Isle of Wight
Strategic Flood Risk Assessment

June 2010

ISLE of WIGHT COUNCIL

Document Revisions

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Isle of Wight Council

Isle of Wight Strategic Flood Risk Assessment

Isle of Wight Strategic Flood Risk Assessment MK2

June 2010

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Preface and Acknowledgements

Building on Existing Success

This is the second Strategic Flood Risk Assessment carried out for the Isle of Wight. The previous assessment it replaces was published in November 2007 and has been cited in the updated (December 2009) practice guidance to national Planning Policy Statement (PPS) 25, 'Development and Flood Risk', as a case study of good practice.

Rationale for Update

Flood risk to people, property and infrastructure is an area that demonstrates particularly well the changing times we live in. Since the first SFRA was published new data has been released, both at the local level and nationally through UKCP09. This change in baseline data combined with the evolving allocation process associated with the Island Plan (the Isle of Wight LDF) has prompted the need for an update. It should be appreciated that while this assessment can make predictions of flood risk on the Island for the next 100 years, the baseline data on which this is based is a snapshot of the most current information now, but that ultimately will again be superseded and require updating at some point in the future.

What is New in the 2010 Update

Carrying out an update of the SFRA has given the opportunity not only to revise existing sections, but consider new areas that provide additional information. It is hoped that this will aid decision-making where flood risk is a consideration. The new elements of this SFRA include;

- assessing the impacts of wind action and wave spray;
- extreme rainfall modelling and surface water management;
- separate appendices for each settlement identified as part of the spatial strategy for regeneration and growth through the Core Strategy, covering:
    1. sustainability & regeneration objectives;
    2. Assessment of risk posed to revised potential development sites;
    3. impacts of climate change;
    4. flood risk management guidance and support for site specific FRAs.

In contrast to the 2007 SFRA, the 2010 report has separated out the discussion of flood risk and flood risk management relating to the 18 Regeneration and Development Areas (previously referred to as Key Development

Areas), and the Island wide assessments. Appendices E to V now contain location specific information and mapping. It was the Isle of Wight Council's view that this approach would allow for easier dissemination of the SFRA on the Council's web site.

The 2007 SFRA produced two GIS datasets the 'Attribute' and the 'Site Specific' this approach has been rationalised so that just one 'Sites Database' has been produced. The 'Sites Database' contains information which will be useful when evaluating the need for FRAs and in providing an overview of possible land uses.

A partnership approach

The success of the previous SFRA was a reflection of the partnership approach taken, right from the specification of the work to be undertaken, provision of information, to active involvement in the assessments production. This partnership has been built upon for the second assessment and thanks must go to certain individuals in the following organisations without whom the SFRA MkII would not have progressed on from the previous SFRA as much as it has.

- Southern Water Services
- Environment Agency
- Isle of Wight Council
- Entec UK Ltd

Executive Summary

This 2010 SFRA represents a replacement of the 2007 SFRA prepared by Entec for the Isle of Wight. The main changes between the 2007 and 2010 SFRA are discussed in the Preface.

The analysis and reporting prepared for this SFRA has been focused on providing a user friendly planning tool for the Local Planning Authority (LPA) and developers alike. The structure of this SFRA has been built around the hierarchical approach to flood risk management advocated by PPS25. Indeed the assessments undertaken as part of the 2007 SFRA have allowed the LPA to review the potential development sites on the basis of flood risk. There are a significant number of potential development sites which intersect with zones of flood risk. The LPA has already worked towards the first two steps of the management hierarchy, i.e. Assess and Avoid. This SFRA provides further information on the process of avoidance and it provides further detail to inform the later steps of the management hierarchy, those being: Substitute; Control; and Mitigate.

Report Structure

The content of this report is designed to provide an evidence base for the flood risk, drainage and other classifications used to attribute each of the potential development sites with. The report is divided into the following sections:

- Section 1 Introduction and a guide to using the SFRA;
- Section 2 Details the regional and national planning policy context within which the SFRA process sits;
- Section 3 Describes the flood risks on the Isle of Wight;
- Section 4 Summarises the guidance provided in PPS25 with regards to the Environment Agency Flood Zone designations;
- Section 5 Details how climate change has been assessed in the SFRA;
- Section 6 Provides details of an assessment into the impacts of wind action and wave spray;
- Section 7 Discusses the sustainable management of surface water;
- Section 8 Principal of flood risk management through avoidance - the sequential approach to the avoidance of risk;
- Section 9 Principal of flood risk management through design - baseline guidance on flood risk management and safe development;

- Section 10 Assessment and management of flood risk at the Regeneration and Development Area (RDA) scale;
- Section 11 Assessment and management of flood risk at the site specific level and guidance on the need for FRAs and the necessary scope of FRAs.

The Assessment of Flood Risk

The following sections briefly describe the nature of the assessments undertaken in this SFRA:

Fluvial and Tidal Flood Risk

Fluvial and tidal flood risks have been assessed in the most detail in the SFRA because they present by far the greatest flood risk and there exists the greatest amount of available data on these sources of flooding. The Environment Agency fluvial flood zones were used throughout the assessment process. The LPA has taken the view that the tidal flood zones held by the Environment Agency should be superseded with tidal flooding predictions which provide an allowance for climate change. As such the assessment of tidal flood risk at the potential development site level uses the 1 in 200 year flood extent (in the year 2115) to represent tidal flood zone 3 and it utilises the 1 in 1000 year flood extent (in year 2115) to represent tidal flood zone 2. This approach reflects the LPAs determination to achieve sustainable coastal development.

Climate Change

The impacts of climate change on flooding are a serious issue recognised by National Government and this concern is reflected in PPS25. Climate change has been addressed in detail in this SFRA with fluvial sensitivity analysis being undertaken alongside tidal climate change modelling. Flood extents for the 1 in 200 and 1 in 1000 year extreme tide levels have been produced for the following time horizons, 2010, 2045, 2080 and 2115, for the entire coastline. The flood mapping has used the sea level rise predictions provided in PPS25

Surface Water Flooding

The SFRA has simulated the 1 in 100 year storm (plus climate change allowance) in 18 areas on the Island. The results of this assessment are presented at the settlement level discussions presented in Section 10 and in Appendices E to V.

Other Sources of Flooding

The SFRA has not included a review of the role of flood defences as there are no defended Flood Zone 3 locations on the Island. Groundwater flooding presents a potential risk and was reported as being a contributing factor in the flooding experienced in the winter of 2000 and 2001, which coincided with and in many cases caused the river levels to be unusually high. There have not been any reported incidents of where *clear water flooding* i.e. where water issues from the ground and is not connected/associated with a fluvial watercourse. Borehole data or ground water contour mapping has not been reviewed as part of this SFRA.

Regeneration and Development Areas Summary

The Table 1 lists the eighteen Regeneration and Development Areas (RDA). The LPA has classified these areas into 3 distinct groups, these are defined in Table 1.

Table 1 Regeneration and Development Areas Summary

RDA	Key Issues Restricting planning
Key Regeneration Areas	
Ryde	Significant restrictions identified in the tidally influenced area and adjacent to Monks Brook
Newport	All sites adjacent to watercourses have partial restrictions, but no significant areas of restriction. Tidal flooding in the Seaclose area represents a significant restriction to planning
The Bay	Significant restrictions in the north east of the area and in the Culver Parade area
Cowes and East Cowes	Tidal flooding along both sides of the Medina Estuary
Smaller Regeneration Areas	
West Wight	Significant restrictions in the Freshwater area along the banks of the Western Yar
Ventnor	No significant restrictions
Rural Services Centres	
Arreton	Two of the potential development sites are impacted by flood risk zones
Wootton	No significant restrictions
Bembridge	No significant restrictions
Wroxall	Significant restrictions to portions of two sites owing to presence of fluvial flood zones
St Helens	No significant restrictions
Yarmouth	Significant restrictions owing to the large tidal flood zone extents which encircle the town
Godshill	Un-modelled water courses may present risks which FRAs should assess
Brading	No significant restrictions
Brighstone	Fluvial flooding in the Brighstone Brook and Shorewell Stream confluence area
Niton	Un-modelled water courses may present risks which FRAs should assess
Rookley	No significant restrictions
Chale	Un-modelled water courses may present risks which FRAs should assess

List of Acronyms

Acronyms	Definition
ABI	Association of British Insurers
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
CFMP	Catchment Flood Management Plan
DPD	Development Plan Document
ESS	Environmental Stewardship Schemes
FRA	Flood Risk Assessment
GIS	Geographical Information Systems
HOST	Hydrology of Soil Types
IFM	Indicative Flood Map
IfSAR	Infometric Synthetic Aperture Radar
RDA	Regeneration and Development Area
LDD	Local Development Documents
LDF	Local Development Framework
LiDAR	Light Detecting and Ranging
LPA	Local Planning Authority
RFRA	Regional Flood Risk Assessment
RPB	Regional Planning Bodies
SDF	Strategic Development Framework
SEEDA	South East England Development Authority
SFRA	Strategic Flood Risk Assessment
SPR	Surface Percentage Runoff
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
UCS	Urban Capacity Study
UDP	Unitary Development Plan
WFD	Water Framework Directive

Contents

1. Using the SFRA

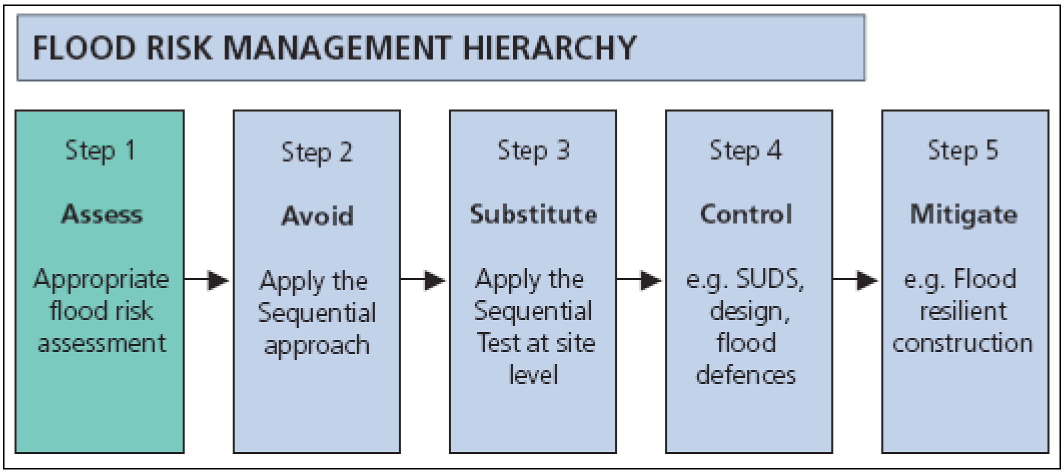
This SFRA has is organised in such a way as to effectively allow the two main user groups (i.e. the Local Planning Authority (LPA) and potential developers), to access flood risk and planning related information. The needs of these two user groups differ. The SFRA aims to provide the LPA with information necessary to apply the PPS25 Sequential Test and so as to inform the spatial planning process, site allocations and the emerging Core Strategy. For developers, the SFRA provides baseline flood risk information for site specific FRAs and it outlines development design standards.

The SFRA report can be divided up into four distinct subject areas:

- Assessment of planning policy and flood risk at the Island wide level
- Principals of flood risk management at the Island wide level
- Flood risk assessment and management at the settlement specific levels
- Further flood risk work, summary and supporting information

This section of the report describes the organisation of the data in the SFRA and it directs readers to the relevant sections and Appendices according to the readers' requirements. Table 1.1 outlines the content and purpose of the SFRA report sections and Sections 1.1 and 1.2 outline how the SFRA meets the differing requirements of the LPA and potential developers.

The Isle of Wight SFRA has been prepared so as to closely follow the flood risk management hierarchy advocated by PPS25, the diagram below illustrates this approach.



Taken from PPS25 Companion Guide December 2009, page 6

1.1 Local Planning Authority

The SFRA provides information to meet three specific LPA objectives:

1 – Informing spatial planning decisions and the Core Strategy

To fulfil this objective the SFRA provides the following:

- Regional and national planning policy frameworks that require the consideration of flood risk in the spatial planning process – (See Section 1)
- The nature and location of the areas of flood risk – (See Sections 3 and 4)
- The potential impact of climate change on flood risk - (See Section 5)
- The extent to which wind action and wave spray are risks to coastal areas – (See Section 6)
- The potential for surface water to be managed through sustainable surface water systems – (See Section 7)
- The principal of flood risk management through avoidance of risk – (See Section 8)
- The principal of flood risk management through development design – (See Section 9)

2 – Flood risk assessment and management at the settlement and site level

- Details of the flood risk and guidance of flood risk management in 14 Regeneration and Development Areas – (See Section 10 and Appendices E to V)

3 – Development management decision making process

- Details of where site specific flood risk assessments are required and guidance on their likely scope – (See Section 11). The flood risk assessment process has been summarised and condensed into a 'Sites Database' which includes all the potential development sites on the Island, Section 1.3 details this database.

1.2 Potential Developers

To meet the requirements of potential developers the SFRA provides an assessment of risk to those sites which the LPA may potentially allocate for development. Each of the potential development sites identified by the LPA has been attributed with all the flood risk information assessed in this SFRA. The flood risk information has been provided to the LPA in a GIS format and site specific information may be available to a potential developer on request. In addition, the SFRA provides guidance on the management of surface water (See Section 7) and makes recommendations on safe development, with regards to flood risk, (See Section 9, 10 and 11).

Table 1.1 SFRA Report Structure

Section Number	Description and purpose
Section 1	Introduction and a guide to using the SFRA
	Island Wide Flood Risk Assessment
Section 2	Details the regional and national planning policy context within which the SFRA process sits.
Section 3	Describes the flood risks on the Isle of Wight
Section 4	Summarises the guidance provided in PPS25 with regards to the Environment Agency Flood Zone designations
Section 5	Details how climate change has been assessed in the SFRA
Section 6	Provides details of an assessment into the impacts of wind action and wave spray
	Principals of Flood Risk Management
Section 7	Discusses the sustainable management of surface water
Section 8	Principal of flood risk management through avoidance - the sequential approach to the avoidance of risk
Section 9	Principal of flood risk management through design - baseline guidance on flood risk management and safe development
	Flood Risk Assessment and Management at the Location Specific Scale
Section 10	Assessment and management of flood risk at the Regeneration and Development Area (RDA) scale
Section 11	Assessment and management of flood risk at the site specific level and guidance on the need for FRAs and the necessary scope of FRAs
	Further Flood Risk Work and Supporting Information
Section 12	Discusses where further more detailed flood risk assessment information may be necessary as part of a Level 2 SFRA or location specific Spatial Planning Document (SPD)
Appendix A	Island wide SFRA mapping
Appendix B	Climate change tidal extent mapping and surface water modelling methodology
Appendix C	Discussion of the datasets used in the SFRA and the GIS layers produced as part of the SFRA
Appendix D	Reproduction of Tables D.1, D.2 and D.3 from Annex D of PPS25
Appendices E – V	The identified flood risks and possible flood risk management techniques in each of the 14 Regeneration and Development Areas (RDAs) are discussed in turn with accompanying location specific mapping. Including, Bembridge, Brading, Brighstone, Cowes and East Cowes, Newport, Ryde, St Helens, The Bay, Ventnor, Wootton, Wroxall, West Wight, Yarmouth, Arreton, Niton, Chale, Rookkley and Godshill
Appendix W	Further information relating to the use of SuDS
Appendix X	Environment Agency Development management guidance on what causes planning application objections

1.3 Interactive GIS Dataset – 'The Planning Tool'

A large amount of site specific information has been collated in this SFRA. The information attached to each of the potential development sites offers much information to inform the scope of future FRAs. The only way of delivering the conclusions of the flood risk and drainage assessments for each of the assessed sites is through the use of a GIS dataset. The SFRA report is supported by a series of digital datasets on a CD-ROM. Key among these is the Sites Database which is detailed in Sections 1.3.1. Through the use of GIS software the Council can interrogate each of the potential development sites and ascertain details of; Flood risks; Climate change implications; Historic flooding and; the drainage assessment.

1.4 Sites Database

One record in the database exists for each of the sites provided by the Council which were derived from the Council's Land Request and Urban Capacity Database. On occasions the database holds just one record for a site comprised of separate land parcels. Thirteen additional fields have been added to the Council's database for the purpose of capturing flood risk information, Table 1.2 provides further details. Owing to changes in the assessment methodology used in the 2010 SFRA update, the number and names of the associated flood risk fields has changed.

It is intended that this database, which can be navigated in a GIS package will represent a key tool in the site allocation process as it provides a complete overview of flood risk for each of the development sites. Each site has been attributed with the percentage area covered by Flood Zones, 3a, 3b, 2 and 1. This classification is provided graphically for each of the 17 Regeneration and Development Areas discussed in Section 10 and Appendices E to V. This information clearly defines which sites are within flood risk areas and which are only partially assessed as being at risk of tidal or fluvial flooding, and as such this data provides a valuable tool to support the application of the Sequential Test. On a site specific level it can be used to inform a risk based approach to landuse planning.

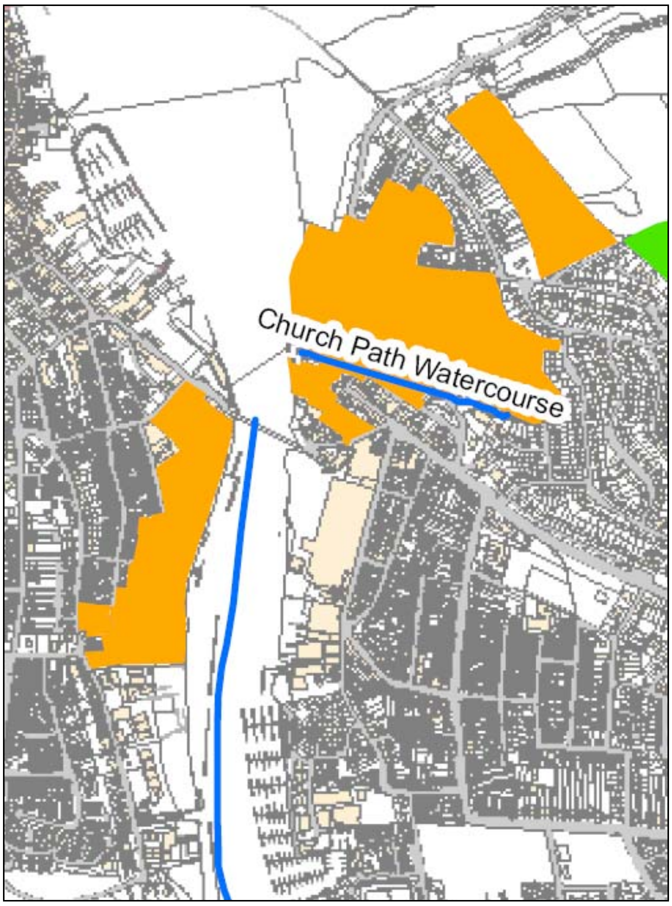
Further information about the attribution process and the data contained within the two Databases can be found in Appendix C.

Table 1.2 Field Descriptions for the Sites Database

Field	Description
All the data fields which were attributed to each of the sites in the 'land_requests24022010.shp'have been retained. The following have been added as additional fields.	
PERC_FZ1	Percentage area of site in Flood Zone 1
PERC_FZ2	Percentage area of site in Flood Zone 2
PERC_FZ3A	Percentage area of site in Flood Zone 3a
PERC_FZ3B	Percentage area of site in Flood Zone 3b
FRA_REQ	Whether or not an FRA is required, based on flood zone location and site size
PROBABILIT	A qualitative assessment of the flood risk posed to each site as defined by PPS25
APP_USES	A basic assessment of the appropriate use of each site as either without restriction or requiring further investigation
HISTORIC	Identifies past historic flooding on the site and lists the month and year of the past flood event
M_Riv_Buff	Whether the site is within 20m of a main river
FLUVIAL_CC	Whether or not a site is likely to be in flood zone 3 in the future as a result of climate change

Figure 1.1 Cowes and East Cowes Example – Site Specific Definition of Flood Risk

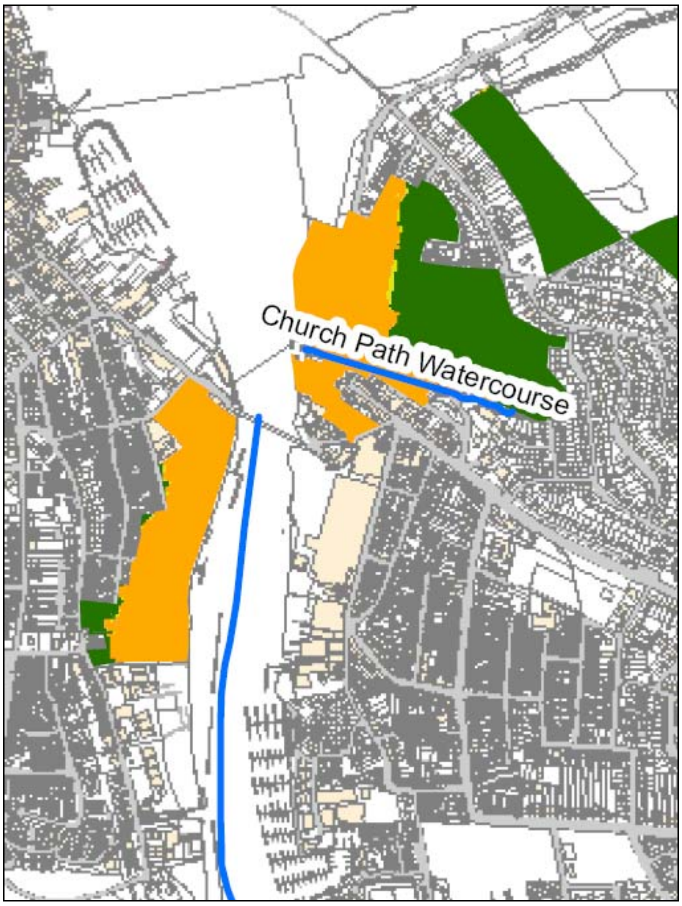
Image 1 - Qualitative Classification



Qualitative Probability

- Highly Likely
- Likely
- Unlikely
- Highly Unlikely

Image 2 - Site Specific Definition of Flood Risk



PPS25 Site Specific Flood Risk Definition

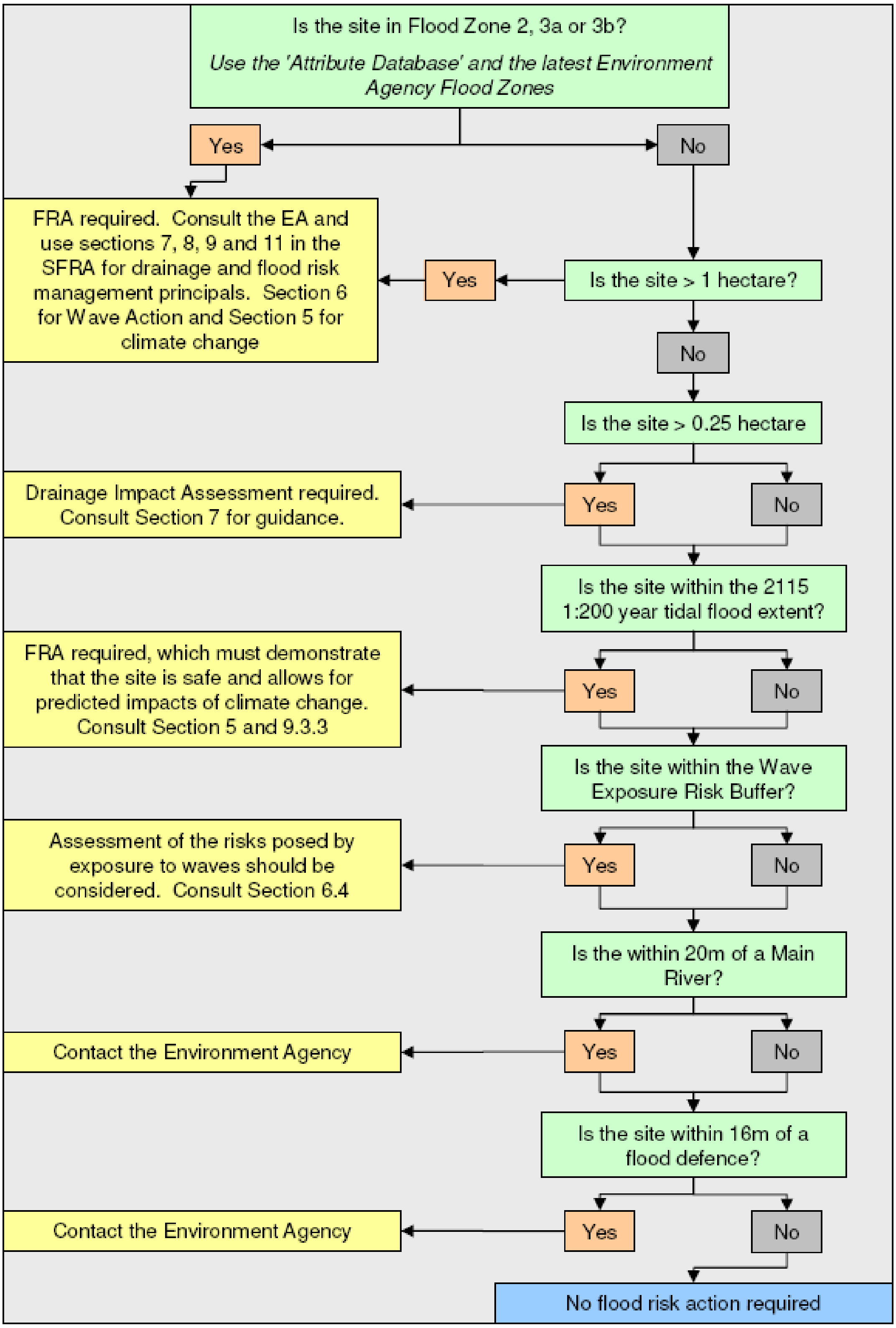
- Functional Floodplain 3b
- Flood Zone 3a
- Flood Zone 2
- No Flood Zone

In Image 1 the sites are attributed with a qualitative flood risk potential based on the highest flood risk zone that the site intersects. In Image 2, the delineation of flood risk across each site has been defined

1.5 How to Use the SFRA – Flow Diagram

To assist developers and Development management Officers alike, a Flow Diagram (Figure 1.2) has been provided which identifies where FRAs are required and other Isle of Wight specific factors trigger the need for further flood risk investigation as part of a planning application. In all instances, it is recommended that in addition to the SFRA the Environment Agency are consulted for guidance on scope and to ensure that the latest information is being used in site specific work.

Figure 1.2 Using the SFRA Flow Diagram



2. Planning Policy and Flood Risk

2.1 Introduction

This Strategic Flood Risk Assessment (SFRA) has been undertaken to assess flood risks on the Isle of Wight, and in particular the flood risks associated with areas being considered for future development as part of the emerging Local Development Framework (LDF). National planning legislation and policy guidance have been considered throughout the SFRA.

Planning process is driven by legislation and guidance developed at a national, regional and local level. Flood risk is just one of many factors to consider when making decisions relating to land use. The challenge for a SFRA is to develop pragmatic principles for steering future sustainable development without conflicting with the requirements of the different planning policies. The '*Making Space for Water*' report published by Defra (2005), identifies the severe flooding experience by mainland Europe in 2000 as being one of the catalysts for the Government to show an increased interest in flood risk management. This, in combination with recent high-profile flood events across the United Kingdom, has kept flood risk in the public eye and makes the need for effective consideration of flood risk in the planning process even more important

2.2 National Planning Policy

The SFRA has taken place in a period during which planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004 and accompanying planning guidance, including PPS 1 (*Planning Policy Statement 1- Delivering Sustainable Development*) and PPS 12 (*Planning Policy Statement - Local Development Frameworks*). These affect all tiers of the planning system and have necessitated major changes at both the regional and local level which will impact on the way in which planned development is reflected in the regional strategy and delivered locally.

The Government has set in motion changes to the planning policy process, which will see the Unitary Development Plan (UDP) replaced by a Local Development Framework (LDF). The LDF is comprised of a framework of documents including the Core Strategy, Development Plan Documents (DPDs), Site Specific Policies and Proposal Maps, Statements of Community Involvement and Supplementary Planning Documents. This will provide further local detail in addition to the Island-wide strategic nature of the Core Strategy.

The documents forming the LDF will set out the Council's planning policies and proposals for meeting the community's economic and environmental needs in terms of spatial land use. The Planning and Compulsory Purchase Act 2004 requires the Isle of Wight Council to prepare a LDF to supersede the current UDP.

2.2.1 Planning Policy Statement 25: Development and Flood Risk

This SFRA has been undertaken in accordance with the guidance provided in Planning Policy Statement 25 – Development and Flood Risk (PPS25) and its accompanying Practice Guide (*Development and Flood Risk – A Practice Guide Companion to PPS25 "Living Draft*). Box 1 Presents a Summary of the guidance presented in PPS25.

Box 1 Summary of Guidance in PPS25

PPS25 Objectives

Through PPS25, the Government has sought to provide clarity on what is required at a regional and local level to ensure that appropriate and timely decisions are made to deliver sustainable planning for development. The key planning objectives as stated in PPS25 are that:

"Regional Planning Bodies (RPBs) and LPAs should prepare and implement planning strategies that help to deliver sustainable development by:

- APPRAISING RISK

Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;

Preparing Regional Flood Risk Assessments (RFRAs) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal of their plans;

- MANAGING RISK

Framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;

Only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;

- REDUCING RISK

Safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences;

Reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SuDS);

Using opportunities offered by new development to reduce flood risk to reduce the causes and impacts of flooding e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SuDS; re-creating functional floodplain; and setting back defences;

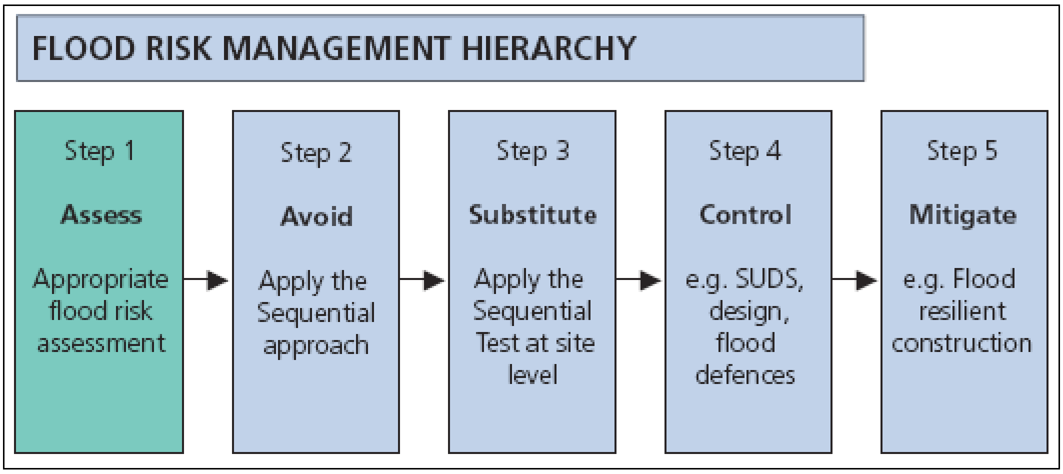
- A PARTNERSHIP APPROACH

Working effectively with the Environment Agency and other stakeholders to ensure that best use is made of their expertise and information so that decisions on planning applications can be delivered expeditiously; and Ensuring spatial planning supports flood risk management and emergency planning.

All forms of flooding and their impact on the natural and built environment are material planning considerations. PPS25 requires flood risk to be taken into account at all the stages of the planning process to avoid inappropriate development. This means following the hierarchy presented below, whilst at the same time taking account of:

- The nature of flood risk;
- The spatial distribution of flood risks;
- Climate change; and

- The degree of vulnerability of different types of development.



Taken from PPS25 Companion Guide December 2009, page 6

Figure 2.1 (taken from PPS25 Companion Guide) summarises how the spatial planning process should achieve the spatial planning approaches advocated by PPS25 which can assist with the strategic management of flood risk, whilst realising the opportunities to improve the quality of the built and natural Environment. Figure 2.2 identifies other strategic planning documents prepared by flood and coastal defence operating authorities and it details who is responsible for producing the key documents required to manage flood risk through each stage of the spatial planning process.

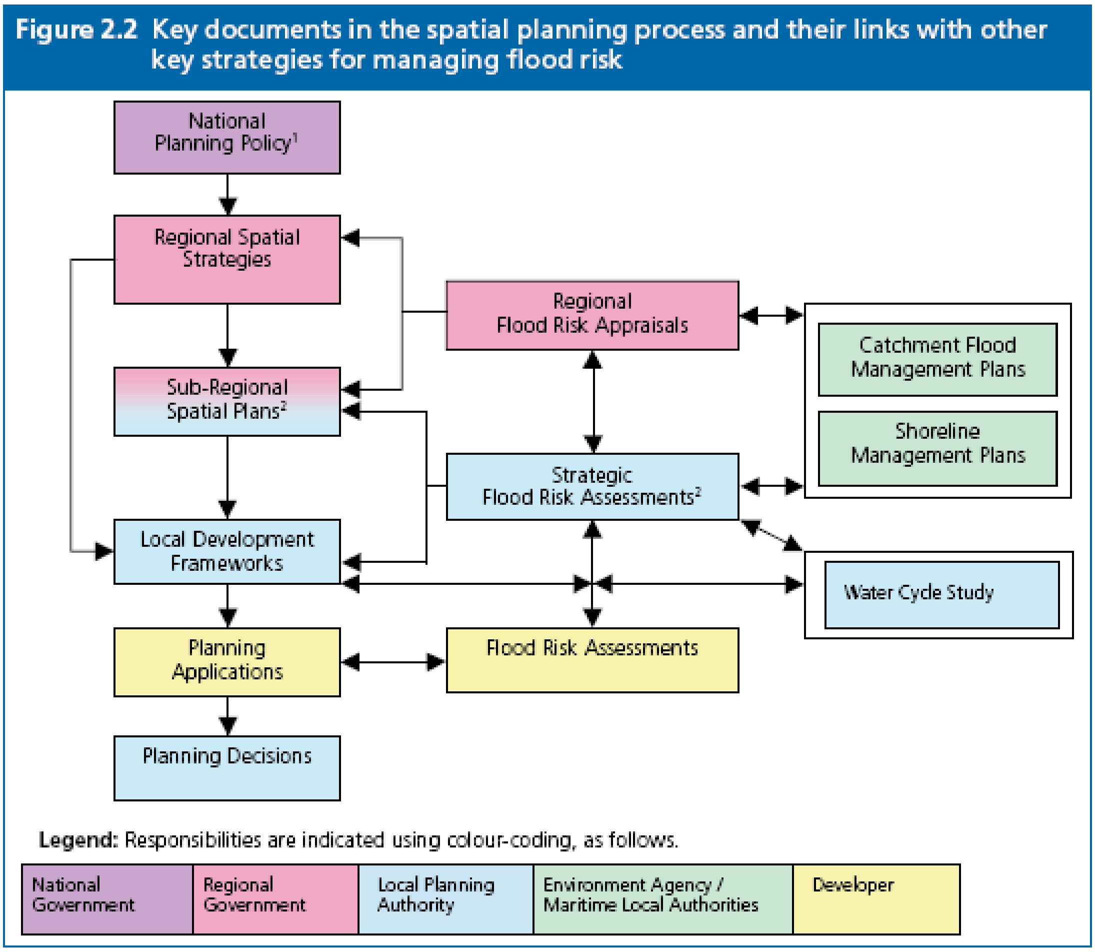
Figure 2.1 Strategic Management of Flood Risk through the Spatial Planning Process

Figure 2.1 Overview of how the spatial planning process can manage flood risk strategically

Flood Risk Management Stage	What it means	How the planning system deals with it	Who is responsible
Assess	Undertake studies to collect data at the appropriate scale and level of detail to understand what the flood risk is.	Regional Flood Risk Appraisals, Strategic Flood Risk Assessments, Flood Risk Assessments and application of the sequential approach.	Planning bodies and developers.
Avoidance/ Prevention	Allocate developments to areas of least flood risk and apportion development types vulnerable to the impact of flooding to areas of least risk.	Use the Sequential approach (including the Sequential Test and Exception Test where relevant) to locate development in appropriate locations.	Planning bodies and developers.
Substitution	Substitute less vulnerable development types for those incompatible with the degree of flood risk.	At the plan level, the Sustainability Appraisal should show how flood risk has been weighted against other sustainability criteria.	Planning bodies and developers.
Control	Implement flood risk management measures to reduce the impact of new development on flood frequency and use appropriate design.	Use River Basin Management Plans, Catchment Flood Management Plans, Shoreline Management Plans, Surface Water Management Plans, Flood Risk Management Strategies, appraisal, design and implementation of flood defences.	Planning bodies, Environment Agency and other flood and coastal defence operating authorities, developers and sewerage undertakers. Developers are responsible for design of new developments.
Mitigation	Implement measures to mitigate residual risks.	Flood risk assessments. Incorporating flood resistance and resilience measures. Emergency Planning Documents. Implementation of flood warning and evacuation procedures.	Planning bodies, emergency planners, developers, the Environment Agency, other flood and coastal defence operating authorities and sewerage undertakers.

Taken from PPS25 Companion Guide December 2009, page 7

Figure 2.2 Key Documents in the Spatial Planning Process



Notes

1 Including Planning Policy Statement 25 '*Development and Flood Risk*' and the other flooding-related national planning policies listed in Appendix A of this Practice Guide.

2 Strategic Flood Risk Assessments may cover more than one local planning authority (LPA). The adoption of a catchment-based approach by a number of LPAs working in partnership could be highly beneficial and is strongly recommended as a means of looking strategically at flood risk issues across local authority boundaries.

3 This diagram has been developed from the original within *Flood Risk Assessment Guidance for New Development Phase 2 R&D technical report FD2320/TR2* (Defra and Environment Agency, 2005).

Taken from PPS25 Companion Guide December 2009, page 9

Links to the some of the key documents listed in Figure 2.2 are provided below.

- SMP http://www.coastalwight.gov.uk/smp/projects.htm
- CFMP http://publications.environment-agency.gov.uk/pdf/GESO1008BOWB-e-e.pdf
- South East Plan http://www.southeast-ra.gov.uk/seplan.html

2.2.2 PPS25 and Local Planning Authorities

PPS25 specifies that LPAs should adopt a risk-based approach to planned development through the application of a Sequential Test. This sequential process relates to the steering of new developments towards areas of lowest flood risk. PPS25 also sets out the need to consider other sources of flood risk (such as groundwater, overland flow and sewer) in addition to the main fluvial and tidal sources. The implications of climate change on flood risk are also required to be considered in the interest of sustainable development.

PPS25 introduces the Exception Test which allows some scope for departures from the sequential approach where it is necessary to meet the wider aims of sustainable development. The criteria for exception include where the development makes a positive contribution to sustainable communities or redevelopment of brownfield land. Exceptions can be permitted where it can be demonstrated that the residual flood risks are acceptable and satisfactorily managed.

The Town and Country Planning (Flooding) (England) Direction 2006 has made the Environment Agency a Statutory Consultee on all applications for development in flood risk areas, including areas with critical drainage problems and for developments exceeding 1 hectare outside of flood risk areas. After discussion with the Agency LPAs are required to notify the Secretary of State if they remain minded to approve a planning application contrary to a sustained objection from the Environment Agency.

2.2.3 Planning Policy Statement 1: Delivering Sustainable Development

Published in February 2005, this document sets out the overarching planning policies for the delivery of sustainable development across the planning system. PPS 1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk of flooding should be avoided. Planning authorities are also advised to ensure that developments are sustainable, durable and adaptable. This should be achieved through taking into account natural hazards such as flooding.

PPS 1 also places an emphasis on *spatial planning* in contrast to the more rigid *land use planning* approach which it supersedes. LPAs will still produce site-specific allocations and a proposals map as part of Local Development Documents (LDDs). The Core Strategies will be more strategic and visionary in content and will take into account the desirability of achieving integrated and mixed use development, whilst considering a broader range of community needs than has historically been the case. It will be important for the Core Strategies and accompanying supplementary planning documents, to recognise the contribution that non-structural measures can make to effective flood management.

2.3 Local and Regional Planning Policy

South East Plan (2006)

Identifies the economic base of the Island has been undergoing change over recent years resulting in employment decline in agricultural and related industries. This process has contributed to higher than UK average unemployment rates and over a quarter of the Island's population receiving means tested benefits. Along side this low employment the housing shortage issue is exacerbated by a high proportion of houses on the Island being owned as second homes. The South East Plan states that future development is expected to create wealth and a sustainable economy to address skills deficits, housing needs, provide improved public transport and to safeguard the landscape and biodiversity.

Future Housing on the Isle of Wight

In the years up to 2020 and beyond, the Isle of Wight is set to change. The Council are responding to the housing requirements of the emerging Regional Spatial Strategy (the South East Plan) which indicate an annual construction of 520 houses on the Island. This number is proposed to provide for housing to meet economic growth, an amount of marketable housing and a housing supply stock to meet local affordable needs. However, the scale of the need for affordable housing on the Island is estimated to exceed the total planned annual provision and the South East Plan notes that the figure is more likely to be in the order of 1,260 per annum. This will contribute towards the annual average of 28,900 new dwellings required to be developed across the South East region between 2006 and 2026.

The Isle of Wight Council, as part of the Core Strategy, has undertaken a Strategic Housing Land Availability Study. This was not intended to undertake the role of DPDs. Rather, it was to identify land without making a judgement on suitability for development. The role of the Core Strategy is not to allocate sites for housing or any other type of development, rather it is to identify broad areas or types of suitable land for development. The South East Plan indicates that the range, type and distribution of housing required will be developed through the LDF. Housing linked to employment will be concentrated, the South East Plan states, in the main urban areas of Cowes, Newport, Ryde, Sandown and Shanklin.

PPS3 (*Planning Policy Statement 3*) sets out a new approach for housing including the identification of sufficient land for the plan period of fifteen years, ensuring that the first five years are allocated and developable and that a five year supply is maintained as sites are developed out.

Urban Capacity Study (2005)

A total of nine Large Capacity Sites (over 1 hectare) have been identified, totalling 22.24 hectares of land. The Urban Capacity Study (UCS) notes that current trends show large housing sites are being developed at densities of approximately 40 dwellings per hectare (dph). The UCS makes the assumption of a minimum density of 30 dph and a maximum density of 50dph. PPG3 refers to densities of between 30 and 50 as being appropriate development standards, depending upon the nature of the area of development.

The Council will seek to provide greater intensity of development at places with good public transport accessibility, such as towns or local centres and along good quality public transport corridors. The Council is exploring the possibilities of rural exception sites and the requirement to meet affordable housing needs in the rural areas of the Island.

Windfall Sites are less than 1 hectare and total just over 1300 sites which amount to 216 hectares. The average size of the plots was 0.15ha. The UCS assumes that the majority of these sites will only yield one dwelling. It was concluded that small windfall sites make up the largest proportion of capacity on the Island.

Over 50% of the Island is designated as Area of Outstanding Natural Beauty (AONB), and the requirements of the associated management plan are an important factor when considering development within the national designation.

2.4 Pitt Review

In response to widespread and severe flooding in the UK during the summer of 2007, the Government commissioned an independent review on the lessons to be learned. The Pitt Review was comprehensive and considered all stages of flooding - preparedness, response and recovery - as well as the coordination, responsibilities, and legislation necessary to ensure the United Kingdom can advance in the area of flood risk management. A total of 92 recommendations were made. Amongst other recommendations the Review emphasised the need to consider surface water flooding in more detail, and recommended that local authorities should take the lead in managing local flood risk. The basis for this should be through a Surface Water Management Plan.

2.5 Floods Directive - The Flood Risk Regulations 2009

The information in Section 2.5 has been sourced from the www.lga.gov.uk

The Flood Risk Regulations 2009 came into force on the10th December 2009, transposing the European Floods Directive into domestic law. Defra and the CLG will be writing to all authorities in 2010 to explain the roles and responsibilities of the lead local flood authorities. The Environment Agency will also issue detailed guidance in due course.

In essence the Regulations require the Environment Agency to prepare flood risk assessments, maps and plans for the sea, main river and reservoir flood risk and will require lead local flood authorities (unitary and county councils) to do the same for all other forms of flooding (except sewer flooding that is not caused by rainfall).

A preliminary flood risk assessment must be prepared before 22nd December 2011 and used to determine areas of potential significant flood risk. Maps must then be prepared for these significant flood risk areas before 22nd December 2013 and flood risk management plans prepared before 2015. Lead Local Authorities will need to submit their work to the Environment Agency six months in advance to allow collation and reporting to the Commission.

Where possible, the lead local authority should make use of existing work, such as SFRAs and Surface Water Management Plans SWMP.

2.6 Flood and Water Management Bill 2010

The information provided in this section has been sourced from http://services.parliament.uk/bills/2009-10/floodandwatermanagement.html

The Flood and Water Management Bill received Royal Ascent on the 08th April 20110 and is now an Act of Parliament. The Bill responds to recent pressure to introduce legislation to address the threat of flooding and water scarcity, both of which are predicted to increase with climate change.

Key areas

- requires the Environment Agency to create a National Flood and Coastal Erosion Risk Management Strategy, which a number of organisations will have to follow
- requires leading local flood authorities to create local flood risk management strategies
- enables the Environment Agency and local authorities more easily to carry out flood risk management works
- introduces a more risk-based approach to reservoir management
- changes the arrangements that would apply should a water company go into administration
- enables water companies more easily to control non-essential uses of water, such as the use of hosepipes
- enables water companies to offer concessions to community groups for surface water drainage charges
- requires the use of sustainable drainage systems in certain new developments
- introduces a mandatory building standard for sewers

3. Overview of Flood Risks

The SFRA must define the zones of flood risk so as to be able to appropriately inform the development site allocation process and thus meet the wider objectives of the emerging Island Plan. The two primary sources of flooding on the Island are fluvial and tidal. The greatest amount of data also exists for these two sources. Flooding from groundwater is considered to be less significant and more localised and are dealt with in less detail which is proportionate to the amount of available data on this source. Moreover, there is a degree of overlap between groundwater and fluvial flooding as high river levels in the winter months are often a product of high groundwater levels. 'Clear water flooding' where ground water issues at the surface independently of a fluvial water body is rare. The 2010 SFRA update, includes the simulation of the 1 in 100 year (plus climate change allowance) pluvial flood risks in the 14 Regeneration and Development Areas (See Section 3.7 and 10 for further details)

3.1 Fluvial Flooding

When a river's discharge exceeds the capacity of the channel, out of bank flow occurs and the river's floodplain is inundated. Flooding is an important ecological and geomorphological process. Over centuries man's relationship with the floodplain has changed. It has evolved from one where the seasonal inundation and formation of transient wetlands instigated cyclic shifts in land use and agricultural practice. This relationship has evolved into one of constant struggle to control the forces of nature in order to make way for more sedentary and permanent uses of our rivers' floodplains. This shift in floodplain use has necessitated the need to develop an understanding of the floodplain dynamics and flood risks. The implementation of measures to avoid flood risk is currently superseding the older more reactive approaches to flood management which tended towards defending against an identified risk.

The majority of watercourses are in the northern half of the Island and discharge in to the Solent. The Isle of Wight's largest river is the Eastern Yar and this discharges in to the Solent at Bembridge. A history of flooding is well documented along the lower reaches of this watercourse, the most recent significant events being during the autumn of 2000. Figure 4 (Appendix A) depicts the main rivers on the Isle of Wight and illustrates how the majority of them flow in a northerly direction. As a result of this drainage pattern, which is a function of the underlying geology, the main estuarine environments are on the northern shores of the Island, with the exception of the Eastern Yar Estuary.

The causes of flooding in the main catchments are being assessed by the Isle of Wight CFMP, the findings of the scoping report are outlined in Table 3.1.

Table 3.1 Causes of Flooding for Each of the Rivers in the Catchment

Location	Key Issues of Flooding
Eastern Yar	• Rainfall runoff events leading to surface water flooding • Structure blockages impeding drainage in the upper catchment • High groundwater levels imposing a high baseflow on the river • Overbank flooding as a result of insufficient channel capacity • Lower catchment is reclaimed and from the sea and land is below high tide level • Tide locked sluice • Surge Tide overtopping
River Medina	• Tidal flooding • Problems with intervention in the channel impeding free drainage • High water levels in the Lukely Brook tributary • Flashy response to storm events reported for in Merstone Brook
Western Yar	• Very flashy catchment with rapid response to Rainfall • River flooding unable to drain • Tide locking
Gurnard Luck	• Tide Locking
Monkton Mead Brook	• Flashy urban catchment • Tides flap and supporting pumping during high flow • Sewer Flooding

The Source of this data is the 'Isle of Wight Catchment Flood Management Plan Scoping Report' (February 2007)

3.1.1 Historic Flooding

The CFMP Scoping Report for the Isle of Wight notes that prior to 2000 there are a limited number of records of fluvial flooding on the Island. Events affecting more than 10 properties appear to be fairly low, with the exception of Ryde which has a long history of flooding dating back over 100 years.

The Table 3.2 summarises the main areas of flood risk, the information is taken from the '*CFMP Scoping Report*' (February 2007)

Table 3.2 Key Flood Risk Locations on the Isle of Wight based on 2000/01 Flooding Event

Watercourse	Location	Cause	Properties Impacted	Previous recorded incidents
Monkton Mead Brook	Ryde	Pump failure / drainage	20, 74	1914, 1662, 1971, 1974, 1975, 1989, 1993, 1999
River Medina	Newport	Fluvial, drainage, tide locking	8	1934, 1951, 1960/61 (150 properties), 1993, 1999
Western Yar	Freshwater	Extreme rainfall, drainage	1	1954, 1968, 1999 (45 properties)
Eastern Yar	Small numbers at several locations	Drainage, fluvial	Less than 10 at 11 locations	1934, 1954, 1960

The Source of this data is the 'Isle of Wight Catchment Flood Management Plan Scoping Report' (February 2007)

Autumn 2000 Flood Event

The main cause of flooding was the prolonged rainfall in the months of September to November 2000. This had the effect of raising and maintaining high groundwater and river water levels. Once saturated, the watercourses are considered 'flashy' in that they respond quickly to intense rainfall events with levels and flow rates rising and falling quickly. The result is short term flooding at times of peak rainfall. Other factors which the '*Isle of Wight Autumn 2000 Flood Investigation – Consultation Report*' (January 2002) identified as being significant factors in the Autumn 2000 floods included:

- The geomorphology and geology resulting in high groundwater levels and high levels of ground saturation.
- Inappropriate historic development in the floodplains.
- Insufficient drainage capacity and maintenance causing water to back up and flood property.
- Highway drains being blocked or where flows were in excess of drainage capacity; and
- A history of changes in water resource management and budgetary constraints

The Consultation report included an assessment of the return period for the October/November flooding of 2000 as being in the order of 1 in 20 years.

The information below, on individual settlements, has been obtained from the '*Flood Event – Final Report 24th December to 26th December 1999*' (September 2000). The number of properties flooded has been derived from questionnaires returned at the time of the event.

Gurnard

Gurnard Luck became tide locked and the increased river Levels caused five properties to be flooded. In Newport four properties were flooded from a main river and one was flooded by an ordinary watercourse. The tidal high water coincided with the rising river levels and when the two levels matched the tidal flaps closed and thus tide-locked the river. This caused the river levels to rapidly rise a further 300mm. Marsh Road was reported to have been covered by about 400mm of water.

Cowes

Cowes experienced some tidal flooding during December 1999, one property was reported as being flooded inside and a further six were flooded outside. Tidal flooding was abated by a sand bag wall constructed by Environment Agency contractors and by a change in the wind direction which reduced wave action.

Newport

An engineering team had been deployed since early in the morning of the 24th December to ensure that the three trash screens on the Lukely Brook were regularly cleared during the day. Lukely Brook responded rapidly to the heavy rainfall and levels soon rose to a dangerous level for workmen to clear the trash screens. Consequently, four properties were flooded from the main river and one was flooded from an ordinary watercourse.

Ryde

Ryde was identified as being the settlement which sustained the most severe damage during the 2000 floods. Investigations on Monkton Mead Brook have previously been carried out as there has been a history of regular flooding problems. Many of the properties were flooded from sewers being overwhelmed and because high water levels in the brook prevented free discharge of storm drains. The high river flow coincided with the high tide locking the Brook. One of the pumps which are designed to help alleviate the tide locking suffered a brief failure but was quickly returned to operation. Around seventy houses were flooded by the high groundwater and combined sewers overflowing. Basement flooding was a key issue.

Seaview

Flooding started around midnight on 24th December and lasted for around three to four days. The flooding was the product of two factors: high tide waters flooding over the sea wall; and flooding of the salt lake to the rear of the town due to poor drainage.

3.1.2 Impact of Tide Locking River Discharge

The tide can have a direct impact on fluvial flooding. If high fluvial discharges coincide with mean high water in a river's estuary then discharge from the river is inhibited. Effectively, a high tide raises the downstream boundary of the river and when this occurs the fluvial waters are forced to back up and, depending on the discharge, spill out over the floodplain. The problem of tide locking river discharge is one that is frequently cited in the CFMP

Scoping Study (February 2007) as being a key flooding concern. The tide locking of Monkton Mead Brook in Ryde caused some of the worst flooding on the Island during the 2000 flooding event.

3.1.3 Residual Risk

The CFMP Scoping Report identifies the greatest part of the Environment Agency's major flood defence work on the Island is on the tidal reaches of the rivers. The CFMP highlights the following alleviation schemes:

- The Schoolgreen area of Freshwater on the Western Yar;
- A 4km stretch of the River Medina through Newport;
- Lukely Brook between Towngate Bridge and Westminster Mill;
- A flood storage area in the centre of Newport; and
- The tributaries of the Lukely Brook, Gunville and Merstone Streams, include lined sections of channel, velocity weirs and culverts

The '*CFMP scoping Study*' (February 2007) notes that in 2001 the Environment Agency installed a new scheme at Ryde to more effectively release floodwaters into the sea. This was achieved by extending the concrete outfall pipes and by installing two new high capacity pumps. The report states that current flood risk management for the Island has included improvements in flood forecasting. Forecasting on the Western Yar, is said to have been historically difficult due to the fast response times of the series of relatively small sub catchments. The Environment Agency has developed a new flood forecasting model in 2006 to improve the warning time that can be provided.

No flood defences have been identified on the Island which offer protection from the 1 in 100 year event or greater. As such there are no areas benefiting from defences to the level required by PPS25 in order to be of material planning concern and therefore no areas of Flood Zone 3 are considered to be at residual risk.

3.2 Tidal Flooding

3.2.1 Meteorologically Induced Extreme Sea Levels

Meteorologically induced extreme sea levels is the term used to describe the phenomena of deep low pressure weather systems causing the surface of the sea beneath the centre of the depression to dome upwards. The sea surface is raised because the centre of the deep low pressure system is applying less downward force on the sea surface than is being applied by the atmosphere outside the low pressure system. This *dome* of water advances with the progression of the storm and when the storm makes landfall so does the dome of water or 'storm surge'. If meteorological conditions coincide with astronomically controlled flood tides then the resultant water level can be even higher and thus the flooding can be even more extensive. One of the most notable examples of this type of flooding to have been recorded in the UK was the 1953 event which caused destruction along the coasts of Norfolk, Essex and in the Thames Estuary.

3.2.2 Residual Risk

Figure 17 in Appendix A illustrates where the SMP2 has identified flood defence structures. The SFRA has not quantified the areas benefiting from these defences nor has it modelled the consequence of flood defence failure. No coastal defences have been identified which offer protection from the 1 in 200 year tide level. PPS25 therefore considers there to be no areas of defended Flood Zone 3. Nonetheless any area behind a flood defence structure is in a zone of residual risk in the event of failure. Failure of flood defences can either be structural or by exceedance of the design standard.

When preparing a FRAs in coastal areas the role of flood defences and the impact of their failure should be included if the developer is seeking to place floor levels below the predicted 1 in 200 year tide level plus an appropriate freeboard allowance. Flood defence locations can be obtained as part of a data request to the Environment Agency External Relations team. Further details on preparing FRAs in areas where there are flood defences can be found in Sections 3.63 and 3.64 of the PPS25 Practice Guide Companion.

3.3 Groundwater Flooding

Groundwater flooding on the Isle of Wight is not considered by the Environment Agency as a significant issue and for the purposes of this SFRA, a summary of the available information has been agreed to be all that is required.

The ability of surface water to be absorbed is a function of the permeability of the soils and superficial geology deposits and of the porosity of the solid geology. Chalk and limestone are generally considered to be highly permeable and no flooding is reported to have occurred in the chalk areas, except along the spring line at the boundary between the chalk base and clay formations.

The 2002 Consultation Report into the Autumn 2000 floods states that in some cases it may not so much be groundwater causing the flooding, as impermeable bedrock restricting the infiltration of rain and thus leading to high rates of surface run-off. The following were identified in the Consultation Report as being the areas of geological formations noted on the Island as being flood affected. Figure 1 (Appendix A) broadly represents the major geological formations on the Island.

Wealden Beds

The Wealden beds are composed of two series, Marls and Shales. Both of which have very low permeability. The low permeability is a function of the rock being formed from fine particles of slit and mud. As such these beds present a barrier to the passage of groundwater, fractures within the lithology represent the only routes for the percolation of groundwater. The Wealden beds can be found in the Atherfield and Sandown areas

Lower Greensand

The Lower Greensand beds are composed of a series of sands and clay strata of varying thicknesses and permeabilities. Owing to these variations and discontinuities in the underlying rock, the formation's groundwater response to Vainfall events is characteristically non uniform. The Consultation report concluded that it is not possible to predict groundwater levels for any location without further investigation. Although, where the Carstone and Sandrock beds are know aquifer bearing rocks. The Carstone formations can be found in the Allens, Redhill Lane and Sandford areas and the Sandrock beds are found at Newport, Whitwell and Stonebrook.

Upper Greensand with Chert layers

The permeability of this structure is dependant on the level of cementation between the composite grains. The formation is permeable and is noted as being one of the most important aquifer baring rocks on the Island as the sandstone is underlain with thick blue Gault clay which acts as an impermeable barrier and it creates a spring line. The Upper greensand has been identified in the Niton, Shorewell and Whitwell areas of the Island.

Osborne and Headon Beds

The Osborne and Headon Beds are a series of sands, silts, clays and marls with some limestone bands. The presence of low permeability clays and marls reduce the permeability of the sands within which they are inter-bedded. Groundwater has been known to rise to the surface at the old railway works in Newport. In order to ascertain the proportion of flooding attributable to groundwater, the Consultation report recommends the need for more detailed site specific information. Freshwater and Brading have been listed by the Consultation report as areas on the Island where the Osborne and Headon beds are located.

Bembridge Marls

The Bembridge Marls, which are present at Gurnard, Bembridge, Seaview and Wootton Bridge, are impermeable lagoon and freshwater blue and green clays.

Hamstead beds

Across a large part of the north of the Island lie the Hamstead Beds, they are composed of clays, loams, sands and shales. The permeability is thus highly variable, with the sand deposits being the most water bearing of the composite units. More detailed information at a site specific level is said to be necessary by the Consultation report in order to determine the proportion of the flooding attributed to groundwater.

3.4 Runoff Potential

An Island wide assessment of runoff potential was undertaken so that each potential development site could be attributed with a qualitative likely runoff potential. The SFRA sought to establish a preliminary categorisation of runoff potential to inform subsequent site specific FRA's and to indicate where surface water flooding may be considered to be more likely. At the strategic level a simplified qualitative assessment was considered appropriate as any subsequent FRA's will have to provide drainage assessments.

The runoff potential categorisation was based upon *SPR_HOST* (the standard percentage runoff, derived from hydrology of soil types classification – as defined by The Flood Estimation Handbook 1999). HOST values for the Island were defined by a national soils map made available for use in the SFRA by the Environment Agency. This map divides the UK into a 1km x 1km vector grid of 29 HOST classes. This dataset shows the dominant HOST class for each 1km square, and is a reproduction of the HOST dataset used by the Flood Estimation Handbook (FEH, 1999). However, it must be noted that the soil classifications in the HOST dataset do not necessarily match up, in all instances, with the Groundwater Vulnerability.

SPR_HOST values can be assumed to be approximately equal to the greenfield runoff resulting from the rainfall falling onto a greenfield site (Kellagher, 2004). Thus, they only provide a baseline indication of the percentage runoff, and do not necessarily represent developed or brownfield sites accurately. It should also be noted, that the HOST dataset is a coarse representation of reality, with uniform 1km grids that indicate the dominant HOST values for each cell. It is therefore intended for the runoff potential classification to be used as an indicator and not a definitive assessment. Where necessary, specific site analysis will be undertaken to refine the calculations.

The Isle of Wight has nine unique HOST classes, and seven corresponding and unique SPR_HOST. Figure 16 in Appendix A shows an Island wide distribution of HOST values. Each of the potential development sites in the Attribution Database have been attributed with a potential runoff classification of very low, low, medium, high or very high. The SPR_HOST qualitative classifications are presented in Table 3.3**.**

Table 3.3 SPR_HOST qualitative classifications

SPR_HOST	Qualitative Runoff Potential Classification
-999	Unknown
0.02	Very Low
0.145	Low
0.253; 0.292	Medium
0.472; 0.496	High
0.6	Very High

3.5 Surface Water Flooding

Site specific FRA's should consider the risk associated with surface water run-on. Surface water run-on is flooding associated with surface water which is generated off site, which can nevertheless impact the site because of local flow routes. Surface water run-on is distinct from surface water run-off, in that run-off is associated with the generation of surface water from a developed site whereas run-on describes the flow of water on to a site. This type of flooding typically occurs following intense rainfall events. Sources of surface water flooding can include:

- Surface water generation is more likely in heavily urbanised catchments and in areas with low infiltration potential. Following intense rainfall events, water can flow over the surface from surrounding areas and cause localised flooding;
- During intense rainfall events, drainage networks can become surcharged and result in water being discharged to the surface, this can lead to localised flooding issues; and
- Burst water mains can result in significant volumes of water being discharges to the surface, which may result in localised flooding issues.

The potential for the above sources to be a risk should be considered when preparing site specific FRAs. The potential surface water ponding areas and flow route maps in Appendices E to V present the results of the pluvial modelling undertaken as part of the 2010 SFRA update. Southern Water have supplied a point data set of all the incidents that have been reported to them to the year end of 2006. Unfortunately the most recent database was not available. The surface water sections of Appendices E to V include a discussion of any areas where there are correlations between the reported incidents and potential ponding areas and flow routes mapping.

In reports published by the Environment Agency, surface water flooding has been linked to some of the flooded properties during the 2000 floods on the Island. A recurring theme has been drains not being able to discharge because of raised river levels and thus the capacity of the drains was soon exceeded resulting in surface water flooding.

Surface water flooding results from excessive rainfall being unable to enter the local drainage system, due to blockages or capacity being exceeded or because the rainfall intensity is greater than the infiltration rate of the soils. Therefore the only route for rainwater to take is over the surface. Incidents are usually isolated and difficult to predict owing to the complex interaction of local infrastructure and circumstance, the impacts of which are often localised with potentially only low flood depths being attained. There is a likelihood of overland flow from one area of ponded surface water towards local low points in the topography, which is typically the river channel.

The occurrence of flooding caused by insufficient capacity of the drainage system is related to the probability of a given rainfall event over a given area. The likelihood of flooding is dependant on the condition of the surface drainage network, as well as the rates of surface water run off generation. The likelihood of flooding may change over time; due to increases in development, changes in impermeable area and climate change. As a result, flooding related to surface drainage may become more frequent in the future. Every new development proposal[1] must

[1] Only if the site is within Flood Zones 2 or 3 or if it has an area of more than 1 hectare, it is recommended that drainage assessments are undertaken for all sites greater than 0.25 hectares, see Section 7.4.

include an FRA inclusive of a consideration of surface water drainage and measures to mitigate against any potential increase run off.

The Environment Agency has not identified any Critical Drainage Areas on the Isle of Wight.

4. Definition of Flood Risk Zones

4.1 Overview of the Flood Zones

Flood Zones are described throughout this SFRA and they refer to flood extent datasets held by the Environment Agency. The Flood Maps are the successor to the Indicative Flood Plain Map (IFM) and have been in the public domain in their current format since October 7th 2004. Since their initial publication the Agency has worked with consultants to refine these maps through the commissioning of detailed hydraulic modelling projects. Updates to the published datasets are made on a quarterly basis. Box 2 outlines the different Environment Agency Flood Zones.

Box 2 Introduction to the Environment Agency's Flood Zones

Flood Zone 1

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)

Flood Zone 2

This zone comprises land assessed as having a 1 in 100 and 1 in 1000 annual probability of river flooding (1% 0.1) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Flood Zone 3a

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Flood Zone 3b

This zone comprises land where water has to flow or be stored in times of flood. This Flood Zone is land which would flood with an annual probability of 1 in 20 (5%) or greater in any year.

Additional Information

- The Flood Zones are mapped using a 'no defences' scenario which has necessitated areas of floodplain know to be defended to be identified on the Flood Map as benefiting from defences.
- The Flood Zone extents, regardless of whether the area benefits from a defence, are used to determine when Flood Risk Assessments are required to support a planning application.

The Flood Zones are spatial datasets indicating the area of land likely to be inundated in the event of an extreme flooding event with a given probability of occurrence. The four zones described in Box 2 are listed in order of decreasing extent but of increasing probability of occurrence.

Fluvial and Tidal Flood Zones

The Agency supplied the published Flood Zones 2 and 3 for use in this SFRA in August 2009. These datasets were divided into their respective tidal and fluvial components (see Figure 12 in Appendix A), enabling the source of flood risk (fluvial or tidal) to be identified. The Isle of Wight Council has adopted the predicted 1 in 200 year tidal flood mapping for the year 2115 as a replacement to the current tidal Flood Zone 3. The Isle of Wight Council have also adopted the predicted 1 in 1000 year tidal flood mapping for the year 2115 as a replacement to the current

tidal Flood Zone 2. This approach ensures that the possible impacts of climate change are incorporated in to the spatial planning process.

Functional Flood Plains (Zone 3b)

Functional floodplain extents have been produced for the Western Yar and the Monkton Mead Brook. These were the only two watercourses that the Environment Agency held detailed hydraulic models for and as such no other watercourses in other Regeneration and Development Areas could have their functional floodplains' mapped. The Monkton Mead Brook Isis Model was run for the 1 in 20 year fluvial event in order to map the functional floodplain. The model was run in a '*without pumps working*' scenario, which is representative of the history of the failure of the flood alleviation pumps on the Monkton Mead Brook.

The Agency were already in possession of a 1 in 25 year flood extent outline for the Western Yar and it was agreed with the Agency that the 1 in 25 year extent could be used to represent the functional floodplain along this watercourse. The Monkton Mead Function Floodplain is illustrated in Figure 4.1 and the Western Yar functional floodplain is illustrated in Figure 4.2.

Figure 4.1 Monkton Mead Functional Floodplain

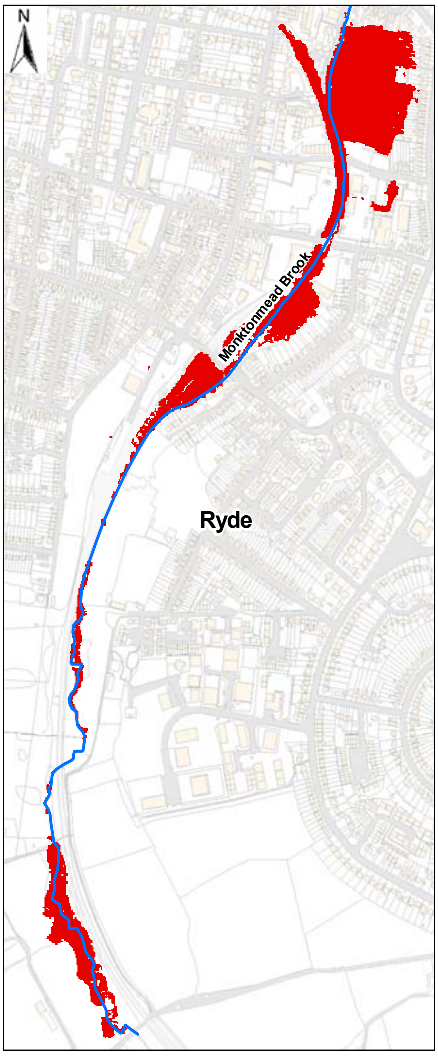
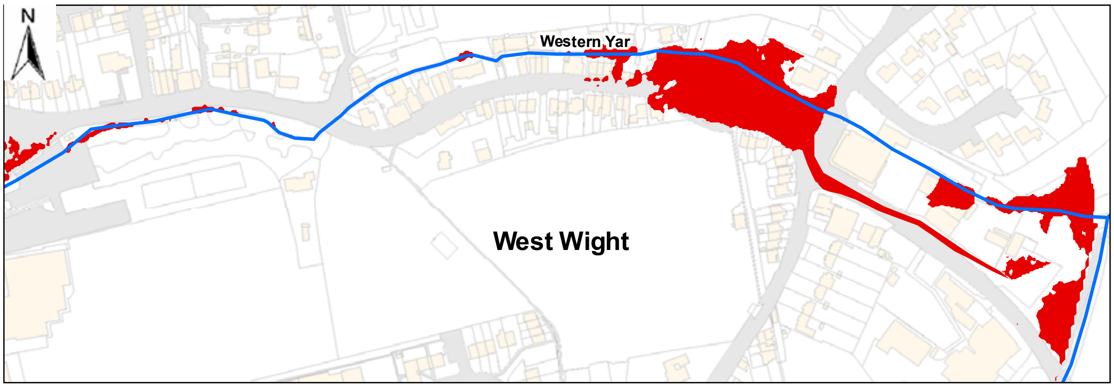


Figure 4.2 Western Yar Functional Floodplain



The definition of the functional floodplain is important from a planning viewpoint as it represent the area of land upon which PPS25 imposes the most stringent planning constraints. Indeed PPS25 states that only water compatible uses and essential infrastructure (listed in Table D.2 in Appendix B) are considered as 'acceptable'. In this context, 'acceptable' is based on the assumption that the Sequential Test has been applied and no other alternative sites are available. Any development, of 'acceptable' nature must be designed to:

- Remain operational and safe for users in times of flood;
- Results in no net loss of floodplain storage;
- Not impede water flows; and
- Not increase flood risk elsewhere.

Essential infrastructure in this zone is required to pass the Exception Test.

5. Climate Change

5.1 Background

Climate change is frequently cited as being one of the most significant threats to the long term sustainability of our environment. It is essential that the likely impact of climate change on the extent of the future Flood Zones is considered if development is to be sustainable over the long term. The Isle of Wight Council is unique in the UK in being the only LPA, to be bordered by the sea on all sides, thus making the issue of sea level rise one of critical concern.

PPS25 and Defra Guidance

Defra stated in October 2006 in their '*Supplementary Note to Operating Authorities – Climate Change Impacts*' that climate change impacts on flooding are a challenge to Local Authorities. The impacts are stated to include sea level rise and the potential increase in intensity and frequency of coastal storms. It is also predicted that rainfall events affecting flooding in fluvial catchments and urban surface water systems will increase in regularity and intensity. Defra's October 2006 supplementary note to Operating Authorities is designed to support the publication of PPS25 and states that; Defra's response to climate change impacts is to promote policy guidance based on appropriately precautionary allowances and sensitivity testing to enable Operating Authorities to take climate change impacts into account in planning appraisal, decision making and operations.

Pending further work being carried out by Defra and the Environment Agency on the differences between the UKCIP09 and UKCIP02 projections, the Chief Planner's letter advised that whilst there is a range of projections in UKCIP09 of future climate for any given variable, based on different emissions scenarios and probability levels, around the 50% probability point on the central emissions scenario, the data are broadly similar to the UKCIP02 projections. As a result, there is a general expectation that the assumptions on changes in climate that the LPAs have been working from remain reasonable.

Sustainability Implications

The current extent of Flood Zone 2 and 3 is critical to the site allocation process, but a view as to how these extents may change in the future is of importance. PPS25 (Paragraph B10) notes that the implications of climate change could mean that a site currently located within a lower risk zone could be reclassified as lying within a higher risk zone at some point in the future.

5.2 Fluvial Domain

It was the intention of this assessment to determine how sensitive the fluvial domain on the Isle of Wight is to increased river flows. This involved an uncomplicated Island wide approach that utilised all the available data.

5.2.1 Assessment Approach

Climate change is predicted to increase the magnitude of the 1 in 100 year flood. To model this, a larger fluvial flow would have to be simulated along each of the Island's watercourses. The objective of climate change modelling is to ascertain whether increased flows will have a significant impact on the extent of the Flood Zones. The approached adopted in this SFRA utilises existing data without requiring need for additional modelling work.

Flood Zone 2 outlines were produced for the Environment Agency by modelling a 1 in 1000 year fluvial flow in each watercourse and Flood Zone 3 was produced using the same methodology but with a 1 in 100 year fluvial flow. The two different flows used to produce Flood Zones 2 and 3 were used to identify areas of fluvial floodplain that are potentially sensitive to an increase in fluvial flow. In doing so it is possible to assess the sensitivity of the fluvial flood extents to climate change.

If there is little or no difference between Flood Zones 2 and 3, then the flooding extent in that area of floodplain can be considered to insensitive to an increase in fluvial flow and thus insensitive to the impacts of climate change. Floodplain topography controls how sensitive the flood extent is to an increase in fluvial flow. Along reaches where the valley floor is narrow and the sides are steep, there will be little lateral expansion of the flood extent. The depth and velocity will increase more significantly in areas where the extent increases the least. Accordingly, areas where the valley floor is wide and flat and not bounded by steep valley sides, the flood extents are large and expand laterally more significantly as a consequence of increased in fluvial flows.

To assess the sensitivity of the Island's floodplains to increased fluvial flows, the smaller extent of Flood Zone 3 was clipped from the larger extent of Flood Zone 2 within a GIS software package. This produced a dataset which represented all the locations where the extent of Flood Zone 2 is larger than the extent flood Zone 3. Tiny fragments of this dataset were removed to leave only areas considered to be significant. The value of 250m² was used as the threshold of significance. This is the threshold used by the Environment Agency when editing the Flood Map. Areas of flooding less than 250m² which are not connected to the main body of flooding are deleted from the Flood Map.

5.2.2 Sensitivity to Climate Change in the Fluvial Domain

Areas of fluvial floodplain identified as being potentially sensitive to the impacts of climate change are illustrated in Figure 15 in Appendix A. This figure shows that, for the most part, the extents of Flood Zone 2 and 3 are very similar as there are not many large areas of black on the map. This is due to the fact that the majority of the Island's rivers flow in well defined floodplains. Every potential development site which intersects the *Areas of Fluvial Floodplain Potentially sensitive to Climate Change* dataset is attributed accordingly in the Sites Database. This is so that the Council can be alerted as to whether climate change might present long term sustainability issues to a site.

Two locations where there are significant differences between the extent of Flood Zone 2 and 3 have been highlighted for further discussion. These are the lower Eastern Yar Floodplain and Monkton Mead Brook through Ryde.

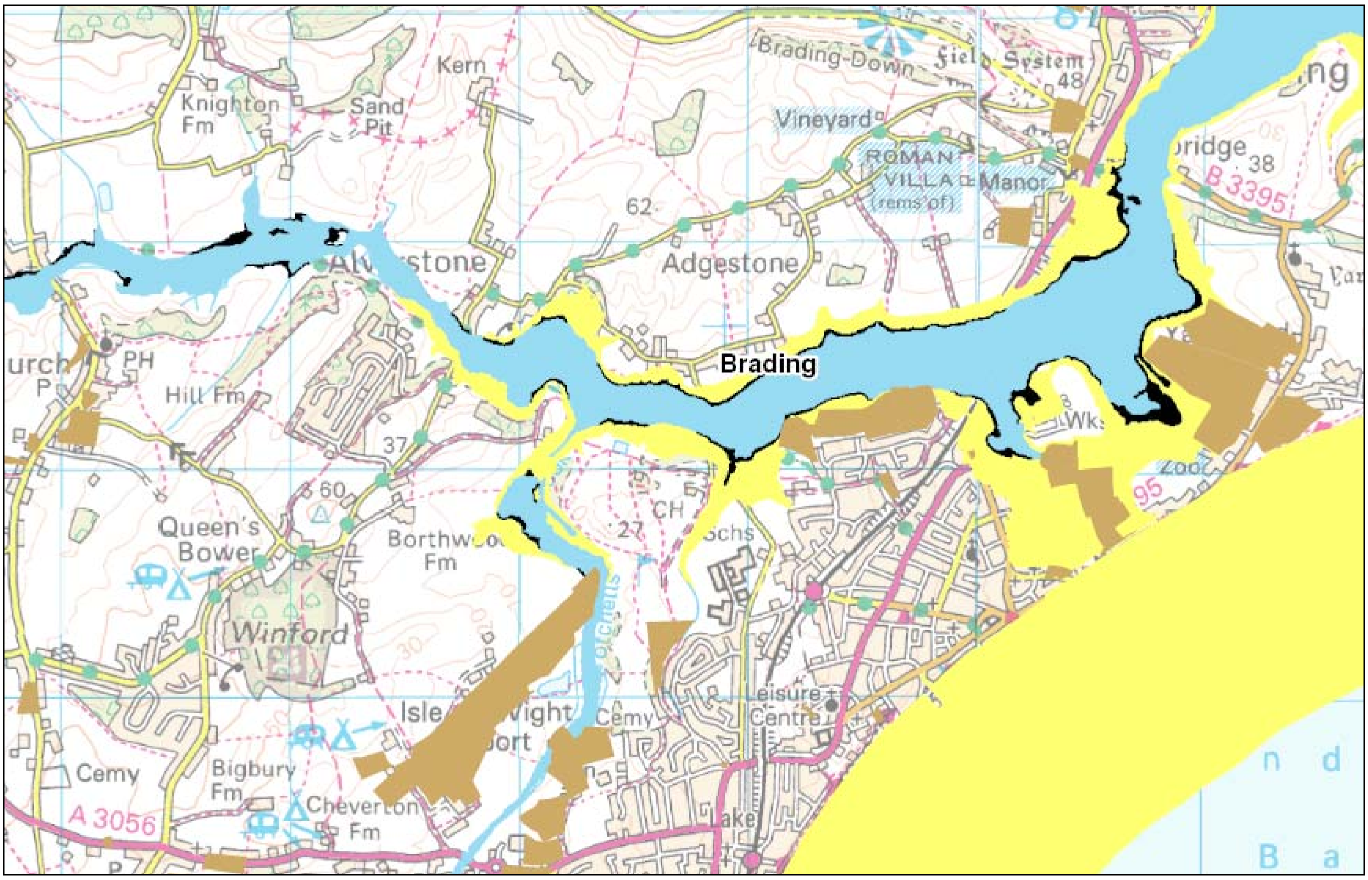
Lower Eastern Yar

The area of floodplain downstream of Alverstone is the widest expanse of fluvial floodplain on the Isle of Wight. The largest differences between Flood Zone 2 and 3 can be found here, as shown in Figure 5.1. For the purposes of the SFRA, only one area requires identifying, and that is the area of land to the north and east of Sandown and near Yaverland as there are a large number of potential development sites in the area. It is recommended that any subsequent FRAs should assess the implications.

Monkton Mead Brook - Ryde

Flood Zone 2 appears to be significantly larger than Flood Zone 3. It is thought that some of this difference may be attributed to different modelling methods used to produce the two Flood Zone extents. Flood Zone 3 in Ryde appears to be the product of the detailed Monkton Mead model whereas Flood Zone 2 appears to be the product of a more generalised modelling.

Figure 5.1 Lower Eastern Yar Floodplain



The black areas represent the significant parts of Fluvial Flood Zone 2 that extend beyond the extent of Fluvial Flood Zone 3 and the brown areas are the potential development sites. Please note that as with many of the coastal locations, the extent of the tidal Flood Zone 3 present day (yellow) is greater than the fluvial Flood Zone 2

This high level assessment intended to establish whether the potential impacts were extensive or restricted to a few locations. It is found that Island wide fluvial climate change modelling is not necessary to inform the SFRA. It can be concluded that small areas of the Island's fluvial floodplains contain small areas where climate change may have an impact on the extent of the Flood Zones. The '*Areas of Fluvial Floodplain Potentially Sensitive to Climate Change*' dataset (see Figure 15 – Appendix A) should be used as an indication of where the impact of climate change on the fluvial Flood Zones should be considered in more detail as part of site specific FRA's. Any development proposals for sites which fall within the *Areas of Fluvial Floodplain Potentially Sensitive to Climate Change*' dataset must account for climate change allowances in their accompanying FRAs, to be inline with advice offered in PPS25.

5.3 Coastal Domain

The extensive tidal Flood Zones and the perceived risk posed by sea level rise necessitated the need to carry out detailed tidal climate change modelling along the coastline of the RDAs. The methodology adopted is detailed in Section 5.3.1.

5.3.1 Assessment Approach

The 2010 SFRA mapping update has been based upon an ArcGIS shapefile supplied by the Environment Agency 24/08/09 and subsequent revisions on the 07/09/09. Environment Agency LiDAR topographic data now exists for the entire Isle of Wight coastline and this formed the ground model in the mapping exercise. The ground model of the coastal topography had a resolution of five metres. Table B.1 in PPS25 was used to determine the rate of sea level rise, the South East figures were used for the purposes of this exercise. Figure B1 in Appendix B provides an illustration of the coastal cells and it details the predicted sea-levels for the mapped epochs.

The 2007 SFRA mapped the 2000, 2026, 2070 and 2115 epochs. It was decided that the revised mapping should include the 2010, 2045, 2080 and 2115 epochs instead. The base 1990 sea levels issued by the Environment Agency are to the nearest 0.1m. With the intention of not adding false accuracy, the climate change predictions have been rounded to the nearest 0.1m. Appendix B provides Figure B1 which displays a map of the Island and the coastal cells along with the associated predicted sea level rise values.

The extreme sea levels used in the modelling were calculated from adding the incremental sea-level rise figures specified by PPS25 (B.1) for the South East, to the base 1990 extreme levels issued by the Environment Agency (September 2009). These extreme sea levels are derived from probabilistic storm surge heights, but do not account for wind or wave action.

The Island wide predicted flood extents for the 1 in 200 and the 1 in 1000 events are presented in Figures 13 and 14 in Appendix A. Higher resolution mapping for the Regeneration and Development Areas is provided in Appendices E to V.

The predicted flood extents were derived using a technique called horizontal projection modelling. In this process the peak water level is projected across the coastal topography, all areas of land lower than the water level therefore form part of the flood extent. In line with the Environment Agency's Flood Map specifications all areas of flooding with an area of less than 250m² were removed from the flood extents.

5.3.2 Sensitivity to Climate Change in the Tidal Domain

Where there are significant differences between the year 2010 and the year 2115 extents, they are discussed in the Climate Change sections of Appendices E to V which discuss the flood risks facing the Regeneration and Development Areas in more detail. There are no areas covered by the tidal climate change modelling which exhibited large predicted increases in spatial extent, which implies that the tidal floodplains are topographically

well defined. A well defined tidal floodplain is bounded by steep topography meaning that an increase in surface water level does not dramatically increase the extent of flooding. Although the extent of flooding does not always increase by much, the depth of flooding will increase.

The tidal climate change flood risk zones should be used to provide an indication of the likely possible extent of future flood zones, however they are not definitive. The outlines are considered to be sufficient to inform the Council of where the long term sustainability of developments may potentially be compromised. Moreover, these datasets can be used to draw the Council's attention to where site specific FRAs should include mitigation measures to demonstrate how the risk of flooding will not increase as a result of the impacts of climate change.

5.4 Planning Implications of Climate Change and FRAs

See Section 9.3.3

6. Assessing the Impacts of Wind Action and Wave Spray

6.1 Rationale for Assessment

This section of the SFRA aims to assess the potential risks to the areas which fall outside the zones of tidal inundation, where there is a potential risk associated with the impacts of wave energy and wave spray. Wave action relates to both the erosive capacity of the waves themselves but also spray action and its effects in damaging coastal infrastructure. This can cause a problem in more exposed areas, areas of high energy wave environments and/or during winter months when stronger winds create a more aggressive wave environment around the coastline.

This assessment has informed the creation of a zone around the Island which highlights the area which may be at risk of the potentially damaging influences of wind and wave action. The available information has enabled this buffer zone to be classified into the High, Medium and Low Risk. An Island wide map is provided in Figure 18 in Appendix A and higher resolution mapping is provided in Appendices E to V.

A review of the potential impact of wind and wave action only has value, in an SFRA context, if applicable policy recommendations can be produced by the assessment. In coastal areas predicted to be at risk of tidal inundation, finished floor levels, ground floor uses and the requirement for safe internal escape routes are governed by the predicted extreme tide levels. Wave action is more a function of energy and spray than flood depth and flood extents. In this instance, the assessment and therefore the Development management guidance produced will relate to building resilience against the impact of wave action and wave spray impact.

6.2 Baseline Assessment

6.2.1 Coastal Vulnerability

Evaluating vulnerability of the coastline to wave action is complex and there are many environmental factors that need to be considered when considering the vulnerability of the Isle of Wight coast. The factors reviewed in this assessment are exposure, tidal heights and coastal geomorphology and wind action and spray, these are addressed in turn below.

Exposure

The key criterion in determining vulnerability to wave impact is exposure. It is possible to broadly identify coastal environments based upon two different levels of wave energy on the basis of prevailing wind speeds, fetch and coastal configuration[2].The amount of energy available in wind driven waves depends upon the velocity, duration and fetch of the wind. The highest waves are produced by strong winds blowing in the same direction and over a long distance. Those areas of the coast that are more exposed to wind energy and have a longer fetch will be most at risk to higher energy wave environments, while other areas will be naturally more sheltered by surrounding land masses. Exposure is also a function of the predominant wind and wave direction.

Vulnerability may also be determined by the coastal landform, in general, headlands and promontories are more exposed and therefore more vulnerable while estuaries inlets and bays are more sheltered and less vulnerable.

In addition, some areas of the coast may have natural or man-made defences in place whereas others may be left undefended and are therefore more at risk. Areas with wide beaches or gravel barriers may be naturally well protected while in other areas coastal defence measures provide artificial protection.

Tidal heights and coastal topography

It is likely that exposed areas of coast will be subject to the highest waves as there is a greater distance for wind generated waves to propagate, as described above. However the likelihood of exposed areas suffering extreme wave impacts and spray is also a function of the tidal regime and topography of the area. If winds are strong, waves may become unusually large and sea spray may travel many metres inland and in some cases can overtop cliffs. However generally it is in lower lying areas, and areas with high tidal levels in which storm winds and waves present the greatest hazard. If land is low lying over a large distance inland this can also increase risk as larger areas are more exposed, conversely if lower lying areas are backed by steeply rising land or cliffs this can offer some protection to the land behind. Storm conditions can often create very low pressure, during which tidal levels can become even higher creating a 'storm surge'. As well as flood risks, high tidal levels plus increased wave heights maximise the likelihood of wave and spray impacts at the coast and further inland.

Wind action and spray

Storm processes rarely act separately, wind, waves and rising water all interact during storm events and it is the combination of these effects that can make sea or coastal storms so damaging. Rising tidal levels during storm events causes issues of overtopping and flood inundation while direct wave impacts on the coast can be incredibly damaging causing erosion of costal areas and infrastructure failure. However the effects of storm winds at the coast can also be very damaging to both the urban and environmental fabric. Storm winds can cause direct damage to buildings and infrastructure but in combination 'sand blasting' of buildings can occur when impacted with spray heavily laden with sand and finer particles. During extreme coastal storms heavier particles including gravels and even boulders can become airborne, which can be extremely dangerous and costly to coastal infrastructure. Even during calmer weather, strong coastal winds are capable of transporting damaging salt spray inland.

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[2] Summerfield, M.A. 1991. Global Geomorphology. Prentice Hall.

6.2.2 Coastal Characterisation

The following section describes the baseline conditions for the Isle of Wight Coastline. Available information has been used to provide, an assessment of the coastline in terms of topography, characterisation and condition i.e. exposure, erosion/accretion and sediment transport, an assessment of the wave boundary conditions including wave heights, direction and storm waves and an overview of coastal defence measures in place. Understanding the current coastal environment provides an indication of the levels of exposure which can then be used alongside tidal height predictions to create a vulnerability profile for the Isle of Wight.

Information used in this assessment includes:

- LiDAR topographical data (Environment Agency);
- Geological maps of the Isle of Wight (British Geological Survey)
- Assessment of shoreline dynamics for the Isle of Wight (Isle of Wight SMP 2, Appendix C);
- Southeast Strategic Regional Coastal Monitoring Programme Annual Report 2009 (Channel Coastal Observatory);
- Average and storm wave heights for boundary areas (Channel Coastal Observatory);

The following sections describe the general coastal characteristics around the Isle of Wight in terms of exposure, stability, erosion and accretion, the dominating hydrodynamic regime and sediment transport. The summary presented uses information provided within the report 'Assessment of Shoreline Dynamics for the Isle of Wight' produced by the Isle of Wight Centre for the Coastal Environment and which forms Appendix C of the new SMP2 document.

General coastal characteristics

The Isle of Wight coastline is extremely varied and dynamic over a relatively small area. Marine erosion is in action around the coast to produce an almost continuous cliffline with a varied morphology resulting from the varied geology present. The solid geology and structure of the Isle of Wight is dominated by an east-west chalk ridge which cuts through the centre of the Island and is exposed at either end to form headlands at the Needles in the west and Culver Cliff in the east. To the north of this ridge, the relatively sheltered coastline of the Solent is characterised by low lying land and estuaries. While to the south the coastline is dominated by high sea cliffs and is more exposed to wave and weathering impacts and associated erosion. A prominent feature of the south coast is the Undercliff, an ancient coastal landslide complex measuring approximately 12 km in length and extending up to 500m inland and 2 km seawards.

In terms of erosion the south coast is particularly vulnerable, due to a combination of exposure to the large storm events that cross the Atlantic and the formation of softer Wealden rocks that are present across the south west coast of the Island. The exposed high energy southern coast also presents greater potential for sediment transport, compared to those areas along the sheltered environments of the north and north east which are characterised by five estuary environments. However strong tidal currents are generated in the western Solent and these contribute to sediment mobility in certain areas.

The offshore and nearshore zones of the Island are characterised by a thin layer of sand and gravel that forms gravel banks in some locations and provide a source of onshore gravel during storm conditions. Sediment transport in the nearshore zone is complex around the Island as sediment movement is interrupted by estuaries, headlands and offshore features. Around the coast, seabed sands and gravels are highly mobile during peak flows with a general eastward transport from the predominantly south, south westerly winds. At locations where this transport is interrupted for example at Thorness Bay and Hurst Narrows, sand and shingle banks have formed.

Much of the coastline of the Isle of Wight is undefended in engineering terms, however a number of sections of the coast around key developed areas have been heavily modified by hard coastal defences. Areas include Cowes, Ryde and Bembridge Harbour, Ventor, Sandown Bay and in the extreme north west at Totland and Yarmouth. At these locations defences are reported to be in fair or good condition.

Coastal condition – exposure, erosion and accretion

North east to east – Old Castle Point to Culver Cliff

The north east Isle of Wight is mostly low lying or of low relief. Erosion occurs along the majority of the coast resulting in the development of varied cliff forms and includes inlets of Bembridge Harbour and Wootton Creek. Waves to the east of Ryde are generated in Hayling Bay and the English channel and therefore wave energies are moderate approaching predominantly from the east or south east. In contrast to the west of Ryde the area is more sheltered and prevailing winds are generated in Southampton Water and the East Solent and are fetch limited. Wave conditions in this area are therefore generally low energy, dominated from a north west direction. In general tidal current speeds in the east are slower than in the west and the area is dominated by coarse sediments although most are in-channel rather than shoreline deposits. The foreshore at Ryde is dominated by increasingly sandy sediments and at 'Ryde Sands' a major accumulation of sand deposits have developed.

East to south - Culver Cliff to St Catherine's Point

The coast between Culver Cliff and Dunnose on the south east coast has developed through marine erosion of the predominantly soft clays and sands of the Wealden and Lower Cretaceous Groups. The east facing coast is relatively protected from waves generated by dominant westerly winds, but it is fully exposed to east and south easterly winds which have a fetch distance of just over 200 km and over which large waves can propagate.

Almost the entire length of this coastline is characterised by active cliff development, with local beaches of varying width associated with numerous groyne installations. Substantial seawalls and promenades at Shanklin and Sandown serve to protect the cliff line from direct wave attack and between Yaverland and Shanklin Chine the coast is fully protected by a variety of structures including seawalls, revetments and groyne fields. Between

Shanklin Chine and Dunnose there are few defences but this area of coast is not believed to have changed in recent decades.

