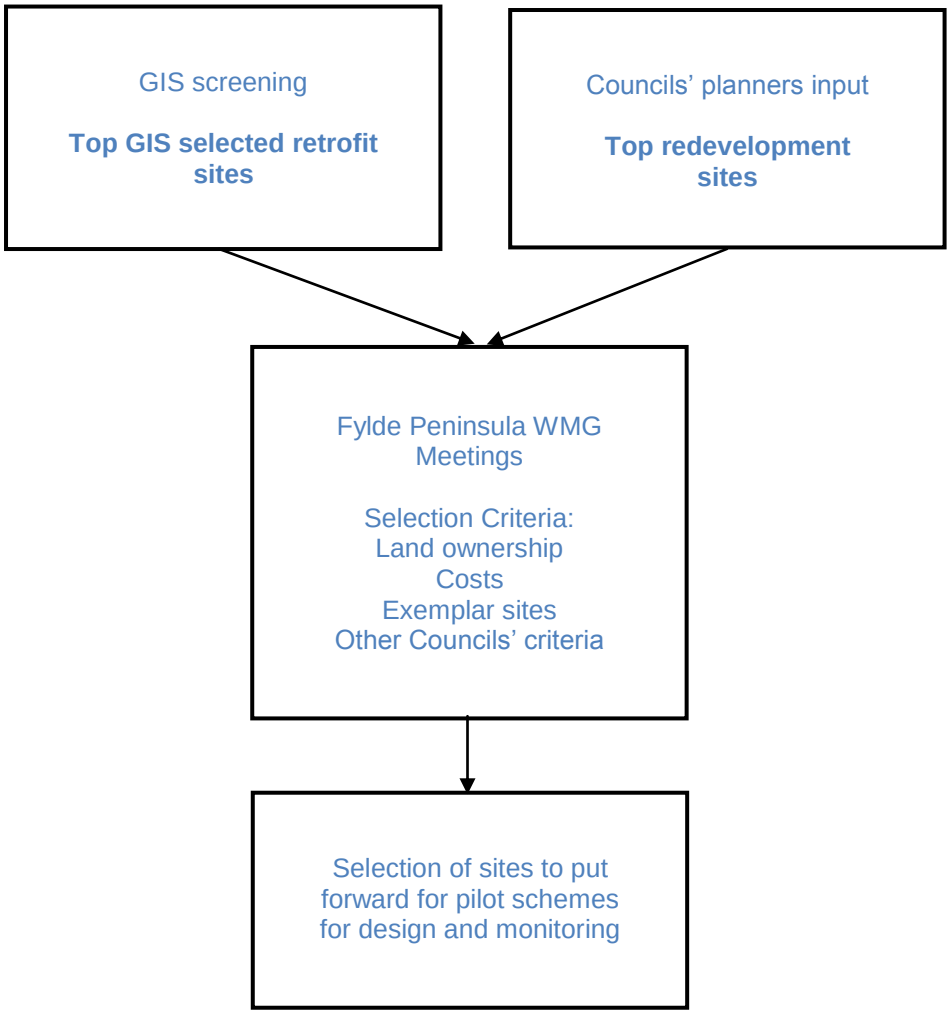

Figure 2-10 SUDS retrofit sites selection process

A final selection of potential SUDS retrofit sites has been made based on the feasibility of their implementation and typicality of their future implementation in the area. Once the arrangement of SUDS implementation has been tested through pilot schemes, a similar strategy could be rolled out across the whole area, which will in time contribute towards flow reduction and subsequent improvement in bathing water quality.

There are some sites that would warrant more investigation to confirm flow routes and arrangements. While UU has models of some aspects, such as the airport site, these can be generic inputs as they are not in the precise areas of interest. The airport has a number of large hard standing areas from runways and taxiways which may have pollution control measures (e.g. for winter operation). The precise discharge arrangements could warrant investigation to ensure that the default arrangement is not for flows to pass to combined sewer. The airport site is understood to lie on a catchment divide and hence part connects to the Blackpool network while some connects to Lytham St Anne's and hence passes to Preston.

The FPWMG applied their criteria to decide priorities for the selection of the site to be carried forward into Task 2 of the project as pilot sites and has selected two sites: one retrofit site from the shortlisted sites and one site from redevelopment opportunities:

- Tesco supermarket with adjacent car park at Sandham's Green (shortlisted retrofit site); and
- Council building and car park at Fylde (redevelopment site).

The first site contributes flows to the failing CSOs, whilst Council building at Fylde discharges towards St Anne's outfalls.

However, these sites have been selected to provide pilot sites to test speed of implementation based on difference in funding streams and stakeholders engagement.

Both sites would provide opportunity for monitoring of SUDS effectiveness to start building of a local evidence base for future SUDS schemes on Fylde.

