Shellfish Pollution Reduction Programme

As required by Article 5 of the Shellfish Water Directive 2006/113/EC and
Section 6 of the Quality of Shellfish Waters Regulations, 2006 (S.I. No. 268 of 2006)

Characterisation Report Number 33

WEXFORD HARBOUR OUTER SHELLFISH AREA
COUNTY WEXFORD

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ABBREVIATIONS

AA	Appropriate Assessment
BOD	Biochemical Oxygen Demand
CFB	Central Fisheries Board
CSO	Combined Sewer Overflow
DED	District Electoral Division
DEHLG	Department of Environment Heritage and Local Government
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
EU	European Union
Ha	Hectare
IPPC	Integrated Pollution Prevention Control
Kg	Kilogram
LU	Livestock Units
NACE	European industrial activity classification
MI	Marine Institute
NPWS	National Parks and Wildlife Service
OSWWTS	On-Site Waste Water Treatment System
P.E.	Population Equivalent
PRP	Pollution Reduction Programme
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SFPA	Sea Fisheries Protection Authority
SPA	Special Protection Area
SWMC	Shellfish Waters Management Committee
TCE	Tetrachloroethylene
WFD	Water Framework Directive
WSIP	Water Services Investment Programme
WTP	Water Treatment Plant
WWTP	Waste Water Treatment Plant

1.0 INTRODUCTION

Article 5 of the Shellfish Directive (2006/113/EC) and section 6 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006) require the development of Pollution Reduction Programmes (PRPs) for designated shellfish areas in order to support shellfish life and growth and to contribute to the high quality of directly edible shellfish products. Shellfish PRPs relate to bivalve and gastropod molluscs, including oysters, mussels, cockles, scallops and clams. They do not cover shellfish crustaceans such as crabs, crayfish and lobsters.

1.1 Aims and responsibility

The objectives of Shellfish PRPs are to:

- Protect or improve water quality in designated shellfish areas;
- Achieve compliance with water quality parameter values outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedules 2 and 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006);
- Determine the factors responsible for any non-compliances with the water quality parameter values; and
- Ensure that implementation of the Shellfish PRPs does not lead, directly, or indirectly, to increased pollution of coastal and brackish waters.

Under the Regulations, the Department of Communications, Marine and Natural Resources is responsible for the development of Shellfish PRPs. However, this responsibility was transferred to the Department of the Environment, Heritage and Local Government (DEHLG) on 5th November 2008. An Inter-Departmental /Inter Agency Shellfish Waters Management Committee (SWMC) supports the Department in the development of the Shellfish PRPs.

The Regulations also place an obligation on every public authority to perform its functions in a manner that promotes compliance with the Directive and the Regulations, and to take such actions as are necessary to secure compliance with the Directive and the Regulations and with the Shellfish PRPs.

1.2 Shellfish water quality parameters

Compliance with the directive is measured against achievement of shellfish water quality parameter values outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedules 2 and 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006). Table 1 summarizes these values. Mandatory (I) values must be fully achieved while it must be endeavoured to achieve guideline values (G).

TABLE 1 - Parameters listed in Annex I of the Shellfish Water Directive

Physical	Guideline Values (G)	Mandatory Values (I)
pH (pH units)		7 – 9 pH units
Temperature (°C)	A discharge affecting shellfish waters must not cause the	No mandatory value set in the Directive

	temperature of the waters to exceed by more than 2°C the temperature of waters not so affected	
Colouration (after filtration) (mg Pt/l)		A discharge affecting shellfish waters must not cause the colour of the waters after filtration to deviate by more than 10 mg Pt/l from the colour of unaffected waters
Suspended Solids (mg/l)		A discharge affecting shellfish waters must not cause the suspended solid content of the waters to exceed the content in unaffected waters by more than 30%
Salinity (%)	12 to 38%	≤ 40% A discharge affecting shellfish waters must not cause their salinity to exceed the salinity of unaffected waters by more than 10%
Chemical	**Guideline Values (G)**	**Mandatory Values (I)**
Dissolved oxygen (Saturation %)	≥ 80%	≥ 70% Should an individual measurement indicate a value lower than 70%, measurements shall be repeated An individual measurement may only indicate a value of less than 60% if there are no harmful consequences for the development of shellfish colonies
Petroleum hydrocarbons		Hydrocarbons must not be present in the shellfish water in such quantities as to: - produce a visible film on the surface of the water and/or a deposit on the shellfish - have harmful effects on the shellfish
Organohalogenated substances	The concentration of each substance in shellfish flesh must be so limited that it contributes in accordance with Article 1 (of the Directive), to the high quality of shellfish products	The concentration of each substance in the shellfish water or in shellfish flesh must not reach or exceed a level which has harmful effects on the shellfish larvae
Metals (Ag, As, Cd, Cr, Cu, Hg, Ni, Pb and Zn) (mg/L)	The concentration of each substance in shellfish flesh must be so limited that it contributes in accordance with Article 1 (of the Directive), to the high quality of shellfish products	The concentration of each substance in the shellfish water or in the shellfish flesh must not exceed a level which gives rise to harmful effects on the shellfish and their larvae The synergic effects of these metals must be taken into consideration
Others	**Guideline Values (G)**	**Mandatory Values (I)**
Faecal coliforms (per 100 mL)	≤ 300 per 100 mL in the shellfish flesh and intervalvular liquid	No mandatory value set in the Directive

Substances affecting the taste of shellfish		Concentration lower than liable to impair the taste of the shellfish
Saxitoxin (produced by dinoflagellates)	No limit given	No limit given

1.3 Designated shellfish areas

Fourteen shellfish areas were originally designated in 1994 under the Quality of Shellfish Waters Regulations (S.I. No. 200 of 1994, revoked by S.I. No. 268 of 2006). A further 49 areas were subsequently designated in 2009 under the European Communities (Quality of Shellfish Waters) (Amendment) Regulations, 2009 (S.I. No. 55 of 2009). All 63 designated sites are illustrated in Figure 1 below.

Note: Map numbers I to XIV refer to waters originally designated under the European Communities (Quality of Shellfish Waters) Regulations 2004 (S.I. No. 200 of 1994), while map numbers 1 to 45 refer to waters designated under the European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009 (S.I. 55 of 2009). The referenced maps can be found in the relevant regulatory documents.

FIGURE 1 - 63 designated shellfish areas

1.4 Development of Shellfish Pollution Reduction Programmes

The Directive and Regulations require that any non-compliances with the shellfish water quality parameter values are identified. The Directive and Regulations further require that the factors responsible for such non-compliances are identified.

Information on impacts and pressures has therefore been collated in an individual characterisation report for each shellfish site from available inventories. The likelihood of the pressures to impact on shellfish water quality parameter values in the shellfish areas has been estimated.

Individual site Pollution Reduction Programmes (PRPs) and a supporting toolkit of measures outline the measures which can be used to control pressures where necessary to protect and improve water quality in a specific shellfish area.

The 2009 Shellfish PRPs (including the supporting characterisation reports and toolkit of measures) represent an initial phase of Shellfish PRP development, drawing on available information sources. Their development has been a desk-based exercise and they provide a good indication of the main pressures likely to be impacting on shellfish water quality and the measures that can be used to control those pressures. Ongoing assessment and monitoring of shellfish waters will be used to confirm the effectiveness of these programmes and to refine the programmes where necessary. As the shellfish monitoring database grows, and as programmes are implemented, incremental changes will be made to ensure compliance with the standards and objectives established.

PRPs produced during 2009 supersede Action Programmes which were developed in 2006 for the 14 original shellfish areas.

1.5 Assessment of Shellfish Pollution Reduction Programmes

A Strategic Environmental Assessment (SEA) of the Shellfish PRPs and supporting toolkit of measures has been carried out in accordance with the requirements of the EU Strategic Environmental Assessment Directive (2001/42/EC). SEA is a process for evaluating, at the earliest appropriate stage, all of the possible environmental effects of plans or programmes before they are adopted while giving the public and other interested parties an opportunity to comment and to be kept informed of decisions and how they were made. The assessment of the PRPs resulted in mitigation of some of the measures contained in the PRPs and toolkit of measures that were identified as likely to lead to adverse effects on other aspects of the environment. The reports associated with the SEA process can be downloaded from www.environ.ie.

An ‘Appropriate Assessment’ of the Shellfish PRPs has been carried out in parallel with the SEA assessment in accordance with the requirements of the EU Habitats Directive (92/43/EEC). Appropriate Assessment is a process for evaluating the implications of plans or programmes for sites which have been designated for the protection and conservation of habitats and species of European importance. The reports associated with the Appropriate Assessment can be downloaded from www.environ.ie.

1.6 Links with the River Basin Management Plans

The EU Water Framework Directive (2000/60/EC) provides a framework for the protection and restoration of the aquatic environment and terrestrial ecosystems and wetlands directly depending on the aquatic environment. In accordance with the requirements of the directive, River Basin Management Plans (RBMPs) were published in draft form in December 2008 with the final RBMPs published in December 2009. They are the primary plans in place in relation to the water environment for the foreseeable future.

Article 13(5) of the WFD states that 'river basin management plans may be supplemented by the production of more detailed programmes and management plans for sub-basin, sector, issue, or water type, to deal with particular aspects of water management'. Shellfish PRPs are an example of such programmes. In addition, Article 13(4) and Annex VII of the WFD requires that RBMPs include 'a register of any more detailed programmes and management plans for the River Basin District dealing with particular sub-basins, sectors, issues or water types, together with a summary of their contents'. The Shellfish PRPs are included in the registers of each of the River Basin Districts.

Articles 4 (1)(c) and 4 (2) of the WFD specify that, in relation to protected areas, where more than one of set of objectives relate to a given body of water, the most stringent shall apply. Designated shellfish areas are included in the WFD register of protected areas provided for in Articles 6 and 7 of the directive.

The WFD strengthens and consolidates a number of existing environmental directives while repealing others on a phased basis. The Shellfish Directive is due to be repealed by the WFD in 2013. Shellfish PRPs are therefore closely aligned with the RBMPs.

1.7 Layout of the Shellfish Pollution Reduction Programmes

Characterisation Report

- **Section 1**
  Section 1 is an introductory section which puts the Characterisation Reports in context and outlines their contents.

- **Section 2**
  Section 2 describes the general characteristics of the designated shellfish areas as well as their contributing catchments.

- **Section 3**
  Section 3 describes water quality in the designated shellfish areas.

