

1. Introduction

1.1 Introduction to Water Cycle Strategies (WCS)

1.1.1 Background

The water cycle describes the pathways and processes through which water moves through the natural and built environment, including the infrastructure that provides drinking water, collects and treats wastewater and provides protection against flooding. Figure 1.1 illustrates the traditional image of the water cycle showing the movement of water between the sea, atmosphere, catchments, groundwater and rivers.

Figure 1.1 Traditional View of the Hydrological Water Cycle - Without Artificial Influences

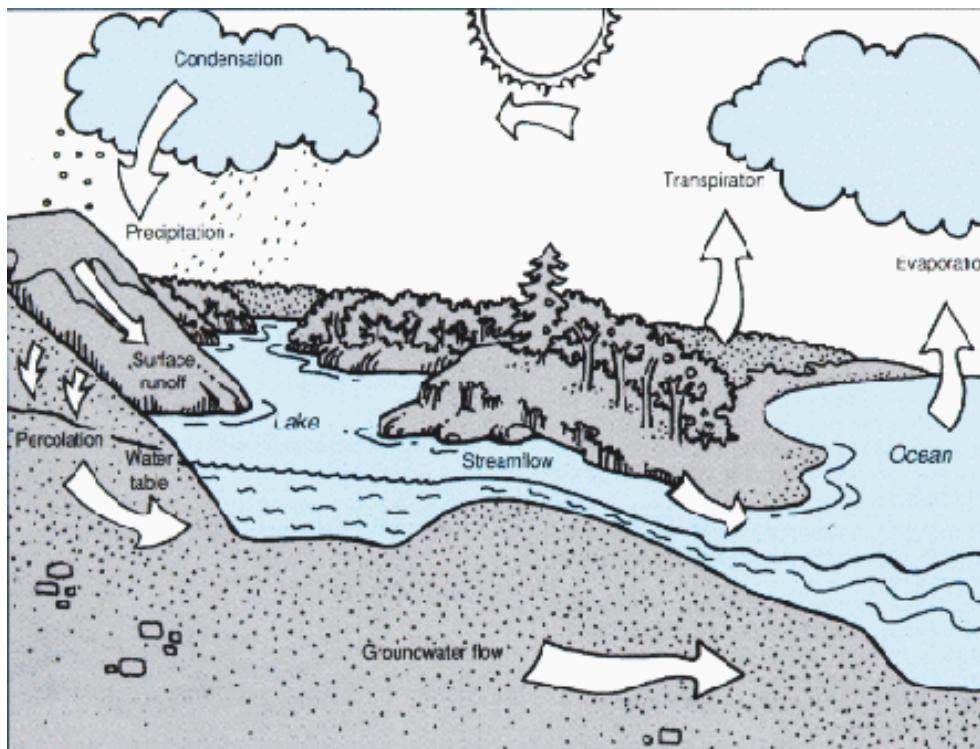
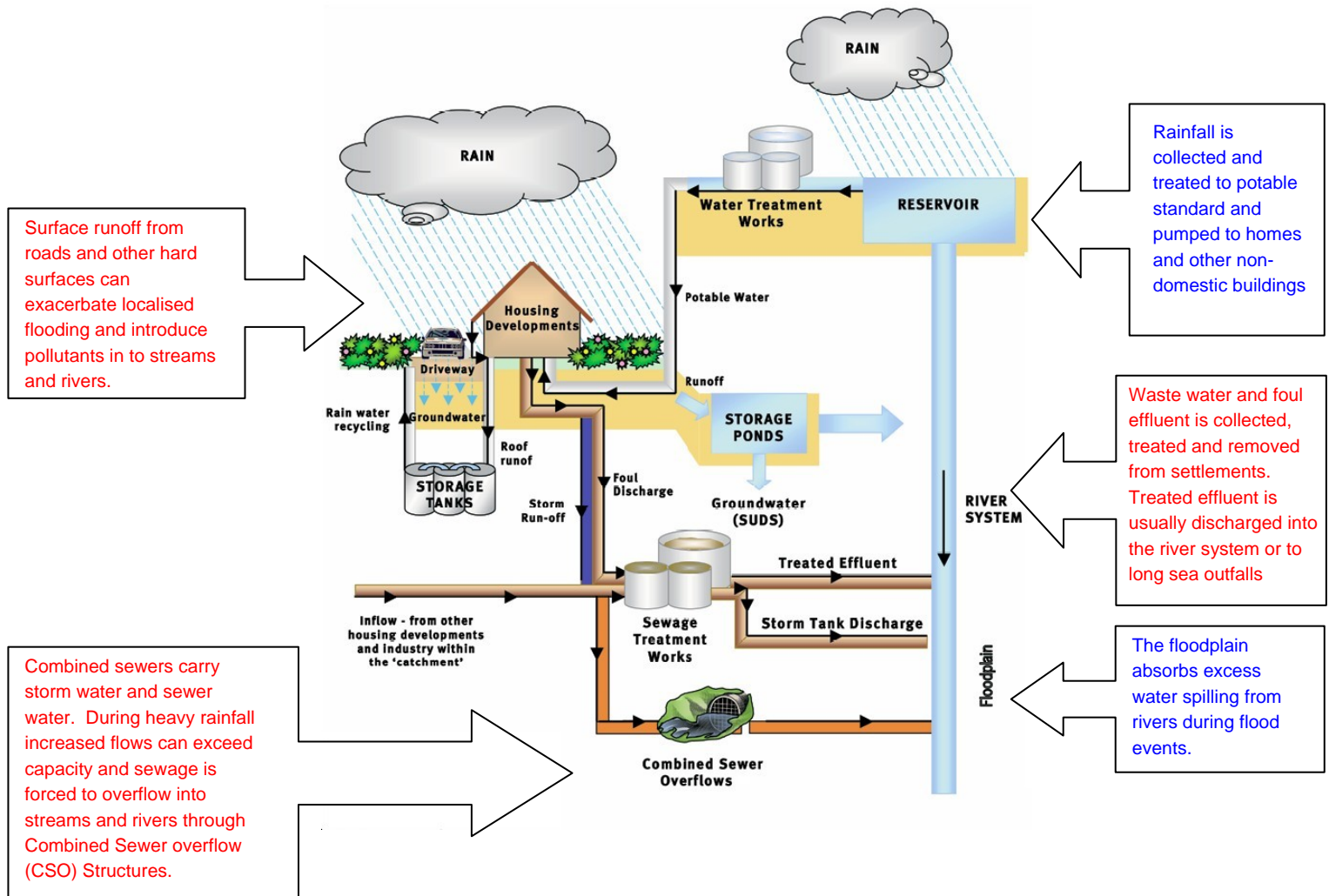