3 Task 2: SUDS Design and Monitoring of Pilot Sites

The two proposed sites will provide pilot schemes for testing both the funding mechanism for SUDS implementation, and once implemented, test efficiency of proposed schemes in flow reduction. That will be achieved through monitoring. The development of detailed designs for both sites was not completed as part of this project.

3.1 SUDS retrofit at Tesco site at Sandham's Green

Typicality

This site has been selected as a typical site across the area; there are a number of large car parks dotted across the catchment, especially adjacent to supermarkets, retail and commercial parks, large government buildings, schools and hospitals, which could be used for SUDS retrofit. Successful implementation on one site would unlock the potential of similar applications across the catchment and their cumulative effect might have larger effect on flow reduction.

The site will provide a pilot for a retrofit SUDS scheme.

Figure 3-1 Selected Tesco site at Sandham's Green

Ownership

The site is privately owned. The selection of this site was lead by the fact that this could provide a pilot site to test the partnership of public-private sector.

Benefits to the owners

(1) Evaluation of extent in water bill reduction should be carried out to assess potential in saving for Tesco
(2) Corporate environmental credentials.

3.2 SUDS retrofit at Council building and car park in Fylde

Typicality

This is another example of a typical large building with adjacent car park. There are number of similar settings across the catchment. Successful implementation on one site could unlock the potential of similar applications across the catchment and their cumulative effect might have larger effect on flow reduction.

The site has been selected because the Council building and adjacent car park are currently undergoing major upgrade and this presents an opportunity to install SUDS on site.

Figure 3-2 Fylde Council building

Ownership

The site is owned by the Council.

Benefits to the owners

(1) Evaluation of extent in water bill reduction should be carried out to assess potential in saving for the Council.
(2) Corporate environmental credentials.

4 Task 3: Strategy for Future Proofing

4.1 Meetings and workshops

Meetings and a project workshop have been organised to gather information on feasibility of SUDS in the catchment and understand the issues at planning level preventing wider SUDS use. In addition to that, Zorica Todorovic and Claire Hammond from Atkins spent two days with Councils in order to better understand planning procedures in Blackpool Council (as a Unitary Council) and relationship of Fylde and Wyre Councils (as two District Councils) with Lancashire County Council and their preparations for new responsibilities arising from the Floods and Water Management Act (FWMA), which will provide a platform for a strategy for future proofing.

4.1.1 Meeting with United Utilities

A meeting was held at UU's offices on 4 May 2012 and attended by Rob Tidswell and Chris Hames of UU. The aim of the meeting was to understand what studies UU had already completed and what information could be made available.

UU outlined the overall system operation of the surface water and foul sewer system, with the main focus being on Blackpool. One of the key themes was that there are few natural surface water outlets and the urban area is largely combined sewers. With the storage tanks to reduce the amount of spills, there is a complex operational mechanism to ensure that the storage is utilised effectively between the tunnel systems. It was stated that the modelling completed was appropriate for the overall planning of the system but may have some local inaccuracy at the detailed "block" level.

UU stated that the main improvement to reducing spill frequency and volume was by separation to remove surface water flows from the combined system completely. Their perception was that while SUDS would be good to attenuate peak flows, and hence have some benefit on any flooding locations, the slow return to the combined system would have a negative impact on the long "tails" after the storm had passed. Given the response time and storage emptying requirement, there was a risk that there could be no overall benefit without a reduction in total volume.

Their surface separation works were discussed in outline, but with the proviso that the modelling had shown very large areas had to be disconnected to demonstrate any benefit on the spills. In correspondence after the meeting, UU said that removal of 35.9 ha of combined impermeable area could relate to the number of spills at Anchorsholme reducing from 8.5 to 8.3 per summer and from 3.9 to 3.6 at Chatsworth with no change at Manchester Square. The total summer spill volumes are approximately 11% lower with the three surface water solutions applied. As the main driver is a reduction in the number of spills, the sensitivity of the system can be seen.

Separation works would provide opportunities for other surface water flows to be connected and discharged. The concept of pumping low return period storms was discussed and this could be a benefit as some storm flows are already being pumped (sometimes more than once) and hence it could be beneficial.

There is a perception that the existing surface water channels are at capacity. Parts of the catchment are low-lying and hence there is insufficient head to discharge peak flows to the local watercourses without having an impact downstream. SUDS attenuation will benefit this but more detailed hydrological studies on these watercourses are needed. There can also be issues in relation to the operation and maintenance of these watercourses as ownership is not easily defined.

UU undertook to provide the model build and option reports associated with Blackpool as these would give the necessary background. These were provided on DVD by post after the meeting.