- **Section 4**
  Section 4 consists of a series of maps illustrating the general characteristics of the shellfish areas and catchments, as well as the marine and land-based pressures in the catchments.

- **Section 5**
  Section 5 provides a series of tables summarising the marine and land-based pressures in the catchments. The likelihood of the pressures to impact on shellfish water quality parameters is discussed. A summary is also provided highlighting the key pressures and potential secondary pressures which are most likely to be impacting on shellfish water quality parameters. The discussions in this section draw on available information including information generated during the WFD implementation process and geographical features of significance. The differing nature of the pressures are also taken into account as pressures vary substantially in terms of how severely they are likely to impact on shellfish water quality parameters.

Pollution Reduction Programmes

- The Pollution Reduction Programmes summarise the specific measures for controlling the key and potential secondary pressures, identified in this characterisation report, which are most likely to be impacting on shellfish water quality in Wexford Harbour Outer shellfish area. This can be downloaded from www.environ.ie.

Toolkit of Measures

- The supporting toolkit of measures outlines all of the measures available for controlling all of the pressures which can impact on shellfish water quality. Due to the close alignments between the Shellfish PRPs and the RBMPs, the toolkit is drawn from the programme of measures contained within the RBMPs. This strengthens the integration of shellfish management and wider water quality management policy in Ireland. The toolkit can be downloaded from www.environ.ie.

2.0 GENERAL CHARACTERISTICS

Name	Wexford Harbour Outer Shellfish Area
Map number	33
Year of designation	2009
Area	16.5 km^2
River Basin District	South Eastern RBD
County	Wexford
Location of sampling point	52 deg 19.683 min North (Lat) 6 deg 24.700 min West (Long)
Catchment area	1,993.45 km^2
Catchment area within 20 km zone	553.45 km^2
Adjacent PRP	Wexford Harbour Inner

Wexford Harbour Outer is situated in County Wexford in the South Eastern River Basin District (Map 1). The designated shellfish area is 16.5 km² in area and is located immediately downstream of the Slaney Estuary. Wexford Harbour Inner shellfish area is situated approximately 1 kilometre upstream.

The contributing catchment of the shellfish area is 1,993.45 km^2 in area (Map 3). The principal river is the Slaney which rises in the Glen of Imaal near Lugnaquilla in the Wicklow mountains and has a total length of 117 kilometres from source to Wexford Harbour. The river is tidal to Enniscorthy, approximately 20 kilometres from the Harbour. The principal tributaries are the Derreen, Derry, Bann, Douglas, Clody, Urrin, Boro and the Sow rivers.

Within the South Eastern region, the population of County Wexford has grown to approximately 131,615. This county had the highest growth rate of 12.9% in the Census period to 2006. The population residing within the catchment is 34,933 and is increasing. The main centres of population within the catchment are Wexford Town and environs with a population of 9,450, Enniscorthy and environs with a population of 3,290, Tullow with a population of 2,417 and Baltinglass with a population of 2,030.

Farming in the region is based mainly on sheep and cattle. Pasture and arable farming account for 63% and 25% of the land use within the catchment respectively. The numbers of cattle and sheep in the catchment are 59,679 and 71,376 respectively.

2.1 Protected areas

The designated shellfish area lies within Wexford Harbour candidate SAC (Map 11). Other SACs which intersect the shellfish area's catchment are Raven Point Nature Reserve, Slaney River Valley SAC, Screen Hills and Carnsore Point. SPAs include The Raven SPA, Wexford Harbour SPA and Wexford Nature Reserve. Nutrient Sensitive Areas include the Slaney Estuary upper and lower. Ramsar sites include The Raven and Wexford Wildfowl Reserve. Water Dependant Habitats include the Slaney

River. Recreational waters include Rosslare Strand and Curracloe. Drinking water sources include the Sow and Slaney rivers

2.2 Shellfish growing activity

Table 2 summarises the number and area of shellfish licensed areas within the designated shellfish area. Mussel cultivation is predominant in the area (Map 2).

TABLE 2 - Shellfish licensed areas

Shellfish types	Number	Area	% Area
Abalone	0	0	0 %
Clams	0	0	0 %
Cockles	0	0	0 %
Lobsters	0	0	0 %
Scallops	0	0	0 %
Mussels	38	16.2 km^2	98%
Oysters	1	0.3 km^2	2 %
Sea Urchins	0	0	0 %
Periwinkles	0	0	0 %
Seaweed	0	0	0 %
Other	0	0	0 %

3.0 WATER QUALITY IN THE SHELLFISH AREA

Dedicated shellfish monitoring data has been collated and compared with shellfish water quality parameter mandatory and guideline values outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedule 2 and 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006) (Table 1).

Additional monitoring data from other monitoring programmes has also been collated in order to highlight any water quality issues in the vicinity of the shellfish areas. This can aid in the identification of the pressures most likely to impact on the shellfish areas and thereby in the identification of any measures to be applied. Datasets were collated from the Environmental Protection Agency (EPA), the Marine Institute (MI) and the Sea Fisheries Protection Authority (SFPA). Where applicable these additional monitoring data were compared with the shellfish water quality parameter mandatory and guideline values outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedules 2 and 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006) (Table 1).

Marine Institute Shellfish Monitoring Programme

The MI carries out shellfish monitoring at designated shellfish areas. This dedicated shellfish monitoring programme involves analysing for general components, metals and organics in both water and biota samples. The results have been compared with the shellfish mandatory and guideline values outlined in Table 1.

For this designated area one water sample was available for 2004 and six biota samples were available from the period 2004 to 2008. The shellfish mandatory and guideline values outlined in Table 1 were not breached in any of these samples.

Faecal coliform biota results were also available from the MI at all shellfish areas from November 2008 February 2009, May 2009 and August 2009. The shellfish guideline value for faecal coliforms in biota outlined in Table 1 was breached in the November 2008 sample and the May and August 2009 samples.

EPA Marine Monitoring Programme

The EPA Marine Monitoring Programme analyses for general components in water samples at a large number of marine sites around Ireland.

There are 11 EPA sites located in the designated area with monitoring data available from the period 2006 to 2008 for pH and dissolved oxygen. They were compared against the mandatory values in Table 1. There was one very slight exceedance of the shellfish mandatory value for pH in a 2006 sample. This may have been related to an isolated unauthorised discharge from a creamery at that time. None of the later samples have exceeded the mandatory value.

WFD Monitoring Programme

WFD status classifications from the WFD monitoring programme apply at the water body scale and are generally based on several samples/surveys targeting a variety of

parameters including biological, physico-chemical, chemical and hydromorphological elements. The monitoring information on which the marine status classifications are based was collected by the EPA, the Marine Institute, the National Parks and Wildlife Service (NPWS) and the Central Fisheries Board between 2005 and 2008.

The WFD status of the coastal water, within which the shellfish area is situated, is 'moderate' and therefore unsatisfactory, reflecting the results of general components (dissolved oxygen (DO) and biological oxygen demand (BOD)) and microalgae sampling. The lower and upper parts of the estuary which feed into the designated area are also both at 'moderate' status due to general components and microalgae in the lower region and to elevated levels of nutrients in the upper region (Map 12).

Shellfish Flesh Monitoring Programme

Shellfish flesh classifications (carried out under the European Communities (Live Bivalve Molluscs) (Health Conditions for Production and Placing on the Market) Regulations, 1996 (S.I. No. 147 of 1996)) indicate faecal contamination in shellfish flesh. Sampling is carried out by the Sea Fisheries Protection Authority (SFPA) on at least a monthly basis.

The licensed area within Wexford Harbour Outer is classified as Class B meaning that shellfish may be placed on the market for human consumption only after treatment in a purification centre or after relaying so as to meet the health standards for live bivalve molluscs laid down in the EC Regulation on food safety (Regulation (EC) No 853/2004). This indicates faecal contamination in this shellfish area.

Overall Water Quality

The dedicated shellfish samples available for this shellfish area were found to be non-compliant with shellfish guideline values for faecal coliforms in biota outlined in Annex I of the Shellfish Waters Directive (2006/113/EC) and Schedule 4 of the Quality of Shellfish Waters Regulations (S.I. No. 268 of 2006) (Table 1). Ongoing shellfish monitoring will strengthen the assessment of compliance status at this shellfish area.

The results of the WFD monitoring programme indicate that there are water quality issues within the area and in some of the waters discharging in the vicinity of this shellfish area.

The shellfish flesh classification indicates faecal contamination in the shellfish area.

4.0 CHARACTERISATION MAPS

The following series of maps illustrate the general characteristics of the designated shellfish area and its contributing catchment, as well as the marine and land-based pressures that could potentially impact on the shellfish area. The pressures are further divided into point source pressures, diffuse source pressures and morphological pressures.

Some of the point source pressures are symbolised according to whether they are 'at risk' or 'not at risk'. These risk designations were developed during the WFD implementation process. Some of the designations date back to the Article V characterisation process in 2004 and 2005 but many of the risk designations were updated in 2008 to feed into the draft RBMPs. The risk designations are based on a variety of information, for example, waste water treatment plants can be designated as 'at risk' because they are serving a larger population then they were designed to cater for or because their discharges are impacting on water quality. Section 5 of this characterisation report provides the detail behind the risk designations for each of the pressures and discusses their likelihood to be impacting on shellfish water quality parameters.

Whilst the risk designations under the WFD provide a useful screening tool for pressures, their relevance in terms of any water quality issues measured in Shellfish Waters has been assessed in further detail to identify key pressures at a particular site. For example the WFD risk may be based on particular impacts to freshwater ecology which are not pertinent to the shellfish water status.

TABLE 3 - List of maps

Map No.	Map Title	Details
General Characteristics Maps		
MAP 1	Designated shellfish area	Designated shellfish area with summary statistics.
MAP 2	Licensed shellfish areas	Department of Agriculture, Fisheries and Food register of licensed shellfish areas within the designated shellfish area.
MAP 3	Contributing catchment	Nested river water bodies and inter-coastal freshwater bodies discharging in the vicinity of the designated shellfish area.
MAP 4	Topography	Topography of the contributing catchment.
MAP 5	Soil wetness	Soil wetness which indicates drainage characteristics
MAP 6	Vulnerability of groundwaters to pathogens from subsoil discharges	Potential risk of pathogens from sub-soils discharges reaching groundwaters. Based on vulnerability, presence of alluvium, mineral content of soils, wetness, aquifer type, subsoil depth and subsoil permeability.