The undercliff coastal frontage is an exceptionally dynamic and unique section of coast exposed to a maximum fetch of 150 km defined by the width of the English Channel. Although coastal defences protect large sections of the developed coastline of the Undercliff, the undefended areas are subject to high energy wave attack resulting from storm events which has led to significant loss in beach material over a relatively short timeframe. Storm surges that propagate in the English Channel typically move through from west to east reaching a maximum near the Isle of Wight and can add over 1 m to predicted sea level in the area. Tidal currents are often strong in this area, particularly at St Catherine's Point. Sediments of the Undercliff coastline consist almost entirely of gravel and sandy gravel and between Ventor and St Catherine's Point, several well defined pocket beaches consisting of 'pea size' gravel (D50 10mm) have developed.

South to west – St Catherine's Point to The Needles

The frontage between St Catherine's Point and The Needles occupies one of the most exposed locations on the south coast of England with long fetches in excess of 4000 km, extending directly into the north east Atlantic and the English Channel. It is exposed to swell wave (Ocean wave) activity as well as to energetic locally generated wind waves. Numerical modeling undertaken by HR Wallingford indicated that maximum wave heights for a 1 in 1 year event is up to 5m for the coastline between Freshwater Bay and the Needles. Wave exposure and the steepness of the nearshore profile are greatest towards the south east so that Chale Bay experiences the most energetic shoreline wave environment. Tidal currents are generally weak at the shoreline, but increase in velocity as they are forced around the headland of the Needles and Rocken End. Generally beaches consist of gravel backshores and sandy foreshores and progressively steepen between Rocken end and Freshwater Bay. Along the south west coast a concrete sea walls defend the development of Freshwater while the remainder of the coast consists of agricultural land with isolated small settlements and is unprotected.

West to North – The Needles to Old Castle Point

From the Needles to Cliff end, the area comprises a combination of relatively resistant rock material with spatially varied exposure to waves and currents, resulting in the formation of a predominantly eroding coastline characterised by well developed cliffs and landslides. The Needles headland provides shelter to this area from waves but despite this it remains exposed to dominant waves approaching from the northwest, west and south west. HR Wallingford Predictions (1999) provide potential maximum significant wave heights of up to 2.36 m for a 1 in 50 year return period south of Fort Albert. The rapid erosion of cliffs provides large quantities of fine sediments that are easily transported and at this location a net movement of sediment transport offshore is inferred.

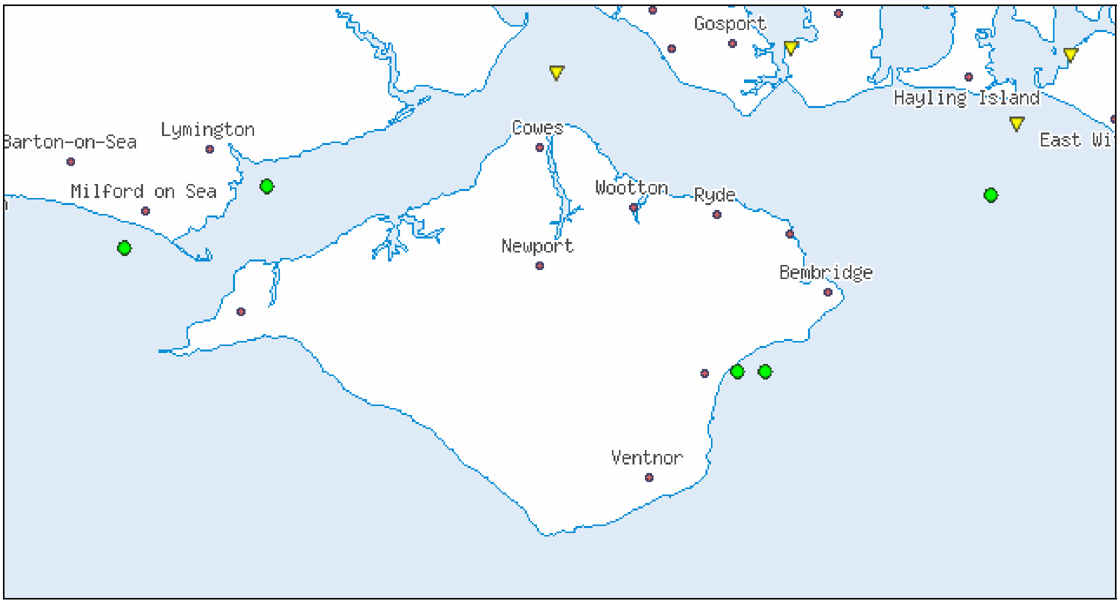
Further north between Fort Albert and Cowes the coast is sheltered from the open sea and incident waves generated in the West Solent are Fetch limited and generally less than 1 m in height. The coastal topography of this area is undulating with erosion of the soft mud strata forming a series of high points along the coast at Bouldner Point, Burnt Wood and Gurnard Cliff. Tidal currents and wave action continue to erode the base of these cliffs and transport fine material off and alongshore, promoting further instability. The shoreline has a complex and varied sediment transport regime due to a combination of the coastal configuration and hydraulic regime in operation. Transport of sediment is separated by headlands and estuaries with weak littoral drift in a north eastward direction, that is intercepted at inlets and estuaries which promote storage of sediments.

Most of the coastline across this area is natural but there has been some localised shoreline stabilisation by seawalls at Yarmouth and Cowes. In addition limited beach nourishment has occurred at several locations to avoid the undermining of coastal protection structures in place.

Wave boundary conditions

The figure below (Figure 6.1) shows the location of waverider buoys and wave gauges in place around the Isle of Wight. These are deployed and managed by the channel coastal observatory and provide boundary conditions for the Isle of Wight in terms of wave climate. Wave buoys at Sandown Bay provide an indication of wave conditions for the south east of the Isle, the wave gauge at Hayling Island provides boundary conditions for the north east and those at Lymington and Milford provide indications of wave conditions for the northwest and west. Although only boundary conditions these present the best wave data available and can be used to provide an indication of the wave regime around the coast.

Figure 6.1 Location of wave gauges and wave buoys (Channel Coastal Observatory)



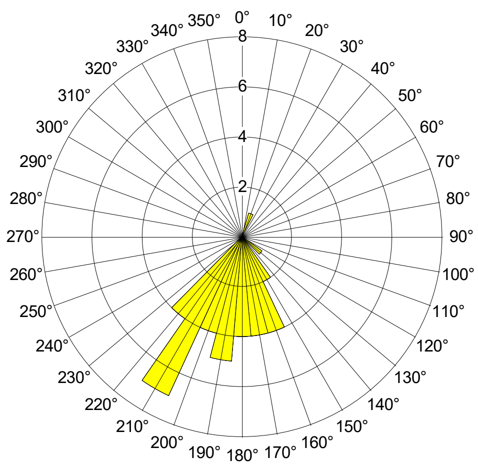
The table below (Table 6.1) presents a summary of wave heights for the each of wave buoys and gauges around the Isle of Wight. Both monthly and average heights are demonstrated. It is clear that those wave approaching from the west and north east are higher than those approaching from the north and the south east. In particular the gauge at Lymington within the sheltered area of the Solent demonstrates particularly low wave heights throughout the year. It would be useful to present wave data from the south west as this area of the coast is most exposed, but unfortunately no buoys are currently positioned at this location. In general wave heights are increased during autumn and winter months as opposed to spring and summer which is to be expected based upon prevailing weather conditions.

Table 6.1 Boundary condition wave heights

Location (10 m water)	Average wave height (m)												
	Jan	Feb	Mar	Apr	Mar	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av
Hayling Island	1.19	0.78	0.90	0.59	0.42	0.49	0.61	0.75	0.68	0.76	0.69	0.68	0.71
Sandown Bay	0.81	0.60	0.56	0.47	0.41	0.32	0.43	0.50	0.55	0.52	0.51	0.55	0.52
Sandown Pier	0.54	0.43	0.38	0.37	0.35	0.28	0.31	0.33	0.39	0.37	0.40	0.43	0.38
Lymington	0.23	0.16	0.17	0.15	0.12	0.13	0.15	0.21	0.15	0.16	0.14	0.13	0.16
Milford	1.13	0.65	0.90	0.52	0.28	0.54	0.67	0.86	0.60	0.78	0.63	0.53	0.67

The wind rose below (Figure 6.2) presents a summary of the predominant wind and wave direction for the Isle of Wight. The directions used are monthly averages for each of the directional waverider buoys at Hayling Island, Sandown Bay and Milford, the wave gauges at Sandown Pier and Lymington do not record directional data and these are therefore not included.

Figure 6.2 Boundary condition wave directions



The wind rose demonstrates that in general prevailing or dominant wind and wave direction across the year is from the south west with a moderate frequency from the south east. It is therefore the south west of the coast and to a lesser extent the south east that is considered to be most exposed to wave impacts.

The table below (Table 6.2) presents storm wave data for those storms recorded during 2008. The highest and most frequent storm waves were experienced at the Hayling Island buoy with wave heights exceeding 3 m in 3 events. Sandown Bay also demonstrates waves of over 3 m during two storm events as does the buoy at Milford. Again it is the wave gauge at Lymington that demonstrates the fewest storms with the lowest wave heights (0.91 m) indicating the sheltered nature of the coast at this location. In addition to the data presented below, as stated in section 1.4.2 above, predictive modelling undertaken by HR Wallingford provides maximum storm wave heights of 5 m for a 1 in 1 year event in the south west of the Island and this should be considered when taking into account wave exposure conditions of the coast.

Table 6.2 Highest storm events in 2008

Location (10 m water)	**Highest storm events in 2008**		
	Time	Wave height m)	Direction (o)
Hayling Island			
10-Mar-2008	08.00	3.79	183
13 -Dec-2008	10.00	3.64	169
04-Dec-2008	09.00	3.02	187
15-Jan-2008	11.30	2.92	191
03 -Feb-2008	23.00	2.90	159
Sandown Bay			
10-Mar-2008	11.30	3.63	173
13-Dec-2008	06.00	3.36	172
04-Feb-2008	01.00	2.75	153
04-Dec-2008	09.00	2.53	179
Sandown Pier			
13-Dec-2008	09.00	2.01	-
03-Feb-2008	21.20	1.75	-
10-Mar-2008	08.00	1.62	-
Lymington			
10-Mar-2008	11.40	0.91	-
Milford			
10-Mar-2008	20.00	3.42	-
31-Jan-2008	12.00	3.27	219

6.3 Delineation of a Potential Wave Exposure Risk Buffer Zone

The following section describes the methodology used to assess the coastal vulnerability of the Isle of Wight and create a buffer zone map to inform future development.

6.3.1 Classification of Exposure Risk

Using the information discussed in the previous sections, an assessment of exposure has been undertaken and is presented in Table 6.3. This high level assessment is based on a conservative approach which makes a judgement on the level of exposure that is based upon both exposure to wave impact and wave height and exposure in terms of defences both man made (groynes, seawalls) and natural (beaches, sediment transport, cliff erosion). The risk classifications presented in Figure 18 in Appendix A are based upon the assessment results presented in Table 6.3. A qualitative classification has been undertaken of the predominant wave condition and the exposure of the coast, either 'high', 'medium' or 'low'. These classifications were then combined to form a single risk classification for a given length of the coastline.

Table 6.3 Summary of coastal condition and exposure assessment

Location	Predominant wave condition	Score	Exposure	Score	Risk Classification
North to east		**H/M/L**		**H/M/L**	**H/M/L**
Old castle point to Ryde	Generally low energy fetch limited from north west direction	**L**	Slower currents dominated by coarser sediments	**L**	**L**
Ryde to Culver Cliff	Moderate wave energy predominantly from east to south east	**M**	Faster currents - large sand deposits present 'Ryde Sands'	**L**	**M**
East to South					
Culver Cliff to Dunnose	Moderate, protected from westerlies but fully exposed to east and south easterlies. fetch over 200km	**M**	Active cliff development (erosion) local beaches a variety of defence measures in place (groynes, sea wall etc)	**L**	**M**
Dunnose to St Catherine's Point (The Undercliff)	Dynamic area of coast maximum fetch 150km undefended areas at risk during storm attack	**M**	Large areas protected by defences (man made) and gravel beaches	**L**	**M**
South to West					
St Catherine's Point to The Needles	Exposed to swell waves and energetic local waves maximum fetch of 4000km over which very large waves propagate	**H**	One of most exposed coastlines in south east England. Sea wall at Freshwater – remainder of coast is exposed	**H**	**H**
West to North					
The Needles to Cliff End	Exposed to waves from west, north west and south west	**H**	Although some protection from the needles remains exposed with rapidly eroding coastline and fast sediment transport	**M**	**H**
Cliff End to Old Castle Point	Fetch limited waves generally less than 1 m in height	**L**	Sheltered, weak littoral drift, localised shoreline stabilisation, limited beach nourishment	**L**	**L**

In general the areas to the north of the Isle of Wight are considered low risk as they face the sheltered waters of the Solent and wave generation is limited by a small fetch. Areas to the north east and east are considered medium risk as they are more exposed but are subject to the less dominant easterly waves rather than more dominant westerlies and although fetch distances may reach 200km waves are still considered fetch limited. In addition these areas of coast are generally more protected with a variety of sea defence measures in place including groynes, sea walls and revetments. Areas to the south and the south east are the most exposed with fetch distances of over 4000km and few defences in place. This area of coast is considered to be one of the most exposed in south east England. Areas to the north west are again considered low exposure as waves are fetch limited, the coastline is well sheltered and some defence measures are in place.

6.3.2 Defining the Buffer Zone

The exposure map produced needs to take into account tidal data for the Isle of Wight. Areas that are low lying and have high tides are considered at greatest risk as a function of wave height and spray. Tidal inundation is considered in Section 3.4, as such the exposure risk buffer focuses on areas beyond the extent of Flood Zone 2. Land within the extents of Flood Zones 2 and 3 are covered by the requirements of PPS25.

The Exposure Risk classifications have been used to inform the width of the buffer zone. Spray can travel many metres inland and even under calm conditions, coastal fog or mist carrying salt water particles is common. However, although damaging to building material over time through chemical weathering processes this type of spray or 'sea mist' is not considered to be a risk in relation to wave impact. Instead it is the distance larger particles can travel when picked up and transported by extreme wave events which present the greatest risk. Under extreme storm conditions gravel and even boulders may be picked up and thrown inland but over relatively short distances. Sand particles may travel further and 'sand blasting' of buildings can be very damaging during storm conditions.

Three buffer widths (Table 6.4) have been created and applied to the Isle of Wight coastline based upon the low, medium and high risk exposure risk classification.

Table 6.4 Exposure risk and buffer width

Exposure risk	Buffer width (m)
High	100
Medium	50
Low	10

The buffer widths are estimates of the distances which wind and wave processes may transport particles.

6.4 Using the Wave Exposure Risk Buffer in Development management Decisions

The Exposure Risk Buffer is intended to highlight areas which are outside the Environment Agency Flood Zones 2 and 3, within which it may be considered appropriate to require development proposals to demonstrate as part of the planning application that the potential risks associated with wind and wave action have been considered in the building design.

The buffer width is determined by the expose risk classification and not by ground elevation. Thus there are likely to be areas of high ground which have been included in the buffer zones. It is suggested that the exposure risk, and therefore the need for building design considerations, be reviewed on a site by site basis. Based on the wave height data available for review in this assessment, a suggested guide for identifying those sites where mitigating building design should be considered would select site where the ground level is less than the sum of:

- The 1:200 year tide level for the year 2105 (see Figure 13 in Appendix A); and
- 4m, which represents the peak wave heights recorded in 2008, represented to one significant figure.

This guide accounts for predicted climate change induced sea level rise and recorded peak wave heights. The type and availability of sediment should also be considered when assessing the risk to specific sites. Areas of gravel beaches for example should be noted as a potential higher risk during extreme storms due to the supply of larger potentially more damaging particle sizes. Sand areas should also be considered as these will supply smaller particle sizes that may be transported over larger distances.

Mitigation Measures - Building Design

These areas are outside the tidal inundation zones as such it is unlikely that there will be any requirement for floor level adjustment. In these areas, the risk is associated with spray and the debris and sediments that it may contain, as such appropriate mitigation would include the use of toughened glass in sea facing windows and doors. The choice of building material should also be informed by the risk of the building being impacted by potentially corrosive salt water.

7. Sustainable Management of Surface Water

7.1 Introduction

PPS25 states that surface runoff is an important consideration in the assessment of flood risk and must be addressed at the SFRA and FRA level. The risks associated with surface water and the need to sustainably manage this risk was clearly identified in the Pitt Review (2008). Historically, surface water drainage in developed areas uses underground piped systems in order to remove excess water as rapidly as possible. PPS25, the Pitt Review and the emerging guidance on the management of surface water represent a shift in the approach. Above ground solutions are now considered preferable as in addition to drainage management advantages they can also provide ecological and amenity value. The traditional approach sought to discharge and convey water as quickly as possible, often with negative downstream flooding consequences and as direct pollution pathways. This concept is being replaced with the idea of attenuating flows, limiting peak discharges and source control of rainwater.

When considering the present emphasis on sustainable development and the requirements of the Water Framework Directive (WFD), different approaches to past drainage conventions are required. PPS25 and the Pitt Review identify opportunities to reduce flood risk, manage water quality and provide integrated amenity and ecological benefits through the implementation of sustainable drainage solutions.

PPS25 requires an FRA to accompany a planning application for all sites in Flood Zone 1 which are greater than one hectare in size. This is to ensure that downstream flooding problems are not aggravated by increased runoff post development. The planning system therefore represents an effective means of ensuring that new developments manage water in a sustainable manner. As a minimum requirement of PPS25, the negative environmental impacts of development on surface water runoff need to be mitigated against. PPS25 states that post development rates of runoff must not exceed pre-development runoff rates. The Environment Agency and the Isle of Wight Council have an aspirational target of reducing the runoff rates wherever possible. Particular attention should be paid to the use of sustainable drainage systems given the wider sustainability aims of Planning Policy 1 – '*Delivering Sustainable Development'* (PPS1) and the specific requirements of PPS25.

7.2 What is Sustainable Surface Water Management and where should it be applied?

7.2.1 What does sustainable drainage mean?

The concept of sustainable drainage is simple and the basic principals include:

- Reduced dependence on piped solutions

- Reductions in peak flow rates and overall run-off volumes, with the intention of better reflecting the discharge patterns of undeveloped greenfield sites.
- Where possible the solution should contribute to wider water quality sustainability issues by providing pollution control and where necessary treatment of contaminated surface water run-off
- Reduce the hard engineering components and maintenance requirements of the drainage solution
- Where possible the drainage scheme should provide ecological and amenity enhancement value.

7.2.2 In what situations should the concept be applied?

The design and implementation of sustainable drainage solutions should be factored into the design of any new development. This follows best practice, but also it is a fundamental requirement of PPS25 that the new development do not result in an increase in surface water run-off rates post development. Moreover the Isle of Wight Council have an aspiration to see run-off rates and run-off volumes reduced from the current condition on previously developed sites.

New development provides a means of achieving the benefits of sustainable drainage. But new development does not facilitate enhancement in areas where surface water flooding issues are currently identified. Surface water flooding issues in currently developed areas should be considered for the undertaking of Surface Water Management Plans (SWMPs). In these areas surface water flooding problems can be addressed through source control, reconfiguration of the surface water system or as a result of large scale redevelopment of the area.

In line with PPS23 development should be appropriate and should not lead to pollution. As such, it is not appropriate to install infiltration systems in land affected by contamination as this could lead to pollution of underlying groundwater. Please refer to the Environment Agency's 'Groundwater Protection: Policy and Practice (GP3)' document, which is available at www.environment-agency.gov.uk.

7.2.3 At what scales can sustainable drainage be implemented?

The principal of sustainable surface water drainage can be applied at any scale. Scale only controls the requirements of the drainage solution and it influences the range of possible techniques. On the small scale developments undertaken in isolation, for example s single residential unit, rainwater harvesting, green roofs, and permeable patios areas should be encouraged. On the larger scale where developers or the LPA are seeking to deliver a large number of units it becomes possible to implement integrated drainage solutions. Further details are provided in Section 7.5.

For larger developments the Council require the management of surface water and the associated green infrastructure becomes an integral part of the masterplanning process and the development design.

7.2.4 What options are available and how can the appropriate solution be identified?

The applicability of SuDS techniques for use on a potential development sites should based on an assessment of the following key influences put forward by CIRIA (2007):

- **Land use characteristics** – favour different SuDS techniques. Industrial sites where pollution is an issue are best managed with attenuation SuDS over infiltration SuDS, with multiple treatment stages.
- **Catchment characteristics** – may have a bearing of the choice of SuDS, as particular catchments may be regulated for a sensitivity to flooding or pollution and may potentially be aggravated by one SuDS technique compared to another.
- **Quantity and quality performance** – would guide the choice of a particular SuDS technique and is dependant upon the requirements.
- **Amenity and environmental requirements** – flood risk mitigation is the primary aim and when satisfied, options to add ecological value could be considered.

Chapter 5 of the SuDS Manual by CIRIA (2007) provides further details regarding these key influences, and is recommended as a supporting document to this SFRA. Landuse is considered to be a dominant factor, as it influences the volume of water required to be attenuated, the likelihood of pollution and contaminants and the potential for infiltration to occur. Indications of the most suitable techniques for each site cannot be made as part of a strategic level assessment. Site specific FRA's and Drainage Assessments will provide the required recommendations. Therefore the applicability of SuDS techniques in the SFRA can only be assessed through the consideration of regional characteristics relating to the hydrology and geology. Sections 5.2.2 and 5.2.3 of the SuDS manual provides an indication of the various catchment characteristics that restrict or preclude the use of a particular SuDS technique.

Once it has been established that SuDS are suitable for use on the site, the selection of the appropriate technique(s) is/are dependant on various factors. The following are presented by (CIRIA, 2007):

- ***Soils*** – soil permeability has a significant bearing on the choice of infiltration SuDS techniques.
- ***Groundwater*** – infiltration techniques require at least 1 metre of soil depth between the base of the device and the maximum expected groundwater level.
- ***Area draining to single SuDS component*** – vegetative or filtering SuDS can attenuate smaller volumes of runoff, than ponds which can handle larger volumes generated from a bigger area.
- ***Slope of drainage area*** – steeper slopes reduce the suitability of some SuDS techniques, such as infiltration, which require longer residence times.
- ***Head*** – SuDS that require gravity to operate will require a positive head between inflow and outflow.

Table E2 (in Appendix S) taken from CIRIA (2007) provides a summary of influential site characteristics which should be assessed at the site specific level. Section 7.3 describes how the SFRA has reviewed the appropriateness of infiltration SuDS techniques for the whole Island.

Table W2 (in Appendix W) provides a summary of options for SuDS and their suitability according to subdivisions of water quality, water quantity and environmental benefits. SuDS include a number of techniques such as green roofs, permeable paving, rainwater harvesting, swales, detention basins, ponds and wetlands. SuDS techniques can be implemented in most urban settings, from hard-surfaced areas, to soft landscaped features as a variety of design options are available. This allows designers and planners to consider local land use, future management and the needs of local people, when undertaking drainage design.

7.3 Appropriateness of Infiltration SuDS Techniques on the Isle of Wight

The section describes how the SFRA has provided an assessment of the suitability of infiltration SuDS techniques for each site. Infiltration SuDS are the preferred option of PPS25 (paragraph 4.11 PPS25, 2006) and as such it is the applicability of this technique which forms the focus of this assessment. The assessments have been performed using Island wide datasets and the findings of which are presented for each site in the Sites Database. Two key factors had to be considered:

- The infiltration potential – was based on the BGS Groundwater Vulnerability map which classifies soils and geology in terms of the potential for pollutants to be transferred from the surface to aquifers. See Figure 9 in Appendix A.

- The potential for groundwater contamination – was based upon the Ground Water Source Protection Zones provided by the Environment Agency. See Figure 10 in Appendix A.

- Mass movement issues – the BGS mapping indicates areas where rotational slips are potentially an issue in these areas the promotion of infiltration is not encouraged. See Figure 7 in Appendix A.

It should be noted that the ‘potential for groundwater contamination’ assesses the potential for contaminants to enter groundwater. No assessment has been made of the presence of contaminants or contaminated land. Details on the derivation of the Infiltration Potential, Groundwater Contamination Potential and Infiltration SuDS suitability are provided in Section 1 in Appendix S. Each of the potential development sites included for review in this SFRA has been attributed with the respective infiltration SuDS suitability potential. In all instances site investigation work and consultation with the Environment Agency on the nature of proposed SuDS techniques is recommended.

7.4 Management of Surface Water – New Development Requirements

All planned development, whether in the floodplain or not, must consider the implications for its drainage on flood risk. Where the proposed site exceeds 1 hectare in area, PPS25 requires an FRA to be compiled, which as part of the planning application will be passed to the Environment Agency for review in its role as statutory consultee.

In addition to the PPS25 requirement, the Council require that planning applications for all new developments on sites over 0.25 hectares in Flood Zone 1 should be accompanied by a Drainage Strategy. The threshold of 0.25ha has been selected as it represents the minimum size considered by the Strategic Housing Land Availability Assessment (SHLAA). The drainage strategy should detail how the proposed development does not increase current rates of run-off. For previously developed sites the Drainage Strategy should describe how the development reduces surface water run-off rates and volumes. In flood Zones 2 and 3, where FRA's are required for any proposed development, there again must be no increase in run-off rates or volumes post development and there should be a reduction in run-off rates and volumes from previously developed sites.

7.5 Integrated SuDS Solutions

A strategic approach to the drainage of new urban areas is necessary to ensure that drainage and flood risk management proposals effectively manage runoff changes whilst reducing the flood risks associated with new development. A strategic approach will reduce the chance of cumulative piece-meal additions to drainage systems causing future problems, and allow for the identification and betterment of existing systems with known issues.

LPA's are required to promote the application of SuDS, the preferred option in PPS25 being infiltration techniques as opposed to discharging into watercourses. Where this is not possible, preference should be given to the discharge of surface water into watercourses rather than foul water drains. As the PPS25 *Practice Guide* states, these options enable the preferences of the different stakeholders to be balanced, and the risks associated with each option to be weighed during the decision making process. There is no single correct technique. Rather a combination of drainage techniques often can be implemented to most effectively manage site drainage. To simulate the natural hydrological processes in a catchment through engineered drainage, a management train of SuDS is required. The following are four objectives of a SuDS treatment train which were presented by Greater Dublin Strategic Drainage Study (2005):

- **Pollution prevention** – spill prevention, recycling, public awareness and participation.
- **Source control –** conveyance and infiltration of runoff;
- **Site Control –** reduction in volume and rate of surface runoff, with some additional treatment provided; and
- **Regional Control –** Interception of runoff downstream of all source and on-site controls to provide follow–up flow management and water quality treatment.

Table 7.1 classifies SuDS according to their suitability to each of the management train objectives. Regional control is of the most significance to this SFRA, since the remaining management train objectives are site specific and require participation from developers for their implementation. By considering regional SuDS control, the Council can be proactive in planning for SuDS on a regional level. It should be noted at this point that most drainage systems are gravity fed and thus require a negative gradient in order to operate. SuDS management trains are therefore highly likely to be limited to common drainage areas. Figure W.1 (in Appendix W) illustrates two likely implementation scenarios of a SuDS management train.

Table 7.1 (modified after CIRIA, 2007)

Technique	Management train suitability					
	Prevention	Conveyance	Pre-treatment	Source Control	Site Control	Regional Control
Water butts, site layout & management	#	=		#		
Pervious pavements	#			#	=	
Filter drain		#		#	=	
Filter strips			#	#		
Swales		#		#	#	
Ponds					#	#
Wetlands		=			#	#
Detention basin					#	#
Soakaways				#		
Infiltration trenches		=		#	#	
Infiltration basins					#	#
Green roofs	#		#	#		
Bioretention areas				#	#	
Sand filters			#		#	=
Silt removal devices			#			
Pipes, subsurface storage		#			#	

High/primary process = Some opportunities, subject to design

If SuDS are to be fully effective, they need to be managed properly. It is the responsibility of the developer to ensure that the development drainage is maintained for the lifespan of the development. There are a range of maintenance routes the developer might want to pursue but ultimately the developer has to demonstrate that there is a drainage maintenance plan presented. Section 106 of the Town and Country Act 1990 provides a suitable

mechanism whereby properly designed SuDS components can be transferred into the management and maintenance responsibilities of the local authority. This is providing the Council wish to enter into such an agreement and there is no legislation which states they have an obligation to.

The '*Interim Code of Practice for Sustainable Drainage Systems*' (NSWG, 2004) endorsed by the Environment Agency should be consulted for further guidance.

7.5.1 Integrated Drainage Strategy

Integrated Drainage, describes the collusion of all stakeholders (typically the LPA, Highways Agency, Environment Agency and the Water Company) to produce a scheme in which surface water drainage is addressed at a more strategic level. Opportunities for developing an Integrated Water or Drainage Management Strategy across development site boundaries is recommended, and ideally a catchment-led approach should be adopted. This has been recognised in the recent consultation paper by Defra, '*Making Space for Water*'. Integrated approaches often lead to a much more efficient and reliable surface water management system because it enables a wider variety of potential flood mitigation options to be used, and a better overall design can be achieved. Integrated management of surface water has potential benefits in addition to flood risk, and can include improved water quality through the use of. Once the site allocation process had been executed on the Isle of Wight, consideration should be given at an early stage as to the best way to manage drainage to maximise benefits. The Environment Agency will be pushing for an integrated urban drainage scheme in the Pan Extension Project in Newport. SUDS will be vitally important to ensure no detriment to water quantity or quality in the receiving watercourses. The river corridors should also be maintained across the site.

It is recommended that Appendix F of PPS25 or Chapter 4 of the Practice Guide from PPS25 is referred to.

7.6 Management of Construction Site Runoff

Construction site runoff is an important but often over-looked area of catchment hydrology, causing local short-term but potentially significant changes in local flood risk.

The clearance of vegetation (and modifications to drainage infrastructure on brownfield sites) may lead to increased runoff above pre-construction rates. The management of runoff during the construction period is an important consideration particularly for large sites and details of measures to mitigate for this phase of development are required as part of an FRA. The WFD places specific requirements on the management of non-point source pollution such as that from construction site silts. Methods to reduce the volume of solids (and runoff) leaving the site include:

- Phased removal of surface vegetation at the appropriate construction phase;
- Provision of a grass buffer strip around the construction site and along watercourses;

- The covering of stored materials;
- Ensuring exposed soil is re-vegetated as soon as feasibly possible;
- Protection of storm water drain inlets; and
- Silt fences, siltation ponds and wheel washes.

8. Principal of Flood Risk Management through Avoidance

8.1 Sequential Approach

Through the planning process, PPS25 aims to reduce the flood risks faced by future developments, and advocates a risk avoidance approach to spatial planning. Avoidance has always been an option for risk management, but it was rarely deployed. There has recently been a paradigm shift which now prioritises the importance of avoidance. Annex D of PPS25 has been reproduced (in Appendix D) of this SFRA for reference purposes. A sequential risk-based approach to determining the suitability of land for development in flood risk areas is central to the Policy Statement and should be applied at all levels of the planning process.

Application of the sequential approach to spatial planning reinforces the most effective risk management measure – that of avoidance. PPS25 states that application of the Sequential Test at the Local Development Document level, will help ensure that development including regional housing targets, can be safely and sustainably delivered.

The sequential approach offers a simple decision making tool that is designed to ensure that areas of little or no risk of flooding are developed in preference to areas at higher risk. PPS25 notes that LPAs should make the most appropriate use of land to minimise flood risk, by planning the most vulnerable development is located in the lowest known risk areas. However, it is recognised that there are cases when development within higher risk zones is unavoidable.

8.2 Sequential Test – Vulnerability and Flood Risk

The Sequential Test is a key component of the hierarchical approach to avoiding and managing flood risk. The SFRA has mapped the flood risk zones (Figure 12 in Appendix A) and has identified the landuses which are considered appropriate[3] for each site based on the guidance specified in PPS25 (see Table 8.1 below and Figure 12 in Appendix A). Table D.1 of PPS25 (in Appendix D) defines the risks associated with each Flood Zone and Table D.2 and Table D.3 indicate the types of landuse considered appropriate for each Flood Zone. The information presented in Table D.3 in PPS25 does not show application of the Sequential Test (see footnote 22 in PPS25), thus the appropriateness of development types is subject to the application of the Sequential Test. There are several key points that the Council should consider when applying the Sequential Test, these are outlined below.

[3] appropriate = as defined by Table D.2 in PPS25

- Increasing the vulnerability of a site by proposing an alternative use of a higher vulnerability (even if consistent with the risk) is considered an increase in flood risk and is not inline with the principals of PPS25;
- If any land in Flood Zones 3a, 3b or 2 has to be utilised (subject to successful application of the Sequential Test) development should be steered towards the areas of lowest hazard;
- Placing less vulnerable land uses in low risk areas, in preference to more vulnerable land uses, is not in line with the sequential approach and should be avoided; and
- If land in Flood Zone 3a has to be utilised, development should be steered towards the areas of lowest hazard within that zone. The information presented in Section 3 can be used to inform this process.

Table 8.1 Appropriate Landuses for Given Flood Risk Zones

Flood Zone	Probability	PPS25 Landuse Guidance
Flood Zone 3b	Functional Flood Plain	Only the water compatible uses and the essential infrastructure listed in Table D.2 (Appendix D) should be permitted in this zone. Development should be designed and constructed in such a way to: remain operational and safe for users in times of flood; result in no net loss of floodplain storage; not impede water flows; and not increase flood risk elsewhere Essential Infrastructure in this zone should pass the Exception Test
Flood Zone 3a	High	This Zone is the Environment Agency's Flood Zone 3 (September 2008). The water compatible and less vulnerable uses of land in Table D.2 are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test is passed. All developments in this zone should be accompanied by a FRA.
Flood Zone 2	Medium	The water compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in table D.2 are only appropriate in this zone if the Exception Test is passed. All development proposals in this zone should be accompanied by a FRA
Flood Zone 1	Low	All uses of land are appropriate in this zone. Other sources of flooding should be reviewed.

Guidance for zones 3b, 3a, 2 and 1 based on Table D.1 in PPS25

Figure 6 in Appendix A, illustrates the highest risk flood zone that each of the potential development sites intersects. Table 8.1 and Figure 6 can be used to inform the Sequential Test and the site allocation process. Please note that all development within Flood Zones 3a, 3b and 2 are subject to the successful application of the Sequential Test. For example, a commercial development is appropriate within Flood Zone 3a, but it should have passed the Sequential Test first.

For windfall sites, and sites not included in the SFRA assessment, the Environment Agency Flood Zones should be used in conjunction with Table 8.1.

8.3 Other Sources of Flooding

When considering the Sequential Test, the potential extent of surface water flow routes and ponding areas in the Regeneration and Development Areas (see appropriate Appendix E to V) should be reviewed. If there are two otherwise equally suitable sites for development in Flood Zone 1, with one site identified as being potentially at risk of surface water flooding and the other site is outside the potential zone of surface water flood risk, then the site outside the potential surface water flooding risk zone should be preferentially selected for development.

8.4 Spatial Extent of Flood Risk Zones at the Site Specific Level

Each of the potential development sites that were made available for assessment in the SFRA have been classified according to the highest risk flood zone that each intersects (See Figure 6 in Appendix A). Each of the 14 Regeneration and Development Areas is discussed individually in Appendices E to V, and within each is a figure illustrating the distribution of flood risk zones across each of the potential development sites. The colour coded classifications are based on Table 8.2.

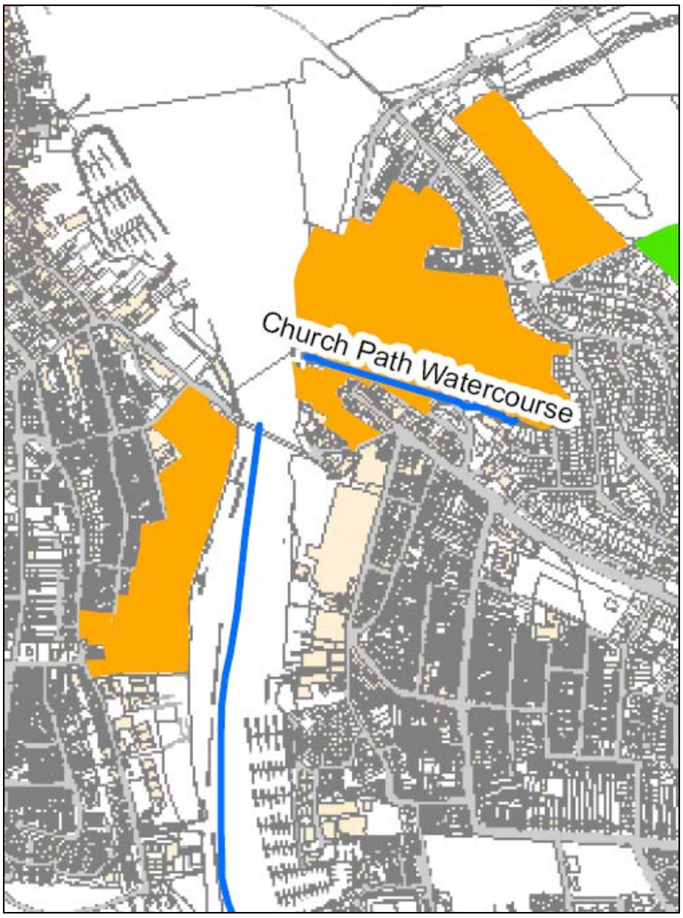
Table 8.2 Qualitative Flood Risk Classifications

Classification	Flood Zone Intersection	Definition
Highly Likely	Site intersects with Functional Floodplain (3b)	Events of common occurrence that an individual may experience a few times in their lifetime. This corresponds approximately to an annual exceedance probability of 10% - 4% (i.e. return periods of between 10 and 25 years)
Likely	Site intersects with Flood Zone 3a but not 3b	Events that an individual may experience once in a lifetime, approximately equivalent to the 1% to 0.5% annual exceedance probability event (i.e. return periods of 1 in 100 years to 1 in 200 years)
Unlikely	Site intersects with Flood Zone 2 but not 3a or 3b	Events that are of a low order of likelihood, approximately 0.1% annual exceedance probability.
Highly Unlikely	Site does not intersect with either Flood Zone 2, 3a or 3b	Extreme flood events with an annual probability of less than 0.1%.

If a potential development site fell within a range of flood risk zones, the whole site was attributed with the highest probability of flood risk. Those sites which intersect Flood Zones 2, 3a and 3b have been further analysed to illustrate the distribution of the flood risk zones across each of the sites. Of the 1470 sites assessed in Level 2, only 138 sites are partially or fully within Flood Zone 2, 3a or 3b. Figure 8.1 illustrates this process has been applied in Cowes.

Figure 8.1 Cowes Example – Site Specific Definition of Flood Risk

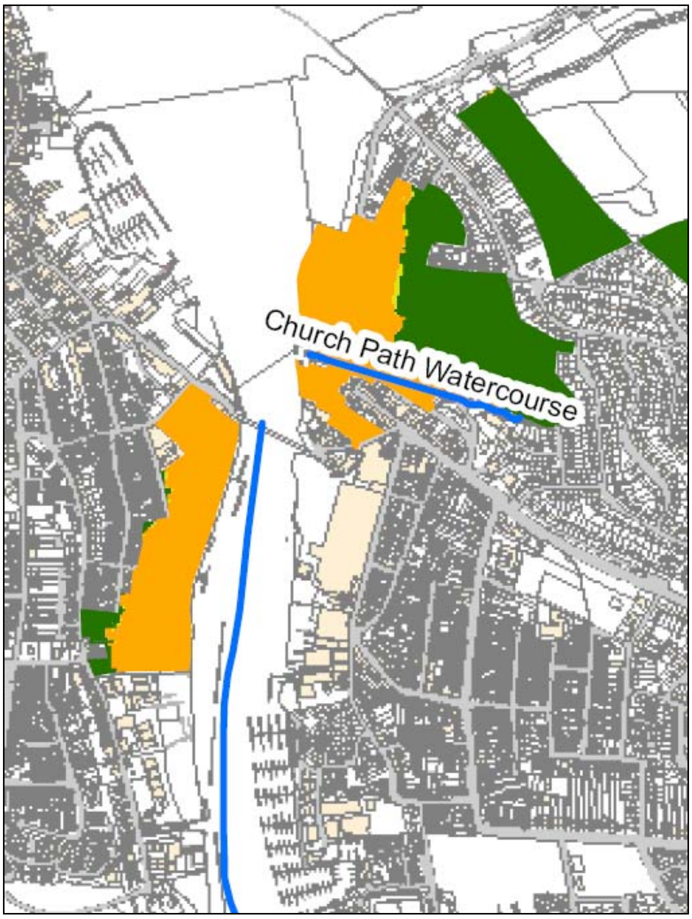
Image 1 - Qualitative Classification



Qualitative Probability

- Highly Likely
- Likely
- Unlikely
- Highly Unlikely

Image 2 - Site Specific Definition of Flood Risk



PPS25 Site Specific Flood Risk Definition

- Functional Floodplain 3b
- Flood Zone 3a
- Flood Zone 2
- No Flood Zone

In Image 1 the sites are attributed with a qualitative flood risk potential based on the highest flood risk zone that the site intersects. In Image 2, the delineation of flood risk across each site has been defined

In line with the principal of avoidance, landuse planning on site should be informed by the distribution of flood risks across the sites

9. Principal of Flood Risk Management through Design

9.1 The Exception Test

The PPS25 Exception Test recognises that there will be some exceptional circumstances when development within higher risk zones may be unavoidable. The Council's development targets, driven by Planning Policy Statement 3 – Housing (PPS3) may result in some of this future development being residential. The allocation of this necessary development must still follow the sequential approach and where exceptions are proposed, the Exception Test must be satisfied.

Flood mitigation measures should be considered as early as possible in the design development process to reduce and manage the flood risks associated with development. This section describes how flood risk can be managed through development design. The instances where a FRA is required to support the planning application is discussed in Section 11.

9.1.1 Passing the Exception Test

To pass the Exception Test three key criteria must be met. These criteria and the sources of supporting information are presented in Table 9.1.

Table 9.1 Exception Test Guidance

Part	Criteria	Guidance
a	It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the DPD has reached the 'submission stage' – the benefits of the development should contribute to the Core Strategy.	Review site against aims and objectives of Sustainability Appraisal and Local Development Documents
b	The development should be on previously-developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously developed land	PPS3
c	A FRA must demonstrate that the development will be safe, without increasing flood risk else where, and where possible reduce the overall flood risk.	Refer to Sections 8 and 9 of this report.

Criteria based on paragraph D9 of PPS25

PPS25 states that the Exception Test should only be undertaken once the Sequential Test has been applied and passed. For the Sequential Test to have been passed, it must be demonstrated that there are no other reasonably alternative sites available in zones of lower flood risk. This is an essential evidence base and should be considered a prerequisite for any development proposed in a zone of flood risk. Once the Sequential Test has been applied and passed, PPS25 requires the Exception Test to then demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risks. Where development is essential in a flood risk zone, PPS25 requires it to be on previously developed land, if this is not possible it must be demonstrated that there are no reasonable alternative sites on developable previously developed land. The final requirement of the Exception Test states that the development must be safe, without increasing the flood risk elsewhere and where possible reduce overall flood risk.

9.1.2 Part c of the Exception Test

Part c of the Exception Test requires an FRA, demonstrating that the proposed development will be safe, without increasing the flood risk elsewhere. To achieve this, PPS25 identifies a number of factors which need to be considered.

- Safe access and egress;
- Operation and maintenance;
- Design of development to manage and reduce flood risk wherever possible;
- Resident awareness;
- Flood warning; and
- Evacuation procedures and funding arrangements.

These key aspects are expanded in the Section 9, where flood risk management is discussed in terms of design and emergency responses.

9.2 Flood Risk Management through Design

Flood risk management by design should only be considered after the sequential approach has been applied to development proposals. The sequential approach is applicable both in terms of site allocation and site layout. Only when it has been established that there are no suitable alternative options in lower risk areas, should building design solutions be considered to exceptionally allow development to proceed in flood risk areas.

The sequential approach to landuse planning on site can mitigate some of the flood risks, and should be deployed ahead of building design solutions (See Sections 6.6 to 6.14 in the PPS25 Practice Guide). However, there will be instances where a level of risk remains. In these circumstances, flood risk management through design is required. This would need to be addressed as part of site-specific FRA. The following sections provide some over-arching guidance to the Isle of Wight when considering planning applications.

9.3 Development managements

The guidance presented in this section is intended for application in the Island's fluvial and tidal flood zone areas. The SFRA does not include any residual tidal or fluvial flood risk analysis.

9.3.1 Development in Flood Risk Zones Areas

Development managements in Fluvial Flood Risk Zones may include:

- The FD230/TR1 Report Section 7.5.3 states that - New developments are required to provide safe access and exit during a flood. The measures by which this will be achieved should be clear in the site-specific FRA. Safe access and exit is required to enable the evacuation of people from the development, provide the emergency services with access to the development during a flood and enable flood defence authorities to carry out necessary duties during the period of flood. A safe access or exit route is a route that is safe for use by occupiers without the intervention of the emergency services. The FD230/TR1 emphasises that a route can only be completely safe in flood risk terms if it is dry at all times. However it is recognised that this is not always practicable, necessitating more detailed analysis;

- Finished floor levels of more vulnerable uses should be above the predicted 1 in 100 year water levels (plus climate change and inclusive of a freeboard allowance of 300mm or 600mm). The Environment Agency should be consulted for confirmation of the appropriate freeboard allowance. Ideally less vulnerable landuses should also have floor levels that do not flood and this arrangement should be sought where ever possible. Water level data for areas in the fluvial floodplains should be obtained upon request from the Environment Agency; and

- The existing footprint of buildings on a site must not be increased post re-development. This is because additional construction can reduce floodplain storage and increase the risk of flooding elsewhere. PPS25 does not permit this. Options to offset the increased footprint of a proposed structure could be possible. Such schemes should be discussed in detail with the Environment Agency.

Figure 4 (in Appendix A), illustrates the extent of the Environment Agency's Main rivers. To ensure that flood risk is considered as part of a development along the banks of any of these watercourses, a theoretical buffer zone along both banks has been implemented by the Environment Agency. The Environment Agency's policy is that any proposed development within 20m, of the bank of a main river requires Environment Agency consultation.

9.3.2 Development in Areas Designated as Functional Floodplain (Zone 3b)

Development in the functional floodplain should be avoided in line with the Sequential Approach presented in PPS25. Only water compatible uses will be permitted providing there is no reduction on flood conveyance or flood storage. Less vulnerable, more vulnerable and Highly vulnerable uses are not permitted in Zone 3b. Essential Infrastructure may be permitted providing the Exception Test is satisfied.

9.3.3 Planning Implications of Climate Change and FRA Scope

General

When undertaking FRAs in Flood Zones 2 and 3, an allowance for climate change has to be provided. PPS25 requires this allowance to be a minimum of 100 years, less will only be acceptable if the development will only be short term, which will need to be reflected in an associated planning condition. When undertaking an FRA the required scope of the assessment should be requested as part of the data request which will need to be submitted to the Environment Agency External Relations Team.

The PPS25 practice Guide states that a minimum of 100 years worth of predicted climate change impacts should be considered for new development. In some instances the lifespan of a development may be significantly less, in which case the consideration of a shorter period of climate change influence may be appropriate. The development lifespan an associated climate change implications need to be discussed and agreed with the LPA at the earliest possible stage.

Rainfall

Climate change should be accounted for when assessing sites in Flood Zone 1. Historically this has typically involved increasing peak rainfall intensity by 20-30% (see Table B.2 in Annex B of PPS25). It is however recommended that the extent of the tidal climate change predictions is considered in FRAs in Flood Zone 1. This is important as climate change induced sea level rise has the potential to increase both flood depths and extents.

Tidal

The tidal climate change mapping in Appendix A and in Appendices E-V should be consulted. In line with the principals of risk avoidance, site layout should seek to avoid the predicted flood extents. If this is not possible, risk management should be undertaken through design. As such it is recommended that finished floor levels for more vulnerable or highly vulnerable landuse types (See Table D.2 in Annex D of PPS25) of a site should reflect the 2115 1 in 200 year predicted tide level plus an appropriate free board allowance.

The LPA has taken the view that the tidal flood zones held by the Environment Agency should be superseded with tidal flooding predictions which provide an allowance for climate change. As such the assessment of tidal flood risk at the potential development site level uses the 1 in 200 year flood extent (in the year 2115) to represent tidal flood zone 3 and it utilises the 1 in 1000 year flood extent (in year 2115) to represent tidal flood zone 2. This approach reflects the LPAs determination to achieve sustainable coastal development. Please consult Figure B1 in Appendix B for tide level predictions around the Island.

9.3.4 Freeboard Allowance

Predicted flood water levels alone, are not necessarily sufficient to inform finished floor levels. An additional freeboard may be required to account for uncertainties and in tidal area, the action of waves. In all instances, the Environment Agency should be consulted to establish the necessary freeboard allowance for the proposed development.

9.3.5 Basements

It is recommended that habitable rooms in basements should not be permitted in Flood Zones 2 or 3. Adaptation of existing properties, to include a basement for habitable rooms should be discouraged in Flood Zones 2 and 3. It is however recognised that the implementation of this may be challenging, as basement development is sometimes classified as Permitted Development when within the bounds of the existing building.

Basements for less vulnerable uses or non habitable rooms must be designed with safe internal escape. Each application should be discussed with the Environment Agency. Site specific analysis should accompany any proposal, to demonstrate that a proposed basement would not impact the flow of groundwater in such a way that the risk of groundwater flooding elsewhere is increased.

9.3.6 Access and Egress

Safe escape to outside the flood risk zone should be incorporated into site designs to facilitate safe evacuation. Additional detailed modelling of watercourses may be required to provide the necessary flood levels and speeds of onset and flood hazard classifications needed to inform safe evacuation routes. Safe routes should be identified both inside and beyond the site boundary of the new development. Even where a new development is above the floodplain and is considered to be acceptable with regard to its impact on flood flows and flood storage, it should be demonstrated that the routes to and from the development are also safe to use.

PPS25 recommends that where safe access and egress are likely to be an issue, this should be discussed with the LPA and the Environment Agency at the earliest stage, as this can affect the overall design. It can be difficult to 'design in' satisfactory routes retrospectively. Access considerations should include the voluntary and free movement of people during a design flood, as well as the potential for evacuation before a more extreme flood. Dry access and egress above the design flood level is preferable, however there may be instances when an FRA has to demonstrate safe access and egress routes rather than dry routes. When considering the suitability of safe access and egress routes, the Environment Agency recommends that Table 13 in the FD2320/TR2 report is consulted (a pdf version is available at http://www.rpaltd.co.uk/documents/J429-RiskstoPeoplePh2-Guidance.pdf), to identify what combinations of flood depth, velocity and debris are considered safe. The white cells in Table 13 are considered by the Environment Agency as providing safe routes.

PPS25 states that developer should ensure that the appropriate evacuation and flood response procedures are in place to manage residual risk associated with an extreme event to the satisfaction of the LPA. In advising the LPA, the emergency services are unlikely to regard developments which increase the scale of any rescue that might be required, as safe. Even with defences in place, if the probability of inundation is high, safe access and egress should be maintained for the lifetime of the development.

9.4 Building Design

The final step in the flood risk management hierarchy is to mitigate through building design. PPS25 considers this as the least preferred option and should not be used in the place of the sequential approach to landuse planning on a site.

The communities and Local Government[4] have published guidance on improving the flood performance of New Buildings. The guide identifies a hierarchy of building design which fits within step 5 of the flood risk management hierarchy of PPS25 Practice Guide. The other steps in the Practice Guide are (assess, avoid, substitute and control – see PPS25 Practice Guide June 2008) and need to have been considered first before using the hierarchy below which is taken from the PPS25 Practice Guide:

Flood Avoidance

Construction a building and its surrounds (at site level) to avoid it being flooded (e.g. by raising it above the flood level)

Flood Resistance

Constructing a building in such a way to prevent flood water entering the building and damaging its fabric.

Flood Resilience

Constructing a building in such a way that although flood water may enter the building its impact is reduced (i.e. no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated).

Flood Reparable

Constructing a building in such a way that although flood water enters a building, elements that are damaged by flood water can be easily repaired or replaced.

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[4] Improving the Flood Performance of New Buildings – Flood Resilient Construction', *Communities and Local Government* (2007)

The Flood Resilient Construction Report, sets out to help the designer determine the best option or design strategy for flood management at the building site level, based on knowledge of basic flood parameters (e.g. depth, duration and frequency), these factors would normally be determined by the site specific FRA during the planning application process. Depending on these parameters (in particular depth) and after utilising options for flood avoidance at site level, designers may opt for a water exclusion strategy or a water entry strategy, as illustrated in Figure 6.1.

Figure 9.1 Flexible and Risk Averse Approaches to Managing Flood Risk and Safe Development

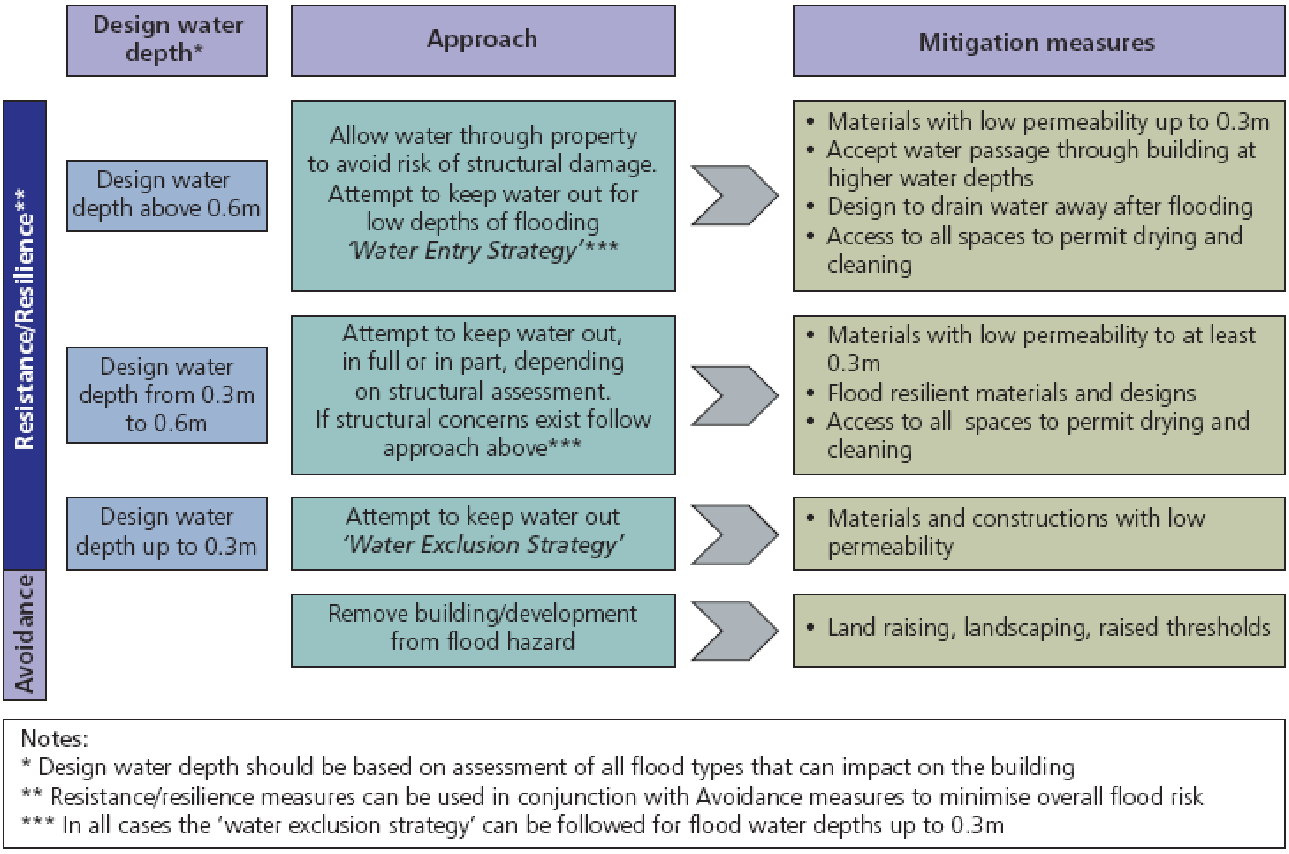

Figure Taken from 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', *Communities and Local Government* (2007)'

In a **Water Exclusion Strategy**, emphasis is placed on minimising water entry whilst maintaining structural integrity, and using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (up to a possible maximum of 0.6m).

In a **Water Entry Strategy**, emphasis is placed on allowing water into the building facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water lever

difference between outside and inside of the building of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved

9.5 Flood Warnings

The Environment Agency provides flood warnings for on the Isle of Wight for the following areas that include:

- Eastern Yar from Whitwell to Bembridge including the Scotchells Brook and Wroxall Stream;
- River Medina from Whitwell to Newport and Lukely Brook from Carisbrooke
- All around the coast of the Isle of Wight;
- Monkton Mead Brook at Ryde;
- Coastal areas at Wootton, Ryde, Spring Vale, and Bembridge;
- Coastal area at Cowes and East Cowes, and tidal areas of Newport;
- Coastal area at Yarmouth, Isle of Wight;
- Western Yar, Thorley Brook and Caul Bourne;
- Western Yar from Schoolgreen and Freshwater Bay to Yarmouth; and
- Coastal area at Sandown

It is important to note that the Environment Agency flood warnings will not be able to provide advance warning for all different flood mechanisms. Warnings will not give advance notice of flooding from structural failures, culvert blockages or from groundwater. Intense rainfall events may also generate localised and severe rapid onset floods that are very difficult to predict.

The Agency's flood warnings are provided for existing developments at risk from flooding. They should not be considered as a mitigation measure for new and planned developments.

9.6 Emergency Planning

In light of this SFRA the council should take the opportunity to review its Emergency Planning procedures in the event of widespread flooding on the Island (similar to the Autumn/Winter 1999/2000 flood events). In the event of flooding it is the Council's role, supported by the emergency services, to coordinate procedures and responses. Key issues that should be covered in an emergency plan are:

- Responsibilities and roles of key services and communication protocols;

- Susceptibility of key emergency response centres (council offices, fire and police stations and hospitals) to flooding;
- Evacuation routes and reception centres; and
- Contingency plans for the loss of power and/or water.

There is likely to be several days notice of meteorological predictions of prolonged frontal rainfall that could cause major flooding along the larger catchments like the Eastern Yar. But other watercourses and urban area flood events may exhibit a more ‘flashy’ response due to convectional storms and rapid runoff rates.

Residents in areas of flood risk should be encouraged to sign up to the Environment Agency’s Flood Warning System, particularly those identified as living in isolated properties in Flood Zone 3b (functional floodplain), where waters would likely rise most rapidly and access routes may become cut off.

The SFRA can be considered to be a refinement of the Environment Agency Flood Map / Flood Explorer. For example the tidal modelling work in the SFRA does not show Yarmouth to be cut off by flood waters in the event of the 1 in 1000 year flood like it is in Flood Explorer. As such, the SFRA could be used to locate emergency infrastructure and emergency services depots. Where potential development sites are adjacent to these structures and utilities options to reduce the flood risk posed to them could be explored.

10. Assessment and Management of Flood Risk in Regeneration and Development Areas

This section of the report addresses each of the regeneration areas and rural service centres. They can be summarised in order of scale (from large to small) as comprising of 3 Key Regeneration Areas, 2 Smaller Regeneration Areas and 12 Rural Service Centres. These have been identified by the Council's emerging spatial strategy, which has been shaped by regional and national planning policy, local public consultation and the SA/SEA process. The overall strategic development strategy for the Isle of Wight is for economic led regeneration that concentrates the majority of development within and around the main urban areas, to create strong, sustainable, cohesive and inclusive mixed communities.

The Council has asked Entec to look at five large possible development sites (sites with a cumulative threshold of greater than one hectare) in more detail. This will enable the Council to make more informed decisions when it considers which sites may be appropriate for development within the Core Strategy or Area Action Plans.

The Council provided Entec with all the sites contained within both the Councils' Land Request and Urban Capacity database, these included the following use requests;

- Housing
- Mixed Housing Plus
- Mixed Use
- Local Needs Housing
- Employment
- Infrastructure
- Leisure
- Tourism
- Minerals and Waste
- Open Space
- Development Envelope Change- request for changes to the envelope
- Not Specified- request for development has not been specified

Most of the sites which have been provided to Entec have been through the 'call for sites' process from landowners and developers whereby interested parties have completed a site proforma form for land to be considered through the LDF process. The only sites which have not been through the 'call for sites' process are those sites identified as Urban Capacity Sites. These sites were initially identified form the Urban Capacity Study update (November 2005) which was used as the starting point for the Strategic Housing Land Availability Assessment (SHLAA).

All sites requested/identified for (a) Housing (b) Mixed Housing Plus (c) Mixed Use (d) Local Needs Housing (e) Development Envelope Change have been assessed through the SHLAA as sites which could accommodate either all or an element of housing development on site.

The SHLAA provides an initial assessment of site suitability, availability and deliverability and is the evidence to support decision-making within the plan process[5]. However these sites should not be inferred as being suitable for development or looked upon favourably when determining planning applications.

It should be noted that although Newport, Cowes and East Cowes have been grouped together under the Medina Valley in terms of development plan (as will be exemplified by the Medina Valley AAP) for the purposes of the SFRA Newport has been assessed separately from Cowes and East Cowes (which have been grouped together) due to the physical separation, the differences in the physical environment and the differences in the nature of flood risk.

The flood risk, drainage and flood risk management information and mapping associated with each of the regeneration areas are included in the following Appendices;

Key Regeneration Areas (Area Action Plans)

- Appendix J - The Bay (Sandown, Lake & Shanklin)
- Appendix N – Ryde
- Appendix P - Newport
- Appendix Q - Cowes & East Cowes

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[5] The SHLAA assessment terms used here are defined in the Communities and Local Government Strategic Housing Land Availability Assessments Practice Guidance (CLG, 2007); http://www.communities.gov.uk/documents/planningandbuilding/pdf/399267.pdf

Smaller Regeneration Areas

- Appendix E - West Wight (Freshwater & Totland)
- Appendix H - Ventnor

Rural Service Centres

- Appendix F - Yarmouth
- Appendix G - Brighstone
- Appendix I - Wroxall
- Appendix K - Brading
- Appendix L - Bembridge
- Appendix M - St Helens
- Appendix O - Wootton
- Appendix R - Arreton
- Appendix S - Niton
- Appendix T- Chale
- Appendix U - Rookley
- Appendix V- Godshill

11. Flood Risk Assessments and Windfall Sites

11.1 Windfall sites

It is highly likely that there will always be windfall development, and these sites will need to be assessed. The Island's emerging Core Strategy will identify the target areas for growth and regeneration. The appropriateness for sites outside these areas will need to be addressed on a site by site basis. Proposed windfall development should pass the Sequential and Exception Tests. Additionally, the sequential approach to flood risk management will be required within the development site, and this will need to be addressed within the development proposals and accompanying FRAs.

11.2 Site Specific Flood Risk Assessment (FRA) – Where are they required on the Isle of Wight?

Table 11.1 provides a clear instruction to developers and Planning Officers as to where a Flood Risk Assessment (FRA) is required on the Isle of Wight. If any one of the criteria listed in Table 11.1 applies to the site in question then, a FRA needs to be prepared to accompany a planning application. PPS25, should then be referred to for the establishment of the scope of the FRA and the Environment Agency should also be consulted. Table 11.1 also provides an outline of the likely scope of the FRA.

The latest Environment Agency Flood Zones should be reviewed in consultation with Table 11.1.

The following links to the Environment Agency provide additional information

http://www.environment-agency.gov.uk/research/planning/82587.aspx

http://www.environment-agency.gov.uk/research/planning/82584.aspx

http://www.environment-agency.gov.uk/static/documents/Research/pps25factsheet_1657913.pdf

Table 11.1 When is an FRA Required.

Criteria Requiring a FRA or further investigation	FRA Required (Yes/No)	Scope of the FRA or further investigation
In Flood Zone 3b	Yes	Follow the requirements of PPS25
In Flood Zone 3a	Yes	Follow the requirements of PPS25
In Flood Zone 2	Yes	Follow the requirements of PPS25
Greater than 1 hectare in Flood Zone 1	Yes	Follow the requirements of PPS25.

Criteria Requiring a FRA or further investigation	FRA Required (Yes/No)	Scope of the FRA or further investigation
Is the site within the extent of the 1:200 year flood event in 2105?	Yes	Follow the requirements of PPS25 – i.e. development must be safe inclusive of an allowance for climate change (See Section 9.3.3)
Greater than 0.25 hectare	Drainage assessment required	For all sites over 0.25 hectare in Flood Zone 1 an assessment of surface water drainage will be required with any planning application. This assessment should review the potential to incorporate sustainable drainage techniques and attenuate flows in line with the Councils aspirations.
Within the Exposure Risk Buffer	Review of potential risks associated with wave action is required.	If the site is lower than the sum of the 1 in 200 year (2105) peak tide (see Figure 21 in Appendix A) plus a 4m extreme wave height allowance, then it could be considered appropriate for the development to be inclusive of appropriate mitigation against the risk associated with spray.
Within 20m of the bank top of a main river?	Consult Environment Agency Development management	All potential development sites assessed in the SFRA which are within 20m of a Main River have been attributed with this information. Development is likely to require Environment Agency consent in these areas
Within 16m of a flood Defence	Consult Environment Agency Development management	Development is likely to require Environment Agency consent in these areas

Appendix T provides details of the Environment Agency's standard responses justifying objections to FRAs.

11.3 Contact Information

The list below provides useful contact information to assist in the FRA process

- Environment Agency data and contact information of local officers can be requested from corporate.services@environment-agency.gov.uk
- The Environment Agency's main telephone number is 08708 506 506
- The Isle of Wight Council's on line planning services can be found at http://www.iwight.com/council/departments/planning/appsdip/PlanningOnline.aspx
- The Isle of Wight Planning team can be contacted on 01983 821000 or customer.services@iow.gov.uk
- Details on consultancy services to relating to flood risk and drainage work can be found at http://www.entecuk.com/frm/

12. Further Flood Risk Work for SPD/DPDs and Surface Water Management

The SFRA for the Isle of Wight provides a detailed assessment of flood risks across the Island and in 17 of the Regeneration and Development Areas. Details of the 17 focus areas are provided in Section 10. This section of the report is intended to outline if there are any areas where there remains a flood risk knowledge gaps which need to be filled to inform the planning decisions made by the LPA. The possible further work identified in this section is separate to the additional flood risk work which will likely be required when site specific FRAs are prepared in the Flood Zones.

The management of surface water is an increasingly important issue which LPAs, in partnership with other stakeholders, are being given the responsibility to coordinate. Based on the pluvial modelling work undertaken as part of this SFRA and the comparison of this data with the Southern Water flooding records, areas where there is a perceived pluvial flood risk problem have been highlighted.

12.1 Additional Flood Risk Work to Support the Planning Process

Additional flood risk work can be undertaken by the LPA for a number of reasons, these primarily include:

- There is insufficient data available to inform the SFRA process;
- To inform SPD, DPDs or inform masterplan design briefs; or

On the Isle of Wight it is considered that sufficient flood risk information is available to produce a robust SFRA to support the site allocation process and the emerging Core Strategy. The detail to which flood risk needs to be understood (i.e. flood depths, hazard ratings, velocities, rates of onset and time to inundation), in specific locations is determined by the planning aspirations. LPAs with restricted land availability, expensive areas of flood risk zones and high development targets are sometimes forced to consider allocations in the areas of higher flood risk. The flood risk evidence base necessary for such an approach is required by PPS25 and the Environment Agency to be more detailed. The Isle of Wight Council's planning decision making process, on the other hand, is driven by the principal of avoidance. Indeed it is understood that development within zones of flood risk will not be promoted unless completely necessary in specific locations. This stance to a large extent negates the need for the Council to undertake further flood risk work in many areas. Should the Council's current view change, and there becomes a requirement to allocate residential uses in flood zones, then more detailed work may be necessary.

At the site specific level the Council may wish to undertake 'Flood Risk Constraints and Opportunities Studies' or 'Outline FRAs' for priority sites. These types of study set out the risks and using SFRA guidance they advise on how sites can be safely developed. It is typical for such studies to be also undertaken by developers and land owners alike to better understand the development potential of a site.

Of the locations reviewed in the SFRA, the following have been identified as areas where the Council may wish to consider more detailed work a potentially significant number of the Potential Development sites are impacted by flooding:

- **Yarmouth** – the town is encircled by flood zones and sea level rise is predicted to increase the extent of the risk zones in the town. Flooding is therefore a key factor in the long term sustainability of this settlement, the management of this and any proposed further development could benefit from further flood risk analysis. The A3054 is predicted to flood in extreme events, which could isolate the settlement, the implications of this should be reviewed from a both a regeneration and development and an emergency planning perspective.

- **Newport, Cowes and East Cowes** – there are a number of large potential development sites along the Medina estuary. These sites are at least partially within flood risk zones and the influence of climate change is potentially significant here, in terms of flood depths. Flood defences have been identified along this part of the coastline, their role in a flood event is not yet understood. Owing to the number of sites adjacent to the coastline in Newport, Cowes and East Cowes, it may be appropriate to understand the nature of the residual risk facing these sites which can be used to inform masterplan design briefs and site specific FRA work.

- **Niton, Chale and Godshill** - the current flood zone extents do not extend into these settlements, this is because the respective watercourses have drainage areas smaller than the 3km^2 applied by the Environment Agency. As such a number of these sites may be presented with a fluvial flood risk which the SFRA has not been able to identify. The Council may wish to take the view that the potential flood risks in these settlements so as to further in form the site allocation process.

The Environment Agency recognise that future regeneration strategies may result in development being located within flood zones. If this is so, the Environment Agency recommend that these areas are identified and specific outline FRAs are undertaken which will advise on (but not be limited to):

- Flood risk
- Safety standards
- Building policy
- Infrastructure requirements
- How residual risk will be managed (if located behind flood defences)
- Emergency planning

12.2 Surface Water Management Plans

There are two aspects to the management of surface water management in this section of the SFRA, the first relates to the emerging guidance driving LPAs to develop Surface Water Management Plans (SWMPs) and the second relates to areas where, through coordinated planning, the Council can oversee the implementation integrated surface water management solutions.

12.2.1 Surface Water Management Plans – Locations for Further Investigation

The first part of the SWMP process is to understand the areas that are at most risk and which require further investigation. The SFRA has essentially undertaken a high level surface water scoping exercise by modelling surface water for 14 of the major urban areas on the Island. From a review of this data it is clear that some areas are at greater risk than others, these settlements are outlined below. An advancement of the surface water flood risk understanding could be achieved through following the guidance provided in the section titled 'Scope of Future Assessments'.

All future development in each of the 14 modelled settlements should review the surface water mapping so as to ensure that this risk is firstly avoided and secondly be sustainably managed. Site design and layout should accommodate the predicted flow routes and there should be careful consideration for how a development has the potential to influence the surface water flood risk to surrounding areas, as PPS25 does not allow for flood risk to be increased elsewhere.

Settlements with the Predicted Greatest Risk

The surface water modelling undertaken for the 14 Regeneration and Development Areas on the Isle of Wight indicates that some settlements are more at risk of surface water flooding than others. Based on the modelling undertaken in this SFRA update, the following settlements are predicted to be at the greatest risk; Newport, Cowes, Ventnor and The Bay. These settlements have been selected because these are the urban areas where there are the largest number of reported incidents, the locations where the modelling predicts there to be the most significant potential flow routes or ponding areas and the areas where the greatest number of potential development sites are impacted. The degree of predicted surface water flooding is a product of the flowing factors:

- The depth of rainfall, this is a function of the underlying soil and geology types;
- The drainage length from the edge of the contributing catchment to the nearest river or the sea; and
- The local topography.

Scope of Future Assessments

This section outlines what additional work might be appropriate in each of the identified locations so as to better understand the nature of the surface water flood risks and to inform management solutions.

- Build an integrated surface water model of the town, inclusive of the Southern Water surface water drainage network. This model should be built in such a way so as to enable pipe flows and surface water flows to be simultaneously simulated;

- The incorporation of information relating to the drainage network discharge points, with an allowance for high river/tide levels;
- Analysis of all the historic surface water flood incident reports – only data up to 2006 were available to the SFRA; and
- In the SFRA the modelling approach included the use of LiDAR from which buildings and man made structures were removed, a more detailed analysis should consider and compare the output of results that utilise a ground model inclusive of buildings;

12.2.2 Integrated Surface Water Management Solutions

Sections 7.2 and 7.5 discuss the concepts of integrated drainage and sustainable drainage, this section expands on this by outlining how, through the planning process, the Council could encourage this approach by ensuring that the drainage and SuDS strategy is a high priority factor in the masterplanning process.

The development of an integrated and sustainable approach to drainage requires it to be considered early in the development process, much in the same way that highways and utility provisions are reviewed. The concept of sustainable drainage centres on the regulation of flows by providing the necessary attenuation, utilising natural flow routes, improvement of water quality and where possible providing ecological and/or amenity value. The potential of sustainable drainage is often limited by the phasing of sites being brought forward for development and the phased delivery of sites.

The consideration of integrated surface water drainage should include a consideration of current drainage issues and where possible new development and its associated drainage schemes should seek to improve existing problems.

The sustainable drainage infrastructure for part of a town's re-development and future new development, needs to be considered early in the process so that the subsequent design for adjacent or down slope sites accommodate the sustainable drainage requirements. The Council is considered to be best placed to undertaken a review of the potential for integrated SuDS systems. Such an undertaking is likely to be more appropriate either following the site allocation process or in areas sites are likely to be developed out in the near future.

The Council could either undertaken outline Drainage Concept Design for whole urban areas, which subsequent developers should follow or work could be undertaken on a more location and site specific basis.

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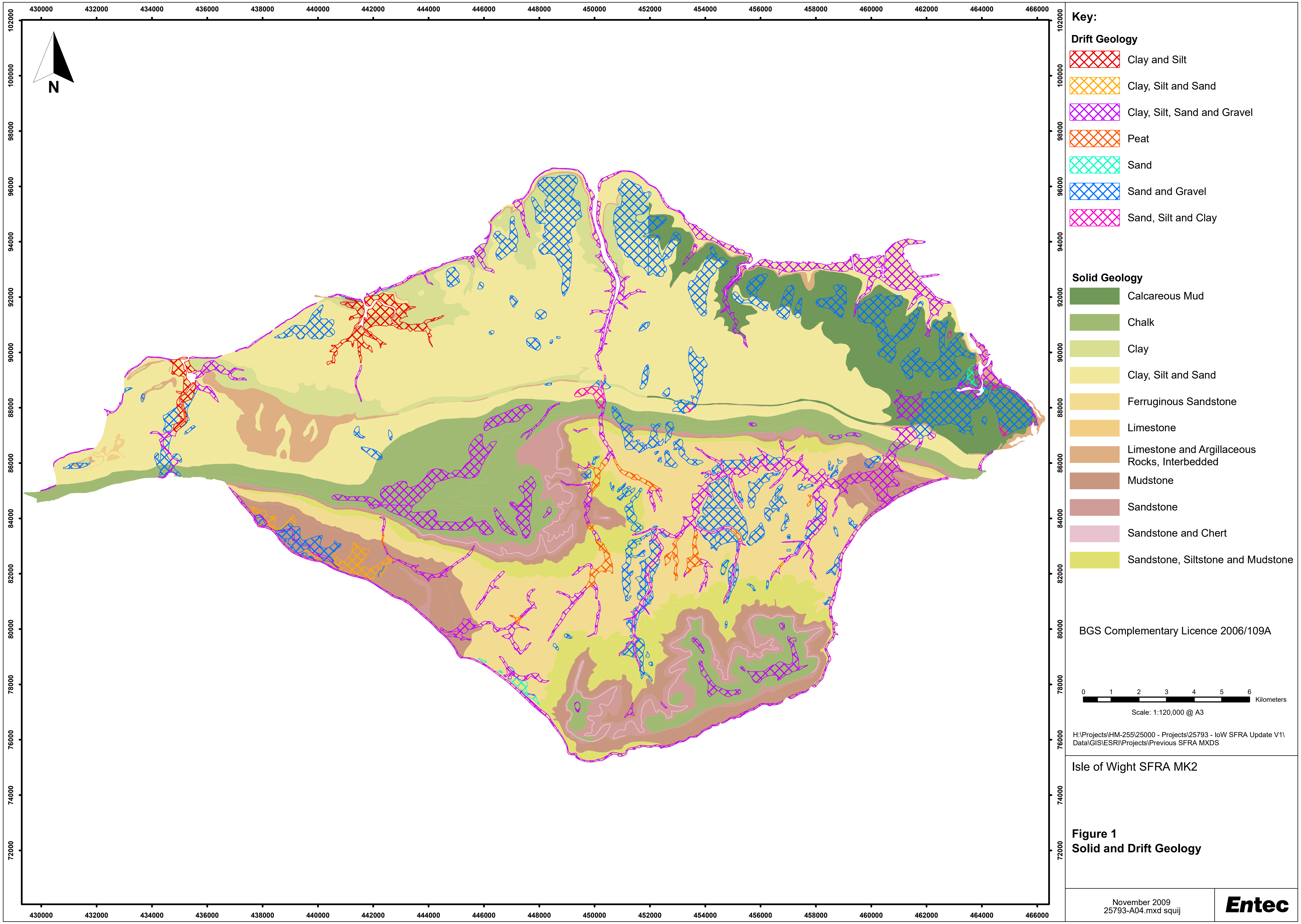
Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix A
Island Wide Mapping

June 2010

ISLE of WIGHT COUNCIL



Isle of Wight SFRA MK2

Figure 1
Solid and Drift Geology

November 2009
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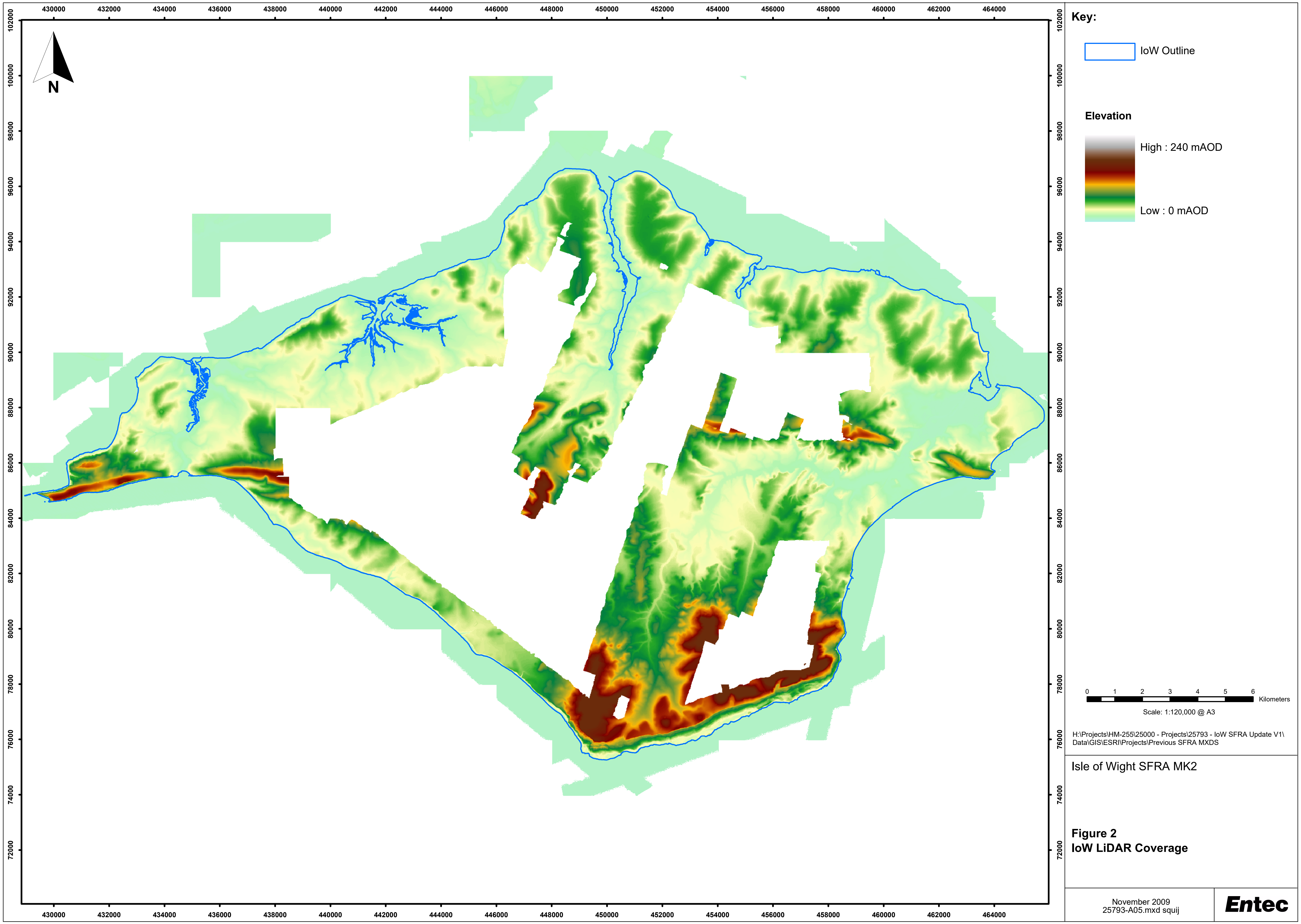
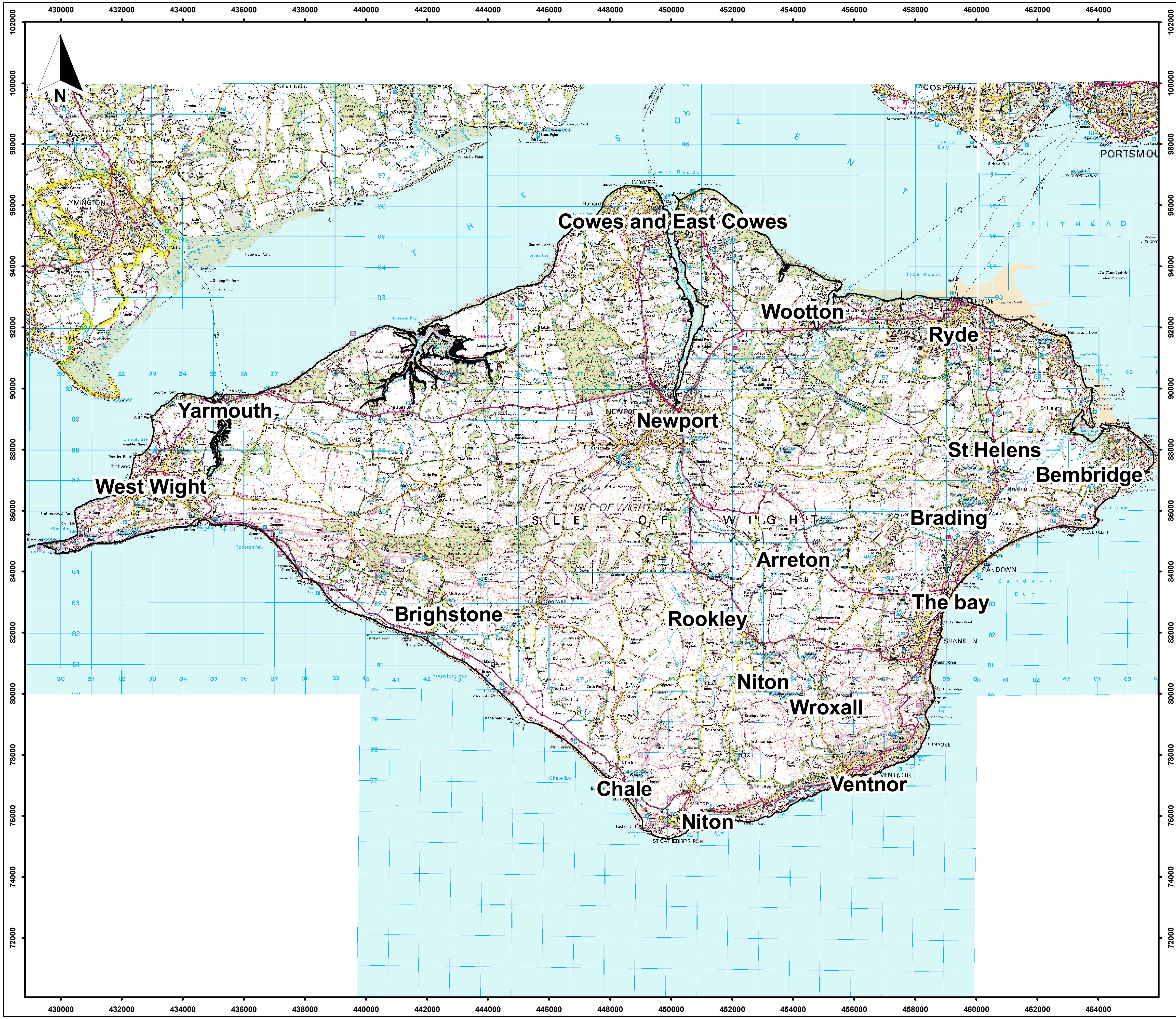
Entec


N
Key:
IoW Outline
Elevation
High : 240 mAOD
Low : 0 mAOD
0 1 2 3 4 5 6 Kilometers
Scale: 1:120,000 @ A3
H:\Projects\HM-255\25000 - Projects\25793 - IoW SFRA Update V1\Data\GIS\ESRI\Projects\Previous SFRA MXDS
Isle of Wight SFRA MK2
Figure 2
IoW LiDAR Coverage
November 2009
25793-A05.mxd squij
Entec



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Isle of Wight SFRA MK2

Figure 3

Regeneration and Development Areas

November 2009
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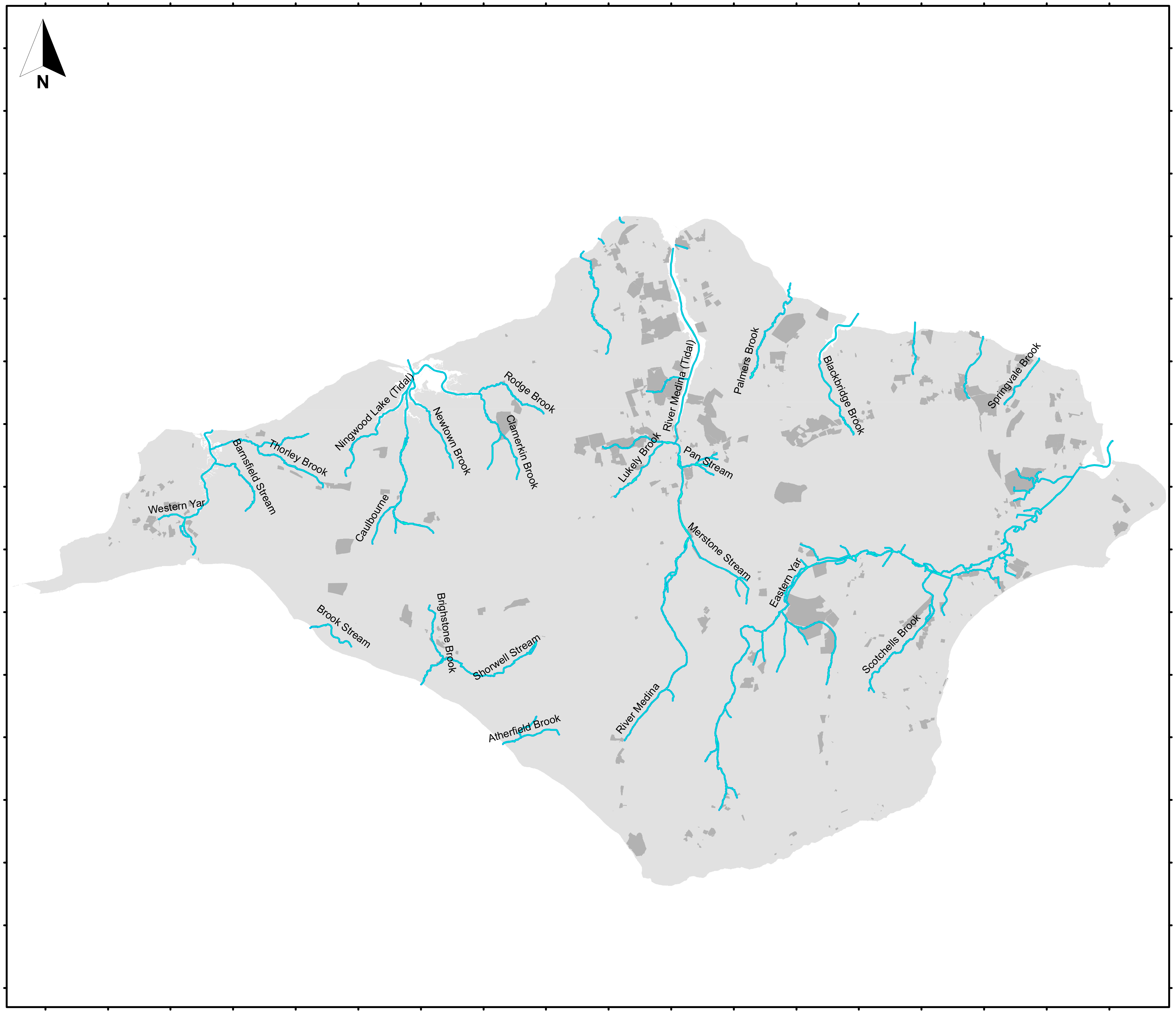

Key:

Main Rivers - 20m Buffer

IoW Outline

Potential Development Sites

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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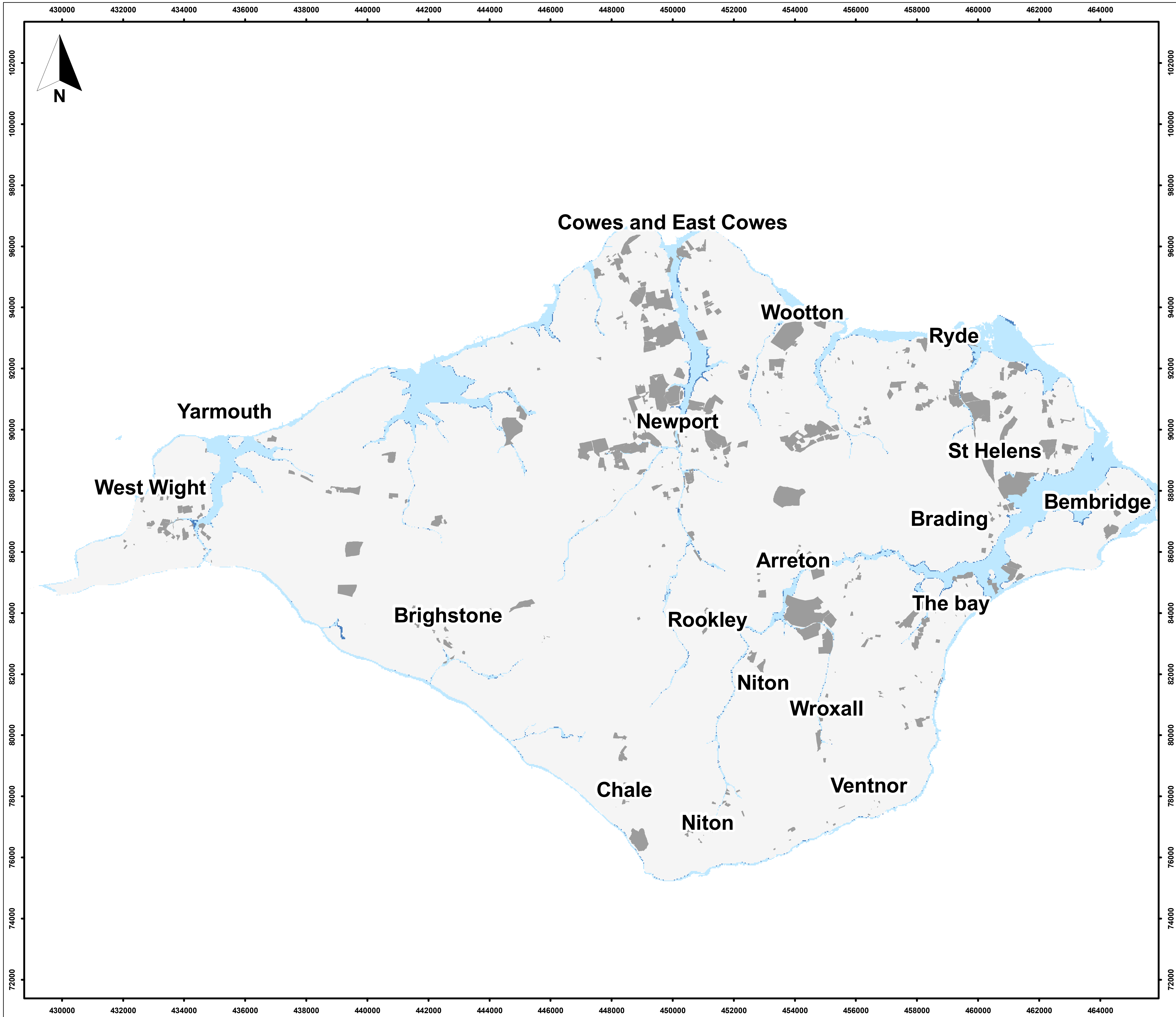
Isle of Wight SFRA MK2