Figure 1.2 illustrates the added elements of human infrastructure that influence the water cycle in urban areas. In the urbanised cycle, water is captured and stored for use, and this water only re-enters the river network once it has been used and then treated at wastewater treatment works. Consequently, the timing and quality of water entering the river network can be significantly different in the urban environment.



Figure 1.2 Schematic of the Urban Water Cycle



The capacity of the water infrastructure needs to be sized appropriately to ensure sufficient supply of clean water to homes and industry and provide a wastewater collection system that can collect and treat foul drainage and, thereby, control the discharge of polluted runoff and untreated foul drainage to receiving waters and dependant habitats. The drainage system also needs to be designed to reduce the risk of surface water flooding.

The capacity of the water environment to provide water supply through abstractions and receive wastewater from discharges is constrained by environmental regulation enforced by UK and European legislation (information on this is provided in Section 3). The Environment Agency provides the leading role in enforcing this legislation and controls wastewater discharges and abstractions through a system of consents and licences that they issue to operators (e.g. water companies, industry, farms, etc.) in order to maintain the quality of the water environment by preventing failure of agreed targets and standards. In planning housing growth it is essential that potential impacts on the water environment are assessed and measures taken to avoid negative impacts on the water environment through this regulatory system.



1.2 Aims of a Water Cycle Strategy

A Water Cycle Strategy (WCS) is one of a number of strategic studies used by Local Planning Authorities as part of the evidence base for Local Development Frameworks. The Strategy proposes necessary infrastructure and policy requirements to achieve the planned growth without compromising and, where possible, enhancing, the water environment. It also aims to identify the phasing of the water infrastructure requirements so that these do not constrain the timing of the proposed development. Where environmental constraints on housing growth exist that cannot be accommodated these also need to be identified.

The key issues that should be addressed in a WCS include:

- Assessing the capacity of the current water infrastructure to accommodate growth without adversely affecting the environment by considering:
 - The availability of water resources;
 - The capacity of the drainage network;
 - The potential to increase flood risk;
 - The capacity of existing wastewater infrastructure;
 - The environmental capacity of receiving watercourses;
- In assessing the capacity of current water infrastructure, identify constraints to accommodating the planned growth of development, and comment on where development may be best located to minimise such constraints;
- Determining the potential impact of the proposed development in the context of requirements of environmental legislation including Water Framework Directive, Habitats Directive and any other relevant water cycle policy;
- Identifying the infrastructure necessary to achieve the proposed growth within the constraints of the environment and legislation; and,
- Developing a strategy for a phased approach to development that allows key growth targets to be met whilst providing sufficient time for the identified infrastructure to be adopted.

The Strategy provides a mechanism to ensure that all stakeholders have their say. Most of the data and information used in a WCS will already exist within these organisations and one of the key benefits of the partnership approach is unlocking this understanding and information and making it available.

It is important to understand the different scales at which the elements of the water cycle (water supply, sewerage and drainage) are managed, and the impacts this has on assessing constraints to growth. Water supply is managed strategically, as there is a high level of connectivity in the water supply network and water can be moved great distances from the raw water sources (rivers, reservoirs, or groundwater) to the point of delivery. Generally, new developments can be connected to the main system relatively easily. In contrast, wastewater treatment works have



much smaller defined catchment areas and so the location of development relative to the capacity of the nearest treatment works and receiving water can be critical. Although drainage issues are specific to individual developments, the integration of drainage development across sites offers significant potential for green space/habitat creation, in addition to reducing flood risk and potentially water demand.