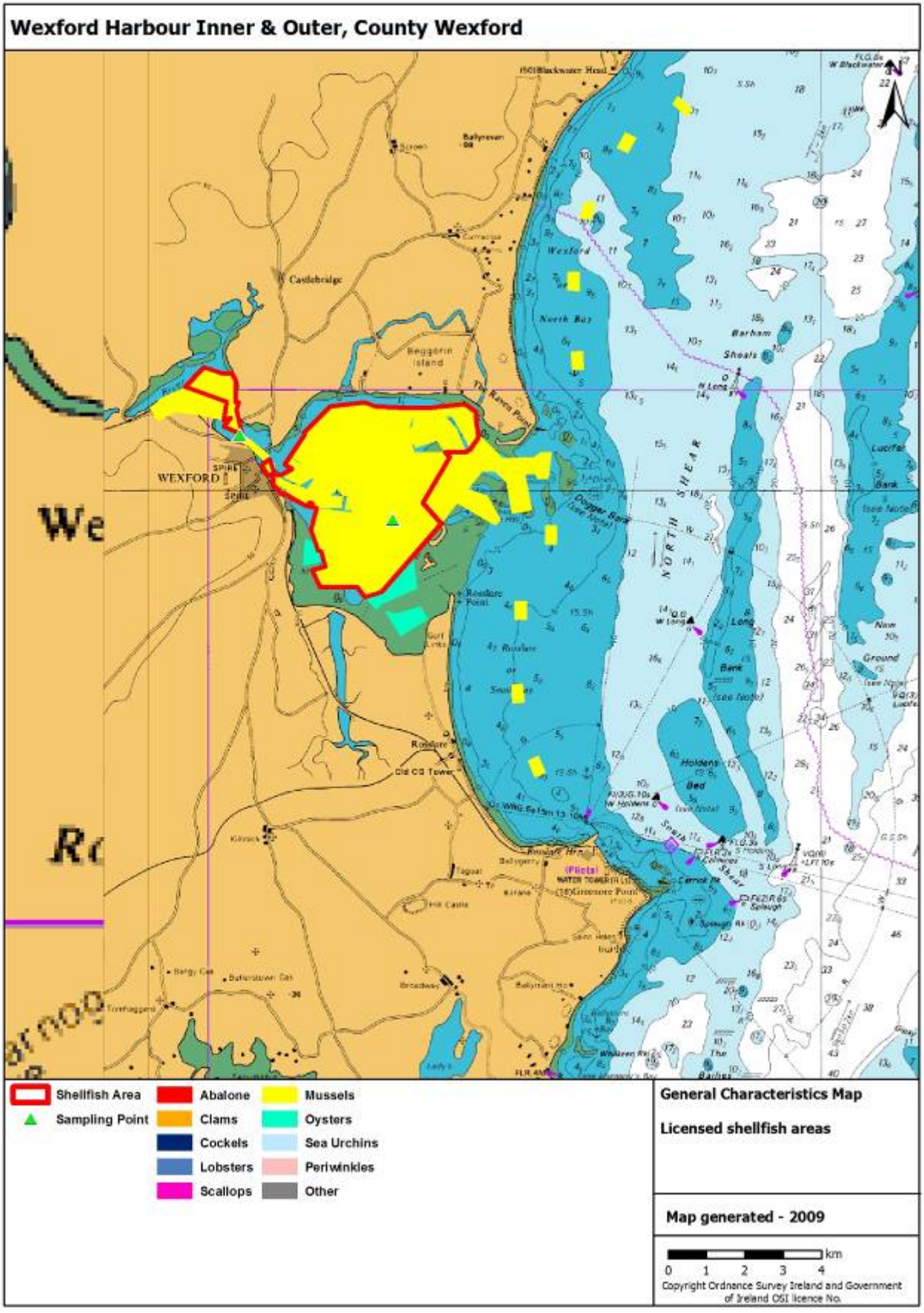
Map No.	Map Title	Details
MAP 7	Vulnerability of groundwaters to phosphorus from subsoil discharges	Potential risk of phosphorus from sub-soils discharges reaching groundwaters. Based on vulnerability, presence of alluvium, mineral content of soils, wetness, aquifer type, subsoil depth and subsoil permeability.
MAP 8	Vulnerability of surface waters to pathogens from subsoil discharges	Potential risk of pathogens from sub-soils discharges reaching surface waters. Based on vulnerability, presence of alluvium, mineral content of soils, wetness, aquifer type, subsoil depth and subsoil permeability.
MAP 9	Vulnerability of surface waters to phosphorus from subsoil discharges	Potential risk of phosphorus from sub-soils discharges reaching surface waters. Based on vulnerability, presence of alluvium, mineral content of soils, wetness, aquifer type, subsoil depth and subsoil permeability.
MAP 10	Likelihood of inadequate percolation in subsoils	Likelihood of inadequate percolation in subsoils. Based on aquifer type, vulnerability and subsoil permeability.
MAP 11	Designated protected areas	SACs, SPAs, freshwater pearl mussel areas, recreational waters, drinking waters, nutrient sensitive areas, water dependant habitats and RAMSAR sites within the contributing catchment.
MAP 12	WFD surface water status	River, lake, transitional and coastal water body status resulting from the WFD monitoring programme.
MAP 13	EPA diffuse risk assessment	Water body based risk to waters from diffuse sources. Based on the percentages of diffuse land cover per water body including peatlands, coniferous forestry, agriculture and urban areas.
Marine Pressures Maps		
Point Source Pressures		
MAP 14	Marine finfish farms	Marine finfish farms in the vicinity of the designated shellfish area. Taken from the Marine Atlas.
Morphology Pressures		
MAP 15	Fishing gear activity	Fishing gear activity in the vicinity of the designated shellfish area. Taken from the Marine Atlas.
MAP 16	Structures	Marine morphology structures such as bridges and causeways

Map No.	Map Title	Details
MAP 17	Physical modifications	Physical modifications such as shoreline reinforcement, embankments, reclaimed land, capital and maintenance dredging, aggregate removal, dumping at sea and heavily modified waters within the designated shellfish area.
Land-based Pressures Maps		
Point Source Pressures		
MAP 18	Municipal waste water systems	Urban waste water treatment plants and combined sewer overflows within the contributing catchment. These are symbolized based on their risk designations.
MAP 19	Agricultural and aquacultural point source pressures	Pig units, and freshwater fish farms within the contributing catchment.
MAP 20	Industrial point source pressures	Industrial IPPCs, Section 4s, water treatment plants, abstractions, mines, quarries, landfills and contaminated sites within the contributing catchment. These are symbolized based on their risk designations.
Diffuse Source Pressures		
MAP 21	On-site waste water systems	On-site waste water treatment plants within the contributing catchment.
MAP 22	Dairy and drystock livestock units	Dairy and drystock livestock units per hectare of farmed land within each DED in the contributing catchment.
MAP 23	Nitrogen fertiliser usage	Nitrogen fertiliser usage per hectare of farmed land within each DED in the contributing catchment.
MAP 24	Phosphorus fertiliser usage	Phosphorus fertiliser usage per hectare of farmed land within each DED in the contributing catchment.
MAP 25	Forestry types with acidification risk areas	Forest cover in the contributing catchment with areas identified as being at risk from acidification.
MAP 26	Forestry types with eutrophication risk areas	Forest cover in the contributing catchment with areas identified as being at risk from eutrophication.
MAP 27	Forestry types with sedimentation risk areas	Forest cover in the contributing catchment with areas identified as being at risk from sedimentation.
Morphology Pressures		

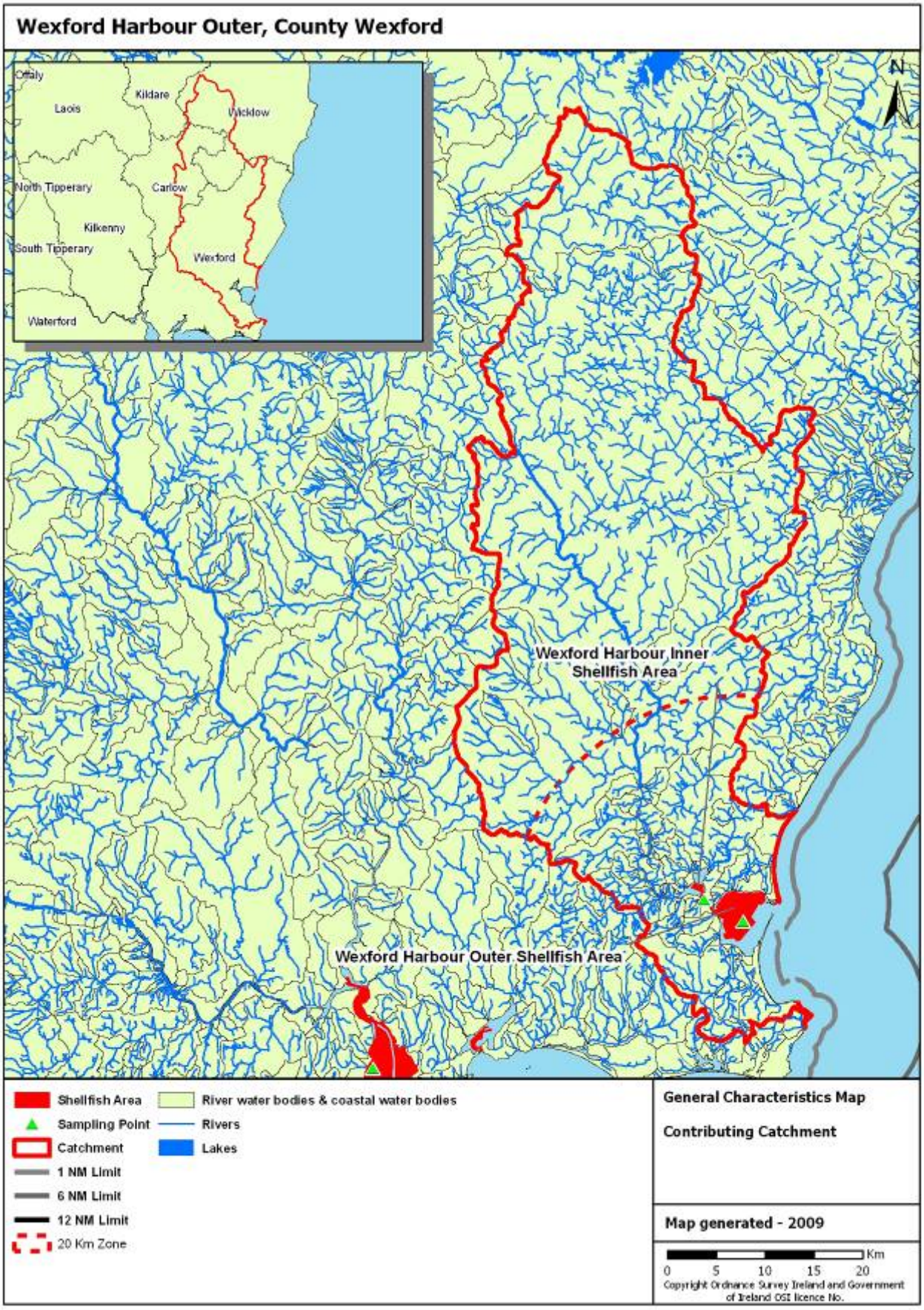
Map No.	Map Title	Details
MAP 28	Structures	Barriers to migration, both natural and man-made in the contributing catchment.
MAP 29	Physical modifications	Channelisation, heavily modified and artificial water bodies in the contributing catchment.