Figure 4
Buffered Main Rivers (20m)

November 2009
25793-A07a.mxd squij

Entec



Key:

Main Rivers

Potential Development Sites

Isle of Wight Outline

Flood Zone 3

Flood Zone 2

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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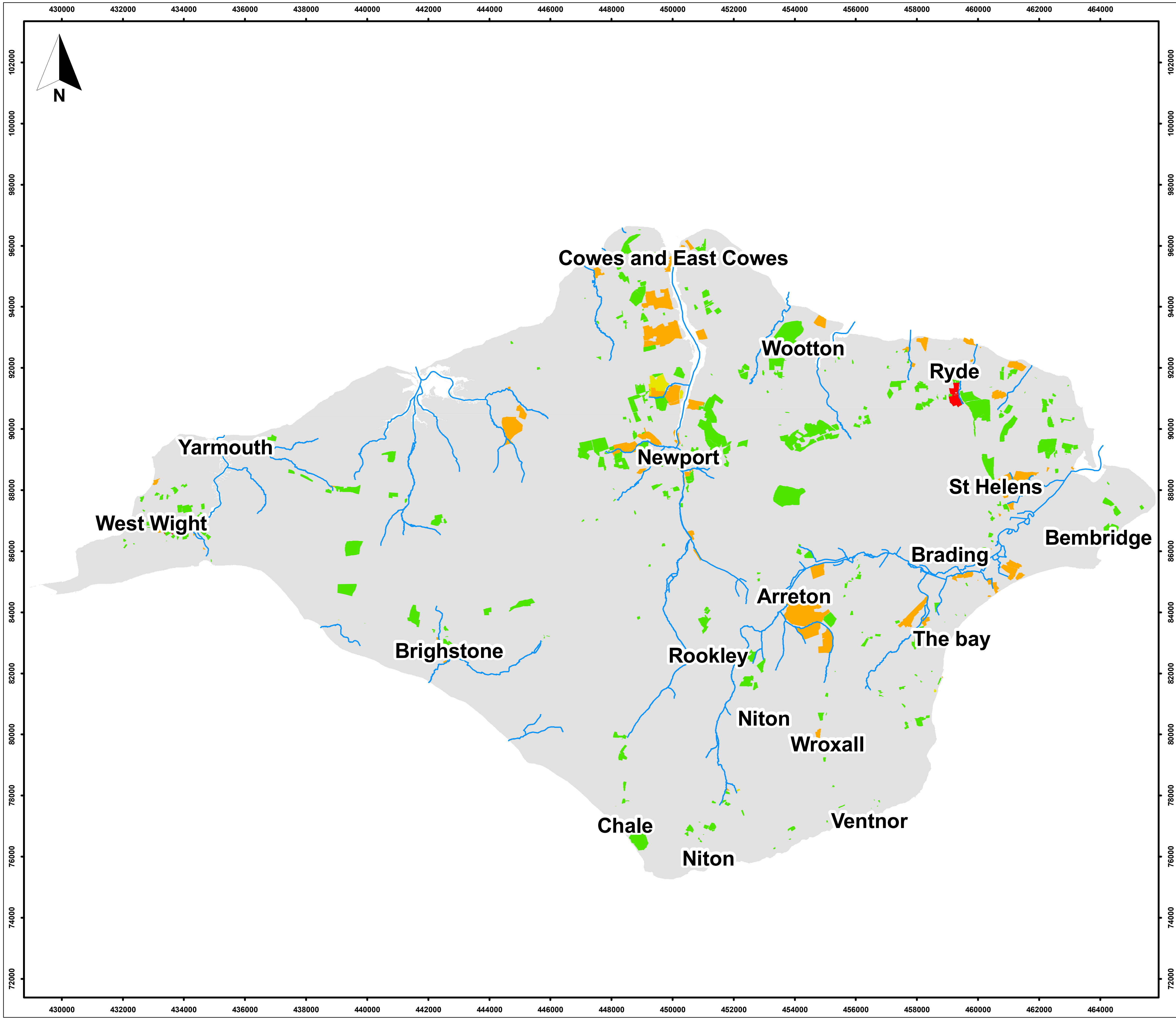
Isle of Wight SFRA MK2

Figure 5
Potential Development Sites and Flood Risk

November 2009
25793-A08a.mxd squij

Entec



Key:

- Main Rivers
- Potential Development Sites
- IoW Outline

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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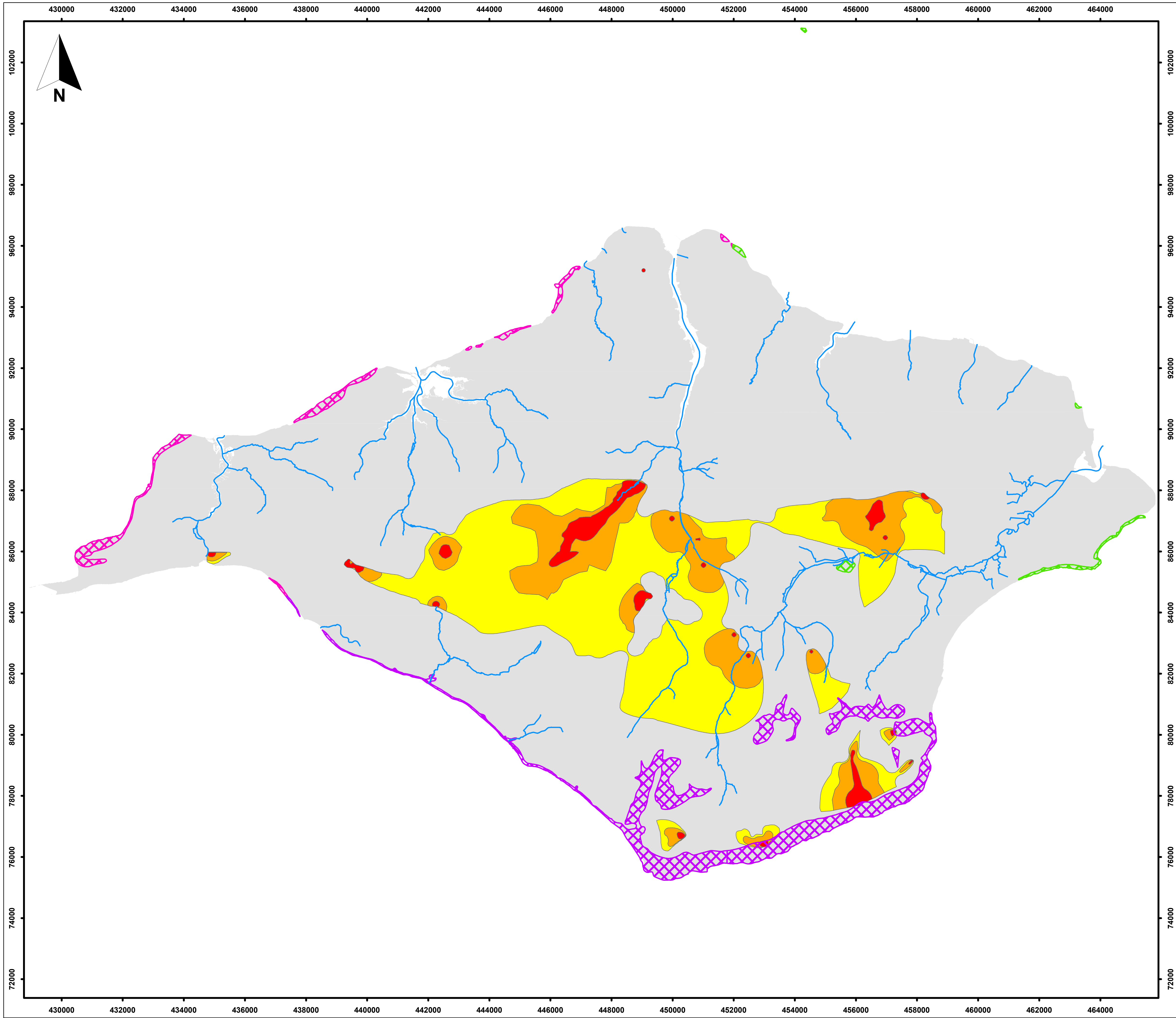
Isle of Wight SFRA MK2

Figure 6
Potential Development Sites
Qualitative Flood Risk

November 2009
25793-A09a.mxd squij

Entec



Key:

Main Rivers

IoW Outline

Mass Movement - Rock Description

Clay (Undifferentiated)

Rock (Undifferentiated)

Sandstone (Undifferentiated) and Mudstone

Source Protection Zone

Inner Zone (1)

Outer Zone (2)

Total Catchment (3)

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

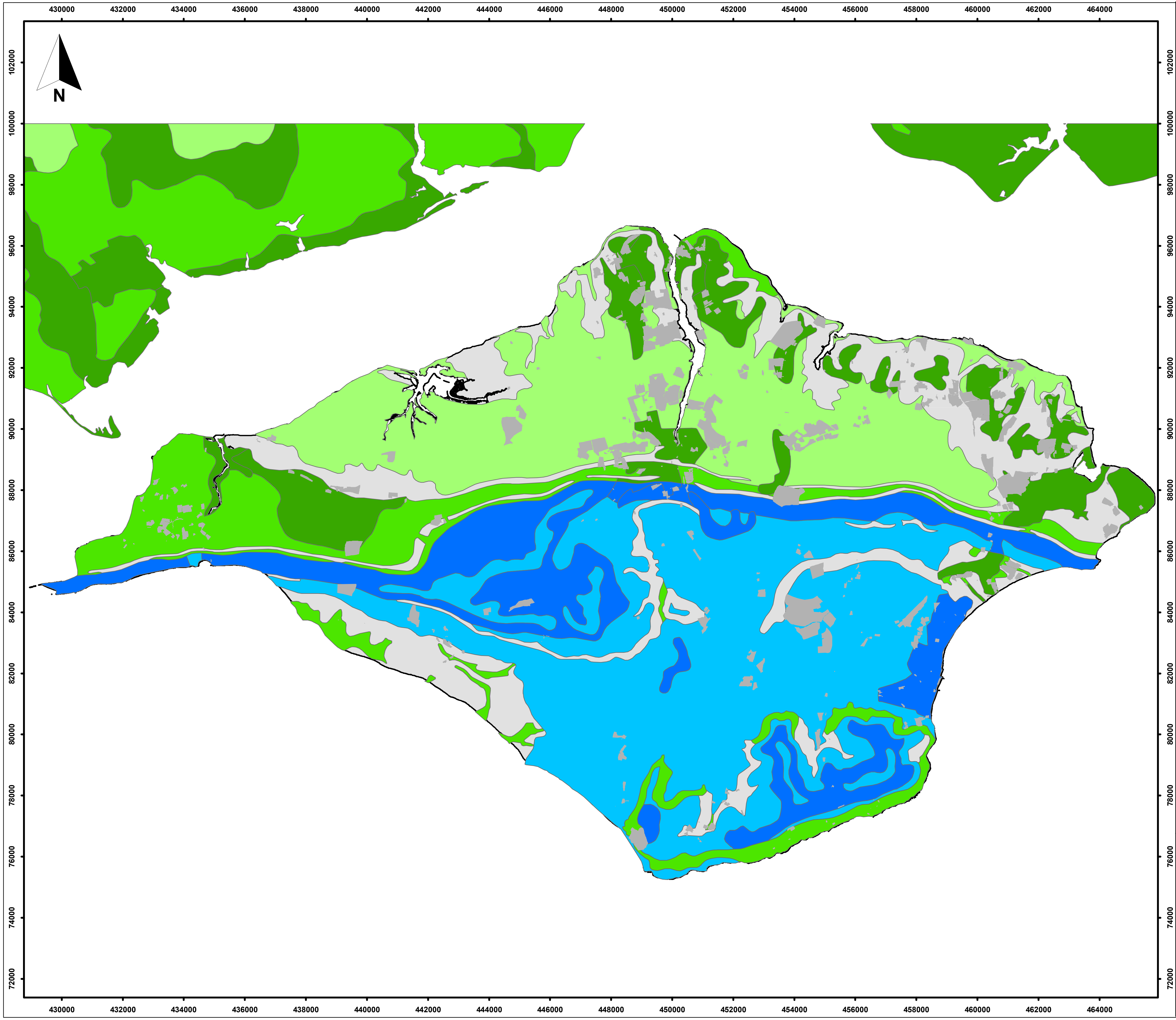
H:\Projects\HM-255\25000 - Projects\25793 - IoW SFRA Update V1\Data\GIS\ESRI\Projects\Previous SFRA MXDS

Isle of Wight SFRA MK2

Figure 7
Source Protection Zones (SPZs) and areas of Mass Movement

November 2009
25793-A10.mxd squij

Entec



Key:

Potential Development Sites

Groundwater Vulnerability Classification (Aquifer Type/ Leaching Potential)

- Major / High
- Major / Intermediate
- Minor / High
- Minor / Intermediate
- Minor / Low
- Non-Aquifer

0 1 2 3 4 5 Kilometers

Scale: 1:120,000 @ A3

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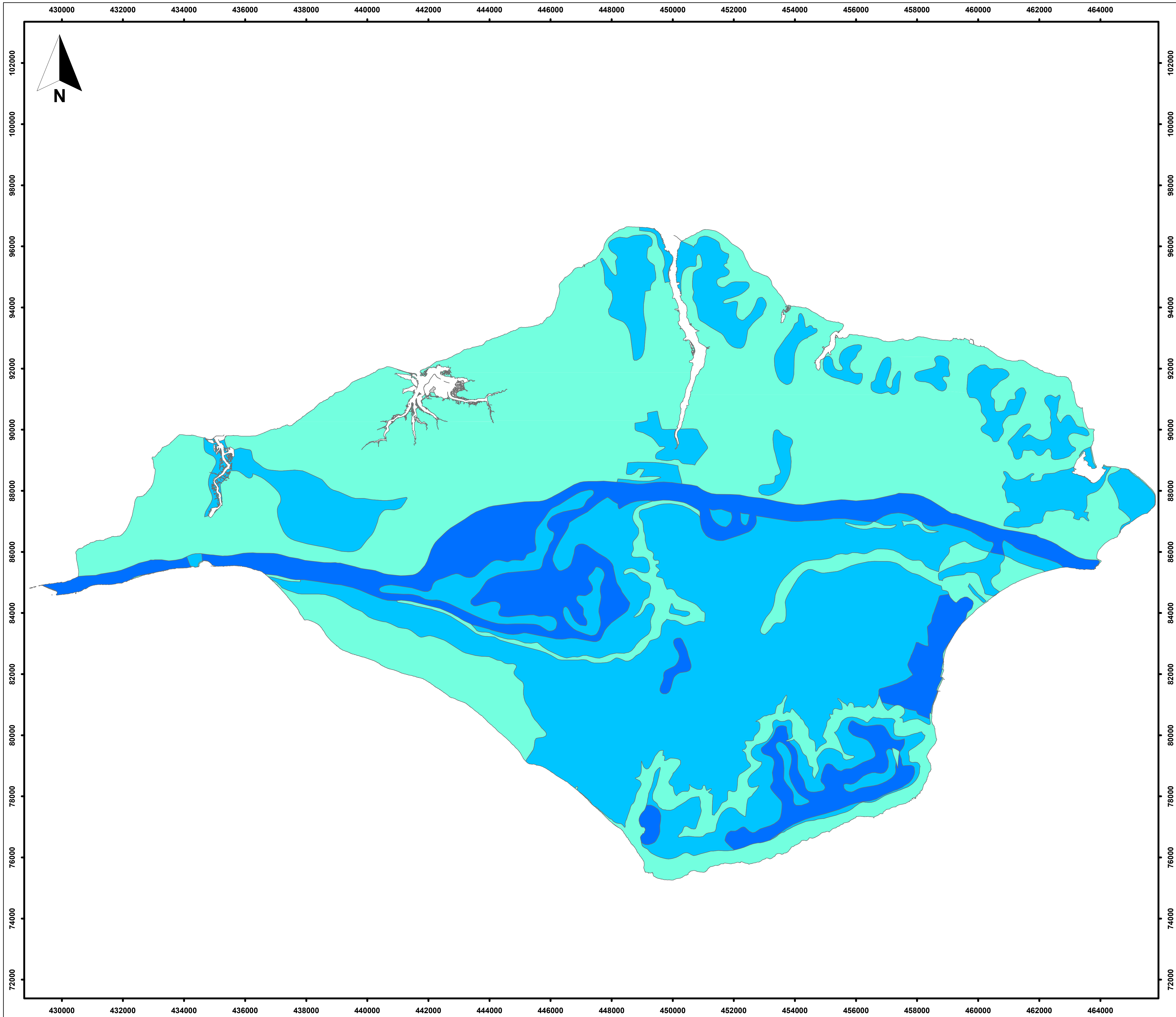
Isle of Wight SFRA MK2

Figure 8
Groundwater Vulnerability Classification

November 2009
25793-A11a.mxd squij

Entec

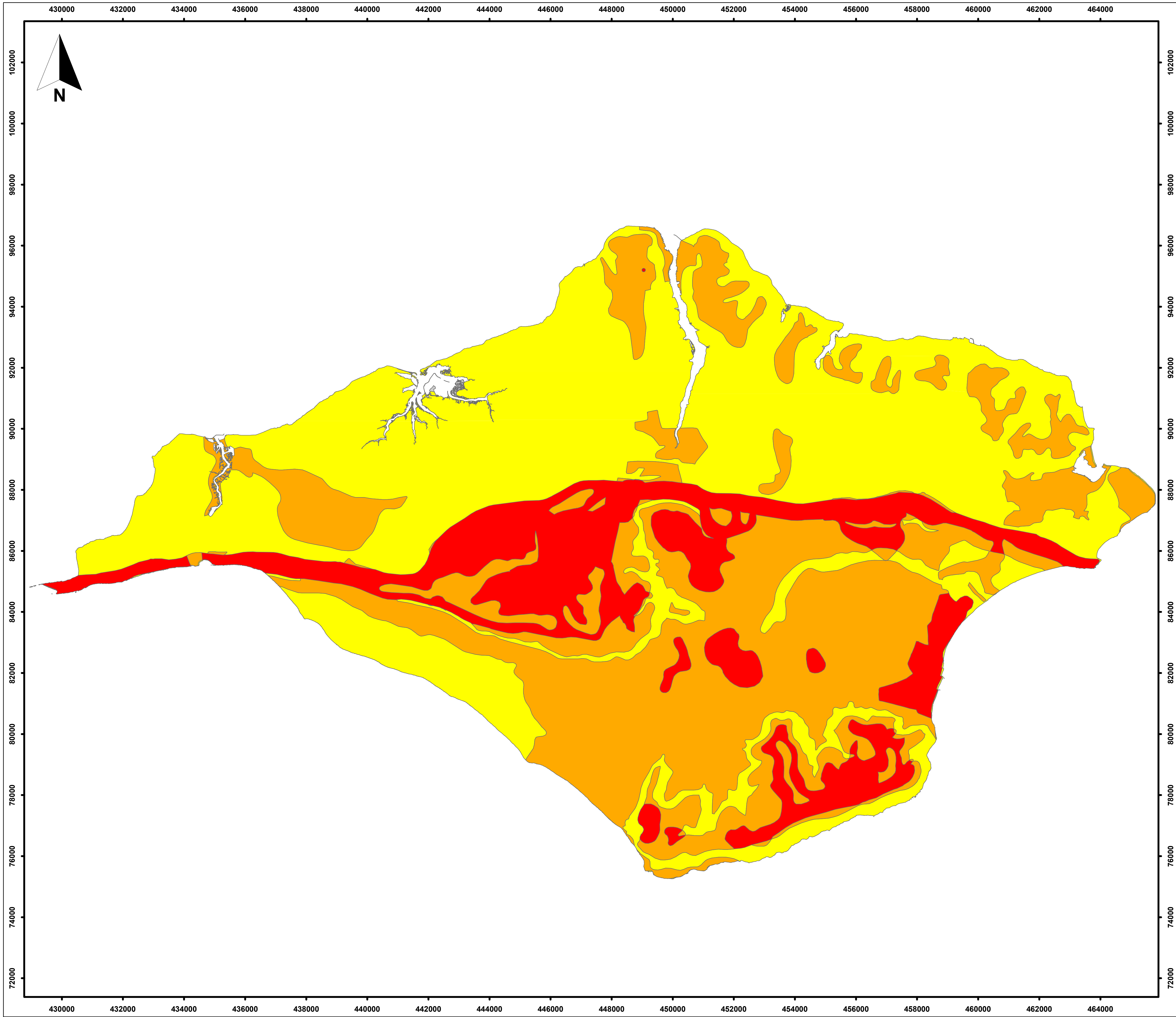


Isle of Wight SFRA MK2

Figure 9
SuDS
Infiltration Potential

November 2009
25793-A12.mxd squij

Entec



Key:

SuDS
Groundwater Contamination Potential

- High
- Medium
- Low
- Unknown

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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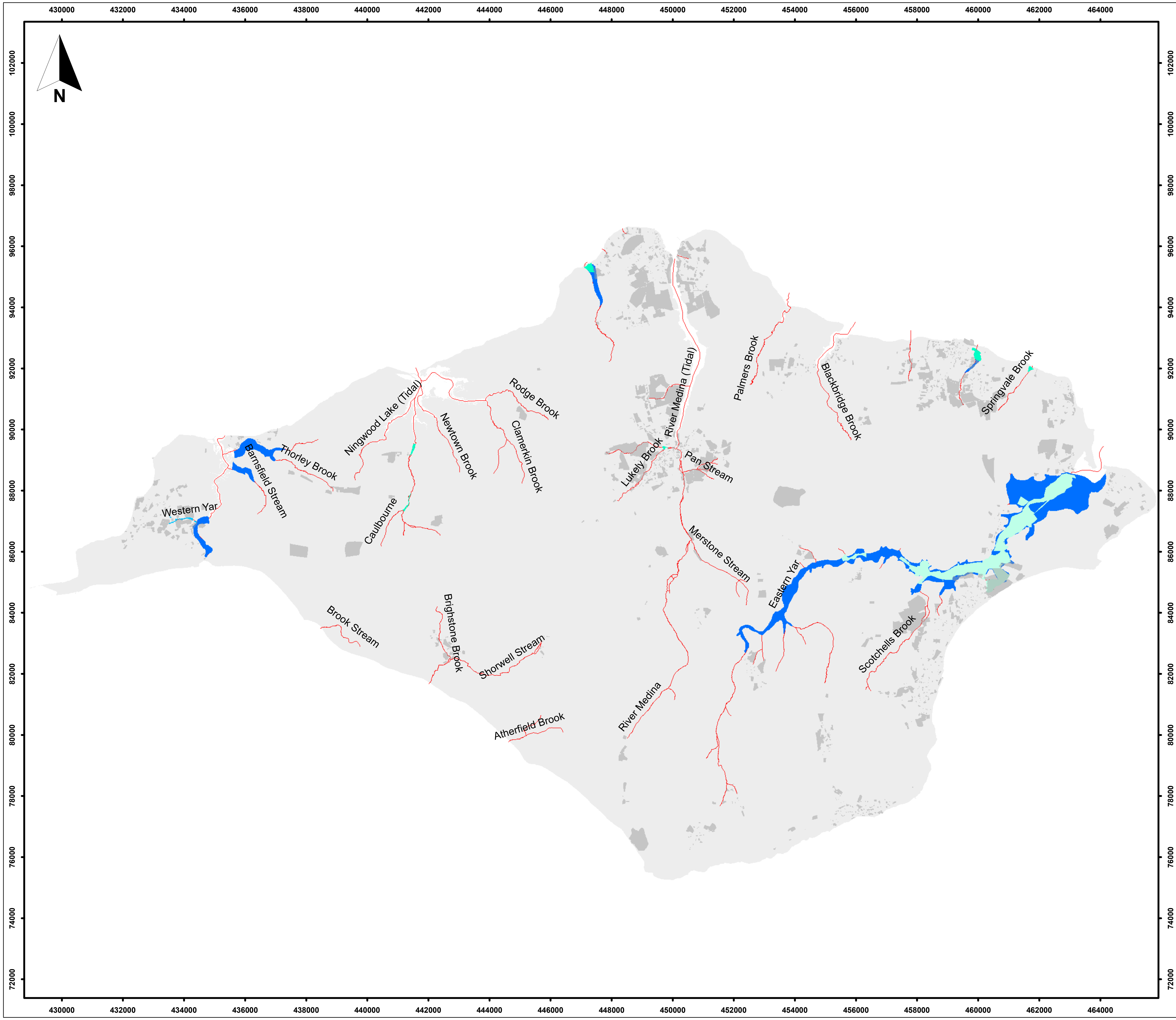
Isle of Wight SFRA MK2

Figure 10
SuDS
Groundwater Contamination Potential

November 2009
25793-A13.mxd squij

Entec



Key:

Historical Flooding (Flood Year)

- 2000
- 1999
- 1993
- 1974
- Potential Development Sites
- IoW Outline
- Main Rivers

0 1 2 3 4 5 Kilometers

Scale: 1:120,000 @ A3

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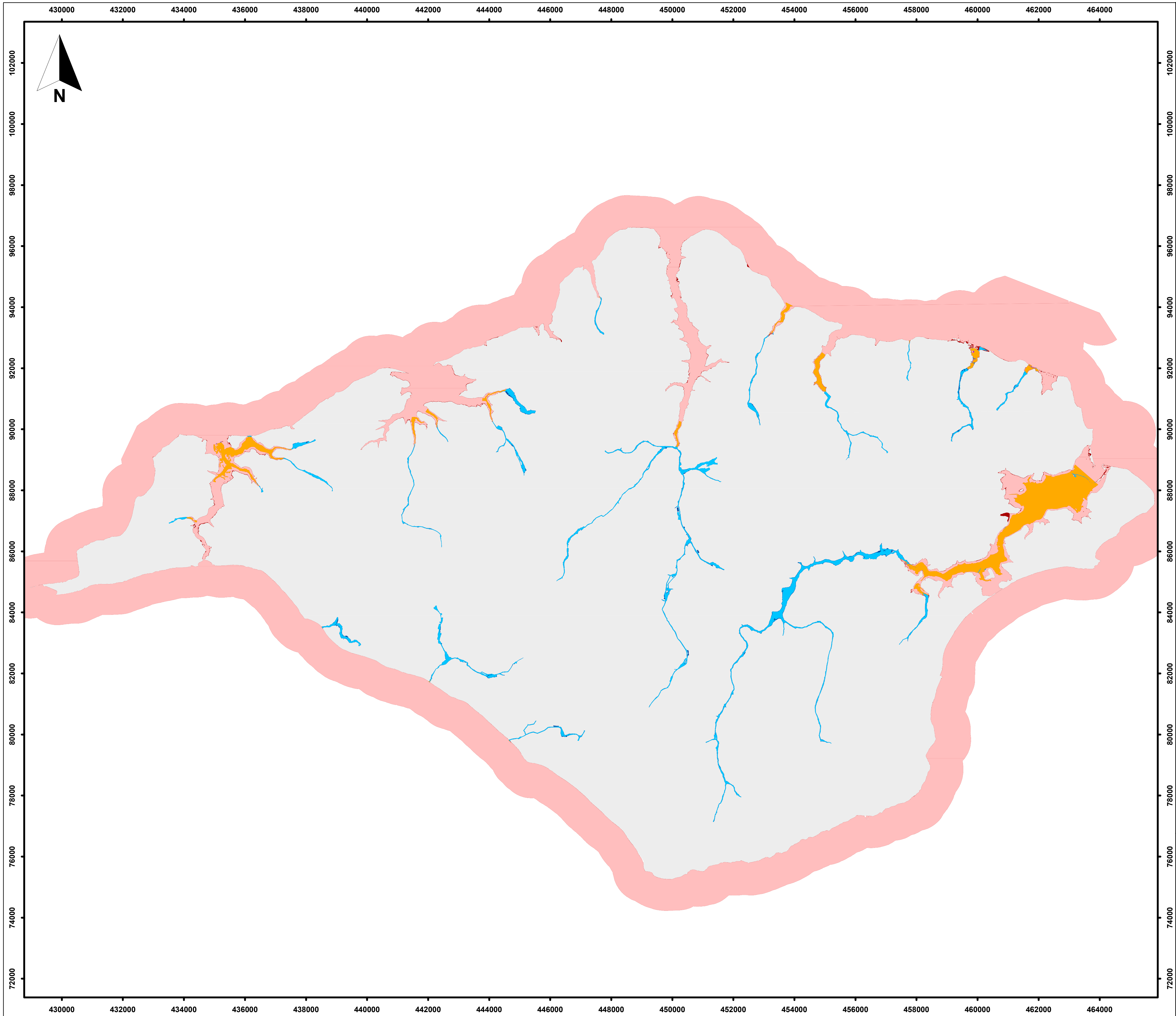
Isle of Wight SFRA MK2

Figure 11
Historical Flooding

November 2009
25793-A14.mxd squij

Entec



Key:

Environment Agency Flood Zones August 2009

Flood Zone 3b

- Fluvial
- Fluvial/Tidal
- Tidal

Flood Zone 3b

- Fluvial
- Fluvial/Tidal
- Tidal

- IoW Outline

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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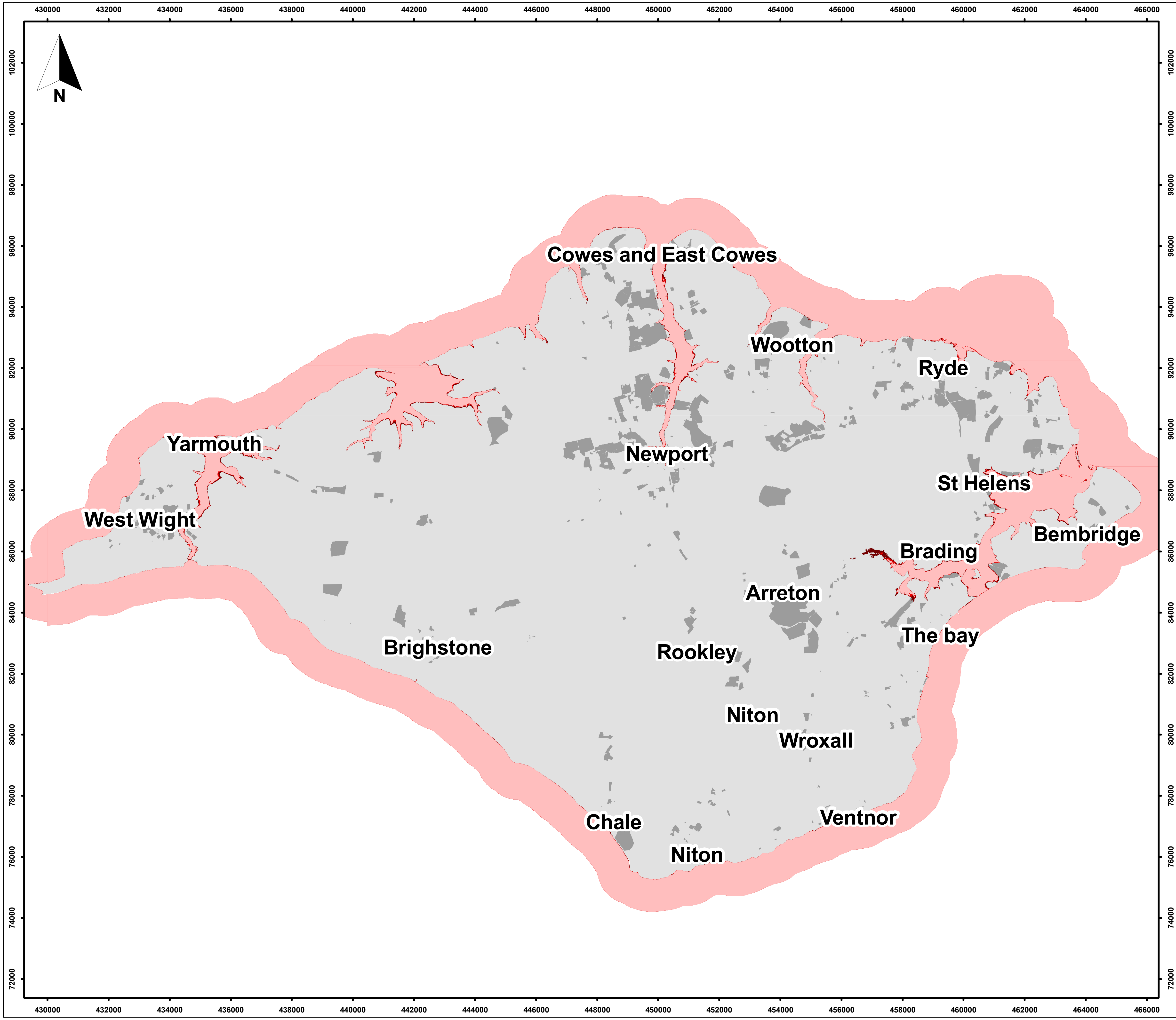
Isle of Wight SFRA MK2

Figure 12
Flood Zones 2 and 3
(Tidal & Fluvial)

November 2009
25793-A15.mxd squij

Entec



Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115
- Potential Development Sites
- IoW Outline

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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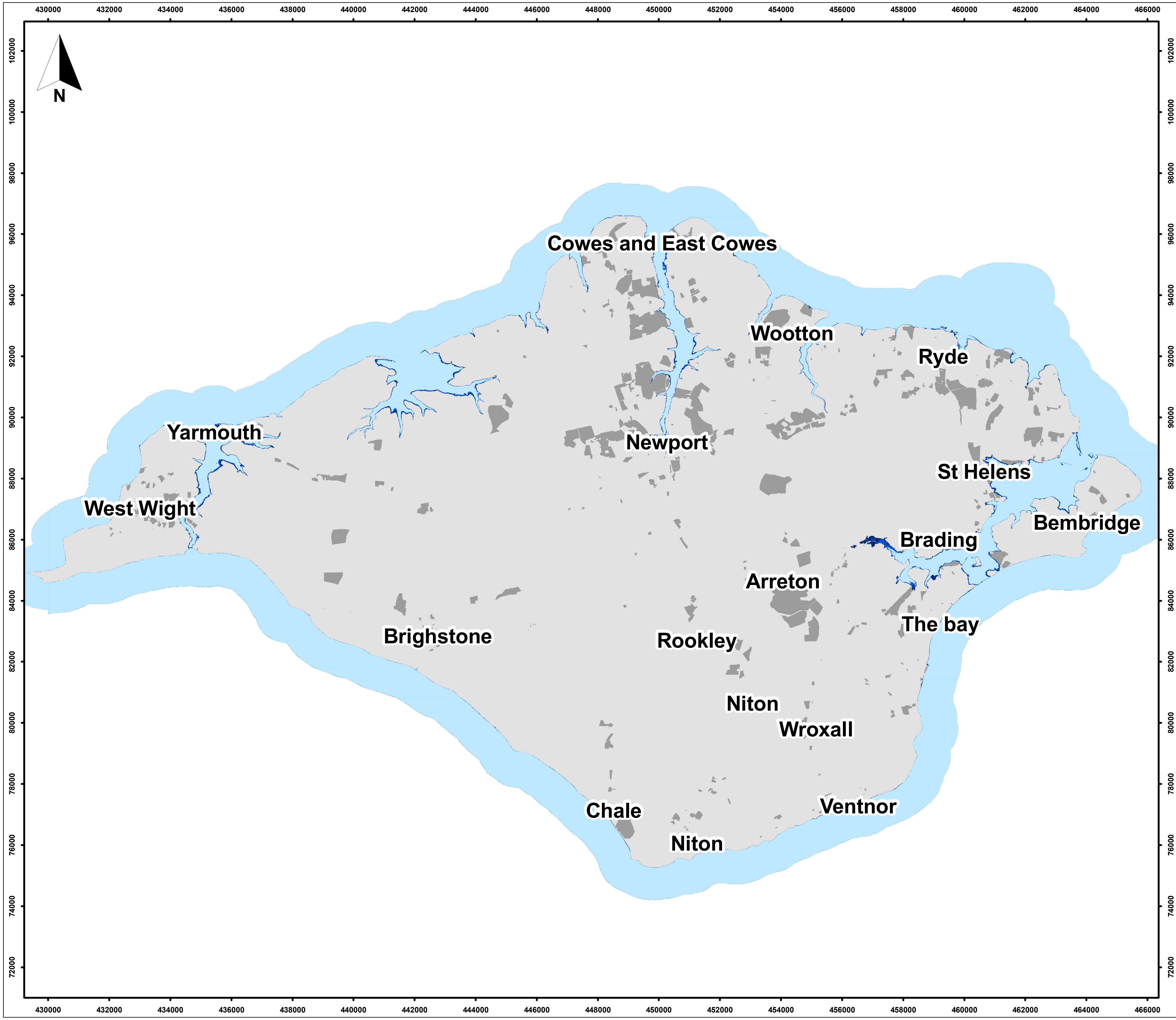
Isle of Wight SFRA MK2

Figure 13
Tidal Flood Zone 3
Climate Change

November 2009
25793-A16a.mxd squij

Entec



Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

- IoW Outline

0 1 2 3 4 5 Kilometers

Scale: 1:120,000 @ A3

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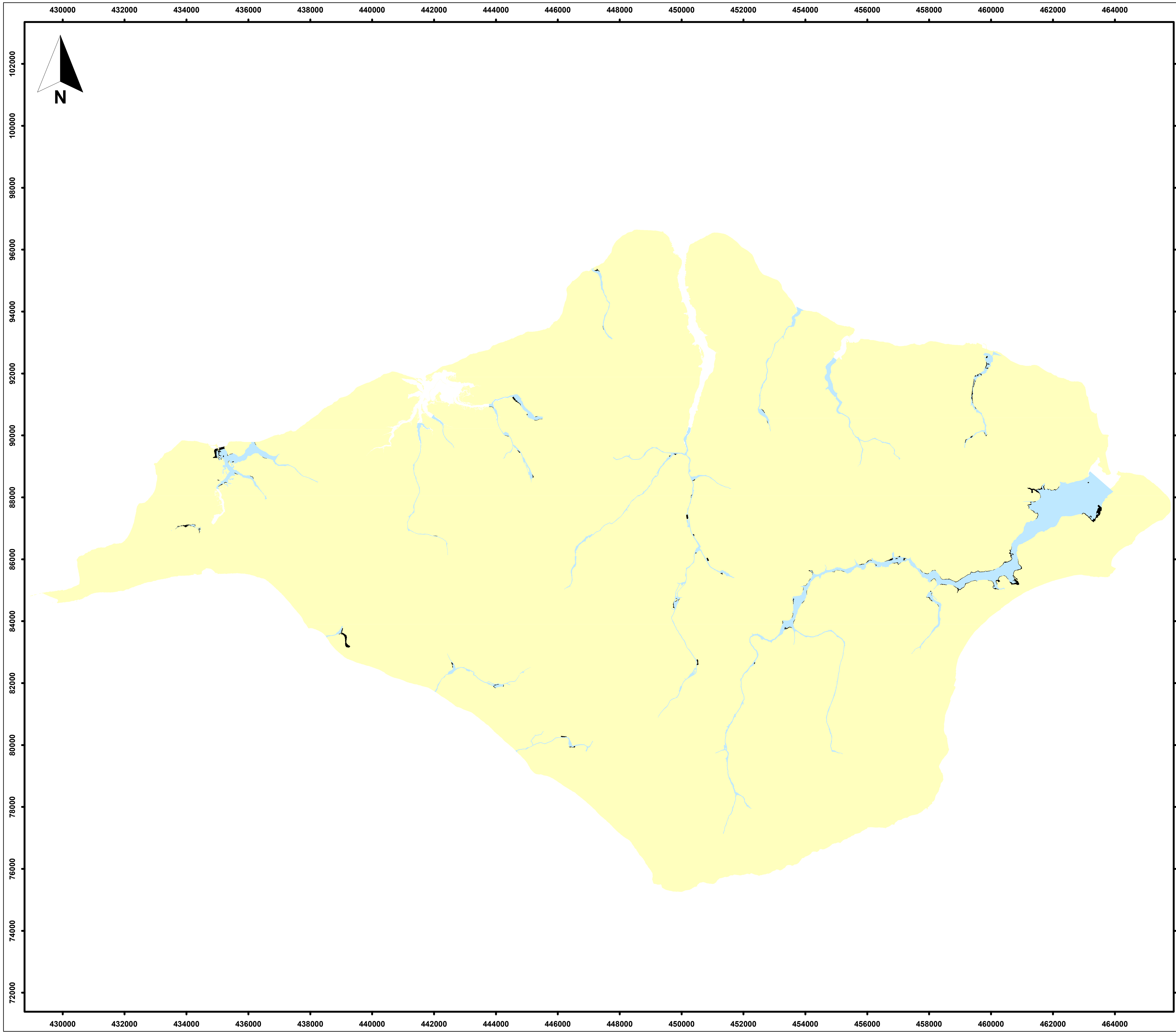
Isle of Wight SFRA MK2

Figure 14
Tidal Flood Zone 2
Climate Change

November 2009
25793-A17a.mxd squij

Entec



Key:

- Fluvial floodplain areas potentially sensitive to climate change
- IoW Outline
- Fluvial Flood Zone 3

0 1 2 3 4 5 Kilometers

Scale: 1:120,000 @ A3

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Isle of Wight SFRA MK2

Figure 15
Areas of floodplain potentialy sensitive to climate change

November 2009
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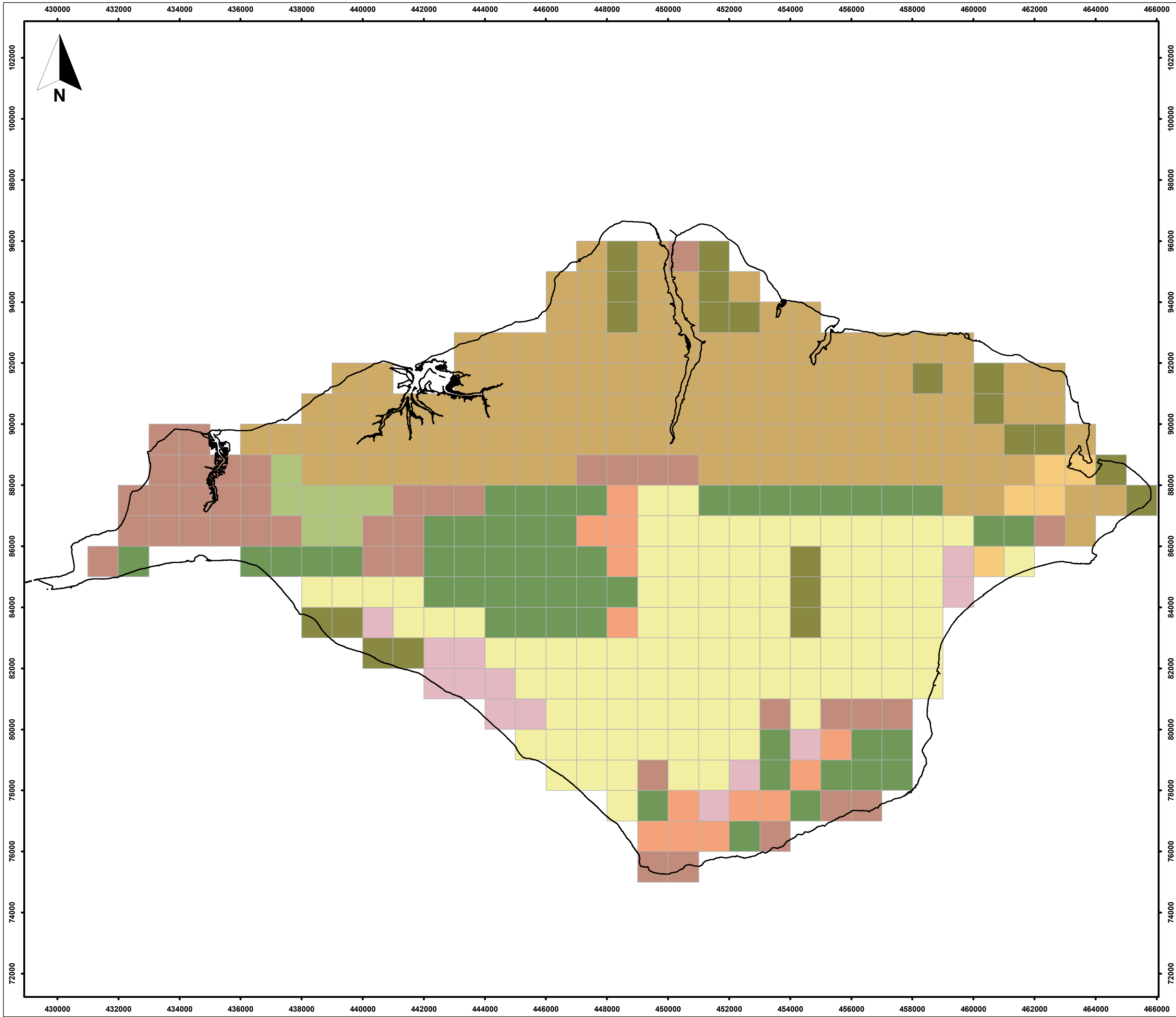

Key:

Soils
HOST Classes

- 1
- 2
- 3
- 5
- 9
- 16
- 18
- 20
- 25

IoW Outline

0 1 2 3 4 5 6 7 Kilometers

Scale: 1:120,000 @ A3

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Isle of Wight SFRA MK2

Figure 16
Soil HOST Classifications

November 2009
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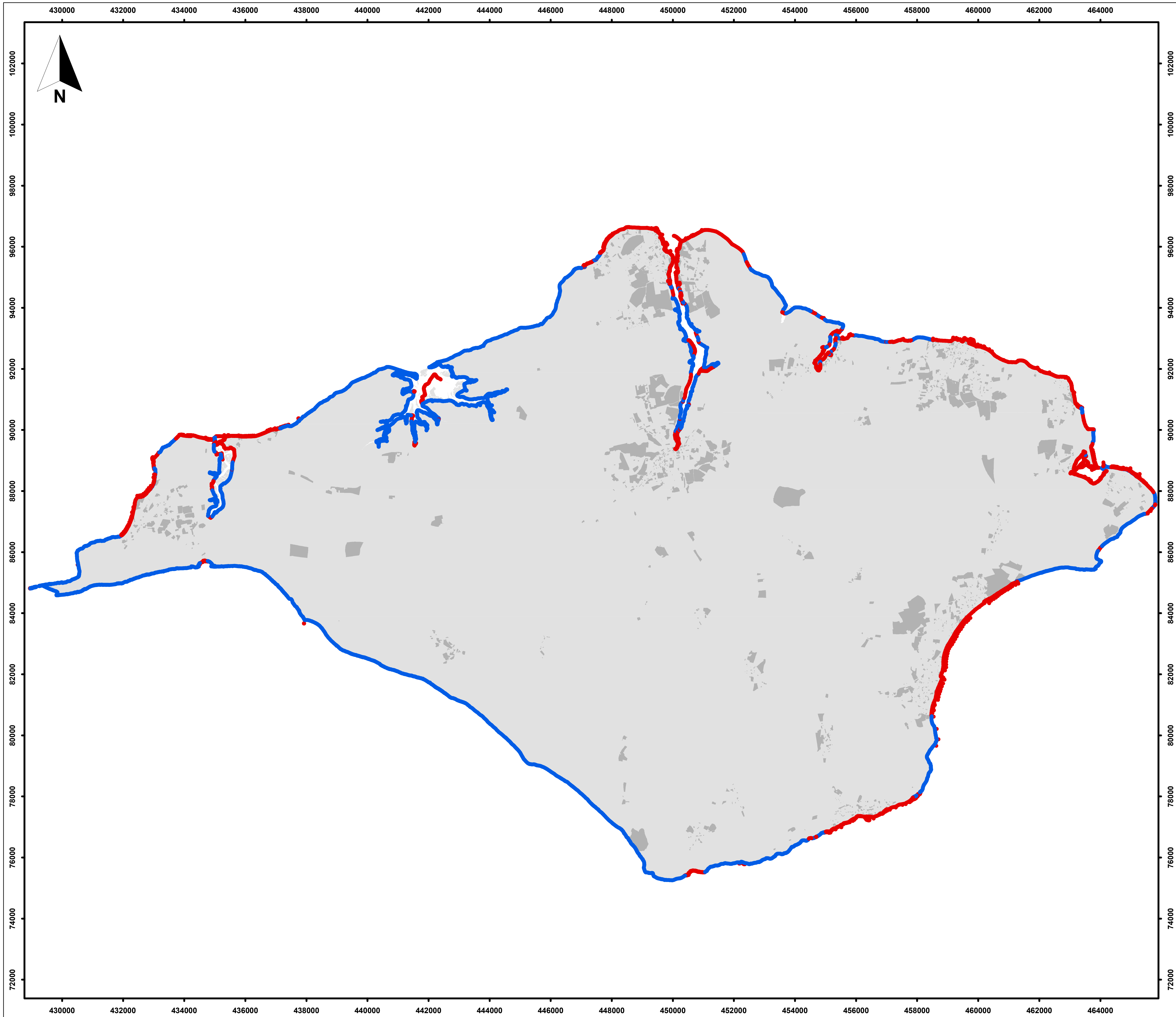
Entec



Key:

- Flood Defence Present
- No Flood Defence Identified
- IoW Outline
- Potential Development Sites

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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Isle of Wight SFRA MK2

Figure 17
Flood Defence Condition

November 2009
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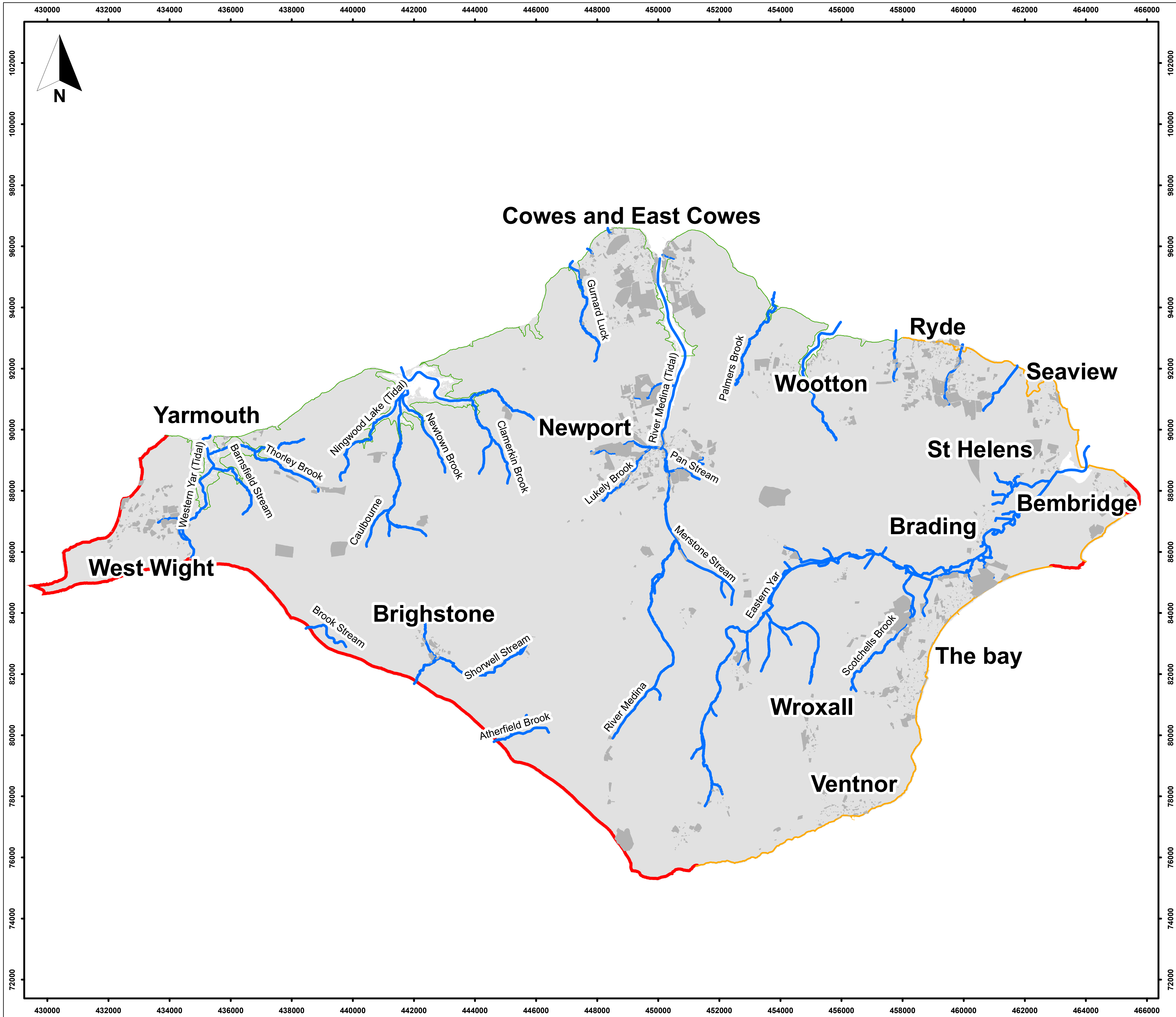

Key:

Potential Exposure Risk

- High
- Medium
- Low

- Potential Development Sites
- IoW Outline
- Main Rivers

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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Isle of Wight SFRA MK2

Figure 18
Qualitative Wind and Wave Exposure Risk

November 2009
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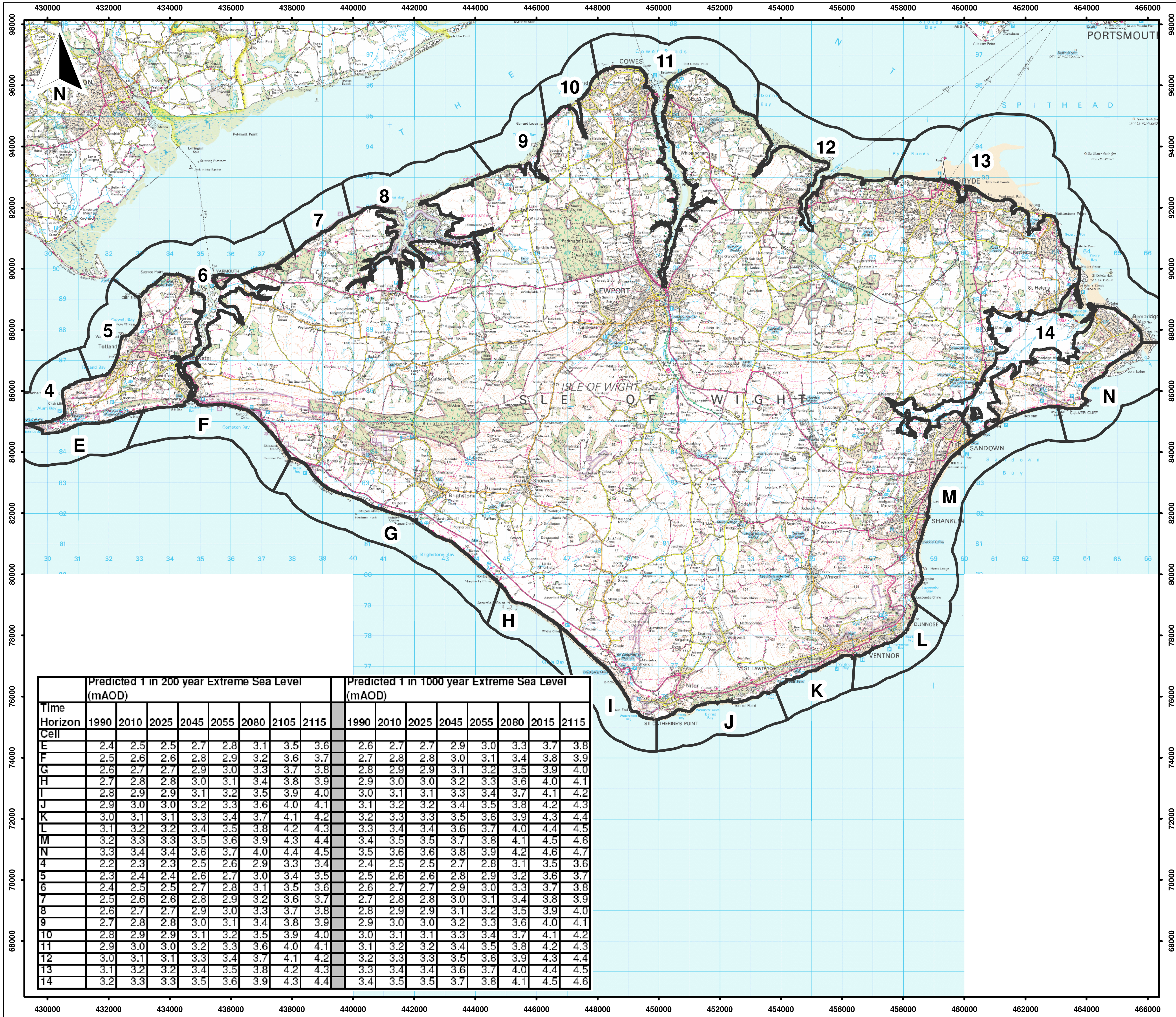
Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix B
Climate Chancge
Tide Level Predictions

June 2010



	Predicted 1 in 200 year Extreme Sea Level (mAOD)									Predicted 1 in 1000 year Extreme Sea Level (mAOD)							
Time Horizon	1990	2010	2025	2045	2055	2080	2105	2115		1990	2010	2025	2045	2055	2080	2015	2115
Cell																	
E	2.4	2.5	2.5	2.7	2.8	3.1	3.5	3.6		2.6	2.7	2.7	2.9	3.0	3.3	3.7	3.8
F	2.5	2.6	2.6	2.8	2.9	3.2	3.6	3.7		2.7	2.8	2.8	3.0	3.1	3.4	3.8	3.9
G	2.6	2.7	2.7	2.9	3.0	3.3	3.7	3.8		2.8	2.9	2.9	3.1	3.2	3.5	3.9	4.0
H	2.7	2.8	2.8	3.0	3.1	3.4	3.8	3.9		2.9	3.0	3.0	3.2	3.3	3.6	4.0	4.1
I	2.8	2.9	2.9	3.1	3.2	3.5	3.9	4.0		3.0	3.1	3.1	3.3	3.4	3.7	4.1	4.2
J	2.9	3.0	3.0	3.2	3.3	3.6	4.0	4.1		3.1	3.2	3.2	3.4	3.5	3.8	4.2	4.3
K	3.0	3.1	3.1	3.3	3.4	3.7	4.1	4.2		3.2	3.3	3.3	3.5	3.6	3.9	4.3	4.4
L	3.1	3.2	3.2	3.4	3.5	3.8	4.2	4.3		3.3	3.4	3.4	3.6	3.7	4.0	4.4	4.5
M	3.2	3.3	3.3	3.5	3.6	3.9	4.3	4.4		3.4	3.5	3.5	3.7	3.8	4.1	4.5	4.6
N	3.3	3.4	3.4	3.6	3.7	4.0	4.4	4.5		3.5	3.6	3.6	3.8	3.9	4.2	4.6	4.7
4	2.2	2.3	2.3	2.5	2.6	2.9	3.3	3.4		2.4	2.5	2.5	2.7	2.8	3.1	3.5	3.6
5	2.3	2.4	2.4	2.6	2.7	3.0	3.4	3.5		2.5	2.6	2.6	2.8	2.9	3.2	3.6	3.7
6	2.4	2.5	2.5	2.7	2.8	3.1	3.5	3.6		2.6	2.7	2.7	2.9	3.0	3.3	3.7	3.8
7	2.5	2.6	2.6	2.8	2.9	3.2	3.6	3.7		2.7	2.8	2.8	3.0	3.1	3.4	3.8	3.9
8	2.6	2.7	2.7	2.9	3.0	3.3	3.7	3.8		2.8	2.9	2.9	3.1	3.2	3.5	3.9	4.0
9	2.7	2.8	2.8	3.0	3.1	3.4	3.8	3.9		2.9	3.0	3.0	3.2	3.3	3.6	4.0	4.1
10	2.8	2.9	2.9	3.1	3.2	3.5	3.9	4.0		3.0	3.1	3.1	3.3	3.4	3.7	4.1	4.2
11	2.9	3.0	3.0	3.2	3.3	3.6	4.0	4.1		3.1	3.2	3.2	3.4	3.5	3.8	4.2	4.3
12	3.0	3.1	3.1	3.3	3.4	3.7	4.1	4.2		3.2	3.3	3.3	3.5	3.6	3.9	4.3	4.4
13	3.1	3.2	3.2	3.4	3.5	3.8	4.2	4.3		3.3	3.4	3.4	3.6	3.7	4.0	4.4	4.5
14	3.2	3.3	3.3	3.5	3.6	3.9	4.3	4.4		3.4	3.5	3.5	3.7	3.8	4.1	4.5	4.6

Key:

Isle of Wight Coastal Cells

Notes:

The Costal Cells illustrated in FIgure 1 were provided by the Environmnet Agency and the 1990 base sea levels were confirmed by the Environment Agency on the 07/09/09. The climate change predictions are based on the incremantal rates provided in Table B.1. in PPS25 (South East figures)

0 1 2 3 4 5 6 Kilometers

Scale: 1:120,000 @ A3

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IoW SFRA

Figure 1
Coastal Cells and Predicted Extreme Sea Levels

September 2009
25793-A001 RAMPJ

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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix C
SFRA GIS Data
Discussions

June 2010

ISLE of WIGHT COUNCIL

Source Data Discussion

Many datasets were requested for use in this SFRA, and these were primarily received from the Isle of Wight Council and the Environment Agency. These geographic data had various formats by which they were made available and originated from different sources (e.g. digitised paper maps, survey data and satellite data).

The following is a short description of the source data GIS data used during the course of the SFRA. Where available, the reference scale of the map has been included in order to indicate the maximum scale of use for which the map was intended.

Ordnance Survey Basemap

A high level topographic map which provides an overview of the Island and the RDA's was used as a basemap where detailed ordnance information was not required. This map includes data such as the road network, green areas and contours. The data of this map was captured at 1:50,000 reference scale.

Mastermap

Mastermap data was made available by the IoW Council. This dataset is an accurate source of ordnance survey data that informed the SFRA at RDA and site specific scale. The reference scale of the dataset differs depending on the degree of urbanisation, with urban areas having a capture standard of 1:1,250 while for rural areas detail is reduced.

Potential Development Sites

Potential development sites were supplied the IoW Council and included several different datasets of '*Sites*', '*Large Sites*' and '*Employment Sites*'. This dataset identified those areas on the Island that were/might be considered for development. The reference scale of this dataset is unknown. Section 6 provides further details of the potential development sites on the Island.

Geology

Geological maps of the Island were sourced from the British Geological Society (BGS) on behalf of the Council. The datasets included solid (bedrock), drift (superficial), artificial geological maps, as well as linear geological features and areas of mass movement. The reference scale of these maps are 1:63,360. The mass movement dataset is discussed in greater detail in Section 7.3.1.

Soils

Soils data for the Island was sourced from a national gridded dataset of soils. This dataset is comprised of $1km^2$ cells with attributed values for the percentage composition of various soils for the cell of interest. The dataset also contains a HOST value for the soils in the cell. Given that the data originated in a 1km^2 grid, specific detail about the spatial distribution of soils was lacking. Section 7.3.3 provides additional detail.

Groundwater Vulnerability

A digital dataset of groundwater mapping was provided by the Environment Agency. These maps show the vulnerability of groundwater as a combination of aquifer type and soils. The reference scale for this dataset is 1:100,000. Since soils data are included in the dataset, it was possible to supplement the less accurate national soils grid. Sections 7.3.1 and 7.3.2 discuss this dataset in greater detail.

Source Protection Zones

Source Protection Zones were provided by the Agency for the Isle of Wight. The zones show the risk of contamination from activities that might cause pollution to aquifers used for public water supply. The closer the potential contamination activity is to the abstraction point, the greater the risk classification. The reference scale of this dataset is unknown. Section 7.3.1 provides further information.

Environment Agency Main Rivers

The main rivers on the Island were sourced from an Environment Agency dataset of rivers defined as larger streams and rivers, including smaller watercourses of local significance.

Fluvial and Tidal Flood Outlines for Zones 2 and 3

The Environment Agency provided a digital dataset of the Island which outlined those areas affected by flooding. The data was divided according to flood zone 2 and 3, as well as fluvial and tidal. This data is sourced from modelling done for the Agency which used Synthetic Aperture Radar (SAR) elevation data.

Environment Agency Flood Model Outlines

The Environment Agency provided flood model outlines of various return periods for some of the rivers on the Island, including the Medina, Monkton Mead and Western Yar. This data was used where necessary, to update the fluvial flood outlines provided by the Agency. The accuracy of the datasets is dependant on the modelling process and its input data. The application of this data is discussed further in Section 5.

Historic Flood Outlines

Historic flood outlines were also provided by the Agency. The past flooding events included the years 1974, 1993, 1999 and 2000. The annual exceedence probability of the flood outlines is unknown, and as such, they were used to supplement the existing flood outlines. The reference scale of these outlines is unknown and is dependant on the accuracy of the original data and the scale at which they were digitised. Sections 2 and 6 provide further information about historic flooding on the Island.

Flood Defences

The National Flood and Coastal Defence Database from the Agency was the source for the location, extent and level of protection of flood defences on the Island. The reference scale of this dataset is unknown.

Data Precision

Each data source has an associated level of precision. The groundwater water vulnerability mapping has a reference scale of 1:100,000. Whereas LiDAR data has a 2 metre resolution, which means that each 2m by 2m area of land is assigned a single elevation value. Much of the Island wide data (e.g. Groundwater Vulnerability Mapping, Source Protection Zones and Soils Data) come from national data sets, the spatial precision of which is low, but appropriate for strategic Island wide assessments. The individual potential development sites are attributed with values derived from these low precision national datasets (e.g. the generalised classifications of infiltration SuDS suitability, groundwater vulnerability and runoff potential). It must be noted that the precision of the data does not increase despite the analysis being performed on the smaller site specific scale.

It is important that the site specific detail of the datasets covered in the following section be considered in respect to the level of accuracy of the source data. The reference scale of any of the original source data should be deemed as the maximum scale at which the data is considered accurate.

Datasets Produced by the SFRA

'Sites Database'

The purpose of this section is to detail the method by which the potential site attribution dataset was created. Much of the relevant detail is mentioned in previous sections, and therefore the intention is to provide an overview of how a single attribute was assigned to a site which was covered by multiple attribute values. The attribute fields in this dataset were derived as follows:

PERC_FZ1

This defines the percentage area of the site which falls within Flood Zone 1.

PERC_FZ2

This defines the percentage area of the site which falls within Flood Zone 2.

PERC_FZ3a

This defines the percentage area of the site which falls within Flood Zone 3a.

PERC_FZ3b

This defines the percentage area of the site which falls within Flood Zone 3b.

FRA_REQ

Sites were categorised into those requiring and not requiring a FRA. This was determined by whether or not a site was within any of the flood zones as recorded by the fields (Func_FP, FZ3_T, FZ3_F, FZ2_T and FZ2_F) and whether or not the site was over 1ha. Sections 3 and 4 provide an overview of the flood risk zones as defined by PPS25.

FUNC_FP, Func_FP, FZ3_T, FZ3_F, FZ2_T and FZ2_F

Each site was attributed as to the flood zones into which it either partially or completely fell. This categorisation was independent of scale, such that a site was accordingly attributed even if only fractionally touched by a flood zone. Details about the flood zones as defined by PPS25 are found in Section 3.

PROBABILIT

By assessing whether a site fell within a flood risk area, and the maximum flood risk posed, it was possible to assign a qualitative attribute to each of the affected sites corresponding to the qualitative descriptions used by PPS25. This attribution applied a precautionary approach by identifying the greatest flood risk posed to a site.

APP_USES

The various fields recording flood risk to the sites allowed for an initial assessment of appropriate land uses for each site. Thus a site falling outside the flood zone was attributed as not having any restrictions in terms of suitable uses, while for sites falling within flood risk zone, a precautionary approach was used, identifying the most severe flood risk falling on the site, and specifying appropriate uses accordingly. It is therefore advisable to consult the site specific flood risk definition dataset to determine the site distribution be consulted. Table D.2 of Annex D PPS25, as replicated in Appendix B provides further information.

HISTORIC

Historic flood outlines were provided by the Environment Agency for the Island. These outlines provided supporting information of those areas already identified at risk of flood as defined by the functional floodplain, flood zone 2 and flood zone 3 as well identifying potential flood risk areas not included in the Environment Agency maps. The sites were therefore attributed with the month and year for each of the historic floods which they intersected. This categorisation was independent of scale, such that a site was accordingly attributed even if it only fractionally passed through a historic flood zone. Section 3 contains further detail about historic flooding on the Island.

M_RIV_BUFF

A generic assessment of the influence of major rivers on flood risk was carried out, since the fluvial flood risk zones as defined by the Agency do not cover all the main rivers on the Island. It was therefore agreed at a meeting between the IoW Council, the Agency and Entec (on the 18 September 2007), that a 20m buffer would be applied to all major rivers on the Island. Sites that intersected the buffered rivers where then attributed accordingly. This advice is in line with current Agency requirements, since as the Environment Agency is a statutory consultee under Town and Country Planning Act, their authority extends past areas within Flood Zone 2 and 3, and includes development within 20 metres of main rivers. The buffer is 20m either side of the main river centreline.

WAVE_RISK

The assessment of potential Wave exposure risk is detailed in Section 5. The objective of the assessment was to identify areas potentially susceptible to wave action and spray. A three tier classification has been applied which is based upon a consideration of the exposure of the coastline, prevailing wind and recorded wave heights. The coastline has either been classified as having a high. Medium or low risk of potential wave exposure. The purpose of which is to indicate to future developers that this potential risk should be assessed and addressed when developing along the coastline, so that development can be appropriately designed.

FLUVIAL_CC

Climate change on fluvial flood risk was also necessary to assess, since rainfall intensities and hence peak river flows are likely to increase on the Island in the future, resulting in the extension of current fluvial flood zones. Section 4 discusses this in more detail, and provides clarity on the assumptions and simplifications made.

Once areas of fluvial climate change were identified, it was then possible to attribute the sites with an attribute as to whether or not they intersected the identified fluvial climate change areas. A site was accordingly attributed even if it only fractionally passed through an area " *of Fluvial Floodplain Potentially Sensitive to Climate Change*. (See Figure 15 in Appendix A for the areas identified as being potentially sensitive)

SUDS_SUIT and SUDS_VUL

The applicability of SuDS on the Island was a component of the work undertaken as part of the SFRA. This was done in order to provide a site by site generalisation of the suitability of SuDS as categorised by attenuation vs. infiltration techniques. Section 7 provides a description of the origin of the datasets used to attribute the sites, and the processing involved to arrive at the two SuDS classifications.

SUDS_SUIT was assigned to each site it describes the suitability of infiltration SuDS techniques. If a site was predominantly in an area of 'high' infiltration suitability, and only a small portion was intersected by a 'low' infiltration suitability area, a worst case scenario was assumed, and the resulting *SUDS_SUIT* attribution for that site was recorded as 'low'. Areas of mass movement were assigned a low suitability

SUDS_VUL this classification describes the potential for the contamination of groundwater. This assessment was based on Groundwater protection Zones and three classifications of were produced, low, medium and high. As with *SUDS_SUIT* a worst case scenario was assumed in that if a site was predominantly in an area of low contamination potential but with a small portion in an area of medium contamination potential – the site was assigned a medium contamination potential.

RUNOFF_POT

A component of all FRA's is the requirement for an assessment of site drainage to be undertaken. This process is site-specific and would be inappropriate for the purposes of a SFRA, as 7.3.3 details. Nonetheless, an initial Island wide assessment of runoff potential was carried out, since it provides a preliminary indication of runoff.

This assigned a qualitative attribute to each site of very low, low, medium, high or very high. This attribution was determined through the *SPR_HOST* for each site, which in turn was assigned according to the *HOST* classification for the site. Unlike much of the previous attribution in the dataset, *RUNOFF_POT* required that the predominant *HOST* class for each site be assigned as the attribute value for that site. Therefore, each site was attributed according to the *HOST* class most prevalent (assuming a site was intersected by more than one class). It should be noted though, that some sites were not covered by the original *HOST* dataset, and were therefore attributed as 'unknown'.

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix D
Useful Extracts from PPS25

June 2010

ISLE of WIGHT COUNCIL

Table D.1: Flood Zones

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone.

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Table D.1: contd.

Zone 2 Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this zone.

Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test (see para. D.9.) is passed.

FRA requirements

All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 3a High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land in Table D.2 are appropriate in this zone.

The highly vulnerable uses in Table D.2 should not be permitted in this zone.

The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test (see para. D.9) is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Table D.1: contd.

Zone 3a High Probability *(continued)*

Policy aims

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;

ii. relocate existing development to land in zones with a lower probability of flooding; and

iii. create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to:

– remain operational and safe for users in times of flood;

– result in no net loss of floodplain storage;

– not impede water flows; and

– not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements

All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

ii. relocate existing development to land with a lower probability of flooding.

Table D.2: Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.[19]
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.[20] • Sites used for holiday or short-let caravans and camping, **subject to a specific warning and evacuation plan**.
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).

[19] DETR Circular 04/00 – para. 18: *Planning controls for hazardous substances.* www.communities.gov.uk/index.asp?id=1144377

[20] See *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* for definition. www.communities.gov.uk/index.asp?id=1500757

Table D.2: contd.

Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, **subject to a specific warning and evacuation plan**.

Notes:

1) This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2)[21] and also on the need of some uses to keep functioning during flooding.

2) Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

3) The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

Table D.3[22]: Flood Risk Vulnerability and Flood Zone 'Compatibility'

	Flood Risk Vulnerability classification (see Table D2)	Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	✗	✗	✗

Key:

✔ Development is appropriate

✗ Development should not be permitted

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix E
West Wight

June 2010

Overview

The West Wight RDA is comprised of the towns of Totland and Freshwater and is classified as a Smaller Regeneration Area. Totland lies on a raised area of land adjacent the coast, while Freshwater is built at a lower level, with a significant area of the town under 10 mAOD. Flood risk in the two centres is contrasting with minimal flood risk posed to sites in Totland, yet both tidal and fluvial flooding present a flood risk in Freshwater. The town of Freshwater has a history of flooding relating to the Western Yar. The Western Yar presents a fluvial risk and a tidal risk by acting as a conduit for tidal flood waters. A few of the potential development sites in Freshwater are consequently at high risk of flooding.

Please review this discussion in conjunction with the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

Both settlements of Totland and Freshwater are areas of need in terms of regeneration and therefore the Isle of Wight Council will be receptive to development proposals. The West Wight SRA has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

West Wight has both fluvial and tidal flood risk. Freshwater has the most severe flood risk of the two towns, with historical flooding recorded in 1974 along the headwaters of the Western Yar towards Freshwater Bay. The Agency has also issued two flood reports for the town of Freshwater, both for fluvial flood events from the Western Yar as a result of high rainfall events prior to flooding which saturated the soil and consequently flooding occurred. The two flood events occurred on the 2 June 1999 and on the 9th of October 2000. The Isle of Wight Autumn 2000 Flood Investigation Study – (*Freshwater Parish Council Flood Report*) identified one site specific example of flooding. West Wight Printers, located on the small industrial estate adjacent to Afton Marsh was flooded by surface water and not from the Western Yar.

Fluvial flooding is therefore of concern in Freshwater due to the close proximity of properties to the main river. The sites identified in Figure 19 as being 'Highly Likely' are the product of a functional floodplain (Zone 3b) being defined for the Western Yar. This designation only permits water compatible land uses and essential infrastructure to be developed, providing they do not impede the conveyance of flood waters. Figure 20 illustrates that the functional floodplain is only narrow and it is only the parts of the potential sites nearest the river that are actually within the functional floodplain and Flood Zone 3a. Development should be steered to the areas of lowest risk.

In contrast, very few potential development sites have been identified as being within Flood Zones 2 or 3 in Totland. This is due to the absence of any main rivers running through the town, as well as the land quickly becoming elevated with increasing distance from the shoreline.

Climate Change

The impact of climate change on extreme tidal levels to Totland is not likely to have a significant impact. The predicted extent of future flood zones is close to that of the present zones. Only the two development sites already identified as being at risk of flooding marginally affected by the impact of climate change.

Figures 21 and 22 in Appendix A show the extent of the predicted change in extent of Flood Zones 2 and 3 over four even epochs up to the year 2115. Of the available potential development sites, severity of future tidal flooding is likely to increase particularly for sites about the Western Yar confluence. Fluvial areas potentially susceptible to climate change are predominantly confined to areas along the western reach of the Western Yar. The area south west of the Western Yar confluence is also a potentially susceptible area. Other than currently affected sites, no new sites are identified as being affected by fluvial climate change.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The majority of the predicted flooding areas are either small isolated patches (which are most likely to be a result of small undulations in the LiDAR ground model), flow routes or areas of predicted ponding.

In West Wight there are well defined potential surface water flow routes, it is clear that the model has routed the rainfall along the roads and highways which are represented in the LiDAR ground model as local topographic low points. The roads are either following the bottom of natural depressions or, in places, they appear to be positioned in man-made cuttings.

The areas of predicted ponding are areas where water has accumulated during the simulated storm and due to the form of the topography it has not drained away over the surface. These areas do not however correspond to the reported incidents provided by Southern Water, this discrepancy may be the product of the actual Southern Water surface water drainage system not being represented in the model. It is possible that the piped drainage network has the potential to drain topographic low points, which cannot drain by overland surface flow routes.

The confinement of the flow routes to roads and topographic low points, results in there not being a significant surface water flood risk being predicted for any of the potential development sites in this Regeneration and Development Area.

Surface Drainage and Infiltration SuDS Potential

The Freshwater Flooding Feasibility Report (1999) assesses the surface drainage network of Freshwater, and many of the culverts in the river channel, to suffer from under capacity issues.

The soils map of the town shows consistent distribution of soils with an SPR of about 47%. This means that runoff potential in the area is likely to be high. This assumed consistent soil distribution is mirrored in the map of groundwater vulnerability which shows the site as lying predominantly over Secondary Aquifer with an intermediate leaching potential. Except for the area the south of Freshwater which has a few small areas of Unproductive Strata and Principal Aquifer associated with intermediate and high leaching potential soils. Infiltration potential in the area is therefore mostly low, except of the south part of Freshwater which is divided into areas of medium and high infiltration potential. The area immediately along the coast of Totland is also associated with an area of mass movement and consequently infiltration SuDS are considered to be unsuitable. Groundwater contamination reflects the infiltration potential classifications except for a small area to the far south of Freshwater which overlies a zone 1, 2 and 3 SPZ.

Due to the high runoff and a low soil leaching potentials in much of West Wight, infiltration SuDS techniques are considered to have a low suitability. This excludes a small area to the south of Freshwater which has high infiltration potential but is defined as lying over a SPZ, which makes contamination mitigation of any infiltrated water an important concern. Volumes of surface water can be discharged into the sea without restrictions. The presence of a SSSI to the east of Freshwater and a SAC south of Freshwater Bay require extra precaution be taken to prevent pollutants from entering the environment in these locations. Consideration should be given to the potential for tide locked surface water drainage outfalls. On site attenuation and storage will need to be provided to ensure that high tides do not result in sites flooding.

Wave Exposure Risk

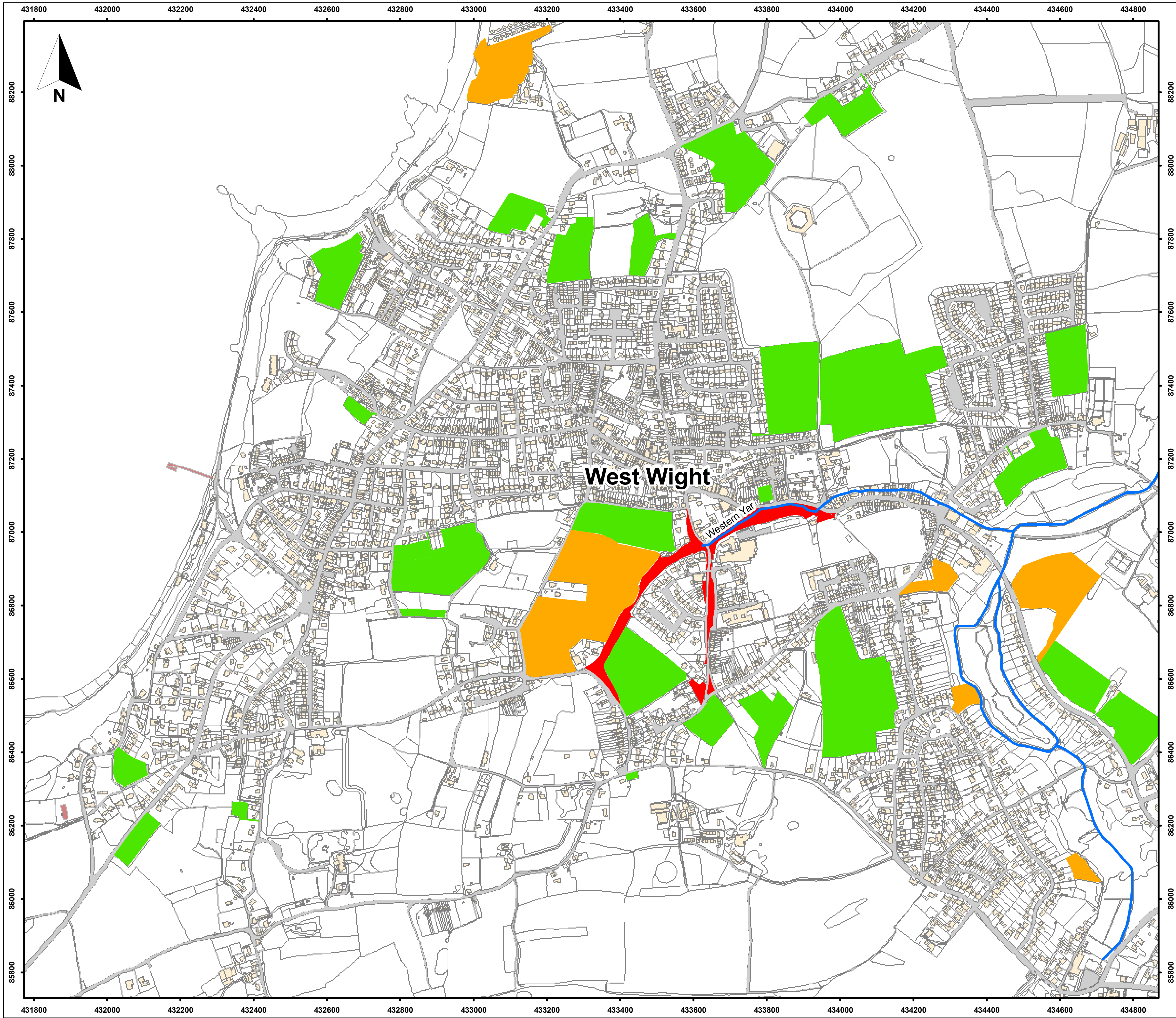
The coastline of West Wight has been classified as being at high risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 100m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Yarmouth. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.
- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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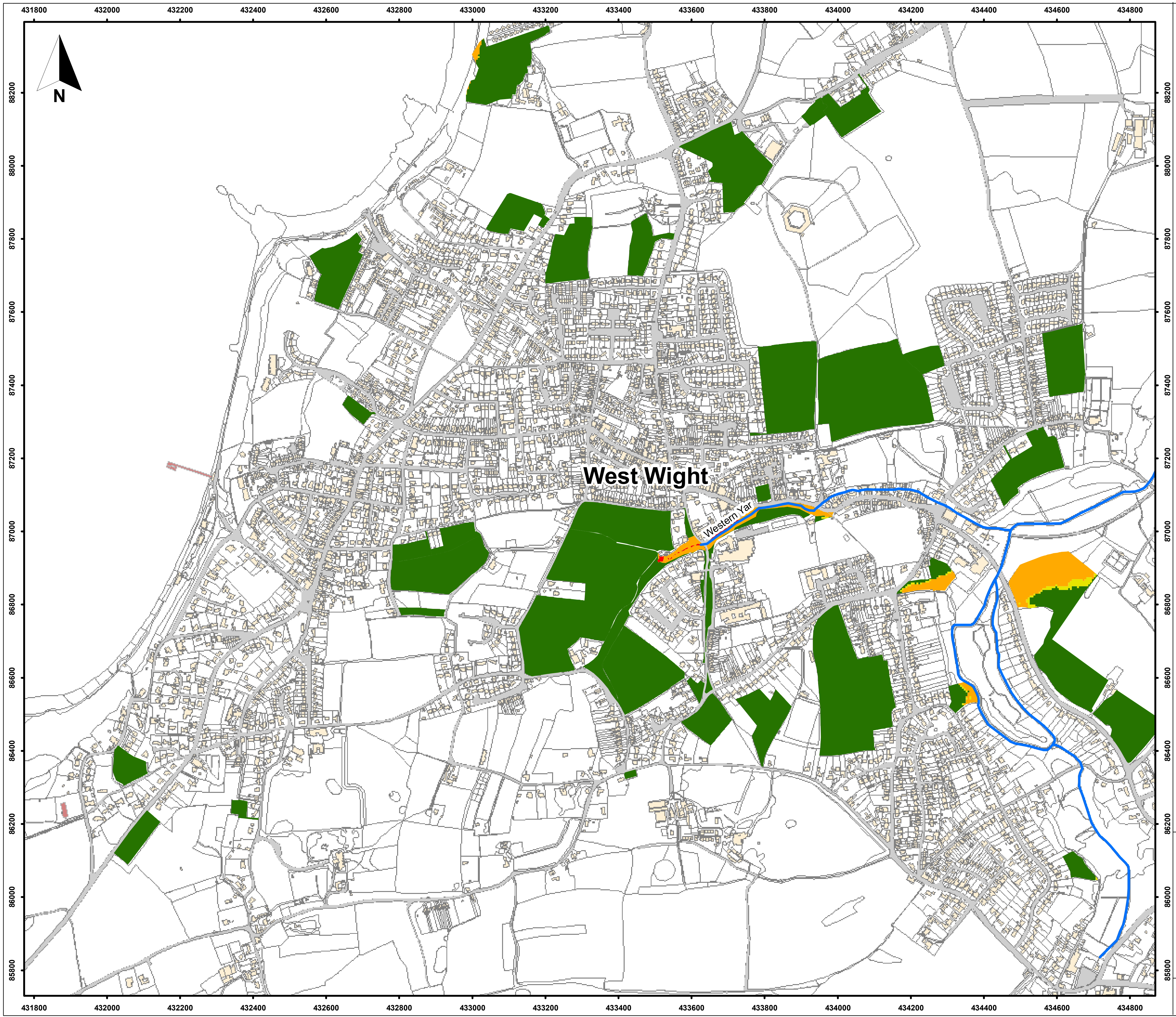
Isle of Wight SFRA MK2

Figure 19
Potential Development Sites
Qualitative Flood Risk
West Wight

November 2009
25793-A22a.mxd squij

Entec



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Isle of Wight SFRA MK2

Figure 20
Potential Development Sites
Site Specific Flood Risk Definition
West Wight

November 2009
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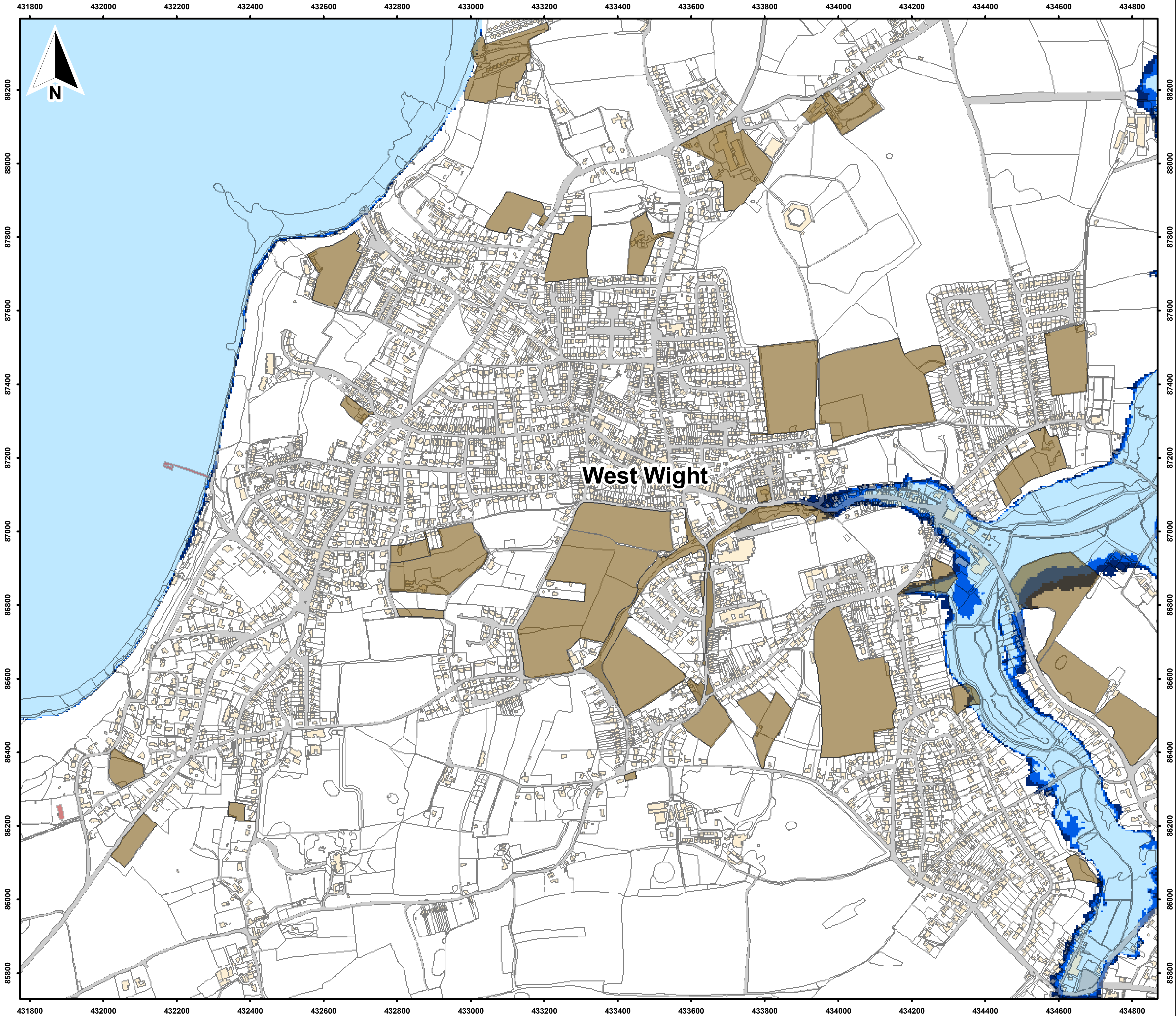

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115
- Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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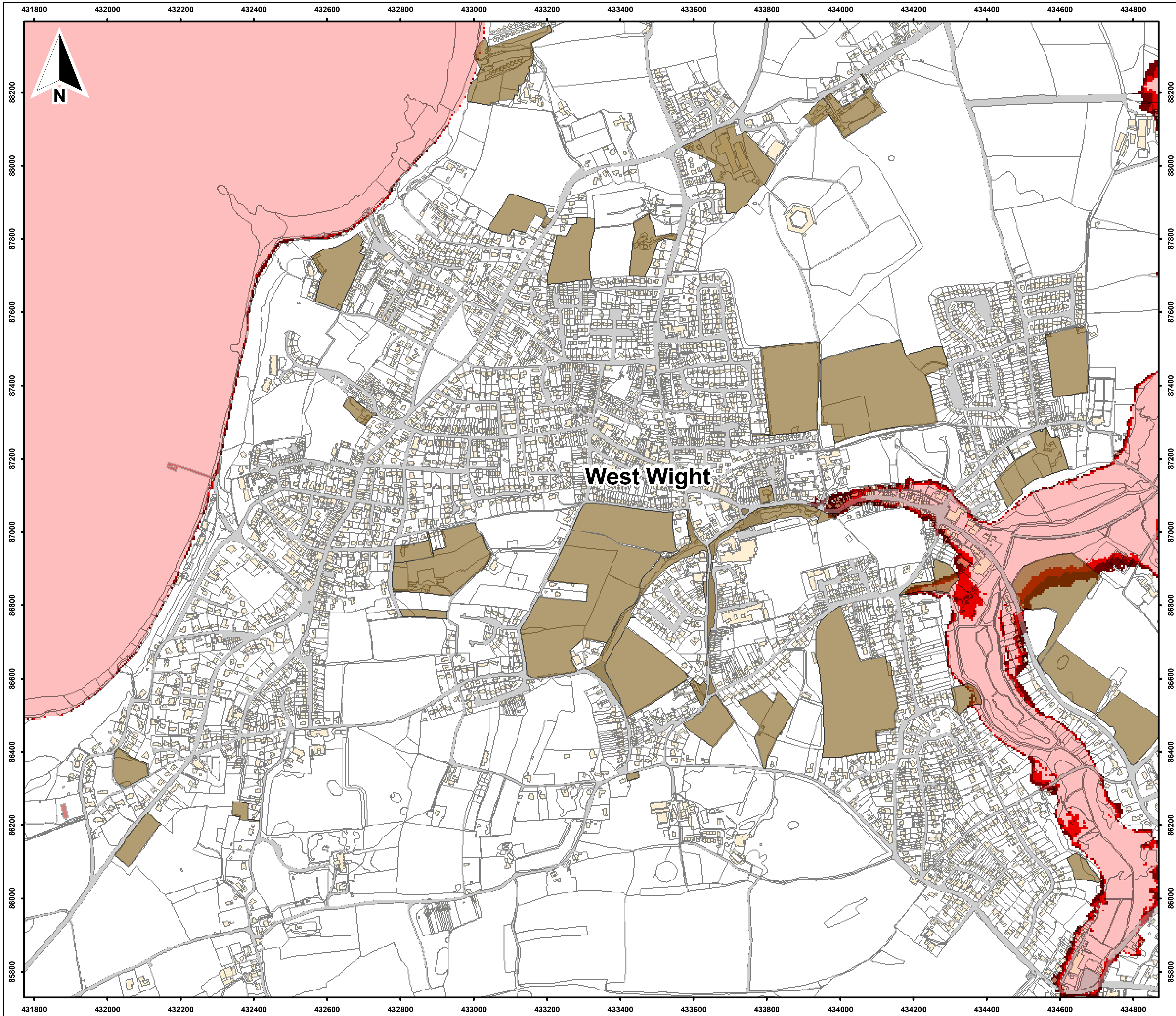
Isle of Wight SFRA MK2

Figure 21
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
West Wight

November 2009
25793-A24a.mxd squij

Entec



Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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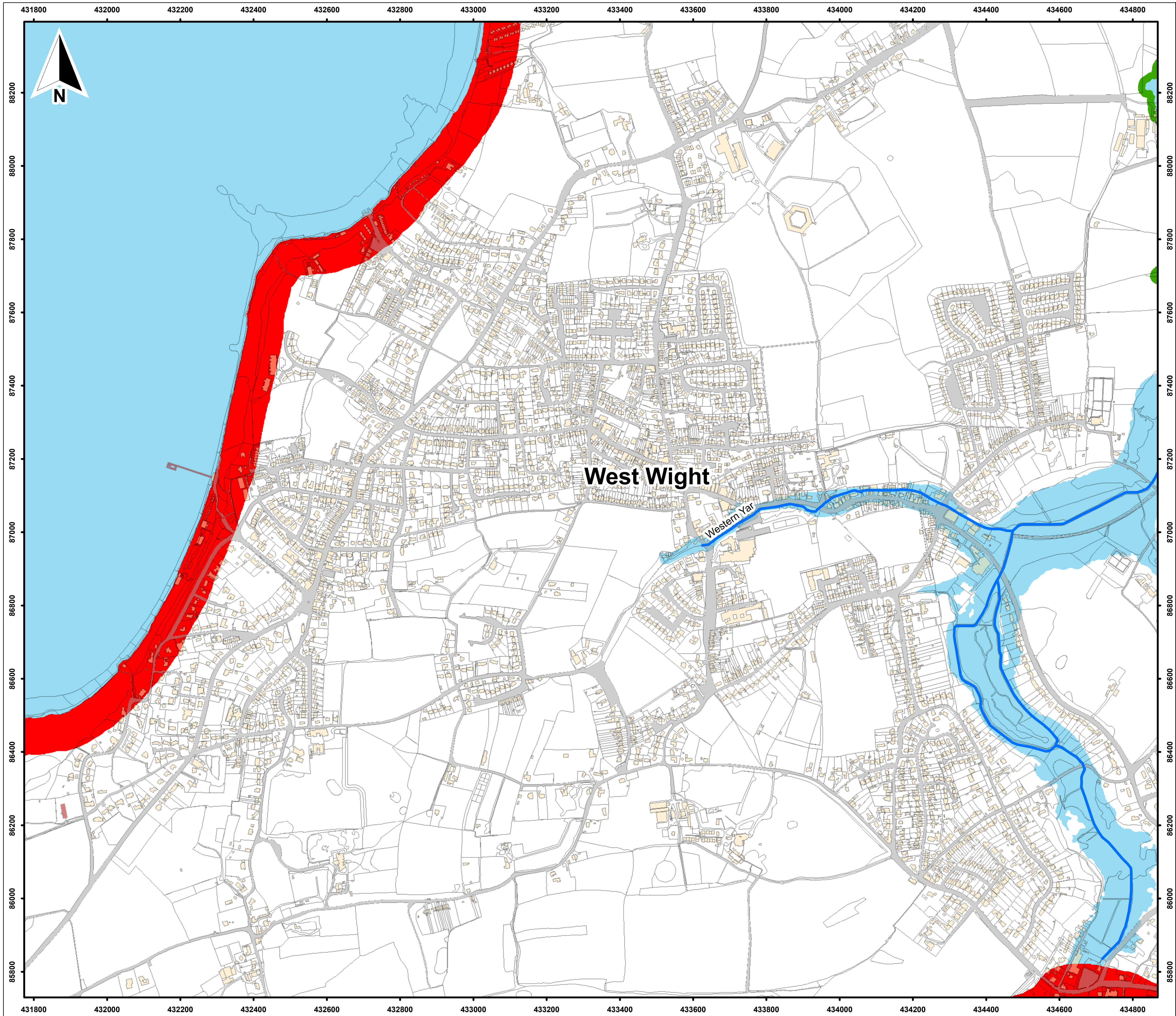
Isle of Wight SFRA MK2

Figure 22
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
West Wight

November 2009
25793-A25a.mxd squij

Entec



Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 23
Qualitative Wind and Wave Exposure Risk West Wight

November 2009
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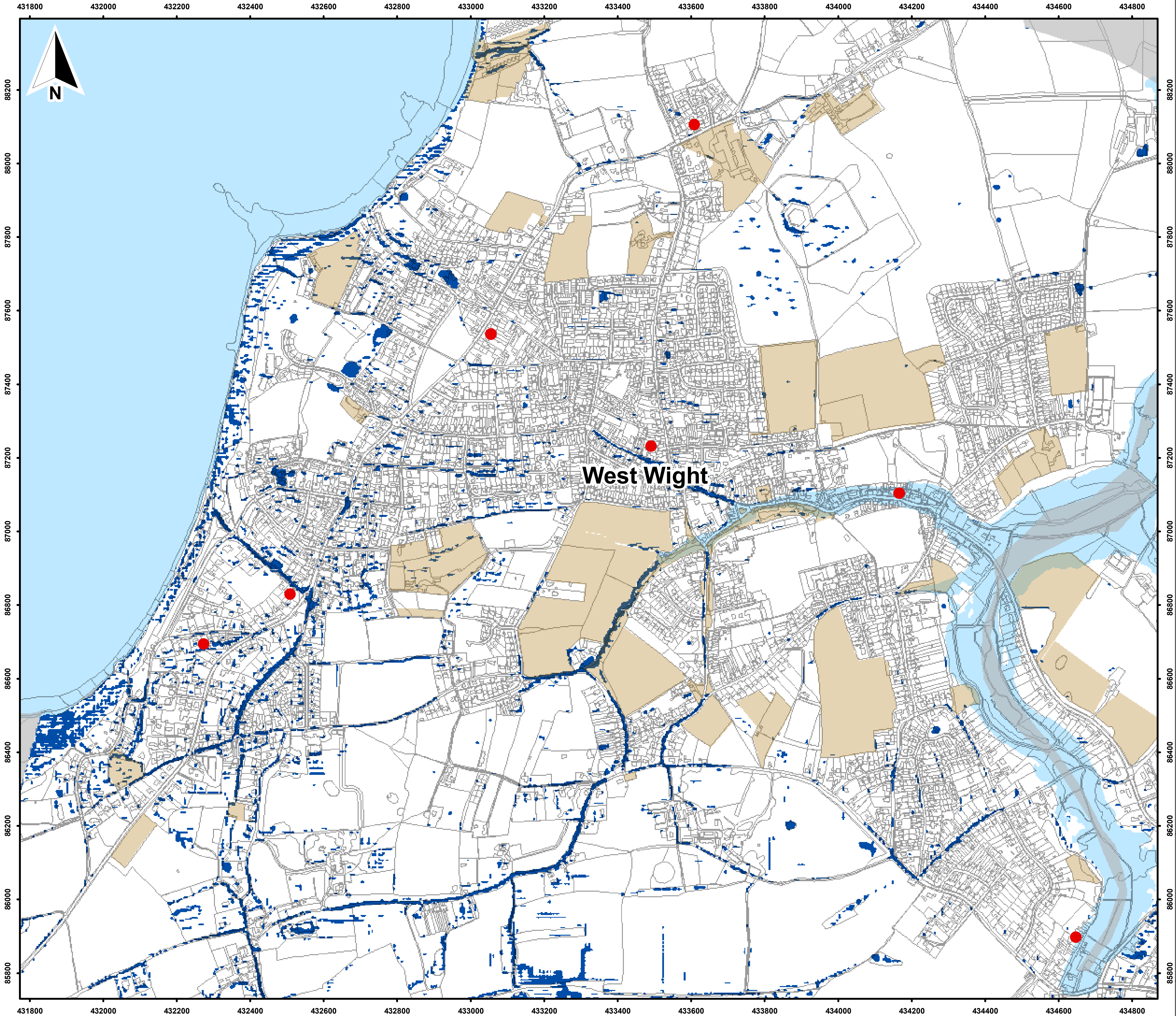
Entec



Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 24
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) West Wight

November 2009
25793-A27.mxd squij

Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix F
Yarmouth

June 2010

Overview

The topography of Yarmouth is relatively flat, with western parts of the town below 3 mAOD, and is classified as a Rural Service Centre. Flood risk in the town is complex with the tidal risk from the sea along the northern edge of the town, and a combination of tidal and fluvial risk from the estuary to the south and west.