4.1.2 Meeting with Planners

A meeting was held on the 21st May 2012, attended by the following participants: Steve Ball, Julie Glaister and Matthew Park (Fylde), Jane Saleh and Gary Johnston (Blackpool), David Shepherd and Philippa Clark (Wyre). The conclusions of the meeting were summarised against the following two themes:

SUDS and current planning processes

- Wyre and Fylde are District Councils and liaise with Lancashire County Council (LCC) for flood risk management issues. In accordance with the FWMA (2010) LCC will be a lead Local Flood Authority (LLFA).
- Blackpool Council is a Unitary Council and will be a lead LLFA in their area.
- Councils usually consult UU and internal engineers during planning regarding drainage requirements. Wyre has drainage engineers, Fylde has limited capacity and UU has advised them they should not be responding on drainage as they don't have the necessary plans or models and UU is the statutory consultee. Fylde can only let the developer know if there are any flooding issues.
- UU would state the allowable discharge rate, but would not provide guidance on the type of drainage systems to include in the design – **This is a missing link in the system which appears to limit wider SUDS use.**
- The Councils had not been made aware of UU's sewer separation project.
- Blackpool's experience is that the Environment Agency favours SUDS but then UU are not yet willing to adopt the SUDS and the local authorities cannot currently afford to.
- Wyre were not very familiar with the FWMA, but assumed that LCC were dealing with it.
- Rick Hayton from Lancashire CC is informing the FPWMG; however there is no dissemination of information to planners.
- Blackpool felt they could use SUDS to introduce green infrastructure, which they are currently struggling to do at the moment. Funding and integration of different strategies are key issues.
- Street trees are absent due to historic urban development behind the sea front. Trees don't grow well in the salty conditions. Tamarist trees survive in St Anne's, as an example of salt-friendly tree species. Central Corridor in Blackpool demonstrates those species that grow and those that don't. Councils do not specify plant species to developers. Supplementary Guidance will be useful to address this and provide a unified strategy for all 3 Councils.
- Public open space requirements could be multi-functional and also be used for SUDS but this is not underpinned by current policy or legislation. That is a major issue and requires further work.
- Highways are the largest impermeable area and are LCC's responsibility in Wyre and Fylde areas. There is a need to address SUDS as part of the long term upgrade plan of roads. The same should be developed for Blackpool area.
- LCC has developed the Lancashire Green Infrastructure Strategy (and tool kit) and need for SUDS incorporation is required.
- SUDS guidance would be best as Supplementary Planning Guidance, but additional work to address links with other strategies.
- Potential funding for SUDS could come from the Community Infrastructure Levy (CIL), but again needs a joint strategy.
- In Blackburn, only executive houses on Greenfield sites were found to be viable for CIL funding.

- CIL may be channelled in other directions such as the sea walls in Fylde, which are falling down, but claimed that the Environment Agency is not paying for them to be maintained.
- The biggest problem is felt to be a lack of sewer capacity, but there is reluctance for UU to address this through planning. It appears that the UU has stated that there should be no developments of greater than 20 dwellings until 2016, but have recently approved an 83 unit dwelling, which puts additional pressure on the drainage systems.

Future needs for Councils under FWMA implementation

- Wyre and Fylde have not been engaged by LCC regarding any future change to planning processes (e.g. to facilitate SAB inclusion in the process).
- As part of a revised planning process, Fylde and Wyre would consult Lancashire CC who would specify the requirements for SUDS as conditions.
- Fylde and Wyre felt that Lancashire CC should produce Supplementary Planning Guidance.
- Soil type and vegetation found along the Fylde and Wyre coast would be atypical of much of Lancashire and may need to be mentioned specifically – section specific to coastal environments may be advantageous.
- Councils' planners felt that information sheets and example SUDS in highly urbanised areas to give to developers would be useful.

4.1.3 Meeting at Lancashire County Council

During a two day visit to Councils, Atkins has met with the LCC (Graham Todd, seconded from the Environment Agency to LCC to assist in developing flood risk management strategy) to get better understanding on future plans and the findings are summarised in the following:

- UU has four SUDS retrofit schemes in the North West but none of these is in the Fylde Peninsula catchment.
- LCC are currently restructuring. There are still waiting for some positions to be established/filled.
- With respect to the FWMA implementation, they have been currently focussing on the watercourse consenting and asset register, both are significant (and most immediate) tasks for LCC.
- With regards to the SUDS Approval Bodies (SABs), LCC would be SAB for Fylde and Wyre Borough Councils.
- A local partnership has been established that meet regularly on several levels (Figure 4-1):
  - Regional Flood and Coastal Committee - Funding, schemes, set direction;
  - Local Authority Councillors and some technical officers, UU, EA - Plans, strategies (meet 3 times a year);
  - Technical group - District Authorities, Local Authorities. Drainage and Highways officers from Fylde and Wyre attend these;
  - Making space for water group - facilitated by Districts - local problem areas.

