

Great Yarmouth Borough Surface Water Management Plan



Flooding in Northgate Street, Great Yarmouth, 2006

Great Yarmouth Borough

Surface Water Management Plan

Stage 1 Report

May 2012



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Executive Summary

This report concerns Stage 1 of the Great Yarmouth Borough Surface Water Management Plan (SWMP).

The aim of a SWMP is to understand and resolve complex and high risk surface water flooding problems in urbanised areas. A SWMP brings together key local partners, with responsibility for surface water and drainage in their areas, to collaborate to investigate the causes of surface water flooding and agree the most cost effective way of managing surface water flood risk.

The principal output from a SWMP study is an action plan outlining the preferred surface water management strategy and identifying the actions timescales and responsibility of each partner.

The project is being led by a Steering Group who, through Norfolk County Council, are steering the delivery of the work. The Steering Group is composed of the following organisations: Anglian Water, Environment Agency, Great Yarmouth Borough Council, local Internal Drainage Boards (IDBs), Norfolk County Council and representatives from the Broads Authority.

The Great Yarmouth Borough SWMP is being undertaken in two Stages. Stage 1 (Inception) covers the Phase 1 (Preparation) part of the DEFRA defined process, and Stage 2 covers Phases 2, 3 and 4 of the DEFRA process ([see Section 4 for details](#)).

This report is in regard to Stage 1 only.

Stage 1 of the Great Yarmouth Borough SWMP has achieved the following:

- Identified the level of assessment at which the SWMP study will be carried out, ([see Section 4](#)). It will be at an intermediate level, with detailed assessments undertaken in specific areas vulnerable to surface water flooding where funding allows;
- Established a partnership and clarified the roles of responsibilities of each partner, ([see Section 2 for details](#));
- Established the method and timing of stakeholder engagement, ([see Section 2.4](#));
- Set the overall objectives for the Great Yarmouth Borough SWMP ([see Section 1.3](#));
- Collated and mapped all available data for the SWMP, identified missing data and presented the data in a format which will aid Stage 2 of the SWMP, ([see Section 3.5](#));
- Identified areas more vulnerable to surface water flooding from existing data, ([see Figure 3.04](#)); and

- Determined the approach for Stage 2 (Phases 2, 3 & 4) of the Great Yarmouth Borough SWMP, ([see Section 4](#)).

The key deliverables from Stage 1 are:

- A report (this report), including a list of contacts, tables of available data (plans, reports, GIS and spreadsheet data), gap analysis, maps of available data and a preliminary estimate of surface water flood risk; and
- DVDs providing all data collated during Stage 1 for use in Stage 2.

The final technical reports and final action plan produced under this study will be available under the Freedom of Information Act (FOI) at the end of the study. However, working draft versions of documents and the raw data provided to the study by participating organisations will not be available under the FOI Act from Norfolk County Council. Any requests for the underlying information would need to be made directly with the participating organisations.

Glossary of Terms

Term	Definition
Baseflow	The sustained flow in a channel or drainage system.
Catchment	The area contributing surface water runoff flow to a point on a drainage or river system. Can be divided into sub-catchments.
Combined sewer	A sewer designated to carry foul sewage and surface water sewage in the same pipe.
Control structure	Structure to control the volume or rate of flow of water through or over it.
Conventional drainage	The traditional method of draining surface water sewage using subsurface pipes and storage tanks.
Critical Drainage Area (CDA)	A discrete geographic area (usually a hydrological catchment) where multiple or interlinked sources of flood risk cause flooding during a severe rainfall event thereby affecting people, property or local infrastructure.
Culvert	A covered structure under a road, embankment etc, to direct the flow of water.
Defences	Structures that are used to reduce the probability of floodwater or coastal erosion affecting a particular area (for example a raised embankment or sea wall).
Flood	<p>Definition of flooding from the Flood and Water Management Act:</p> <ol style="list-style-type: none"> 1. "Flood" includes any case where land not normally covered by water becomes covered by water. 2. It does not matter for the purpose of subsection (1) whether a flood is caused by <ol style="list-style-type: none"> (a) heavy rainfall, (b) a river overflowing or its banks being breached, (c) a dam overflowing or being breached, (d) tidal waters, (e) groundwater, or (f) anything else (including any combination of factors). 3. But "flood" does not include <ol style="list-style-type: none"> (a) a flood from any part of a sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system, or (b) a flood caused by a burst water main (within the meaning

	given by section 219 of the Water Industry Act 1991).
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions.
Foul drainage	The infrastructure that drains wastewater and sewage.
Greenfield runoff	The surface water runoff regime from a site before development or the existing site conditions for brownfield redevelopment sites.
Groundwater	<p>The Flood and Water Management Act 2010 defines groundwater as;</p> <ul style="list-style-type: none"> • Water below the surface of the ground and in direct contact with the ground or subsoil. <p>It is worth noting that this definition does not include water in buried pipes or other containers.</p>
Gully	Opening in the road pavement, usually covered by metal grates, which allows surface water runoff to enter conventional drainage systems.
Highways Agency	The government agency responsible for strategic highways in England, i.e. motorways and trunk roads.
Highway Authority	A local authority with responsibility for the maintenance and drainage of highways maintainable at public expense.
Main River	Any watercourse shown as such on a main river map, and for which the Environment Agency has responsibilities and powers
Lead Local Flood Authority (LLFA)	Local Authority responsible for local flood risk management – for the County of Norfolk this is Norfolk County Council.
Local Flood Risk	<p>Local Flood Risk is defined as flooding that occurs from;</p> <ul style="list-style-type: none"> • Surface run-off • Groundwater • Sewers (partly or wholly influenced by precipitation) • Ordinary watercourses
National Planning Policy Framework (NPPF)	The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. This framework replaces the Planning Policy Statements including 25: Development and Flood Risk.
Ordinary Watercourses	<p>Ordinary Watercourses are defined as;</p> <ul style="list-style-type: none"> • Every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.