Please review this discussion in conjunction with the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Yarmouth and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Yarmouth RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted

Sites at Risk

Tidal flood risk in Yarmouth is significant, however one two of the six potential development sites are impacted by the 2115 Flood Zone 3 extent. Tidal Flood Zone extents are more extensive than the fluvial extents on all sides of the town.

Although not exactly related to a particular potential development site, the current Environment Agency Flood Zones appear to completely encircle the town. This potentially presents serious problems relating to access and egress routes for existing and proposed developments and emergency planning. In the event of the 1 in 200 year tidal event, the A3054 is predicted to flood (see figure 24). This situation has the potential to restrict the ability of emergency services to access the settlement and thus becomes an emergency planning consideration for the council.

Climate Change

Increasing sea levels as the result of climate change have the most significant impact in the west of the town, where the topography is the flattest. The extent of the flood zones in 2115 do not include any additional potential sites that are not already included by the current flood zone extents.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The town of Yarmouth is completely surrounded by low land, as such there town does not have an upslope surface water catchment that can deliver surface water run-off to the town. As such the modelling predicts there to be a minimal surface water flood risk in Yarmouth. There are only a small number of areas where the model has predicted accumulations of water over 0.1m deep and greater than 25m^2 in area. These small pockets of flooding do not appear to follow a particular flow route and are more likely to be the product of small variations in the recorded LiDAR ground levels.

Surface Drainage and Infiltration SuDS Potential

The runoff potential of soils in Yarmouth is only available for the east of the town which has a SPR of approximately 50%, thus indicating a high runoff potential. The groundwater vulnerability map of the area also shows much of Yarmouth overlying a Unproductive Strata, expect for the south west edge of the town which is characterised by a Secondary Aquifer with a high leaching potential, and the east of the town which is associated with a Secondary Aquifer of low leaching potential. Infiltration potential is classified as low for Yarmouth other than for the south western edge of the town which has a medium infiltration potential. The low infiltration potential of the town makes infiltration SuDS techniques unsuitable except of the south west of the town, that is, under the assumption that appropriate precautionary measures are employed to prevent pollution of the underlying aquifer.

The sea north of Yarmouth and the Western Yar estuary, west of the town, are designated as a SAC. Thornley Brook is associated with a SPA and SSSI, which extend towards the coast between The Mount and Thornley Road. The close proximity of a SAC, SAP and SSSI around the town means it is important that measures be considered to mitigate against pollutants entering the estuarine environments through surface water discharges. The estuarine and coastal waters around Yarmouth allow for an unconstrained volume of runoff discharge, assuming water is free of contaminants. Consideration should be given to the potential for tide locked surface water drainage outfalls. On site attenuation and storage will need to be provided to ensure that high tides do not result in sites flooding.

Wave Exposure Risk

The coastline of West Wight has been classified as being at low risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 20m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within West Wight. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.

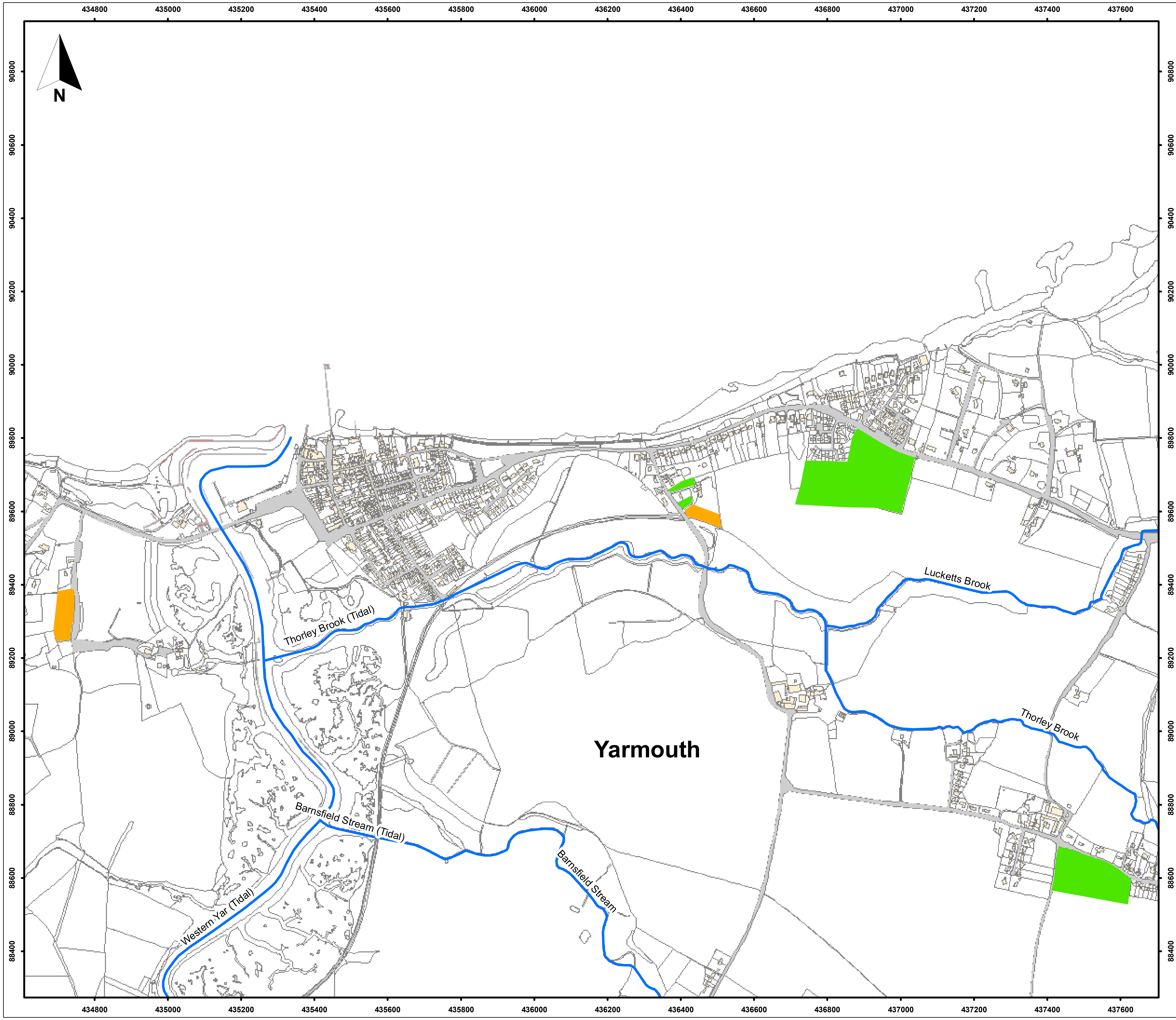
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

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Isle of Wight SFRA MK2

Figure 25
Potential Development Sites
Qualitative Flood Risk
Yarmouth

November 2009
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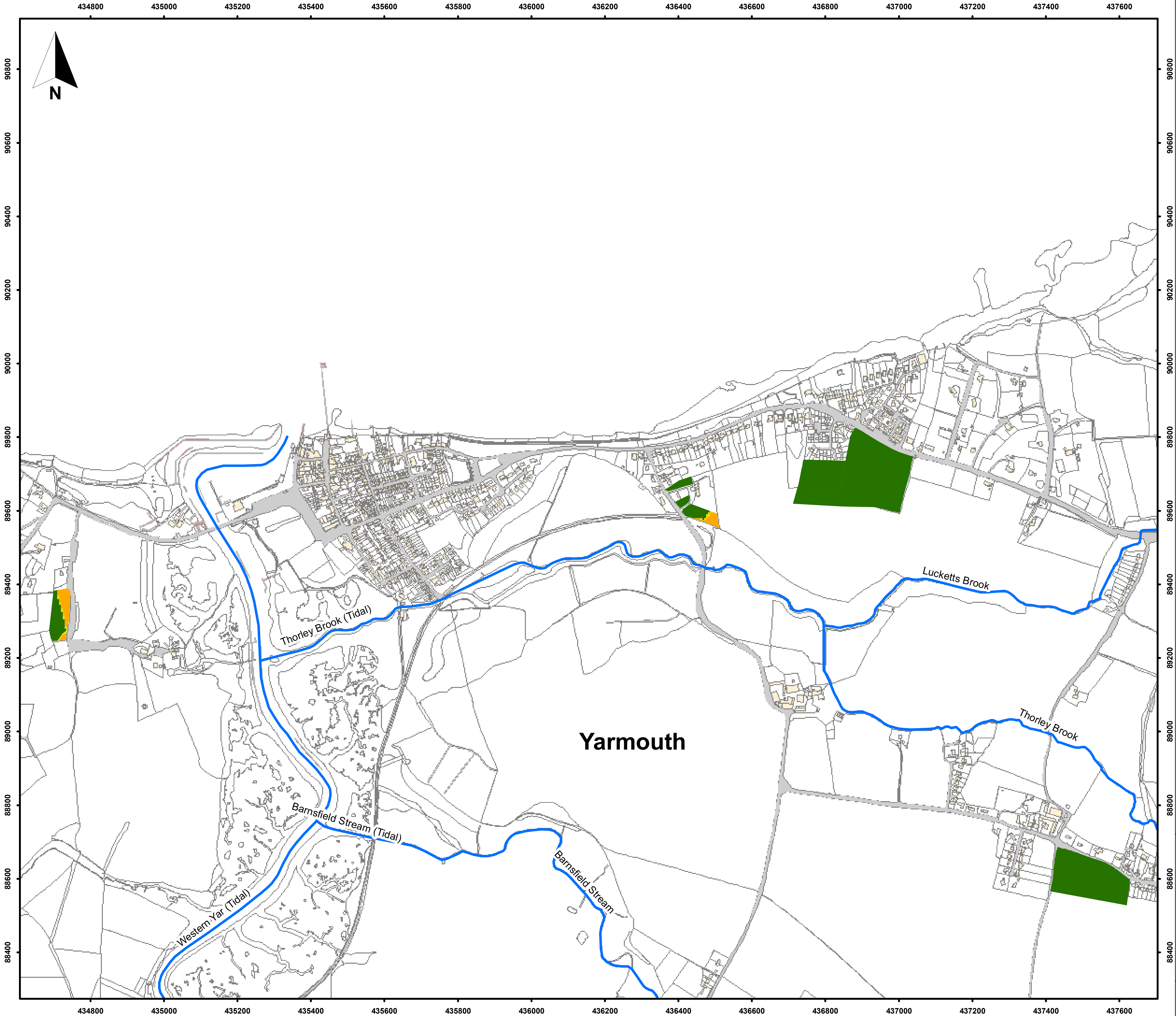

Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 26
Potential Development Sites
Site Specific Flood Risk Definition
Yarmouth

November 2009
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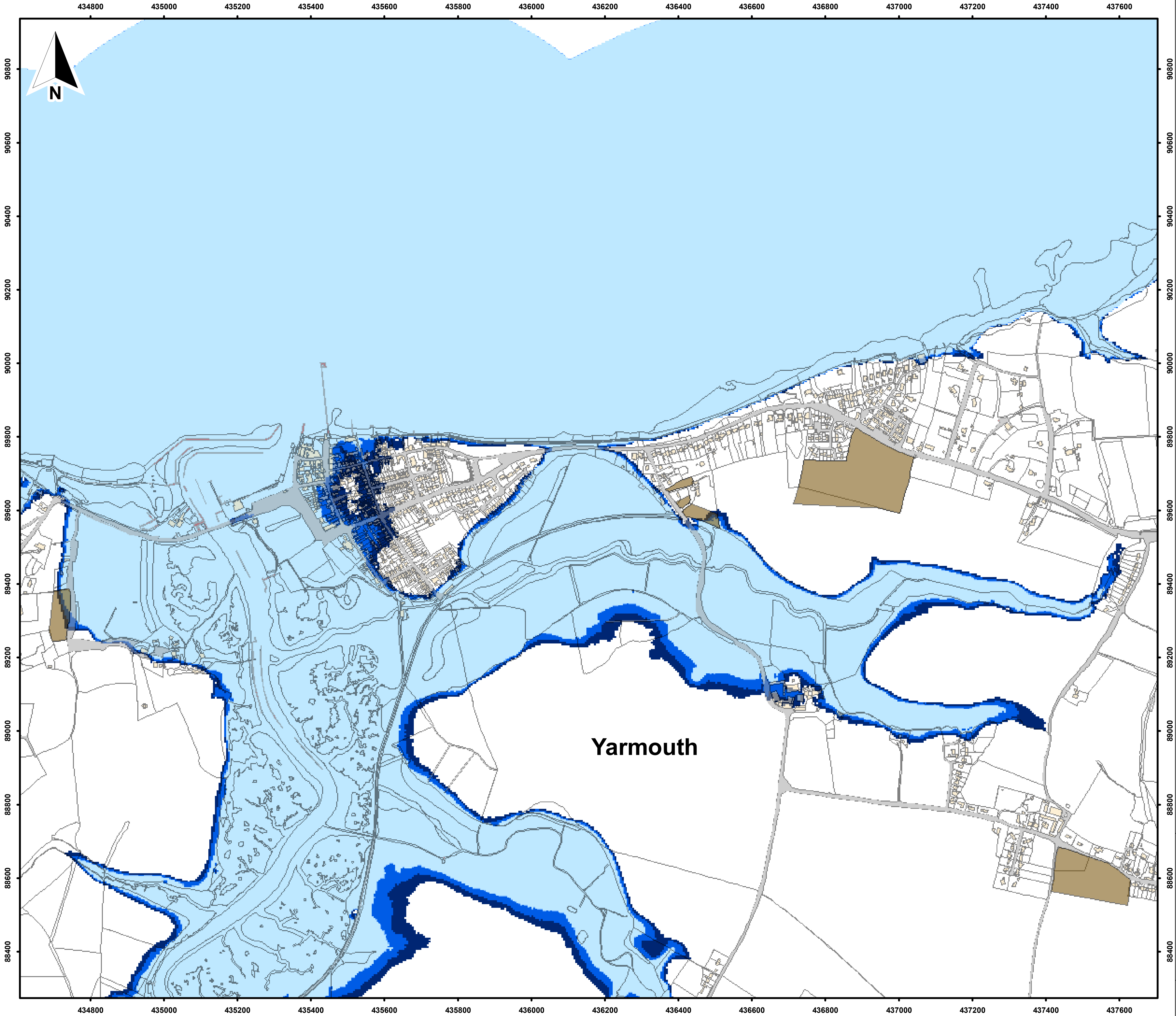

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115
- Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 27
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Yarmouth

November 2009
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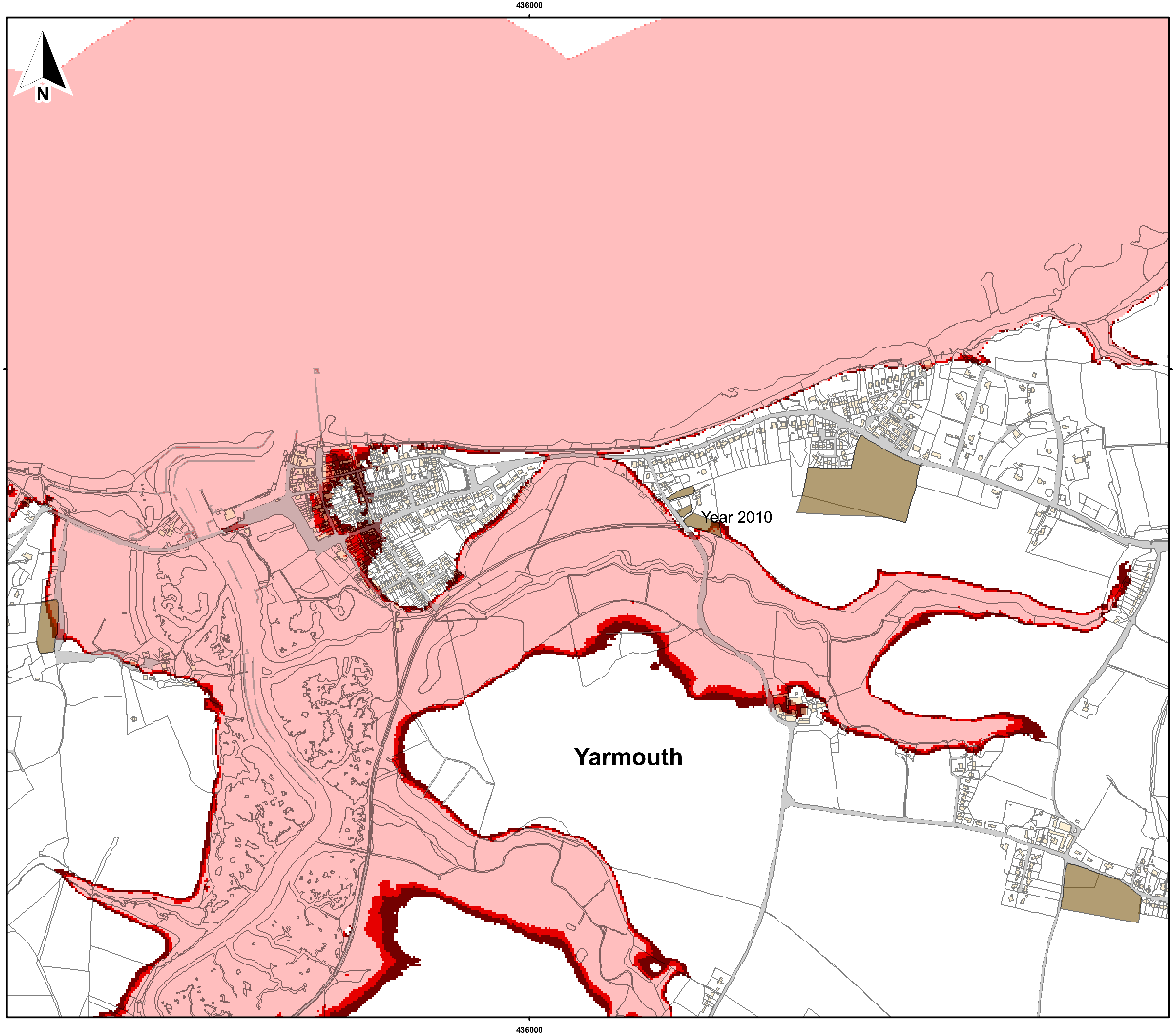

Key:

Predicted 1 in 200 year Tidal Extents

Year 2010

Year 2045

Year 2080

Year 2115

Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 28
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Yarmouth

November 2009
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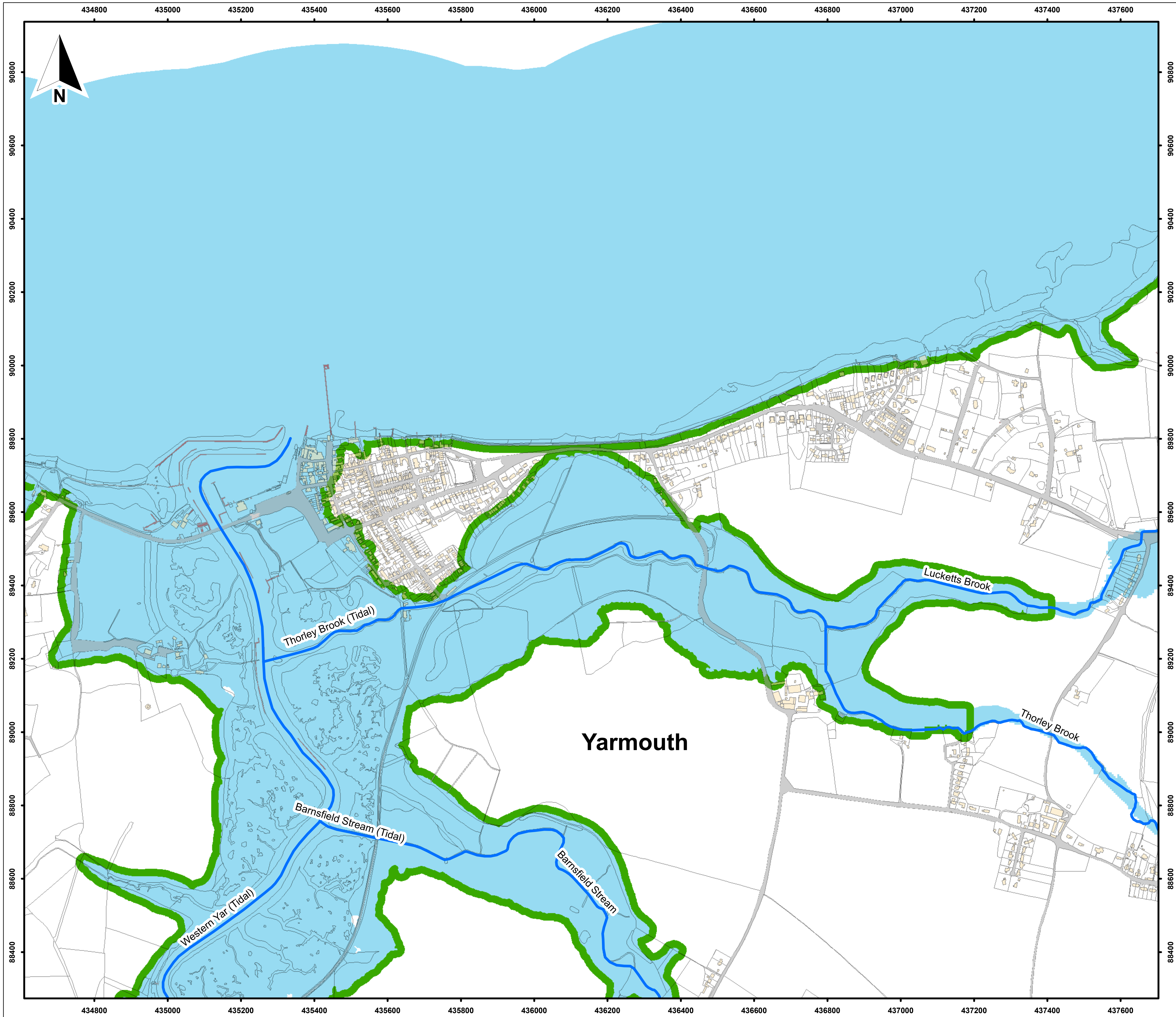

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 29
Qualitative Wind and Wave Exposure Risk - Yarmouth

November 2009
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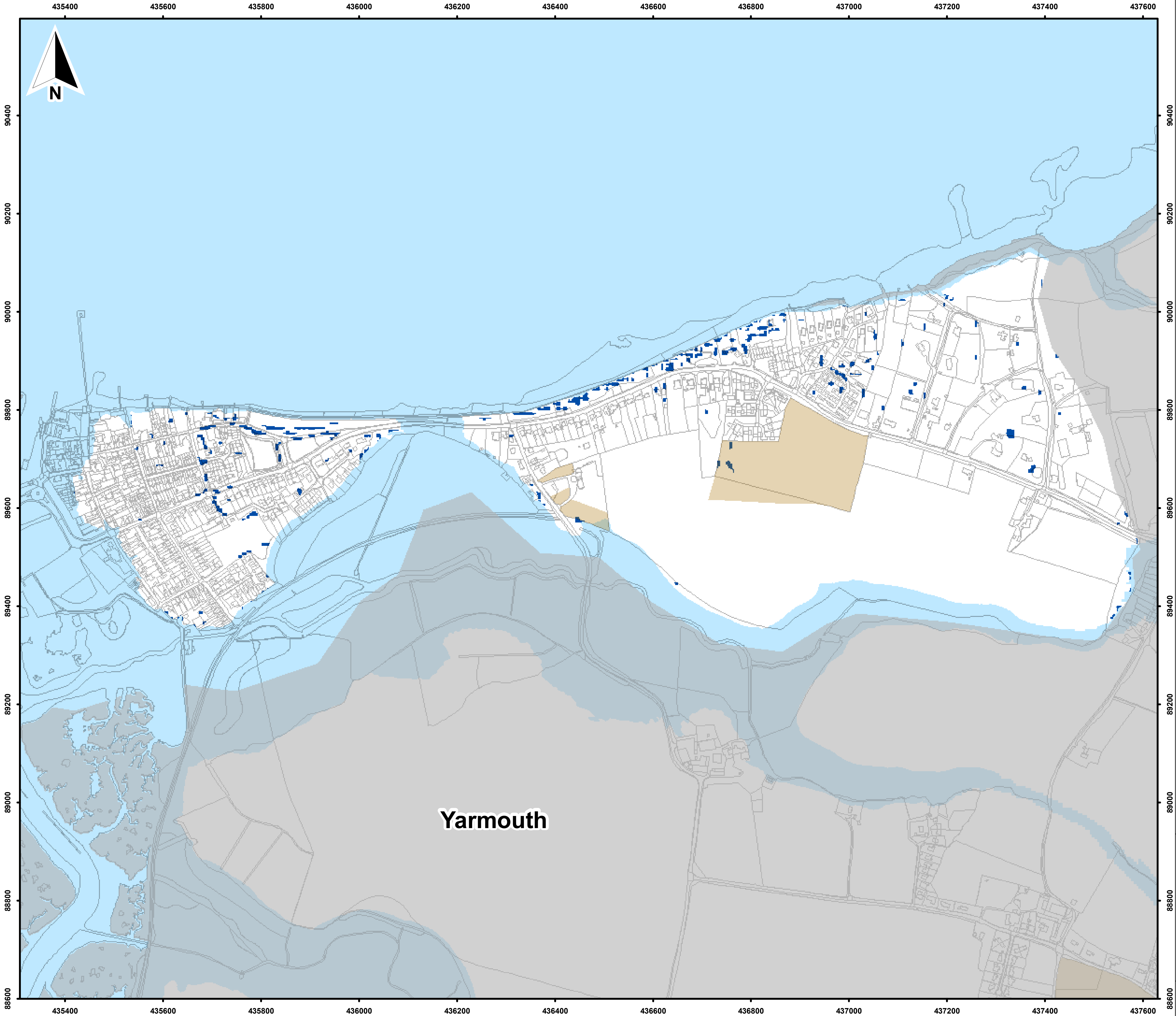

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc)

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 are shown

0 200 400 Meters

Scale: 1:7,500 @ A3

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Isle of Wight SFRA MK2

Figure 30
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Yarmouth

November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix G
Brighstone

June 2010

Overview

Brighstone is classified as a Rural Service Centre and is located on the confluence of Brighstone Brook and Shorewell Stream, both of which are Environment Agency Main Rivers. The main issue in this town is that the Flood Zones do not extend the full length of the watercourses. As such potential developments which may be in a flood plain are attributed in the Sites Database as being in Flood Zone 1 and thus appropriate for all development types. Therefore the Main River 20m buffer dataset is very important and it is recommended that this dataset be consulted should any of the potential sites be released for development. If a site is within 20m of a main river then it will be stated in the Sites Database.

Please review this discussion along side the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Brighstone and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Brighstone RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

Fluvial flood zones associated with Brighstone Brook extend through the length of the settlement, which results in at least 50% of the potential development site on the south bank of Brighstone Brook being in flood zone 3a. At the eastern end of the settlement Brighstone Brook has its confluence with Shorewell Stream. The flood zones in the location of the confluence impact on three potential development sites, with two of them being completely within Flood Zone 3a.

Climate Change

The fluvial climate change assessment outlined in Section 5.2 indicates that sites (ID Brighstone1334 and Brighstone1203) are potentially susceptible to the impacts of climate change as there is a significant difference between the extents of Flood Zone 2 and 3. It is therefore recommended that, should either of these sites be put forward for planning, the impact of climate change on the extent of Flood Zone 3 be assessed as part of a site specific FRA.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The topography of Brighstone can be characterised two narrow valleys, one running from the north west and the other from the north east. These two valleys converge in the village to form another valley which leads southwards towards the English Channel. The hillside above the town is a steep south facing slope with no significant defined drainage pathways. This results in the model simulating unconfined broad extents of shallow flooding. Through the village, and where drainage routes are better defined, the predicted flooding becomes confined to drainage pathways. The difference between the northerly parts and southern parts of the model are also a product of the fact that the topography of the northern portion is defined by SAR (Synthetic Aperture Radar) data which is significantly less detailed than the LiDAR data which is present in the southern part of the modelled area.

The model predicts several potential flow routes that are not currently covered by the flood zones; these exist outside the main built area and are not predicted to impact any of the potential development sites. These flow routes should however be considered in the production of any site specific flood risk assessments that may come forward.

Surface Drainage and Infiltration SuDS Potential

Soils on the site have a low to very high runoff potential with SPR values between 15% and 60%. The steeper parts of the Brighstone, in the north east, have been classified as having a low runoff potential, while the flatter areas in the south west is underlain by soils with a very high runoff generation potential. Groundwater vulnerability in Brighstone is characterised by a Principal Aquifer in the north east and an Unproductive Strata in the south west. An area of Secondary Aquifer is identified in the area around Brighstone Brook and Shorewell Stream. Infiltration potential is classified as medium in the north east and low in the south west.

The application of infiltration SuDS techniques in Brighstone are only constrained by the low infiltration potential classification assigned to the south western part of the settlement.

Wave Exposure Risk

The coastline to the south of Brighstone is classified as being at high risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 100m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Brighstone. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

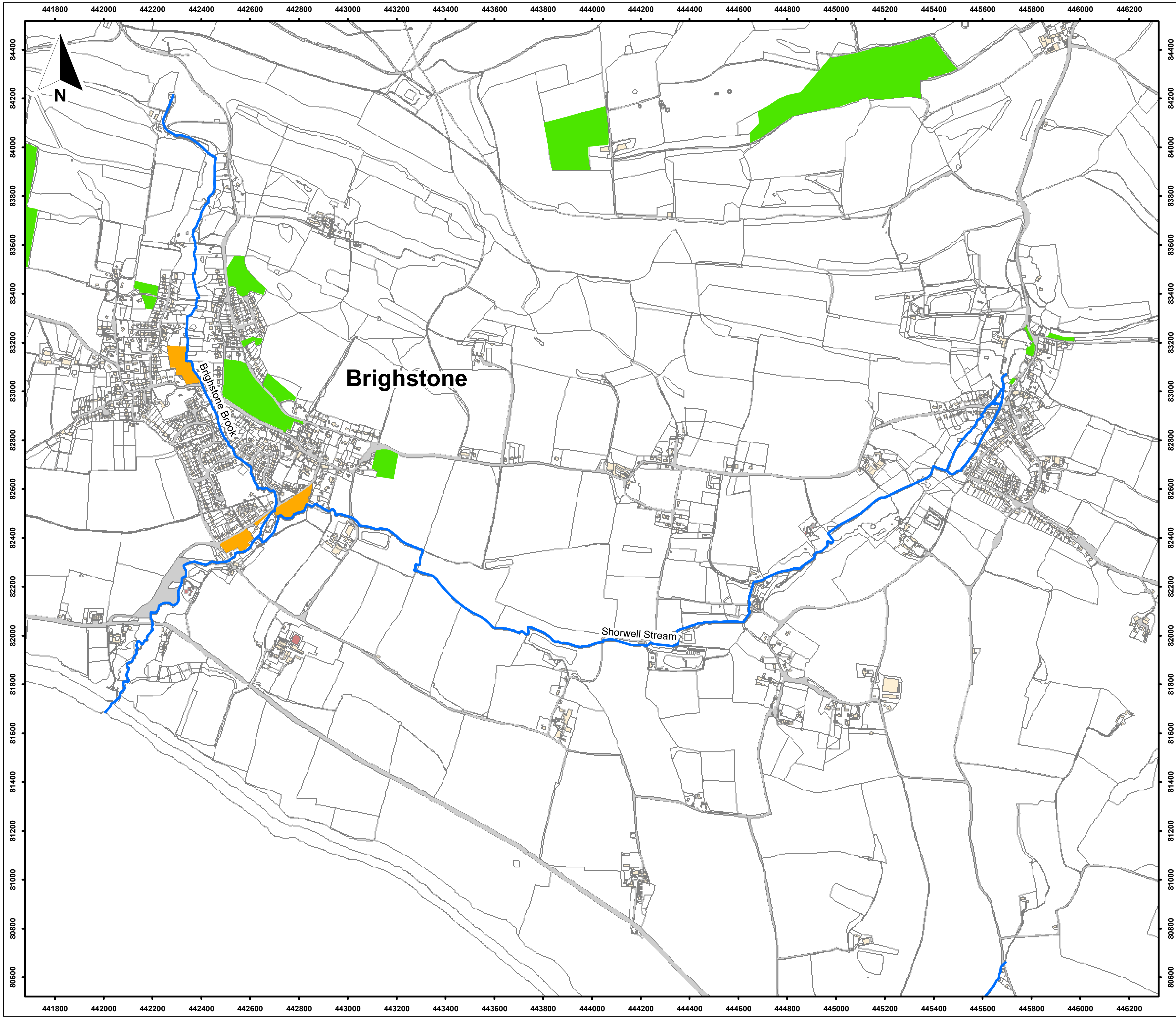
Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied; again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.

A site specific FRA is required for all those potential sites which are within the extent of either Flood Zone 2 or 3. If the Sites Database states that the site is within 20m of a Main river (in field *'Riv_20_Buf'*) then the Environment Agency should be consulted.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain
The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 31
Potential Development Sites
Qualitative Flood Risk
Brighstone

November 2009
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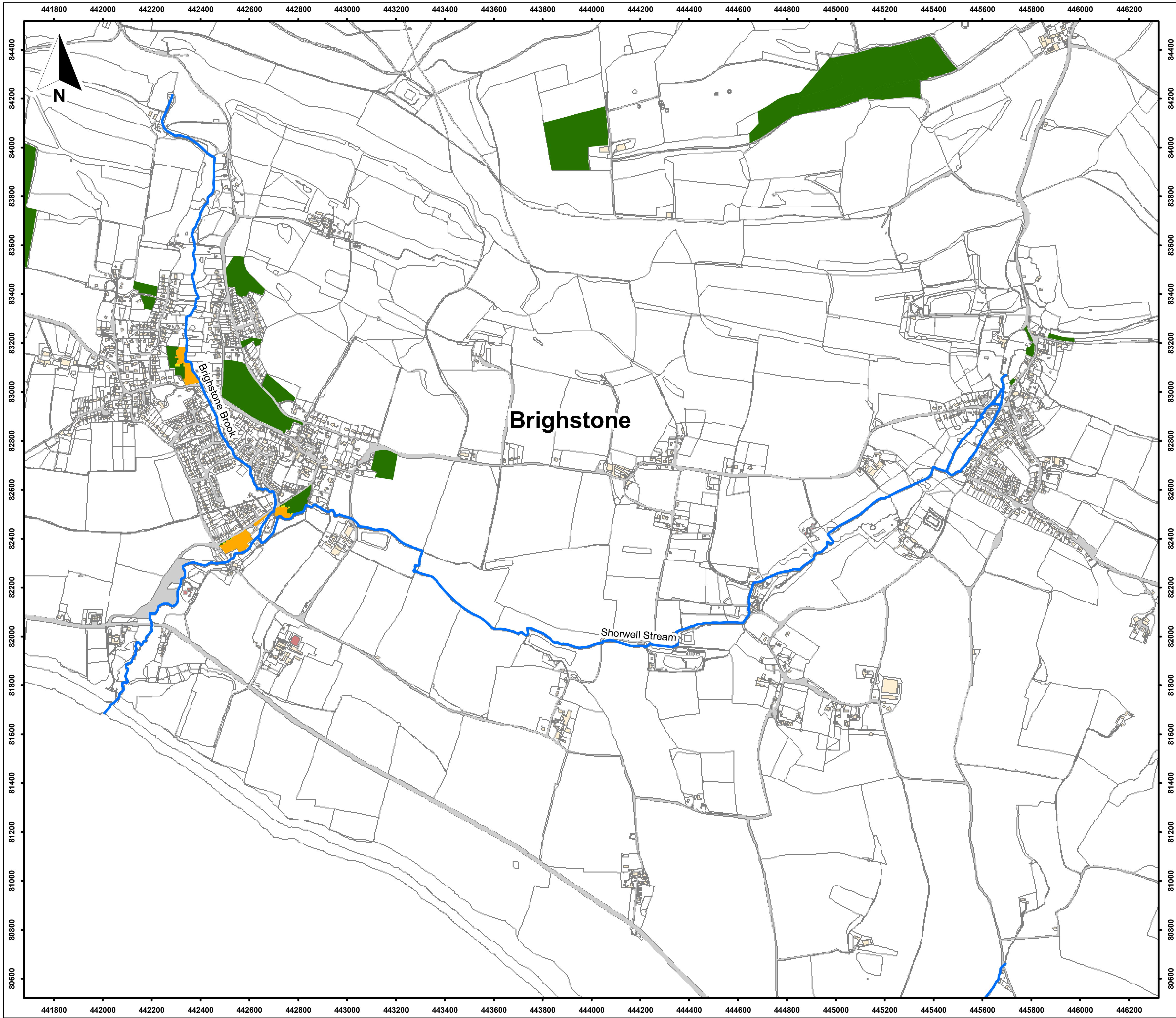

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 32
Potential Development Sites
Site Specific Flood Risk Definition
Brighstone

November 2009
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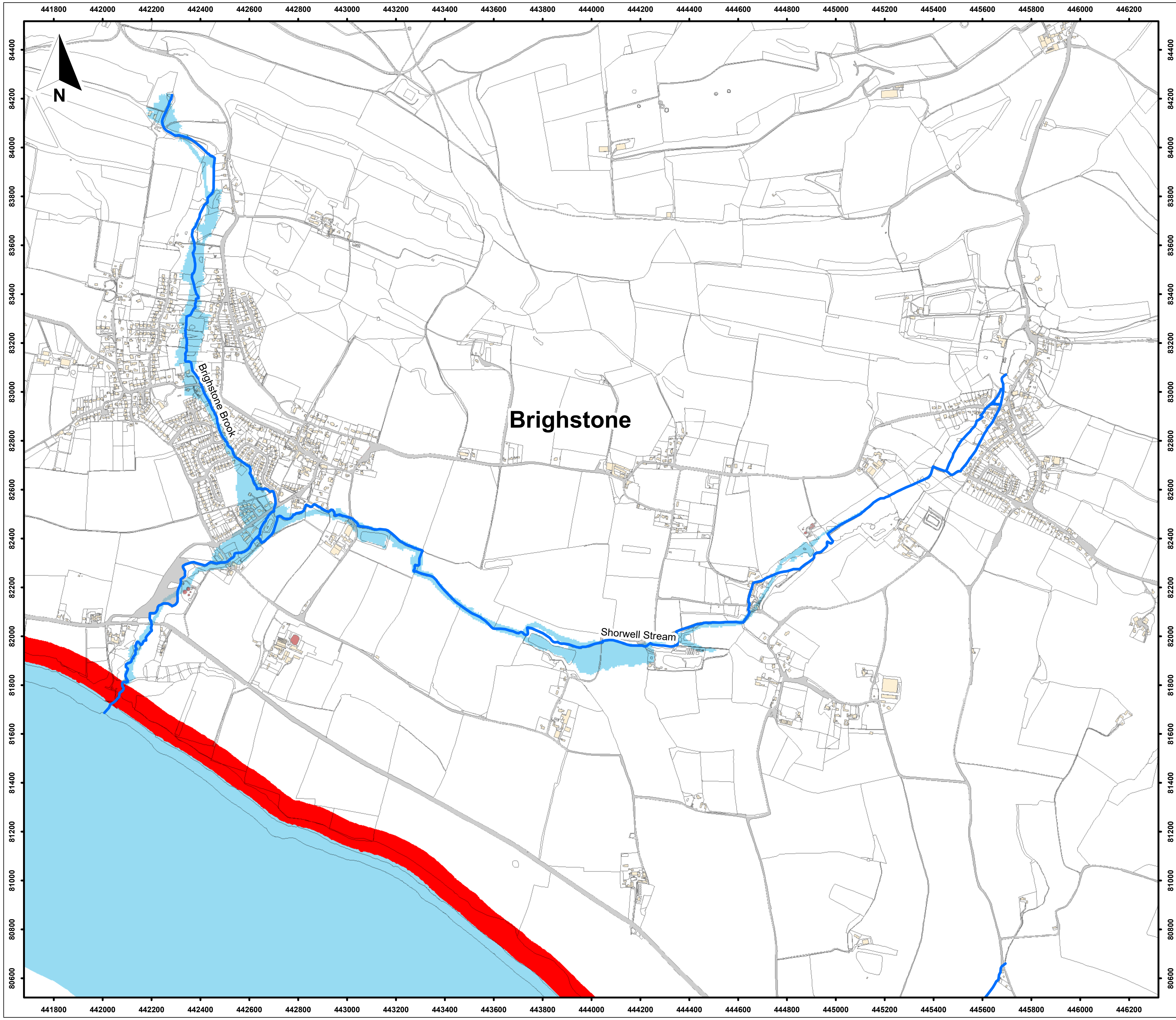

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 33
Qualitative Wind and Wave Exposure Risk - Brighstone

November 2009
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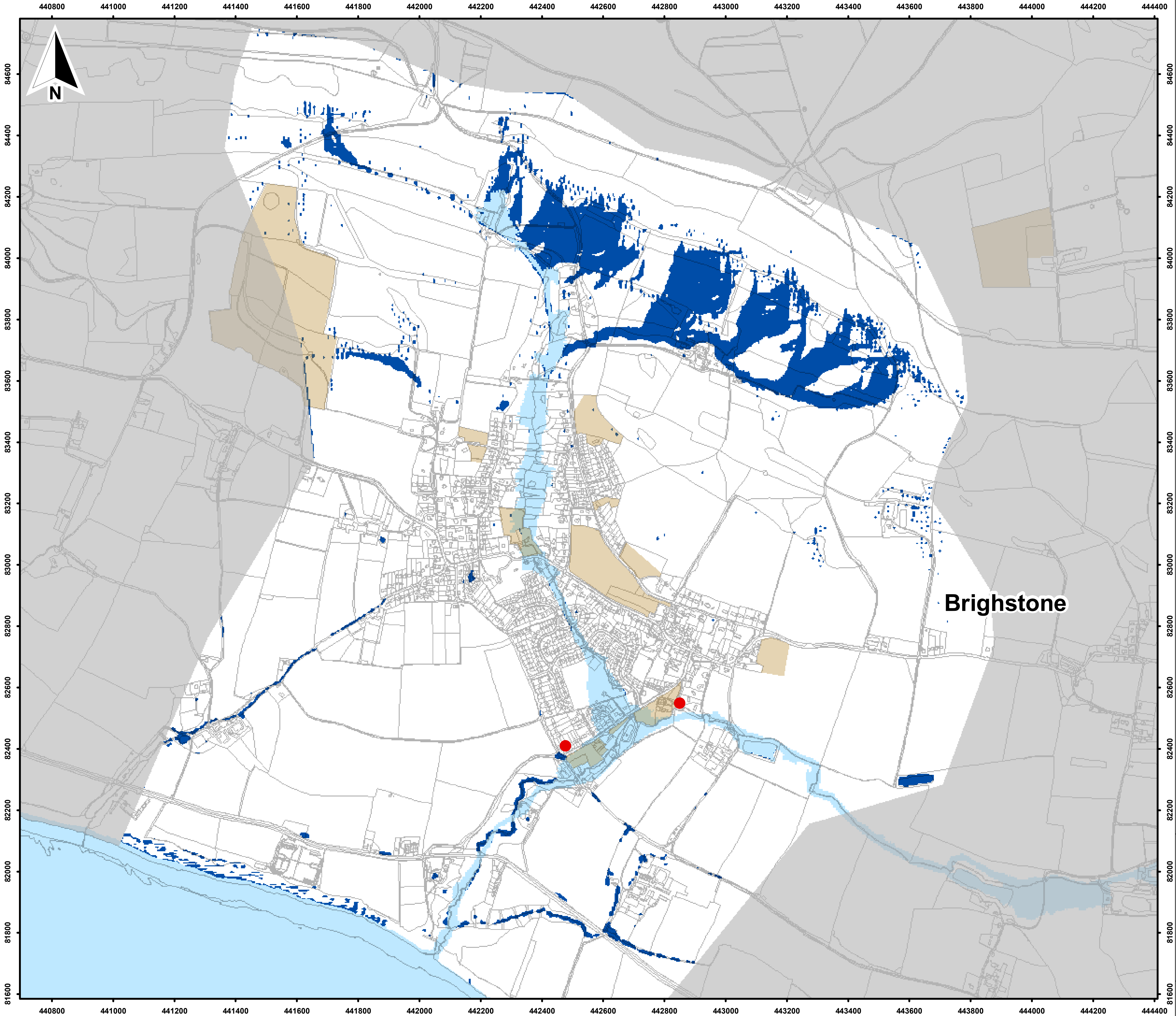

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Isle of Wight SFRA MK2

Figure 34
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Brighstone

November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix H
Ventnor

June 2010

Overview

Ventnor is a Smaller Regeneration Area and it is built on a relatively steep south east facing slope, elevation which rises quickly from the shoreline. Flood risk in the town is considered to only be small.

Please review this discussion along side the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

Ventnor is a Smaller Regeneration Area. It is an area of need in terms of regeneration and therefore the Isle of Wight Council will be receptive to development proposals. Ventnor SRA has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

Ventnor has no fluvial Flood Zones and little in the way of tidal Flood Zones. All the potential development sites are located within Flood Zone 1

Climate Change

Figures 37 and 38, illustrate that the potential impact of climate change does little to increase the flood risk in Ventnor. This is due to much of the ground being above the predicted future extreme tide levels.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The patterns of predicted surface water flow routes and ponding areas are primarily determined by two key model parameters, the topographic model and the rainfall hyetograph. In Ventnor the most significant influence is provided by the topographic model. The topography of Ventnor is generally characterised by a steeply sloping south facing slope with very few well defined flow routes. When the LiDAR is examined at the local level, it is apparent that there are a large number of small *rills* which follow the contours of the slope. The source of these features is not clear, although it is likely that the process of removing the buildings from the ground model has been an influence. The presence of rills that are aligned with the contours is that the down-slope flow of water is interrupted, resulting in a series of what appear to be lateral flow routes. In the east of the town, this phenomenon is replaced with broad, unconfined shallow flooding as this part of the hillside is devoid of any significant topographic features which would collect and channel the flows.

The form of the ground topographic model in Ventnor is such that it is likely that the surface flow routes and ponding areas predicted in figure 40 are potentially inaccurate. These results have been included for completeness, but they should not be used to guide site-specific flood risk assessments. A more detailed approach, in which the ground model is vertically adjusted using survey data, and through the inclusion of the Southern Water surface water drainage network, would be necessary to improve the definition of the surface water flood risks.

Surface Drainage and Infiltration SuDS Potential

The central area of Ventnor is characterised by soils with an SPR of about 47%, while the fringe areas of the town have a much lower SPR of about 2%. A Secondary Aquifer with an intermediate leaching potential follows the coastline through the town with a width of approximately 350m. A thin band of Principal Aquifer overlain by soils of intermediate leaching potential lies adjacent the Secondary Aquifer. The north of the town, up towards Lowtherville, is underlain by a Principal Aquifer overlain with soils of high leaching potential. A substantial area of mass movement is identified in the town which is associated with clay strata. Due to the presence of this band of mass movement and the Secondary Aquifer, infiltration potential over much of the town is classified as low. Due to the soils and mass movement along the coast, the use of infiltration SuDS techniques is considered unsuitable. The impact that surface water drainage might have on areas of geological instability should be considered. The presence of a SAC, along the coastline, requires precautions be taken to ensure that contaminants are not introduced into the environment in these areas. Consideration should be given to the potential for tide locked surface water drainage outfalls. On site attenuation and storage will need to be provided to ensure that high tides do not result in sites flooding.

Wave Exposure Risk

The coastline of Ventnor has been classified as being at medium risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 50m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

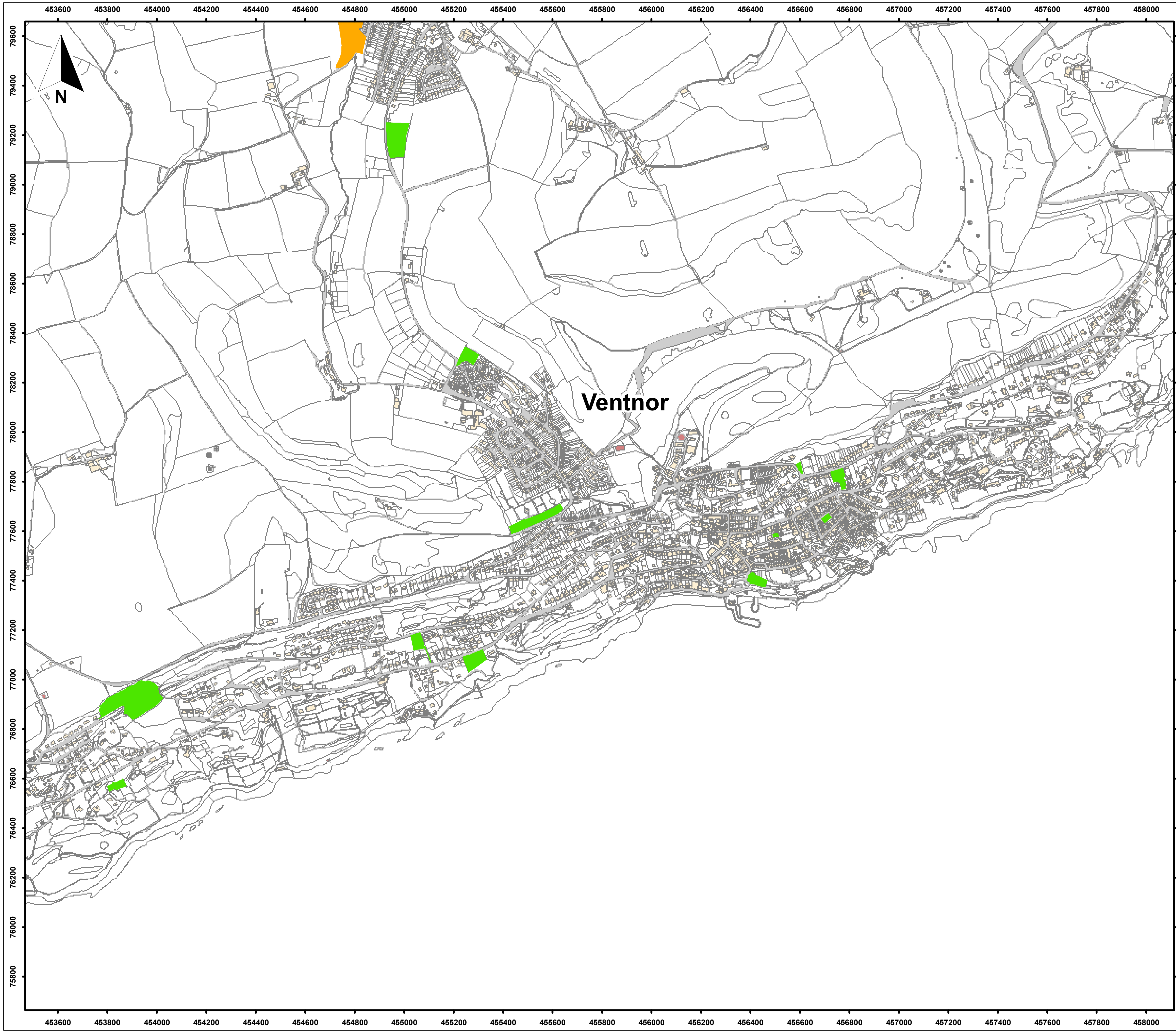
Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Ventnor and given that the flood risk zones only impact a very small land area in the town, avoidance of risk should be pursued in spatial planning process.

Should a circumstance arrive where development is proposed in a flood risk zone, the following will apply. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions and if not provide new ones. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.
- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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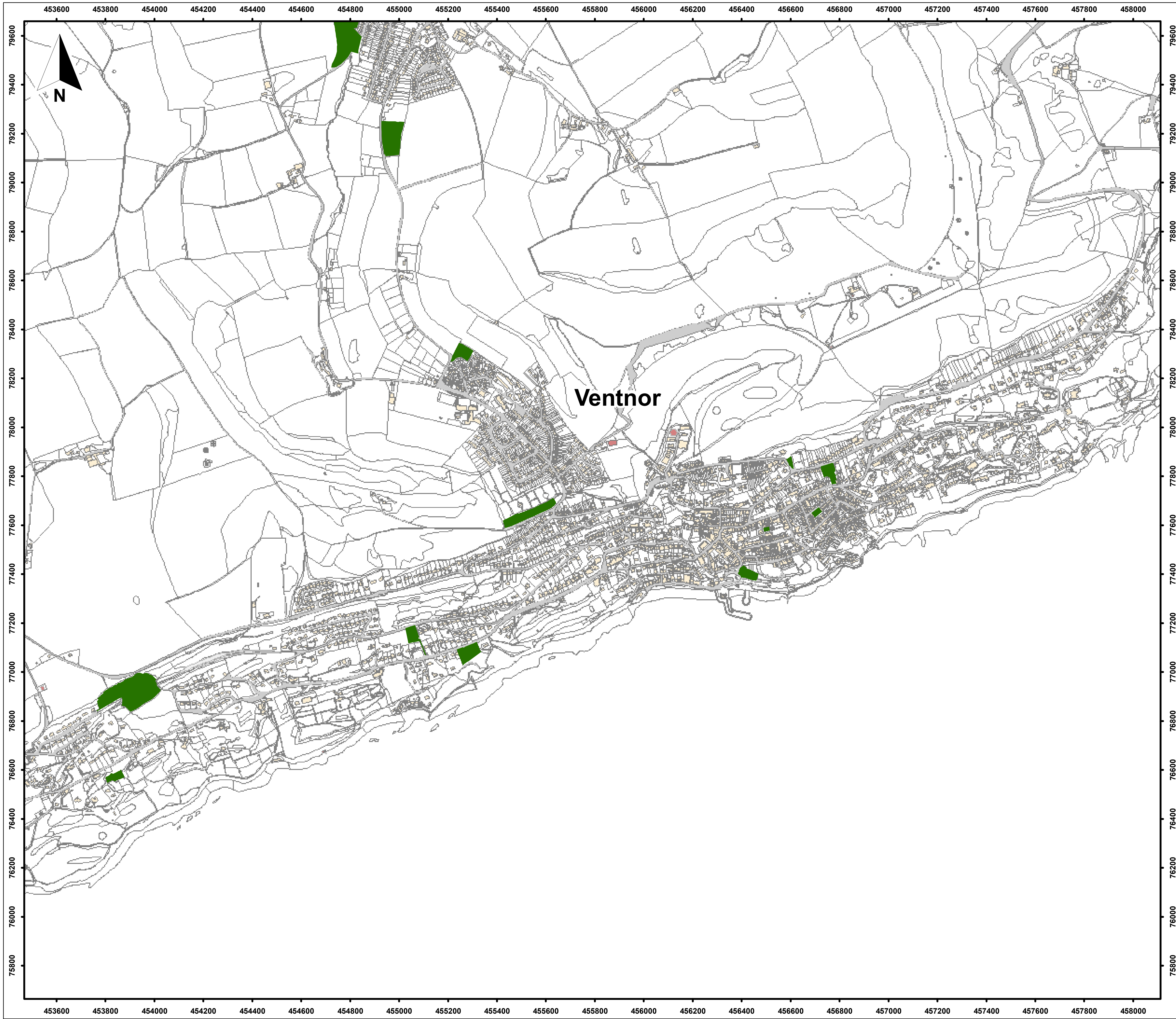
Isle of Wight SFRA MK2

Figure 35
Potential Development Sites
Qualitative Flood Risk
Ventnor

November 2009
25793-A38a.mxd squij

Entec



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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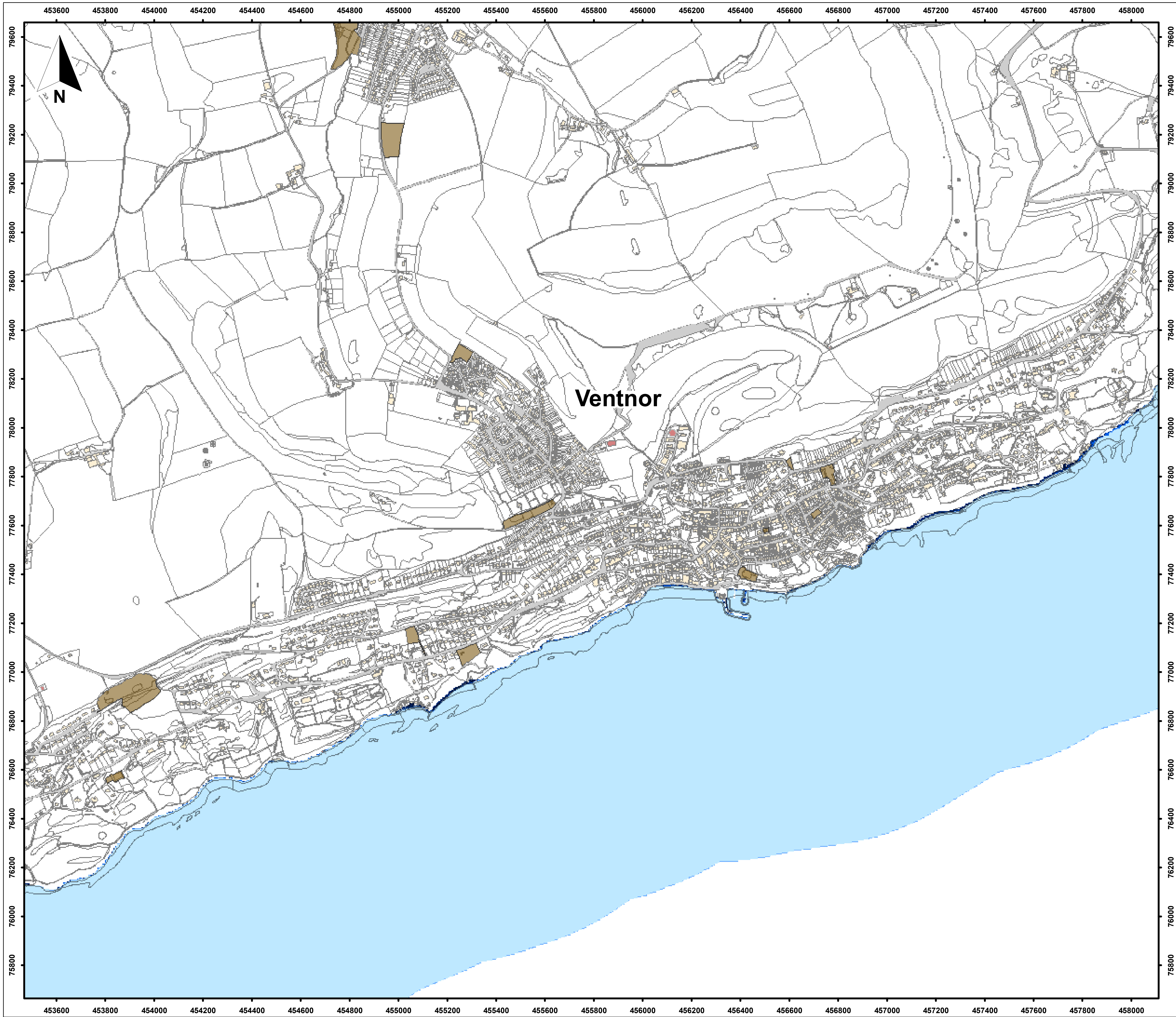
Isle of Wight SFRA MK2

Figure 36
Potential Development Sites
Site Specific Flood Risk Definition
Ventnor

November 2009
25793-A39a.mxd squij

Entec



Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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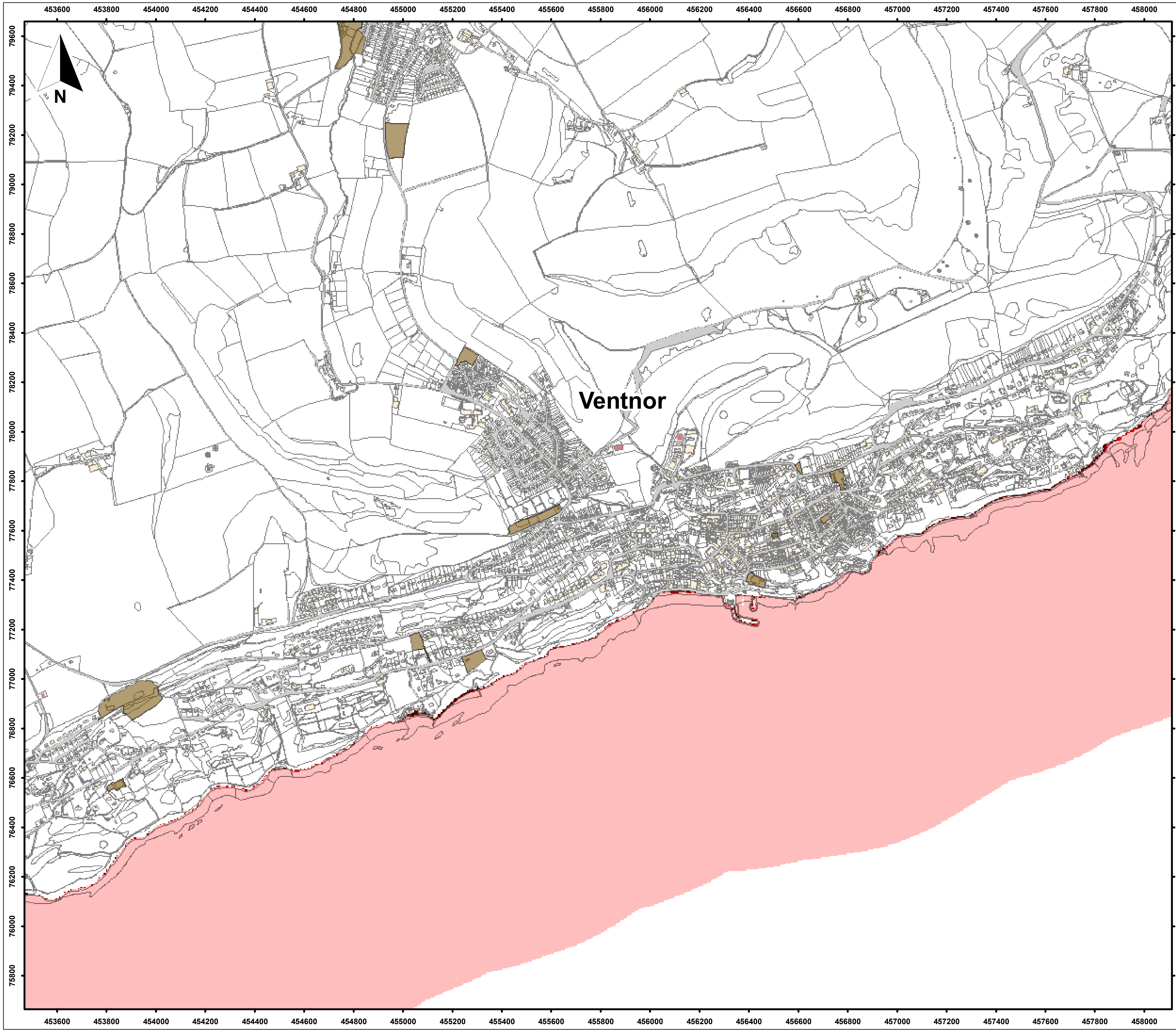
Isle of Wight SFRA MK2

Figure 37
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Ventnor

November 2009
25793-A40a.mxd squij

Entec



Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 Meters

Scale: 1:15,000 @ A3

H:\Projects\HM-255\25000 - Projects\25793 - IoW SFRA Update V1\Data\GIS\ESRI\Projects\Previous SFRA MXDS

Isle of Wight SFRA MK2

Figure 38
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Ventnor

November 2009
25793-A41a.mxd squij

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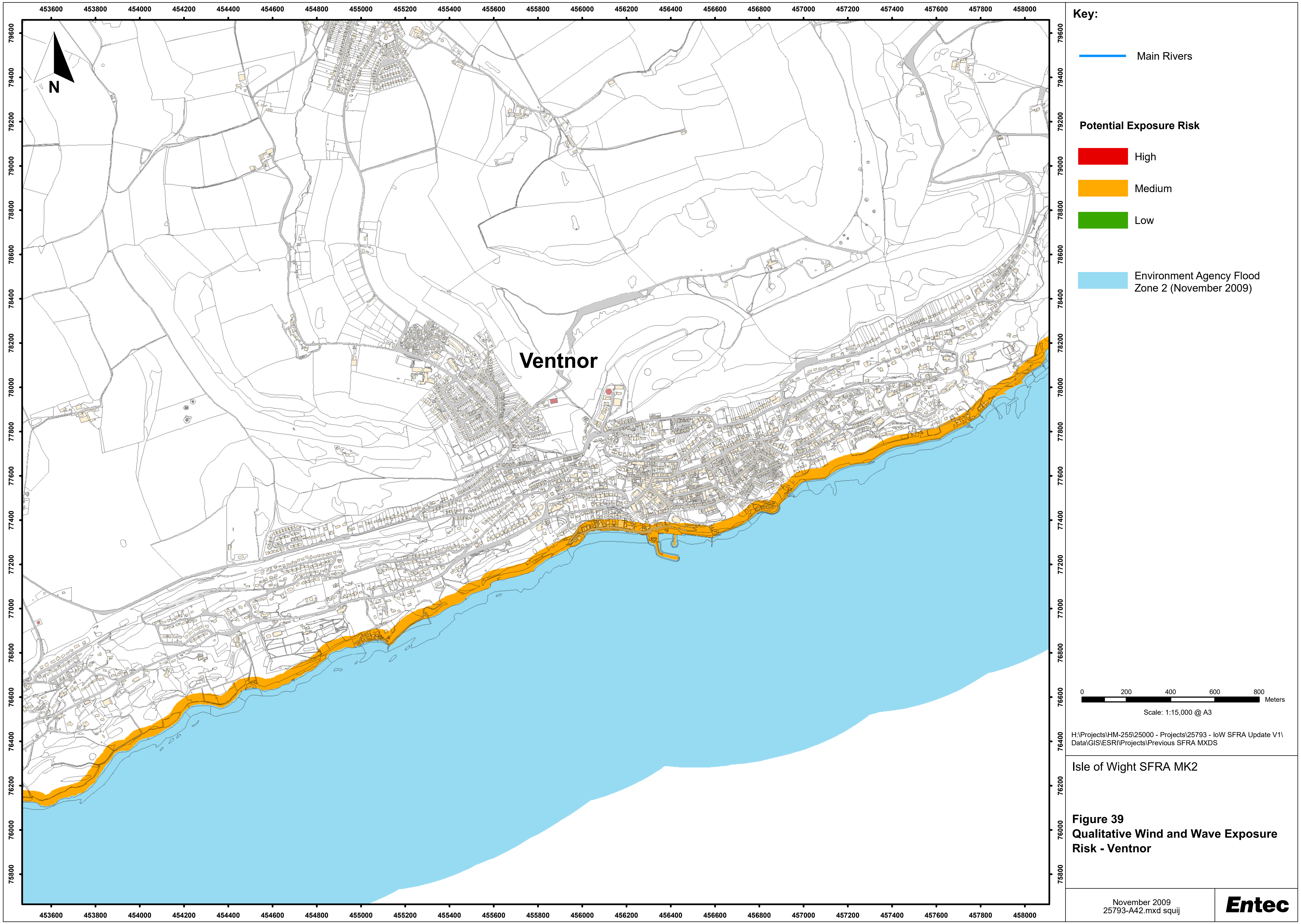
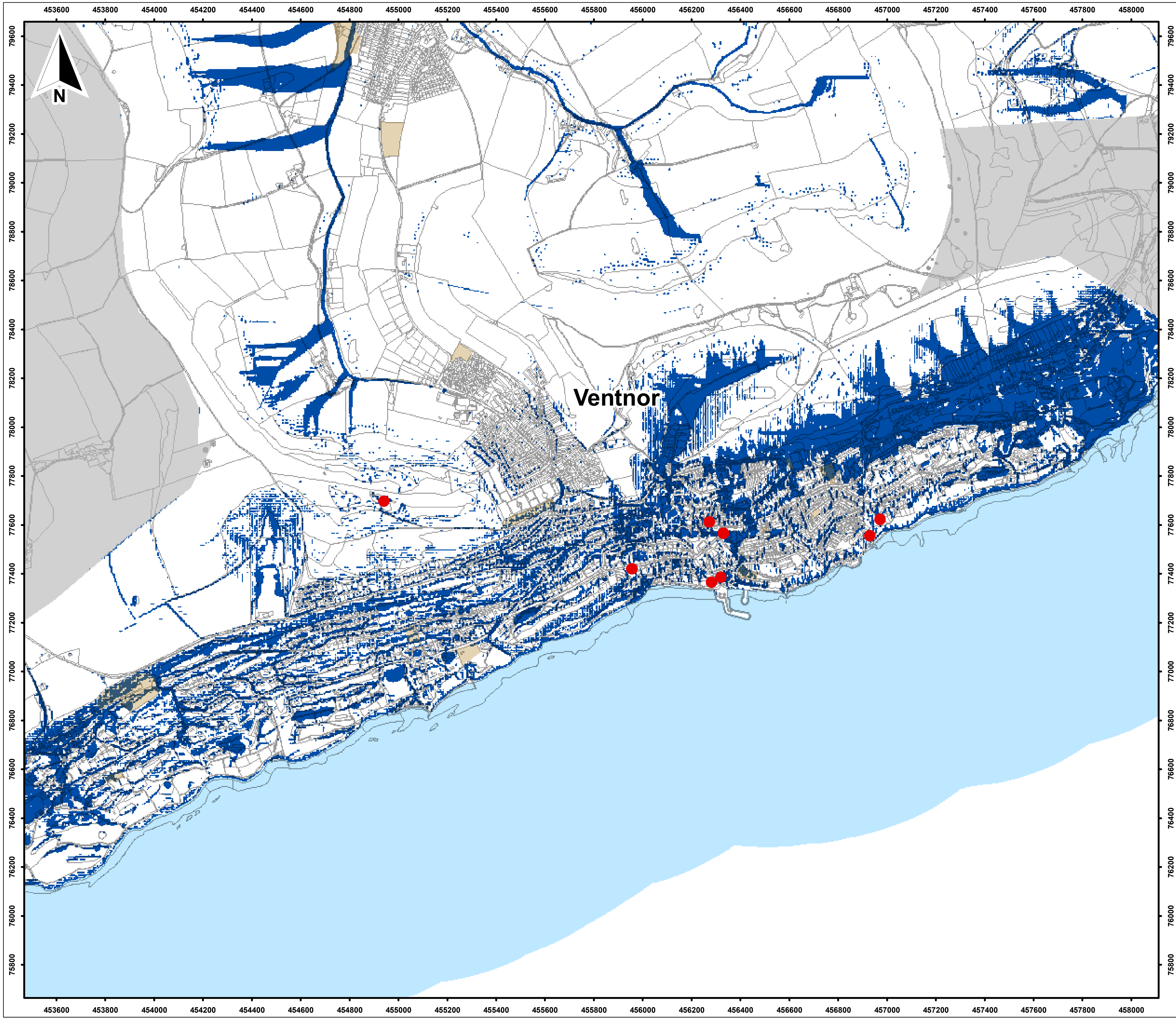


Isle of Wight SFRA MK2

Figure 39
Qualitative Wind and Wave Exposure Risk - Ventnor

November 2009
25793-A42.mxd squij

Entec



Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 40
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Ventnor

November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix I
Wroxall

June 2010

Overview

Wroxall is classified as a Rural Service Centre and it is situated in the upper catchment of the Eastern Yar, it is located in a valley with hills to the east and west. Flood risk in Wroxall is limited to areas immediately adjacent the river, with only 2 sites seriously affected.

Please review this discussion along side the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Wroxall and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Wroxall RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

Flood risk in the town is fluvial, which affects areas adjacent to the tributary of the Eastern Yar which flows from south to north along the western side of the settlement.

The Flood Zones through Wroxall are narrow, owing to the narrow valley floor which is bounded by relatively steep topography. Only one of the potential development sites in the settlement is directly influenced by fluvial flooding. This is the large site on the western bank of the river. The eastern strip of this site falls into flood zone 3a. Owing to the topography much of it remains in Flood Zone 1.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

Wroxall is situated in the bottom of a small valley which drains towards the north. Only SAR (Synthetic Aperture Radar) data is available for Wroxall. SAR data typically includes far less small surface detail than LiDAR, as such it is just the general surface trends which are included in the model. The surface water modelling predicts flow routes in the valley bottoms and it also predicts that there is a potential surface water flood risk posed to the southern portion of the large potential development site located on the western bank of the watercourse. This potential risk should be reviewed if and when the site is developed.

Surface Drainage and Infiltration SuDS Potential

The runoff potential in Wroxall is varied, with four SPR classifications being present. In the north east, SPR values are about 15%, and in the south east the value is 29%. The north west has SPR values around 47% while the south west has SPR values of 60%. Soil leaching potential in the town is slightly more uniform, with the west and far east parts having intermediate leaching potential associated with a Principal Aquifer, while the north of the town is characterised by a Secondary Aquifer with intermediate leaching potential soils. The south is underlain by Unproductive Strata. The areas of Principal Aquifer are classified as having a medium infiltration potential while the other areas of the town has been assigned a low infiltration potential. An area potentially susceptible to mass movement associated with clay strata has been identified in Wroxall this zone has been classified as having low suitability for infiltration SuDS Techniques. Each potential development site in the Sites Database is assigned a classification for infiltration potential, groundwater contamination and runoff.

Wroxall is one few towns on the Isle of Wight without a coastline and consequently unconstrained discharge of surface waters is not possible. Infiltration potential is therefore a potential limiting factor in the use of infiltration SuDS. The western side of Wroxall and the areas along its eastern margin have been assigned a moderate suitability for infiltration SuDS techniques. The remainder of the town has been classified as having a low suitability for infiltration SuDS.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Wroxall. The Flood Zones 2 and 3 only occupy small land areas and as such attempts to avoid these zones should be made. One large site in Wroxall has been identified as a potential development site and Figure 42 illustrates the delineation of risks across this site. If this site is brought forward for development then a sequential risk based approach to landuse distributions should be applied. Lower lying areas of higher flood risk should be designated for water compatible or less vulnerable uses.

The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

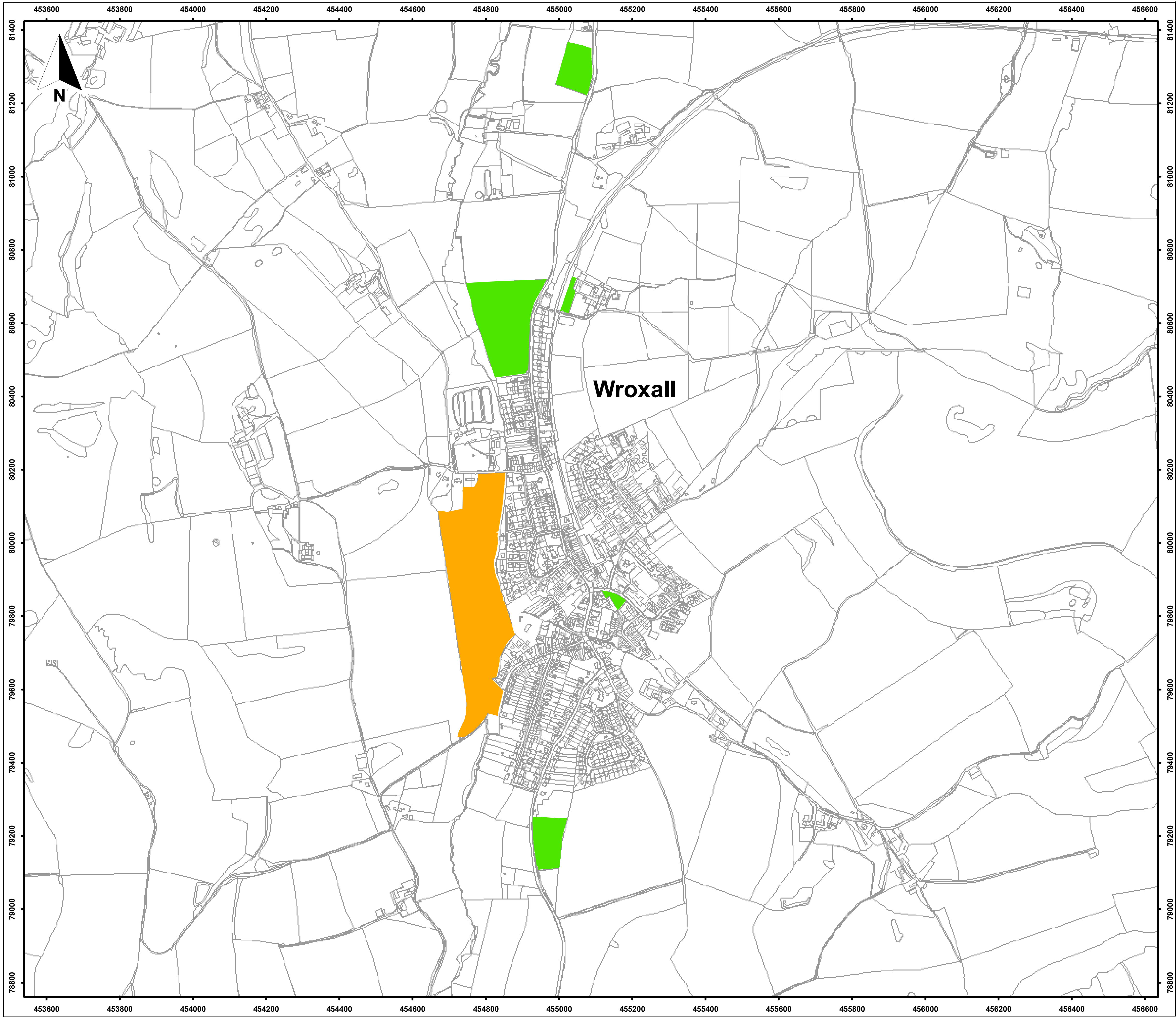
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance. The Environment Agency should be consulted for fluvial flood levels. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

- Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 41
Potential Development Sites
Qualitative Flood Risk
Wroxall

November 2007
25793-A44a.mxd squij

Entec

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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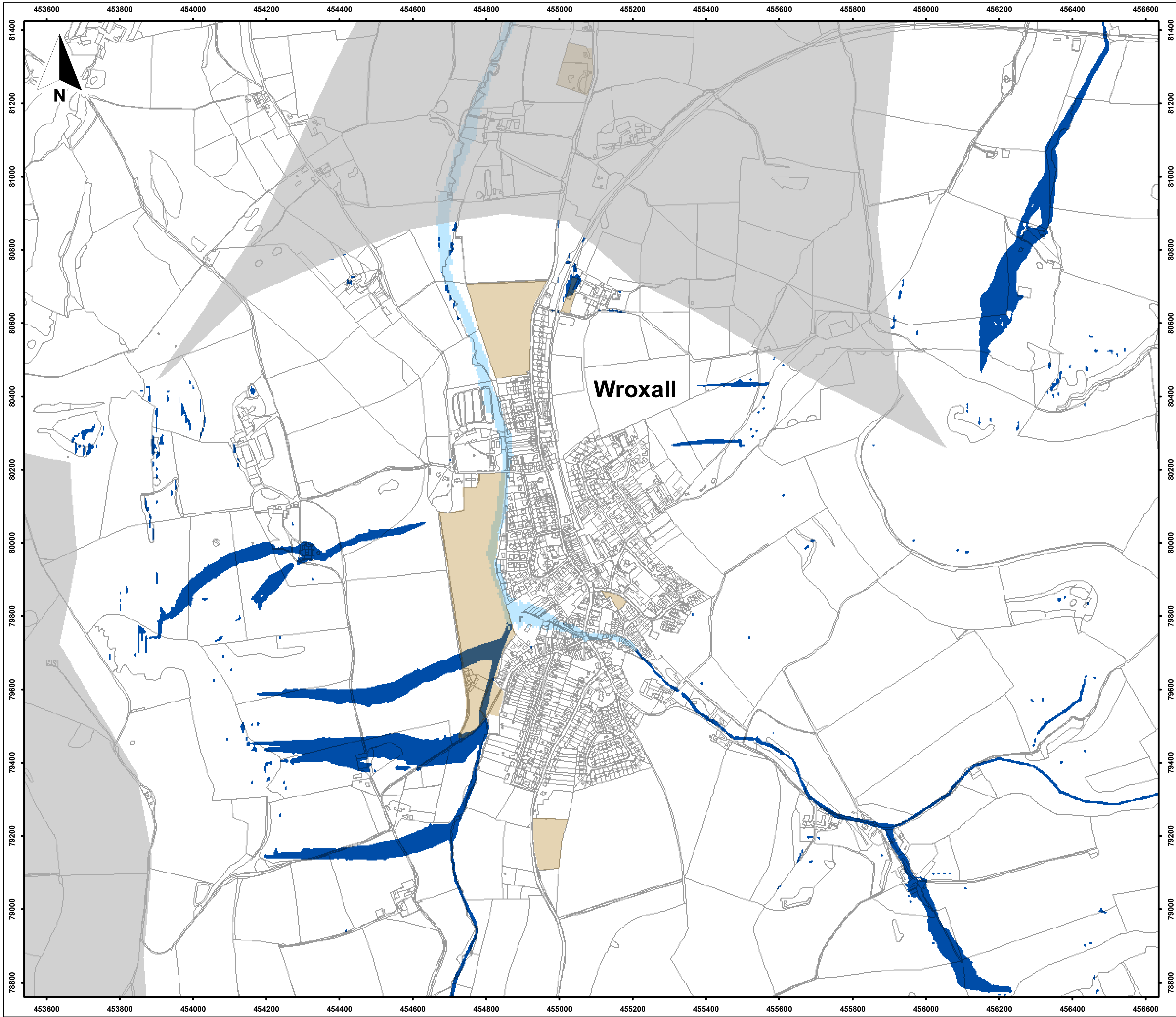
Isle of Wight SFRA MK2

Figure 42
Potential Development Sites
Site Specific Flood Risk Definition
Wroxall

November 2009
25793-A45a.mxd squij

Entec



Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc)

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.2m deep and greater than 25m2 are shown

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 43
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Wroxall

November 2007
25793-A46.mxd squij

Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix J
The Bay

June 2010

Overview

The Bay RDA is classified as a Key Regeneration Area (KRA) and is comprised of Sandown, Lake and Shanklin which are located along the stretch of coastline in the south east of the Island. The settlements have developed into a linear urban centre. Tourism and leisure are the main commercial activities in Sandown and Shanklin. Topography changes from low lying areas north east and west of Sandown, to higher lying areas south of Shanklin. Flood risk to development sites in The Bay area is associated with tidal flooding along the coast and fluvial/tidal flooding in the low lying areas in the north of the RDA. Fluvial flooding from Scotchells Brook in the west of The Bay is also a potential issue

Please review this discussion in conjunction with the mapping provided in this Appendix.