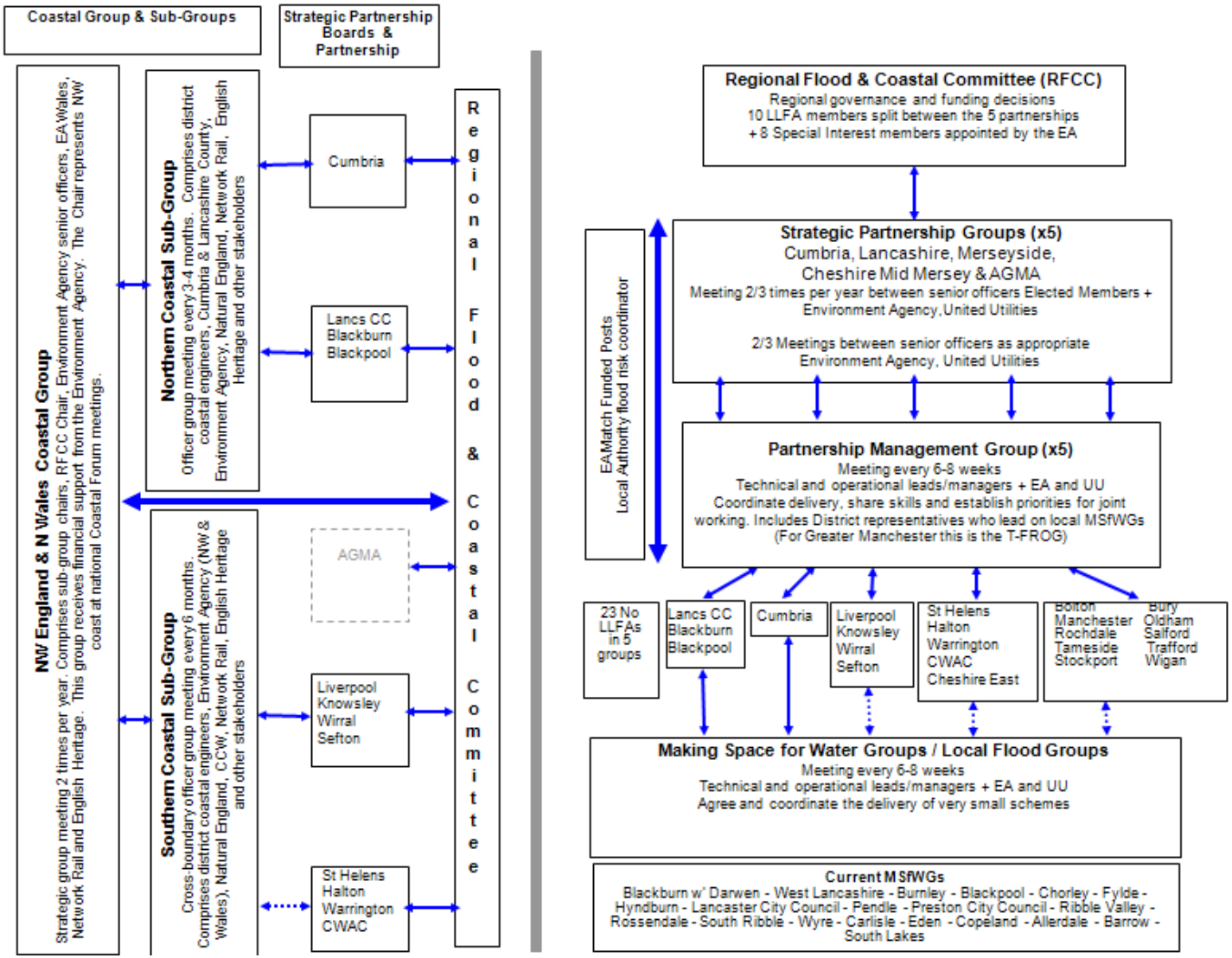

Figure 4-1 North West Regional Flood Risk Management Partnership - Links with Coastal Groups

- LCC acknowledged that Fylde and Wyre planners had maybe not been sufficiently engaged and kept abreast of the FMWA implementation strategy and that this needed to happen - **more cross-functional dialogue across Councils is needed.** Planners need the heads-up that planning process will need to accommodate for additional requirements for SUDS approval either in parallel or as part of the planning process. . The FWMA states that no planning application will be granted until SUDS has been approved by a SUDS Approval Body.
- LCC deals with planning for minerals and waste. Everything else should be done by District planners. Across Lancashire there are over 20,000 applications per year (for general comparison the national mean as assessed by DEFRA is 8,000) which puts a lot of pressure on resources.
- LCC is waiting for guidance before strategising exactly who will roll out the FWMA strategy, and how. The key question is how SUDS will be funded and answering this will require decisions at a national level.
- A hierarchy is in place to implement the requirements (but the planners need to be brought into the loop).
- SAB should streamline drainage consultation – this is currently done by their engineer, local drainage engineer, UU and EA.
- There is a need to establish a hub of the 3 coastal Councils - Blackpool, Fylde and Wyre and FPWMG provides a starting point for this. There is a need to raise awareness of SUDS and SABs across drainage engineers and technical officers (who are aware) and planners (who are not). LCC has concluded that it is better to do so when the guidance is out and the definite timeline is known (and actions are taken more seriously). Everything will be a lot clearer post-announcement, but some preliminary work on putting in place cross-sectional communication is required.