MAP 1 - Designated shellfish area

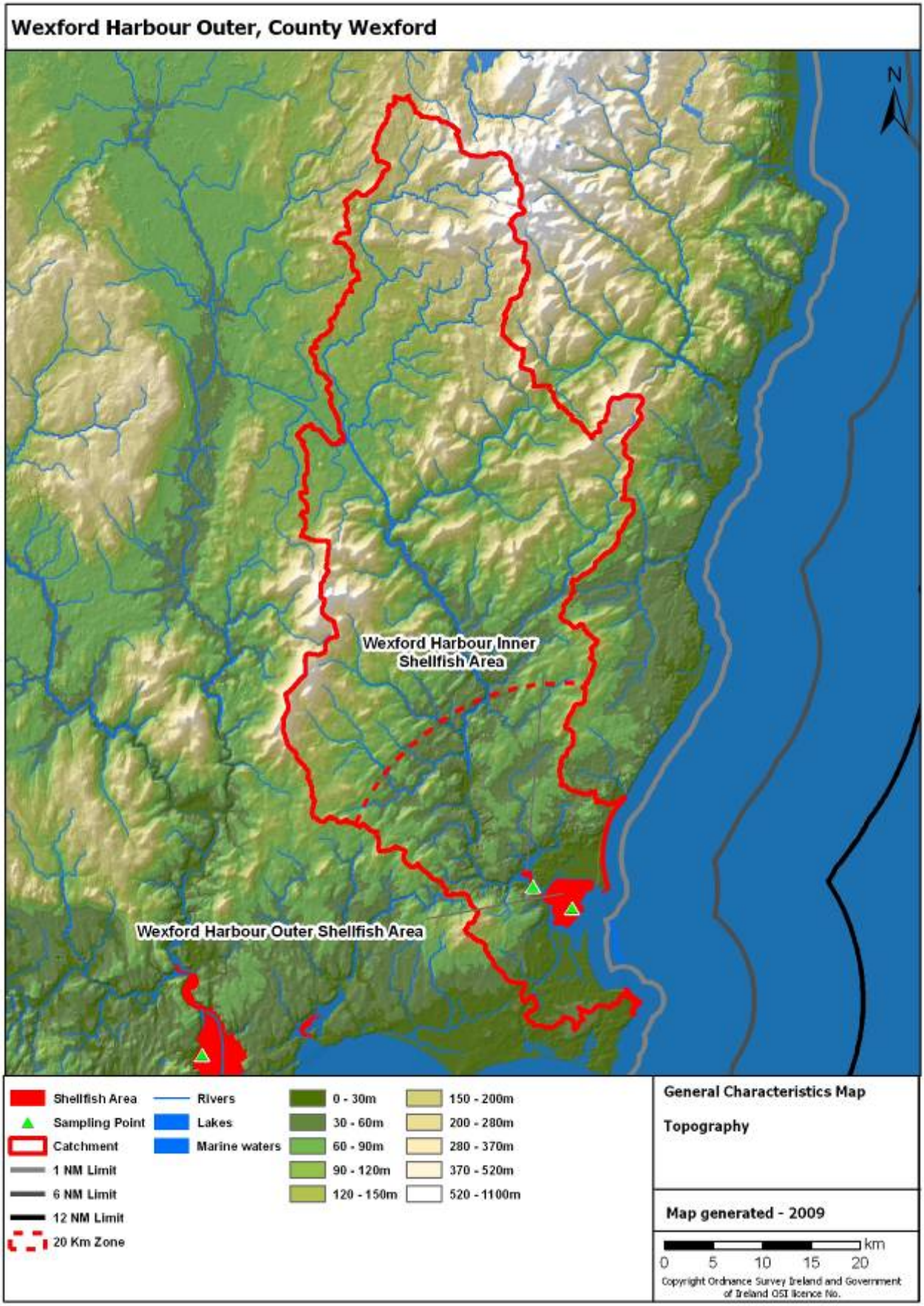
MAP 2 - Licensed shellfish areas



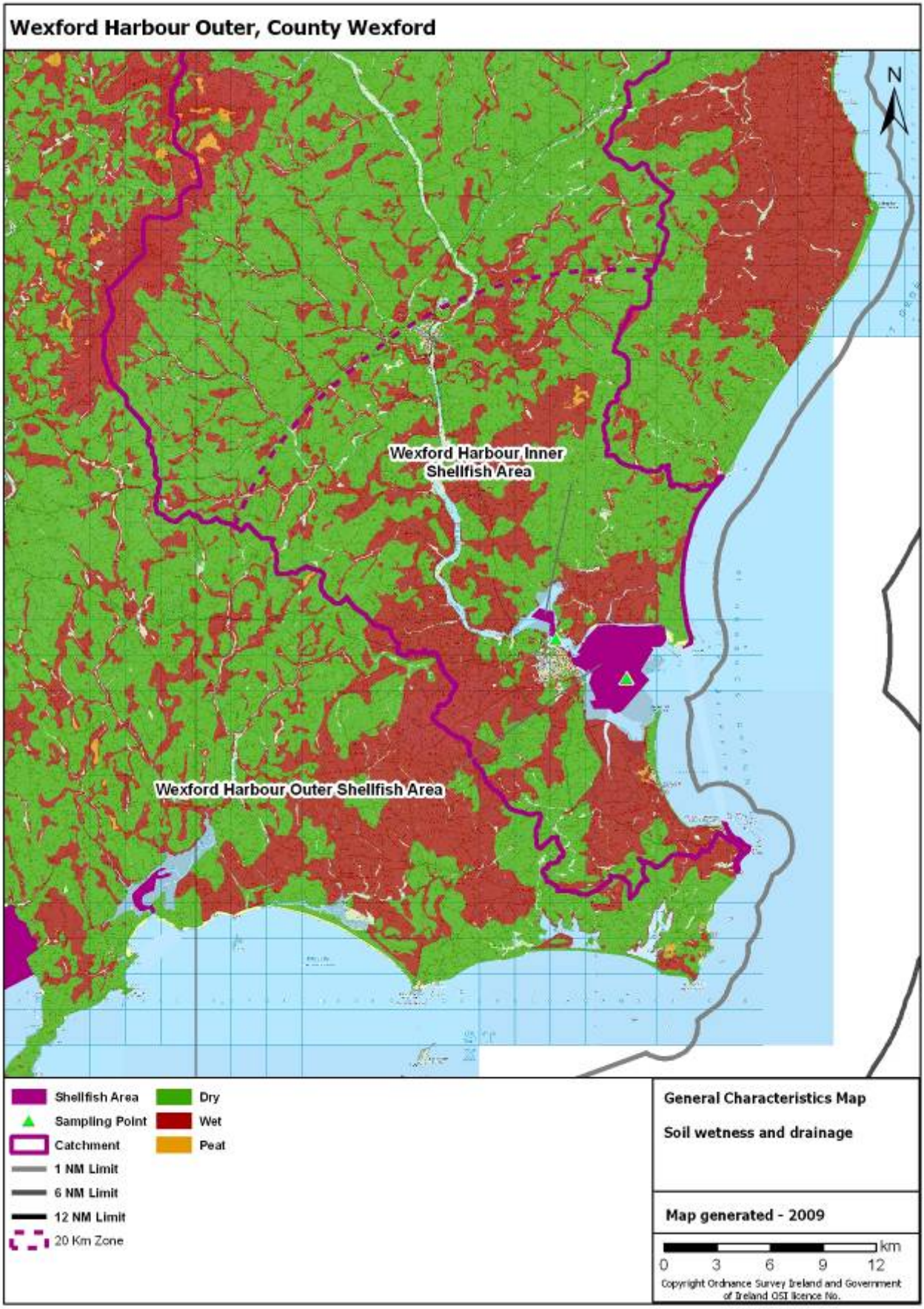
MAP 3 - Contributing catchment



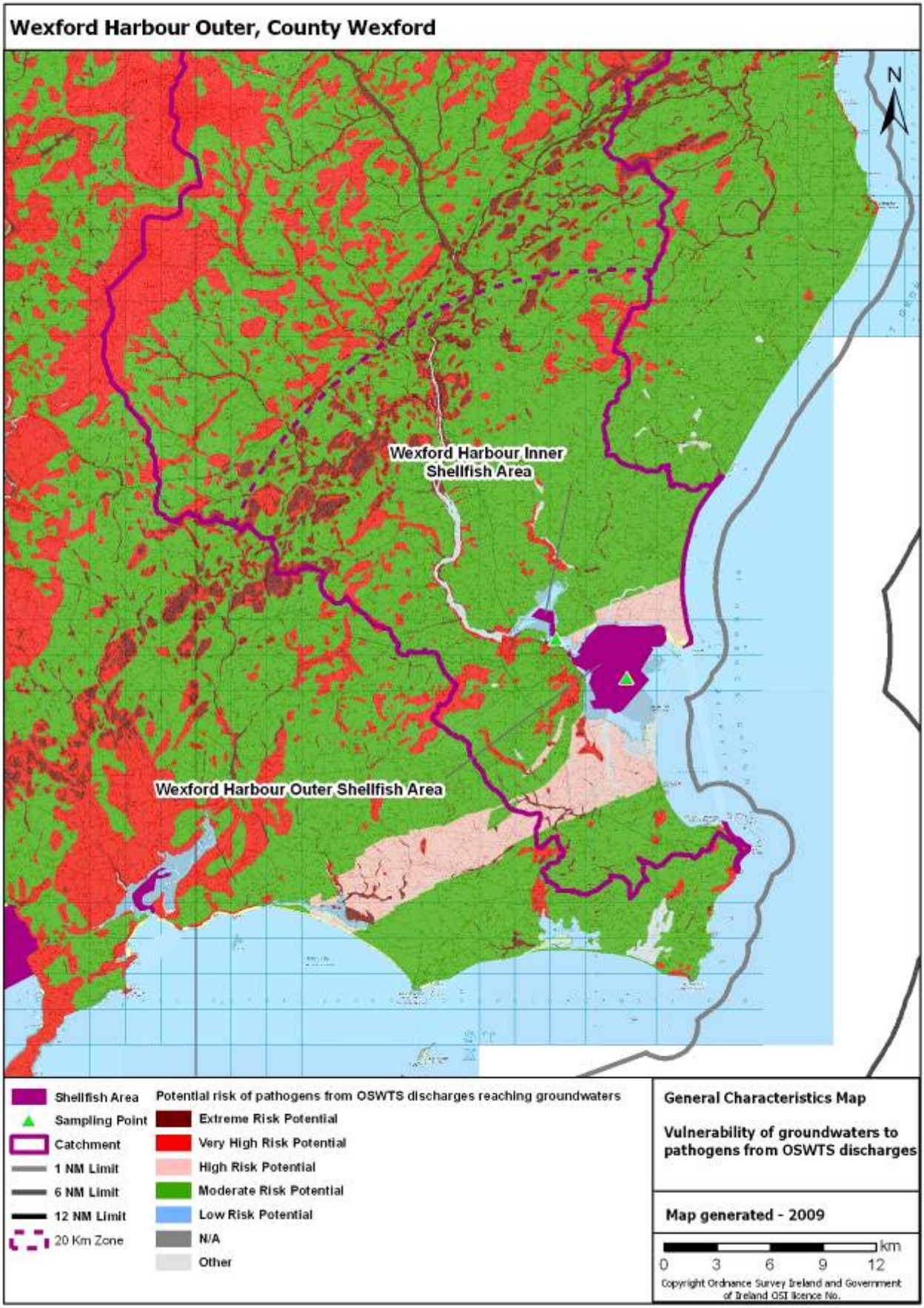