Sustainability and Regeneration Objectives

The key objectives for The Bay area are to encourage regeneration of Sandown and Shanklin for tourism, while adding a more diverse business base and strengthening of the community. This will be achieved through a focus on tourist facilities, development of services including transport links to other parts of the Island, encouraging development on brownfield sites, and supporting residential growth.

Sites at Risk

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Sandown Town Council Report*) identifies the following to have been flooded during the Autumn of 2000:

- South Wight Housing Association on East Yar Road was flooded as a result of on site drainage capacity being exceeded.
- Fort Holiday Park is in the floodplain and water is described as having backed up the ditches in East Sandown and the surrounding areas causing an overflow into the holiday park.
- Booker Cash and Carry suffered flooding due to what was described as poorly designed on site drainage.

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Shanklin Town Council Report*) attributed heavy rainfall exceeding the capacity of surface drainage systems as the cause of isolated surface water flooding incidents.

Two key areas at risk of flooding have been highlighted, these being, the north of Sandown in the Yaverland area and to the west of Sandown adjacent to Scotchells Brook. These two areas will be assessed separately of each other:

North Sandown: The Eastern Yar has recorded historic flood events. In January 1974 and October 2000, flooding occurred north of Sandown. In both instances the historic flood outlines held by the Environment Agency impact upon some potential development sites. The affected sites are attributed accordingly in the Sites Database. Some of the sites in north Sandown are only partially within Flood Zone 3 (2115), as such the primary method of flood risk management should be through a risk based sequential approach to land use planning. There are two sites located behind the B3395 and between north Sandown and the zoo. These sites are assessed as being completely within the tidal Flood Zone 3 extent in 2115. On the basis that development of these sites can be supported by the

East Sandown: A large potential development site located to the east of Sandown is flagged as being impacted by flood zone 3, however when the risks are assessed at the site specific level, it is clear that only the northern most tip is in Flood Zone 3, with the majority being in Flood Zone 1.

In line with the Sequential Test and the principal of risk avoidance, sites in Flood Zone 1 should be considered before sites in higher flood risk zones.

Climate Change

Along the coast, the impact of climate change is minimal. Only two potential development sites, near Eastcliffe Promenade, possibly fall within the future 2115 Flood Zone 2 extent. To the north of Sandown in the Eastern Yar floodplain, climate change is predicted to bring about a moderate increase in the extent of Flood Zone 2 and 3 (see Figures 46 and 47 in Appendix A). This will have the impact of increasing flood risk to some of the potential development sites, as well as existing properties.

The site on the corner of Avenue Road and St Johns Crescent is one example where flood risk status is predicted to turn from highly unlikely to likely (flood zone 1 to flood zone 3) within the next 100 years. No other potential development sites that are currently not impacted by the Flood Zones have been identified as being impacted within the next 100 years. Many of those sites currently within the tidal Flood Zones are predicted to experience a reduction in the amount of land currently within Flood Zone 1.

The impact of fluvial climate change has been assessed to be of less significance, as the few areas of fluvial floodplain highlighted as being potentially sensitive to the impacts of climate change, are currently within the extents of tidal Flood Zones 2 and 3.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The surface water modelling in The Bay area predicts that there are a significant number of potential surface water flow routes in both the urban and rural parts of the catchment. The vast majority of this model area is covered by detailed LiDAR topographic data which includes a representation of small topographic depressions, along which the TuFLOW model has routed the surface water flows. In many cases these drainage features are just upslope extensions of the fluvial drainage network which are not covered by the current Flood Zones. In addition to natural topographic features it can clearly be seen that the model has routed flow along the railway line and along some of the highways. Many of the potential development sites in this Regeneration and Development Area are predicted to be impacted by surface water flow routes, this risk should be considered during the planning stage of any future development of these sites. There is also a reasonably high density of recorded surface water flooding incidents in The Bay area, many of which correlate well with the predicted surface water flooding risk areas. The exact causes of these incidents are not clear, but it is likely to be a combination of either the capacity of the surface water drainage network or overland surface flow.

In accordance with the modelling approach used in all areas, the Southern Water surface water drainage network has been represented by removing an assumed capacity (the 1 in 20 year storm). The Bay area catchment is largely urban and it is likely that the Southern Water surface water drains will discharge into the English Channel or the Eastern Yar Estuary, in which case there is a potential for the performance of the surface water network to be influenced by the tide level. The series of reported incidents along the edge of the Eastern Yar Estuary in the north of the area may be a result of discharge restrictions resulting from high tide levels. A more detailed understanding of the risks posed to the potential development sites and the existing infrastructure could be achieved through the use of an integrated model which includes the Southern Water surface drainage network and a variable tidal boundary.

Surface Drainage and Infiltration SuDS Potential

The soils underlying The Bay area have a low SPR of around 15%. In the north of Sandown and in a small area south of Shanklin there are soils with higher SPR values of about 60%. Much of The Bay is underlain by a Principal Aquifer with high leaching soils. The southern half of Sandown comprised of an Unproductive Strata and a Secondary Aquifer with soils of a high leaching potential. The western edge of The Bay and the southern end of Shanklin are underlain by a Principal Aquifer with an intermediate leaching potential.

In the far south of The Bay, areas of mass movement have been identified, which causes the infiltration potential to be set as low. The infiltration potential is high for most of The Bay RDA. The only exception is along the western edge and in small areas in the south, where infiltration potential is classified as medium and low respectively.

Surface water can be discharged into the sea without restrictions on volume. The release of pollutants would need to appropriately mitigated. The urban areas of Shanklin and south Sandown have the potential for infiltration SuDS, but the high groundwater contamination potential must be considered.

Wave Exposure Risk

The coastline of The Bay has been classified as being at medium risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 50m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within The Bay area. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

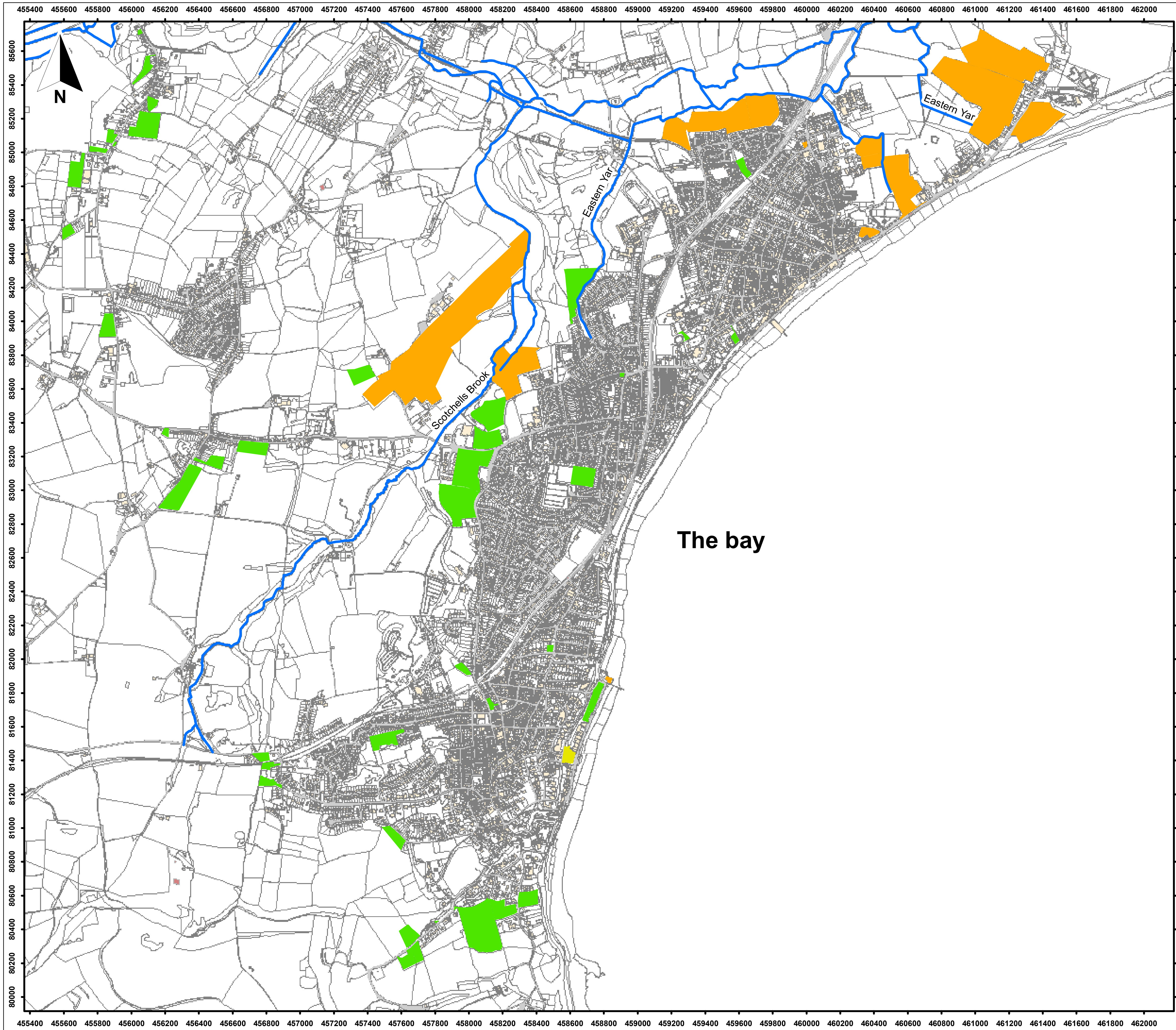
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.

There are a number of sites over 1ha in The Bay area, while two sites in particular are very large at 85 and 63ha. All sites over one hectare will require an FRA / Drainage Assessment to assess the drainage implications of the development. Historic records show surface water flooding to be an issue in Shanklin. It is advisable that any ensuing FRAs provide a detailed assessment of the local surface drainage network. A tributary of the Eastern Yar is located to the east of Scotchells Brook, and is recorded as a main river by the Environment Agency. No flood risk is associated with this river's headwaters. Any sites within 20 metres of the river and would require consent from the Agency in advance of any development proposals.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain
The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 1,000 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 44
Potential Development Sites
Qualitative Flood Risk
The Bay

November 2009
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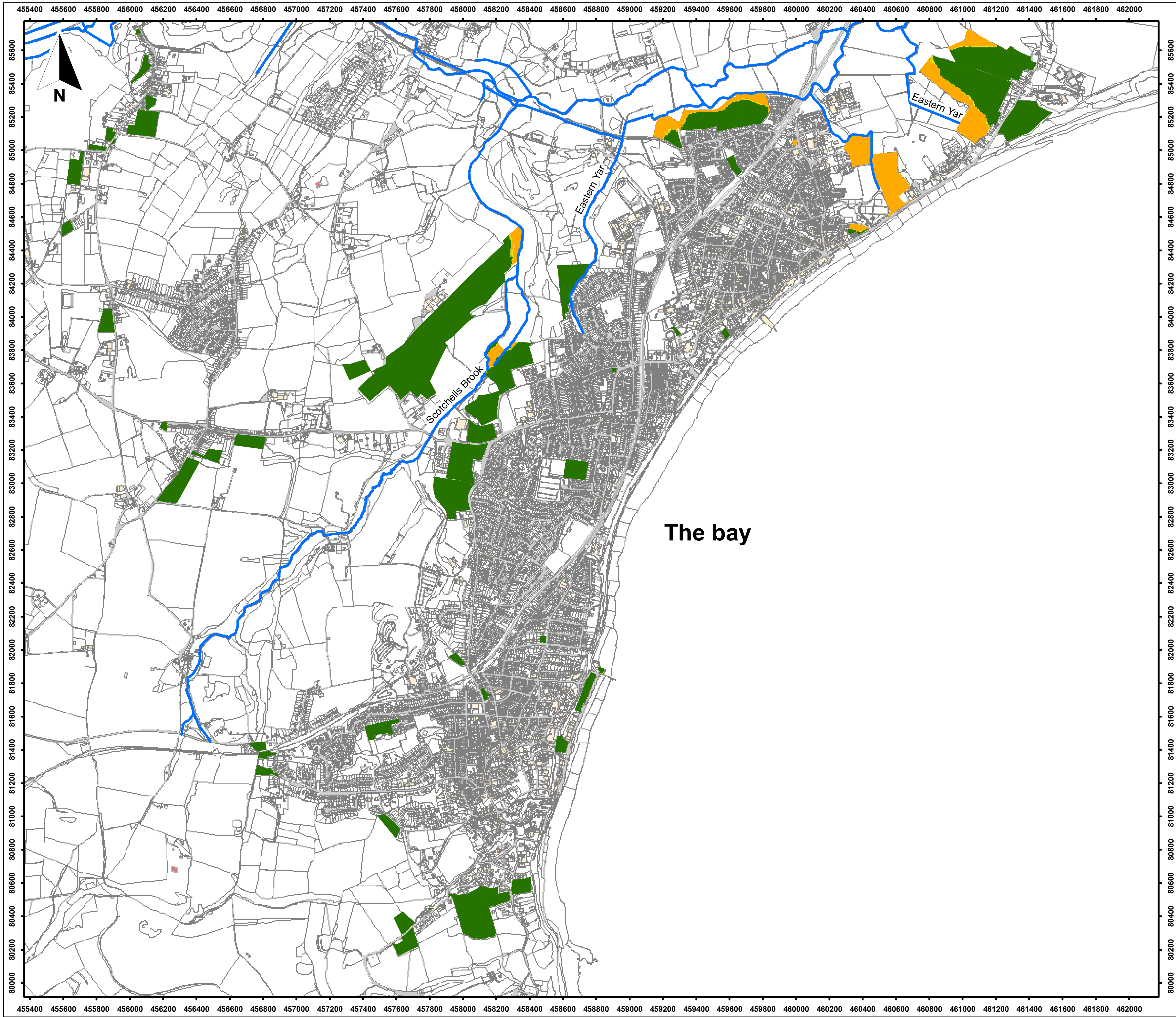

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 800 1,000 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 45
Potential Development Sites
Site Specific Flood Risk Definition
The Bay

November 2009
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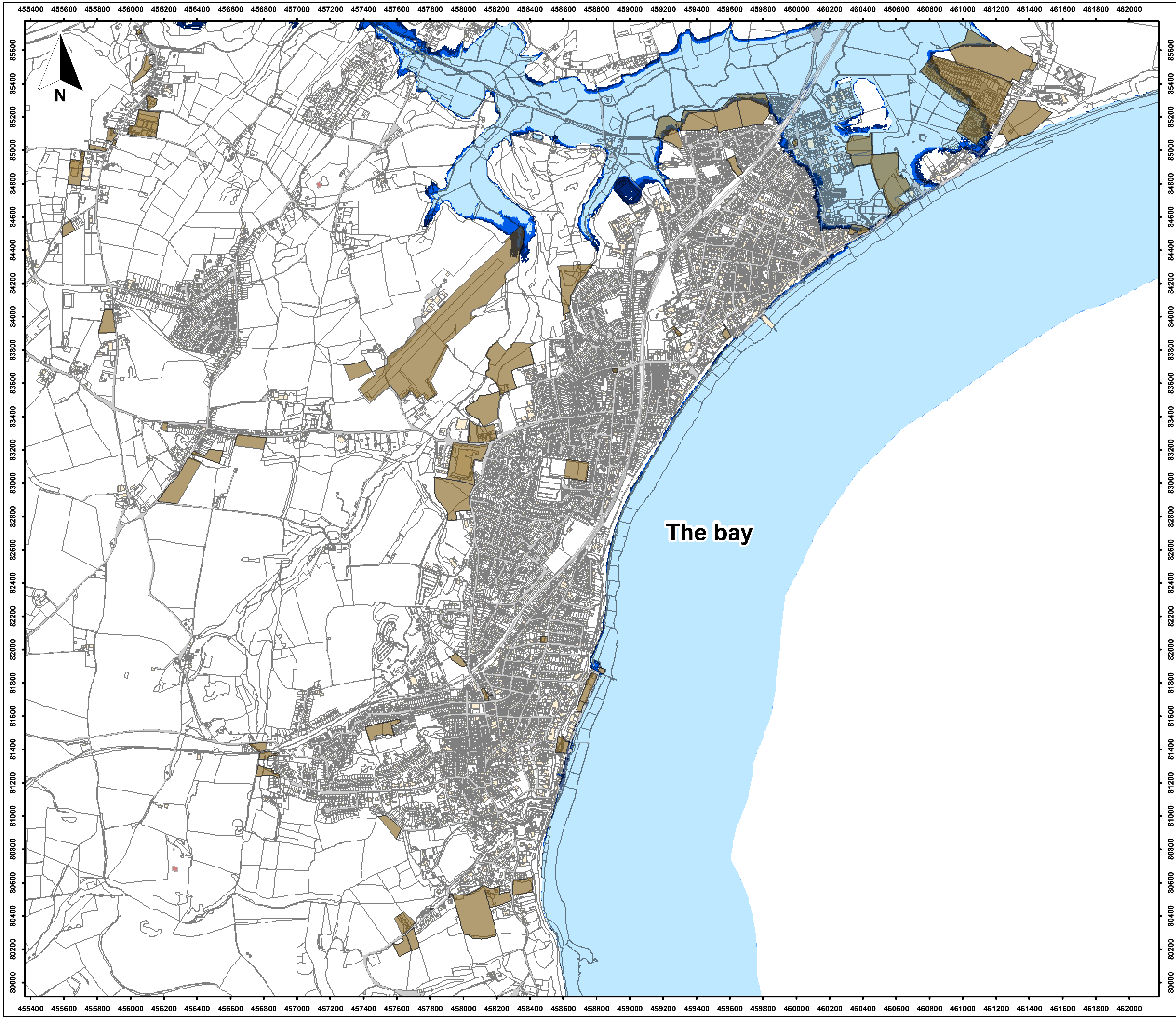

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 1,000 1,200 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 46
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
The Bay

November 2009
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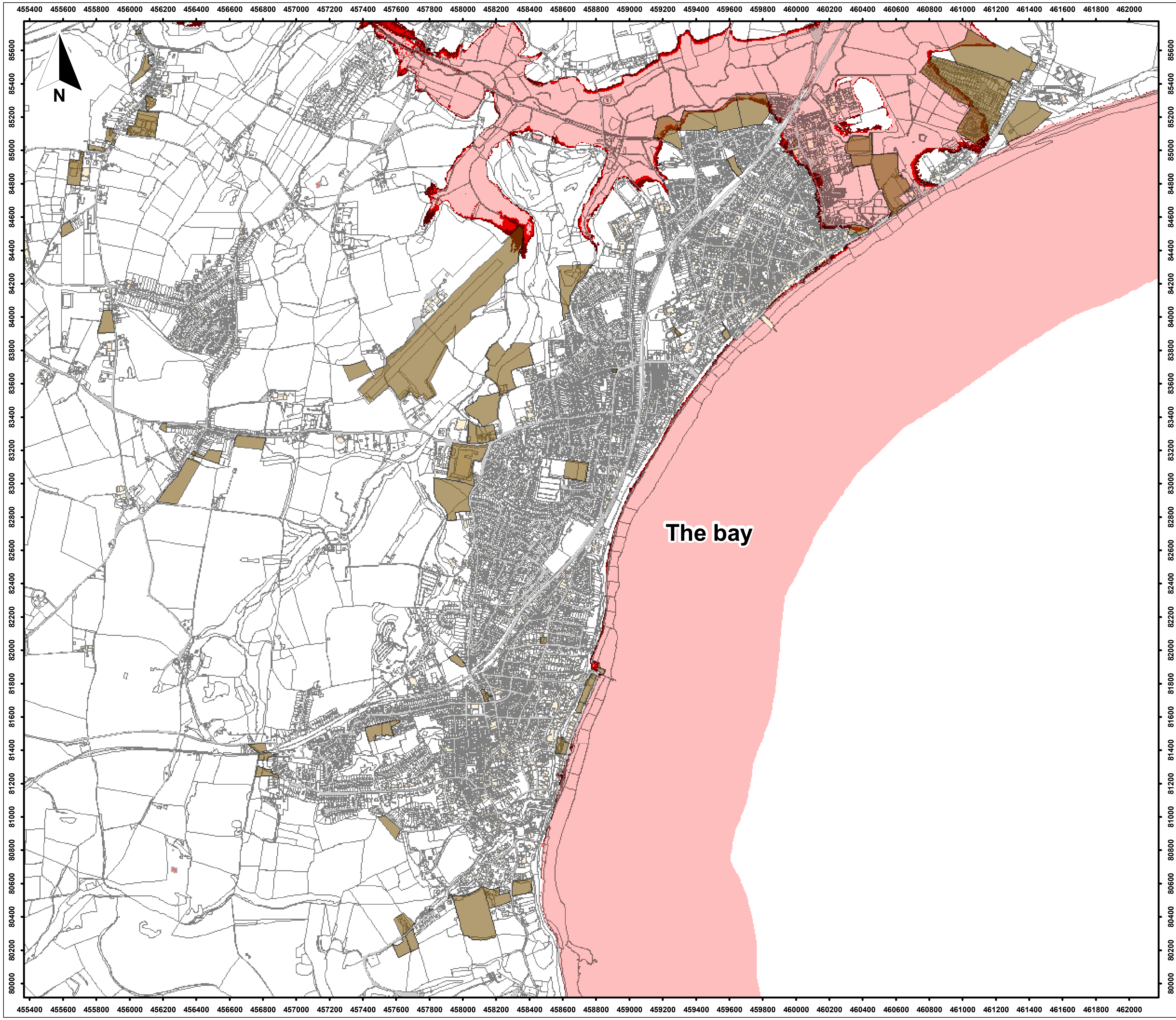

Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 1,000 Meters

Scale: 1:22,000 @ A3

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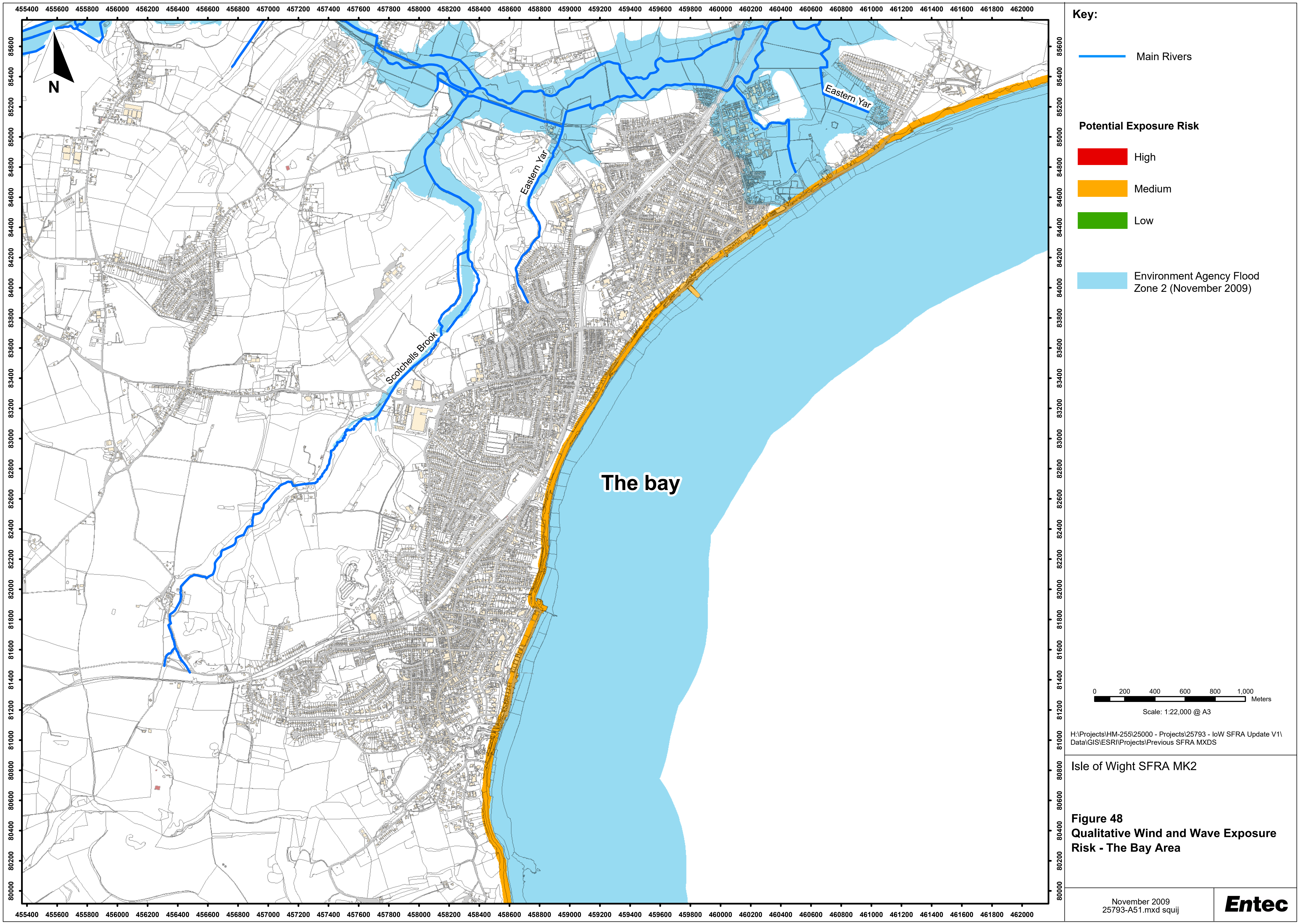
Isle of Wight SFRA MK2

Figure 47
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
The Bay

November 2009
25793-A50a.mxd squij

Entec



N
Scotchells Brook
Eastern Yar
Eastern Yar
The bay
Key:
Main Rivers
Potential Exposure Risk
High
Medium
Low
Environment Agency Flood Zone 2 (November 2009)
0 200 400 600 800 1,000 Meters
Scale: 1:22,000 @ A3
H:\Projects\HM-255\25000 - Projects\25793 - IoW SFRA Update V1\Data\GIS\ESRI\Projects\Previous SFRA MXDS
Isle of Wight SFRA MK2
Figure 48
Qualitative Wind and Wave Exposure Risk - The Bay Area
November 2009
25793-A51.mxd squij
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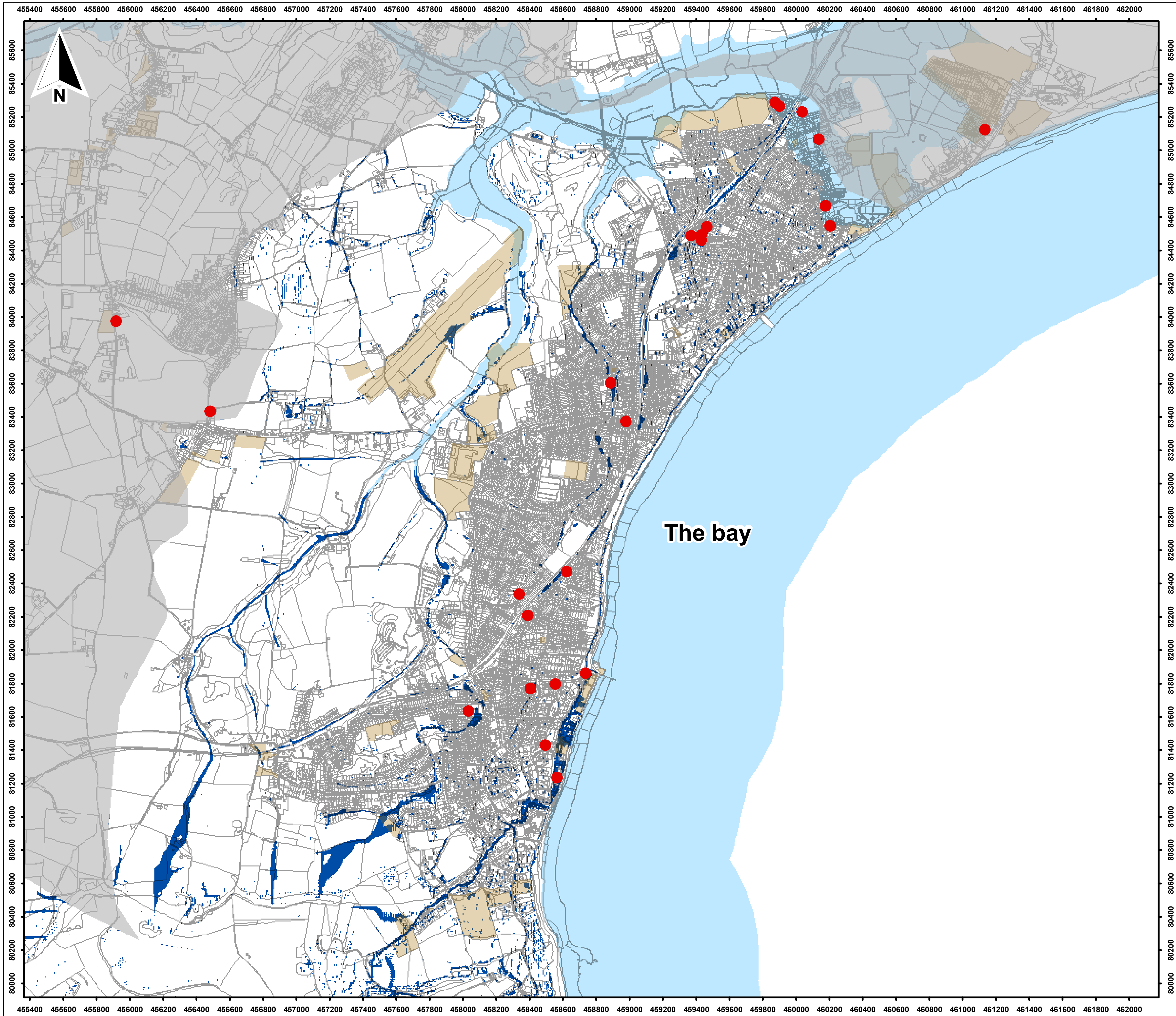

Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 1,000 1,200 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 49
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - The Bay Area

November 2009
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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix K
Brading

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Brading is classified as a Rural Service Centre, it is situated on the north western side of the Eastern Yar floodplain on the eastern limb of the Brading Downs. The Brading Downs follow the central ridge of chalk which runs across the Island. This chalk stratum is present under the middle of the settlement. Despite the Brading's inland location, flooding from extreme tides is a real risk to the settlement. Historic flood outlines are held by the Agency for two events which occurred in 2000 and 1974. The 2000 outline shows the floodwaters not to have crossed the railway line, which runs between the edge of the floodplain and the town. However, the 1974 event was more extensive and a couple of the potential development sites lie within this extent. The Sites Database indicates which of the potential development sites are affected.

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Brading Town Council Report*) identified several site specific flooding incidents. These are listed below:

- Groundwater inundation from the Bagshot Beds is attributed for the cause of basement flooding at 63a High Street, Brading as no other method of flooding was obvious with the threshold being well above the road level.
- Nicholas Close is built on a peat marsh at a low elevation of between 1.5 to 3m AOD. A ditch is described to run parallel to the railway bank, which is culverted under the railway and then joins the Eastern Yar. Flooding is caused by excess water levels in the ditch and water backing up through the culvert from the Eastern Yar.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Brading and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Brading RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

The floodplain of the Eastern Yar forms the eastern boundary of this settlement. Essentially all sites to the east of the A3055 have some degree of potential flood risk. In this location the risk is posed by both fluvial and tidal sources, with the tidal risk presenting the greater flood water levels and thus greater extents. Development sites on the west of the town are considered to provide more sustainable, from a flood risk perspective, development prospects.

Climate Change

The climate change outlines, modelled with LiDAR topographic data, are more extensive and indicate that a number of the potential sites situated between the railway line and the A3055 may become within a flood zone over the next 100 years. The sites which have been identified are attributed, in the Sites Database with details of which climate change horizon is likely to impact each site.

This is one of the areas where the greatest extent changes are predicted between the present day and future extreme flood extents. Any site that comes forward for development should ensure that the proposed development has accounted for the potential increase in flood extent and will remain safe.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The topography of Bading is dominated by a finger of high ground which extends from the west, which almost divides the drainage catchment into two. The modelling results clearly pick this up as water is gathered and routed off either the north east facing slope of the south west facing slope. Once the water has flowed off the high ground, the model predicts that it will be routed into and along the topographic low points. In Brading these appear to be either highways or field edges and/or agricultural drainage ditches. The main urban area of Brading is not predicted to be at a significant risk, nor are the potential development sites. The recorded incidents of surface water flooding do not appear to correlate to the predicted flow routes and ponding areas, which may suggest that these incidents were not directly related to overland flows and possible the product of Nonetheless, surface water flood risk should be reviewed as part of any subsequent FRA.

Surface Drainage and Infiltration SuDS Potential

Soils in the south of Brading have a high SPR (50%), whilst soils in the north have much lower SPR values in the order of 2%. The area around the sewerage works in the north east of Brading has SPR values of around 25%. Therefore, runoff potential is low in the southern half of the town and higher in the north part of the town. The potential for infiltration SuDS in the Brading is low in the south and higher in the north. To areas of medium suitability exist near the sewerage works and in the Morton Old Road area in the south west of Brading. The groundwater vulnerability map reflects this suitability distribution.

The volume of discharge, through SuDS or conventional drainage systems, into the tidally influenced river need not be strictly controlled. Although the levels of drain outfalls need to take into account high tide levels and consider the implications of discharge being inhibited by high tides.

Brading Marshes SSSI and Solent and Southampton Water SPA are the only ecological designation in the immediate vicinity of the town. The location of ecologically designated areas suggests that the use of SuDS techniques which attenuate or remove pollutants would be aspirational.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Brading. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

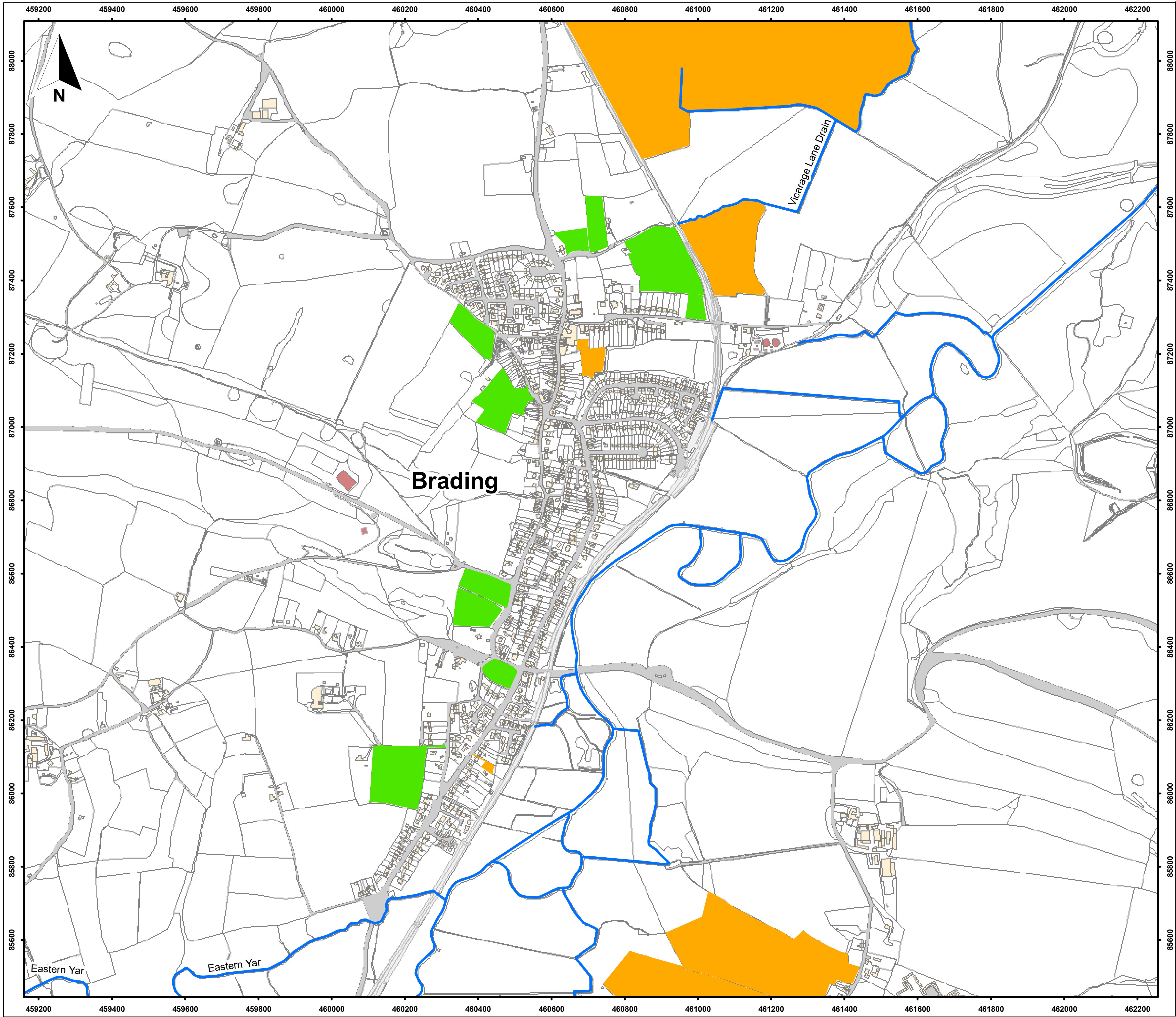
Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 50
Potential Development Sites
Qualitative Flood Risk
Brading

November 2009
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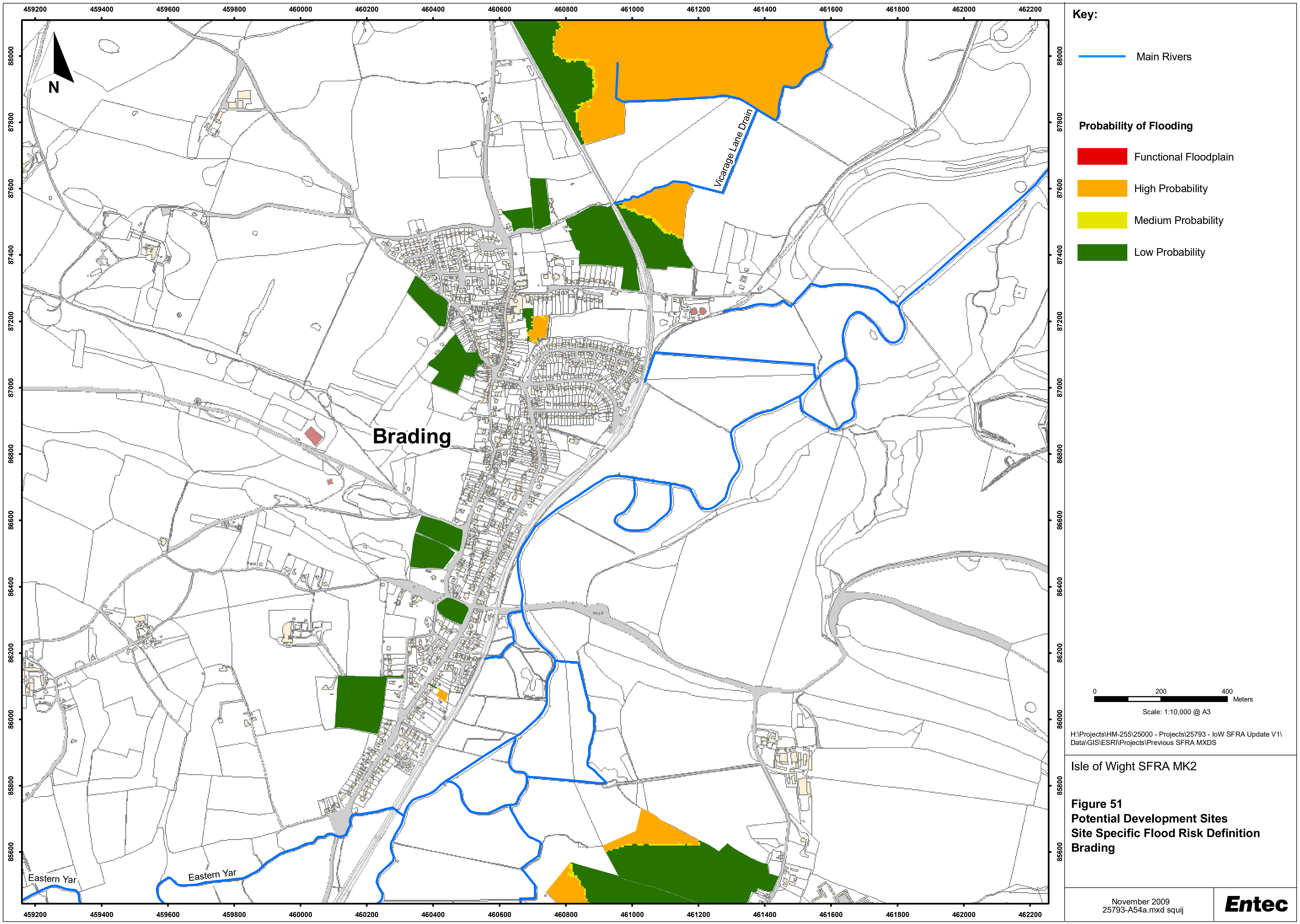

Key:
Main Rivers
Probability of Flooding
Functional Floodplain
High Probability
Medium Probability
Low Probability
Brading
Vicarage Lane Drain
Eastern Yar
Eastern Yar
N
0
200
400
Meters
Scale: 1:10,000 @ A3
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Isle of Wight SFRA MK2
Figure 51
Potential Development Sites
Site Specific Flood Risk Definition
Brading
November 2009
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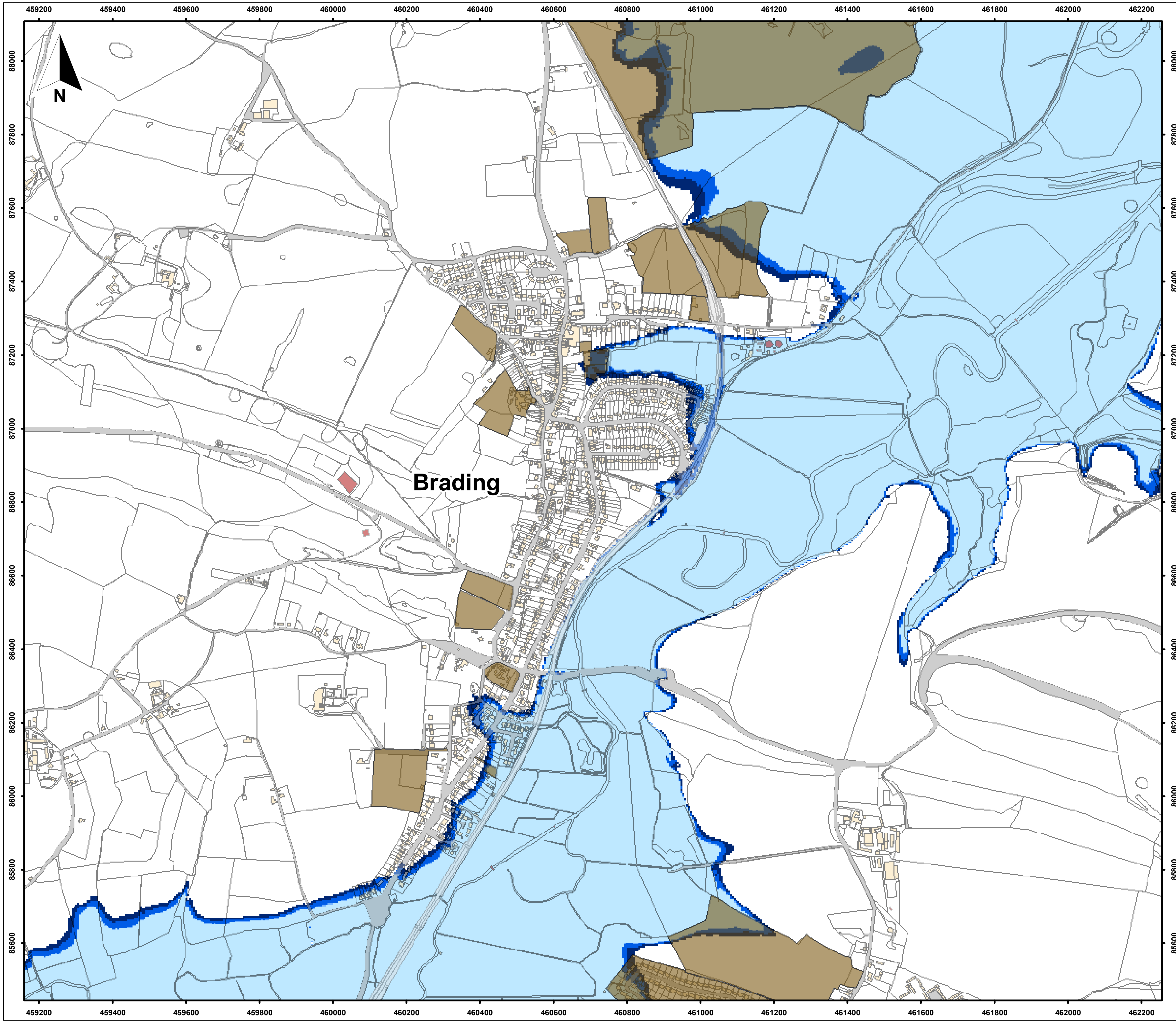

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 52
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Brading

November 2009
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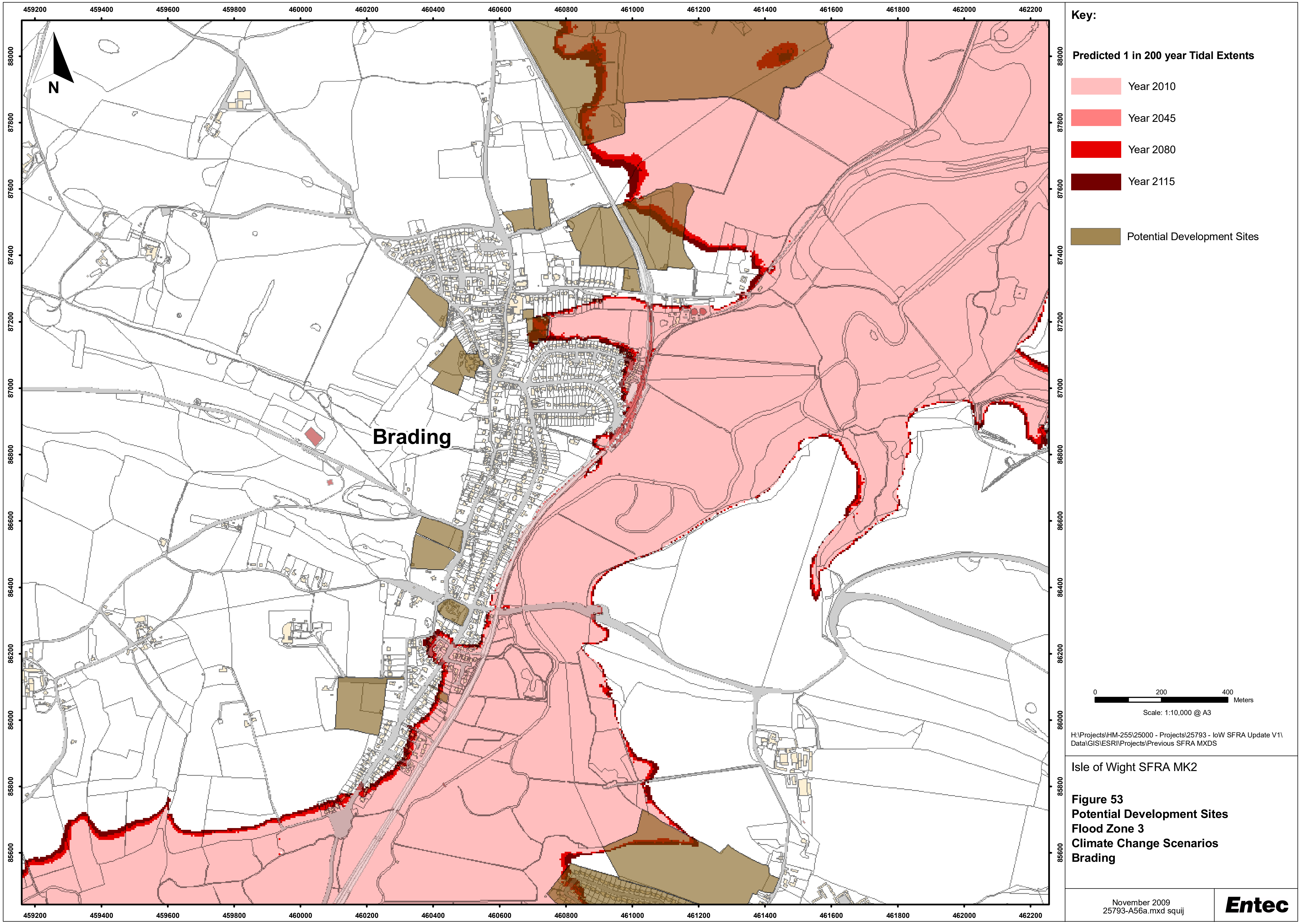

Brading
N
Key:
Predicted 1 in 200 year Tidal Extents
Year 2010
Year 2045
Year 2080
Year 2115
Potential Development Sites
0 200 400 Meters
Scale: 1:10,000 @ A3
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Isle of Wight SFRA MK2
Figure 53
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Brading
November 2009
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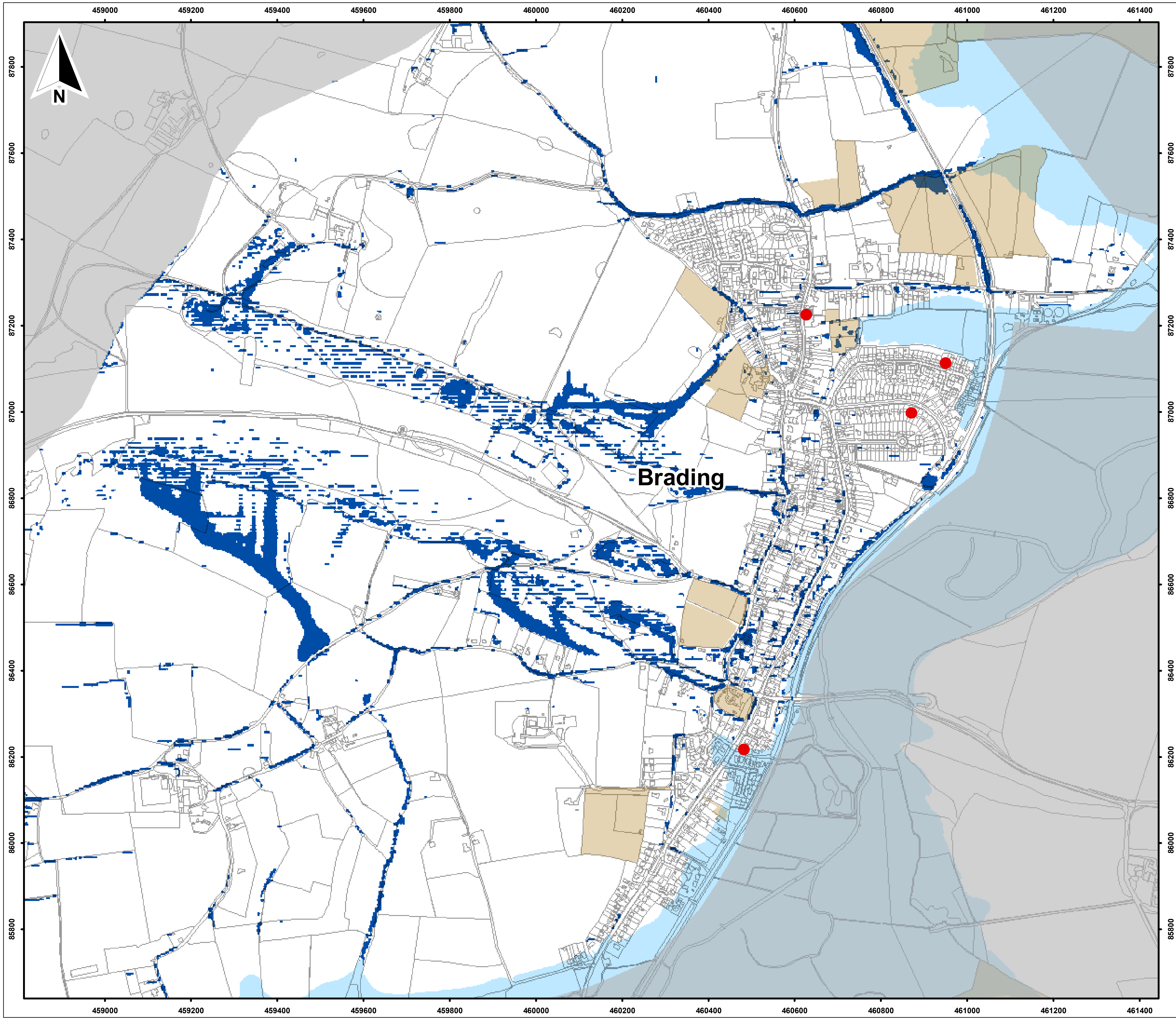

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 Meters

Scale: 1:8,500 @ A3

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Isle of Wight SFRA MK2

Figure 54
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Brading

November 2009
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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix L
Bembridge

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Bembridge is classified as a Rural Service Centre. Figure 55 illustrates that the potential development sites in Bembridge are not in Flood Zones 2 or 3. This is despite the town having a coastline to the south and east and Eastern Yar Floodplain to the north. Sites to the immediate south of the Eastern Yar tidal floodplain have been identified as being potentially within Flood Zone 3 when the influence of climate change is accounted for. The town is surrounded by tidal Flood Zones on three sides, but no watercourse with a fluvial Flood Zone passes through the town. The risk from the sea rapidly diminishes with distance from the coast as the town is built on a headland which reaches over 40m AOD in elevation in the centre of the headland.

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Bembridge Parish Council Report*) identified several site specific flooding incidents, these are detailed below:

- 71 High Street is a small craft shop, adjacent to the shop is an access track to some yards and business premises. Flooding of the craft shop due to poor maintenance of the yard drainage causing water to overflow in to the shop. By way of mitigation, the shop owners have undertaken some drainage works.

- 33 Steyne Road is said to be a known problem to the Isle of Wight Council. This bungalow is built in a dip in the land and below the road level, excess surface water flows off the recreation ground and playing fields into the property. Water also is said to accumulate in the road at this point due to under capacity of the road drains. Extensive drainage works are required to resolve the problem.

- Behind 84 Steyne Road is a farmland drainage ditch, during the heavy rains the capacity of the ditch was exceeded and the property was flooded.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Bembridge and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Bembridge RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted."

Sites at Risk of Flooding

The Flood Zones (2 and 3) do not intersect with any of the proposed sites and as such, all the sites in Bembridge have been assessed, from a flood risk perspective, as being appropriate for all types of development.

Climate Change

The impact of climate change on the extents of Flood Zones 2 and 3 (Figures 57 and 58) are small along the south and east coasts of Bembridge. These small increases do not extend to include any of the potential development sites. The insensitive nature of this stretch of coastline to increasing sea levels is due to the topography quickly becoming elevated landward of the high water mark. The northern coast of Bembridge, which faces on to the Eastern Yar Estuary, is more sensitive to climate change owing to the much flatter topography of this shoreline.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

Bembridge is situated on a headland, with very little in the way of a contributing drainage catchment that is outside the limits of the settlement. The land is the highest in the centre and it slopes down towards the coast in all directions. This topography results in the surface water modelling not predicting significant areas of surface water flood risk. The most notable feature is flow route which follows the line of the road running through the centre of the town from west to east, which does not appear to impact any of the potential development sites and is not flagged by any reported incidents. The absence of correlation between the recorded and the predicted, may be a result of surface water flood risk event not having recently occurred or because incidences may not been reported. Moreover, the SFRA surface water modelling does not incorporate details of the underground drainage network, rather an approximate capacity is assumed, please see Section 3.5.

Surface Drainage and Infiltration SuDS Potential

The town is built on Bembridge Marls which comprise of a series of blue and green clays. The Isle of Wight Autumn 2000 Flood Investigation Study – (*Bembridge Parish Council Report*) states that this will result in high surface runoff rates and high levels of ground saturation, which is of significance to the recorded flooding in the Steyne Road area. Soils in Bembridge have a high SPR (50%) in the south west, with decreasing values towards the north east (15%). Therefore, runoff potential is high in the south west and lower in the north east. The north and eastern portions of the town have been classified as having medium infiltration potential and the south and west parts of Bembridge have been classified as having low infiltration potential.

A wide range of SuDS techniques can be considered in Bembridge. Although infiltration SuDS are likely to be less suitable in the south west and only of moderate suitability in other areas. The volume of discharge into the estuary, either through SuDS or conventional drainage systems, need not be restricted. This is because the volume of drainage waters would be insignificant in comparison to tidal volumes. The coastal and estuarine areas of the town are associated with ecological designations (SSSIs, SACs and SPAs). These ecologically designated areas suggest that the use of SuDS techniques which attenuate or remove pollutants would be advisable.

Wave Exposure Risk

The coastline of Bembridge has been classified as being partly at medium and partly at high risk of wave exposure, with the greatest risk being associated with the eastern headland, (see Section 6 of the SFRA Report). It is recommended that for any site within the buffer zones, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

Flood Risk Management Guidance and Site Specific FRAs

None of the potential development sites have been identified as being within either Flood Risk 2 or 3. Assuming this situation remains the same, the principal of flood risk avoidance has been followed. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent

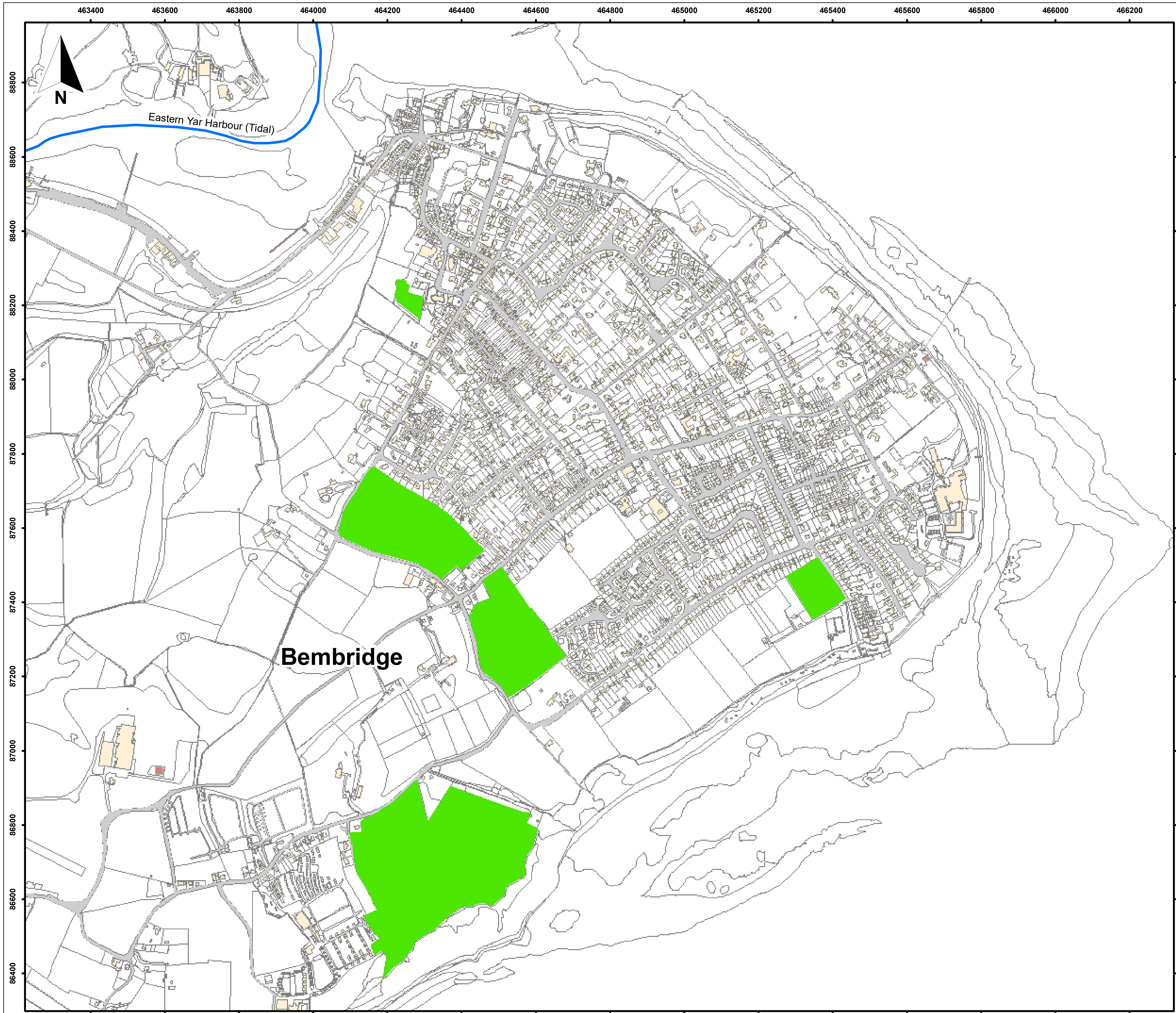
predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 55
Potential Development Sites Qualitative Flood Risk Bembridge

November 2009
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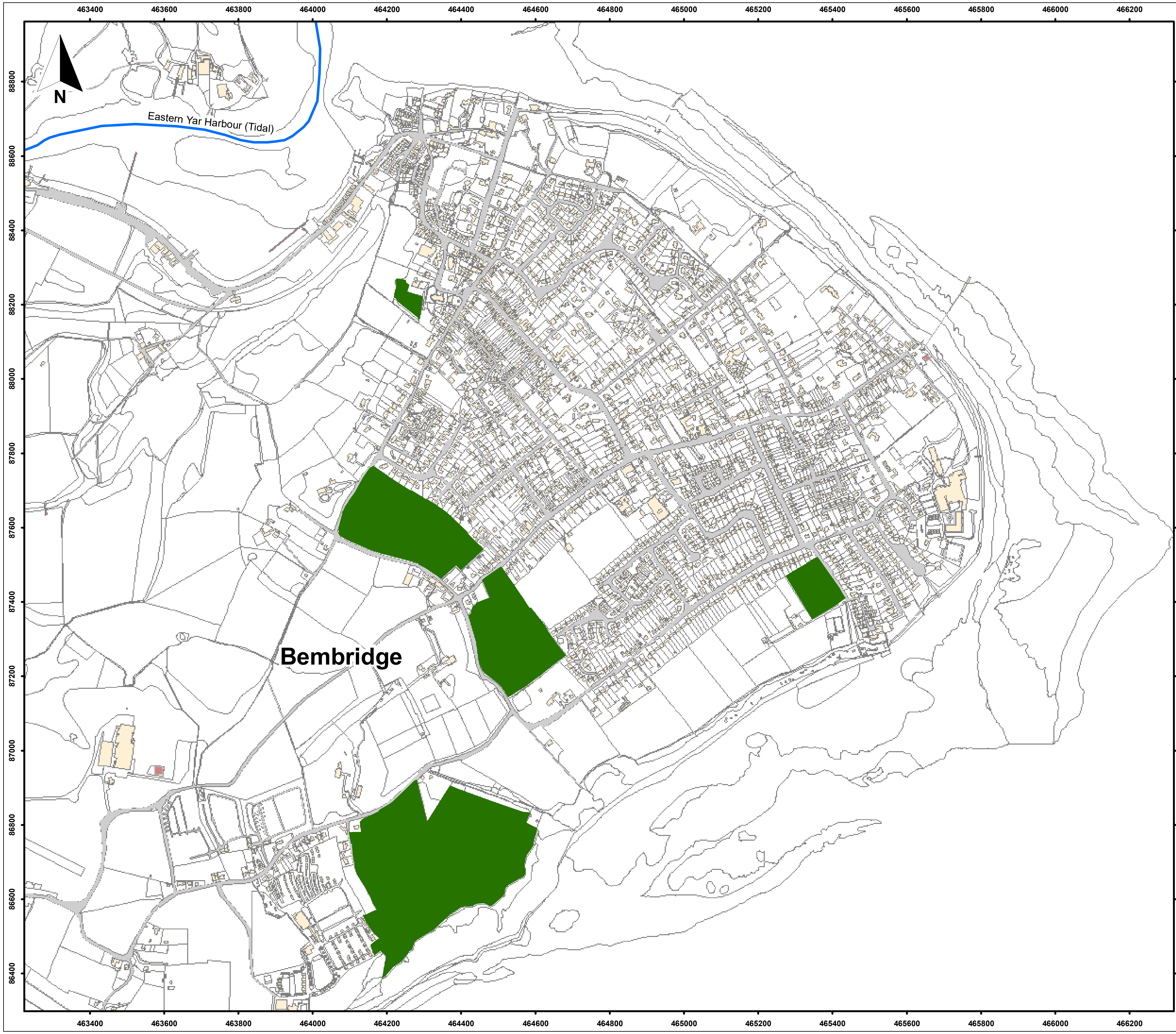

Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 56
Potential Development Sites
Site Specific Flood Risk Definition
Bembridge

November 2009
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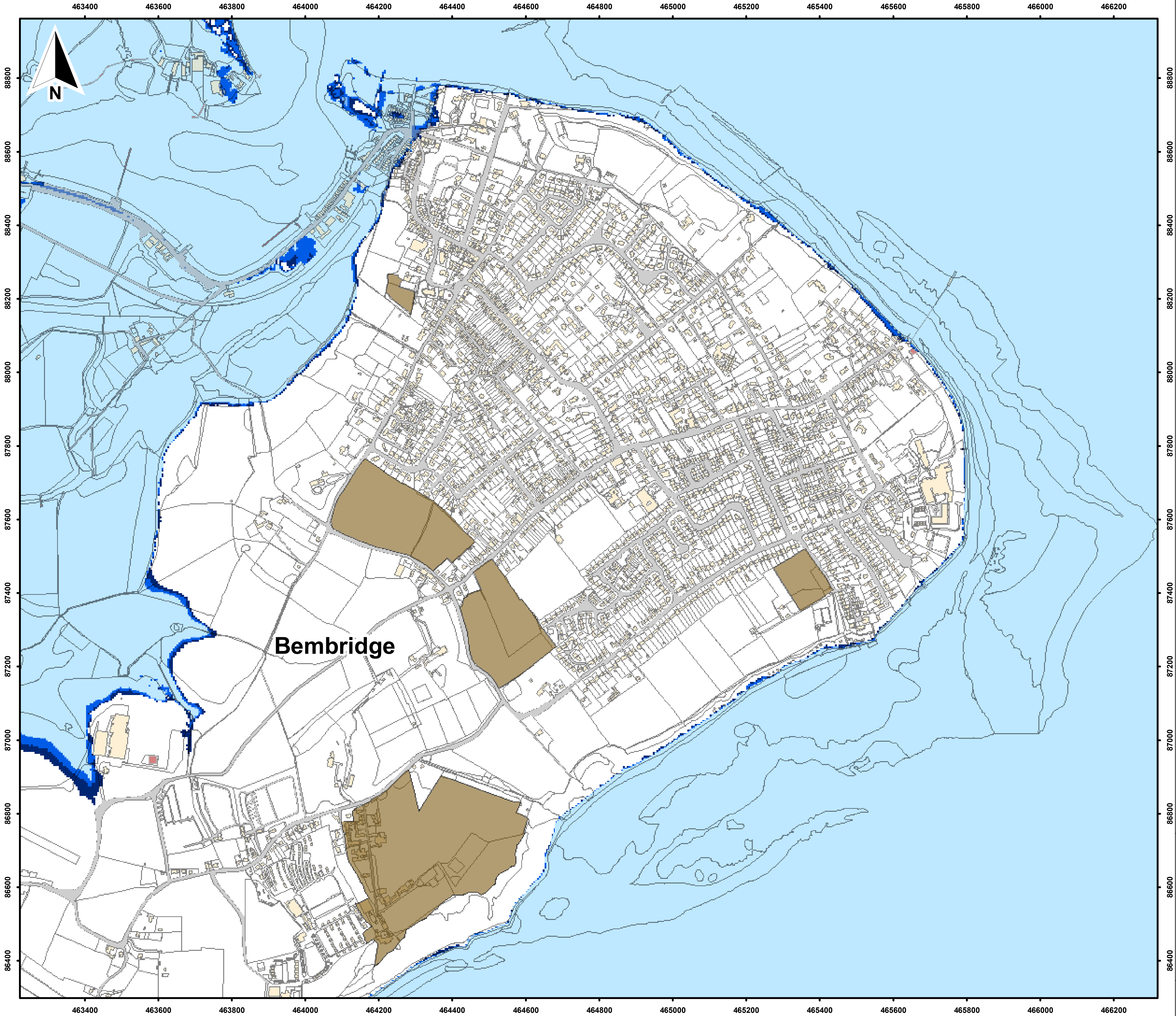

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 57
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Bembridge

November 2009
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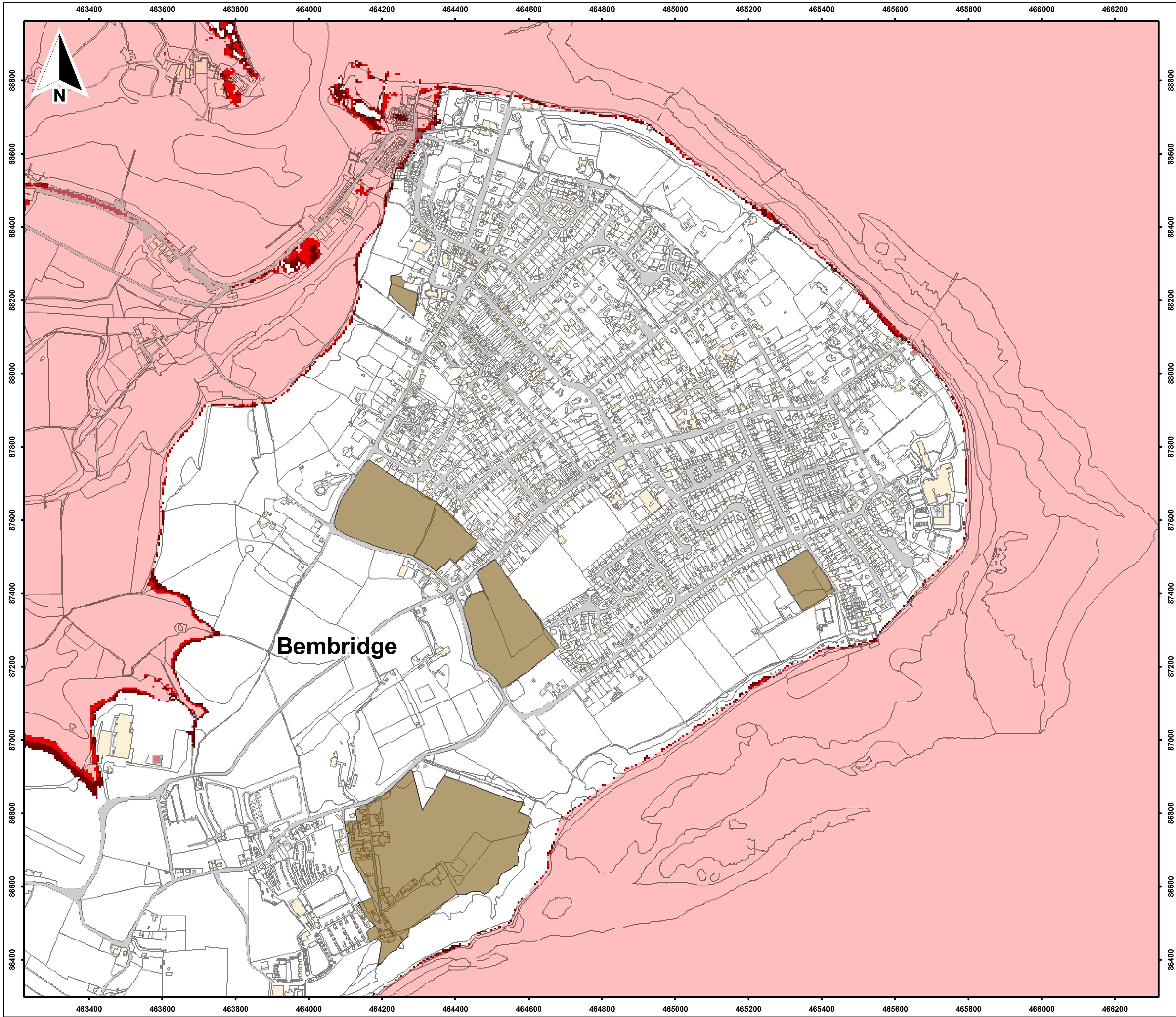

Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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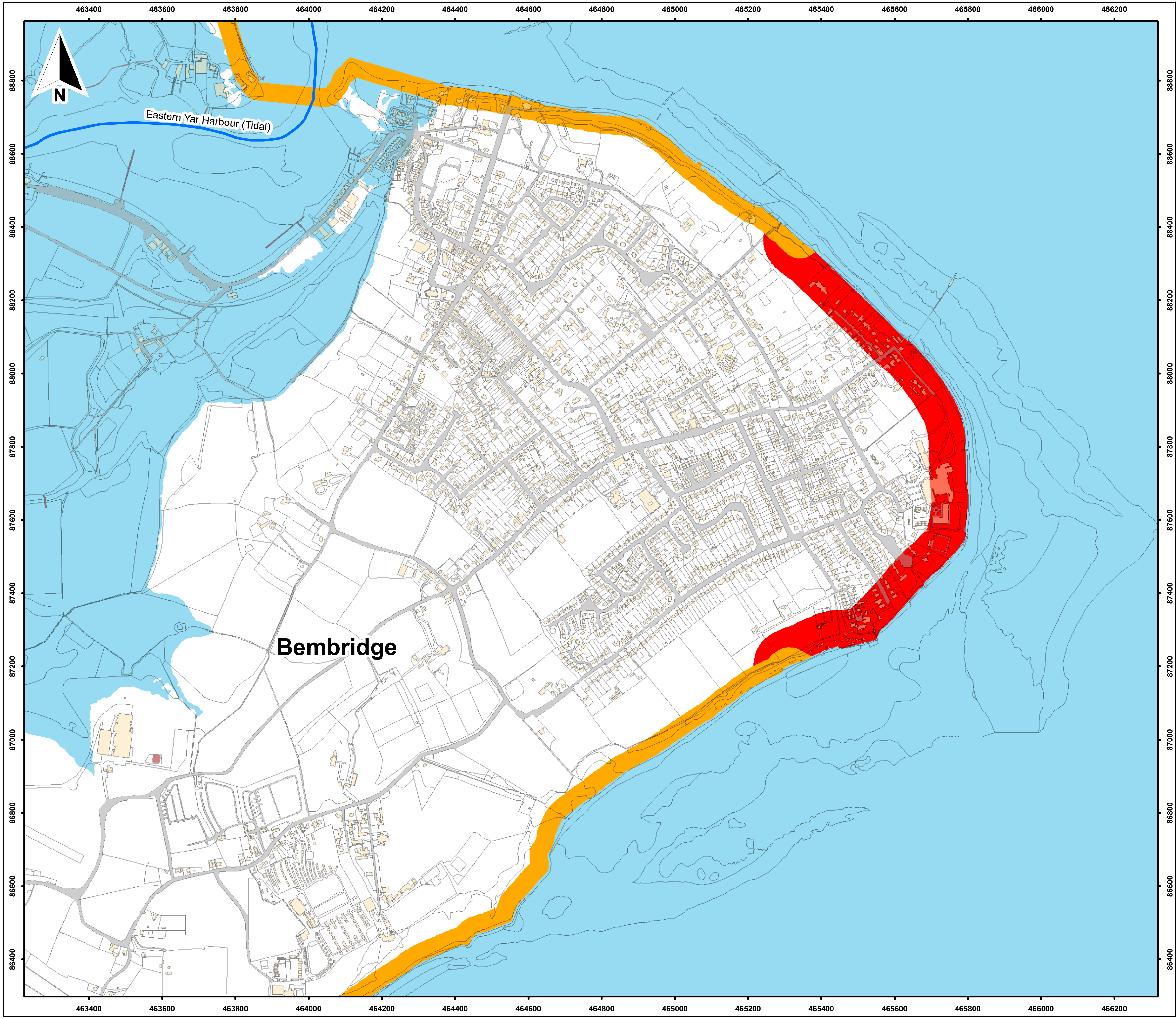
Isle of Wight SFRA MK2

Figure 58
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Bembridge

November 2009
25793-A61a.mxd squij

Entec



Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 Meters

Scale: 1:10,000 @ A3

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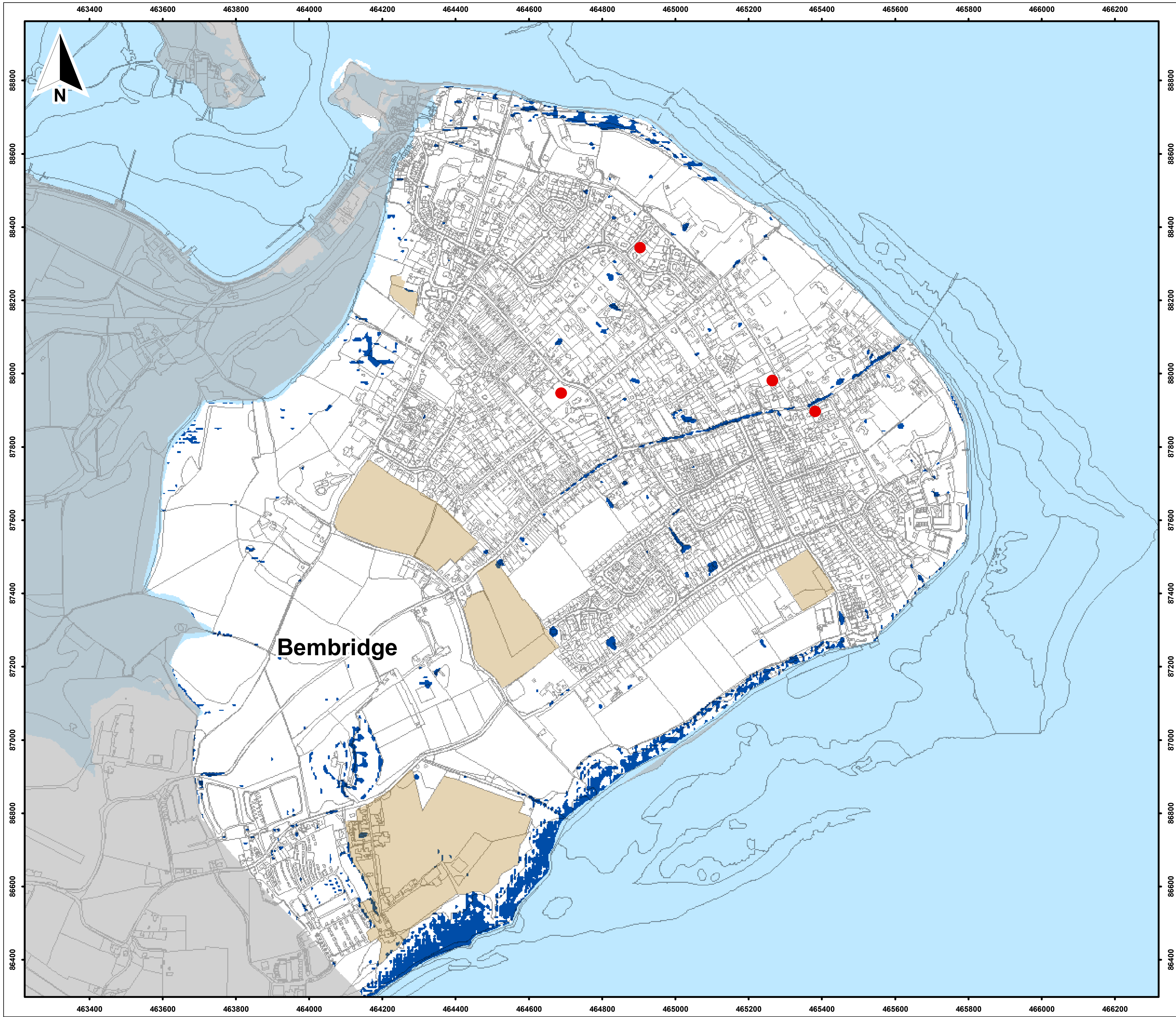
Isle of Wight SFRA MK2

Figure 59
Qualitative Wind and Wave Exposure Risk - Bembridge

November 2009
25793-A62.mxd squij

Entec



Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 60
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Bembridge

November 2009
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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix M
St Helens

June 2010

ISLE of WIGHT COUNCIL

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

St Helens is classified as a Rural Service Centre, which is situated in the north western corner of Bembridge harbour on the reasonably steep South Facing slope of the high ground between St Helens and Seaview. Owing to the mostly elevated topography (above the extent of the tidal Flood Zones) and absence of any Main Rivers running through the town, the flood risk posed to the potential development sites is minimal. Only a couple of site on the lowest land and nearest to the river are at risk.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as St Helens and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

St Helens RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted."

Sites at Risk

Flood risk in St Helens is present from both fluvial and tidal sources, with the later presenting potentially higher water levels and thus flood extents. Only a couple of smaller potential development sites in the south of the settlement are considered to be within the extent of the flood zone 2 and 3 extents (2115), these risk areas should be avoided and managed through a risk based sequential approach to landuse planning.

There is a large potential development site to the south west of St Helens which is located on a piece of land between the A3055 and the B3330. This site is assesses as being at significant risk of flooding, indeed a large portion of the site was flooded in 1974. Flood risk to this site is posed by the Vicarage Lane Drain and the tidal risk associated with the wider Eastern Yar Estuary. Only the northern most portion of the site, adjacent to the B3330 is identified as being in Flood Zone 1.

Climate Change

There is very little difference in the extents for the modelled year 2015 and year 2105 flood zones. This implies that the increased sea level associated with climate change will only really have an impact on the depth and velocity of the flooding in those areas already covered by the flood map. Only two sites become partially affected

by the modelled climate change flood extents. The exact implications of climate change should be assessed for these two sites at the FRA level if they are released for planning.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The surface water modelling does not predict there to be significant surface water flood risks in the village of St Helens or across any of the potential development sites in the area. Potential flow routes are defined, but these are largely limited to the rural areas.

Surface Drainage and Infiltration SuDS Potential

Surface runoff potential in the town of St. Helens is varied. The lower half of the town is characterised by a SPR of 25%, while in the north west the SPR is in the order of 15%. This increases to 50% in the far north eastern corner of St Helens. The north and south of the town are characterised by soils with high leaching potential, underlain by a Secondary Aquifer. Infiltration potential is classified as medium in the north west and south and low in the north east.

The south and eastern parts of the town fall within the SPA and SSSI designations which cover the Eastern Yar Estuary. This potentially sensitive environment requires discharge of surface water be contaminant free. It is therefore appropriate that SuDS, with an ability to remove or attenuate pollutants, be considered. SuDS are less suitable for those areas of low infiltration potential around the centre of the town.

Wave Exposure Risk

The coastline near St Helens has been classified as being at medium risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 50m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray. The estuary has not been attributed with a Wave Exposure Risk because of its sheltered situation.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within St Helens. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.

- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

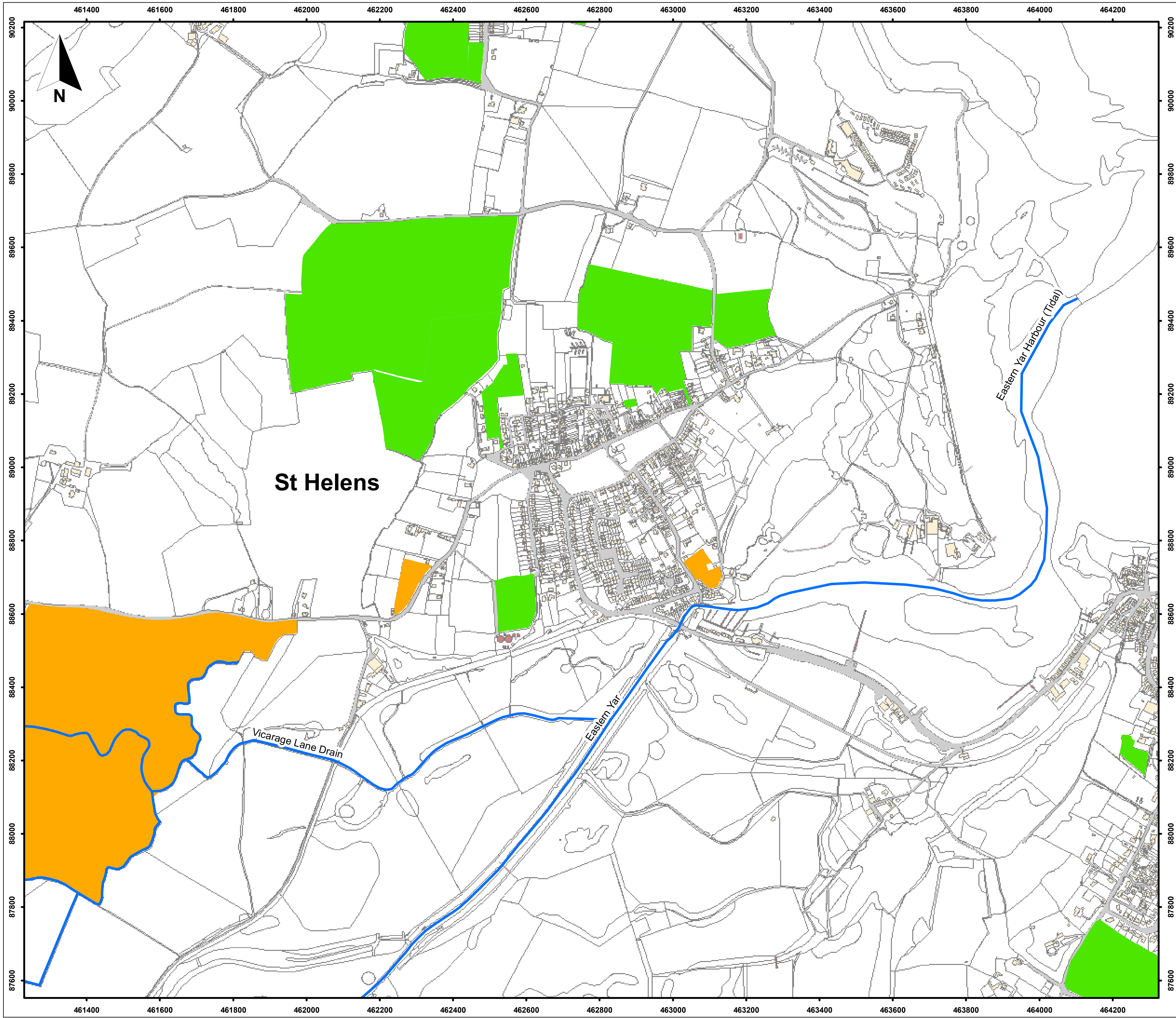
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.