4.2 Strategy for future proofing

4.2.1 Major SUDS retrofit opportunities across Fylde

Based on the new FWMA, all new development would require SUDS to deal with surface water runoff. As it is anticipated that the full scale implementation on the Act would start late 2013, which will take care of all new developments, the following has been suggested for developments put forward for construction before the Act takes place and for the need to retrofit SUDS on existing sites to reduce flows to the public sewers.

The GIS screening process provided a platform to analyse types of developments and open spaces across Fylde and draw general conclusions about potentials for SUDS retrofitting.

These opportunities are grouped based on the ownership of the site and their land use, so that the joint funding stream could be investigated, which would be rolled out for the sites from the same group:

- **Roads and streets** are major contributing areas to surface water runoff across the Peninsula which, together with large car parks, provide major source of urban diffuse pollution. Therefore retrofitting SUDS for these areas would significantly contribute to reduction of diffuse pollution. The screening process of this study did not take into account roads and streets as it would require major funds and traffic management operations; however wide scale SUDS retrofit on these surfaces could provide significant peak flow and/or volume reduction,. In order to achieve that, clear guidance is required to capture the opportunities for implementing SUDS with any new roads and existing roads when any reconstruction work is taking place. This will require liaison of the FPWMG with highways departments (in Blackpool with their highways department and in Fylde and Wyre with Lancashire CC highways department). Historically, highways departments were reluctant to implement SUDS, therefore joint cross-departmental effort is required to

put together local policies and planning documents on types of SUDS solution which have consensus and have the highways departments' agreement and health and safety clearance. For example, promoting construction of narrowing street planters along the roads (Figure 2-8) instead of other traffic calming measures (e.g. 'sleeping policeman') which would have multiple benefits.

In addition to that, other major opportunities captured within the screening process are:

- **Retail and supermarket sites, as they have adjacent large car park and access road areas.** Special opportunities are provided by sites located on sand dunes, where the potential for surface water infiltration could be maximised to reduce not only the peak flows but also the volumes of surface water reaching the public sewers. As there are a number of retail parks dotted across the Fylde Peninsula, local policies and supplementary planning documents should be in place to capture these opportunities for any new and redevelopments. In addition to that, high level evaluation of cost benefits to the owners implementing SUDS in the area is underway as part of this study (Section 3.2), which would provide a platform to approach retail park owners in the future to encourage SUDS retrofit on their sites.
- **Large regeneration schemes.** Planning requirements for large regeneration schemes should include assessment of SUDS implementation at early stages of planning, so that SUDS can be fully incorporated into the layout and not just required at a later stage when the possibilities for implementation are limited. Community Infrastructure Levy (CIL) schemes should be evaluated to establish ways to fund SUDS on these sites.
- **Large public, hospital and commercial buildings and adjacent large car park and access road areas.** A detailed list of these sites has been provided in Appendices B and C and any redevelopments on these sites should be communicated to evaluate opportunity to implement SUDS. In addition to that, high level evaluation of costs benefits of SUDS implementation to the current owners of these sites should be undertaken to encourage SUDS retrofit on those sites where it has been proven to be beneficial. The potential for rainwater harvesting and an associated reduction of water bills should be explored to establish potential benefits.
- **Schools**. Schools provide large roof and surrounding hard standing areas. There is an opportunity to introduce through teaching the benefits of having SUDS components on-site. According to CIRIA Guidance on Surface Water Management in Schools (2006), *this may help to emphasise aspects of the water cycle, and act as a teaching tool, in addition to providing an area of amenity and wildlife habitat. It may also reduce travel cost that would otherwise be incurred in visiting wildlife habitats and could providing a practical, visual aspect of the concept of environmental sustainability, which in turn promotes key concepts such as pupil consideration of: citizenship and stewardship, the needs and rights of future generations, diversity, and quality of life*'. Joint funding which could include educational funds could be explored in order to provide for SUDS retrofit.
- **Large council estates.** Retrofitting on large residential areas has its serious challenges due to the individual ownership of the houses. SUDS retrofit on councils' owned estates could be easier providing that the funds are available. Although a whole palette of SUDS types could be installed on these sites, depending on street layouts, water butts and disconnection planters prove to be most popular measures. A number of similar initiatives exist internationally (e.g. Toronto and Melbourne) and nationally (e.g. London and Hull). More importantly, Fylde Council has recently received approved funding from the Environment Agency and UU for a project installing water butts in a large residential area in Fairhaven. Following the London example, they are also considering the implementation of disconnection planters (Figure 2-9).
- **Blackpool Airport** has the largest single ownership hard standing area in the catchment with large green land adjacent to it. It is understood that the airport owners are finalising their Masterplan and it is a good opportunity to try to influence the implementation of SUDS on this site. The potential for rainwater harvesting and reduction of water bills due to surface water redirection to ground or in open spaces could be explored to evaluate cost benefits to the owners of providing SUDS scheme.