Proper outfall	An outfall to a watercourse, public sewer and in some instances, an adopted highway drain. Under current legislation and case law, having a proper outfall is a prerequisite in defining a sewer.
Public sewer	A sewer that is vested and maintained by the sewerage undertaker.
Riparian Owners	Owner of land or property alongside a river or other watercourse.
Risk Management Authorities (RMA's)	Organisations that have a key role in flood and coastal erosion risk management as defined by the Flood and Water Management Act 2010. These are the Environment Agency, Lead Local Flood Authorities (LLFA's), district councils where there is no unitary authority, internal drainage boards, water companies and highways authorities.
Strategic Flood Risk	Strategic Flood Risk is primarily the responsibility of the Environment Agency and is defined as flooding that occurs from; <ul style="list-style-type: none"> • Main rivers • Large Raised Reservoirs • The sea
Sewerage undertaker	A company responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Surface Runoff	The Flood and Water Management Act 2010 defines surface runoff as; <ul style="list-style-type: none"> • Rainwater (including snow and other precipitation) which <ul style="list-style-type: none"> (a) is on the surface of the ground (whether or not it is moving), and (b) has not entered a watercourse, drainage system or public sewer.
Surface Water	Surface Water, also described as 'Local Flood Risk,' is a term that covers surface run-off and flooding from ordinary watercourses and groundwater.

1. Introduction

1.1 Identifying the need for a Surface Water Management Plan

1.11 Norfolk Preliminary Flood Risk Assessment Report

The need for further determination of Local Flood Risk (LFR) within the Great Yarmouth Borough Council area has evolved from initial work undertaken by Norfolk County Council through the Norfolk Preliminary Flood Risk Assessment (PFRA) process. The PFRA is a high level screening exercise, required by the Flood Risk Regulations 2009, which reviews historical flood events and develops flood risk models for surface water flooding that, builds on Environment Agency mapping.

As a result of Norfolk County Councils PFRA work Great Yarmouth (including Gorleston and Bradwell) was identified as a priority area where, in an extreme rainfall event (1:100 to 1:200), approximately 3,000 properties could be flooded, along with over 700 non-residential properties and more than 30 critical service locations, (such as schools, utilities services (water/power) and hospitals). Further to this area of concentrated Local Flood Risk several other locations within the Borough were highlighted as areas where further assessment would be valuable. These included; Hopton on Sea, Caister-on-Sea, Winterton-on-Sea, Hemsby and Ormesby St Margaret.

1.12 Historic Flood Events

The most recent, significant surface water flooding event occurred on the 25th of September 2006 when a torrential thunderstorm flooded over 50 properties including six schools in Great Yarmouth, flooded properties and businesses in Hemsby and Hopton-on-Sea and caused serious disruption to a much wider area. The impact of the flood and the disruption of traffic was exacerbated by the failure of an Anglian Water pump and the early closure of many schools.

1.13 Understanding the potential risk and consequences of flooding from sources of local flood risk

The following quote from Sir Michael Pitt's Review into the flooding of 2007 highlights the role of Surface Water Management Plans in attaining a greater understanding of the potential risk and consequences of flooding from sources of local flood risk, (i.e. flooding from surface water, groundwater and ordinary watercourses).

"Surface Water Management Plans (SWMPs) are referred to in Planning Policy Statement 25 (PPS25) as a tool to manage surface water flood risk on a local basis by improving and optimising co-ordination between relevant stakeholders. SWMPs will build on Strategic Flood Risk Assessments (SFRAs) and provide the vehicle for local organisations to develop

a shared understanding of local flood risk, including setting out priorities for action, maintenance needs and links into local development frameworks and emergency plans.”

PPS25 has now been superseded by the National Planning Policy Framework (NPPF).

1.2 Overview of the SWMP Process

The overall aim of the SWMP is to understand and manage complex and high risk surface water flooding issues.

Table 1.1 Types of flooding that constitute Surface Water

Surface Runoff

The Flood and Water Management Act 2010 (FWMA) defines surface runoff as;
Rainwater (including snow and other precipitation) which (a) is on the surface of the ground (whether or not it is moving), and (b) has not entered a watercourse, drainage system or public sewer.

In addition, Planning Policy Statement 25 (PPS25) stated that;
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding.

Overtopping from Ordinary Watercourses

Ordinary Watercourses are defined as;
Every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.

Groundwater Flooding

The Flood and Water Management Act 2010 defines groundwater as;
Water below the surface of the ground and in direct contact with the ground or subsoil.
It is worth noting that this definition does not include water in buried pipes or other containers. The UK Groundwater Forum describes groundwater flooding occurring;
...as a result of water rising up from the underlying rocks or from water flowing from abnormal springs.

The Surface Water Management Plan Technical Guidance (Defra 2010) states:

"A SWMP study is undertaken in consultation with key local partners who are responsible for surface water management and drainage in their area. Partners work together to understand the causes and effects of surface water flooding and agree the most cost effective way of managing surface water flood risk for the long term. The process of working together as a partnership is designed to encourage the development of innovative solutions and practices.

It should establish a long-term action plan to manage surface water in an area and should influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.”