The Agency have a flood event outline for the October 2000 event that occurred on the Eastern Yar, this does not extend to cover any of the potential development sites, nonetheless it represents a useful source of information which should be considered in the FRA for either of the two potential sites that have been identified as being at flood risk, should they be put forward for planning. As with all sites over 1ha a FRA will be required and many of the proposed sites in St Helens are over the threshold, the Potential Development Site Attribution dataset details these sites and defines the area of each.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 61
Potential Development Sites
Qualitative Flood Risk
St Helens

November 2009
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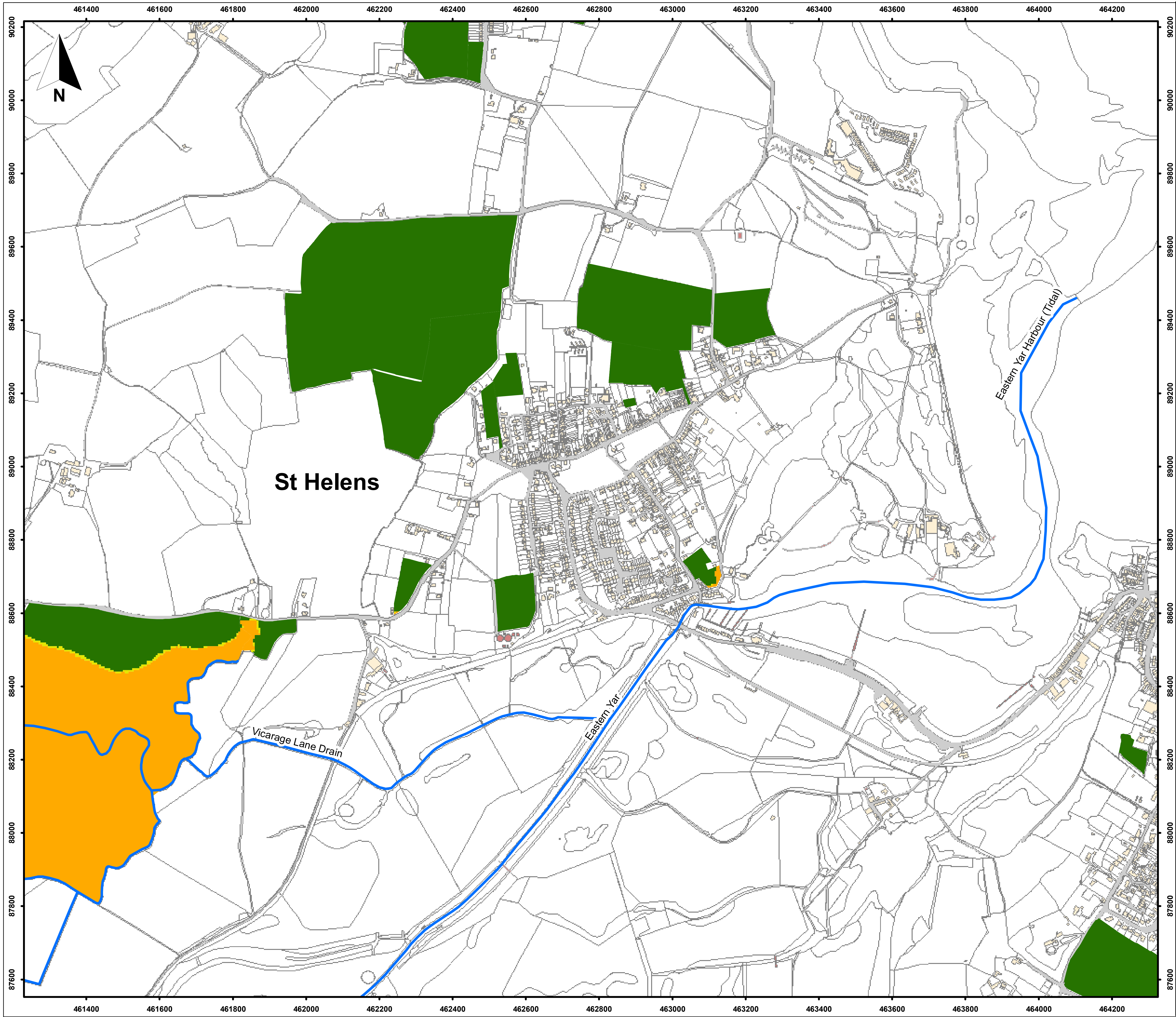
Entec



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 62
Potential Development Sites
Site Specific Flood Risk Definition
St Helens

November 2009
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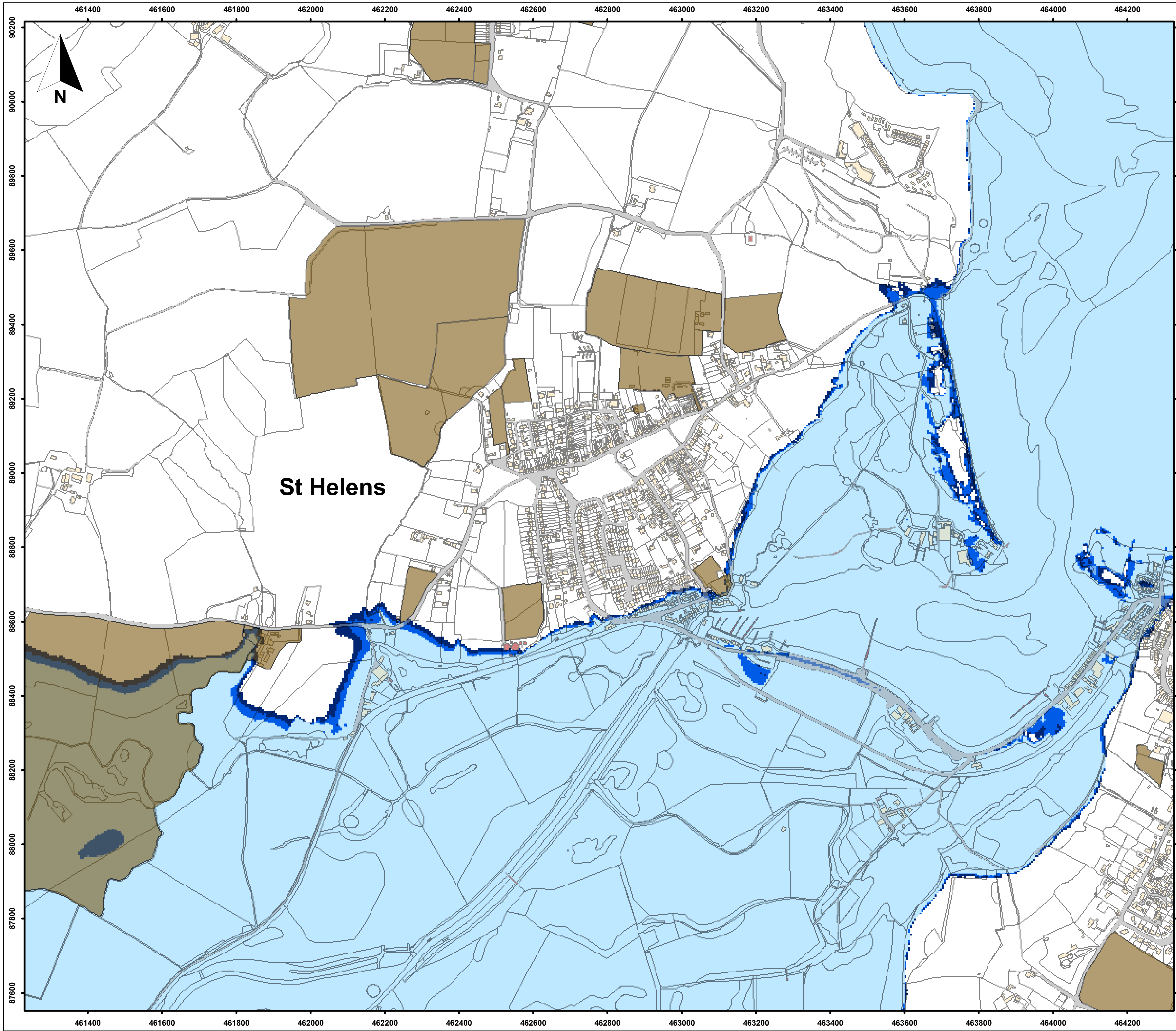

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 Meters

Scale: 1:22,000 @ A3

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Isle of Wight SFRA MK2

Figure 63
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
St Helens

November 2009
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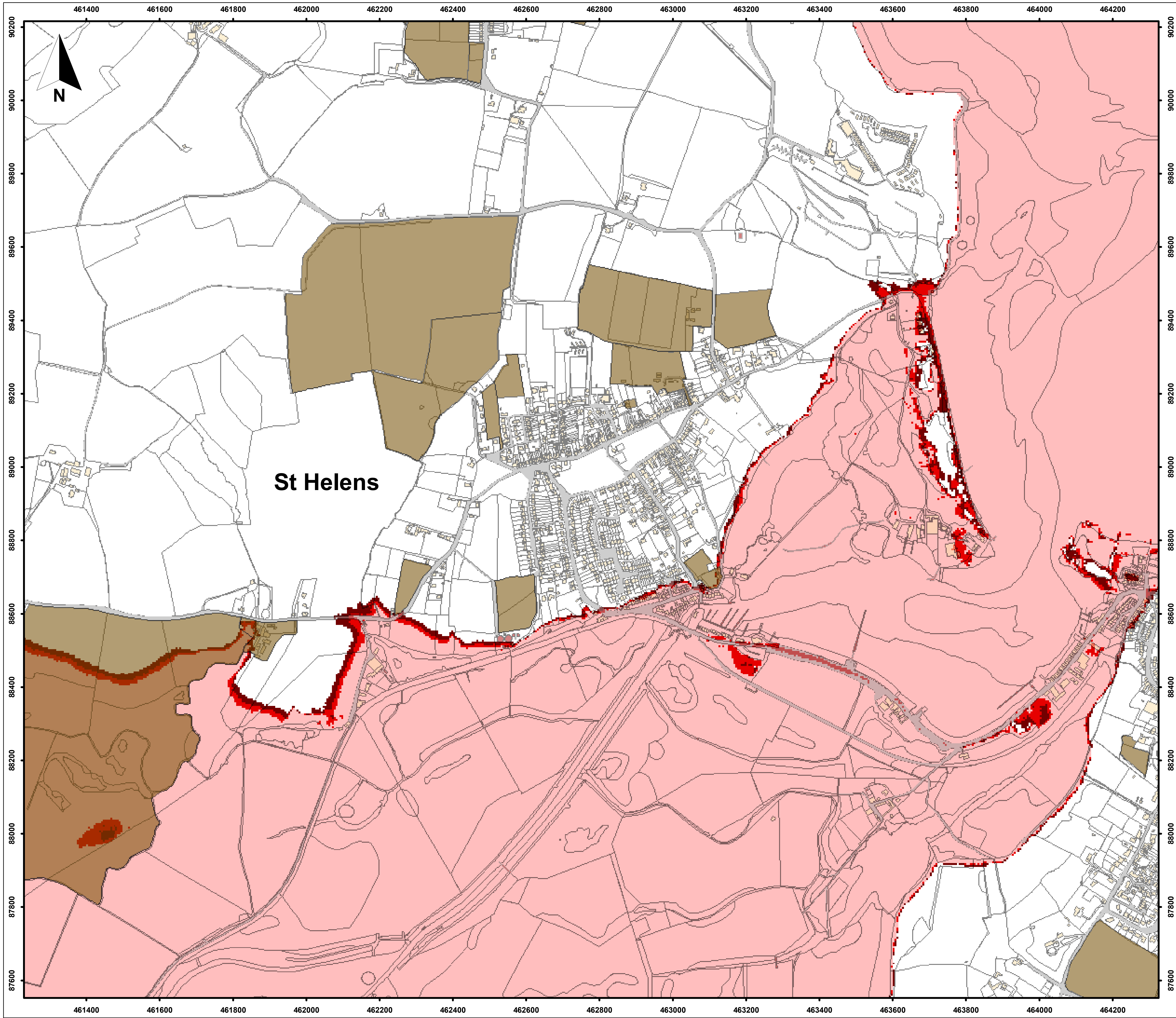

Key:

Predicted 1 in 200 year Tidal Extents

Year 2010

Year 2045

Year 2080

Year 2115

Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 64
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
St Helens

November 2009
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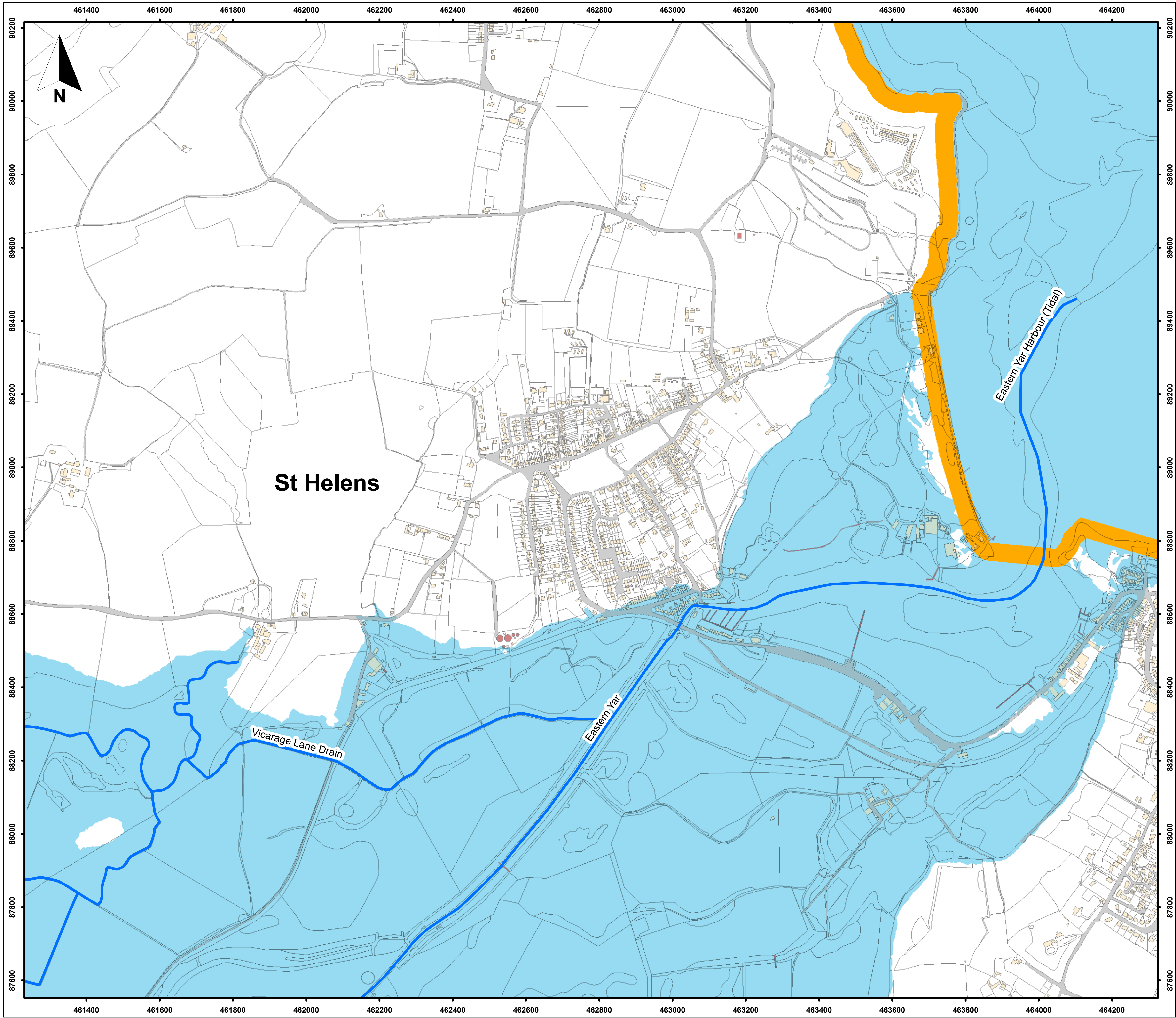

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 65 (Qualitative Wind and Wave Exposure Risk - St Helens)

November 2009
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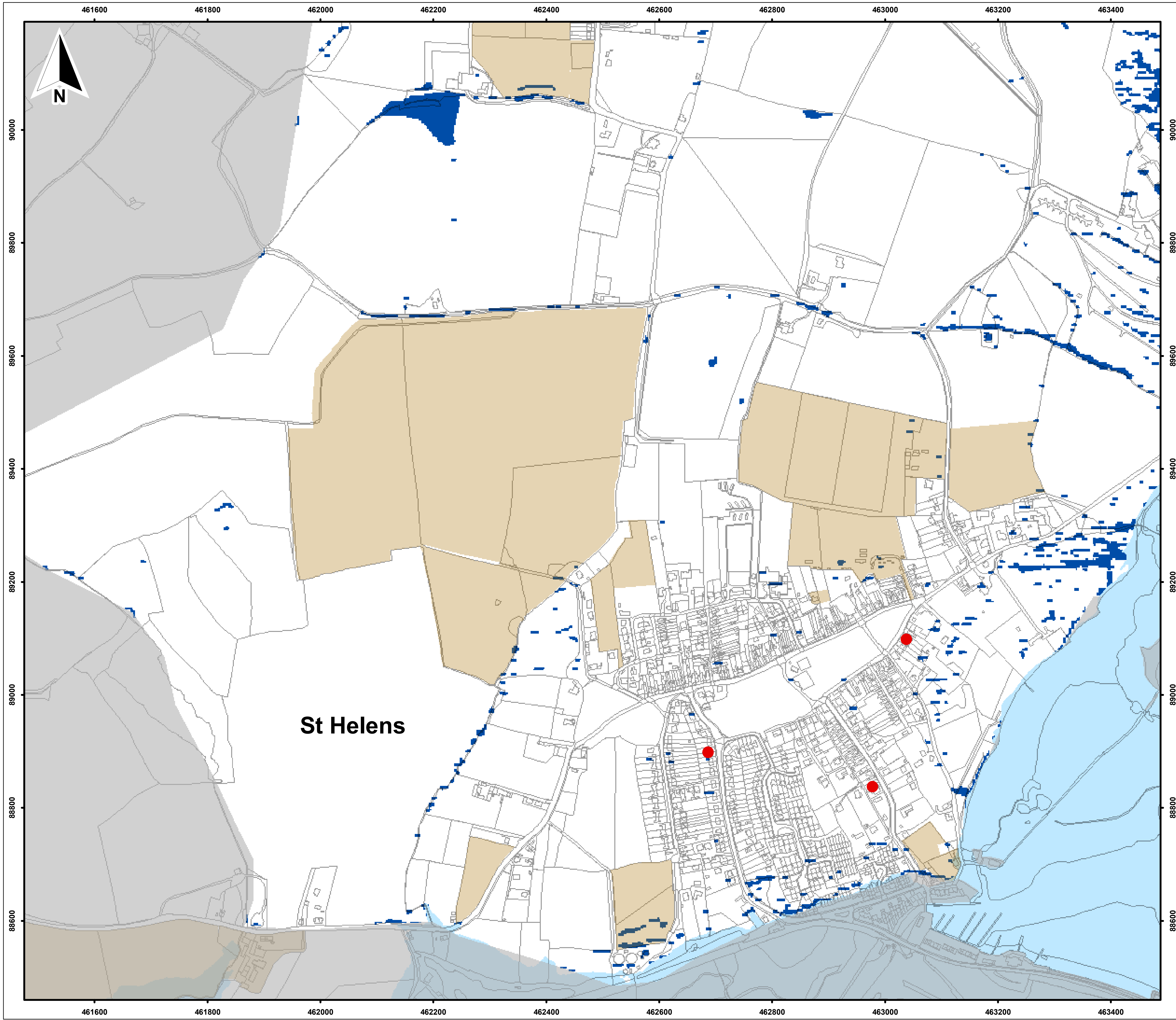

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 Meters

Scale: 1:6,500 @ A3

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Isle of Wight SFRA MK2

Figure 66
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - St Helens

November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix N
Ryde

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Ryde is a Key Regeneration Area, which is located on the north eastern coast of the Island and is a Georgian and Victorian resort town. Ryde as a Key Regeneration Area is the urban area with the largest population and is a Smaller retail and employment centre for the Island. It is a coastal town with traditional enclosed pasture land to the south, with pockets of landscape improvement areas. Critical to the character of Ryde is the sloping land from the foreshore to the ridge and the valley that divides the town. Importantly, the Environment Agency do not have Flood Zones for the Binstead Watercourse which flows through the western part of the town. The implications of this are discussed in the *Additional Information for Site Specific Flood Risk Assessment* section of this Ryde discussion.

Sustainability and Regeneration Objectives

A Public Realm, Strategy has been prepared for Ryde to establish a locally distinctive framework to guide future regeneration proposals in the area. A major new interchange has also been planned, offering enhanced transport facilities for ferry, rail, bus and taxi users. It is intended that Ryde builds on its role as a hub for high speed trans-Solent connections and an Island public transport interchange to strengthen its role as a residential community, centre for small business and as gateway for tourists.

Sites at Risk

Flood Risk in Ryde is dominated by the threat of tidal flooding and fluvial flooding from Monkton Mead Brook and has historically been a problem with the most significant recent events taking place in the winter of 1993, winter 1999 and autumn 2000. It was stated in the *Monkton Mead Brook Flood Risk Mapping Report* (2005) that the coincidence of high tidal events, failure of pumps, debris in the channel and inadequate surface drainage exacerbated the flooding in these recent events.

The town of Ryde is built along the coast and on the sides of the valley through which Monkton Mead Brook flows. The floodplain of the Monkton Mead brook is only partially developed. Several of the potential development sites are located in this floodplain and along the seafront. A detailed hydraulic model is held by the Environment Agency for the Monkton Mead Brook and this was used in the SFRA to define the functional floodplain (Flood Zone 3b – see Section 4.1). The existence of this model has enabled three flood risk zones to be defined through Ryde, these being Flood Zones 2, 3a and 3b. The sites identified as being at anything other than 'Low Probability' in Figure 67 are sites where FRAs would be required as they are partially within the extents of Flood Zone 2 and 3. To remain in line with the Sequential Test though, sites outside the flood risk zones 2 and 3 should be considered first. Sites over 1 hectare, which are located within Flood Zone 1 will require a FRA.

Figure 68 defines the flood risk across each of the potential development sites. This detailed flood risk classification reveals that although the flood risk close to the Monkton Mead Brook is high, it becomes very low with distance away from the river and up the valley sides. The two large potential large sites to the south of Ryde either side of Rosemary Lane in the Rosemary Vineyard are good examples of this zonation of flood risk). This shows that although parts of the potential sites are in either Flood Zone 2 or 3 the vast majority of the area is in Flood Zone 1. A risk based approach to landuse planning should be applied t steer development to the areas of lowest risk within the affected sites.

The Monkton Mead Flood Alleviation Study (2000) identified that the tunnelled section of railway under Ryde runs below sea level and has two pumps to drain it. These pumps exit to the sea near the hovercraft terminal. It took almost three days for the pumps to drain the tunnel following the event of 9th October 2000. Some of the flooding problems which arose on the 9th were the result of large amounts of debris in the channel. As the flows increased the debris was washed downstream and when an obstacle to flow was encountered (e.g. a culvert) a blockage was caused leading to flooding.

Climate Change

The extent to which Ryde is affected by Climate change is illustrated in Figures 69 and 70. The impact of climate change on the predicted extent of tidal Flood Zone outlines is an issue that should be considered if and when any of the potential sites currently identified as partially being at risk of flooding are released for planning. Climate change has the potential to increase the extents of the Flood Zones and as such plots of land, or parts of sites, currently outside the Flood Zone envelope may become included within the next 100 years. In line with the LPAs approach to managing the predicted climate change induced impacts of sea level rise, the 2115 climate change epoch has been used to assess tidal risk to the potential development sites.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook

CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The topography of Ryde is entirely comprised of high resolution LiDAR data which includes the representation of small topographic features. In all urban areas the LiDAR has been edited to remove the buildings. This editing process results in a slightly un even surface profile, which can result in the production of small depressions that fill with water. It is likely that this has been the situation in the northern parts of Ryde where there are many small isolated areas of predicted flooding. The most significant potential flood flow route is predicted in the south of Ryde flowing from west to east towards Monkton Mead Brook and through one of the potential development sites. This potential risk should be reviewed further should this site be put forward for planning submission.

There does not appear to be a strong pattern to the distribution of the recoded incidents of surface water flooding and they do not correlate with the predicted flood flow routes or ponding areas. This might suggest that the recorded incidents are related to factors other than overland flows.

Surface Drainage and Infiltration SuDS Potential

Ryde has varied topography, with the central part of the settlement being located in the bottom of river valleys, whereas the northern and southern parts are on much higher ground.

Soils in Ryde have SPR values of between 15% and 50% with. The areas of Haylands and Elmfield are where the lower SPR and runoff potentials. These areas of lower runoff potential are characterised by Secondary Aquifer geology and soils with a high leaching potential. The remainder of the town is comprised of Secondary Aquifers with low leaching soils and areas of Unproductive Strata. SuDS infiltration potential is classified as medium for the areas with high leaching soils over a Secondary Aquifer. A SAP is located on the northern edge of town, adjacent the coast. The presence of this ecological designation means that care should be taken not to introduce pollutants into the environment. Around coastal areas, surface water could be discharged into the sea with out restriction, providing the surface water was not contaminated.

Wave Exposure Risk

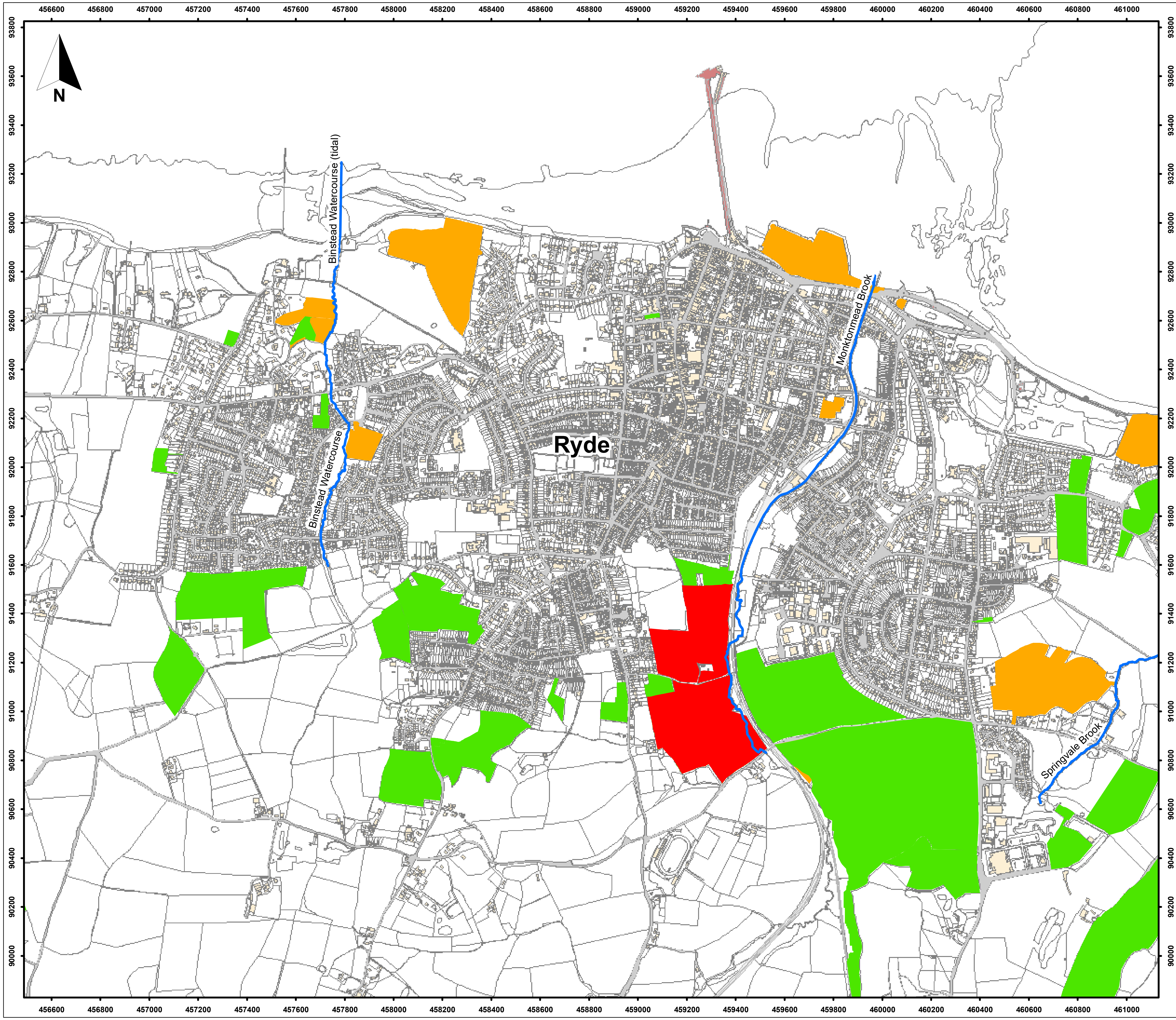
The coastline near Ryde has been classified as being at medium risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 50m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray. The inter tidal area has not been attributed with a Wave Exposure Risk because of its sheltered situation.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Ryde. The development of any previously undeveloped site in Flood Zones 2, 3a or 3b is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.
- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 67
Potential Development Sites
Qualitative Flood Risk
Ryde

November 2009
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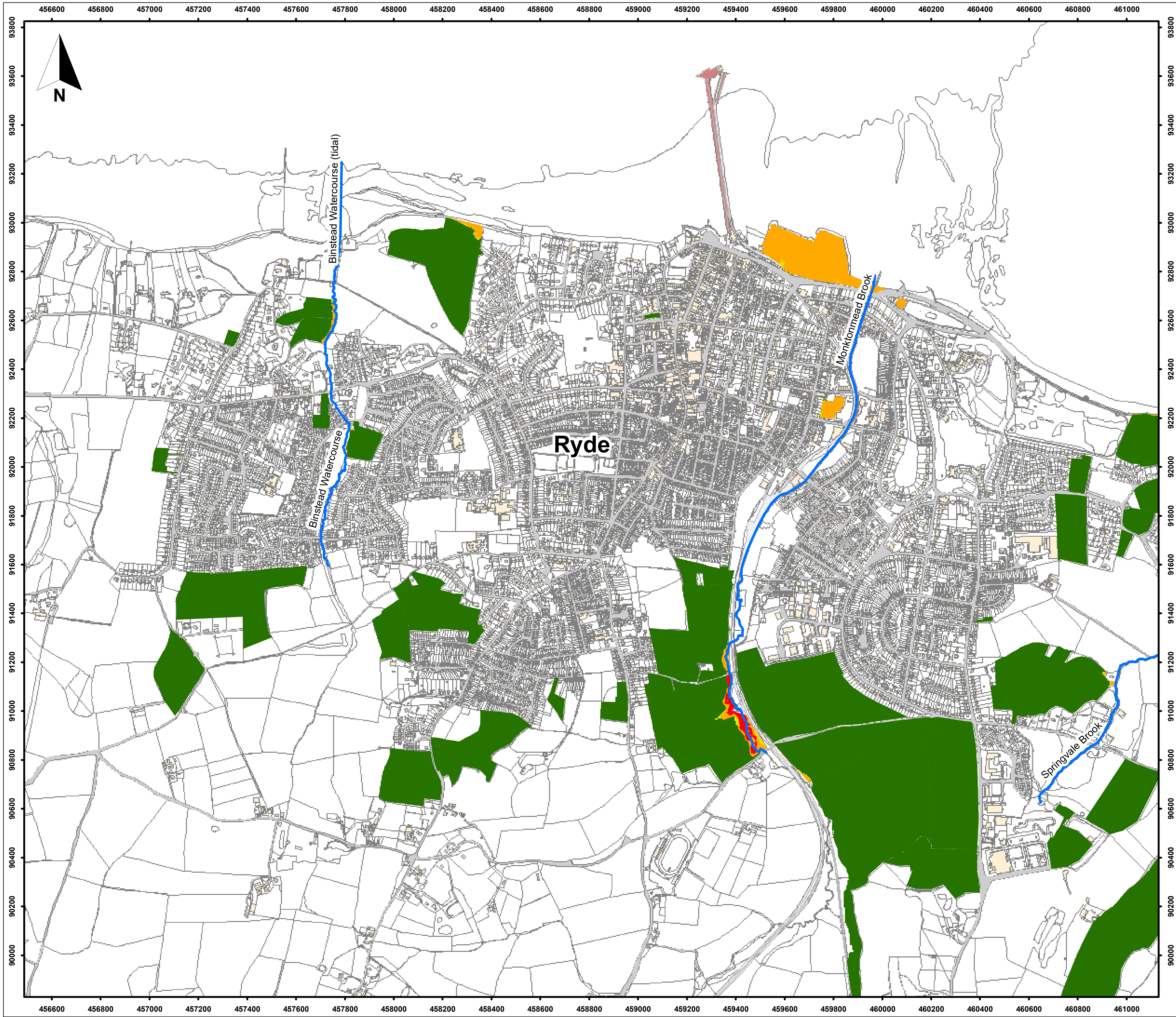

Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 68
Potential Development Sites
Site Specific Flood Risk Definition
Ryde

November 2009
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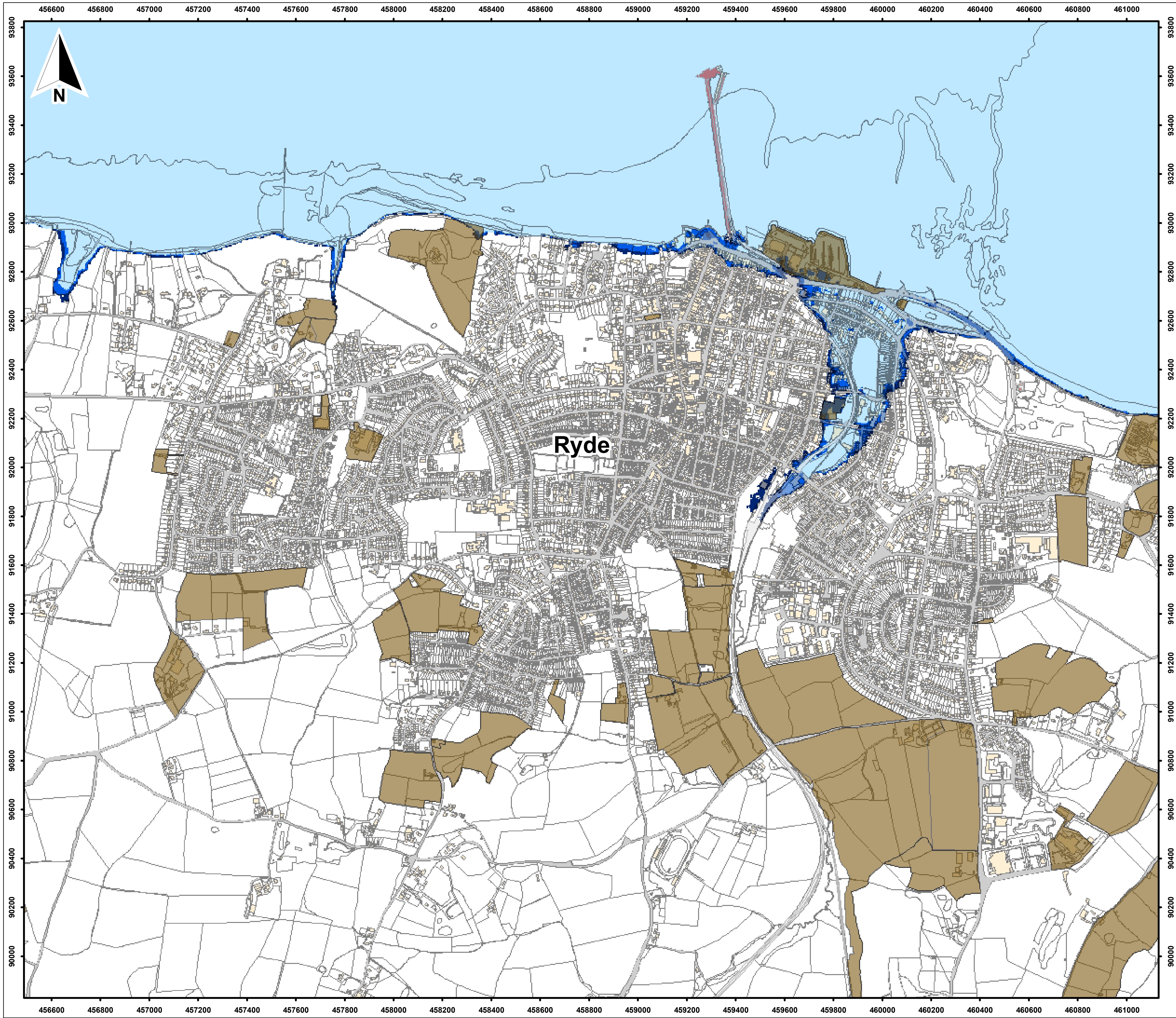
Entec



Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 69
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Ryde

November 2009
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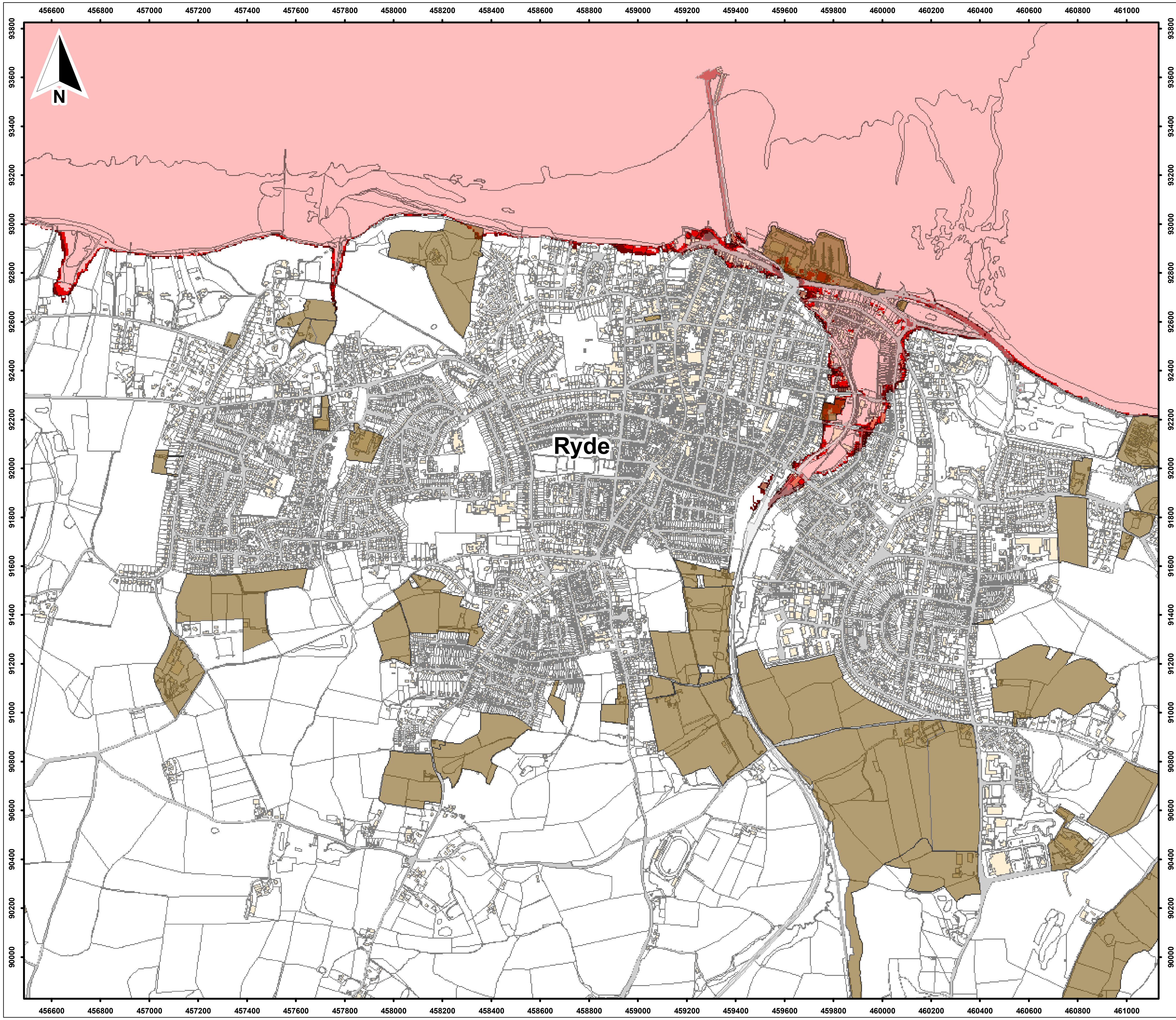

Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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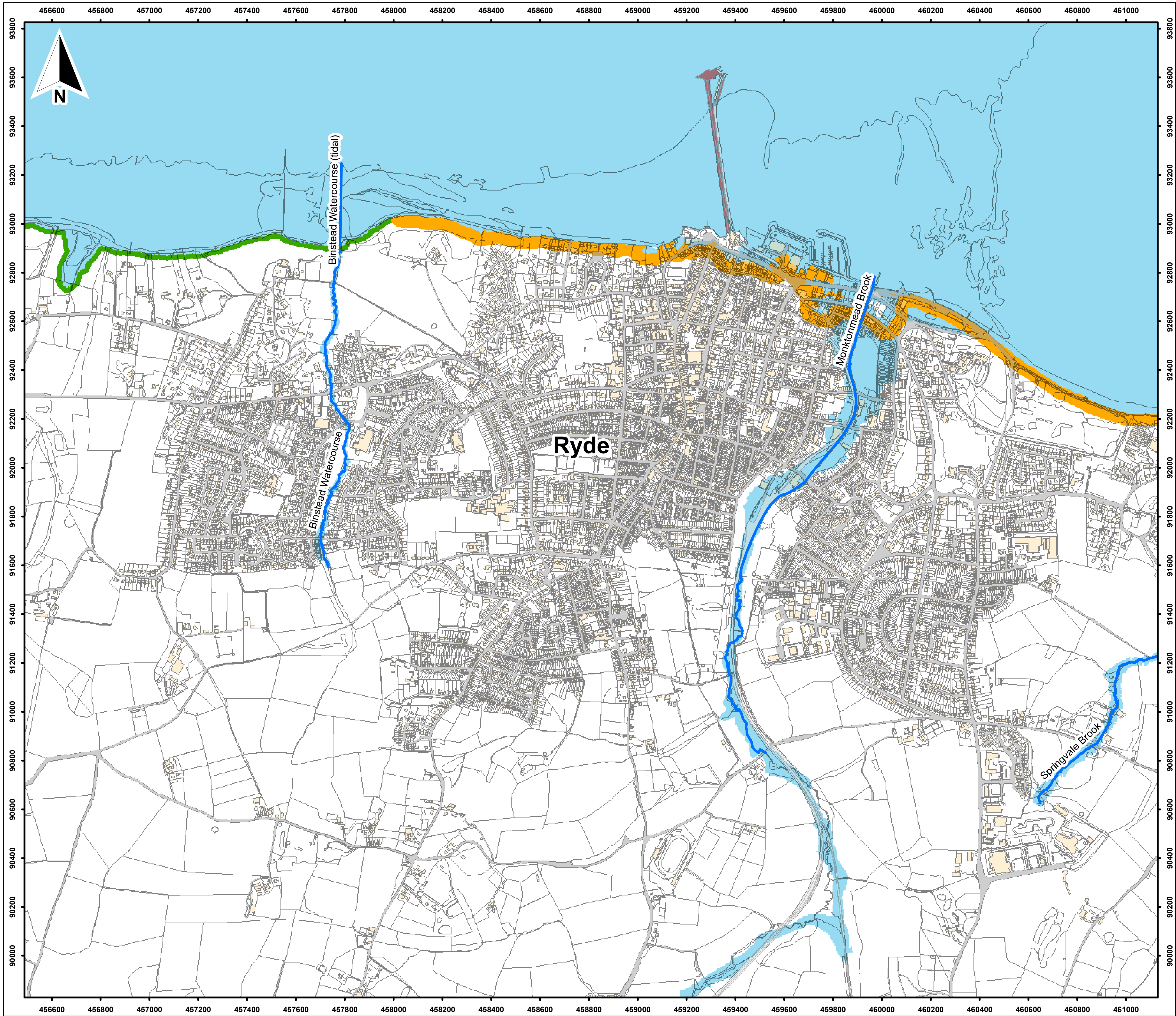
Isle of Wight SFRA MK2

Figure 70
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Ryde

November 2009
25793-A79a.mxd squij

Entec



Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 800 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 71
Qualitative Wind and Wave Exposure Risk - Ryde

November 2009
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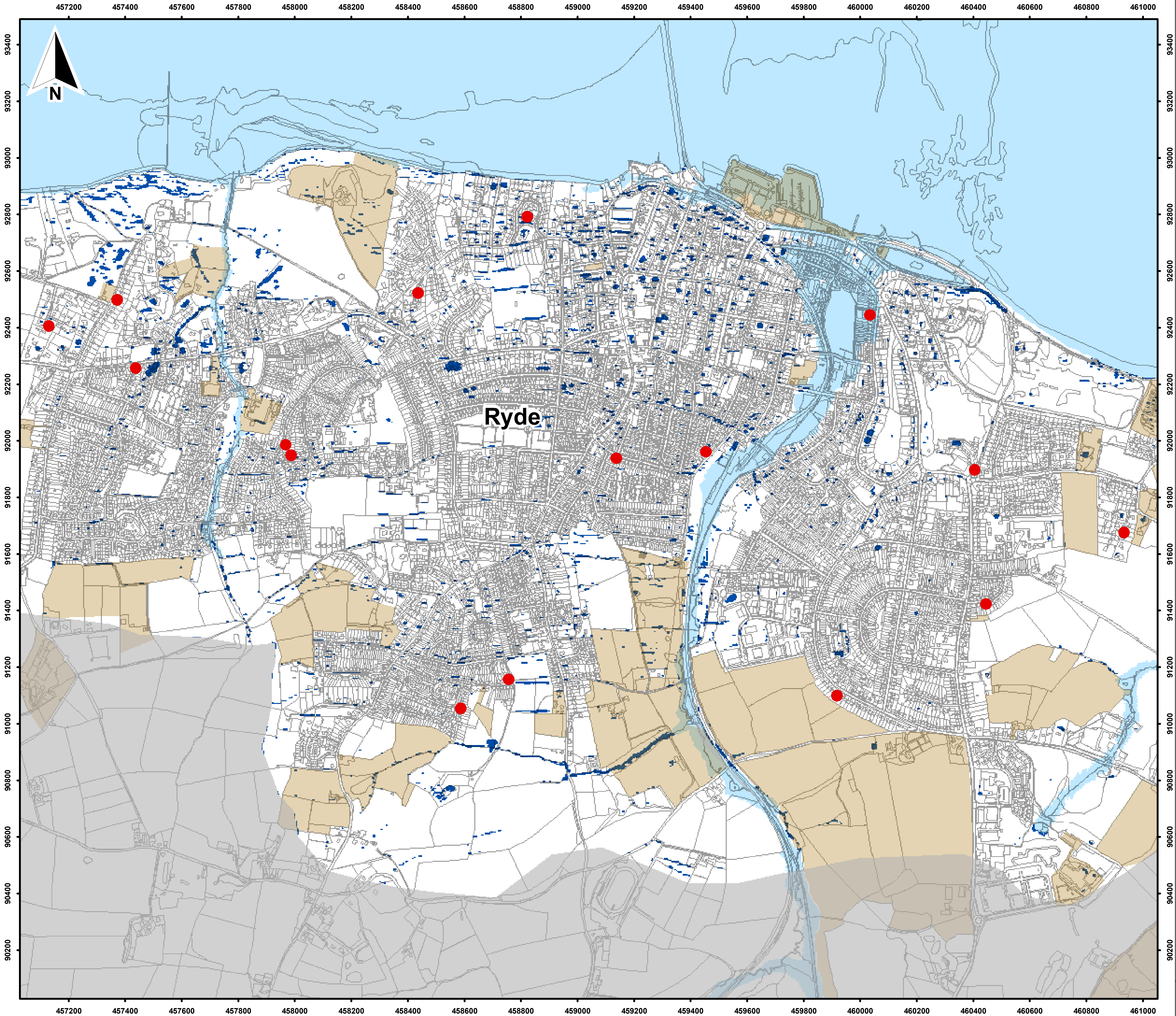
Entec



Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 Meters

Scale: 1:13,000 @ A3

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Isle of Wight SFRA MK2

Figure 72
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Ryde

November 2009
25793-A81.mxd squij

Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix O
Wootton

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

The RDA of Wootton is classified as a Rural Service Centre and incorporates the settlements of Wootton and Fishbourne. The RDA is located on the coast between East Cowes and Ryde, with Wootton Creek dividing the two settlements. There are tidal and fluvial flood risks facing this Key Development Area, however only a small proportion of the potential development sites are assessed as being at risk of tidal or fluvial flooding.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Wootton and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Wootton RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

All the potential development sites in Wootton are located within Flood Zone 1, the areas of flood plain associated with Wootton Creek have been avoided.

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Wootton Bridge Parish Council Report*) noted that two properties were flooded between the 15th September and 13th December. Large rainfall amounts prior to and during the flood event resulted in high volumes of runoff and an overcharging of the combined foul and storm sewer.

Climate Change

Climate change is predicted to have a relatively small impact on the flood extents in the tidal floodplain as the floodplain is topographically well defined. Nevertheless, flood depths are predicted to increase as a result of climate change.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The town of Wootton is build over a hill with the eastern half of the settlement being on a south east facing slope and the western half being on a north west facing slope. The potential flow routes reflect these varying slope aspects. Although within the town itself there are only minor potential flow routes predicted. The model predictions do not correlate with the recorded incidents of surface water flooding, which appear to be distributed throughout the eastern half of the town. The recorded flood incident data sets are good indications of potential hot-spots. However, the database is reliant upon the flooding incidents being reported by the public, as such there is a significant potential for database to be incomplete. The absence of a clear correlation between the predicted and the recorded flooding in Wootton is likely to be the result of either an event not having occurred or an event not having been reported. The potential development sites in Wootton are largely unaffected by the potential flow routes and ponding areas.

Surface Drainage and Infiltration SuDS Potential

Soils in the Wootton are characterised by an SPR of 50%, and consequently surface runoff potential is high. Wootton is underlain by areas of Secondary Aquifer and Unproductive Strata. Infiltration potential is classified as predominantly low, with areas of medium infiltration potential associated with the high leaching potential soils. Each potential development site in the Sites Database is assigned a classification for infiltration potential, groundwater contamination and runoff.

Wootton Creek Estuary is designated as an SPA. The presence of a SPA in the estuary necessitates the need for careful mitigation of contaminants in surface water drainage waters. Volumes of discharge into the estuary are likely to be permitted without a limit assuming appropriate mitigation measures for pollution are taken where necessary.

Wave Exposure Risk

The coastline near Sea View has been classified as being at low risk of wave exposure (see Section 6 of the SFRA Report). It is recommended that for any site within the 20m buffer, where ground levels are less or equal to the predicted peak 1 in 200 year tide in 2115 level plus a 4m allowance for wave height, building design should consider the impact of being potentially exposed to airborne beach material and the corrosive effects of sea spray.

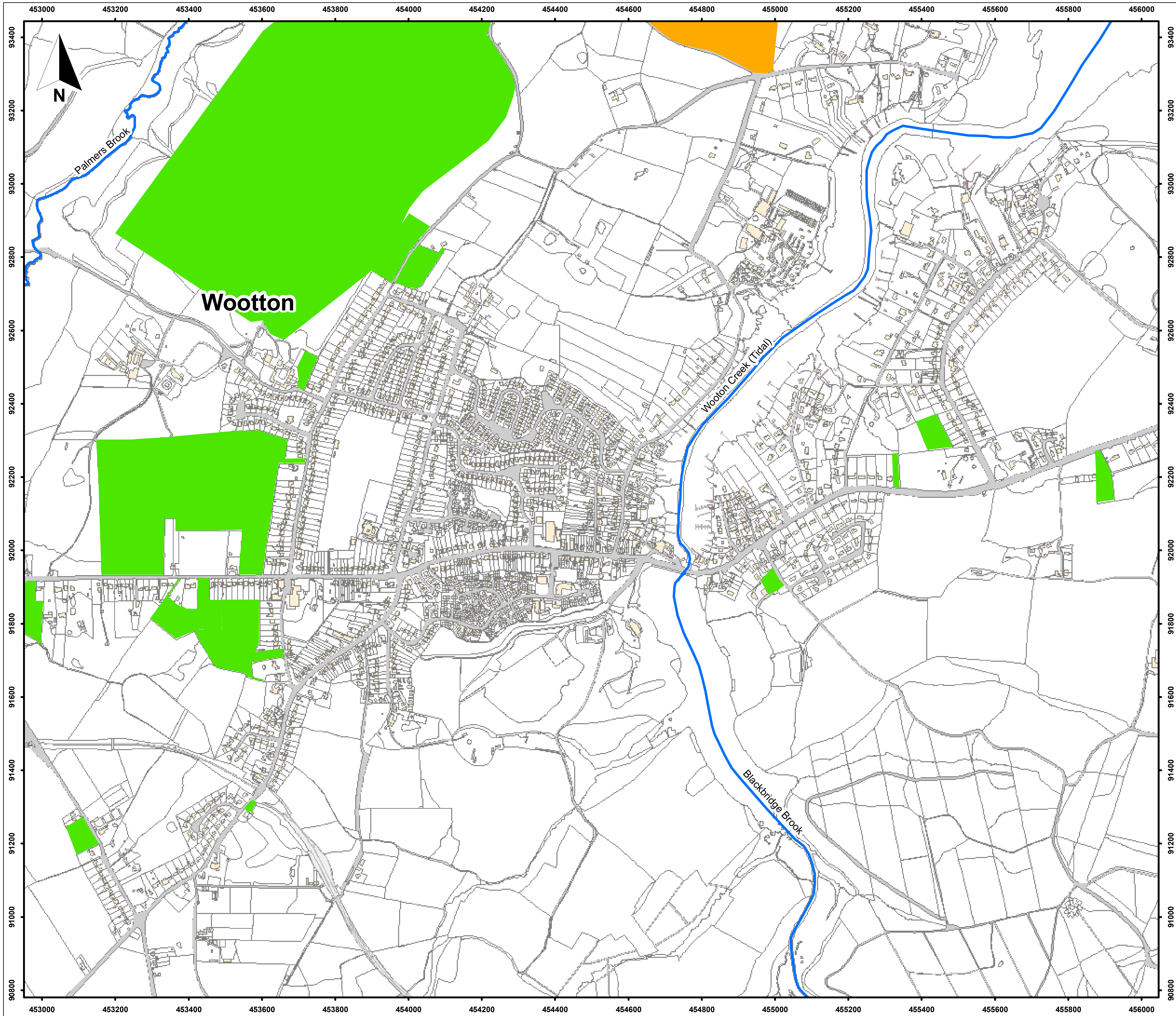
Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Wootton. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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IoW SFRA Draft Output

Figure 73
Potential Development Sites Qualitative Flood Risk Wootton

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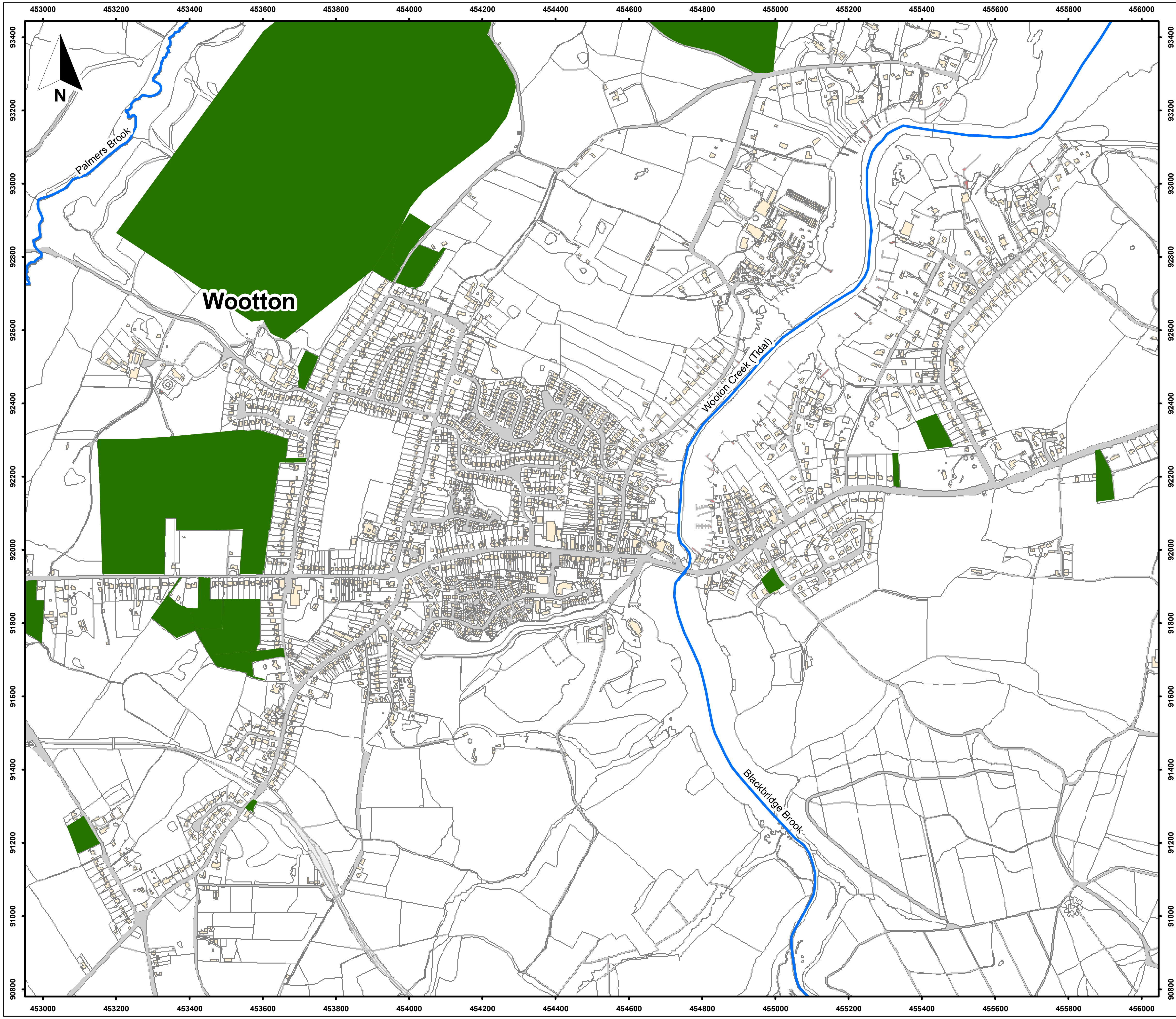

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 Meters

Scale: 1:10,000 @ A3

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IoW SFRA Draft Output

Figure 74
Potential Development Sites
Site Specific Flood Risk Definition
Wootton

November 2009
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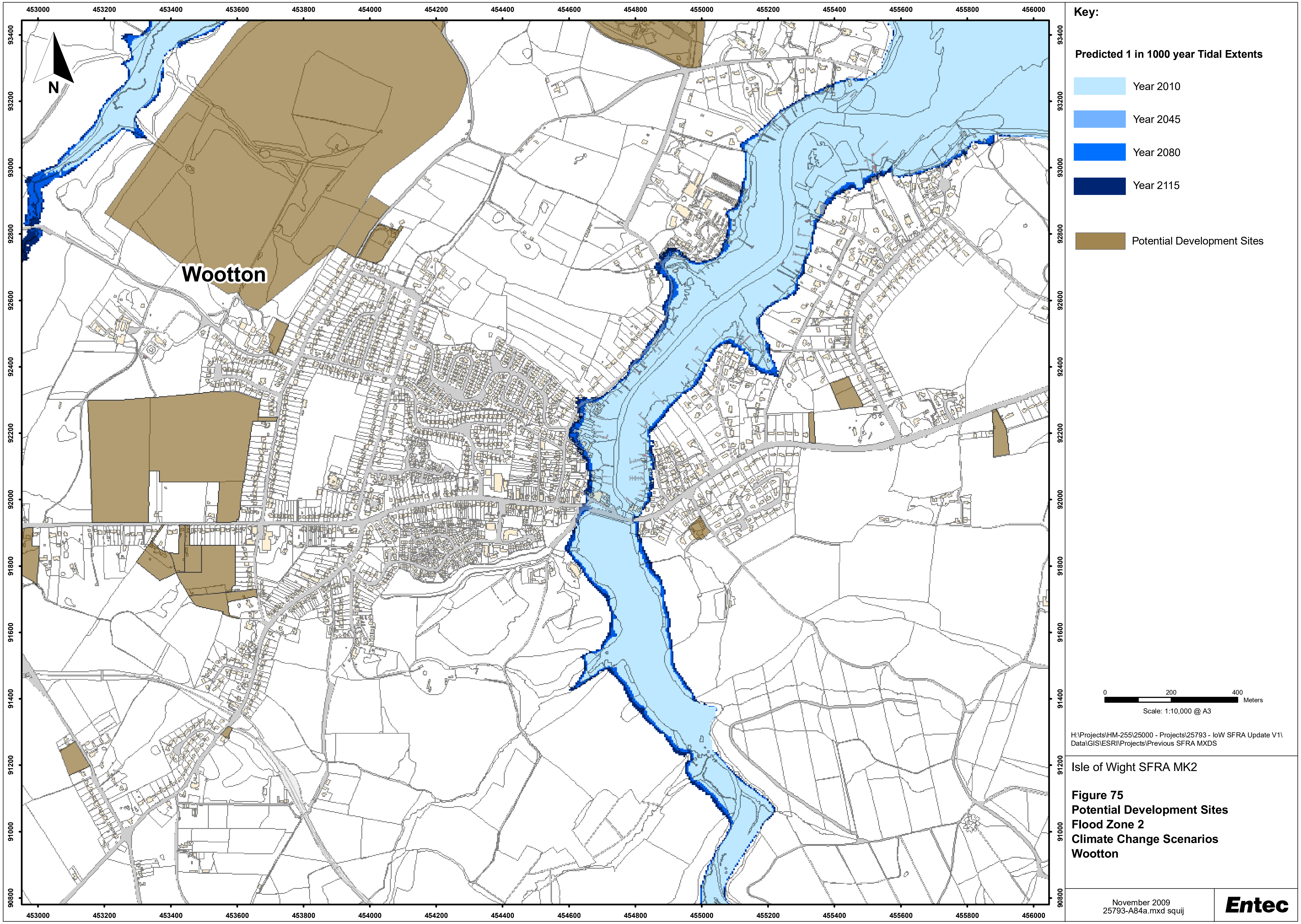

Wootton
N
Key:
Predicted 1 in 1000 year Tidal Extents
Year 2010
Year 2045
Year 2080
Year 2115
Potential Development Sites
0 200 400 Meters
Scale: 1:10,000 @ A3
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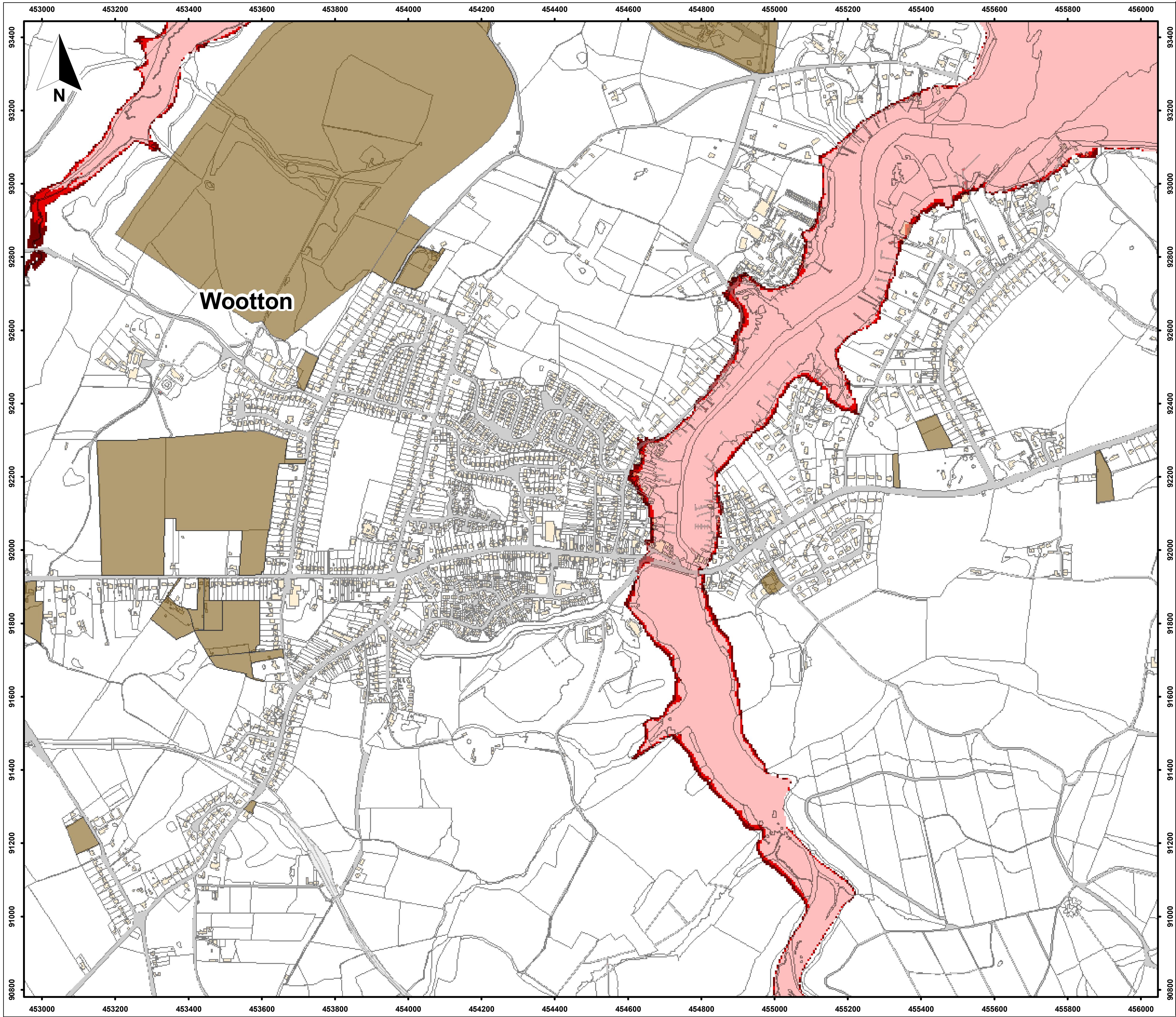
Isle of Wight SFRA MK2
Figure 75
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Wootton
November 2009
25793-A84a.mxd squij
Entec



Key:

Predicted 1 in 200 year Tidal Extents

Year 2010

Year 2045

Year 2080

Year 2115

Potential Development Sites

0 200 400 Meters

Scale: 1:10,000 @ A3

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Isle of Wight SFRA MK2

Figure 76
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Wootton

November 2009
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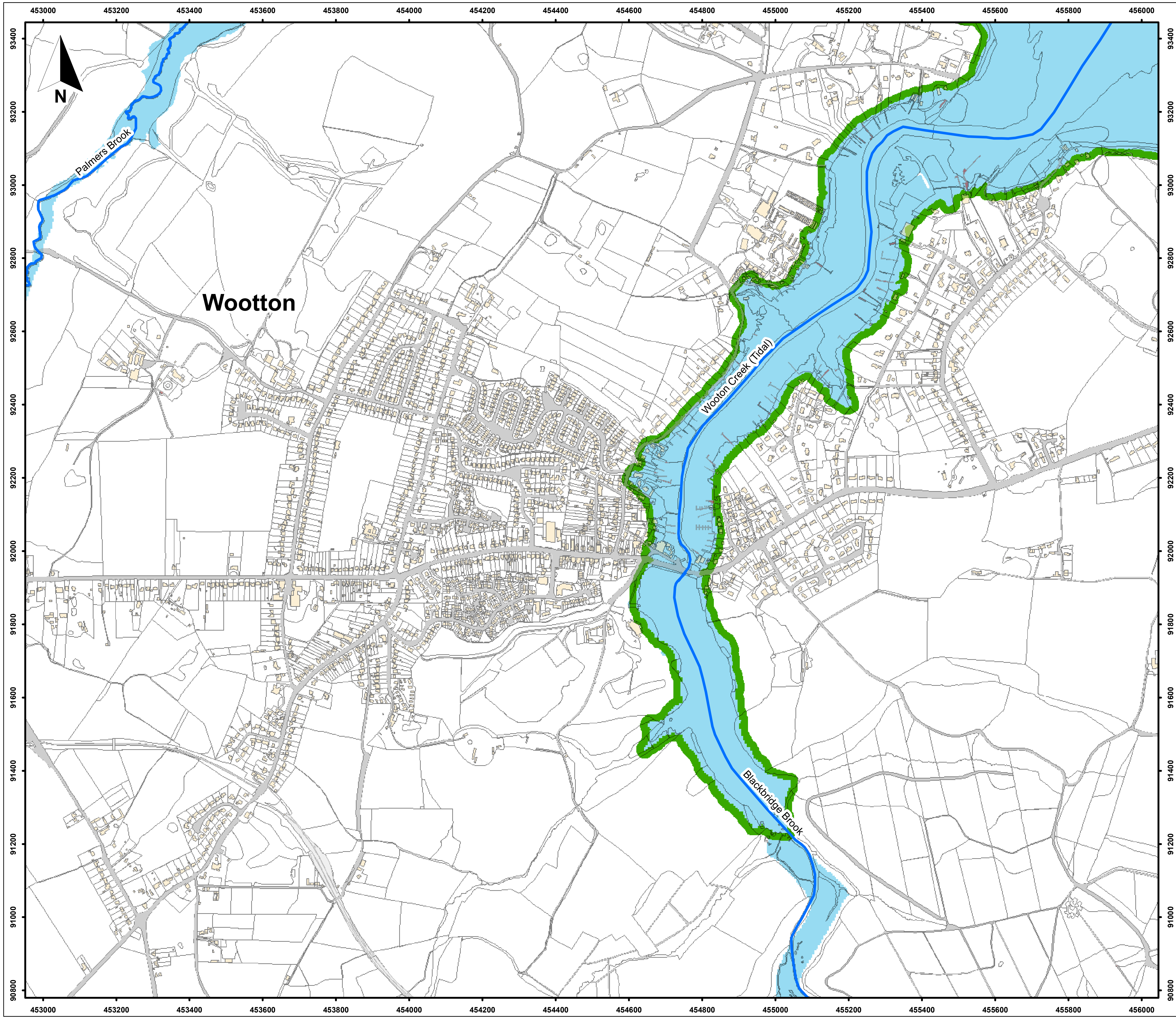

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 Meters

Scale: 1:10,000 @ A3

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IoW SFRA Draft Output

Figure 77
Qualitative Wind and Wave Exposure Risk - Wootton

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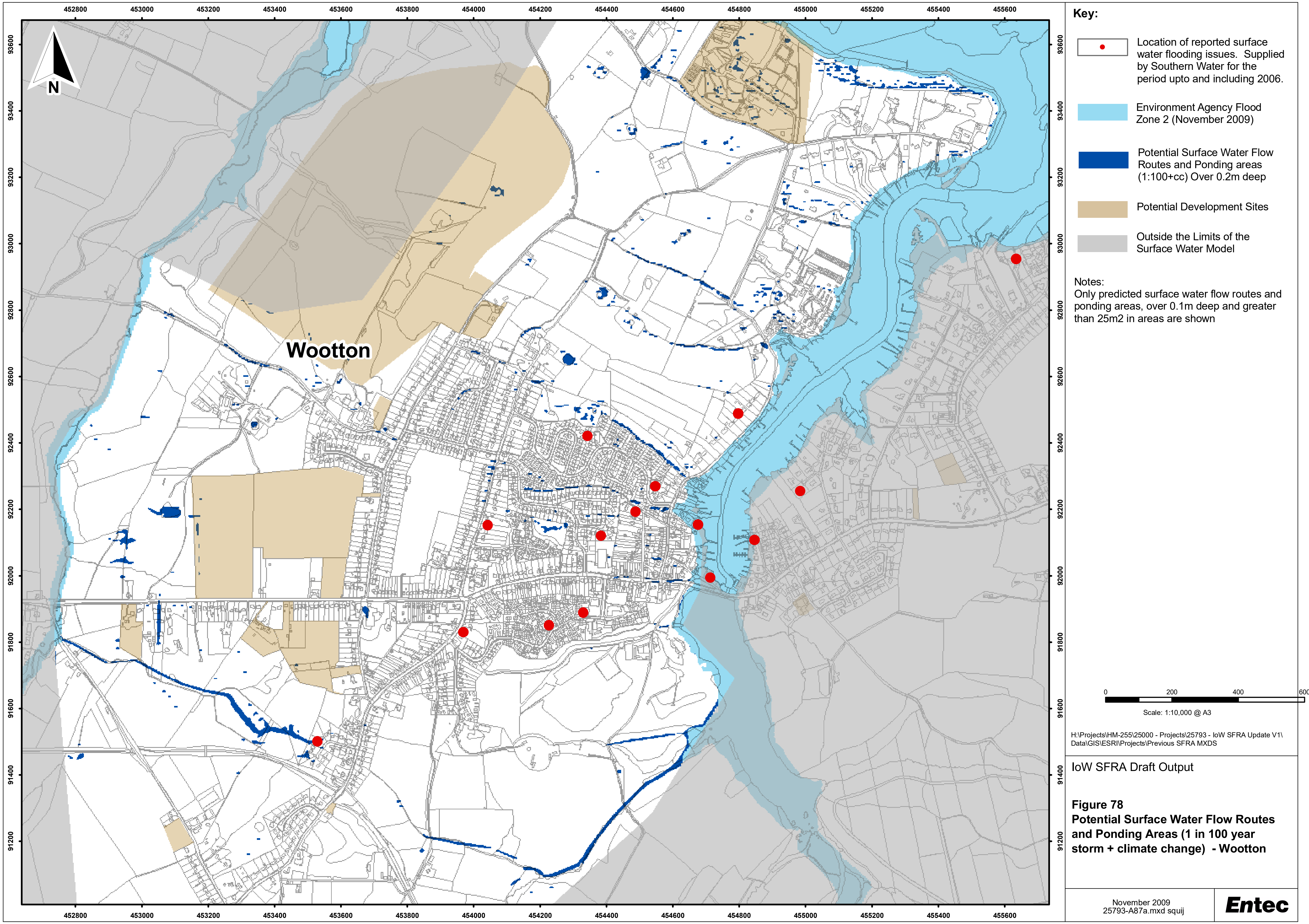
Wootton
N
Key:
Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
Environment Agency Flood Zone 2 (November 2009)
Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
Potential Development Sites
Outside the Limits of the Surface Water Model
Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown
0 200 400 600 Meters
Scale: 1:10,000 @ A3
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IoW SFRA Draft Output
Figure 78
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Wootton
November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix P
Newport

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Newport has the greatest density of watercourses of any town on the Island, all of which are classified as Main Rivers and a significant number of these have got Agency Flood Zones associated with them. There exists both tidal and fluvial flood risks in Newport. The tidal flood risk, as defined by the Flood Zone extends as far up the Medina Estuary as the bridge where the A3020 crosses the River Medina. However, the tidal mapping of the Medina Estuary carried out for this SFRA indicates that the tidal flood risk may extend further upstream. This discrepancy is likely to be due to different methodologies used. Section 5 details the flood mapping methodology used in this SFRA and notes how the extents were determined solely on the basis of the LiDAR topographic data and the extreme sea levels. No site specific information relating to the location of weirs or other control structures was included.

Fluvial Flood Zones exist for the River Medina, Lukely Brook, Pan Stream and Gunville Stream. Parkhurst Stream and the tributaries of Pan Stream however, which are designated as main rivers, do not have Flood Zones.

The Isle of Wight Autumn 2000 Flood Investigation Study –(*Newport Isle of Wight Council Flood Report*) found that although parts of Newport are in the Medina and Lukely Brook floodplains, only St Cross Mill was reported as flooding due to high river levels. Through Newport channel improvement works designed in the 1960s were sufficient to prevent more extensive flooding, although the standard of protection will diminish with time. No tidal flooding was reported during the winter of 2000 / 2001.

The Isle of Wight Autumn 2000 Flood Investigation Study – (*Newport Isle of Wight Council Flood Report*) identified several site specific flooding incidents. These are listed below:

- 47 Garden Way was flooded due to excess water coming down the slope off adjacent Downside School playing fields and pooling against the side of the house.
- 185 Fairlee Road was flooded due to water pooling of water in the road and overflowing the driveway and into the property. This location is a low point in the road that will accumulate water from both sides. In addition surface water would come down from Mews Lane. Insufficient capacity of road and footpath drains has been attributed as the cause of the flooding.
- 2 New Close Farm Cottages, Nunnery Lane. This property lies at the base of a short valley with high ground on three sides. The accumulation of excess runoff entering the property from the slopes must have resulted from saturated areas or areas of low permeability.
- Lukely Mill which is situated adjacent to Lukely Brook flooded when the capacity of Lukely Brook was exceeded.
- 239 Gunville Road, Gunville. The capacity of Gunville Brook was exceeded which caused flooding of the property

Sustainability and Regeneration Objectives

The Spatial Strategy for the Medina Valley area is to plan for housing and employment growth, accommodating the planned urban extensions at East Cowes and Newport. Sites to meet the supply requirement of PPS3 will be allocated in the Medina Valley Area Action Plan.

To deliver the broad distribution of housing required within the Medina Valley, housing will be developed on the existing allocations and on sites with extant permission. Should there be a need to allocate further sites over the plan period they will be identified through the AAP process.

Within the Medina Valley, the focus for employment will be to provide a range of sites for appropriate growth sectors, office and general workspace needs. Existing employment sites and buildings will be safeguarded where they are important to sustaining the local economy and meeting the Council's regeneration led development objectives.

To ensure that there is an adequate supply of sites for businesses which require access to water frontage, employment sites with deep water frontage will be safeguarded for uses which require deep water. The Council will seek to safeguard and maintain the function and facilities of appropriate existing wharf sites.

The assessment of flood risk in Newport, Cowes and East Cowes and the classification of flood risks for each of the proposed sites will aid in the land allocation decision process due to take place as part of the Medina Valley AAP.

Sites at Risk

The sites assessed to be at risk are those which intersect the Flood Zones present within Newport. Figure 79, highlights quite a number of large sites that are assessed as being at risk of flooding, however Figure 80 illustrates that only a small portion of each of these sites are with Flood Zones 2 and 3. This is because the topography rises quickly from the edge of the floodplain. The large potential development sites adjacent to Gunville Stream are examples of this. In line with the LPAs approach to managing the predicted climate change induced impacts of sea level rise, the 2115 climate change epoch has been used to assess tidal risk to the potential development sites. The sites most significantly impacted sites are those along side the Medina Estuary downstream of where the A3020 crosses the river.

Parkhurst Stream, which flows down Horsebridge Hill to the North West of Newport, and the tributaries of Pan Stream to the east of the town have no Flood Zones. Does not have an associated fluvial flood zone, this is likely to be because the watercourse's drainage area falls below the 3km^2 applied by the Environment Agency. Owing to the presence of the Pan Stream, there is likely to be an associated fluvial flood risk, this potential risk should be assessed and appropriately managed in accordance with PPS25 as part of any future development.

Climate Change

The potential sites most vulnerable to the impact of climate change, and the associated increase in sea level, are:

- those on both banks of the Medina between Seaclose Park and the crossing of the A3020
- The region of adjacent to the River Medina in the Coppin's Bridge and East Street
- Along the lower reaches of Lukely Brook just upstream of its confluence with the River Medina.

In these areas there is potentially significant increase in the predicted extent of the tidal flood risk zones when the predicted impacts of climate change are accounted for. In line with e LPAs approach to managing the predicted climate change induced impacts of sea level rise, the 2115 climate change epoch has been used to assess tidal risk to the potential development sites.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

Newport has a relatively large upslope catchment area, which means that the surface water generated from outside the town boundary flows through the town. The modelling predicts a series of potential flow routes and ponding areas throughout the urban area. The modelling has routed the surface water run-off into the topographic low points (valleys), these areas are clearly evident in those locations where there is currently no Flood Zone designation. Potential flow routes can be observed in almost all the valleys which lead down towards the town.

These flow routes are predicted to impact a large number of the potential development sites, this is a risk which should be further investigated to ensure that the risk is sustainably managed and the situation not exacerbated to downstream areas as a result of any future development. The incorporation of Southern Water's surface water drainage network and information relating to the tidal influence on the outfall of surface water drains would be useful additions to further work.

Much of the topography of Newport is comprised of high resolution LiDAR data which includes the representation of small topographic features. In all urban areas the LiDAR has been edited to remove the buildings. This editing process results in a slightly uneven surface profile, which can result in the production of small depressions that fill with water. It is likely that this has been the situation in the densely built urban parts of the modelled catchments where there are many small isolated areas of predicted flooding.

In the south west of the town, Figure 90 depicts large unconfined extents of shallow flooding, this pattern of flooding is the product of SAR (Synthetic Aperture Radar) topographic data being used as there is currently no available LiDAR coverage in this area. The modelling indicates a potential risk in the south east of the town, the predictions could be refined through the use of LiDAR data as and when it becomes available.

Surface Drainage and Infiltration SuDS Potential

Newport's soils for the most part, have a high runoff potential with SPR values between 47% and 50%. Only the southern edge of town has low SPR values of between 15% and 30% (low/medium runoff potential). The southern edge of the town associated with lower runoff potential soils is also underlain by a Principal Aquifer with soils of an intermediate leaching potential. The majority of the rest of the town is predominantly underlain by a Secondary Aquifer with intermediate to high leaching potential. Infiltration Potential is classified as being medium in the centre of the town and low around the edges. Figures 8, 9 and 10 in Appendix A should be consulted.

A small area covered by SPZ 1, 2 and 3 (See Figure 7 in Appendix A) is located in the Lukely Brook area of the south western part of Newport. This area is coincident with a Principal Aquifer and the potential for groundwater contamination requires additional consideration. Infiltration SuDS techniques should be avoided in areas where land contamination is identified as being an issue. The impact of sea level rise on the high water level should be considered when designing the outfall levels of any future surface drainage systems. The Environment Agency will be pushing for an integrated urban drainage scheme is the Pan Extension Project in Newport.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Newport. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.

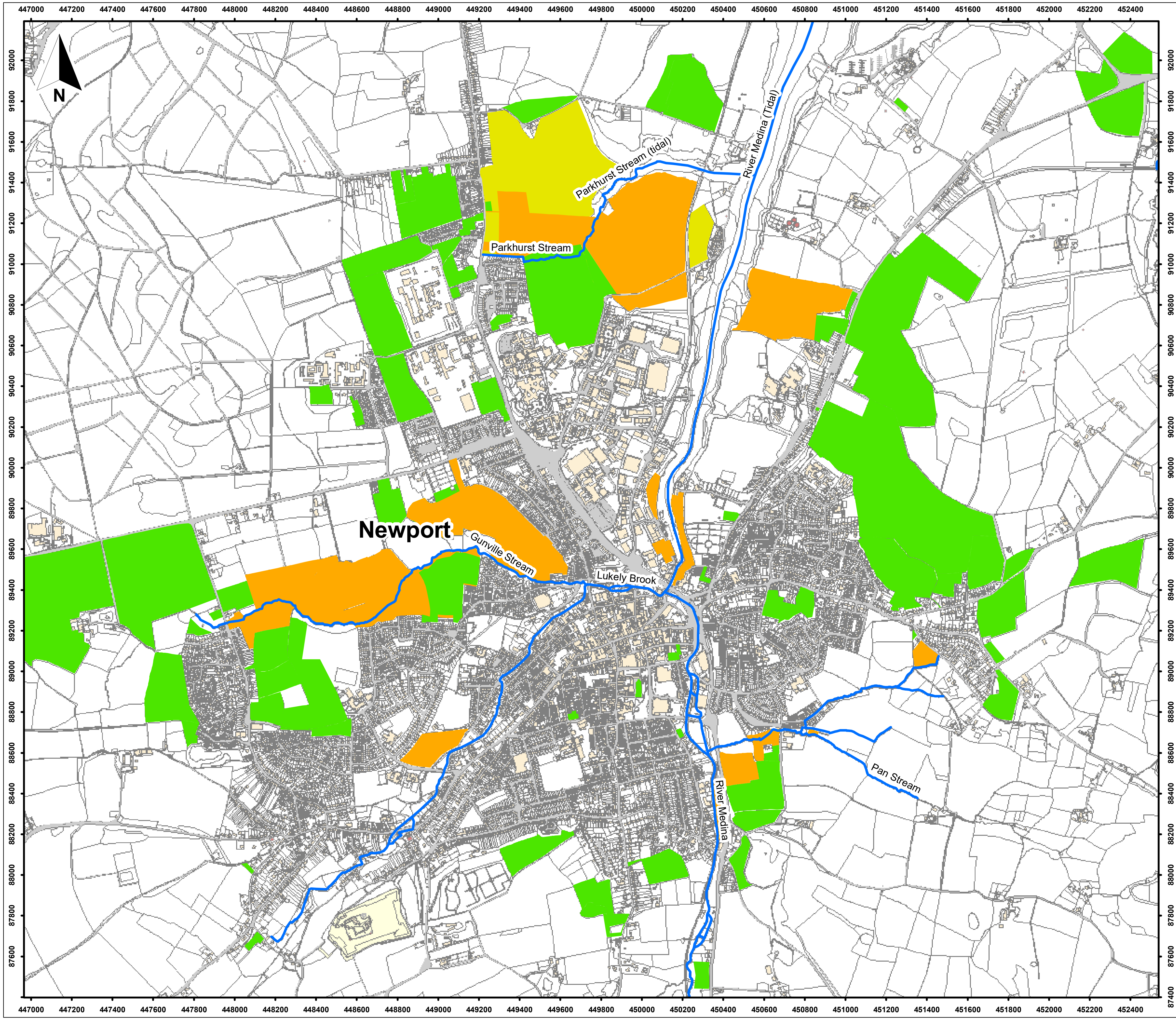
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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IoW SFRA Draft Output

Figure 79
Potential Development Sites
Qualitative Flood Risk
Newport

November 2009
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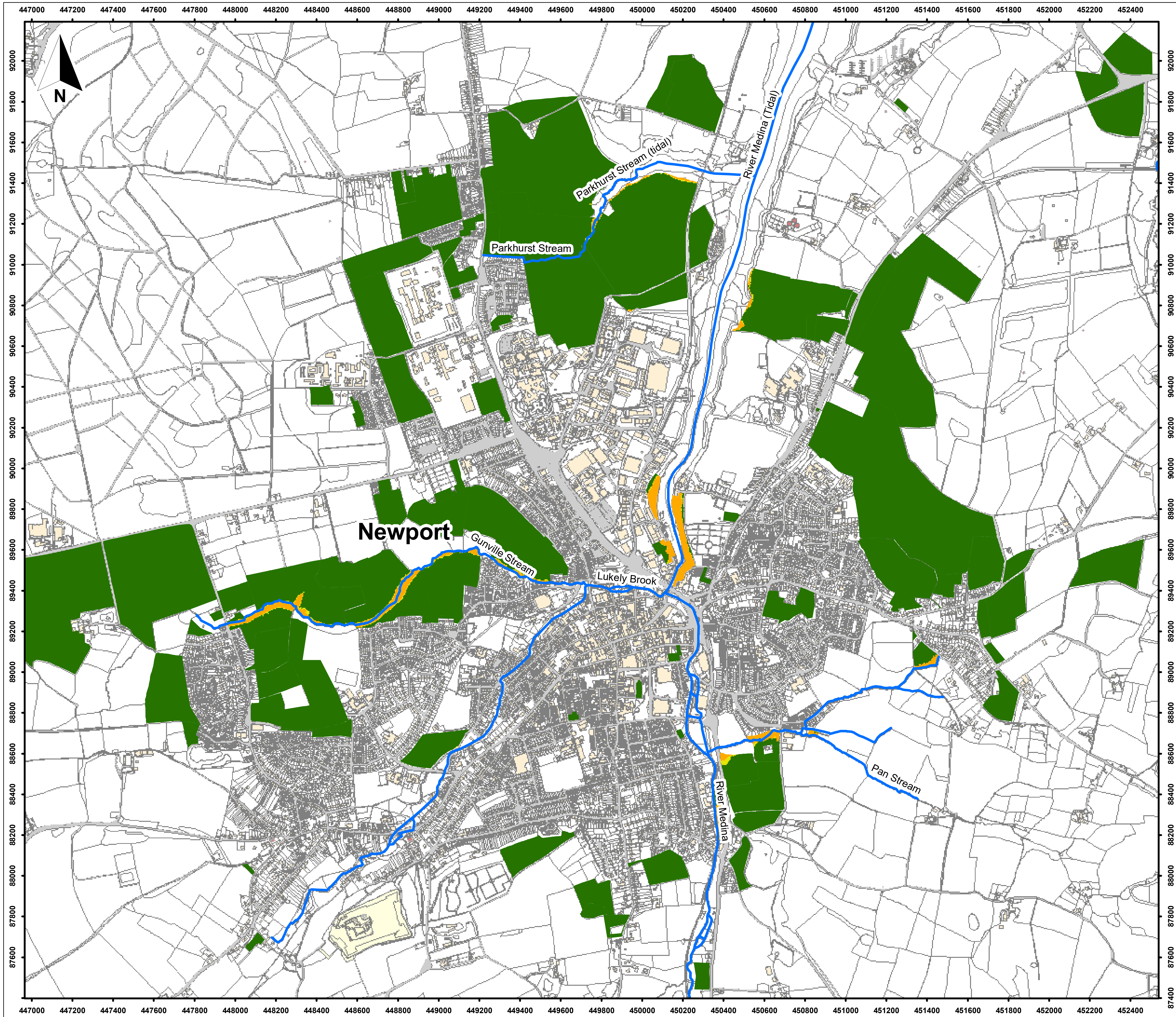

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 80
Potential Development Sites
Site Specific Flood Risk Definition
Newport

November 2009
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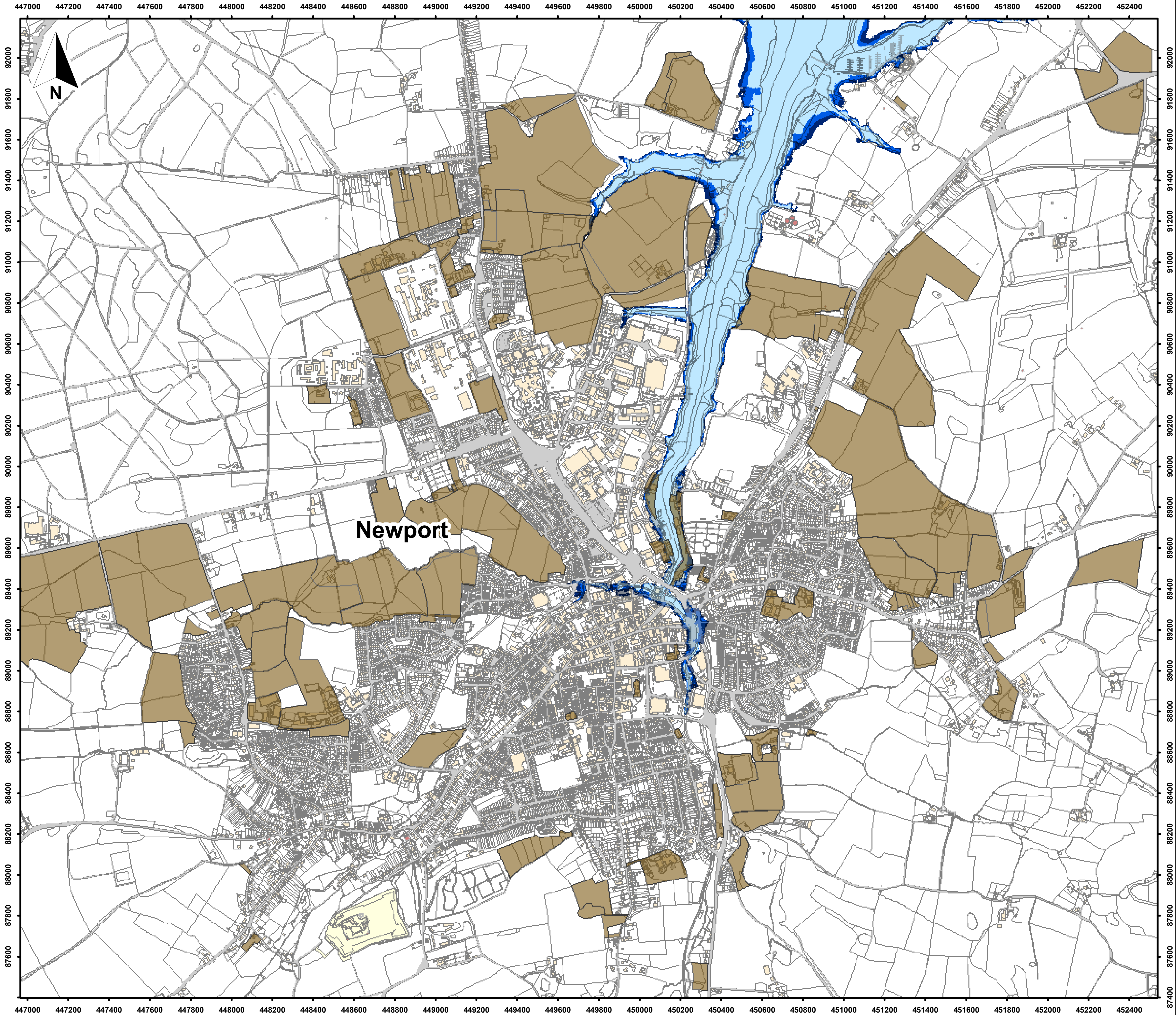

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 81
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Newport

November 2009
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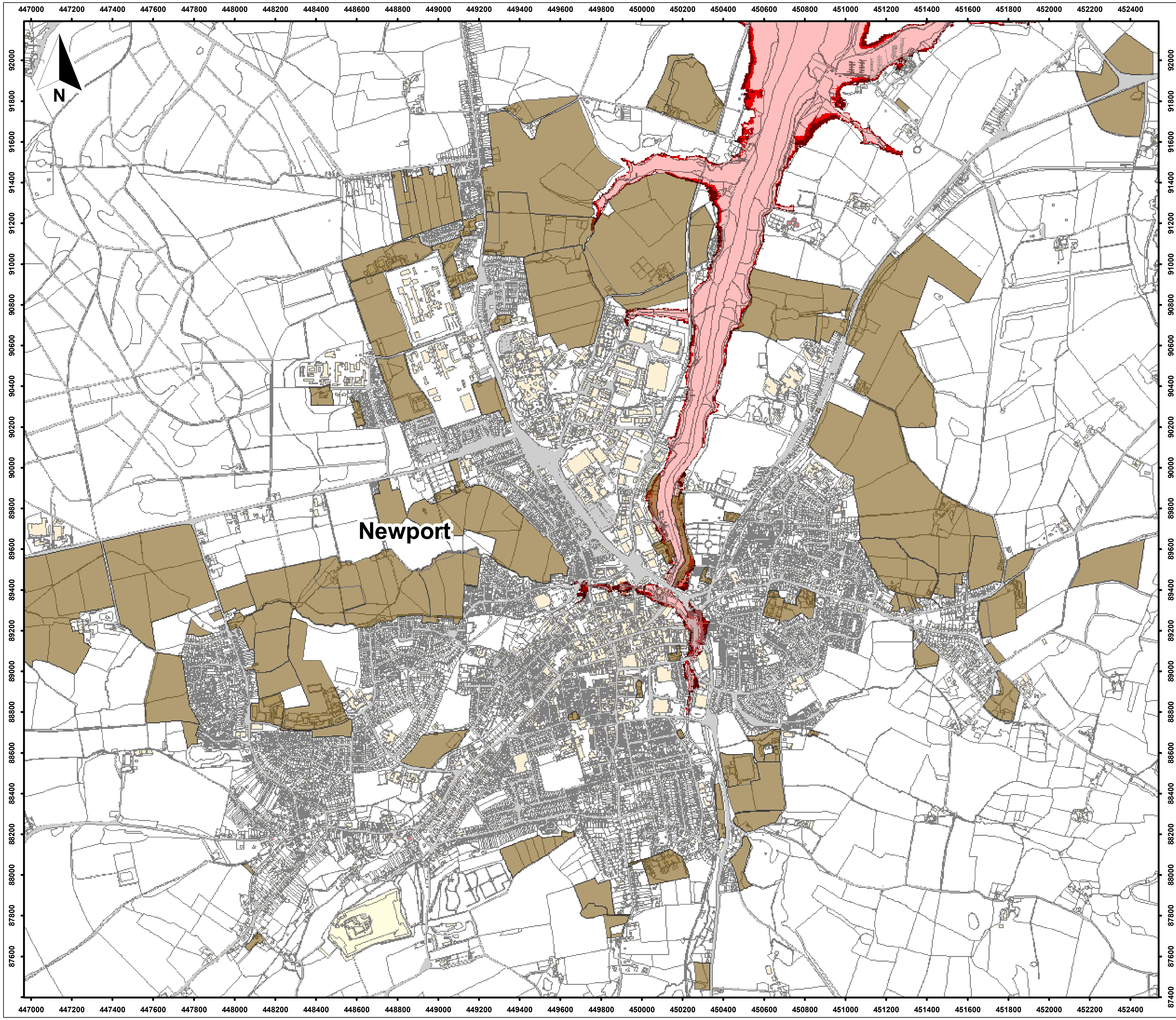
Entec



Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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IoW SFRA Draft Output

Figure 82
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Newport

November 2009
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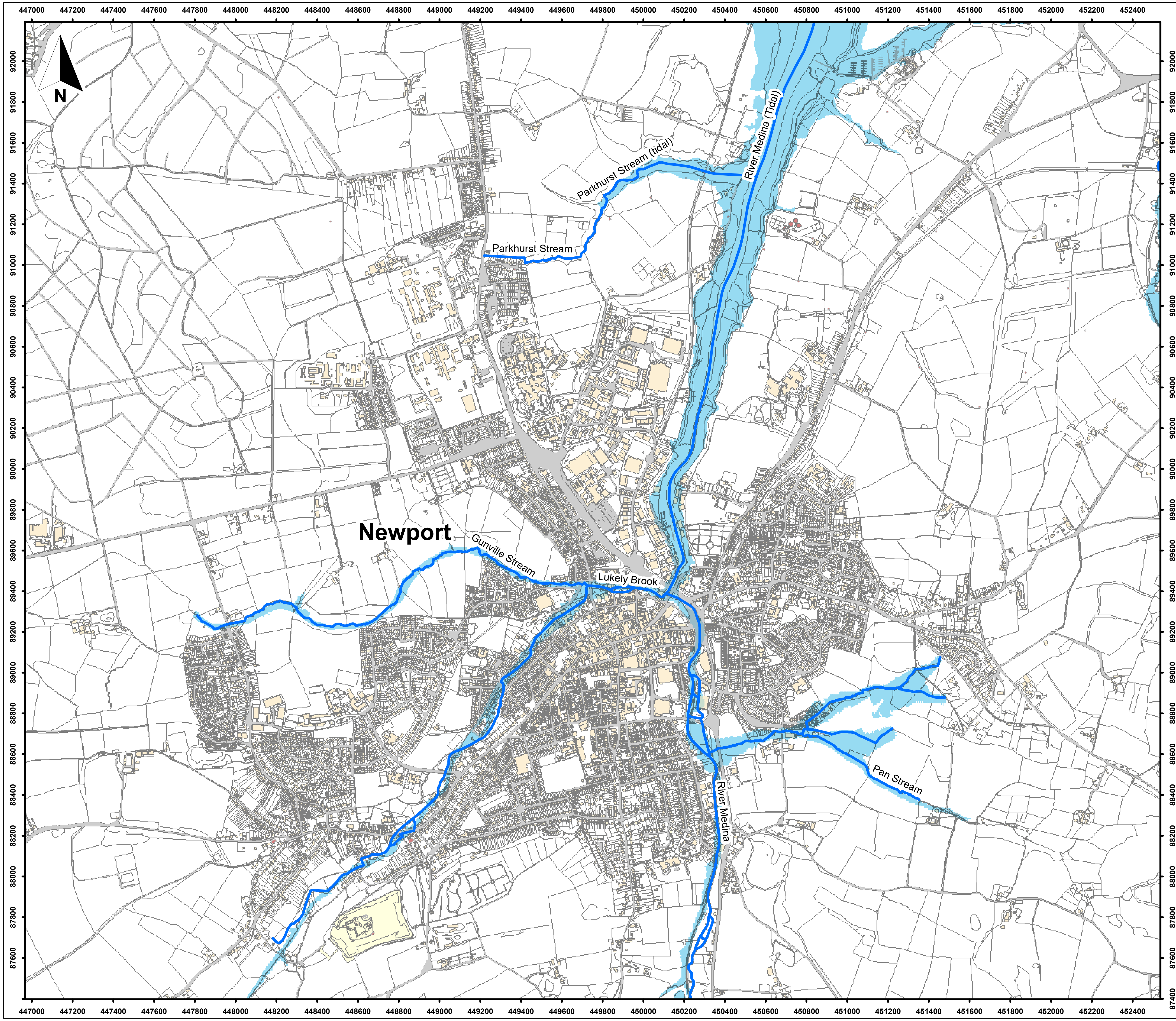

Key:

Main Rivers

Potential Exposure Risk

- High
- Medium
- Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 83
Qualitative Wind and Wave Exposure Risk - Newport

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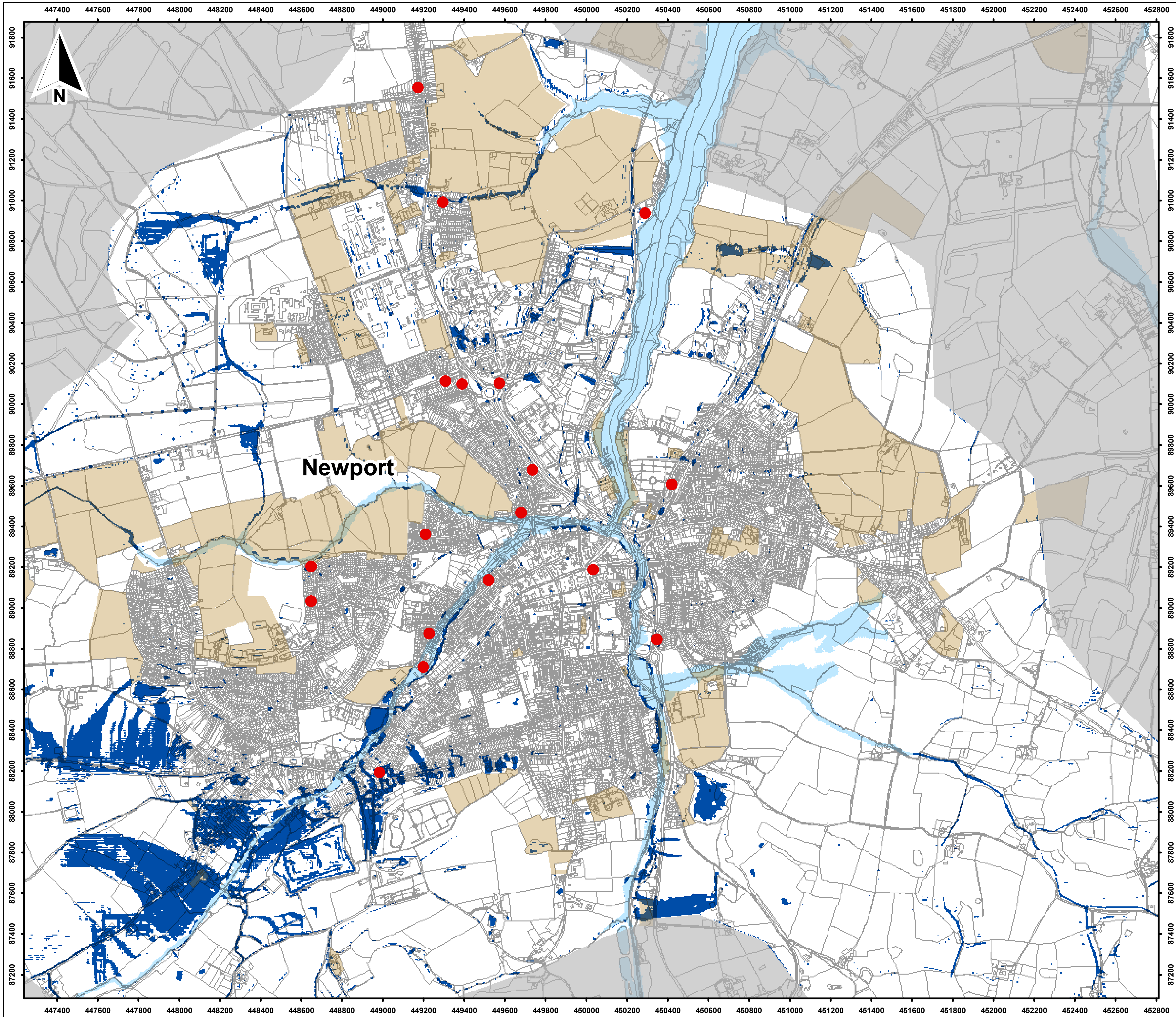

Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 84
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Newport

November 2009
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Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix Q
Cowes and East Cowes

June 2010

ISLE of WIGHT COUNCIL

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Cowes and East Cowes form part of the Medina Valley Area Action Plan. Cowes and East Cowes have been grouped together in the SFRA as they are geographically close and are connected (in terms of flood risk) by the Medina Estuary and the northern Solent coastline. While they are hydraulically independent of each other, they share very similar characteristics. Both areas are situated on high ground which slopes down to the sea or estuary and neither settlement has significant upslope contributing catchments.