4.2.2 Developing regeneration strategies (vision for future)

In order to implement more SUDS and make a real difference in to the severity and number of CSO spillages, the SUDS strategy should be fully integrated in all planning documents. Based on this GIS screening study, the sites with greatest potential for SUDS retrofit are largely located in the Blackpool area. However, it appears that all Councils have limited development potential due to the capacity problems in the sewers. Based on an analysis of the local development plans, it appears that the Councils have slightly different strategies:

Fylde and Wyre

Based on the regeneration and green infrastructure strategies review, the Councils would require strategies mainly for future developments/redevelopments to include SUDS as there are already adequate provisions or green spaces in the area. Lancashire CC has developed the Lancashire Green Infrastructure Strategy and the tool kit, so any SUDS supplementary guidance needs to be fully incorporated into this strategy. It still needs to be decided who is best placed to draft the SUDS guidance, as there are different views on that at District and County Council level. That needs to be discussed between the Councils and through cross-departmental discussions (Section 4.2.4). Councils also have restrictions in allowing future development due to capacity problems in sewers, so a coordinated strategy of Councils and UU needs to detail the areas where SUDS retrofit would be most beneficial. To begin with, the list of GIS screened sites (Appendix B and C) could be used to target the largest area for flow reduction. A more complex network analysis to match areas with critical capacity issues with local development plans would be required to determine the most viable SUDS retrofit sites. In order to secure future proofing, this strategy would need to be incorporated into other spatial strategies across the Councils.

Blackpool

Blackpool has the same capacity issues as Fylde and Wyre and the same strategy for freeing up the capacity through SUDS retrofit applies. In addition to that, Blackpool suffers from a lack of green spaces, especially in and around the town centre and along the Promenade due to historic planning proposals and there are limited options as to what could be done. In order to create a viable strategy for future proofing SUDS retrofit in and around the town centre, it is essential that it is fully integrated with other spatial strategies, i.e. regeneration, green strategy, climate change, biodiversity or use of multipurpose open spaces. It is also critical to include highways department and get their engagement in SUDS implementation for revitalisation of street and road corridors across the town. From the surface water point of view, this approach will not only add to the reduction of flood risk from surface water in some areas and reduce spillages of CSOs, but also unlock future development in and around the town centre and at the same time provide mitigation measure for diffuse pollution.

In order to be effective, the regeneration strategy including SUDS needs to be applied widely across the town centre and the funding is critical. As a starting point, having such integrated strategy would provide the evidence document needed to support any prospect application for funds through national or international sources, either for wider use or for funding individual pilot schemes.

4.2.3 Funding

This is the most critical part of the strategy. During this study, some potential sources of funds have been identified and future work is needed to investigate channels of funds, eligibility and timescales, as well as additional sources of funding:

- European funding schemes such as INTERREG or Life Projects (Green Streets) to fund pilot regeneration schemes.
- UK Technology Strategy Board – funds for feasibility studies for an innovative large scale ‘future cities demonstrator’, showing how the city’s multiple systems will be integrated and how challenges in the city will be addressed. The Fylde Peninsula Councils should be informed on opportunity and deadlines.

- UU funds for schemes where funds to upgrade their assets would offset any loss in charges from the disconnection of surface water. The Fylde retrofit on Fairhaven is an example of this.
- Community Infrastructure Levy (CIL) schemes. This is a new scheme and potential to redirect some fees to fund SUDS retrofit schemes should be explored at Council levels.
- Owners of significantly sized sites (Tesco, other supermarkets and retailers) should be encouraged to invest in retrofitting SUDS at their sites. The savings made from disconnecting from the sewer system would form a key selling point to the owners, along with the potential to use rainwater harvesting to reduce water use, to meet corporate social responsibility targets, or contribute to the local community by contributing to improved bathing water quality.
- Exploring joint funding with other streams of regeneration and spatial strategies, educational funds for schools, etc.

4.2.4 Council training

The Councils' planners have not been fully engaged in surface water management issues up until now and are generally not kept abreast of the FMWA implementation strategy and that this needed to happen. More cross-functional dialogue across Councils is needed. Planners need the heads-up that planning process will need to be amended. During the meetings with them, they have been informed about this study and the SUDS opportunities, but the permanent channels of communications need to be established across the Councils and the FPWMG in order to get more SUDS projects on the ground.

Planners are not aware of the UU Flow Separation Strategy and proposal for building new sewers in the catchment. These strategies need to be communicated and where applicable, SUDS retrofit opportunities highlighted in developers' briefs.