The following benefits will be achieved through undertaking a SWMP study:

- increased understanding of the causes, probability and consequences of surface water flooding;
- increased understanding of where surface water flooding will occur which can be used to inform spatial and emergency planning functions;
- a co-ordinated action plan, agreed by all partners and supported by an understanding of the costs and benefits, which partners will use to work together to identify measures to mitigate surface water flooding;
- identifying opportunities where SuDS can play a more significant role in managing surface water flood risk and may also contribute to fulfilling the requirements of the Water Framework Directive;
- helping to meet the requirements of the Flood and Water Management Act 2010;
- increased awareness of the duties and responsibilities for managing flood risk of different partners and stakeholders;
- improved public engagement and understanding of surface water flooding.

1.3 Objectives of the Great Yarmouth Borough SWMP Stage 1

It is recognised that SWMP studies will vary to meet local needs and circumstances and the Defra technical guidance offers a flexible approach that will allow lead local flood authorities to undertake a SWMP study which is tailored to their needs and requirements.

The specific objectives of Stage 1 are to:

- Establish a partnership and clarify the roles of responsibilities of each partner;
- Collate all available data for the SWMP, identify missing data and present the data in a format which will aid Stage 2 of the SWMP;
- Set the overall objectives for the Great Yarmouth Borough SWMP;
- Establish the method and timing of stakeholder engagement in Stage 2;
- Map the information;
- Identify areas more vulnerable to surface water flooding from existing data;
- Identify the level of assessment at which the SWMP study will be carried out; and

- Determine the approach for Stage 2 (Phases 2, 3 & 4) of the SWMP.

The key deliverables from Stage 1 are:

- The Stage 1 report including:
 - A list of contacts,
 - Tables of available data (plans, reports, GIS and spreadsheet data),
 - Identification of data gaps,
 - Maps of available data and a preliminary estimate of surface water flood risk.
- All data collated in Stage 1 will be provided on DVDs for use in Stage 2.

2. Partnership

2.1 Partner Organisations

The Great Yarmouth Borough SWMP is jointly funded by Norfolk County Council, Great Yarmouth Borough Council and Anglian Water. Norfolk County Council is managing the delivery of the work.

The partnership is composed of Norfolk County Council, Great Yarmouth Borough Council, Anglian Water, the Environment Agency, the Broads (2006) IDB, Waveney, Lower Yare and Lothingland IDB and the Broads Authority. Officers from these organisations sit on the Steering Group that oversees the SWMP.

2.2 Roles and Responsibilities

Table 2.1 Roles and Responsibilities of the Partnership

Partner Organisation	Role and Responsibilities
<p>Norfolk County Council</p>	<ul style="list-style-type: none"> • Lead Partner to secure implementation of the SWMP • Ensure the objectives are set and met. • Ensure a partnership approach is adopted and the Partnership is established. • Develop the SWMP strategy. • Data and information provider for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Land-use planning and urban development. • Highways drainage including sustainable urban drainage systems in their control. (Highways Agency for major routes). • Ordinary watercourses in their control. • Urban green space.

	<ul style="list-style-type: none"> • Strategic Flood Risk Assessment of the area. • Reported flooding incidents. • Costs and practicalities of re-engineering streets and green space as flow routes or storage. • Operations and maintenance regimes. • Property values and damage due to flooding. • Contributes to Multi Agency Tactical Flood Plan
<p>Great Yarmouth Borough Council</p>	<ul style="list-style-type: none"> • Lead partner to secure implementation of the SWMP. • Role as planning authority. • Coast Protection Authority. • Data and information provider for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Land-use planning and urban development. • Highways drainage including sustainable urban drainage systems in their control. (Highways Agency for major routes). • Ordinary watercourses in their control. • Urban green space. • Strategic Flood Risk Assessment of the area. • Reported flooding incidents. • Costs and practicalities of re-engineering streets and green space as flow routes or storage. • Operations and maintenance regimes. • Property values and damage due to flooding. • Contributes to Multi Agency Tactical Flood Plan

	<ul style="list-style-type: none"> • Enhancing community resilience
<p>Anglian Water</p>	<ul style="list-style-type: none"> • Lead partner to secure implementation of the SWMP. • Responsible for public sewerage services within the SWMP area and the reduction of sewer flooding. • Data and information provider for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Sewer network capacity and performance. • Reported flooding incidents. • Sewer network models. • Costs and practicalities of sewer rehabilitation. • Drainage Area Plans (DAPs) and Sewerage Management Plans. • Long term investment plans. • Sustainable drainage systems in their control.
<p>Environment Agency</p>	<ul style="list-style-type: none"> • Essential partner for the SWMP. • Operational role with responsibility for main river and coastal flooding, river defences, river structures, development control and water quality. • National strategic overview for all sources of flooding. • Support SWMP through provision of tools, guidance and advice. • Data and information provider for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • River flows, levels and flooding.