Cowes is located on the western side of the Medina Estuary and represents one of the main transport connections to the mainland, via high-speed passenger ferry services to and from Southampton. Cowes' waterfront is characterised by detached and semi-detached properties and a number of maritime related services and supply businesses. The waterfront of East Cowes has a greater prevalence of industrial activity while also possessing a strategic cross-Solent link in the form of a car ferry service between East Cowes and Southampton.

There exists a belt of land along either side of the estuary which is relatively flat and this area is currently within the Flood Zones. Beyond this coastal belt, the land quickly rises in elevation, which explains the small difference between Flood Zones 2 and 3.

Sustainability and Regeneration Objectives

The Spatial Strategy for the Medina Valley area is to plan for housing and employment growth, accommodating the planned urban extensions at East Cowes and Newport. Sites to meet the supply requirement of PPS3 will be allocated in the Medina Valley Area Action Plan.

To deliver the broad distribution of housing required within the Medina Valley, housing will be developed on the existing allocations and on sites with extant permission. Should there be a need to allocate further sites over the plan period they will be identified through the AAP process.

Within the Medina Valley, the focus for employment will be to provide a range of sites for appropriate growth sectors, office and general workspace needs. Existing employment sites and buildings will be safeguarded where they are important to sustaining the local economy and meeting the Council's regeneration led development objectives.

To ensure that there is an adequate supply of sites for businesses which require access to water frontage, employment sites with deep water frontage will be safeguarded for uses which require deep water. The Council will seek to safeguard and maintain the function and facilities of appropriate existing wharf sites.

There are two gateways for the Island within the Medina Valley at Cowes and East Cowes and, as a minimum, the Isle of Wight Council will work with ferry operators to ensure that current levels of service will be supported and maintained. There is limited growth that can be accommodated within the existing land holding at East Cowes and no plans to expand facilities outside of the existing operational land. Any change to the way in which the port operates will need to clearly address the impact of traffic flows in the area

The assessment of flood risk in Newport, Cowes and East Cowes and the classification of flood risks for each of the proposed sites will aid in the land allocation decision process due to take place as part of the Medina Valley AAP

Sites at Risk

Two large potential development sites are located at the mouth of the Medina Estuary, one in Cowes and one in East Cowes. The site in East Cowes extends over a greater range of topographic elevations and as such only about half the site is predicted to be in Flood Zone 3. The large site in Cowes on the other hand, is almost all situated at a lower elevation and as such the majority of the site is located within Flood Zone 3. Pending completion of the Sequential Test, PPS25 recommends that these flood zone 3 locations are suitable for less vulnerable development types. Only upon successful application of the Exception Test should more vulnerable development be permitted. Where possible more vulnerable development should be directed towards the parts of the site assessed as being in Flood Zone 3.

Figure 85 highlights that two large potential development sites on the western bank of the Medina Estuary are at High probability of flood risk. This is because lowest parts of the site coincide with the tidal flood risk predictions. In line with e LPAs approach to managing the predicted climate change induced impacts of sea level rise, the 2115 climate change epoch has been used to assess tidal risk to the potential development sites. Nevertheless, the majority of both the sites is classified a having a low probability of flooding (Flood Zone 1). The observed zonation of flood risks is a product of the topography of the land, which rises quickly, once landward of the former railway line.

Climate Change

Figures 87 and 89 depict the 1 in 200 and 1 in 1000 predicted tidal flood extents with a climate change allowance in the Cowes and East Cowes region of the Medina Estuary. The areas potentially most susceptible to the impact of climate change in Cowes are:

- The area behind the marina, by the high speed ferry terminal, at the lower end of Denmark Road and St Mary's Road, covering the area of The Cut and Cross Street.
- The area behind the Medina Road Boat Yard and the Langley Road part of town
- Parts of the High Street

The main area susceptible to climate change in East Cowes is behind the industrial units along Clarence Road extending down to Marina Close and Britannia Way. Those potential sites which fall within the modelled climate change extents are identified in the Sites Database.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

Cowes and East Cowes are hydraulically independent of each other, but they share very similar characteristics. Both areas are situated on high ground which slopes down to the sea in all directions other than towards the south. In addition to this, both areas do not have a significant upslope contributing catchments. Owing to the slightly larger size of Cowes and the topographic form of the land, there are a larger number of potential flow routes here. There is a strong correlation between some of the recorded incidents of flooding and the modelling predictions along the main road leading down towards the Red Jet ferry terminal and Marina. There are some larges areas of potential development along the Medina Estuary in south Cowes through which the modelling predicts surface water flow routes. The same occurs in north western Cowes where a long potential flow route flows from the higher central areas down towards the coastline.

Significant potential flow routes are not predicted to affect the urban areas of East Cowes. In both areas the modelling predicts areas of surface water accumulation in the flatter areas by the coast. The nature of the flooding in these areas (the duration of inundation) will be significantly influenced by the configuration of the local surface water drainage network and the relationship between drainage outfalls and tide levels. Further, more detailed modelling work which incorporates these additional datasets will provide a more comprehensive appreciation of the flood risks in these coastal areas.

The topography of Cowes and East Cowes is entirely comprised of high resolution LiDAR data which includes the representation of small topographic features. In all urban areas the LiDAR has been edited to remove the buildings. This editing process results in a slightly un even surface profile, which can result in the production of small depressions that fill with water. It is likely that this has been the situation in the densely built urban parts of the modelled catchments where there are many small isolated areas of predicted flooding.

Surface Drainage and Infiltration SuDS Potential

Both Cowes and East Cowes are underlain by soils with a SPR of between 47% and 50% resulting in relatively high runoff rates. A distinctly different soil classification covers the sides of the estuary where the SPR value is more in the region of 15% which means in these areas the runoff rates will be lower. The area around Cowes and East Cowes is underlain by Secondary Aquifers. Infiltration potential is classified as being medium along the high land and low nearer sea level. A particular point of interest Cowes is the presence of a small area classified as SPZ 1. This area is located at the water treatment works between The Moorings and Windmill Chase.

SuDS in this RDA are only constrained with respect to the low infiltration potential of the south west half of the town. It could be possible to discharge unrestricted volumes uncontaminated surface water into the Medina Estuary. Before infiltration SuDS are implemented, the potential for contaminated land must be considered.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within Cowes and East Cowes. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.

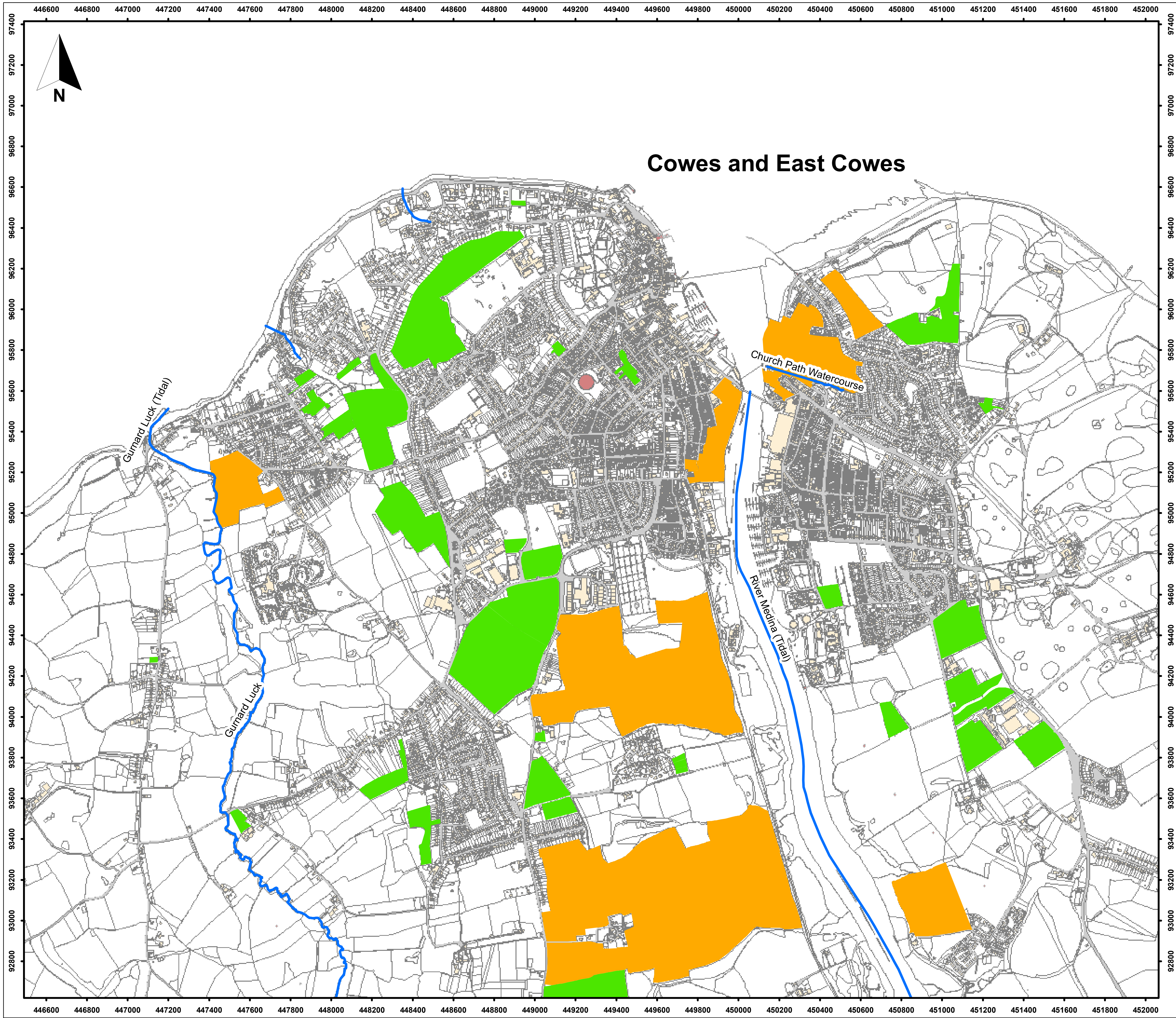
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change allowance and above the 1 in 200 year predicted tide levels for the year 2115. The Environment Agency should be consulted for fluvial flood levels and the Environment Agency should be asked to confirm if the predicted tide levels in Figure 1 in Appendix B are still the most recent predictions. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change) and 1 in 200 year tidal event (plus climate change).

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 85
Potential Development Sites Qualitative Flood Risk Cowes and East Cowes

November 2009
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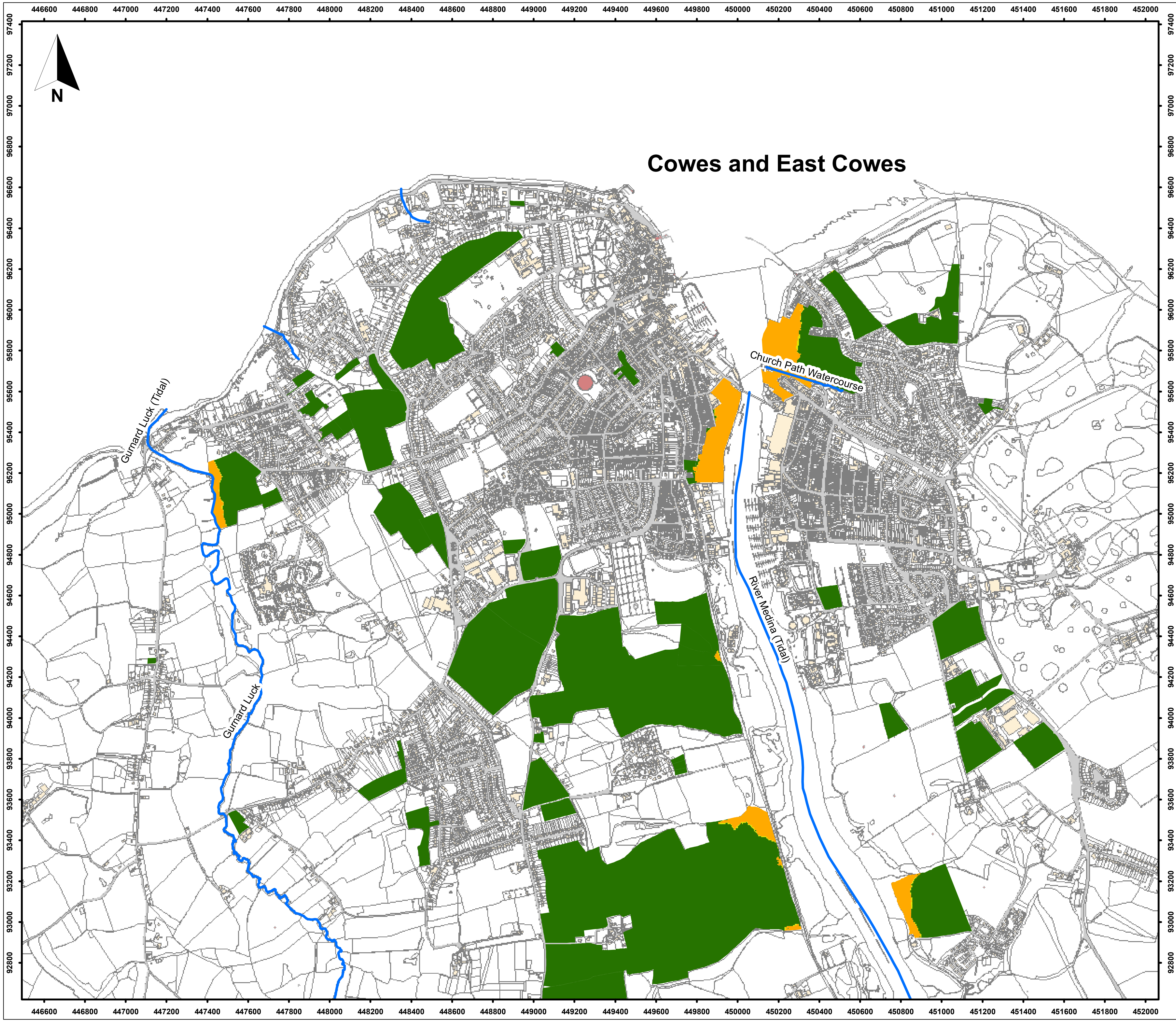

Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 86
Potential Development Sites
Site Specific Flood Risk Definition
Cowes and East Cowes

November 2009
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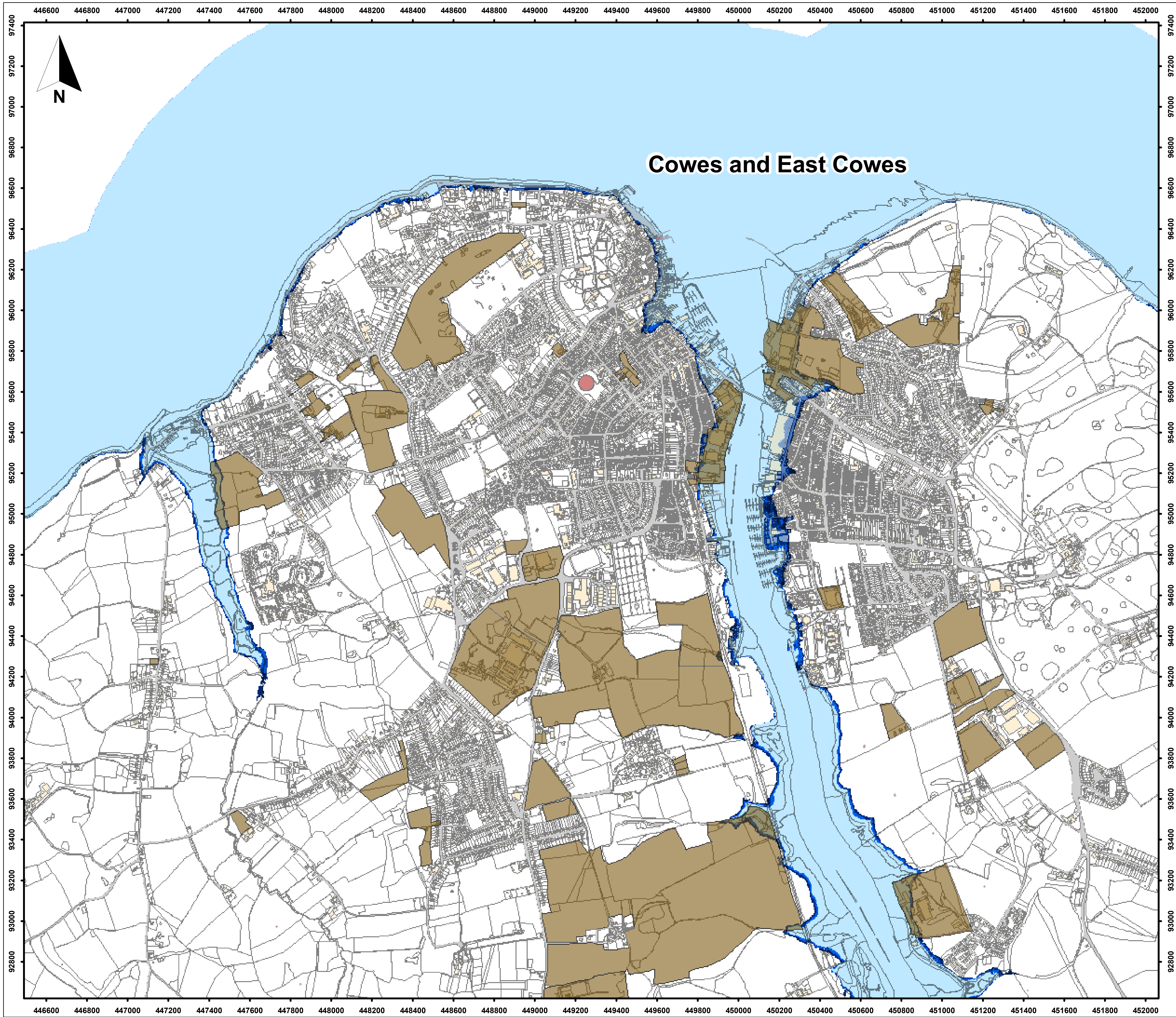

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115
- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 87
Potential Development Sites
Flood Zone 2
Climate Change Scenarios
Cowes and East Cowes

November 2009
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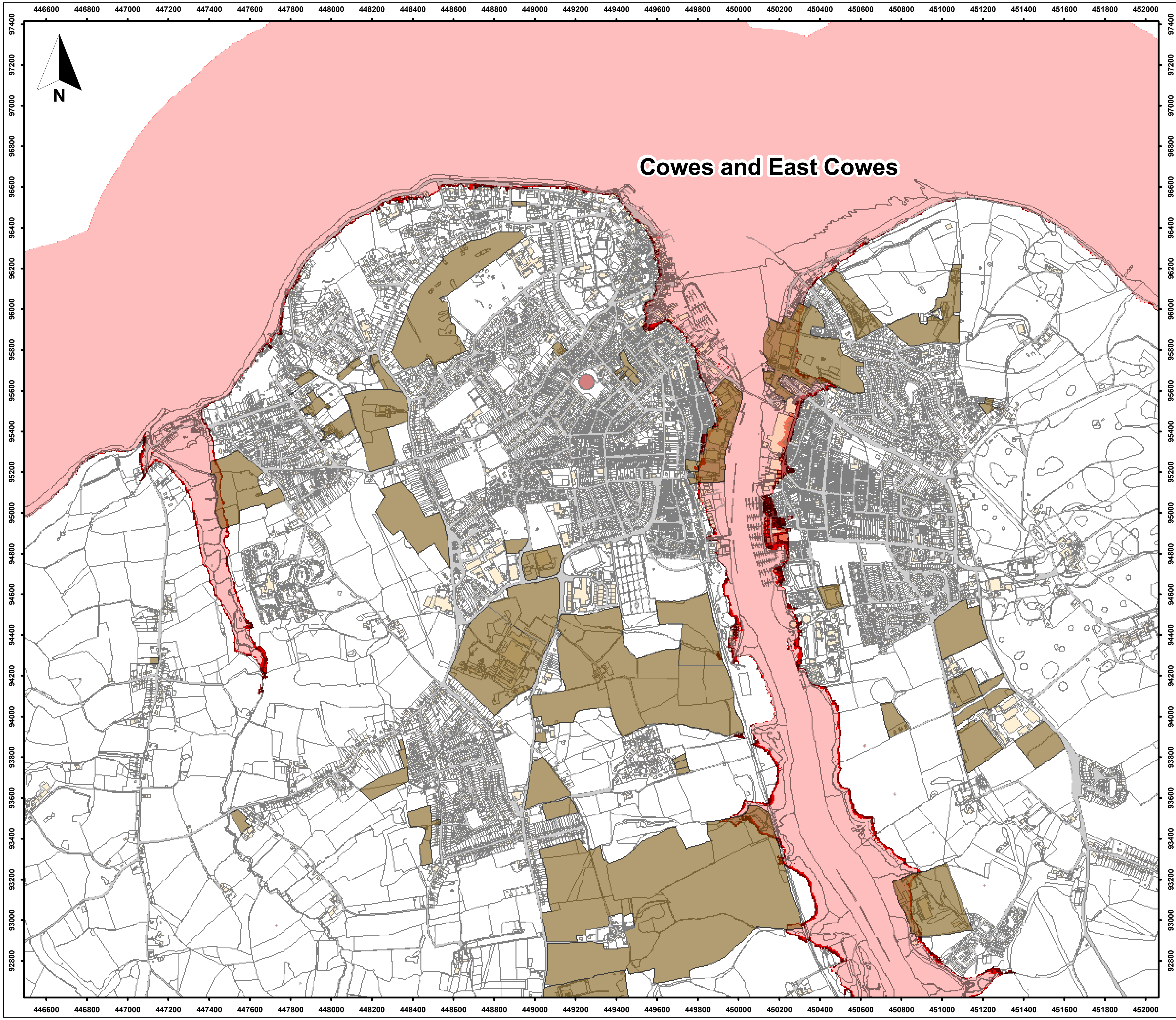

Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 88
Potential Development Sites
Flood Zone 3
Climate Change Scenarios
Cowes and East Cowes

November 2009
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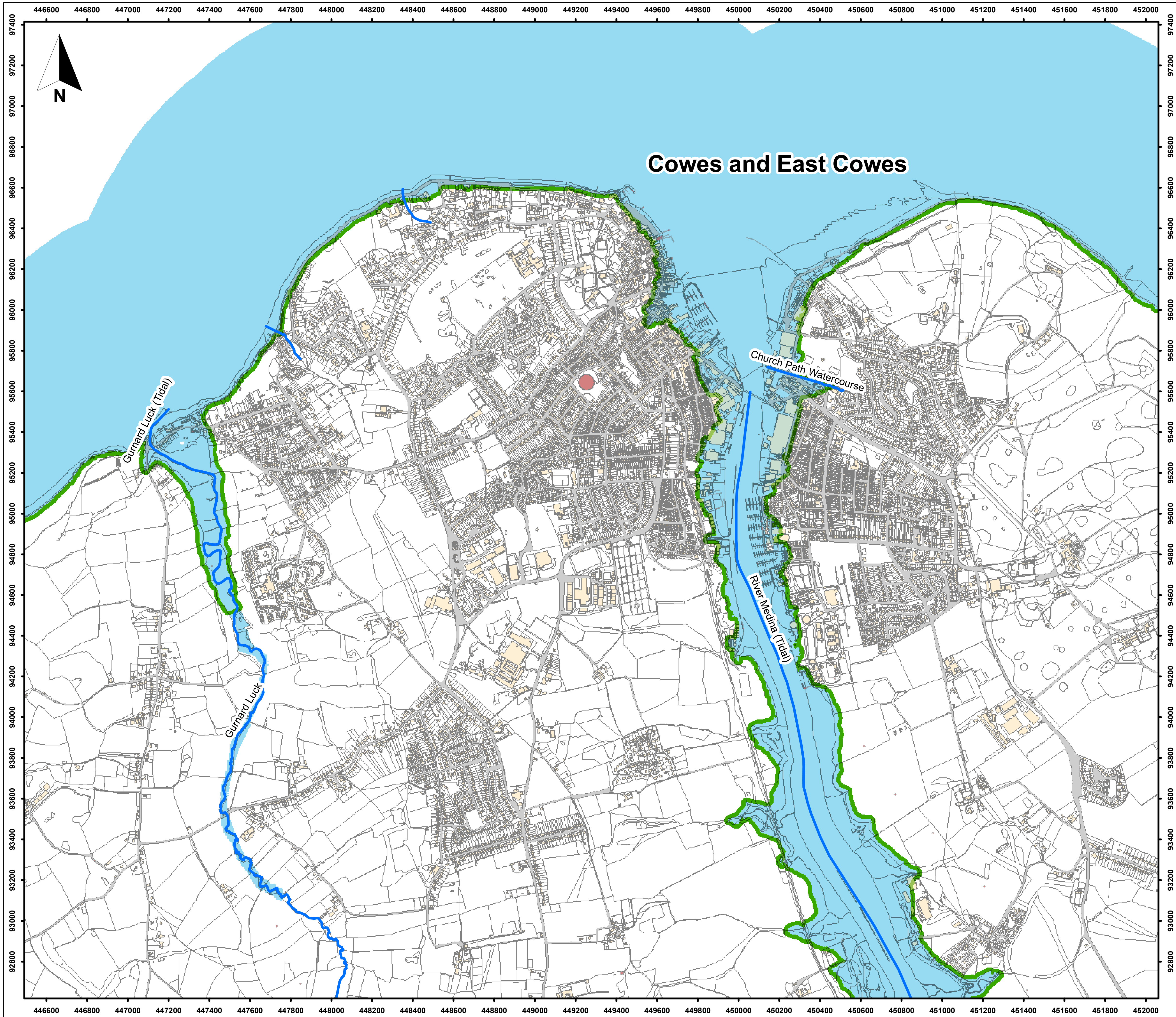

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 89
Qualitative Wind and Wave Exposure Risk - Cowes and East Cowes

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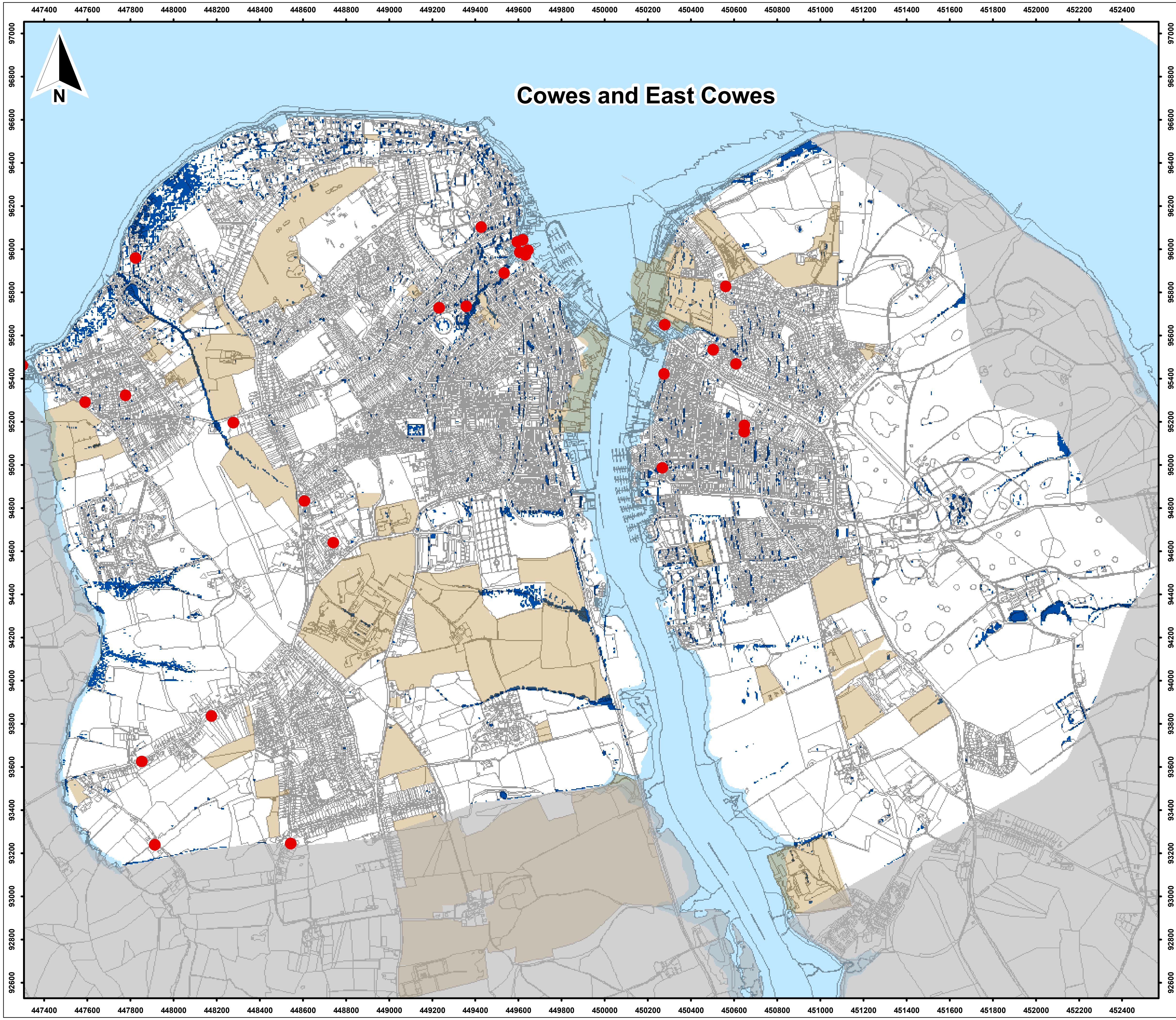

Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 Meters

Scale: 1:18,000 @ A3

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Isle of Wight SFRA MK2

Figure 90
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Cowes and East Cowes

November 2009
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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix R
Arreton

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Arreton is a small settlement, classified as a Rural Service Centre (RSC), located in the mid reaches of the River Yar catchment in the South east quarter of the Island. The majority of the existing development and proposed development sites are outside of Flood Zones 2 and 3. The surface water modelling has identified a potential flow route which could form to the east of the main road (A3056), this should be reviewed and appropriately managed as part of any future development proposal.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Arreton and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Arreton RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

Within the vicinity of this Rural Service Centre only a small number of potential development sites have been identified. With the exception of the large site to the north of the settlement the majority of the sites are located within the Eastern Yar valley corridor. The fluvial flood zones in this area are not very extensive, for example, the Flood Zone 2 extent reaches maximums of between 250m and 300m. As such only two of the identified sites are predicted to be impacted by river flooding, the first is located to the east of Horringford and the other is situated between Little Budbridge Farm and Hale Common. Figure 92 illustrates the parts of the sites located within Flood Zone 2 and 3a.

Both the sites identified above were partially flooded during an event recorded in 1974.

Climate Change

The methodology applied to assess the potential impacts of climate change in the fluvial domain is outlined in Section 5.2 of the SFRA report. There are not considered to be significant differences between the Flood Zone 2 and 3 extents in this settlement. Nevertheless, any future development of the sites partially within Flood Zone 2 should be accompanied by an FRA which demonstrates that the spatial landuse planning and building designs have been informed by a review of the implications of climate change on peak river levels. Unless otherwise agreed with the LPA and Environment Agency, a minimum of 100years worth of climate change should be applied in the FRA.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The results of the surface water analysis predict a potential ponding and flow route through the settlement. This route runs to the east of the main road and appears to currently skirt round the majority of the existing development. The route and ponding areas do however run through and alongside two of the settlement's potential development sites. Future development and regeneration within Arreton should consider the management and preservation of this potential flow route. Future development also provides the opportunity for current surface water issues to be addressed. The data made available to the SFRA has not identified any reported surface water flooding incidents in Arreton, this could be the result of either a flood event not having taken place or because any historic flooding has not been reported.

Surface Drainage and Infiltration SuDS Potential

The assessment of geology, soils and groundwater vulnerability mapping indicates that there is a medium potential for infiltration SuDS to be utilised. Site specific infiltration testing would be required at the detailed design stage of the SuDS design process. The area occupied by the Flood Zones is assessed as having a lower potential for infiltration SuDS, owing to local geology variations within the floodplain. Where possible, SuDS attenuation basins/ponds or other features should be located outside Flood Zone 3.

For an area of approximately 1500m to 2000m there are not Source Protection Zone (SPZ) designations. The SPZ mapping is however subject to change, and should be reviewed with the Environment Agency when proposing any form of SuDS solution.

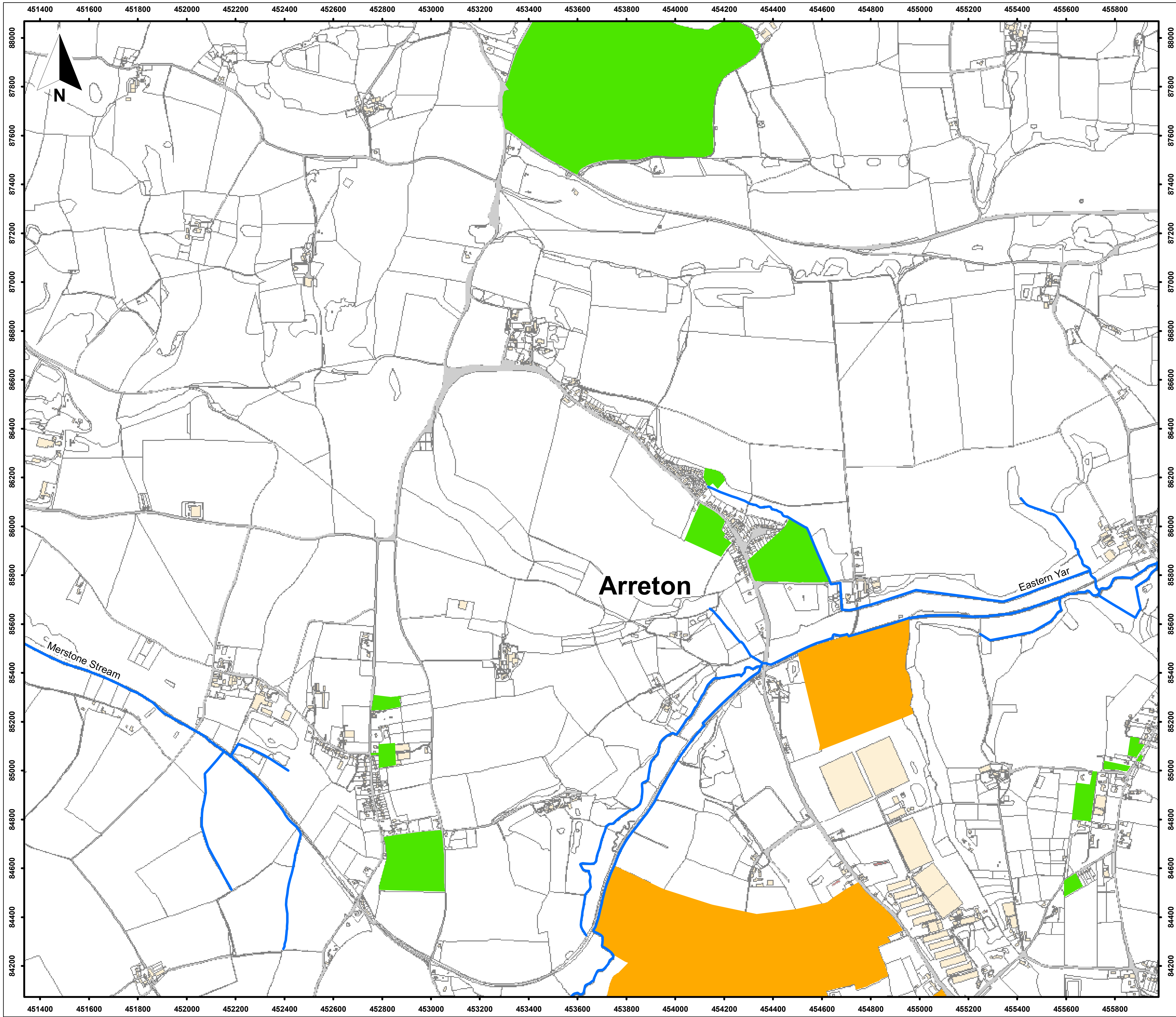
The geology mapping does not indicate that the area is susceptible to mass movement and/or slope instability.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within the Arreton area. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change. The Environment Agency should be consulted for fluvial flood. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change.
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.
- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 91
Potential Development Sites
Qualitative Flood Risk - Arreton

November 2009
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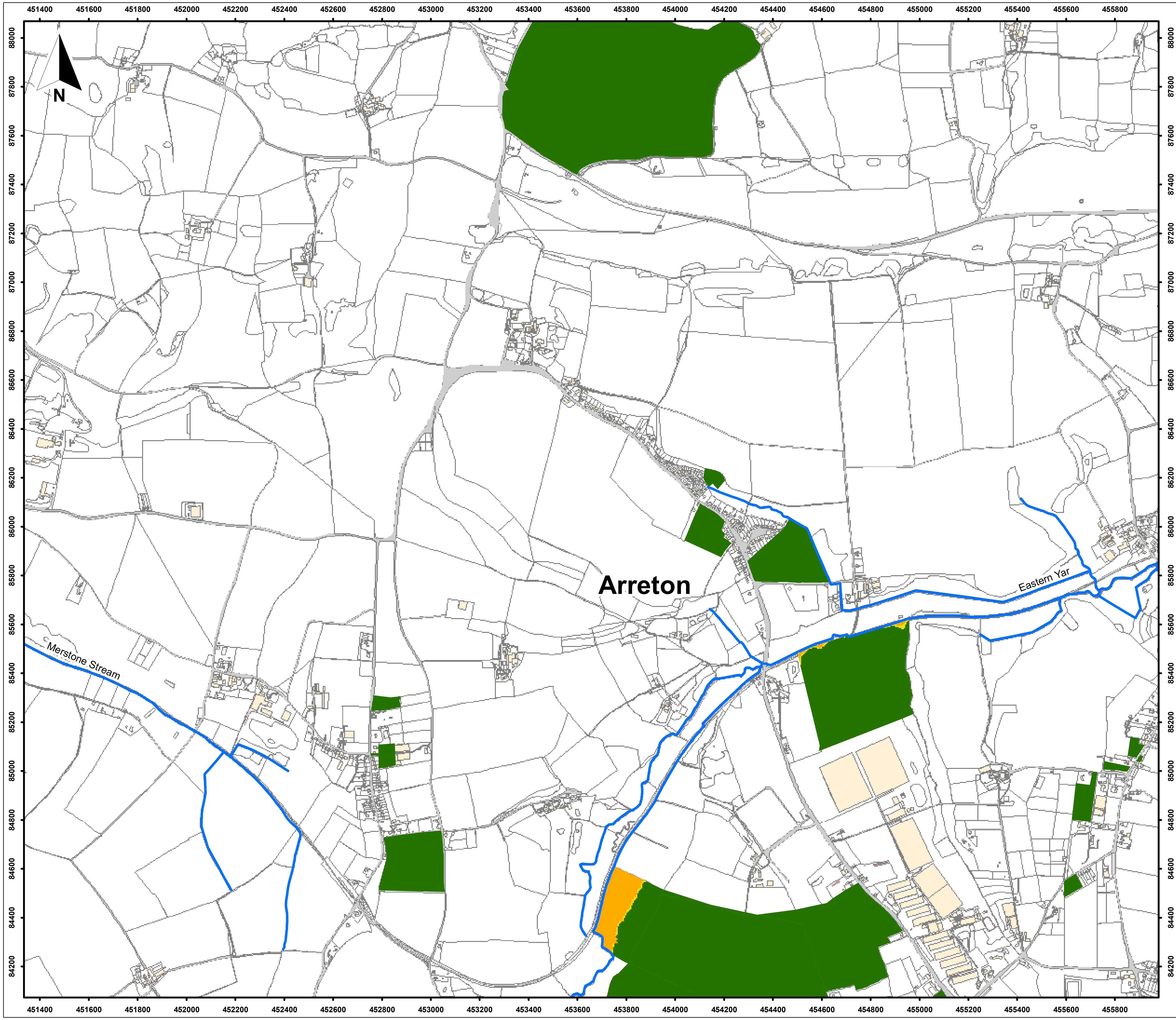

Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 92
Potential Development Sites Site Specific Flood Risk Definition - Arreton

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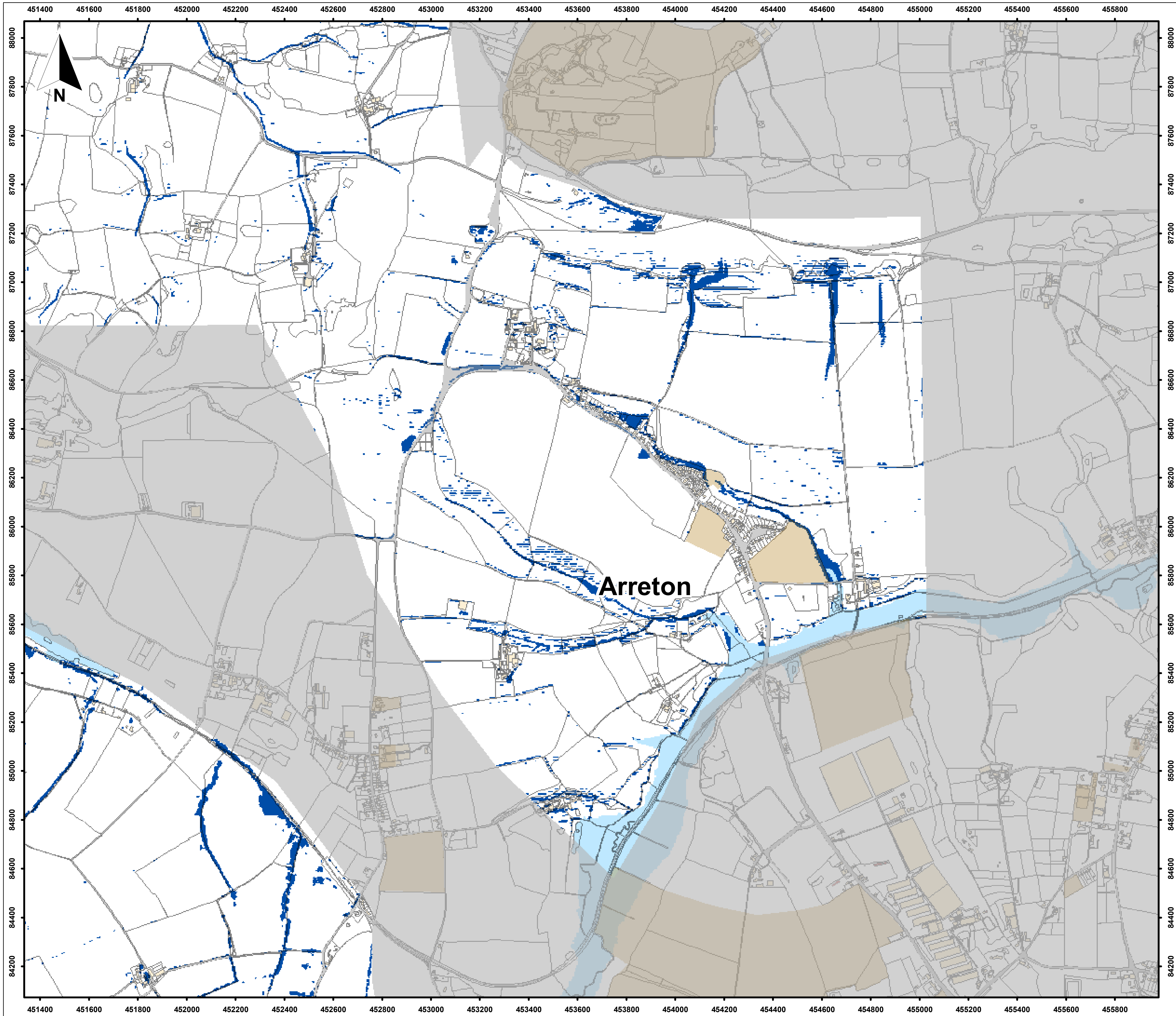

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 93
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Arreton

November 2009
25793-A102.mxd squij

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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix S
Niton

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Niton is classified as a Rural Service Centre which is located in the upper catchment of the Eastern Yar. The Environment Agency flood zones do not extend to cover watercourses with drainage areas of less than $3km^2$, this has resulted in the flood zones not being produced for Niton. Nevertheless, the surface water modelling has provided an indication of route of the floodplain. Any development proposal in Niton, although currently in Flood Zone 1, should be accompanied by an FRA which either confirms the Flood Zone 1 location or demonstrates that any flood risks are appropriately managed in line with the requirements of PPS25.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres such as Niton and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Niton RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

Niton is located in the upper reaches of the Eastern Yar catchment, the associated floodplain in the headwaters of the river are very narrow, as a result of the steeper topography. As such all the potential development sites located in Niton have been assessed as being outside the extent of Flood Zone 2. The Flood Zone 1 classification of all the potential sites in Niton is also a result of the Flood Zone extents not extending through the settlement. The Flood Zone mapping project typically only includes drainage areas of more than $3km^3$. The surface water modelling does however identify the likely route of the floodplain – see the following sections. Further downstream, in Whitwell, two of the potential development sites have been assessed as fractionally encroaching into Flood Zones 2 and 3.

Climate Change

The results of the assessment approach outlined in Section 5.2 of the SFRA report do not identify any significant increase in the extent of fluvial flood risks, as the flood zones do not extend into the settlement centre. Owing to the headwater location of this settlement and the narrow valley floor, it is likely that the increased river flows predicted as a result of climate change, will have little impact on the spatial extent of the flood risk zone.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The surface water modelling has identified a potential flow route through the centre of Niton, which has the potential to impact upon a number of exiting developments. In terms of potential development sites, it is the sites to the north east of the settlement which are predicted to be the most significantly impacted. Development of these sites should therefore carefully consider how development may impact on this flow route. Inappropriate development could have the potential to increase flooding in Niton if the surface water flow routes were not preserved and correctly managed.

Surface Drainage and Infiltration SuDS Potential

The majority of the potential development sites in Niton are assessed as being in areas where infiltration SuDS techniques only have a low potential. This classification is the result of incomplete Groundwater Vulnerability data in the vicinity of this settlement. Nonetheless, infiltration SuDS should remain a preferred option unless infiltration testing demonstrates that it is not a feasible option. Caution should be applied when considering any drainage solution in the west of the settlement owing to the close proximity of a Source Protection Zone (SPZ) 1. The SPZ mapping is however subject to change, and should be reviewed with the Environment Agency when proposing any form of SuDS solution.

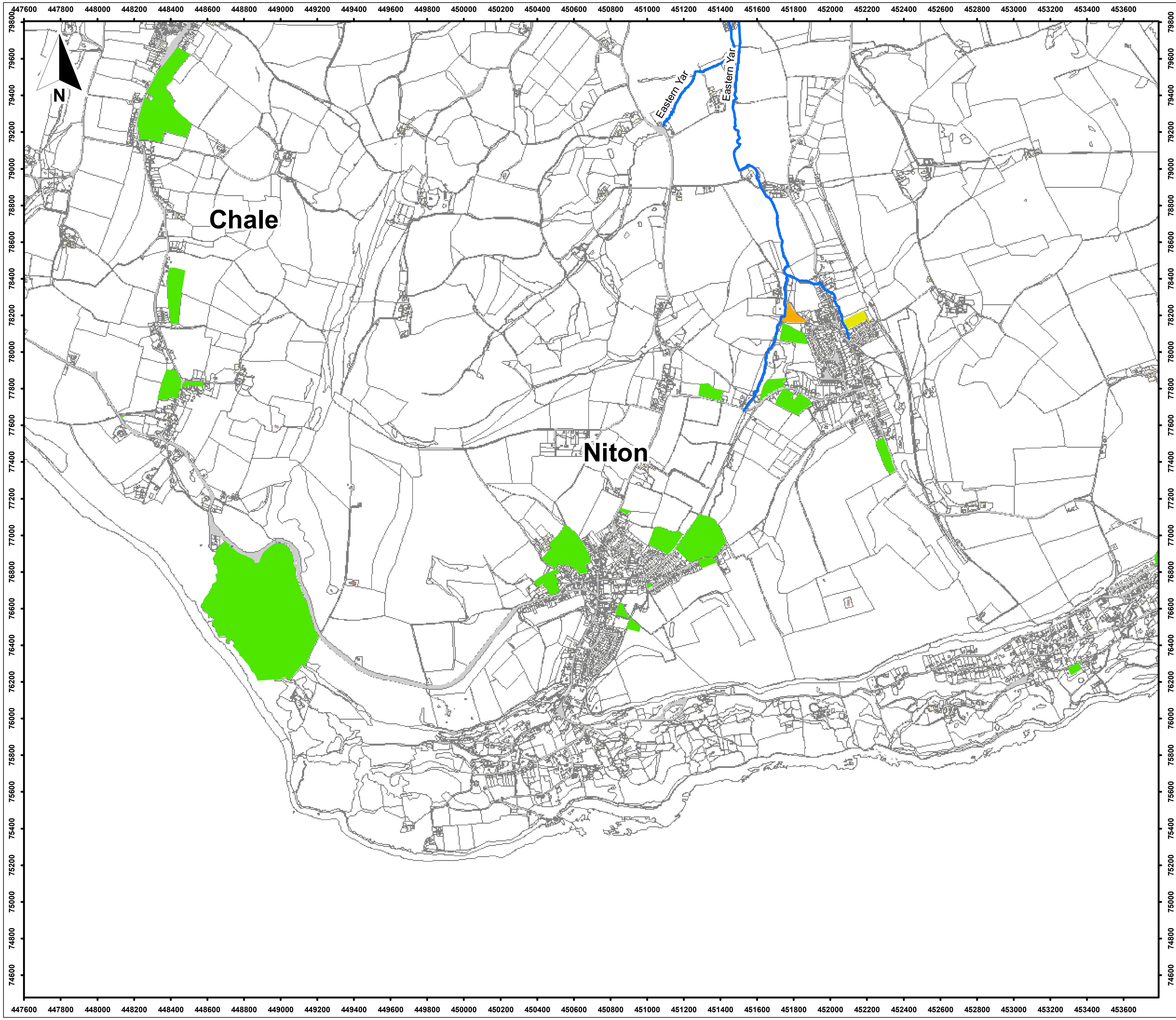
Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within the Niton area. The development of any previously undeveloped site in Flood Zones 2 and 3 is considered by PPS25 as an increase in flood risk and should be avoided. The redevelopment of any previously developed sites within the Flood Zones will require the PPS25 Sequential test to be passed and the Exception Test satisfied where necessary.

As there is no Flood Zone 2 and 3 extent in Niton, despite the presence of the upper reaches of the River Eastern Yar, it is recommended that the Environment Agency be consulted for all development proposals within Niton. It may be necessary for future FRAs to define the fluvial flood risk.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change. The Environment Agency should be consulted for fluvial flood. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design. Site specific hydraulic modelling may be required to define these levels.
- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change.
- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.
- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.
- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain
The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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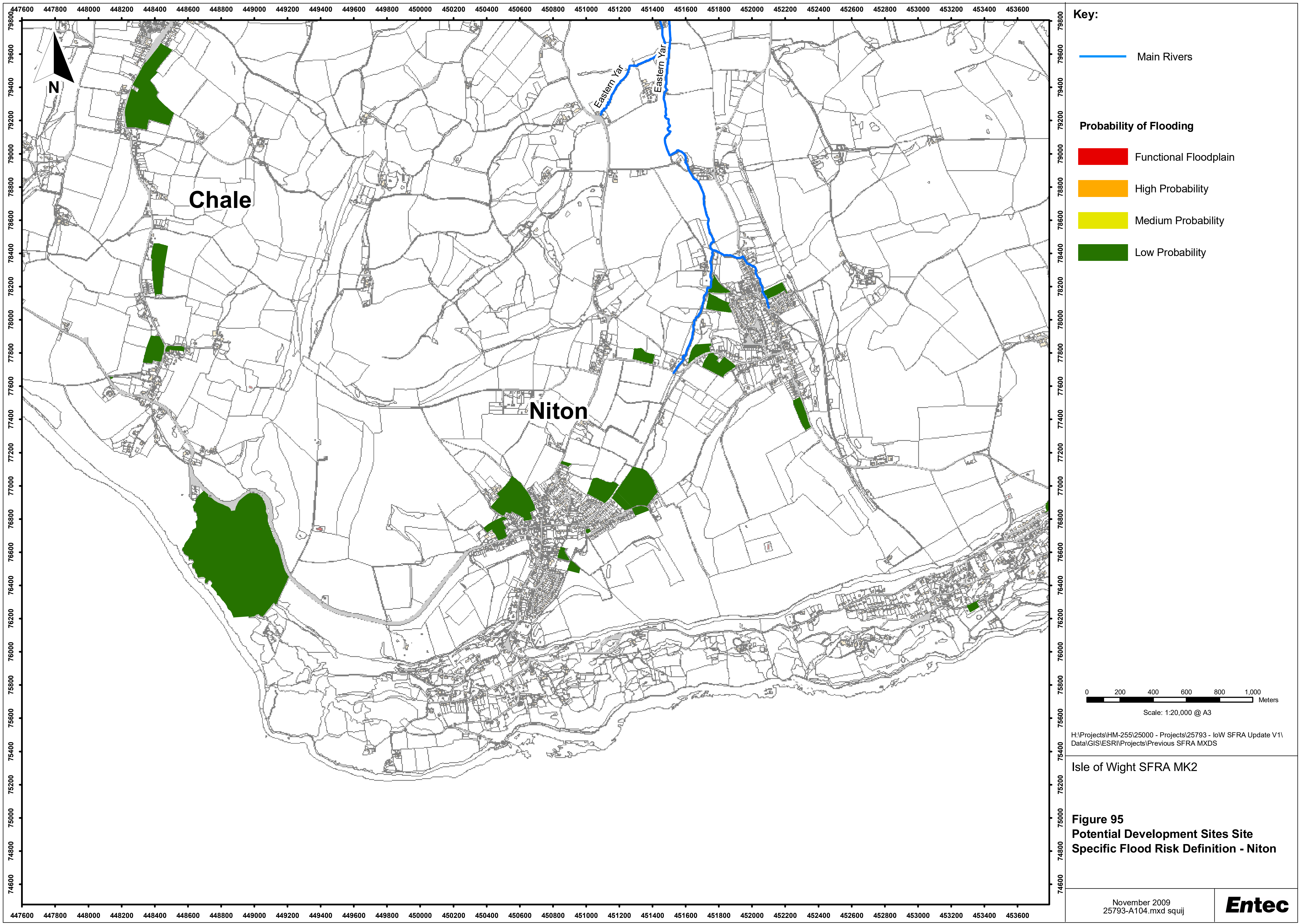
Isle of Wight SFRA MK2

Figure 94
Potential Development Sites
Qualitative Flood Risk - Niton

November 2009
25793-A103.mxd squij

Entec



N
Chale
Niton
Eastern Yar
Eastern Yar
Key:
Main Rivers
Probability of Flooding
Functional Floodplain
High Probability
Medium Probability
Low Probability
0 200 400 600 800 1,000 Meters
Scale: 1:20,000 @ A3
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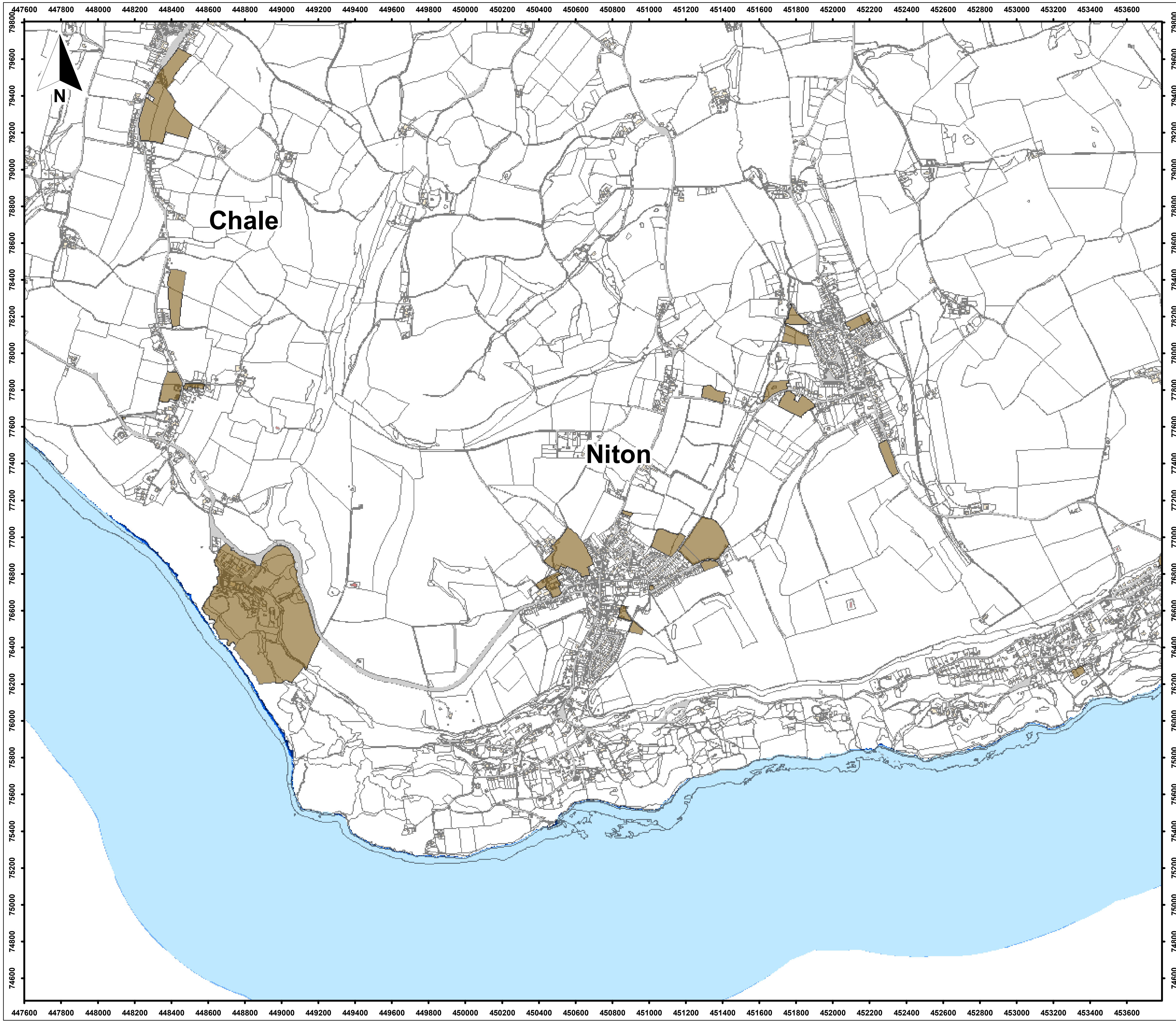
Isle of Wight SFRA MK2
Figure 95
Potential Development Sites Site Specific Flood Risk Definition - Niton
November 2009
25793-A104.mxd squij
Entec



Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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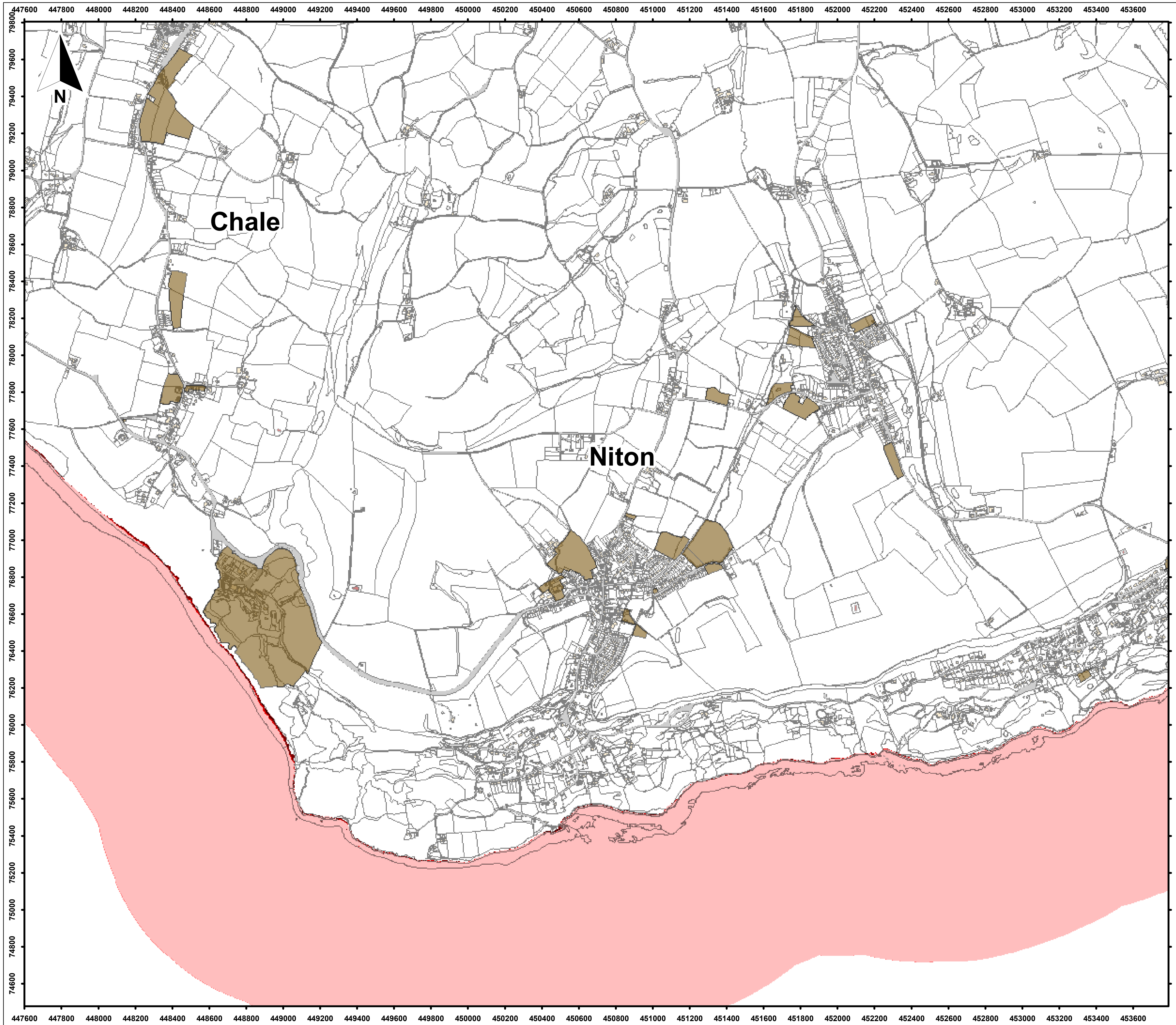
Isle of Wight SFRA MK2

Figure 96
Potential Development Sites
Flood Zone 2 Climate Change
Scenarios - Niton

November 2009
25793-A105.mxd squij

Entec



Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 97
Potential Development Sites
Flood Zone 3 Climate Change
Scenarios - Niton

November 2009
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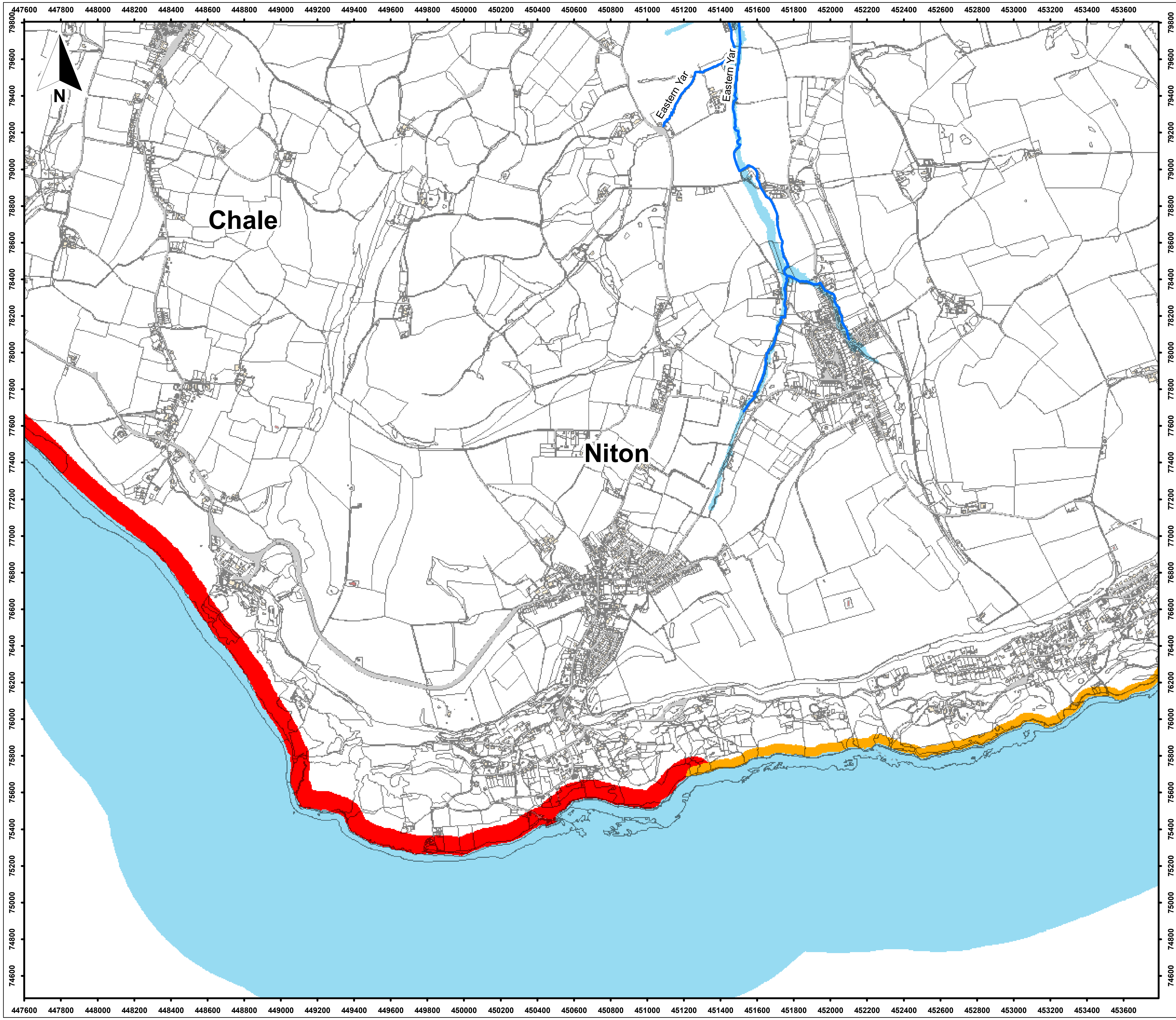

Key:

Main Rivers

Potential Exposure Risk

- High
- Medium
- Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 98
Qualitative Wind and Wave Exposure Risk - Niton

November 2009
25793-A107.mxd squij

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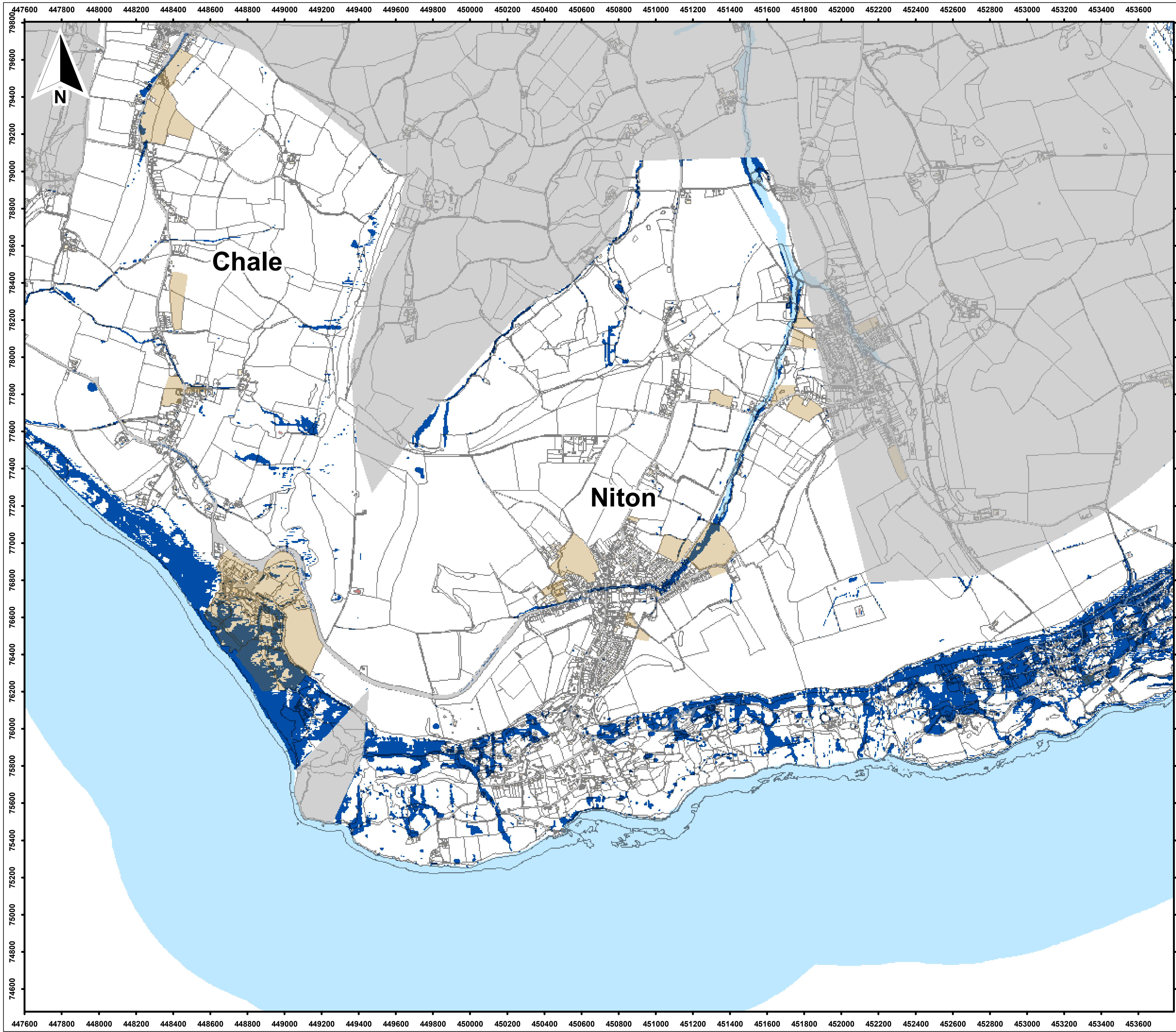

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 99
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Niton

November 2009
25793-A108.mxd squij

Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix T
Chale

June 2010

ISLE of WIGHT COUNCIL

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Chale is classified as a Rural Service Centre (RSC) and is located in the south of the Island to the west of St Catherine's Down. The Environment Agency flood zones do not extend to cover watercourses with drainage areas of less than $3km^2$, this has resulted in the flood zones not being produced for Chale or Chale Green. Nevertheless, the surface water modelling has provided an indication of route of the floodplain in Chale Green. Any development proposal in Chale or Chale Green, although currently in Flood Zone 1, should be accompanied by an FRA which either confirms the Flood Zone 1 location or demonstrates that any flood risks are appropriately managed in line with the requirements of PPS25.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres (RSC) such as Chale and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Chale RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

The potential development sites identified in Chale and Chale Green are located along the corridor of the B3399, all of which have been assessed as being in Flood Zone 1. This is because the settlement of Chale Green is located at the head/source of the River Medina. The OS mapping suggests however, that the water course does extend slightly further south into Chale Green than the Environment Agency flood zones. The inconsistency between the up valley extent of the flood zones and the OS mapping is because the Environment Agency typically on model watercourses with drainage areas of more than $3km^2$, this threshold must be reached just down valley of Chale Green.

Two other small watercourses are identified on the OS mapping, which flow from north east to south west (St Catherine's Down to Walpan), again flood zones are not associated with these watercourses. The potential risk presented by these watercourses should be defined as part of any future development in the area.

Climate Change

The results of the assessment approach outlined in Section 5.2 of the SFRA report do not identify any significant increase in the extent of fluvial flood risks, as the flood zones do not extend into the settlement centre. Owing to the headwater location of this settlement and the narrow valley floor, it is likely that the increased river flows predicted as a result of climate change, will have little impact on the spatial extent of the flood risk zone.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

The surface water modelling has highlighted a potential flow route/ponding area in the north of Chale Green. It is likely that this is an indication of the potential flood risk zone associated with the uppermost reaches of the River Medina (currently not covered by flood zones). Indeed the surface water flow route/ponding area does appear to follow the line of the river on the OS map.

The modelling also suggests that there is a potential flow route from St Catherine's Down towards Chale. The flow route appears to follow highway and the path of a small unnamed water course.

The large potential development site to the south of Chale, adjacent to the coast is highlighted by the modelling as being significantly at risk of surface water flooding. This location, under St Catherine's Hill, is very steep and topographic data in this area does not include any drainage gullies which would otherwise funnel the flow into defined flow routes. The result is an expansive *sheet* flow across the slope and water appears to being ponded behind undulations in the cliff slope. It is unlikely that the under an extreme rainfall conditions, the resultant patterns would reflect the modelling predictions in this particular location. The very steep nature of much of the southern coastal fringe, results in a similar pattern of surface water flooding results.

Surface Drainage and Infiltration SuDS Potential

With the exception of the large coastal site, which is in an area of geological mass movement, the rest of Chale and Chale Green have been assessed as having a high suitability for the use of infiltration SuDS. All the identified sites are located outside the Source Protection Zones (SPZs). Nevertheless, a large SPZ is defined immediately north of Chale (in the Rookley area) and there is a small designation to the east near Niton. The SPZ mapping is however subject to change, and should be reviewed with the Environment Agency when proposing any form of SuDS solution.

Wave Exposure Risk

The coastal margin of the large potential development site to the south of Chale is identified as being within a zone of high potential exposure risk. For details of this classification process please consult Section 6 in the main SFRA document. If this site were to be brought forward for development, the potential risks posed by the action of waves and spray should be evaluated and appropriately managed. Mitigation measures could include corrosive resistant building materials and strengthened glass. A detailed investigation of ground levels may allow for the wave exposure risk to be re-evaluated.

Flood Risk Management Guidance and Site Specific FRAs

The principal of avoidance should be applied when considering sites within the Chale area. Any future development of the identified potential development sites in Chale and Chale Green, despite being in flood Zone 1 should be accompanied by a FRA to confirm the Flood Zone 1 designation. Currently un-modelled watercourses are considered to present a potential risk to the identified sites.

Factors to be considered in safe development could include:

- Ensuring that the sequential approach to landuse planning is, where possible, applied on site. This approach would see more and highly vulnerable landuse types being placed in the lower risk zones.

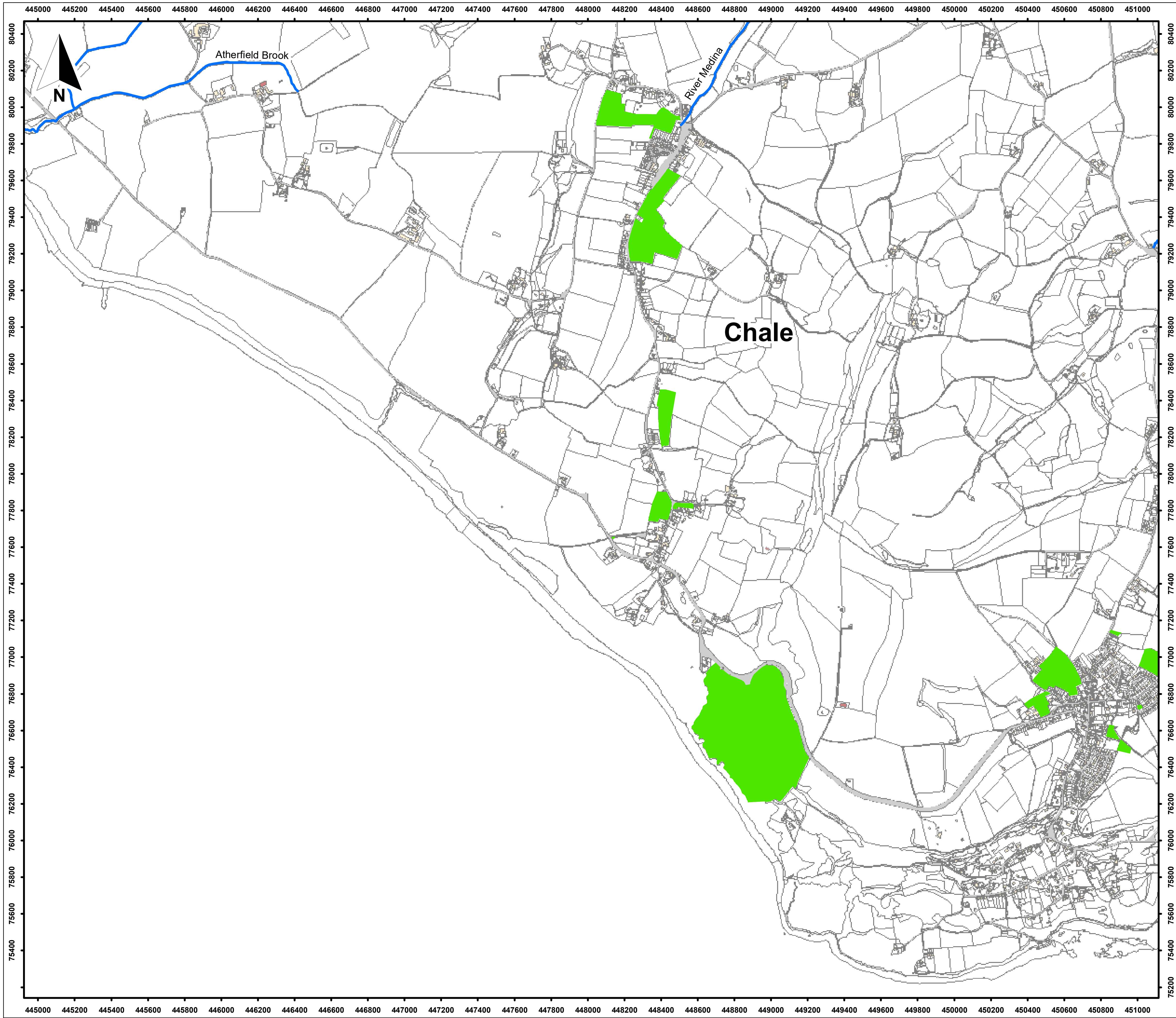
- Finished first floor levels should be set above the predicted 1 in 100 year fluvial flood levels, plus a climate change. The Environment Agency should be consulted for fluvial flood. A freeboard allowance should be applied, again the Environment Agency should be consulted on this aspect of the design. Site specific hydraulic modelling may be required to define these levels.

- Buildings should be designed so that safe access and egress can be facilitated in the event of the 1 in 100 year (plus climate change.

- Development should not increase the risk of flooding elsewhere. As such, the potential for displaced flood water to impact adjacent areas should be considered. This typically applies if an existing building footprint is being increased in fluvial floodplains and defended tidal floodplains. The displacement of water aspect of development along an undefended coastline is not necessarily a concern.

- Building design should account for the potential depths of water that might occur and appropriate flood resilient and or resistant design features should be incorporated.