A training day was agreed between Blackpool, Fylde, Wyre and Lancashire Councils, so a common approach and understanding could be reached in terms of how future duties under FWMA will be distributed across the Councils, especially in terms of future proofing, SUDS applications and providing green infrastructure. A wider audience of planners and engineers for that workshop was proposed. This was an opportunity to inform all parties about the project findings so they were aware of who to contact should the opportunity arise for SUDS application before the FWMA is in place (which will legislate future SUDS use, or on any SUDS retrofit opportunities). This workshop took the place of the production of supplementary planning guidelines, which we had originally envisioned would form the key deliverable for Task 3.

Once permanent channels of communication and dissemination of information have been established, coordination with the Environment Agency and UU is required to integrate policies and amend planning process in order to embed recommendations of flow separation and SUDS retrofit studies.

5 Conclusions and Recommendations

5.1 Conclusions

- The methodology of this project has followed the recommendations of the CIRIA Guidance for Retrofitting to Manage Surface Water C713 (2012) and summary of findings is presented as follows:

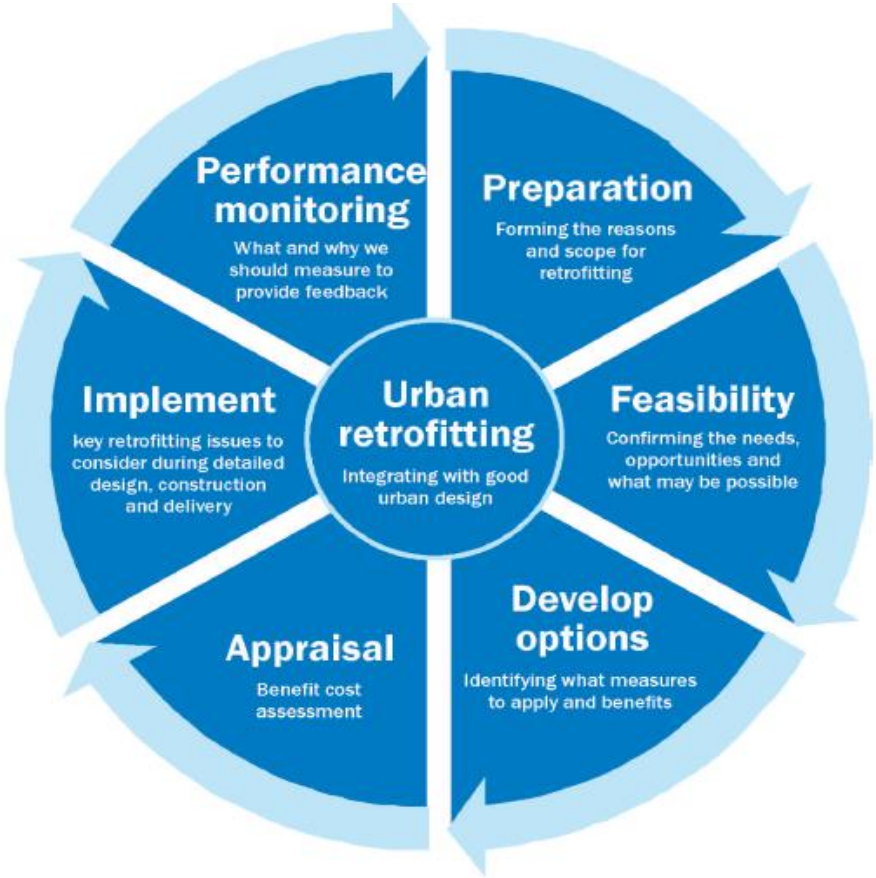

Figure 5-1 Framework for retrofitting surface water management measures (CIRIA 713)

- **Preparation:** There are many sources of pollution contributing to impacts on bathing water quality across the Fylde Peninsula. One of the sources of pollution is CSO spillages as there are mainly combined sewers serving the Peninsula. These sewers are running at capacity and there is an embargo on future developments in the area. Structural mitigation measures to alleviate these spillages are in place, but they are not sufficient. This study has been commissioned to investigate opportunities to retrofit SUDS on Fylde Peninsula to reduce further CSO spillages. This will not reduce the impact from other sources of pollution.
- **Feasibility:** Based on the new FWMA, all new development would require SUDS implementation to deal with surface water runoff. It is anticipated that full scale implementation of the Act would start late 2013, which will apply for all new developments. However, there needs to be a strategy sooner for putting forward sites for SUDS retrofit and any redevelopment proceeding in 2012-2013.
- Surface water separation is preferable to just SUDS attenuation. Based on UU's assessment, in order to start to reduce the number of CSO spills at Blackpool each year, surface water runoff from an impervious area of over 36 ha needs to be addressed and

removed from entering the public sewers. Significant multiples of this impermeable area is needed to reduce the number of CSO spills. It is noted that the area of a typical retailer (with adjacent car park) in this area is in the range of 0.2-0.6 ha; so a wide ranging and on-going approach is needed.