1.3 National Guidance on Water Cycle Studies

The Environment Agency has issued a national guidance (<http://publications.environment-agency.gov.uk/pdf/GEHO0109BPPF-e-e.pdf>) document to ensure that water cycle studies are carried out in a consistent way. This guidance outlines the required approach for the Scoping, Outline and Detailed phases of water cycle studies. The WCS for the Borough of King's Lynn aims to follow this national guidance.

1.4 Climate Change

Climate change has the potential to threaten water infrastructure by reducing the availability of water resources, increasing the risk of flooding as a result of sea level rise and more severe storms and reducing the capacity of the water environment and associated habitats to receive wastewater. Climate change may result in failure of existing water infrastructure to comply with environmental targets and standards which may, therefore, need to be enhanced. In planning new infrastructure, resilience to climate change should be considered to avoid requirements for further adaptation measures in the future.

1.5 Green Infrastructure

In addition to this WCS, the Borough of King's Lynn and West Norfolk has commissioned Entec to undertake a Green Infrastructure Strategy. The aims of this strategy are to:

- gather information on existing green infrastructure within the Borough and in the surrounding area;
- identify opportunities for green infrastructure with stakeholder engagement;
- identify potential constraints for green infrastructure development; and
- provide scoping for the development of the Borough's future green infrastructure strategy.

Existing green infrastructure may influence the locations for the development of water infrastructure whilst development of new water infrastructure, particularly sustainable urban drainage (SuDs), provides opportunities to create new green space. Undertaking these studies together provides an opportunity to explore these issues and, in particular, identify how integration of wastewater and green infrastructure might be taken forward during the implementation phase.



1.6 Aims and Objectives of the King's Lynn WCS

The objectives of this Phase 1 Water Cycle Study (WCS) are to:

- present information on the water cycle for use by Local Authority Planners;
- highlight the issues that are relevant to the Borough of King's Lynn and West Norfolk, arising from national and local planning policies;
- determine the existing and future capacity of the water supply, wastewater and drainage infrastructure in the study area;
- identify potential barriers to development, considering the combination of environmental and water infrastructure constraints taking into account the requirements of the Water Framework Directive as identified within the draft River Basin Management Plan for Anglian Region;
- advise on how development may be best located to minimise the impact of constraints in the water infrastructure system, and sustainability; and
- prepare guidance for local authorities and developers.

Flood risk in the district has been considered within the Strategic Flood Risk Assessment (SFRA), produced for the Council's Local Development Framework (LDF) by Faber Maunsell in 2008. The WCS study will, therefore, only summarise flood risk, using the evidence supplied in the SFRA to avoid repetition of work.

This Outline WCS provides a high level constraints assessment of the existing water services infrastructure and the associated impacts of planned development in the Borough of King's Lynn and West Norfolk upon the water cycle. It also highlights any potential problems that may need to be addressed to ensure the growth is delivered sustainably. The study has involved consultation with key stakeholders in the study area; notably Natural England, Anglian Water, the Environment Agency, the Borough Council and County Council.

In assessing the capacity of existing water infrastructure (supply, wastewater, and drainage) this WCS will help to inform the development of the Borough Council's preferred housing allocation options and highlight areas that should be investigated further in Phase 2.

1.7 How to Use this Water Cycle Study

The data and analyses presented in this Phase 1 document provide a robust evidence base for making informed planning decisions. It does not provide an instant answer for determining planning applications. This evidence should be used to consider which options will best support the LDF Core Strategy and related policies.

This report contains three technical sections presenting the water resource, receiving water quality/wastewater infrastructure and potential drainage and flooding issues across the study area. Assessments of sustainability issues and links with the Green Infrastructure Strategy are also presented. Integrated conclusions are presented with



recommendations for the local authorities and developers to ensure sustainable delivery of the proposed development in the study area.

Detailed information on the methods used in the assessment are provided within a series of appendices.

1.8 Stakeholders

1.8.1 Steering Group

This WCS Outline Study has been overseen by a Steering Group comprising the following organisations:

- Borough of King's Lynn and West Norfolk.
- Anglian Water Services Ltd.
- Environment Agency.
- Natural England.
- Water Management Alliance.
- Norfolk Wildlife Trust.
- Norfolk County Council.

1.8.2 Wider Consultation

In addition to the Steering Group, information on progress with the study has been provided to a wider group. These organisations have been asked to comment on output from the study to ensure they have the opportunity to influence the scope of the work and influence the recommendations.

- Downham Group of Internal Drainage Boards
- Ely Group of Internal Drainage Boards.
- Middle Level Commissioners.

1.9 Data Gathering

The following organisations have provided the key information that has been used to develop the WCS.

- Anglian Water. Information on the water supply and wastewater infrastructure and asset management and water resource plans related to this infrastructure. Entec have signed a confidentiality agreement with AWS with regard to this information.



- Environment Agency. Information on flood risk (maps), environmental water quality (GQA data), Review of Consents output (e.g. Appendix 21 documents), and water resource planning (e.g. CAMS documents).
- Internal Drainage Boards. Information on their assets.
- Natural England. Information related to protected habitats and green infrastructure.

Information gaps and data limitations are identified in this report.