MAP 4 – Topography



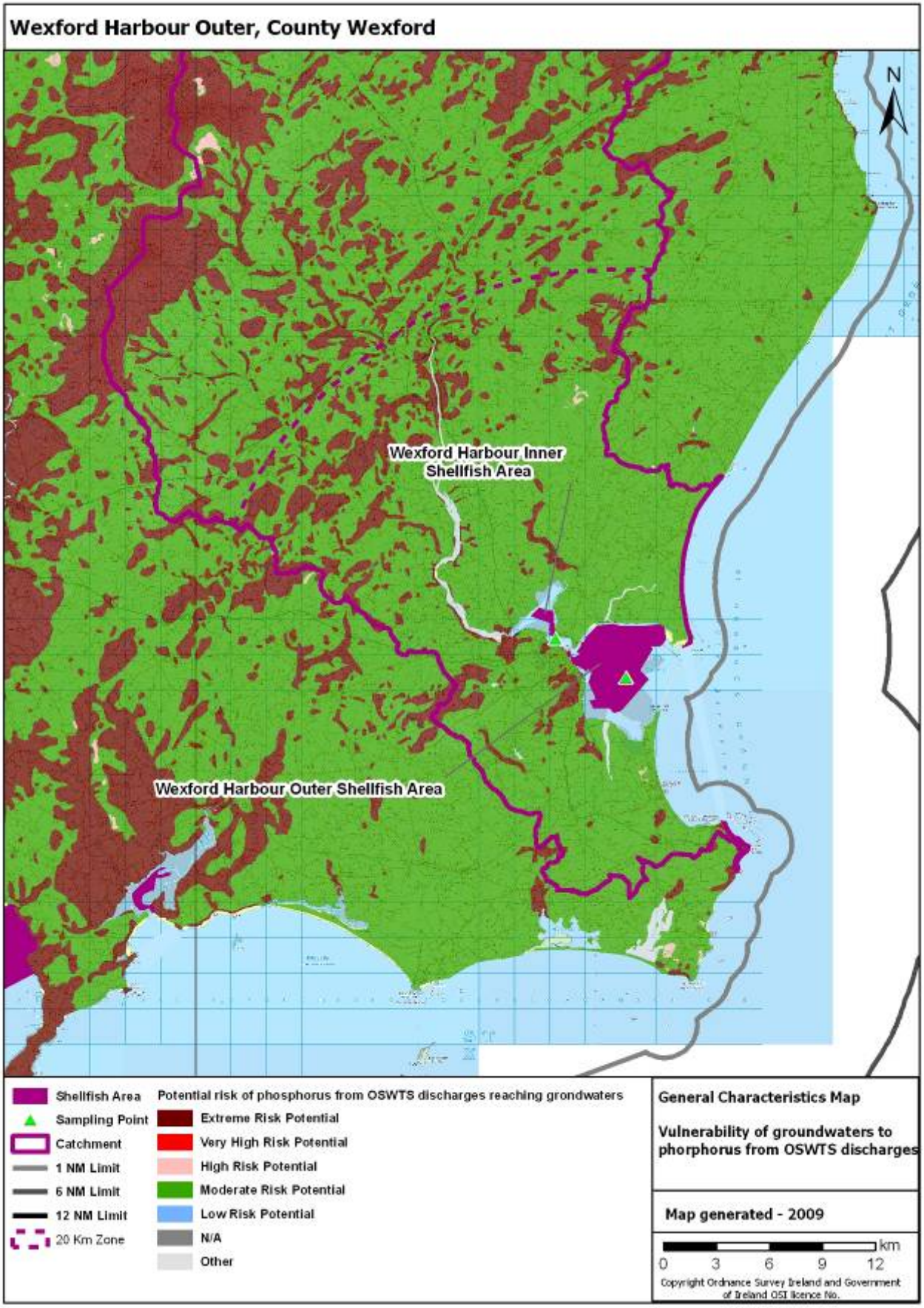
MAP 5 - Soil wetness



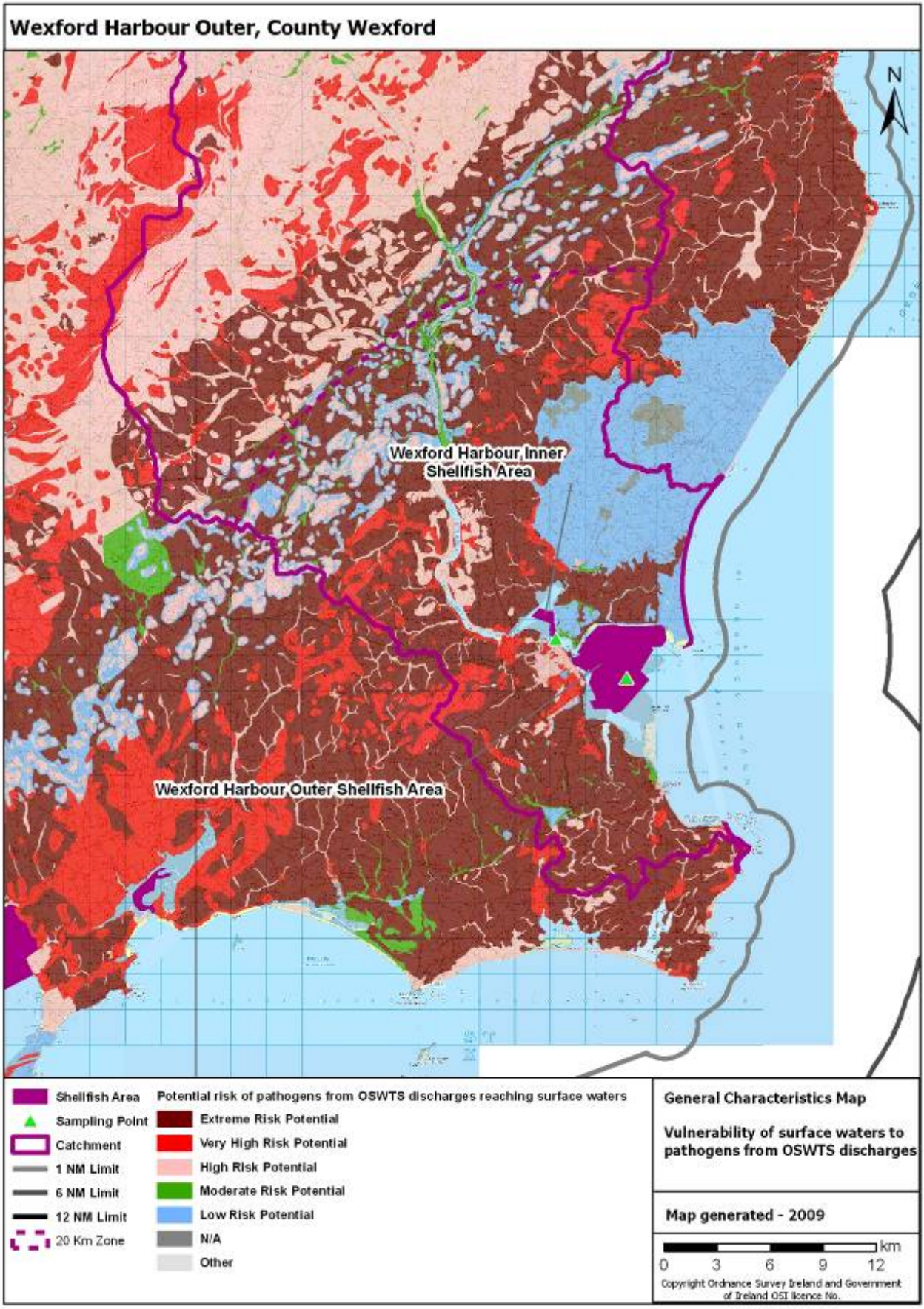
MAP 6 - Vulnerability of groundwater to pathogens from subsoil discharges