	<ul style="list-style-type: none"> • River flow models. • Catchment flood management plans (CFMP). • Reported flooding incidents. • Digital elevation data (e.g. LIDAR) • Interactions between rivers or the sea and drainage systems. • Operation and maintenance regimes. • Long term investment plan • Contributes to Multi Agency Tactical Flood Plan
<p>Internal Drainage Boards: The Broads (2006) IDB and Waveney, Lower Yare and Lothingland IDB</p>	<ul style="list-style-type: none"> • Essential partner for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • River / drain flows, levels and flooding. • River / drain flow models. • Data on pumping stations and flow control structures. • History of flooding incidents. • Information on adopted watercourses • Contributes to Multi Agency Tactical Flood Plan
<p>The Broads Authority</p>	<ul style="list-style-type: none"> • Essential partner for the SWMP. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Data on pumping stations and flow control structures. • Planning Authority • Navigation Authority • Conservation Authority • Navigation channels

	<ul style="list-style-type: none"> • History of flooding incidents. • Contributes to Multi Agency Tactical Flood Plan
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Table 2.2 Roles and Responsibilities of Key Stakeholders

Stakeholder	Role and Responsibilities
<p>Parish Councils: Belton with Browston Parish Council Bradwell Parish Council Caister on Sea Parish Council Hemsby Parish Council Hopton on Sea Parish Council Martham Parish Council Ormesby St. Margaret with Scratby Parish Council Winterton on Sea Parish Council</p>	<ul style="list-style-type: none"> • Stakeholder for the SWMP, particularly where responsible for improvement to / maintenance of open channels or culverted watercourses which are essential for surface water drainage. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Flooding incidents.
<p>Community Resilience Groups</p>	<ul style="list-style-type: none"> • Potential stakeholder for the SWMP. • A valuable source of information about historical flood occurrences and preferences for flow exceedance routes and/or storage. • Can also be involved in the development of solutions. • Channel for raising awareness, distributing information <p>No specific responsibilities.</p>
<p>Riparian Owners</p>	<ul style="list-style-type: none"> • Potential Partner or stakeholder for the SWMP if responsible for improvement to/maintenance of pumps, open channels or culverted watercourses which are essential for surface water drainage. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Flooding incidents.

<p>Highways Agency</p>	<ul style="list-style-type: none"> • Potential Partner or key stakeholder for the SWMP where main or trunk roads form a key part of the drainage or flood risk. • Can also be involved in the development of solutions. <p>Responsible for sharing information about or making available:</p> <ul style="list-style-type: none"> • Flooding incidents. • Highways drainage including sustainable urban drainage systems in their control.
<p>Harbour Authority</p>	<ul style="list-style-type: none"> • Potential stakeholder for the SWMP • Can also be involved in the development of solutions. <p>No specific responsibilities, but sharing information about development proposals and drainage assets as early as possible can help to ensure surface water issues are integrated into the SWMP.</p>
<p>Network Rail</p>	<ul style="list-style-type: none"> • Potential Partner or key stakeholder for the SWMP where the rail network forms a key part of the drainage or flood risk. <p>No specific responsibilities.</p>
<p>UK Power Networks</p>	<ul style="list-style-type: none"> • Potential Partner or key stakeholder for the SWMP where key infrastructure is vulnerable to flood risk. <p>No specific responsibilities, but sharing information about flood resilience of key infrastructure will aid the SWMP.</p>
<p>Greater Yarmouth Tourist Authority</p>	<ul style="list-style-type: none"> • Potential stakeholder for the SWMP • Channel for raising awareness, distributing information <p>No specific responsibilities, but sharing information about the local tourist industry will aid the SWMP.</p>

Essex and Suffolk Water		<ul style="list-style-type: none"> • Potential stakeholder for the SWMP • Can also be involved in the development of solutions.
Developers		<ul style="list-style-type: none"> • Potential stakeholder for the SWMP, especially where large areas of new development are planned and there are opportunities for a strategic approach to surface water management. <p>No specific responsibilities, but sharing information about development proposals as early as possible can help to ensure surface water issues are integrated into the SWMP.</p>
Individuals within areas identified to be at risk from surface water flooding.		<ul style="list-style-type: none"> • Potential stakeholder for the SWMP. • A valuable source of information about historical flood occurrences and preferences for flow exceedance routes and/or storage. • Can also be involved in the development of solutions. <p>No specific responsibilities.</p>

2.3 Treatment of Sensitive Information from Partner Organisations

This section of the Stage 1 report constitutes a brief Memorandum of Understanding (MOU) between the partner organisations regarding data sharing of sensitive information from partner organisations relating to flooding of individual properties, especially concerning the Freedom of Information (FOI) Act and how this information is presented to the public.

Concern was raised that some flood information required for the study may be sensitive, especially relating to surface water flooding of individual properties. Additionally, individual organisations are not permitted to release information regarding flooding which can identify individual properties. Therefore, some historic flooding information has been provided and collated on a postcode basis.

The final technical reports and final action plan produced under this study will be available under the Freedom of Information (FOI) Act at the end of the study. However, working draft versions of documents and the raw data provided to the study by participating organisations will not be available under the FOI Act from Norfolk County Council. Any requests for the underlying information would need to be made directly with the participating organisations.

2.4 Stakeholder and Community Engagement

2.41 Stakeholders

There are various professional stakeholders with an interest in knowing more about the risk of flooding from surface water. As part of the SWMP process, a number of groups have been actively engaged in order to ensure that their understanding of surface water flood risk is improved. Presently, flood risk from surface water is less well understood than flooding from rivers or the sea, so the SWMP is an opportunity to communicate with and inform groups about local flood risk from surface water.

2.42 Public Consultation

The SWMP is an opportunity to communicate and engage with local residents and communities in order to inform them of the risks associated with surface water flooding in the Borough. The public have been engaged in a number of ways throughout the SWMP process in order to raise local awareness and understanding of the key issues across the Borough as outlined below.

2.43 Parish Local Flood Surveys

Local Flood Surveys were sent to all 22 parishes in the Borough of Great Yarmouth in April 2012. Six parishes have returned their surveys and more are expected during Stage 2. [See Appendix 1.4 Local Flood Survey](#)

2.44 Red Cross Flood Stories Project

The British Red Cross has invited flood victims to share their experiences as part of a nationwide project to identify the needs of those victims and find out how best to support them.