- Surface water generated by development should be managed using sustainable techniques. The FRA or drainage assessment should explore the Environment Agency and CIRIA SuDS hierarchy. Discharge rates and volumes should not increase post development, in addition to this PPS25 requirement, the Council and the Environment Agency want to see developers seeking to reduce run-off rates and volumes.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 100
Potential Development Sites
Qualitative Flood Risk - Chale

November 2009
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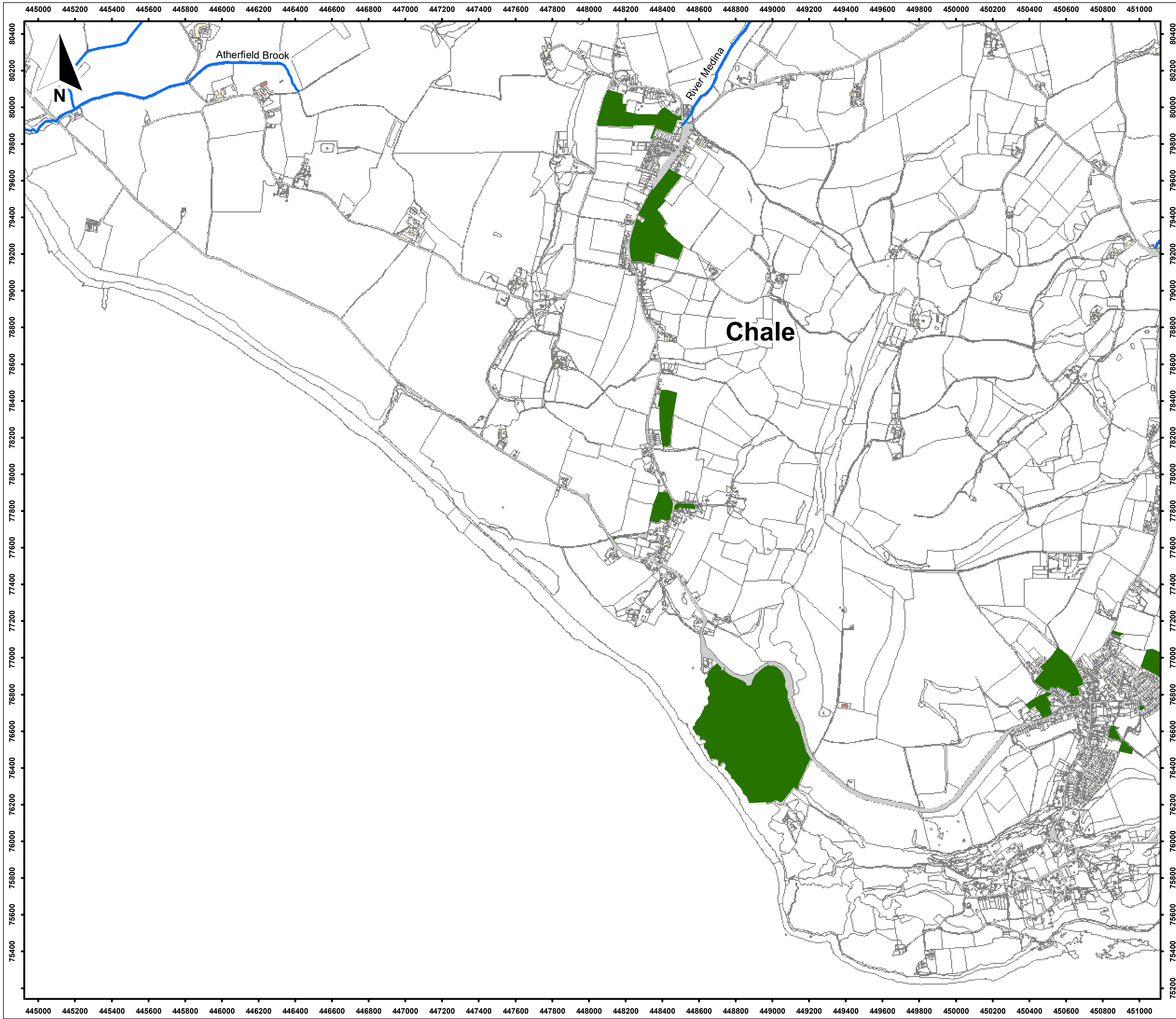

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 101
Potential Development Sites Site Specific Flood Risk Definition - Chale

November 2009
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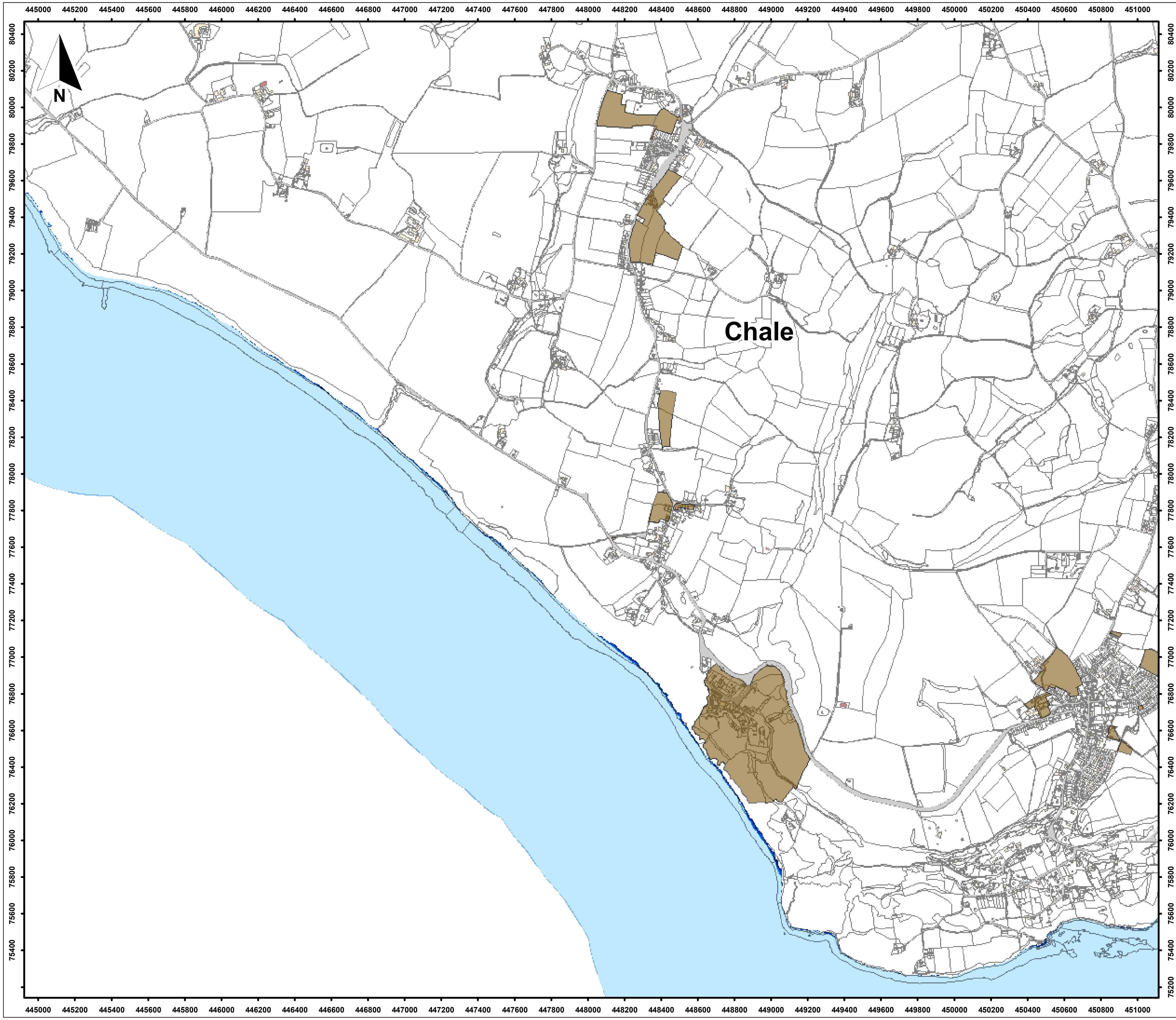

Key:

Predicted 1 in 1000 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 102
Potential Development Sites Flood Zone 2 Climate Change Scenarios - Chale

November 2009
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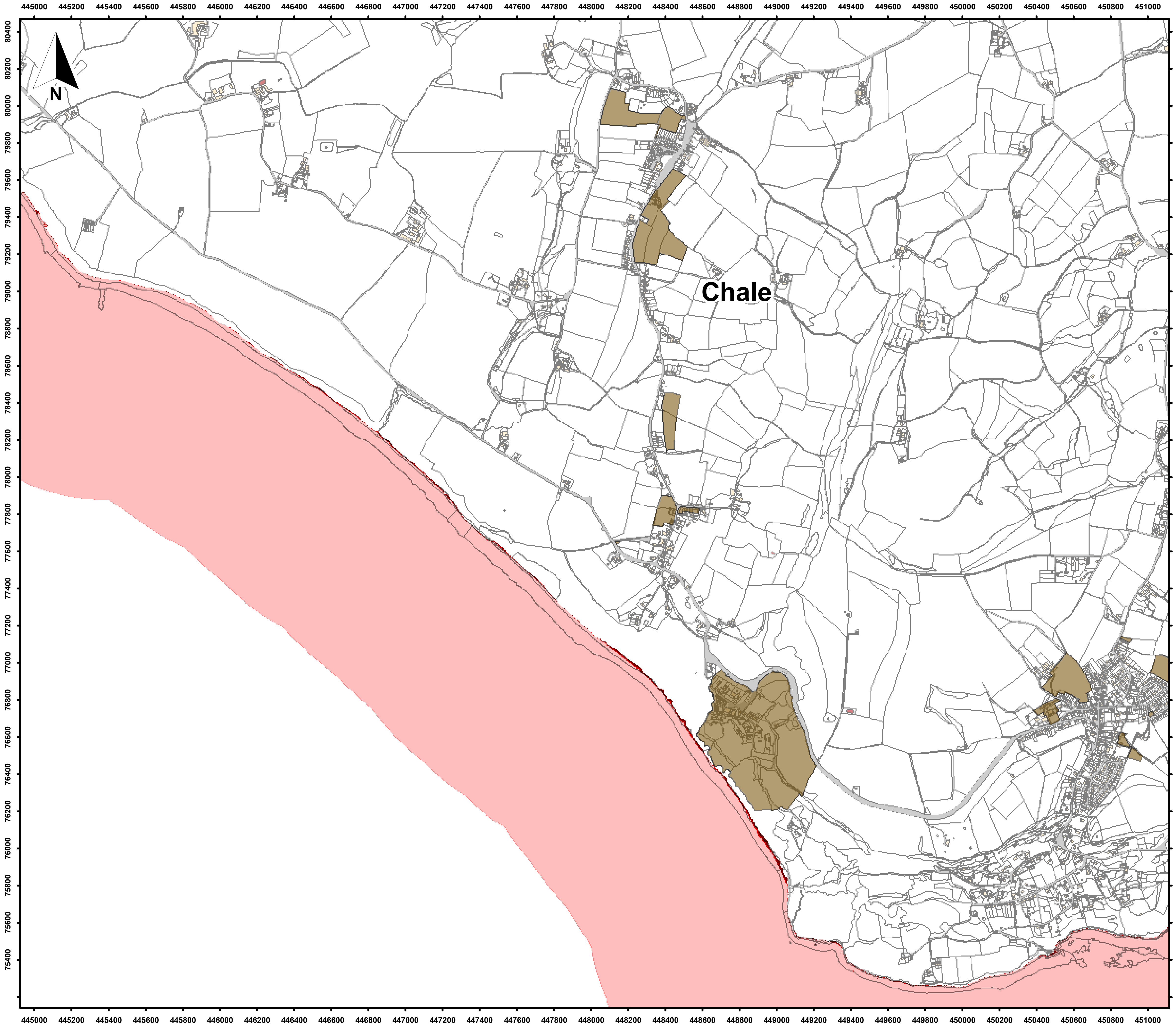

Key:

Predicted 1 in 200 year Tidal Extents

- Year 2010
- Year 2045
- Year 2080
- Year 2115

- Potential Development Sites

0 200 400 600 800 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 103
Potential Development Sites
Flood Zone 3 Climate Change Scenarios - Chale

November 2009
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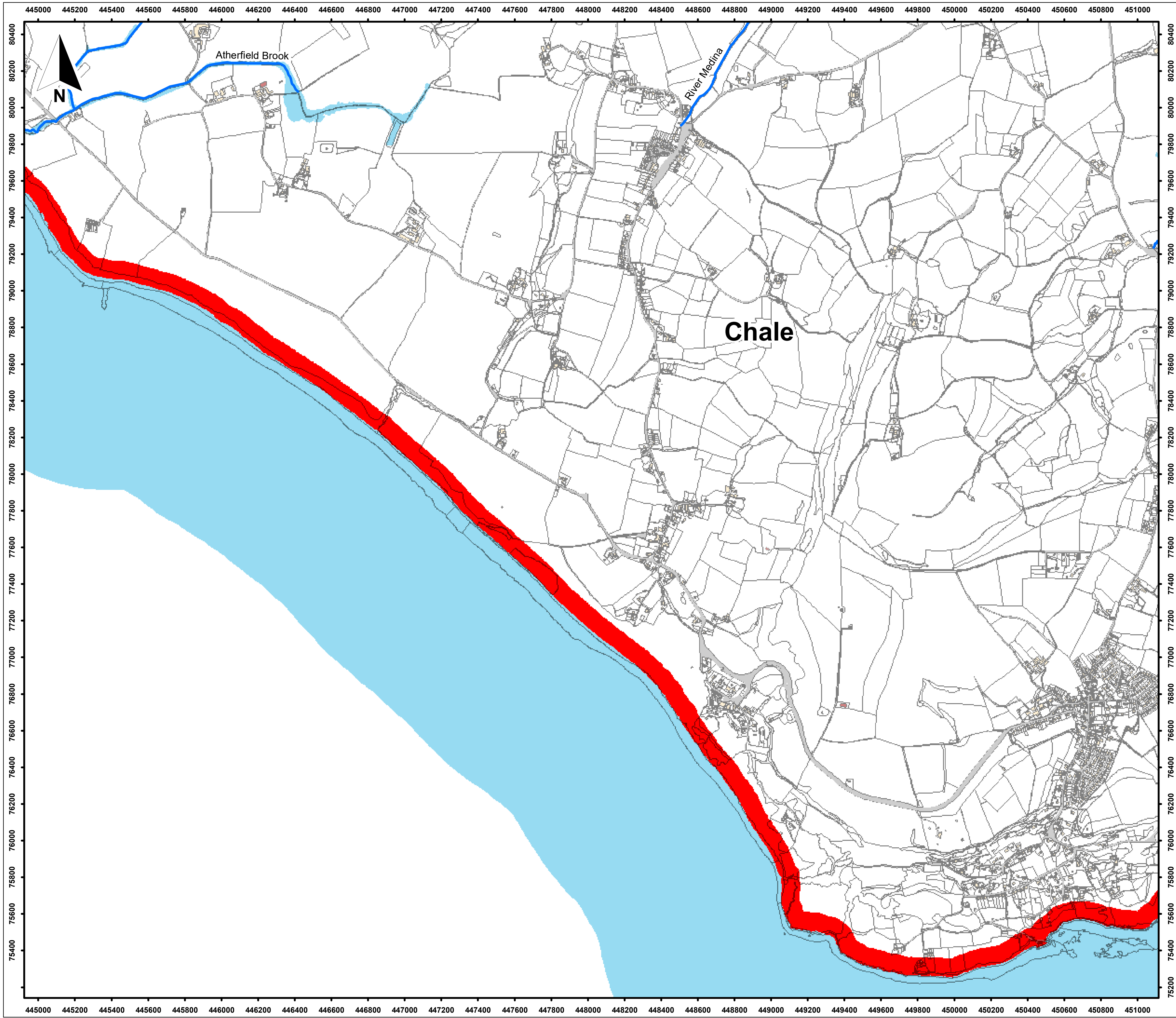

Key:

Main Rivers

Potential Exposure Risk

High

Medium

Low

Environment Agency Flood Zone 2 (November 2009)

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 104
Qualitative Wind and Wave Exposure Risk - Chale

November 2009
25793-A113.mxd squij

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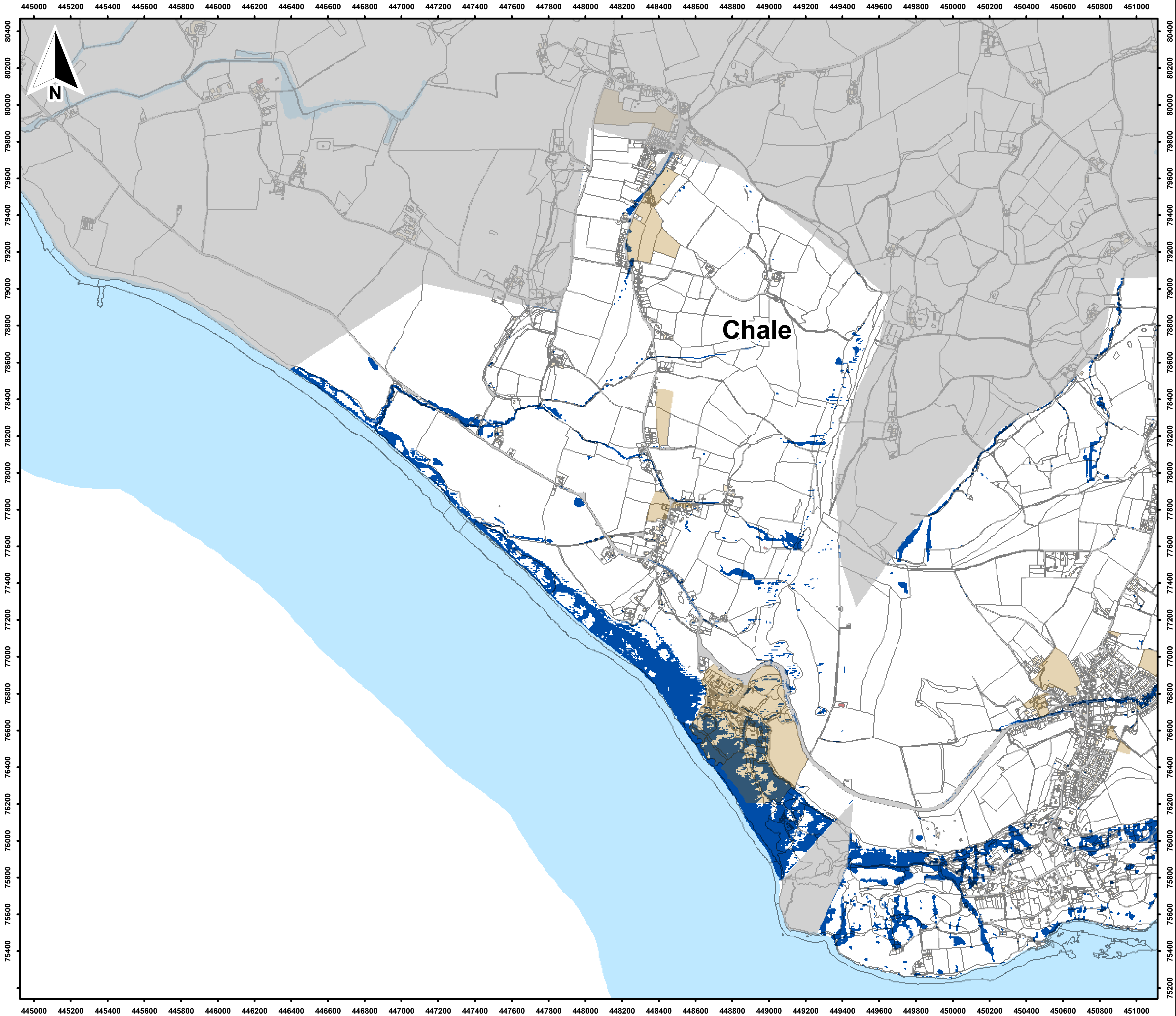

Key:

- Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.
- Environment Agency Flood Zone 2 (November 2009)
- Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep
- Potential Development Sites
- Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 800 1,000 Meters

Scale: 1:20,000 @ A3

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Isle of Wight SFRA MK2

Figure 105
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Chale

November 2009
25793-A114.mxd squij

Entec

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix U
Rookley

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Rookley is located in the south of the Island, around 5km south of Newport, and has been classified AS A Rural Service Centre (RSC). The settlements location on the knoll of a small hill places all existing development and potential development sites in Flood Zone 1. The local topography also places Rookley at the head of the predicted local surface water flow routes. Only the site areas will require FRAs to be undertaken for any future development, these FRAs should carefully consider the implications that landuse change may have on the potential run-off rates and volumes, as required by PPS25.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres (RSC) such as Rookley and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Rookley RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

All the potential development sites in Rookley are in Flood Zone 1. There are rivers and associated flood zones located to the west and east of the site, but these do not affect the settlement or any of the potential development sites because these are positioned on higher ground.

Some of the access routes into and out of the settlement could be impacted during an extreme fluvial event. However a route north eastwards towards Merstone remain unaffected by the flood zone extents.

Climate Change

The method of assessment (See Section 5.2) used to assess the potential impacts of climate change in the fluvial domain do not predict that climate change will result in an increase in fluvial flood risk to the settlement of Rookley. This is because the settlement is located in Flood Zone 1.

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than $25m^2$ in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

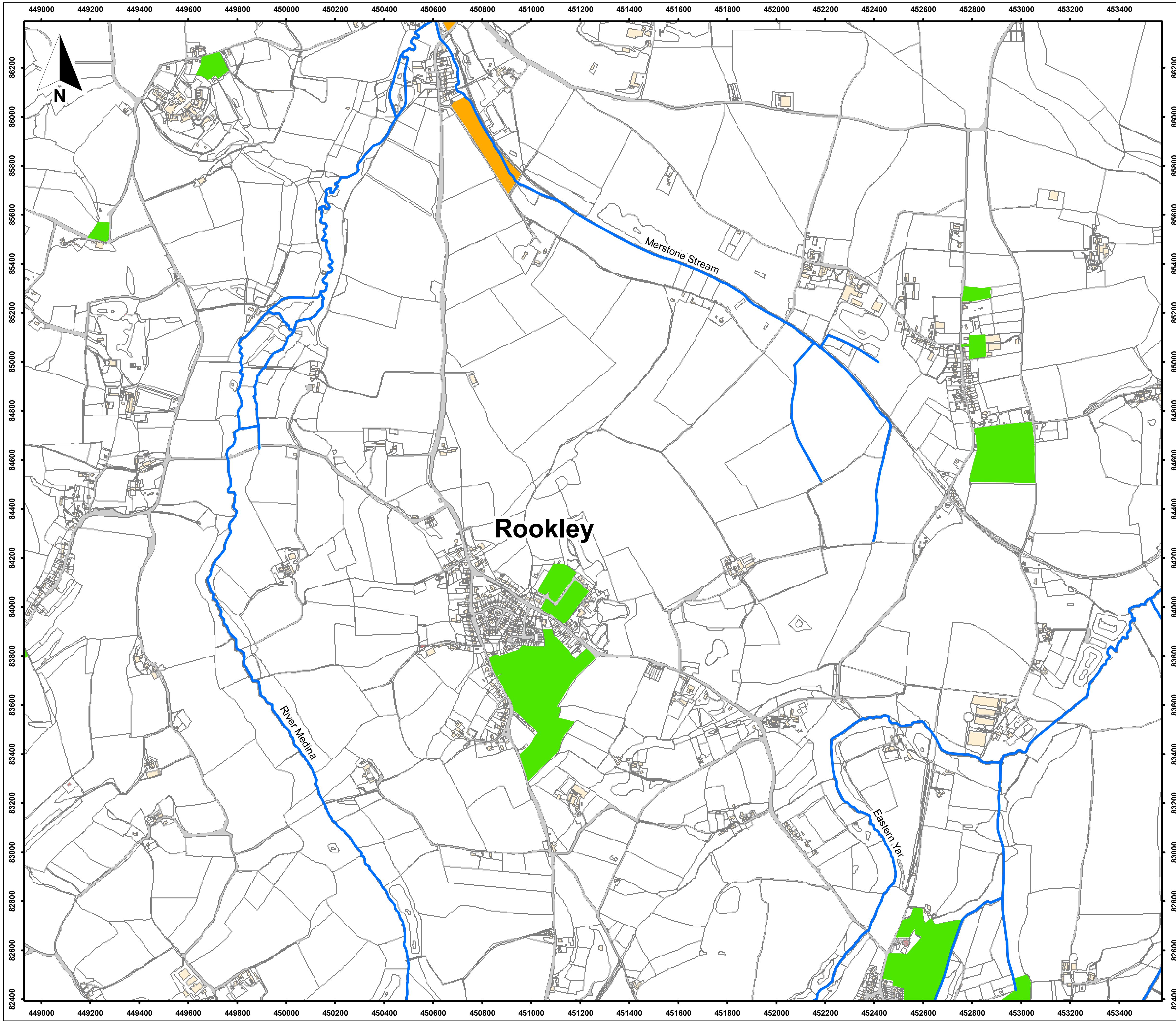
The settlement of Rookley is effectively situated on the knoll of a small hill. This is reflected in the patterns of the surface water flow routes which flow outwards from the settlement area in all directions towards the surrounding lower land. A potential flow route is identified to flow eastwards out of the centre of the large site to the south of the settlement.

Surface Drainage and Infiltration SuDS Potential

Owing to the local soils and geology Rookley has been identified as being of medium suitability for infiltration SuDS. However, Rookley is located within Source Protection Zones (SPZ) 1, 2 and 3. This means that any surface water drainage scheme in corporate robust pollution prevention measures. The Environment Agency should be consulted on all surface water drainage schemes in Rookley.

Flood Risk Management Guidance and Site Specific FRAs

Being at the top of a surface water drainage catchment, changes in landuse and the permeability of the ground have the influence to directly influence the patterns of surface water flow and the volumes of run-off generated. In line with the requirements of PPS25, all the potential development sites within Rookley are over 1 hectare and should any of them be taken forward, a FRA will be required to demonstrate how the surface water will be managed. PPS25 does not allow for flood risk to be increased elsewhere as a result of development.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 106
Potential Development Sites
Qualitative Flood Risk - Rookley

November 2009
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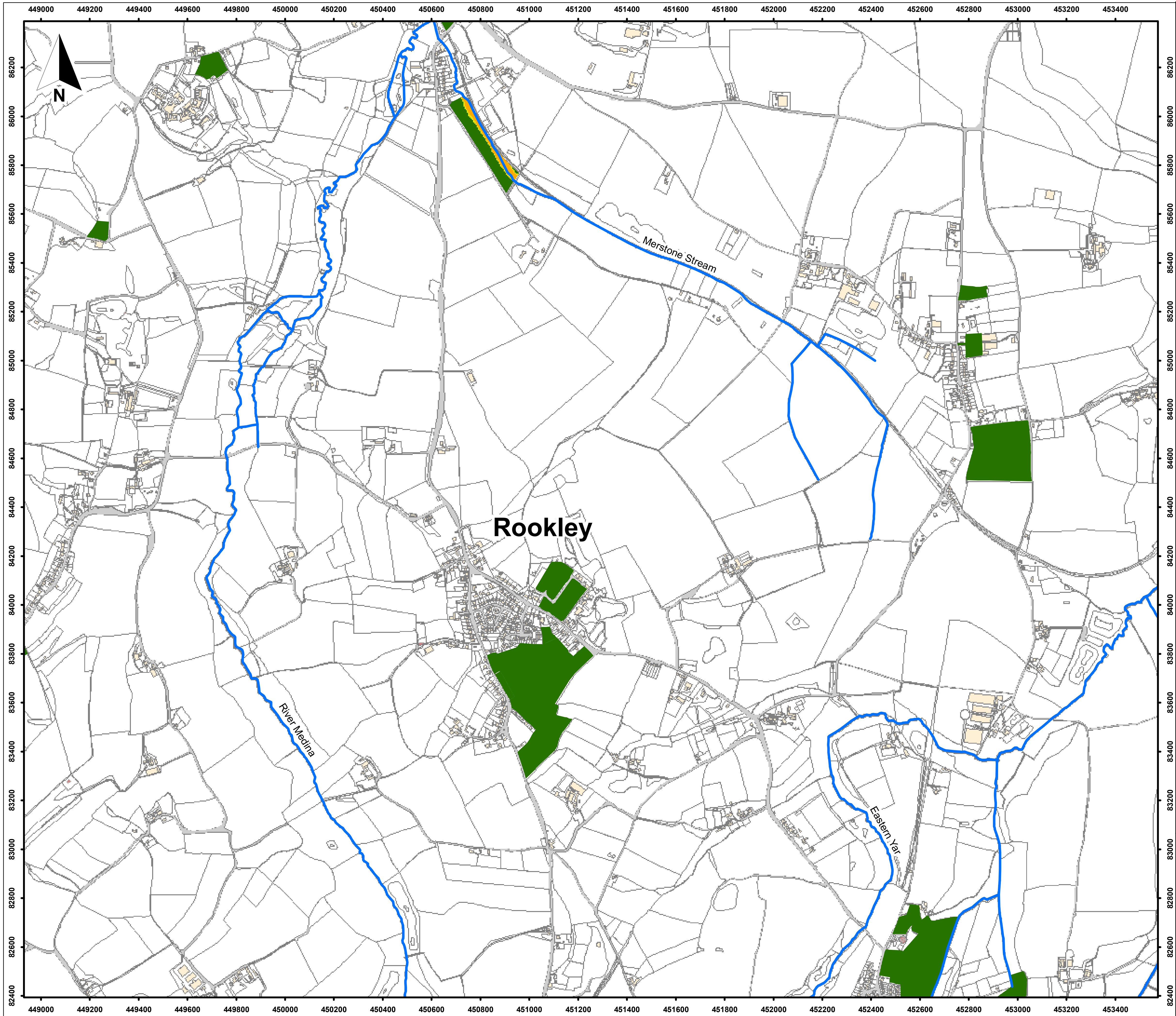

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 107
Potential Development Sites Site Specific Flood Risk Definition - Rookley

November 2009
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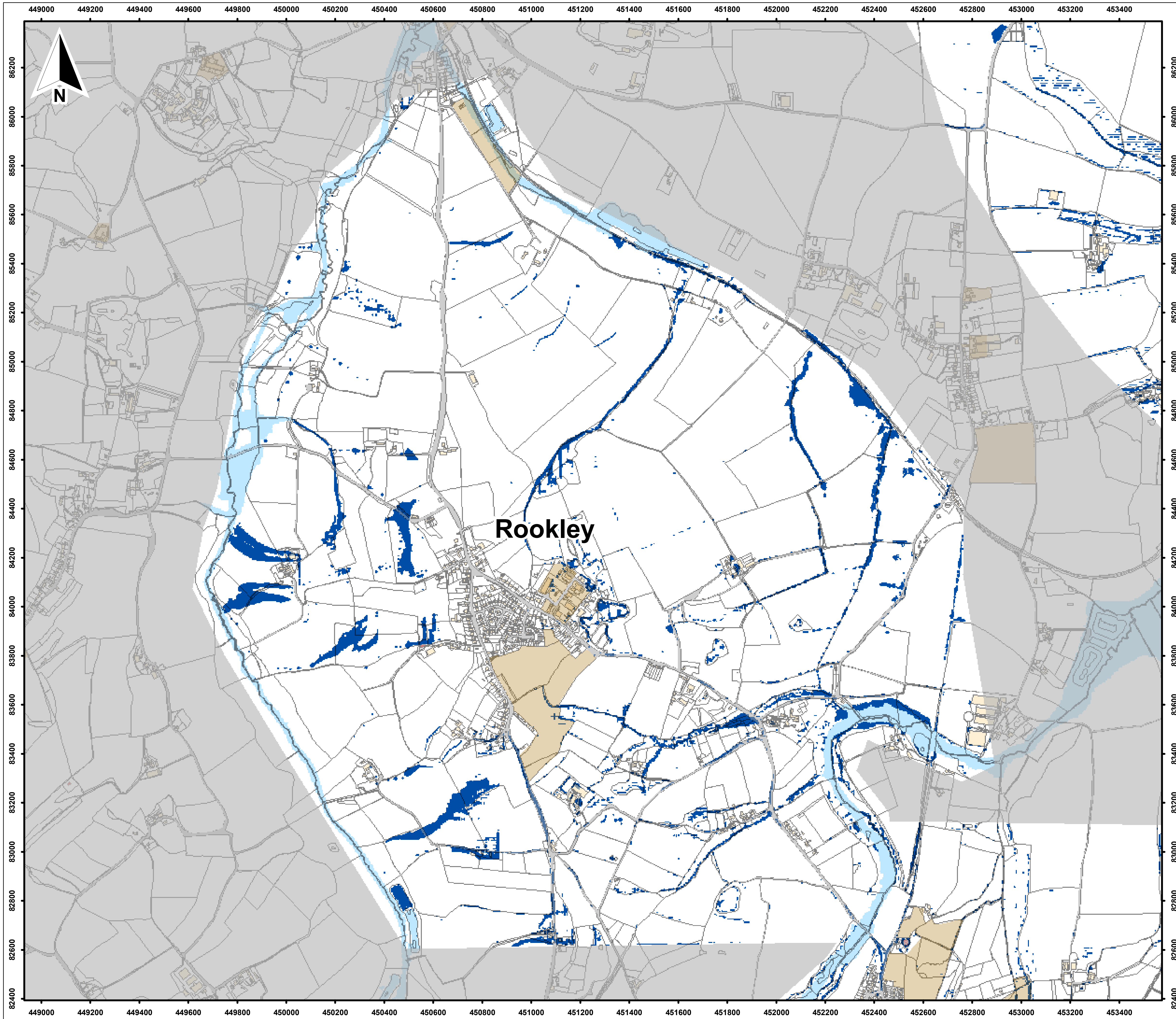

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

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Isle of Wight SFRA MK2

Figure 108
Potential Development Sites Site Specific Flood Risk Definition - Rookley

November 2009
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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix V
Godshill

June 2010

Overview

Please review this discussion in conjunction with the mapping provided in this Appendix.

Godshill is located about 7km south of Newport on a north facing slope. The settlement is classified as a Rural Service Centre (RSC), which has been assessed as being completely within Flood Zone 1. Nonetheless, the SFRA identifies that there are two small fluvial watercourses in the north of the settlement for which flood zone extents are not available. All the potential development sites in Godshill are over 1 hectare and as part of any subsequent FRA process, the fluvial flood risk associated with these water courses should be assessed in line with Environment Agency guidance.

Sustainability and Regeneration Objectives

Development within the wider countryside will be focused on the Rural Service Centres (RSC) such as Godshill and should support their role as wider centres for outlying villages, hamlets and surrounding countryside. For the rural service centres development will be expected to ensure their future viability. Within the rural service centres and outlying rural areas, development will be expected, in the first instance, to meet a rural need and maintain or enhance the viability of local communities and will be subject to local considerations.

Godshill RSC has been identified as having the potential to accommodate further development to meet the regeneration aims and needs of the local community, through improving local services and strengthening public transport. Development will be encouraged on brownfield sites in the first instance and tourism will be promoted.

Sites at Risk

All the existing development and the potential development sites are within Flood Zone 1. There are however, two reaches of an un-named water course (See Figures 110 and 111) which flow from Godshill northwards towards join the Eastern Yar at Kennerly Farm. The Environment Agency do not hold Flood Zones for this watercourse, it is likely that the drainage area is below $3km^2$, which is the minimum threshold typically applied when modelling flood zones.

As such the two potential development sites situated to the north of the town may in fact be at risk of fluvial flooding which the SFRA has not quantified.

Climate Change

The method of assessment (See Section 5.2) used to assess the potential impacts of climate change in the fluvial domain do not predict that climate change will result in an increase in fluvial flood risk to the settlement of Godshill. This is because the settlement is in Flood Zone 1

Potential Surface Water Flow Routes and Ponding Areas

Method

The potential surface water flow routes and ponding areas presented in the SFRA, illustrate areas of predicted flooding greater than 25m^2 in spatial extent and only flooding which is more than 0.1m deep. This refinement of the TuFLOW model output is necessary so as to establish the primary areas of predicted flood risk. The modelling approach utilises a 5m resolution ground model grid. The TuFLOW model does not incorporate the Southern Water surface water drains or sewers, which during a storm event would provide storage capacity. Southern Water advised that the modelling should assume that the surface water sewer network could accommodate the 1 in 20 year storm. Therefore, the 1 in 20 year rainfall depths for the critical storm were subtracted from the 1 in 100 year (plus climate change) rain fall depths.

The 1 in 100 year (plus climate change) winter profile storm hyetographs (hyetograph refers to a graph presenting rainfall depth over time) were generated by deriving catchment descriptors from the Flood Estimation Handbook CD-ROM (FEH) and applying the FEH Rain Profile Method. The storm durations were determined by the critical drainage pathway lengths in each of the model areas. The model boundaries were determined by the topography, the local watersheds were traced to ensure that all contributing parts of the catchments were included in the model.

Results

Godshill is situated on a gentle slope with a north, north west aspect, which results in the predicted surface water flow routes running in a roughly north and north westerly direction towards the lower ground of the Eastern Yar floodplain. The higher ground to the south of Godshill is represented in the ground topographic model with Synthetic Aperture Radar (SAR) data, which is of a lower quality than the Light Detecting and Ranging (LiDAR) data present in other parts of the Island. It is the nature of the ground topographic model which has resulted in the large areas of predicted surface water flooding in the area between Godshill and Wroxhall. It would appear that much of the flow generated by the up slope areas is captured by the B road which connects Beacon Alley to Godshill and the A3020. These highways are represented by slight depressions in the topographic ground which results in the flows being channelled along the route of the highway.

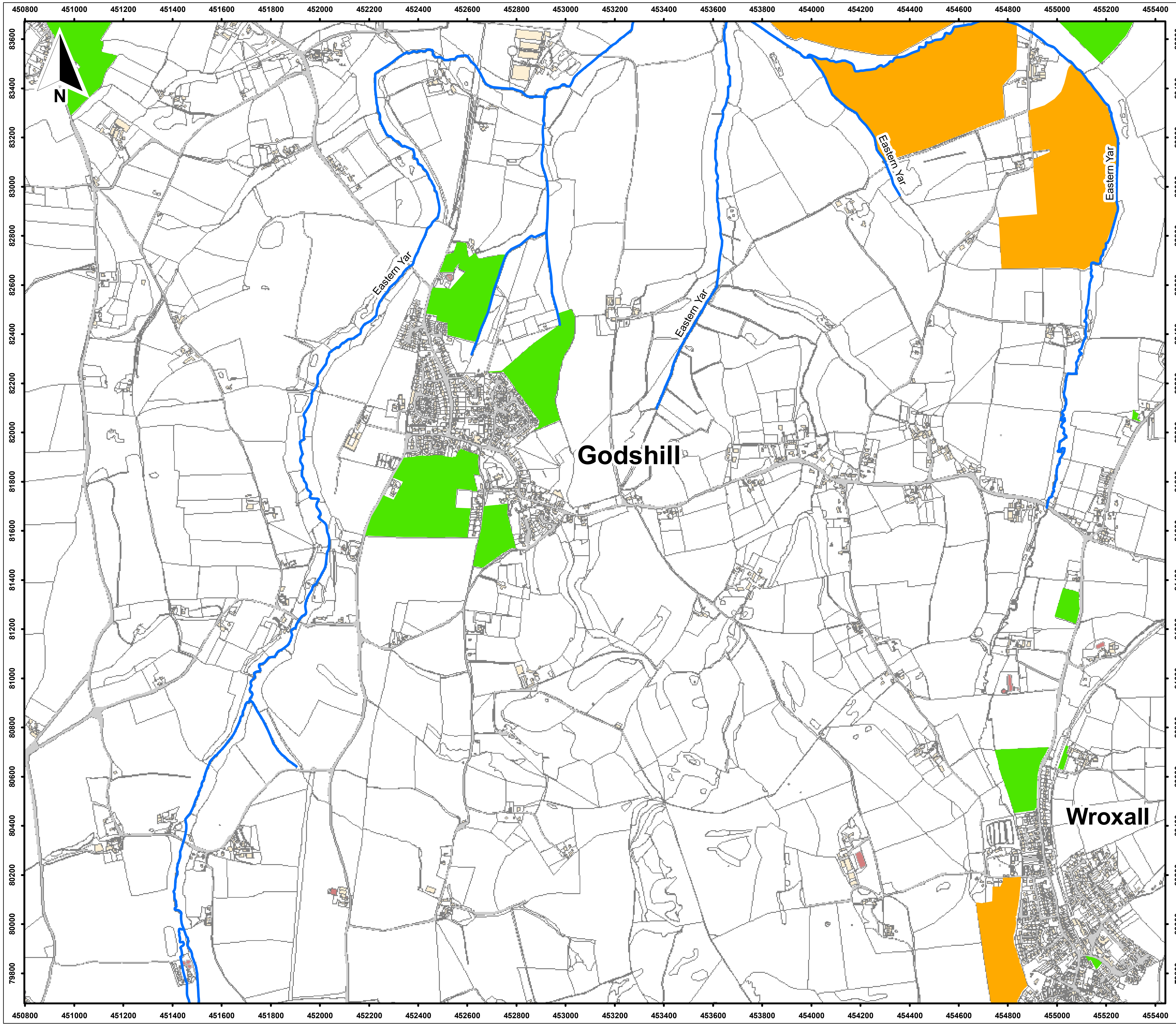
There are potentially significant areas of ponding within the centre of Godshill, these do not however correlate with any of the reported incidents provided by Southern Water. The absence of correlation may be a result of surface water flood risk event not having recently occurred or because incidences may not been reported. Moreover, the SFRA surface water modelling does not incorporate details of the underground drainage network, rather an approximate capacity is assumed, please see Section 3.5.

Surface Drainage and Infiltration SuDS Potential

The soils and geology of the area has resulted in whole of the Godshill settlement being classified as having a medium suitability for infiltration SuDS. All the identified sites are located within either Source Protection Zones (SPZs) 1, 2 and 3. The SPZ designation means that pollution control of groundwater resources is fundamental to any drainage solution. The Environment Agency should be consulted on any proposed drainage schemes.

Flood Risk Management Guidance and Site Specific FRA

All the sites within Godshill are in Flood Zone 1, but they are all larger than 1 hectare and the development of any one of the four sites should be accompanied by a FRA, the primary focus of which will need to be the sustainable management of surface water, which takes into account the requirements of PPS25, climate change influences and the potential flow paths and ponding areas identified in this SFRA. As part of the FRA process, the risk posed by the currently un-modelled water courses in the north of the settlement should be assessed and appropriately managed in accordance with the requirements of PPS25.



Key:

Main Rivers

Probability of Flooding

- Functional Floodplain
- High Probability
- Medium Probability
- Low Probability

Notes:
Site is attributed with the flood probability associated with the highest probability flood zone the site intersects

The mapped extent of Flood Zone 3b has been used to identify Functional Floodplain
The 1 in 100 year fluvial flood zone for the present day and the 1 in 200 year tidal extent predicted for the year 2115 has been used to identify sites at a High Probability. The 1 in 1000 year fluvial flood zone for the present day and the 1 in 1000 year tidal extent predicted for the year 2115 has been used to identify sites at a Medium Probability. Sites only in Flood Zone 1 have been assigned a Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Figure 110
Potential Development Sites
Qualitative Flood Risk - Godshill

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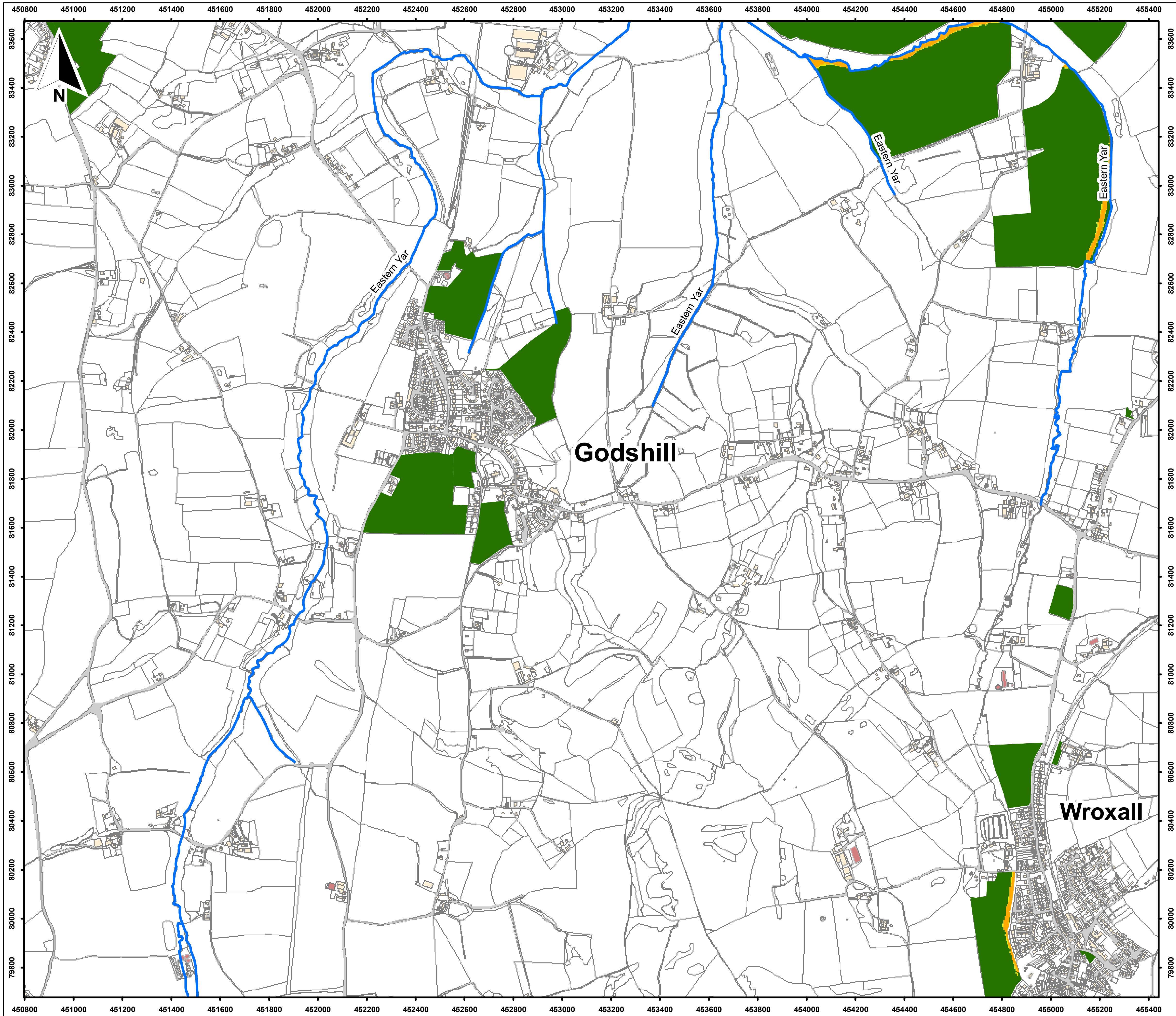

Key:

Main Rivers

Probability of Flooding

Functional Floodplain

High Probability

Medium Probability

Low Probability

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Figure 111
Potential Development Sites Site Specific Flood Risk Definition - Godshill

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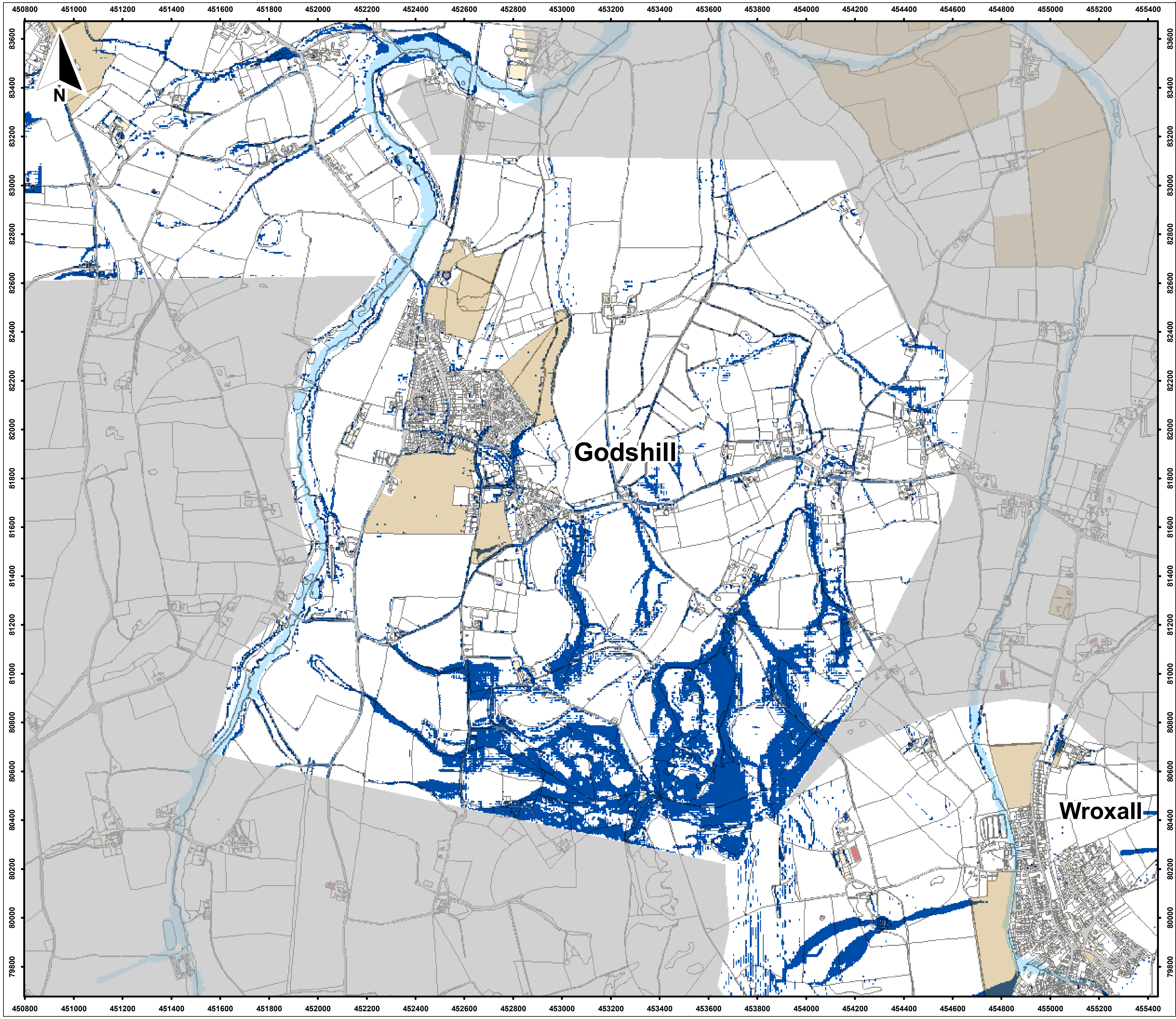

Key:

Location of reported surface water flooding issues. Supplied by Southern Water for the period upto and including 2006.

Environment Agency Flood Zone 2 (November 2009)

Potential Surface Water Flow Routes and Ponding areas (1:100+cc) Over 0.2m deep

Potential Development Sites

Outside the Limits of the Surface Water Model

Notes:
Only predicted surface water flow routes and ponding areas, over 0.1m deep and greater than 25m2 in areas are shown

0 200 400 600 Meters

Scale: 1:15,000 @ A3

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Isle of Wight SFRA MK2

Figure 112
Potential Surface Water Flow Routes and Ponding Areas (1 in 100 year storm + climate change) - Godshill

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Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix W
Supporting SuDS Infornation

June 2010

ISLE of WIGHT COUNCIL

W1 - Infiltration Potential and Groundwater Contamination Potential

W 1.2 - Infiltration Potential

Infiltration techniques generally requiring an infiltration rate of above 10mm/hr for the upper soil layers (Parrett, 2005) and are thus partially controlled by soil characteristics. The combination of the soil and geological characteristics enable the potential use of infiltration techniques on the site to be assessed. The most useful dataset made available for use in the SFRA to determine the infiltration potential was the Groundwater Vulnerability mapping (scale 1:100,000) see Figure 8 in Appendix A. This dataset subdivides soils into those with a high, medium and low leaching potential. Leaching potential is proportional to infiltration potential. In that high infiltration potential equates to high infiltration potential and *vice versa*.

Figure 9 in Appendix A, presents the assimilation of this assessment and can be consulted for regional overview of the applicability of infiltration SuDS techniques. For all sites in the Sites Database, an infiltration potential has been assigned. Figure 9 (in Appendix A) will potentially be of use when processing windfall sites.

Aquifer assessment

The Groundwater Vulnerability map of the Island also provides details on the aquifer type. It provides an indication of the ability of the underlying rocks strata to absorb water which infiltrates from the overlying soil layer. Without knowledge of site specific soil types and depths, it is not possible to fully assess the infiltration potential. As such, the underlying aquifer type (and its permeability) is may limit the infiltration potential and thus the applicability of infiltration SuDS. Three aquifer types exist as defined by the Groundwater Vulnerability map (NRF, 1995):

- Principal Aquifers (Highly Permeable);
- Secondary Aquifers (Variably Permeable); and
- Unproductive Stratas (Negligibly Permeable).

A matrix relating soil infiltration (leaching) potential and aquifer type (permeability) to infiltration potential is presented in Table W.1.1

Table W1.1 Infiltration Potential Derived from Aquifer Vulnerability Classification

Aquifer Vulnerability Classification	Description	Infiltration Potential
Minor_L	Variably permeable groundwater with low leaching potential	Low
Minor_I	Variably permeable groundwater with intermediate leaching potential	Low
Minor_H	Variably permeable groundwater high leaching potential	Medium
Major_L	Highly permeable groundwater with low leaching potential	Low
Major_I	Highly permeable groundwater with intermediate leaching potential	Medium
Major_H	Highly permeable groundwater with high leaching potential	High
Non_Aquifer	Regarded as containing insignificant quantities of groundwater. No soils data.	Low

It should be noted that those parts of the Island are classified as '*Non_Aquifer*' by the Groundwater Vulnerability map and have no soils information on which to assess infiltration potential. These areas have been considered for the purposes of this SFRA to have a low Infiltration potential. Site Specific FRAs should assess this generalisation at the site specific level.

Mass Movement Consideration

Mass movement was also considered during the assignment of assessment of the suitability of infiltration SuDS. The process by which mass movement occurs on the Island is through slippage as defined by the BGS map for the Island (Figure 7 – in Appendix1). Thus additional water in areas defined as being prone to slippage may further lubricate the rock strata, thereby potentially inducing a slippage event. Three rock types are associated with areas of slippage on the Island. These are:

- Clay (undifferentiated);
- Sandstone (undifferentiated) and Mudstone; and
- Rock (Undifferentiated).

Mass movement is an important factor in the areas where infiltration SuDS are otherwise suitable, since the addition of water into the soil profile or underlying rock strata has the potential to trigger a mass movement event. It has been considered inappropriate to implement infiltration SuDS techniques in these areas. The Sites Database accounts for this by assigning a low suitability to sites which overlay any of these geologies.

S1.2 - Groundwater Contamination Potential

The use of SuDS, although a preferred method of managing surface water, has the adverse potential to contaminate groundwater with surface pollutants. Groundwater is known to be vulnerable to contamination from diffuse and point source pollutants through indirect discharges into or onto land. Aquifer remediation is difficult, prolonged and expensive and thus the prevention of pollution is important. The map of Groundwater Vulnerability provides a useful indication of those areas where the implementation of infiltration SuDS techniques has the potential to contaminate the aquifer below through the transfer of pollutants from the surface. It is not a map of contaminated land, rather it is an indication of where there is the potential for groundwater to be polluted.

Source Protection Zones (SPZ's) are defined by the Environment Agency and delineate the risk of groundwater contamination. Figure 7 in Appendix A shows the location of SPZ's on the Island. Generally, the risk is greatest nearest to the abstraction point. The dataset is made up of three main zones, which are the inner, outer and total catchment. A forth zone is sometimes included, and applies to a groundwater source of special interest. The Environment Agency website (Environment Agency, 2007), provides the following definition for each of the SPZ's:

- ***Zone 1 (Inner protection zone)*** – Any pollution that can travel to the borehole within 50 days from any point within the zone is classified as being inside zone 1. This applies at and below the water table. This zone also has a minimum 50 metre protection radius around the borehole. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.

- ***Zone 2 (Outer protection zone***) – The outer zone covers pollution that takes up to 400 days to travel to the borehole, or 25% of the total catchment area – whichever area is the biggest. This travel time is the minimum amount of time that the Environment Agency believe pollutants need to be diluted, reduced in strength or delayed by the time they reach the borehole.

- ***Zone 3 (Total catchment)*** – The total catchment is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

- ***Zone of special interest*** – This is usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment area.

The Assessment of Groundwater Contamination Potential

The potential for groundwater contamination was assessed by combining the infiltration potential classifications made in Section S1.1 and the Source Protection Zones. It was considered important to compile a dataset which utilised the most useful available information to provide broad classifications to give an Island wide appreciation of the potential to contaminate groundwater resources.

Unproductive Strata were assigned a low contamination potential, unless they were over a Zone 1 or 2 SPZ, in which case it was given a rating of 'high' or 'medium' respectively. Areas of high infiltration potential were all assigned high contamination risk values as were areas of medium infiltration potential were they were in SPZ zones 1 and 2. The remaining areas of medium infiltration potential were assigned medium contamination potential values. Three classifications, high, medium and low were created. The resultant contamination potential map can be seen in Figure 10 (Appendix A). Table W1.2 presents the results of the classification process. Please note, that the impact of mass movement on the infiltration potential has been omitted from this classification process.

Table W1.2 Classification of Groundwater Contamination Potential

		Contamination Potential			
		SPZ 1	**SPZ 2**	**SPZ 3**	**No SPZ**
Infiltration Potential	**High**	High	High	High	High
	Medium	High	High	Medium	Medium
	Low	Medium	Medium	Low	Low

The information presented in this section is intended to highlight areas were the simplest of SuDS techniques (i.e. infiltration SuDS) are and are not considered suitable

In line with PPS23 development should be appropriate and should not lead to pollution. As such, it is not appropriate to install infiltration systems in land affected by contamination as this could lead to pollution of underlying groundwater. Please refer to the Environment Agency's 'Groundwater Protection: Policy and Practice (GP3)' document, which is available at www.environment-agency.gov.uk

Supporting SuDS Information

Table W.2 SuDS - Suitability According to Subdivisions of Water Quality, Quantity and Environmental Benefits

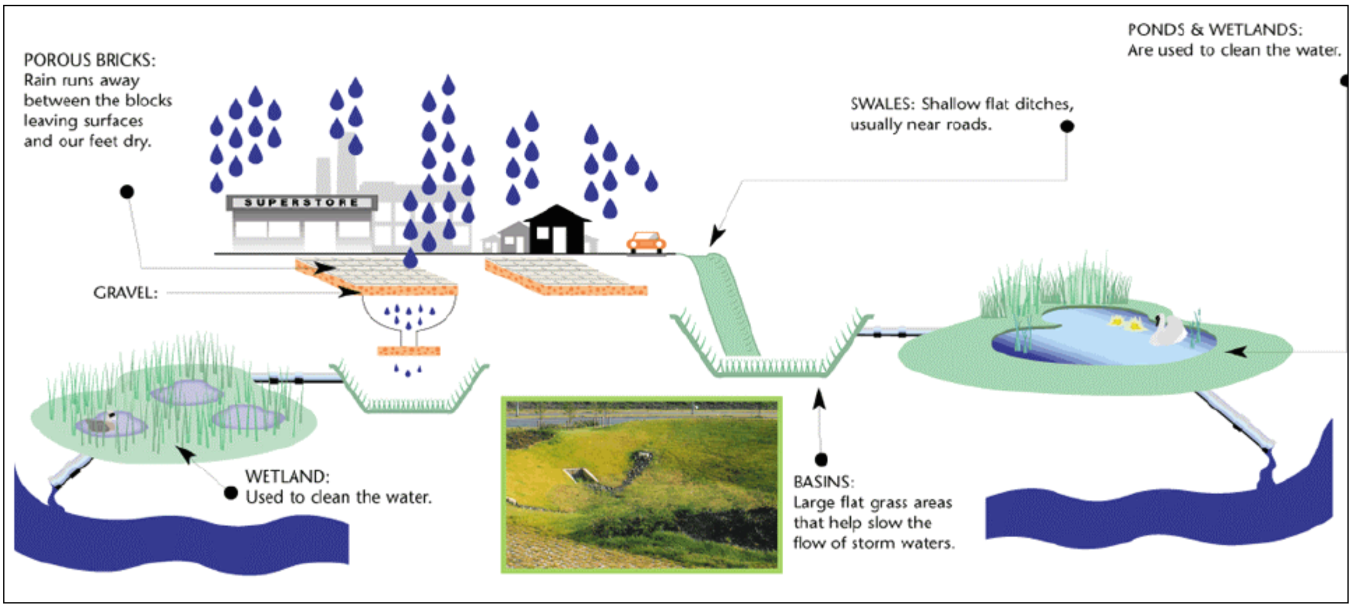
Technique	Description	Water quantity				Water quality								Enviro. benefits		
		Conveyance	Detention	Infiltration	Water harvesting	Sedimentation	Filtration	Adsorption	Biodegradation	Volatilisation	Precipitation	Phytoremediation	Nutrification	Aesthetics	Amenity	Ecology
Water butts, site layout	Good house keeping and design practices	=	=	#	=	=	=	=	=	=	=	=	=	=	=	=
Pervious pavements	Allow inflow of rainwater into underlying construction/soil		#	#	=	#	#	#	#	#				=	=	=
Filter drain	Linear drains/trenches filled with permeable material, often with a perforated pipe in the base of the trench	#	#				#	#	#	#						
Filter strips	Vegetated strips of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and other particulates	=	=	=		#	#	#	#					=	=	=
Swales	Shallow vegetated channels that conduct and/or retain water (and can permit infiltration when un-lined). The vegetation filters particulates	#	#	=		#	#	#	#			=		=	=	=
Ponds	Depressions used for storing and treating water. They have a permanent pool and bankside emergent and aquatic vegetation		#	=	#	#	#	#	#	#	#	#	#	#	#	#
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds	=	#	=	#	#	#	#	#	#	#	#	#	#	#	#
Detention basin	Dry depressions designed to store water for a specified retention time		#			#	=	=	#			=		=	=	=
Soakaways	Sub-surface structures that store and dispose of water via infiltration			#			#	#	#							
Infiltration trenches	As filter drains, but allowing infiltration through trench base and sides	=	#	#			#	#	#	#						
Infiltration basins	Depressions that store and dispose of water via infiltration		#	#			#	#	#	#				=	=	=
Green roofs	Vegetated roofs that reduce runoff volume and rate		#				#	#	#	#	#	#	#	#	=	#
Bioretention areas	Vegetated areas for collecting and treating water before discharge downstream, or to the ground via infiltration.		#	#		#	#	#	#	#	#	#	#	#	#	#
Sand filters	Treatment devices using sand beds as filter media		#	=			#	#	#	#	#					
Silt removal devices	Manhole and/or proprietary devices to remove silt					#										
Pipes, subsurface storage	Conduits and their accessories as conveyance measures and/or storage. Water quality can be targeted using sedimentation and filter media.	#	#			=	=									

High/primary process = Some opportunities, subject to design

Information in table modified after CIRIA (2007)

The information presented in Table E1 is based on the assumption that only a single SuDS technique is implemented on a site and is independent of connected SuDS.

Figure W.1 Likely Implementation of SuDS Management Train



Source of this Graphic = GDSDS (2005)

Table W.3 Influential site characteristics on the applicability of SuDS (Modified after CIRIA 2007)

SuDS Group	Technique	Soils		Area draining to a single SuDS component		Minimum depth to water table		Site slope		Available head	
		Impermeable	Permeable	0 – 2 ha	> 2 ha	0 – 1 m	> 1 m	0 – 5%	> 5 %	0-1 m	1 – 2 m
Retention	**Retention pond**	Y	Y[1]	Y	Y[5]	Y[2]	Y[2]	Y	Y	Y	Y
	Subsurface storage	Y	Y	Y	Y[5]	Y[2]	Y[2]	Y	Y	Y	Y
Wetland	**Shallow wetland**	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y
	Extended detention wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y
	Pond/wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y
	Pocket wetland	Y[2]	Y[4]	Y[4]	N	Y[2]	Y[2]	Y	N	Y	Y
	Submerged gravel wetland	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y
	Wetland channel	Y[2]	Y[4]	Y[4]	Y[6]	Y[2]	Y[2]	Y	N	Y	Y
Infiltration	**Infiltration trench**	N	Y	Y	N	N	Y	Y	Y	Y	N
	Infiltration basin	N	Y	Y	Y[5]	N	Y	Y	Y	Y	N
	Soakaway	N	Y	Y	N	N	Y	Y	Y	Y	N
Filtration	**Surface sand filter**	Y	Y	Y	Y[5]	N	Y	Y	N	N	Y
	Sub-surface sand filter	Y	Y	Y	N	N	Y	Y	N	N	Y
	Perimeter sand filter	Y	Y	Y	N	N	Y	Y	N	Y	Y
	Bioretention/filter strips	Y	Y	Y	N	N	Y	Y	N	Y	Y
	Filter trench	Y	Y[1]	Y	N	N	Y	Y	N	Y	Y
Detention	**Detention basin**	Y	Y[1]	Y	Y[5]	N	Y	Y	Y	N	Y
Open channels	**Conveyance swale**	Y	Y	Y	N	N	Y	Y	N[3]	Y	N
	Enhanced dry swale	Y	Y	Y	N	N	Y	Y	N[3]	Y	N
	Enhanced wet swale	Y[2]	Y[4]	Y	N	Y	Y	Y	N[3]	Y	N
Source control	**Green roof**	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	Rainwater harvesting	Y	Y	Y	N	Y	Y	Y	Y	Y	
	Permeable pavement	Y	Y	Y	Y	N	Y	Y	N	Y	Y

Y = Yes
N = No
Y1 = with liner
Y2 = with surface baseflow
Y3 = Unless follows contours
Y4 = With liner and constant surface baseflow, or high ground water table
Y5 = possible, but not recommended (appropriate management train not in place)
Y6 = Where high flows are diverted around SuDS component

Additional policy and general guidance on SuDS and drainage include the following:

- PPS25 Practice Guide, 2007
- Water Framework Directive (200/60/EC);
- Highways Act, 1980;
- Town and Country Planning Act, 1990;
- Town and Country Planning Act, 1990 (amended) NB covers S106 Agreements;
- Town and Country Planning Act, 1991;
- Construction, Design and Management Regulations, 1994;
- Building Regulations Part C Approved Document H – Drainage and Waste Disposal of the Building Regulations 2002 Amendment;
- ODPM 2004. Planning Policy Statement 1: *Delivering Sustainable Development*;
- Communities and Local Government, 2006. Planning Policy Statement 25: *Development and Flood Risk*;
- Communities and Local Government, 2007. *Development and Flood Risk: A practice guide companion to PPS25* ;
- BRE Digest 365 Soakaway Design BSE EN 752-4: 1998 Drain and Sewer Systems outside buildings, part 4;
- CIRIA. Sustainable Drainage Systems – Hydraulic, Structural and water quality advice (CIRIA 609);
- CIRIA. The SUDS Manual (CIRIA C697);
- CIRIA. *Source control using constructed previous surfaces. Hydraulic, structural and water quality performance issues* (CIRIA 582);
- CIRIA. *Infiltration Drainage – manual of good practice* (CIRIA R156);
- CIRIA. *Review of the design and management of constructed wetlands* (CIRIA R180);
- CIRIA. *Control of pollution from highway drainage discharge* (CIRIA R142);
- CIRIA. *Design of flood storage reservoirs* (CIRIA Book 14);
- CIRIA. *Designing for exceedance in urban drainage systems – good practice* (CIRIA C635);
- CIRIA. *Rainwater and grey-water use in buildings* (CIRIA C539);

- Defra, 2004. *Making Space for Water – Developing a new Government strategy for flood and coastal erosion risk management in England: A Consultation Exercise;*
- Defra, 2005. *Making Space for Water – Taking forward a new Government strategy for flood and coastal erosion risk management in England: First Government response to the Autumn 2004;*
- Defra, 2006. *Urban Flood Risk and Integrated Drainage*. Scoping report and pilot studies;
- Environment Agency, 2003. Harvesting rainwater for domestic uses: an information guide;
- Groundwater Protection: Policy and Practice, Part 4 Legislation and Policies
- HR Wallingford. Use of SUDS in high density development;
- National SUDS Working Group, 2006. Interim Code of Practice for SUDS
- Planning Policy Statement 23
- WRc. Sewers for Adoption 6th Edition (SfA6) (published by Water UK).

Isle of Wight
Strategic Flood Risk Assessment MK2

Appendix X
Environment Agency Standard
FRA Response Text

June 2010

ISLE of WIGHT COUNCIL

Information Taken from Operational Instruction 1045_08 Issued 23/03/2009 Version 2

EFR O 01 No Sequential Test

Environment Agency position

We OBJECT to this application in the absence of any evidence to demonstrate that the flood risk Sequential Test has been applied. We recommend that until then the application should not be determined for the following reasons:

Reasons

The application site lies within Flood Zone <*3a/3b/2*> defined by Planning Policy Statement 25 as having a <*high / medium*> probability of flooding. Paragraph D5 of PPS25 requires decision-makers to steer new development to areas at the lowest probability of flooding by applying a 'Sequential Test'. In this instance no evidence has been provided to indicate that this test has been carried out.

We ask to be reconsulted with the results of the Sequential Test. Our objection will remain until your Authority has carried out the Sequential Test to demonstrate that there are no reasonably available alternative sites in areas with a lower probability of flooding that would be appropriate for the type of development proposed.

Advice to planning liaison and consultees

This objection is unusually worded in that rather than asking the LPA to refuse the application it asks the LPA not to determine the application until the sequential test has been applied. This reflects the uniqueness of this situation where it is the actions/omission of the LPA that is the issue not something that the developer may or may not have done. Moreover the LPA could legitimately carry out the sequential test after consultation. This response therefore makes clear that the LPA must carry out the ST and should reconsult us once this has been carried out.

EFR O 02 Sequential Test submitted but not demonstrated

Environment Agency position

We OBJECT to this application because the flood risk Sequential Test submitted with the application fails to demonstrate that the Sequential Test has been adequately applied. We recommend that the application should not be determined until the Sequential Test has been demonstrated for the following reasons:

Reasons

The application site lies within Flood Zone <*3a/3b/2*> defined by Planning Policy Statement 25 as having a <*high / medium*> probability of flooding. Paragraph D.5 of PPS25 requires decision-makers to steer new development to areas at the lowest probability of flooding by applying a 'Sequential Test'. In this instance the evidence provided to indicate that this test has been carried out is inadequate for the following reasons:

Free text: State the deficiencies

We wish to be reconsulted on any revised Sequential Test. Our objection will remain until we receive a revised Sequential Test from your Authority which demonstrates that there are no reasonably available alternative sites in areas with a lower probability of flooding that would be appropriate for the type of development proposed.

Advice to planning liaison and consultees

Applying the Sequential Test is a task for the local planning authority as assisted through the supply of information by the applicant. Our ability to challenge the quality of the Sequential Test in most cases will be very limited not least by the fact that we lack access to the evidence base which the LPA will use when determining the Sequential Test. Caution is therefore required in using this objection. However, there may be cases where we have sufficiently strong grounds to challenge the quality of a Sequential Test, for example, where we know there are allocated sites at lower flood risk which appear suitable for the development proposed but which have not even been considered as part of the Sequential Test.

As in EFR O 01 –the objection is worded with a request not to determine the application until the Sequential Test has been demonstrated, for the same treasons as explained in the user notes to that paragraph.

EFR O 03 Issue: Sequential Test failed

Environment Agency position

We OBJECT to this application because the Sequential Test information submitted with the application has demonstrated that there are reasonably available sites with less flood risk on which this development could proceed instead. We therefore recommend that the application should be refused.

Reasons

The application site lies within Flood Zone *<3a/3b/2> defined by* Planning Policy Statement 25 (PPS25) as having a *<high/medium>* probability of flooding. Paragraph D5 of PPS25 requires decision-makers to steer new development to areas at the lowest probability of flooding by applying a 'Sequential Test'. In this instance the evidence provided to indicate that this test has been carried out indicates that there are reasonably available sites at lower flood risk. Developing this site therefore fails to apply the sequential approach advocated in paragraph 14 of PPS25.

Free text –list the reasonably available sites/sources of information

Advice to planning liaison and consultees

The previous paragraph covers the situation where the evidence supplied as the Sequential Test is grossly and obviously deficient in some way. In contrast this objection applies where the quality of the Sequential Test may not be in doubt but the outcome indicates that the application should be refused in accordance with PPS25 para D5.

EFR O 04 Proposed development incompatible with Flood Zone

Environment Agency position

We OBJECT to this application because the proposed development falls into a flood risk vulnerability category that is inappropriate to the Flood Zone in which the application site is located. We recommend that the application should be refused planning permission on this basis.

Reasons

Planning Policy Statement 25 (PPS25) classifies development types according to their vulnerability to flood risk and gives guidance on which developments are appropriate in each Flood Zone. PPS25 requires decision-makers to ensure that as part of the Sequential Test, development sites are appropriate to the type of development or land use proposed.

In this case, the application site lies within Flood Zone <*3a/3b functional floodplain*> defined by Planning Policy Statement 25 as having a high probability of flooding. The development type in the proposed application is classified as <*insert vulnerability category in line with table D.2, PPS25*> in accordance with table D.2 of PPS25. Tables D.1 and D.3 of PPS25 make clear that this type of development is not compatible with this Flood Zone and should not therefore be permitted.

EFR O 05 Part (c) of Exception Test failed

Environment Agency position

We OBJECT to this application because it has failed to meet the requirements of part (c) of the flood risk Exception Test and recommend that planning permission be refused on this basis for the following reasons:

Reasons

Planning Policy Statement 25 (PPS25) requires the Exception Test to be applied in the circumstances shown in tables D.1and D.3. Paragraph D9 of PPS25 makes clear that all three elements of the Test must be passed for development to be permitted. Part (c) of the Test requires the applicant to demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall. Paragraph D13 requires that compliance with each part of the Exception Test is openly demonstrated.

The application site lies in a within Flood Zone <*3a/3b/2*> defined by Planning Policy Statement 25 as having a <*high / medium*> probability of flooding. Development classified as <*inset vulnerability classification*> is only appropriate in these areas following application of the Sequential Test and where the Exception Test has been applied in full and has been passed. In this instance the submitted flood risk assessment (FRA) fails to:

<state the deficiencies>, for example >:

i. Demonstrate that the development is ‘safe’ because….

ii. Increases flood risk in the surrounding area

iii. Address the opportunities presented by this development for reducing flood risk for example

EFR O 06 No FRA submitted (development in Flood Zones 3 or 2)

Environment Agency position

In the absence of a flood risk assessment (FRA), we OBJECT to this application and recommend refusal of planning permission on this basis for the following reasons:

Reasons

The application site lies within Flood Zone <*3a/3b/2*> defined by Planning Policy Statement 25 as having a <*high / medium*> probability of flooding. Paragraph E9 of PPS25 requires applicants for planning permission to submit a FRA when development is proposed in such locations.

In the absence of a FRA, the flood risks resulting from the proposed development are unknown. The absence of a FRA is therefore sufficient reason in itself for a refusal of planning permission. This reflects the precautionary approach to development in flood risk areas set out in paragraphs 10 and E9 of PPS25.

We will provide you with bespoke comments within 21 days of receiving formal reconsultation. Our objection will be maintained until an adequate FRA has been submitted.

EFR O 07 No FRA submitted (surface water)

Environment Agency position

In the absence of a flood risk assessment (FRA), we OBJECT to this application and recommend refusal of planning permission on this basis for the following reasons:

Reason

The application lies within Flood Zone 1 defined by Planning Policy Statement 25 as having a low probability of flooding. However the proposed scale of development may present risks of flooding on-site and/or off-site if surface water run-off is not effectively managed. Paragraph E9 of PPS25 requires applicants for planning permission to submit a FRA when development on this scale is proposed in such locations.

In the absence of a FRA, the flood risks resulting from the proposed development are unknown. The absence of a FRA is therefore sufficient reason in itself for a refusal of planning permission. This reflects the precautionary approach to development in flood risk areas set out in paragraphs 10 and E9 of PPS25

We ask to be re-consulted with the results of the FRA. Our objection will be maintained until an adequate FRA has been submitted.

Advice to planning liaison and consultees

Consider whether the PPS25 paragraph 26 reconsultation paragraph (EFR I 09) should be added. Refer to Town & Country Planning (Flooding) (England) Direction 2007

EFR O 08 Inadequate FRA

Environment Agency position

In the absence of an acceptable Flood Risk Assessment (FRA) we OBJECT to the grant of planning permission and recommend refusal on this basis for the following reasons:

Reason

The FRA submitted with this application does not comply with the requirements set out in Annex E, paragraph E3 of Planning Policy Statement 25 (PPS 25). The submitted FRA does not therefore, provide a suitable basis for assessment to be made of the flood risks arising from the proposed development.

In particular, the submitted FRA fails to <*state main deficiencies, for example*>

i. Take the impacts of climate change into account

ii. Consider the effect of a range of flooding events including extreme events on people and property.

iii. Consider the requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event (as advised by PPS25, paragraph G12 and the PPS25 Practice Guide, paragraph 7.23)

If the applicants or agents wish to discuss this position with us, they should contact <*planning liaison name / contact number*>

Advice to planning liaison and consultees

It is important to detail precisely what aspects of the FRA are defective relative to annex E.

NOTE: _Flood emergency planning

In the case of Flood Emergency plans, it is important to be clear that our objection is a procedural one based on the fact that this issue has not been addressed in the FRA as required by Government planning policy in PPS25 and the Practice Guide. Other than flood warning for which we are responsible, we should make clear to the LPA that we will **not comment on the detail** of any Flood Emergency Plan because we are do not the responsible body to do this. Use with informative EFR I 12 ‘Flood warning and evacuation’.

EFR O 08 Risk to life and/or Property

Environment Agency position

We OBJECT to the application and recommend refusal of planning permission on this basis for the following reasons:

Reason

The site lies within Flood Zone <*3a/3b/2*> defined by Planning Policy Statement 25 as having a <*high / medium*> probability of flooding where <*notwithstanding the mitigating measures proposed,*> the risk to life and/or property,

<*both within the development and in upstream and/or downstream locations*> from <*tidal / fluvial*> inundation would be unacceptable if the development were to be allowed.

In particular: *(user to select/amend/add to as appropriate)*

i. The proposed development does not have a safe means of access and/or egress in the event of flooding. Consequently, there would be an unacceptable risk to the health and safety of the occupants in a flood event.

ii. The site is currently not defended to the appropriate standard taking into account climate change over the lifetime of the development and <no / inadequate> provision is made in the application to improve the existing defences to the required standard.

iii. The site lies within the flood plain and the proposed development will impede flood flow and/or reduce storage capacity thereby increasing the risk of flooding elsewhere.

iv. The site lies on a dry Island within the floodplain. Although the site itself would not be inundated during such an event, the area around this site would be flooded. During a flood, residents trying to leave the site would be at considerable danger from the floodwater itself and also from various other hazards such as underwater drops and water bourn debris. The journey to safe, dry areas completely outside the floodplain would involve crossing areas of potentially fast flowing floodwater. Those venturing out on foot in areas where flooding exceeds 100mm or so would be at risk from a wide range of hazards, including for example un marked drops, or access chambers where the cover has been swept away.

v. The information provided suggests that the proposed development will cause an unacceptable risk of surface water flooding to people and property elsewhere. This can apply in flood zone 1 as well, and will require modification of the wording above in that case.

If the applicants or agents wish to discuss this position with us, they should contact <planning liaison name / contact number>

EFR O 10 Culverting

Environment Agency position

We OBJECT to the proposed development which involves culverting works and recommend that planning permission be refused for the following reasons:

Reasons

Environment Agency policy includes a general opposition to culverting except for access purposes. We are opposed to the unnecessary culverting of watercourses, because it can increase the risk of flooding and the maintenance requirements for a watercourse. It can also destroy wildlife habitats, damage a natural amenity and interrupt the continuity of the linear habitat of a watercourse.

In this application, the proposed culverting is unacceptable because:

Free text: Add detail, for example:

- the culvert would cause a restriction of flow in the watercourse
- the culvert would increase the risk of blockage of the watercourse

Advice to applicant

Culverting of the watercourse will require the prior written approval of the Environment Agency under s.23 of the Land Drainage Act 1991 or s.109 of the Water Resources Act 1991. Consent is highly unlikely to be granted in this instance.

Please contact <*planning liaison name/contact number*> for a copy of our policy concerning culverting.

Advice to planning liaison and consultees

The objection will be much stronger if we can refer to any specific local information, for example, known problems with existing culverts on the same watercourse or capacity problems in the catchment. Local plans often contain policies against culverting thanks to our input over many years. Where a supportive policy in a relevant Local Development Document exists, we should use it.

We might also want to suggest options that do not involve culverting, such as reducing the length to the minimum for access crossings, or rearranging the layout of the site to retain an open watercourse. We should be careful however not to go too far in suggesting changes or designing solutions for the developer.

EFR O 11 Building next to a watercourse/flood defence

Environment Agency position

We OBJECT to the application and recommend refusal of planning permission on this basis for the following reasons:

Reason

The proposed development is unacceptable because it involves building <*over/ within X metres of*> a <*watercourse/flood defence/sea wall*>. This would:

Free text: Add site-specific reason or reasons based on following prompts

- restrict essential maintenance and emergency access to the <watercourse / sea wall / defences> The permanent retention of a continuous unobstructed area is an essential requirement for future maintenance and / or improvement works.
- result in an unacceptable obstruction to flood flows thereby increasing the risk of flooding.

- be likely to adversely affect the construction and stability of the flood defence <embankment/wall/ground anchors/power supplies> which will compromise its function. The proposal will therefore increase the risk of flooding in the locality.

Advice to planning liaison and consultees

Where the proposed development falls within the bye-law distance of a main river, remind the applicant of the need for consent using informative paragraph EFR I 01. Where we are objecting we should warn the applicant that consent is unlikely to be forthcoming. Flood risk (England): Conditions

With all these conditions, consider adding the following link paragraph:

Ask to be consulted on discharge of conditions

NMF LF 02 Request for consultation on discharge of condition

We ask to be consulted on the details submitted for approval to your Authority to discharge this condition and on any subsequent amendments/alterations.

EFR C 01 Secure implementation of the FRA

Environment Agency position

The proposed development will only be acceptable if the following measure(s) as detailed in the Flood Risk Assessment <*and/or other planning documents (list)*> submitted with this application are implemented and secured by way of a planning condition on any planning permission.

Condition

The development permitted by this planning permission shall only be carried out in accordance with the approved Flood Risk Assessment (FRA) <*date / reference number / compiler details*> and the following mitigation measures detailed within the FRA:

User to detail as appropriate referring to specific paragraph references or drawing numbers where relevant within the FRA to make the condition as clear as possible, for example:

i. Limiting the surface water run-off generated by the <state return event> critical storm so that it will not exceed the run-off from the undeveloped site and not increase the risk of flooding off-site.

ii. Provision of compensatory flood storage on / or in the vicinity of the site to a <year standard>.

iii. Demonstration within the FRA that the improvement/protection and maintenance of existing flood defences will be provided.

iv. Identification and provision of safe route(s) into and out of the site to an appropriate safe haven.

v. Confirmation of the opening up of any culverts across the site.

vi. Flood-proofing measures detailed on page ….in the proposed development.

vii. Finished floor levels are set no lower than < > m above Ordnance Datum (AOD).

Add others as required.

Reason

T*o be supplied by DC in free form or as set out below (if appropriate)*

i. To prevent flooding by ensuring the satisfactory storage of/disposal of surface water from the site.

ii. To prevent flooding elsewhere by ensuring that compensatory storage of flood water is provided. .

iii. To ensure the structural integrity of existing <and proposed> flood defences thereby reducing the risk of flooding.

iv. To ensure safe access and egress from and to the site.

v. To reduce the risk of flooding from blockages to the existing culvert (s).

vi. To reduce the impact of flooding on the proposed development and future occupants.

vii. To reduce the risk of flooding to the proposed development and future occupants.

Advice to planning liaison and consultees

In theory, mitigation details set out in a FRA (or other documents e.g. drawings or the Environmental Statement) could be considered to form part of the design approved by any grant of planning permission. If these details are then omitted from the finished development it ought to be possible for the LPA to take enforcement action on this basis. However, paragraph 19 of DOE Circular 11/95 notes that it "may well be easier to for local planning authorities to enforce compliance with a condition that has been breached, than to enforce on a material variation from the approved plans or description of development." Therefore, where there are important specific elements of mitigation suggested by the FRA which are crucial to the acceptability of the proposed scheme, it is clearer and more enforceable to pull these elements into a condition or series of conditions.

EFR C 02 Scheme to be agreed - issue not addressed/not satisfactorily addressed in FRA

Environment Agency position

The proposed development will only be acceptable if the following planning condition is imposed:

Condition

The development hereby permitted shall not be commenced until such time as a scheme to <*insert from list below*> has been submitted to, and approved in writing by, the local planning authority.

User to detail as appropriate, for example:

i. Ensure no raising of ground levels.

ii. Improve the existing surface water disposal system.

iii. Ensure access to/improvement/protection and maintenance of existing flood defences.

iv. Incorporate flood-proofing measures into the proposed development.

v. Ensure finished floor levels are set no lower than < > m above Ordnance Datum (AOD).

The scheme shall be fully implemented and subsequently maintained, in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.

Reason

i. To be supplied by DC in free form or as set out below (if appropriate).

ii. To prevent flooding by ensuring the satisfactory storage of/disposal of surface water from the site.

iii. To ensure the structural integrity of existing <and proposed> flood defences thereby reducing the risk of flooding.

iv. To reduce the impact of flooding on the proposed development and future occupants.

v. To reduce the risk of flooding to the proposed development and future occupants.

Advice to planning liaison and consultees

This condition needs to be used with **considerable caution**. It covers the situation where the risks posed by the proposed development appear from the FRA to be acceptable but either certain mitigation required has not been identified or has been identified but lacks sufficient detail, hence the need for a scheme to be agreed. Caution is required because if there is any uncertainty about the feasibility of addressing the flood risks associated with the development, for example, SUDS/flood storage and space requirements, or the requested condition would result in a material change to the application a safer course would be for us to object as per EFR O 08 above on the grounds that the FRA is inadequate.

EFR C 03 Outline application – reserved matters to include scheme to be agreed

Environment Agency position

We consider that outline planning permission should only be granted to the proposed development if the following planning condition is imposed as set out below.

Condition

The development hereby permitted shall not be commenced until such time as a scheme to <*insert from list below*> has been submitted to, and approved in writing by, the Local Planning Authority.

User to detail as appropriate, for example:

i. Ensure no raising of ground levels.

ii. Improve the existing surface water disposal system.

iii. Ensure access to/improvement/protection and maintenance of existing flood defences.

iv. Incorporate flood-proofing measures into the proposed development.

v. Ensure finished floor levels are set no lower than < > m above Ordnance Datum (AOD).

The scheme shall be fully implemented and subsequently maintained, in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.

Reason

This condition is required for the following reasons: (*to be supplied by function in free form or as set out below if appropriate)*

i. To avoid adverse impact on flood storage.

ii. To prevent flooding by ensuring the satisfactory storage of/disposal of surface water from the site.

iii. To ensure the structural integrity of existing <and proposed> flood defences thereby reducing the risk of flooding.

iv. To reduce the impact of flooding on the proposed development and future occupants.

v. To reduce the risk of flooding to the proposed development and future occupants.

Although we are satisfied at this stage that the proposed development could be allowed in principle, the applicant will need to provide further information relating to the proposals to an acceptable standard to ensure that the proposed development can go ahead without posing an unacceptable flood risk.

As the matters referred to in the suggested planning condition are not “reserved matters” as defined in the Town and Country Planning Act, 1990, it will be necessary to impose a separate condition for each issue to ensure that these matters are addressed by future developers.

Advice to planning liaison and consultees

Like EFR C02 above, this condition needs to be used ***with caution****. It is only appropriate to condition the matters listed where it is clear from the initial FRA that the mitigation proposed is achievable but some of the detail about exactly how that will be achieved is missing. Where there is doubt the feasibility of the proposed scheme in flood risk terms (for example, whether the space requirements for SUDS can be met within the site constraints), it will be more appropriate to object on the grounds that the FRA is inadequate to enable assess the flood risks posed as per EFR O 08.*

Historically, applicants for outline planning permission were able to rely on providing very scant detail (often just a red site outline) to accompany applications. Since September 2006, the requirement on applicants to submit a design and access statement with planning applications including at outline stage, means that applicants have to provide more design detail on this type of application. This should help us take a stronger line on outline applications where the applicant has supplied insufficient detail for to assess the associated flood risks.

EFR C 04 Working method statement –works in channel/bankside (ordinary watercourse)

Environment Agency position

The proposed development will only be acceptable if a planning condition is imposed requiring a working method statement to cover all <*channel / bank works*>.

Condition

Prior to the commencement of development, a working method statement to cover <*all channel / bank works*> shall be submitted to and agreed in writing by the local planning authority. Thereafter the development shall be carried out in accordance with the approved scheme and any subsequent amendments shall be agreed in writing with the local planning authority.

Reason

The construction phase of any proposed development affecting the <*bank or channel of a watercourse*> poses significant risks of:

Free text: Add detail of risks

Information for the applicant/LPA –method statement requirements

We would expect the method statement to cover the following requirements:

- timing of works
- methods used for all channel, bankside water margin works
- machinery (location and storage of plant, materials and fuel, access routes, access to banks etc.)
- protection of areas of ecological sensitivity and importance
- site supervision

We ask to be consulted on the details of this scheme when it is submitted for approval to your Authority.

Advice to planning liaison and consultees

This condition applies to situations where works are taking place in the channel or bankside of an ordinary watercourse and won't be covered by the need for a flood defence consent as would be the case with a main river, but the planning application does not provide any/sufficient information about how the developer intends to *undertake in-channel or bankside construction. In this situation the resulting risks are cross cutting. Reasons should not be standard however and should be written for each individual case.*

EFR C 05 Details of surface water drainage scheme incorporating SUDS to be submitted

Environment Agency Position

The proposed development will only be acceptable if a planning condition is imposed requiring the following drainage details.

Condition

Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydro geological context of the development, has been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.

The scheme shall also include:

Free text: User to detail, for example:

- * details of how the scheme shall be maintained and managed after completion

Reason

To prevent the increased risk of flooding, to improve and protect water quality, improve habitat and amenity, and ensure future maintenance of these *<delete/add to as necessary>*

Advice to planning liaison and consultees

Like EFR C02 above, this condition needs to be used **with caution**. It is only appropriate to condition the use of SUDS where it is clear from the initial FRA that their use is achievable but some of the detail about exactly how that will be achieved is missing. Where there is doubt the feasibility of the proposed scheme can be met within the site constraints (particularly whether the space requirements for balancing ponds, swales, reed beds etc), it will be more appropriate to object on the grounds that the FRA is inadequate to enable assess the flood risks posed as per EFR O 08.

Flood risk (England): Informatives

EFR I 01 Consent – adjacent to main river

Advice to applicant

Under the terms of the Water Resources Act 1991, and the <*name local land drainage byelaw/sea defence byelaw*>, the prior written consent of the Environment Agency is required for any proposed works or structures, in, under, over or within <*width*> metres of the top of the bank of the <*watercourse name*>, designated a 'main river'.

EFR I 02 Consent – culverting

Advice to applicant

Erection of flow control structures or any culverting of a watercourse requires the prior written approval of the Environment Agency under s.23 of the Land Drainage Act 1991 or s.109 of the Water Resources Act 1991. The Environment Agency resists culverting on nature conservation and other grounds and consent for such works will not normally be granted except for access crossings.

EFR I 03 Description of SUDS

Advice to LPA/applicant

Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management (SUDS). SUDS are an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on or near the site as opposed to traditional drainage approaches which involve piping water off site as quickly as possible. SUDS involve a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. SUDS offer significant advantages over conventional piped drainage systems in reducing flood risk by attenuating the rate and quantity of surface water run-off from a site, promoting groundwater recharge, and improving water quality and amenity.

The variety of SUDS techniques available means that virtually any development should be able to include a scheme based around these principles.

EFR I 04 Support for SUDS approach (England)

Advice to LPA/applicant

Support for the SUDS approach to managing surface water run-off is set out in paragraph 22 of Planning Policy Statement 1 (PPS): Delivering Sustainable Development and in more detail in Planning Policy Statement 25: Development and Flood Risk at Annex F. Paragraph F8 of the Annex notes that "Local Planning Authorities should ensure that their policies and decisions on applications support and complement Building Regulations on sustainable rainwater drainage".

EFR I 05 SUDS – infiltration

Advice to LPA/applicant

Approved Document Part H of the Building Regulations 2000 establishes a hierarchy for surface water disposal, which encourages a SUDS approach. Under Approved Document Part H the first option for surface water disposal should be the use of SUDS, which encourage infiltration such as soakaways or infiltration trenches. In all cases, it must be established that these options are feasible, can be adopted and properly maintained and would not lead to any other environmental problems. For example, using soakaways or other infiltration methods on contaminated land carries groundwater pollution risks and may not work in areas with a high water table. Where the intention is to dispose to soakaway, these should be shown to work through an appropriate assessment carried out under Building Research Establishment (BRE) Digest 365.

EFR I 06 SUDS – flow balancing

Advice to LPA/applicant

Flow balancing SUDS methods which involve the retention and controlled release of surface water from a site may be an option for some developments at a scale where uncontrolled surface water flows would otherwise exceed the local greenfield run off rate. Flow balancing should seek to achieve water quality and amenity benefits as well as managing flood risk.

EFR I 07 SUDS scheme to include SUDS strategy

Advice to LPA/applicant

The drainage scheme proposed should provide a sustainable drainage strategy to include SUDS elements with attenuation, storage and treatment capacities incorporated as detailed in the CIRIA SUDS Manual (C697).

EFR I 08 SUDS – further information sources (England)

Advice to LPA/applicant

Further information on SUDS can be found in:

- PPS25 page 33 Annex F
- PPS25 Practice Guide
- CIRIA C522 document Sustainable Drainage Systems-design manual for England and Wales
- CIRIA C697 document SUDS manual
- the Interim Code of Practice for Sustainable Drainage Systems. The Interim Code of Practice provides advice on design, adoption and maintenance issues and a full overview of other technical guidance on SUDS.

The Interim Code of Practice is available on both the Environment Agency's website: www.environment-agency.gov.uk and CIRIA's website: www.ciria.org.uk

EFR I 09 Request for LPA reconsultation if minded to approve contrary to Environment Agency objection

Advice to LPA

If you are minded to approve the application contrary to this advice, we request that you contact us to allow further discussion and/or representations from us as advised in PPS25 paragraph 26.

EFR I 10 FRA sources of information

Advice to applicant

The Environment Agency does not prepare or provide FRAs. However, our External Relations Team can provide any relevant flooding information that we have available. Please be aware that there may be a charge for this information. Please contact <*details*> or write in to <*details*> Your local planning authority should have undertaken a strategic flood risk assessment (SFRA), where information on flood risk locally which may inform your FRA has been collated. Please contact your local planning authority to determine what information may be available.

EFR I 11 Flood proofing

Advice to LPA/applicant

The Environment Agency recommends that in areas at risk of flooding consideration be given to the incorporation into the design and construction of the development of flood proofing measures. These include barriers on ground floor doors, windows and access points and bringing in electrical services into the building at a high level so that plugs are located above possible flood levels.

Additional guidance can be found in the Environment Agency Flood line Publication 'Damage Limitation'. A free copy of this is available by telephoning 0845 988 1188 or can be found on our website www.environment-agency.gov.uk click on 'flood' in subjects to find out about, and then 'floodline'.

Reference should also be made to the Department for communities and local Government publication 'Preparing for Floods' please email: communities@twoten.com for a copy.

EFRI 12 Flood warning and evacuation

Advice to LPA

The Environment Agency does not normally comment on or approve the adequacy of flood emergency response and evacuation procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants/users.

Planning Policy Statement 25 and the associated Practice Guide (paragraphs 7.23 to 7.31) places responsibilities on LPAs to consult their Emergency Planners with regard to specific emergency planning issues relating to new development. In all circumstances where warning and evacuation are significant measures in contributing to managing flood risk, we will expect LPAs to formally consider the emergency planning and rescue implications of new development in making their decisions

EFR I 13 Flood risk standing advice applies- pre application

Advice to applicant

The proposed development falls within Flood Zone <*3/2*> as defined in Planning Policy Statement 25 and is therefore at risk of flooding.

We have produced a series of standard comments for local planning authorities (LPAs) and planning applicants to refer to on 'lower risk' development proposals where flood risk is an issue to replace direct case by case consultation with us. Your proposal falls within this category.

These standard comments are known as Flood Risk Standing Advice (FRSA). FRSA can be viewed on our web site at www.environment-agency.gov.uk

The standing advice relevant to your proposal is attached to this response. **Complete the attached form and include it as part of your planning application submission to your local planning authority.** The local planning authority will then determine whether flood risk has been considered in line with FRSA recommendations. We will not be consulted on this planning application.

We recommend that you view our standing advice in full on our website before submitting your planning application to the local planning authority.

EFRI 14 Flood risk standing advice applies- planning application

Advice to LPA

The proposed development sits within Flood Zone <*3/2*> and is therefore at risk of flooding.

We have produced a series of standard comments for local planning authorities (LPAs) and planning applicants to refer to on 'lower risk' development proposals where flood risk is an issue to replace direct case by case consultation with us. This planning application sits within this category.

These standard comments are known as Flood Risk Standing Advice (FRSA). FRSA can be viewed on our web site at www.environment-agency.gov.uk

The standing advice relevant to this application is attached to this response. We recommend that you view our standing advice in full on our web site before making a decision on this application. The advice relevant to this application is attached for your convenience.

Please refer the applicant to our standing advice at the above web address.

Applicants should follow the advice and submit a completed form as part of their planning application submission. We do not need to be consulted further on this application.

EFR I 15 Pre-application advice on FRA -no prejudice to sequential approach requirements

Advice to LPA/applicant

Please note that notwithstanding the Environment Agency's comments on the applicant's flood risk assessment at pre-planning enquiry stage, we will expect to see evidence submitted with any future planning application to show that the PPS25 Sequential Test (and Exception Test if required) has been applied in accordance with Planning Policy Statement 25 paragraphs 14, 18-19 and D1-D6. If this evidence is lacking we may object to the planning application on these grounds.