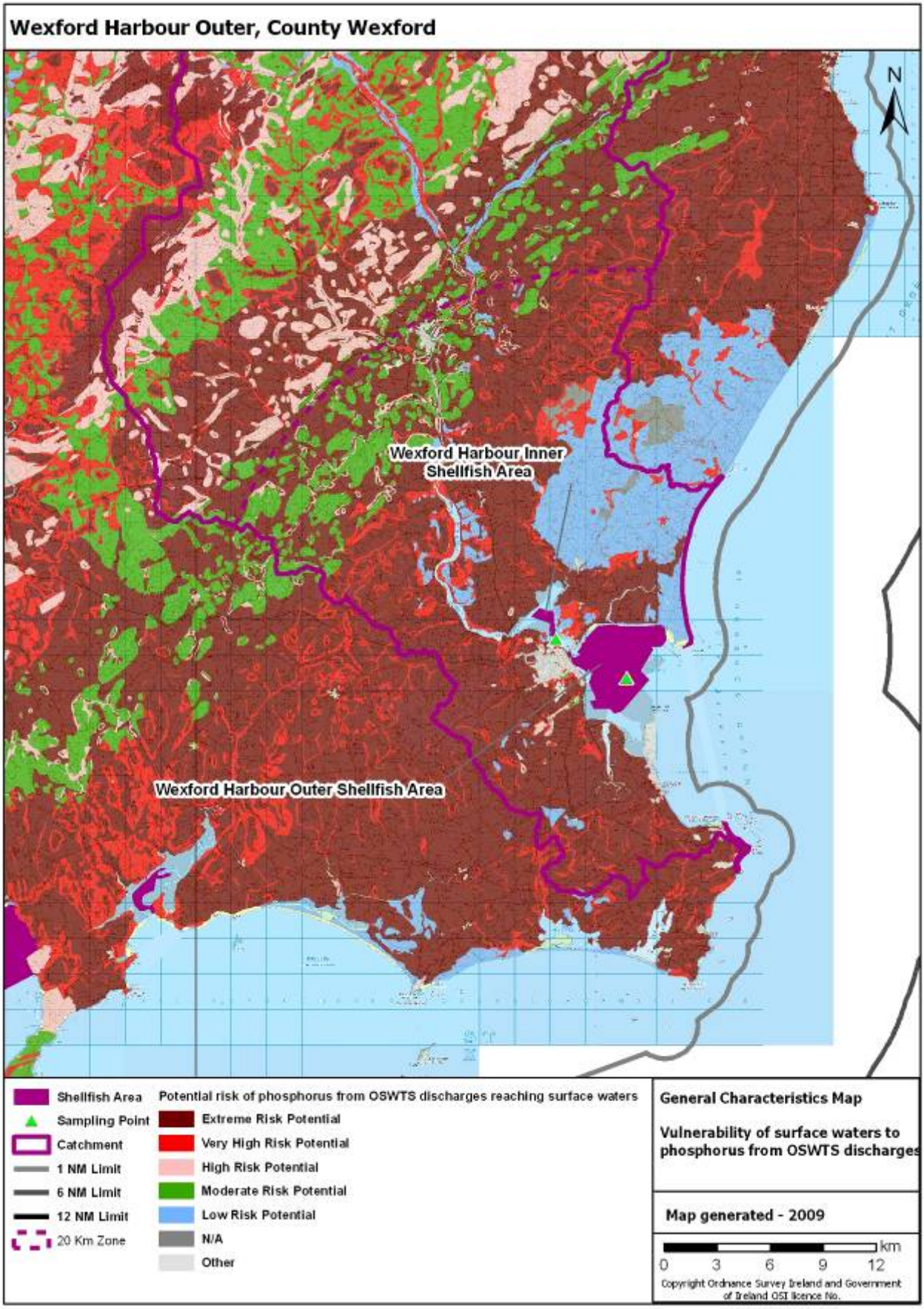
MAP 7 - Vulnerability of groundwater to phosphorus from subsoil discharges



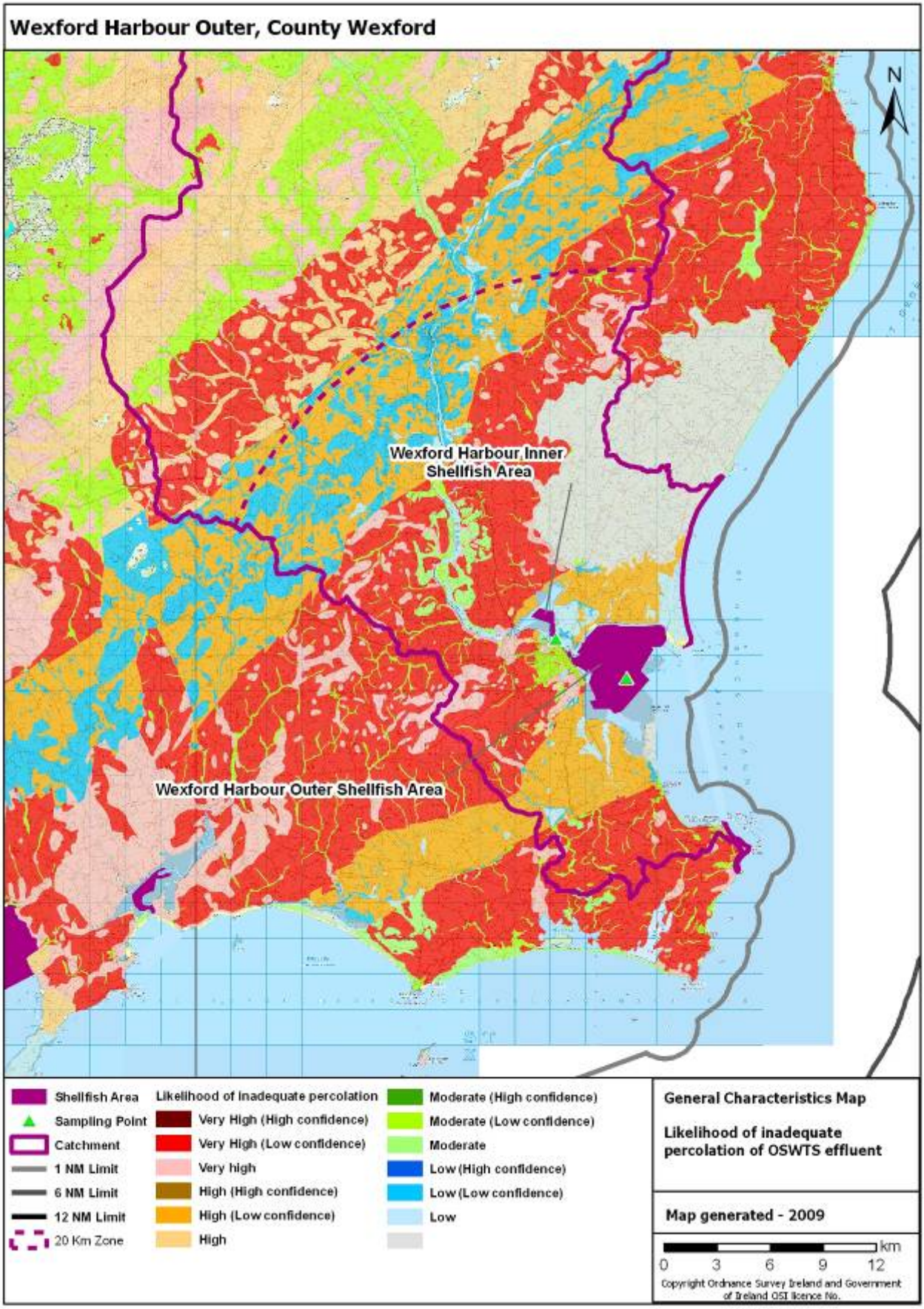
MAP 8 - Vulnerability of surface waters to pathogens from subsoil discharges



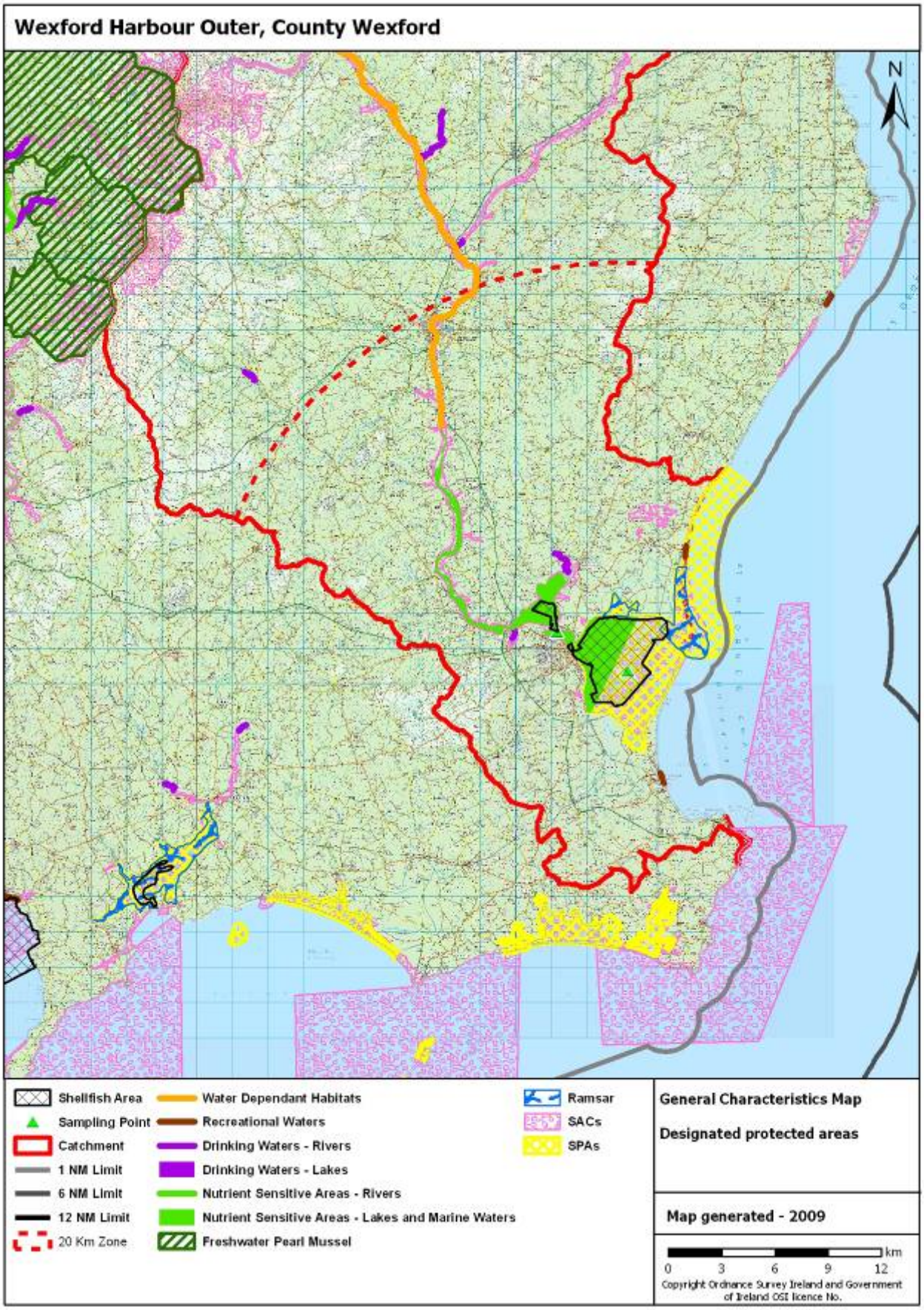
MAP 9 - Vulnerability of surface waters to phosphorus from subsoil discharges