The project will involve meeting with focus groups, sending out questionnaires and conducting one to one interviews.

The results from the project will help the Red Cross and other organisations anticipate the needs of those affected and help plan flood recovery work.

2.45 Future Stakeholder Engagement

Stakeholder consultation is a requirement of the SWMP process, including consultation with the public. It is suggested that only those people in the priority areas identified as vulnerable to surface water flooding are consulted, to ensure they understand and buy-in to the process, and that the consultation is not hijacked by vocal residents from unaffected areas, diluting the value of the study and potentially delaying the output.

We envisage that awareness of the issues will be raised and engagement sought with those likely to be directly affected by the outputs of the study. It will be important to manage public expectation from the study by clarifying the scope of the Great Yarmouth Borough SWMP with the public, especially ensuring that the definition of surface water flooding in this context is made very clear to ensure it is understood. Historic evidence of surface water flooding from those living in the identified priority surface water flood risk areas will be sought, along with their opinions on the potential causes of the surface water flooding.

Raising public awareness will be undertaken locally, as flooding is a very personal issue for those affected. Arrangements will be put in place to speak to affected individuals at a time and place which is relevant to them when they are at home and in their local community.

When the final, approved SWMP action plan of chosen mitigation measures is to be issued, press releases and information packs should be provided to the major news titles. This can explain the process undertaken, especially the consultation with those living in the areas, and manage any unfounded concerns that the article might otherwise have raised.

The outline and timing of stakeholder engagement is set out below:

Table 2.3 Stakeholder Engagement (Actions shaded in grey are complete)

Stage	Action	Responsibility
Phase 1: Preparation	Press release to announce the inception of the SWMP	Steering Group
	Briefing note to County and Borough Councillors	Steering Group
	Data collection and press release	Steering Group
Phase 2: Risk Assessment	Press release to update the progress of the SWMP	Steering Group
	New SWMP pages on Council websites	Steering Group
	Stakeholder workshop detailing outputs and options being considered	Steering Group and consultants
	Press release and public consultation events	Steering Group and consultants
Phase 3: Options	Stakeholder workshop detailing the preferred mitigation options	Steering Group and consultants

	Information leaflet to all residents in identified CDAs detailing the preferred mitigation options	Steering Group and consultants
Phase 4: Implementation and Review	Stakeholder presentation summarising conclusions and next steps	Steering Group and consultants
	Press release to announce end of SWMP and future work	Steering Group

2.5 Objectives of the Great Yarmouth Borough SWMP Stage 2

SMART (Specific, Measurable, Achievable, Relevant and Timely) objectives should be set for the whole of a SWMP. These should be relevant to the local situation.

Suggested objectives are:

- To openly share information, to improve the management of surface water flooding in the Borough;
- To engage with all identified stakeholders and implement the agreed engagement plan;
- To map all known surface water flood risk and engage the community and stakeholders to share this knowledge;
- To identify and prioritise effective, achievable and cost-beneficial measures to mitigate surface water flood risk;
- To develop an implementation plan showing how partners and stakeholders will work together to implement the solutions; and
- To periodically review the plan and monitor the effectiveness of the chosen solutions.

3. Data Collection

3.1 Study Area

3.11 General

Great Yarmouth Borough is located on the east coast of the County of Norfolk. It is bounded by Suffolk to the south, South Norfolk District Council to the west, North Norfolk District Council to the north and the North Sea to the east.

The Borough has a population of approximately 97,000 people, but this figure varies considerably between Easter and the end of October with the influx of tourists.

Table 3.1 Local Tourism

Total number of day trips in 2011:	3,116,000
Total number of staying trips in 2011:	1,292,000
Total number of staying nights in 2011:	4,834,000

Great Yarmouth Borough Council is the Local Planning Authority for the area

Norfolk County Council is the Lead Local Flood Authority, the Highways Authority, Joint Health Authority and the Education Authority. Norfolk County Council will become the SuDS Approval Body (SAB) when Schedule 3 of the FWMA 2010 is commenced.

Two water utility companies operate in the borough. Anglian Water is responsible for water supply, wastewater treatment and surface water removal. Essex and Suffolk Water is responsible for water supply.

Two Internal Drainage Boards (IDBs) operate in the borough. The Broads (2006) IDB covers the lowland area north of the River Yare and the Waveney, Lower Yare and Lothingland IDB covers the lowland area to the south.

An Internal Drainage Board is an operating authority in areas of special drainage need in England and Wales. They have powers to undertake work to secure land drainage and water level management within drainage districts. The area of an IDB is not determined by county or district boundaries, but by water catchment areas. Their responsibilities include the maintenance of rivers, drainage channels, ordinary watercourses, pumping stations and other critical infrastructure, facilitating drainage of new developments, the ecological conservation and enhancement of watercourses, monitoring and advising on planning applications and making sure that any development is carried out in line with the National Planning Policy Framework (NPPF). IDBs are not responsible for watercourses designated

as main rivers within their drainage districts; the supervision of these watercourses is undertaken by the Environment Agency.

The Environment Agency is the principal flood risk management operating authority. It has the power to manage flood risk from designated main rivers and the sea.

Table 3.2 Risk Management Authority Areas

Great Yarmouth Borough area: 18218 ha	
Total Borough Council area the Borough Council covers as a drainage authority: 11747ha	
Total GYBC area covered by the Water Management Alliance Group:	5239 ha
Total GYBC area covered by the Waveney Lower Yare and Lothingland IDB:	1232 ha

This study focuses on Great Yarmouth, including Gorleston and Bradwell and the settlements of: Belton, Bradwell, Caister on Sea, Hemsby, Hopton on Sea, Martham, Ormesby St. Margaret and Winterton on Sea, ([see Figure 1.01 Study Area](#)).