- Whilst the initial benefits of improving bathing water quality would require significant areas to be retrofitted, other shared benefits of any SUDS retrofit in form of (1) alleviating sewer flooding, (2) reducing pressure on sewers to unlock future developments, (3) mitigating diffuse pollution from runoff from urban areas, (4) promoting rainwater harvesting, (5) reducing water bills by disconnecting surface water from the sewer network, (6) promoting traffic calming in a more natural way, (7) providing green corridors throughout tows centre, (8) providing opportunities to link water management with planning public realm and multifunctional open spaces, (9) contribute to regeneration by engaging communities in raising awareness and maintaining SUDS features. By capturing opportunities to implement SUDS on new development/redevelopment sites or by retrofitting them, an incremental benefit towards achieving initial goal of improving bathing water quality could be accomplished. That could be done by capturing opportunities arising from new/redevelopment and proactively seeking opportunities for retrofitting:
- **Develop Options:** The GIS screening process provided a platform to analyse types of developments and open spaces across Fylde and draw general conclusions about potentials for SUDS retrofitting. Based on a GIS assessment of all the available data and discussion with the Councils' planners, a list of most suitable SUDS retrofit and redevelopment sites has been established (list presented in Appendices B and C). The sites have been grouped based on ownership and land use (Section 4.2.1), so that opportunities to roll out so that similar schemes with similar funding streams could be explored.
- Strategies are not yet in place to support the wider use of SUDS, which will be part of new responsibilities under FWMA. Consultations with LCC and cross-departmental consultation is required to assess future roles and channels of communication, so that the SUDS retrofit strategy fits into that overarching strategy. There is still no clarity as who is best placed to produce Supplementary Planning Guidance on SUDS and a workshop has been suggested as part of this study to discuss this issue with wider stakeholders group. The workshop needs to be led by the FPWMG with participation of engineers and planners of all Councils including LCC. The SUDS retrofit strategy needs to be fully incorporated in other spatial strategies, including Green Infrastructure Strategy, produced by LCC.
- Funding of the retrofit schemes is critical and there needs to be a cost benefit analysis produced for different group of stakeholders identified in Section 4.2.1 in order to assess financial viability for them to implement SUDS. Long term monitoring of potential funding streams is required to capture opportunities for fund more SUDS schemes. Application for international funding is possible, but a clear strategy needs to be prepared and presented.
- Two of the proposed schemes, Tesco site at Sandham's Green and Council buildings at Fylde, have been put forward for design and monitoring to build an evidence base for future proposals. It has been agreed that an outline design for the Tesco site is prepared as well as a detailed design for Council building in Fylde. Details of SUDS design and a monitoring plan following retrofit would be presented in the Final Report of this study.
- **Appraisal:** Cost benefit analysis for implementation of SUDS scheme at Tesco supermarket will be developed to support consultation with Tesco in this phase of the project. Cost benefit appraisals for other groups of opportunities identified in Section 4.2.1 is recommended to support future proactive engagement with stakeholders and assess viability and likelihood of more SUDS retrofit schemes on Fylde.

5.2 Recommendations

Based on investigations carried out within this study, the following recommendations have been made:

- SUDS at the two proposed sites should be implemented to build an evidence base for future sites.
- Further discussion is needed with UU so that the list of potential SUDS retrofit locations (Appendices B and C) can be promoted in conjunction with recommendations from the UU Flow Separation Scheme to provide a joint strategy for SUDS retrofit for: 1) water quality improvement and 2) reducing pressure on existing sewers to enable further developments in the area. This will give further support to UU's separation schemes.
- A clarification of roles in the implementation strategy needs to be established between the Councils (Unitary, District, and County) and the Environment Agency and UU. This needs to be followed up by mapping relevant policies and plans and cross-referencing them to establish requirement for any amendments to secure future proofing. Following that, a clear SUDS retrofit strategy needs to be produced which will fit into the other overarching policies and spatial strategies. Mapping the skills across the Fylde Peninsula for sharing expertise is advisable.
- Preparing a cost benefit analysis for stakeholders with major opportunities for SUDS (detailed in Section 4.2.1). Identifying financially viable options and making a plan to engage with relevant stakeholders to follow that up.
- Preparing a plan and resources to track future sources of funding, liaise with stakeholders and prepare relevant documents for application.
- Evaluation of the potential impact of proposed SUDS retrofit on bathing water quality can be achieved by monitoring of pilot sites but also through modelling. Modelling can be used to assess the potential impacts from urban and rural diffuse sources when compared with other sources of pollution in the catchments. We have been undertaking catchment and coastal modelling for Scottish Water to identify the relative contributions of pollution from CSOs treatment works, septic tanks and rural catchments to bathing waters. A similar approach could be applied to the Fylde coast to assess potential impacts, test the potential for SUDS improvements and identify measures to improve bathing water quality.

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7 Appendices

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