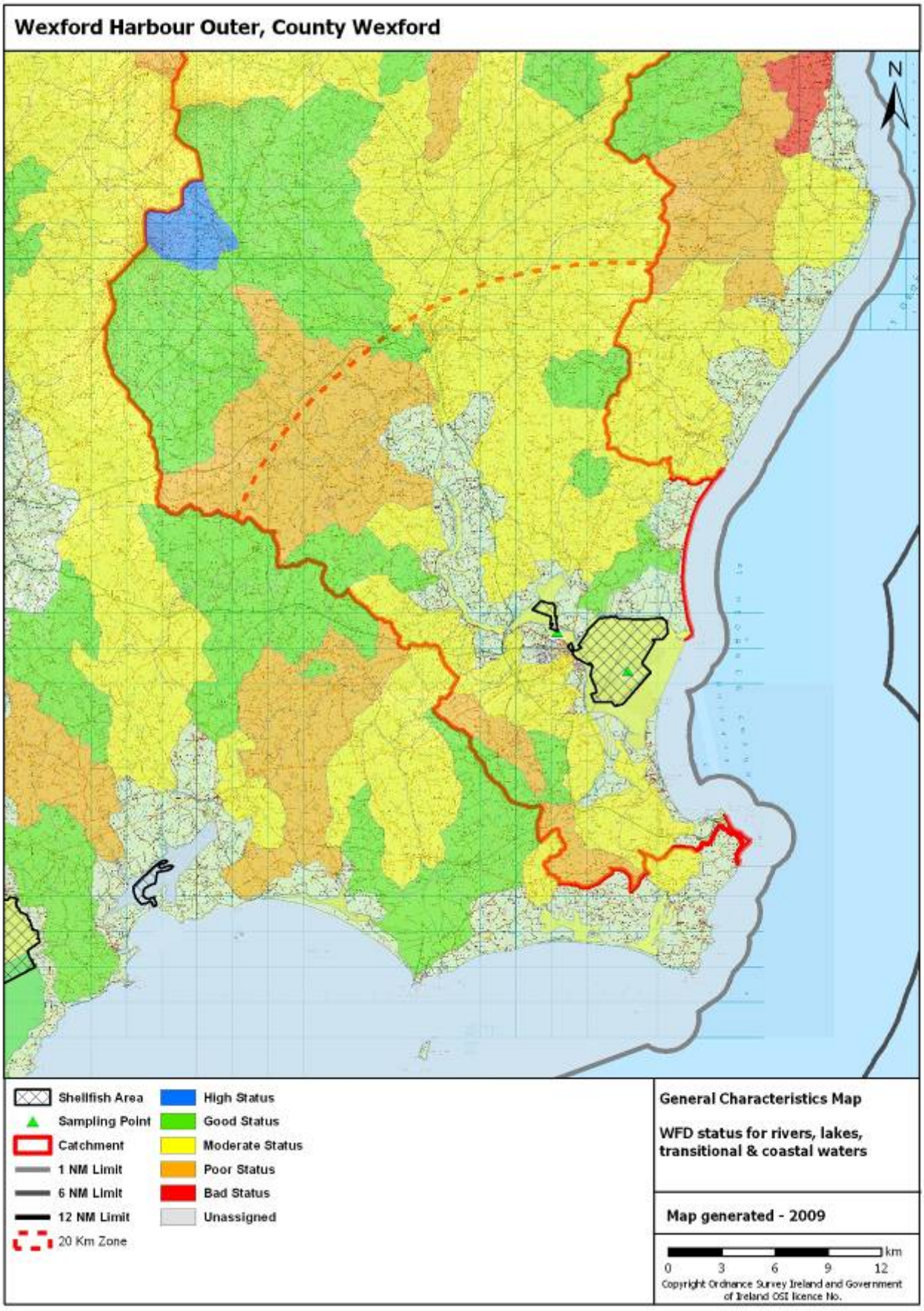
MAP 10 - Likelihood of inadequate percolation in sub-soils