Assessment of critical infrastructure, services and the transport network will cover the Great Yarmouth Borough Council area

3.12 Topography

Topographic information for the study area has been received in the form of LiDAR data from the Environment Agency Geomatics Group at 1m and 2m resolution, respectively. The coverage of both datasets is comprehensive, but there are gaps adjacent to Hopton on Sea and Gorleston in the south of the borough and adjacent to Hemsby, Martham, Ormesby St. Margaret and Winterton on Sea in the north of the borough ([see Figure 7.01 and Figure 7.02](#)).

3.13 Hydrology

Four main rivers bound or flow through the Great Yarmouth Borough Council area. These are the rivers Bure, Thurne, Waveney and Yare; all of which form part of the Broads Rivers Catchment.

Table 3.3 Watercourses

Total Borough Council Area in Broads Rivers Catchment: 17337 ha	
Length of Main River (passing though or adjacent to the Borough that are counted as assets maintained by the Environment Agency): (250m buffer) 60.5 km	
Length of Ordinary Watercourses within Borough as mapped by the EA: 168 km	
Length of IDB Designated Main Drains within Borough where the Broads (2006) has jurisdiction: (only those watercourses that are mapped and reported by the IDB are counted): 102.6 km	

Length of IDB Designated Main Drains within Borough where the Waveney Lower Yare and Lothingland IDB has jurisdiction: (only those watercourses that are mapped and reported by the IDB are counted): **23.2 km**

The Trinity Broads consist of Filby Broad, Lily Broad, Ormesby Little Broad, Ormesby Broad and Rollesby Broad. The Trinity Broads are linked to the River Bure via the Muck Fleet watercourse.

Table 3.4 Drainage Assets

Number of Anglian Water pumping stations within the Borough: **84**

Number of Norfolk County Council Highways pumping stations within the Borough: **4**

Number of Broads (2006) IDB pumping stations within the Borough: **11**

Number of Waveney Lower Yare and Lothingland IDB pumping stations within the Borough: **3**

3.14 Fluvial and Tidal Flood Risk

Although SWMPs do not consider fluvial and tidal flooding to be a source of surface water flooding where the majority of flow is derived from outside the urban catchment, it is useful for this study to have a good understanding of the fluvial and tidal flood risk posed to the SWMP areas.

The Environment Agency flood zone mapping is indicative of flooding from rivers (fluvial flooding) or the sea (tidal flooding).

3.15 Geology

The superficial geology of the Borough consists of glacial sands and gravel and till in the area of East and West Flegg to the north and from Gorleston to Hopton in the south. The river valleys consist of layers of alluvium and some peat. Great Yarmouth is also composed of wind blown sand and man made material.

The superficial geology overlays a bedrock of chalk.

3.2 Information supplied by stakeholder organisations

3.21 Anglian Water

- DG5 Register – properties at risk of flooding from the existing public sewer network from rainfall events less than 1:22 frequency

- Flood report and flood locations from the September 2006 event
- GIS data showing the external, internal and highways flooding from September 2006
- GIS data showing the drainage network including flow controls, storage and pumping stations
- Results from sewer modelling – more detailed model outputs will be available for Stage 2

3.22 Broads (2006) IDB

- IDB area, location and details of main drains and assets

3.23 The Broads Authority

- Broads Authority area

3.24 The Environment Agency

- GIS data showing the Areas Susceptible to Surface Water Flooding
- GIS data showing the Flood Map for Surface Water
- GIS data showing Flood Zones 2 and 3
- GIS data showing watercourses
- GIS data showing the National Receptor Database
- Data on the groundwater levels, rainfall gauging and known pollution incidents will be available for Stage 2

3.25 Great Yarmouth Borough Council

- Reports of flood events dating from 2006
- Landscape Character Assessment 2008
- GIS data showing aerial photography from 2010
- Strategic Housing Land Availability Assessment 2010
- Open Space Study 2011

3.26 Norfolk County Council

- LCLIP flood event data from 2001 – flood events that were reported in the local media
- Reports of highways flooding dating from 2005
- Records of Fire Service call outs to flooding incidents from 2009
- Baseline Report Great Yarmouth Ground Conditions 2005
- Ecological Network Mapping 2007
- Locations of pump installations
- Plans of drainage assets in Bradwell
- GIS data showing gully positions is available for integration in the detailed assessment stage if required

3.27 Waveney, Lower Yare and Lothingland IDB

- IDB area, location and details of main drains and assets

3.28 Other data sources

British Geological Survey

- Geology of the country around Great Yarmouth 1994
- GIS data showing geological and hydrogeological information

Geomatics

- GIS data showing LiDAR information at 1m and 2m resolution

3.3 Potential Development Areas

Great Yarmouth does not have an up to date Local Plan. A new Local Plan is in preparation and the core strategy is likely to be submitted later in 2012. While this means that the allocation of sites has not yet been finalised, much of the evidence that will lead to the allocations has already been progressed.

The Strategic Housing Land Availability Assessment (2010) states:

“108 sites were considered as having ‘development potential’ according to the SHLAA methodology and were subsequently assessed on their suitability, availability and achievability for residential development. Of these, 56 sites were considered to be either deliverable within the first 5 years of the plan or developable within the plan period of 2010 - 2026.

It cannot be assumed that all 56 sites are likely to be developed within the period 2006-2026. Some sites are more suitable for development than others, and some are more likely than others to become available for development. Some sites, whilst being suitable and available, may also be better used for purposes other than residential. However, by way of a ‘snapshot’ of potentially deliverable and developable land in the Borough, in summary, a total of 8414 units could be built between 2010 and 2026, 2627 of which could be within the first 5 years of the plan period (though the effects of the recession mean that this is unlikely to occur).”

Land is likely to be allocated for development in Hemsby, Martham, Great Yarmouth, Cobholm, Gorleston and Bradwell.

At this time it seems likely that in the period 2011 to 2031 Great Yarmouth will seek to deliver at least 5000 dwellings at a rate of 250 per year. Of these, in the region of a thousand houses may be proposed in areas with residual flood risks, behind coastal defences.

3.31 Enterprise Zones

Enterprise Zone status has been awarded to two sites within the Borough of Great Yarmouth at South Denes and Beacon Park.

In order to simplify the planning arrangements in the two areas, the Council has created Local Development Orders at South Denes (and the surrounding industrial area) in Great Yarmouth and at Beacon Park in Gorleston. These have the effect of granting planning permission for certain types of commercial development, subject to complying with specified conditions, without the need to submit a planning application. These will allow “greater permitted development” rights for specified development associated with businesses operating in the Energy, Offshore Engineering and Ports and Logistics sectors. They will also benefit other businesses which either provide a demonstrable supporting role, or facilitate wider economic growth in the area.

In Great Yarmouth, the simplified planning controls contained within the two Local Development Orders apply to 136.6 hectares of land in South Denes (of which 58.8 hectares is designated as an Enterprise Zone) and 16.7 hectares at Beacon Park.

The Beacon Park Local Development Order commenced on 1 April 2012 to align with the start date of the Enterprise Zones and the South Denes Local Development Order on 18 May 2012. Developers will be able to begin construction within the boundaries set by the Local Development Orders without making a planning application, provided it complies with the Local Development Orders.

3.4 Usability of the Data

The data received for use in this study has been taken at face value. No detailed quality checks have been undertaken on data received due to time limitations. Responsibility for the quality of the data remains with the issuing organisations.

Issues relating to sharing data have been documented in [Section 2.3](#).

3.5 Gap Analysis

A list of required data along with information explaining what has been received to date is presented in [Appendix 1.1 Data Request Sheet](#)

Anglian Water is willing to run more detailed models for identified Critical Drainage Areas once they are identified.

Data is expected from the Environment Agency for modelling outputs from the River Bure and tidal flooding, groundwater levels, rainfall data and known pollution incidents.

Small areas of the Borough are not covered by the available LiDAR data at both 1m and 2m resolutions. This may be an issue if alternative data is required for detailed modelling of these areas. [See Figure 7.01 and Figure 7.02](#)

3.6 Identified Areas Vulnerable to Surface Water Flooding

Areas at most risk of surface water flooding have been identified from analysis of the following information:

- Norfolk County Council Preliminary Flood Risk Assessment Report
- Environment Agency Flood Map for Surface Water; and
- Records of anecdotal flooding to households and businesses.

3.61 Norfolk County Council Preliminary Flood Risk Assessment Report

As a result of Norfolk County Councils Preliminary Flood Risk Assessment work Great Yarmouth (including Gorleston and Bradwell) was identified as a priority area where, in an extreme rainfall event (1:100 to 1:200), approximately 7,000 people could be affected by

flooding, along with over 700 non-residential properties and more than 30 critical service locations, (such as schools, utilities services (water/power) and hospitals). Further to this area of concentrated Local Flood Risk several other locations within the Borough were highlighted as areas where further assessment would be valuable. These included; Hopton on Sea, Caister-on-Sea, Winterton-on-Sea, Martham, Hemsby and Ormesby St Margaret.

Table 3.5 Potential local flood risk

County Ranking	Settlement	Potential impact within the Places above the Flood Risk Thresholds
2	Gt. Yarmouth (inc. Gorleston and Bradwell)	Approximately 7,000 people, over 700 non-residential properties and more than 30 critical services
4	Caister on Sea Ormesby St. Margaret Winterton	Up to approximately 800 people, 450 non-residential properties and 10 critical services
5	Martham Hopton on Sea	Up to approximately 70 non-residential properties and 5 critical services

3.62 Environment Agency Flood Map for Surface Water

Analysis of the Flood Map for Surface Water will be available for the commencement of Stage 2.

3.63 Records of anecdotal flooding to households and businesses

Significant flooding occurred in 2006 due to prolonged rainfall. More than 90 properties in Great Yarmouth and Lowestoft were affected. Great Yarmouth railway station was closed and floods also caused one of the pumps at Great Yarmouth Pumping Station to fail (BBC, September 2006).

Other hotspots for surface water flooding over the last 50 years include Southtown around Anson Road, Wolseley Road, Lichfield Road, Mill Road, Bridge Road, Bunns Lane, Ferry Lane and also Northgate Street in Great Yarmouth and the surrounding Roads (Great Yarmouth Mercury, 2008).

Hotspot areas for surface water flooding are also known in the Gorleston area around Quay Road and Riverside road; Hemsby especially on Haycroft Road, Barleycroft Road and Beach Road. Locations in Great Yarmouth include North and South Quay, Marine Parade, Blackfriars Road, North Market Road and Albion Road. There have also been reported incidents of surface water flooding in Caister on Sea along Yarmouth Road and Julian Road.

Further analysis of these areas is required in Stage 2 to identify the likelihood and consequence of surface water flooding in each of these areas and to identify any “quick win” mitigation measures that could be applied. The location and number of identified areas may change in Stage 2. Where funding allows, it is proposed that a small number of these areas, with the highest likelihood and most severe consequences of surface water flooding, are

selected within Stage 2 for more detailed assessment. This could involve integrated sewer/surface water modelling. This is discussed further in [Section 4](#).

4. Suggested Approach for Stage 2: Phases 2 and 3

Stage 2 of the Great Yarmouth Borough SWMP will cover Phases 2, 3 and part of 4 of the DEFRA SWMP phases. Phase 2 is the Risk Assessment and Phase 3 considers the mitigation options.

4.1 Risk Assessment (Phase 2) and Options Appraisal (Phase 3)

In the risk assessment phase (Phase 2), an intermediate assessment will be carried out, followed by a more detailed assessment for areas identified as being particularly vulnerable to surface water flooding.

The intermediate assessment will use information supplied from the data collation undertaken during Phase 1. The historic data collected will be analysed in more detail, and existing results from the Environment Agency surface water flooding model will be analysed in further detail. A preliminary assessment has been undertaken in Phase 1 to assess the areas at greatest risk of surface water flooding using collated information, but further analysis will be needed in Stage 2 to assess the likelihood and consequence of flooding in these areas. This will be achieved by undertaking assessments of each area individually through site visits and discussions with people who have been affected by flooding in these areas in the past. Additionally, discussions will be undertaken with drainage engineers from local councils and Anglian Water, responsible for assets within the areas of concern. A financial assessment on the potential costs to business properties as a result of flooding will also be included. Following this, immediate mitigation measures shall be identified including any “quick wins”. The next step will be to undertake the detailed assessment for a small number of priority areas. For this, a modelling approach may be required if sufficient data exists in the area to warrant modelling. Modelling will only be undertaken if it is deemed the most effective way to use the available funds to achieve the required understanding of flood mechanisms, rather than using other investigative methods. Any modelling undertaken is likely to involve integrated urban drainage modelling. Results will be mapped and communicated to professional stakeholders and the public.

4.2 Suggested Modelling Approach for Detailed Assessment

Detailed assessment will be undertaken for the identified priority areas. Each priority area will be ranked according to the likelihood and consequence of predicted surface water flooding. The ranking of priority areas will be based on historic flood events and an assessment of the Environment Agency's Flood Map for Surface Water. The number of priority areas to be modelled will depend on their size, location throughout the study area, and the availability of data within those areas to inform the modelling. This will be assessed at the end of the intermediate assessment, but it is likely to involve a small number of priority areas. If it is agreed that modelling is the most appropriate use of funds to achieve the required understanding of flooding in these selected areas, the modelling approach is likely to be focused on building an integrated drainage and surface water model for the identified area for a number of return period events (various rainfall intensities and durations) and with various pump failure scenarios. This will allow the sewers, watercourses and overland flow interactions to be represented in an integrated manner. Models will incorporate the affects of flows from ordinary watercourses and the impact of tidal rivers and the sea where applicable. Where funding allows, models will be constructed initially with high level data. These will then be refined, with more detail incorporated for the priority areas.

The options phase (Phase 3) considers a range of mitigation options that will be identified and short-listed for further analysis. Cost-benefit analysis will be used to select the most appropriate local solutions, and where funding allows, these will be taken forward to form the SWMP action plan in Phase 4.

4.3 Implementation and Review (Phase 4)

Phase 4 is about preparing an implementation strategy (i.e. an action plan), delivering the agreed actions and monitoring implementation of these actions. The first step is to develop a coordinated delivery programme. Once the options have been implemented they should be monitored to assess the outcomes and benefits, and the SWMP should be periodically reviewed and updated, where required.

References

1. Surface Water Management Plan Technical Guidance - Defra 2010
2. Flood & Water Management Act 2010
3. Lessons Learnt from the 2007 Summer Floods – Sir Michael Pitt 2008
4. Planning Policy Statement 25 - Development and Flood Risk
5. Norfolk's Earth heritage – valuing our geodiversity – Norfolk Geodiversity Partnership 2010
6. Preliminary Flood Risk Assessment Report – Norfolk County Council 2011
7. Great Yarmouth and Gorleston Strategic Flood Risk Assessment – Capita Symonds 2009
8. [The](#) Strategic Housing Land Availability Assessment - Great Yarmouth Borough Council 2010

Figures

- 1.01 Study Area
- 1.02 Broads Authority Area
- 1.03 Internal Drainage Board Areas
- 2.01 Watercourses
- 2.02 Drainage Network
- 2.03 Drainage Assets
- 3.01 Historic Flooding
- 3.02 Flood Zone 2
- 3.03 Flood Zone 3
- 3.04 Local Flood Risk – Surface Water Mapping from the Norfolk PFRA
- 3.05 PFRA – Grid Analysis
- 4.01 Superficial Geology
- 4.02 Hydrological Drift
- 5.01 Transport Network
- 6.01 Potential Development
- 7.01 Lidar Coverage 1m resolution
- 7.02 Lidar Coverage 2m resolution

Appendices

- 1.1 Data Request Sheet
- 1.2 GYBC SWMP Briefing Note
- 1.3 GYBC SWMP Key Messages
- 1.4 Local Flooding Survey
- 1.5 Flooding – who does what
- 1.6 Press releases
- 1.7 Minutes of steering group meetings
- 1.8 Highway Surface Drainage Lifecycle Management Plan
- 1.9 Contact List