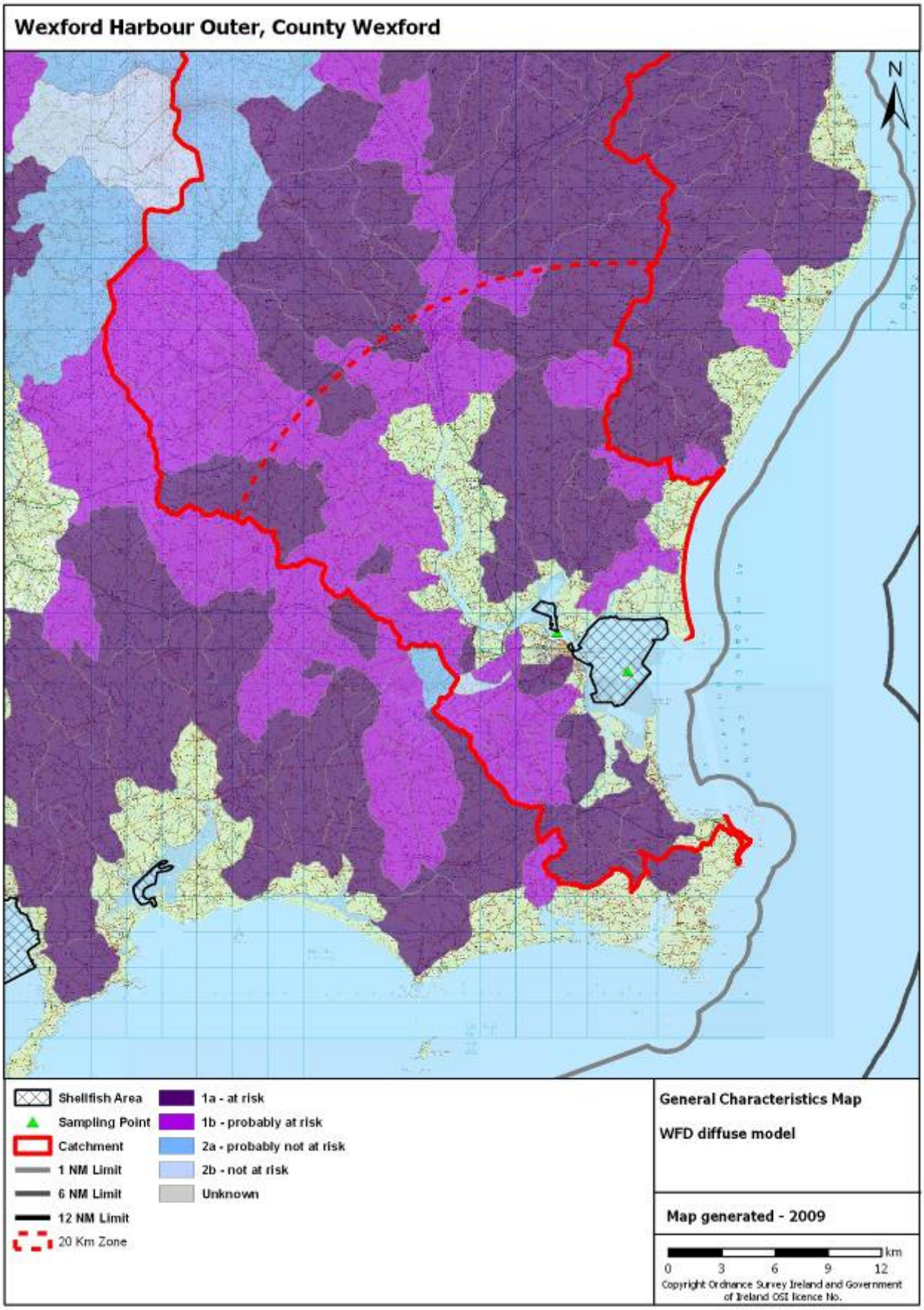
MAP 11 - Designated protected areas



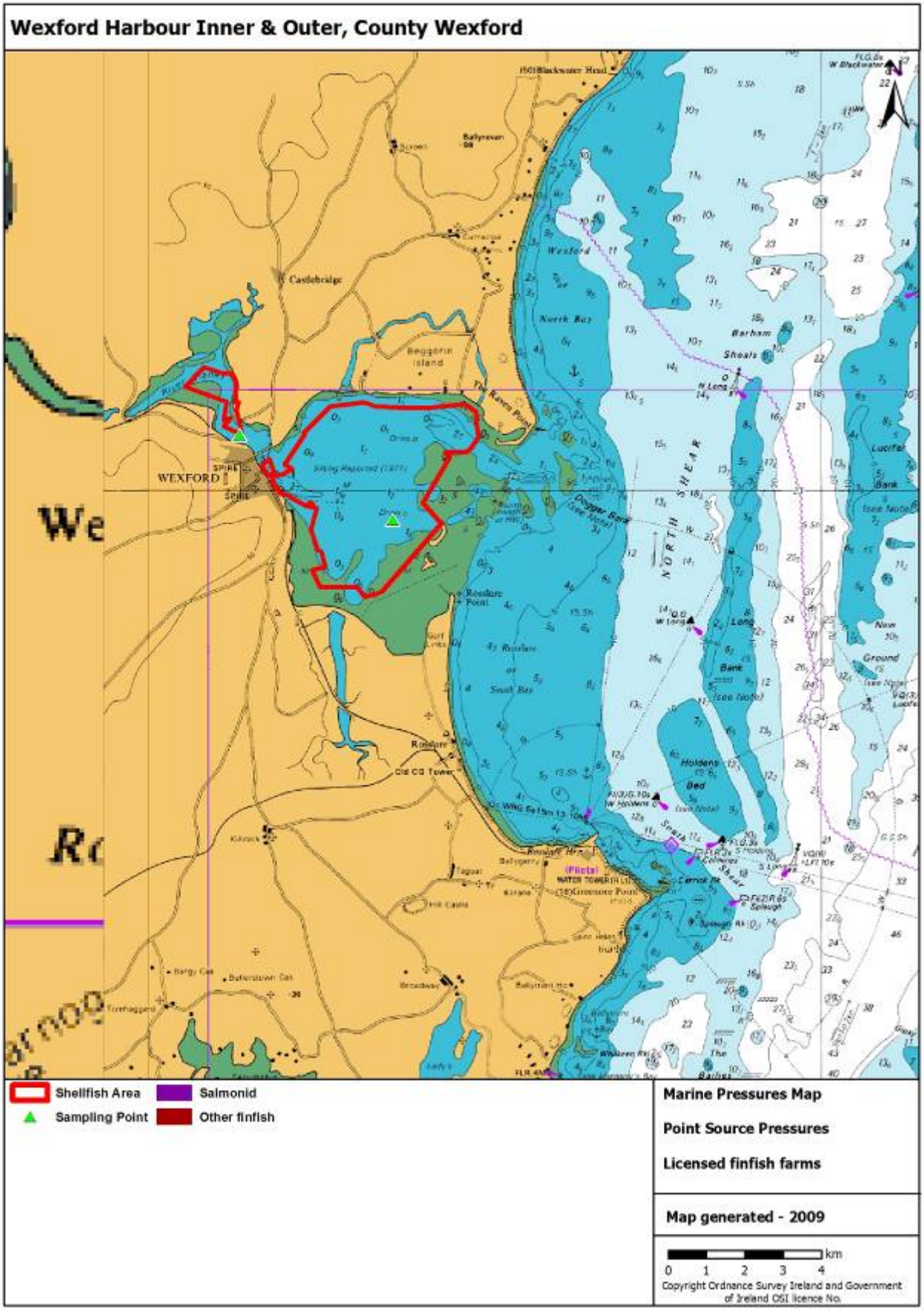
MAP 12 - WFD surface water status



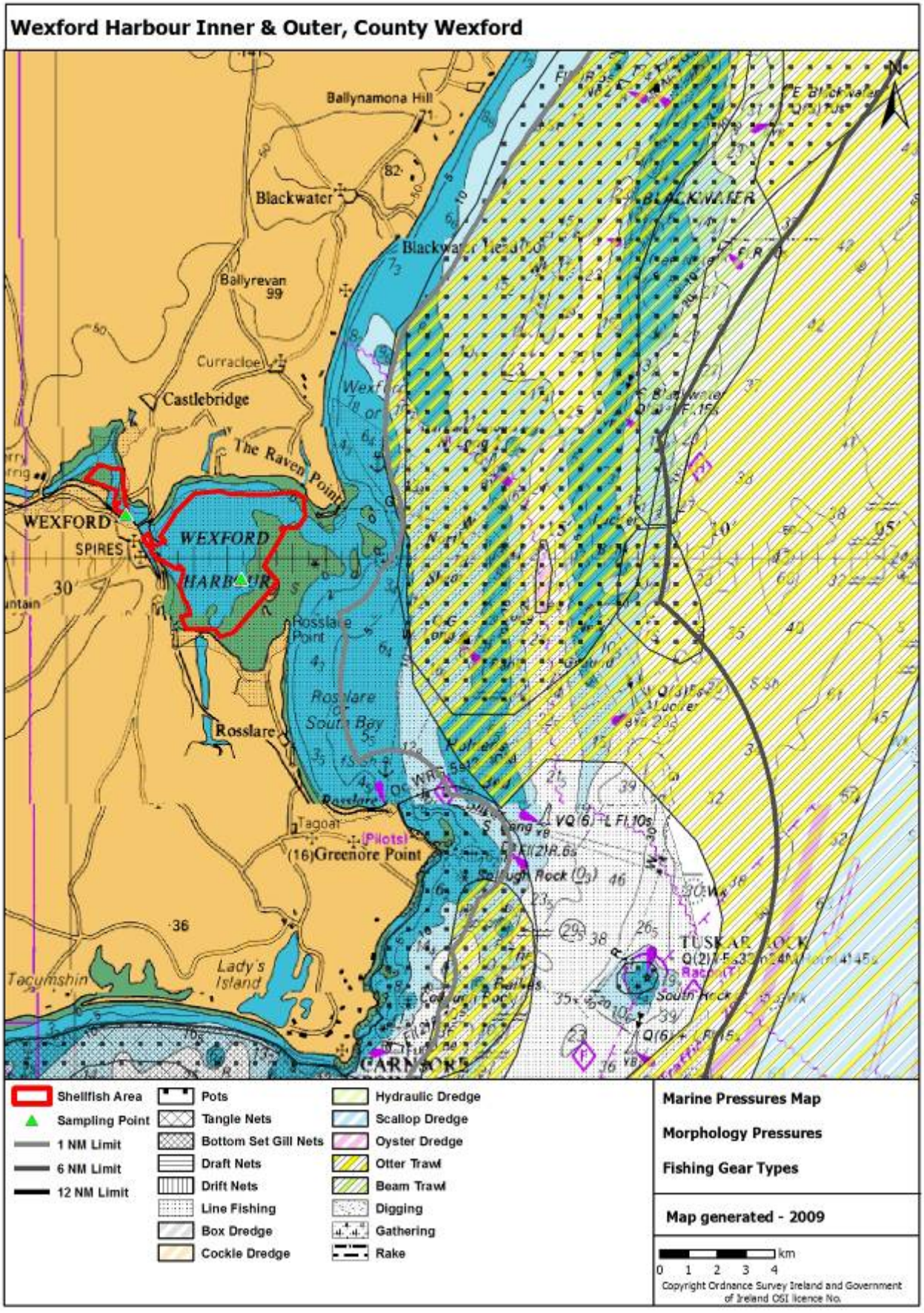
MAP 13 - Diffuse risk assessment



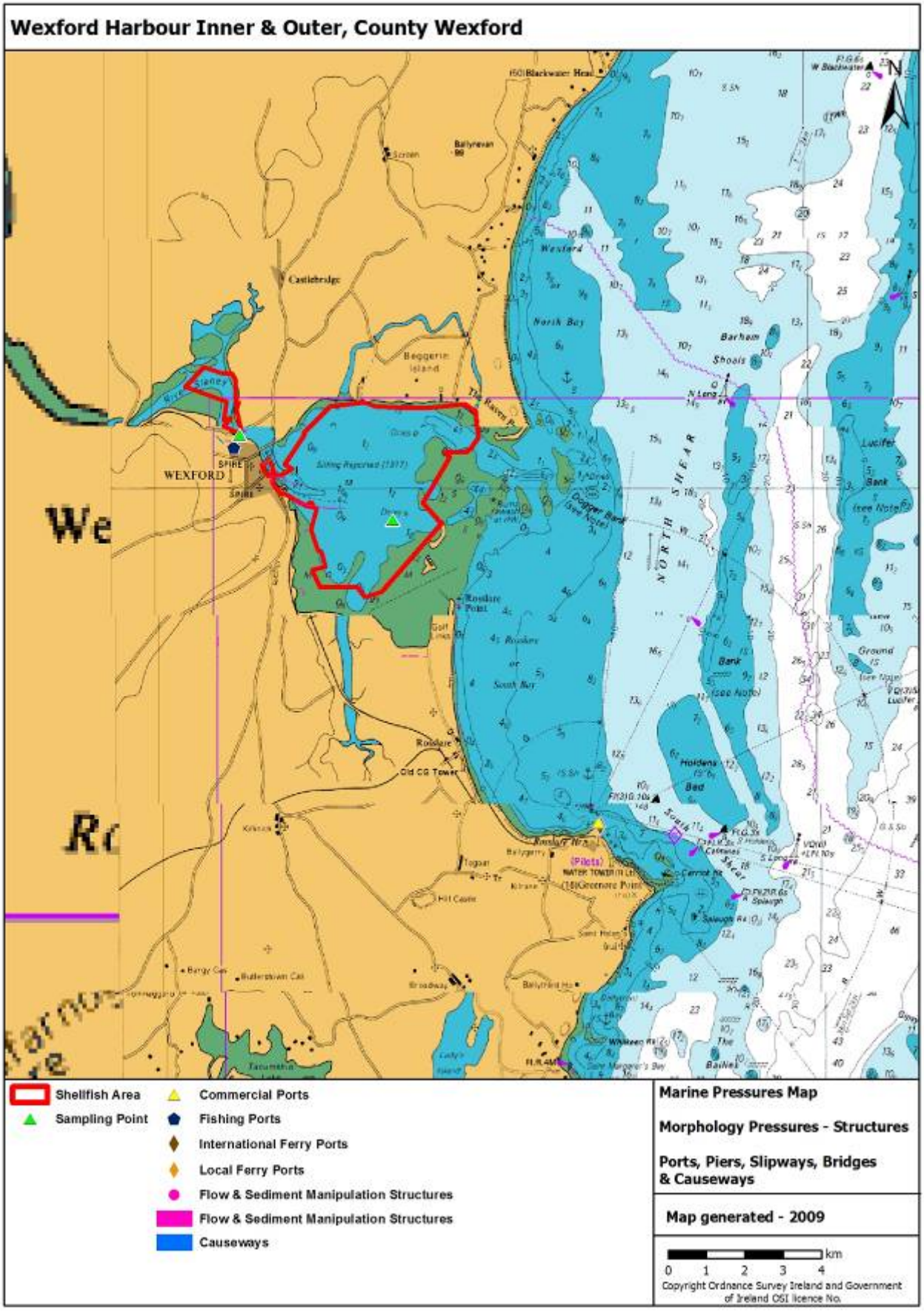
MAP 14 - Licensed finfish areas (None in the vicinity of this shellfish area)



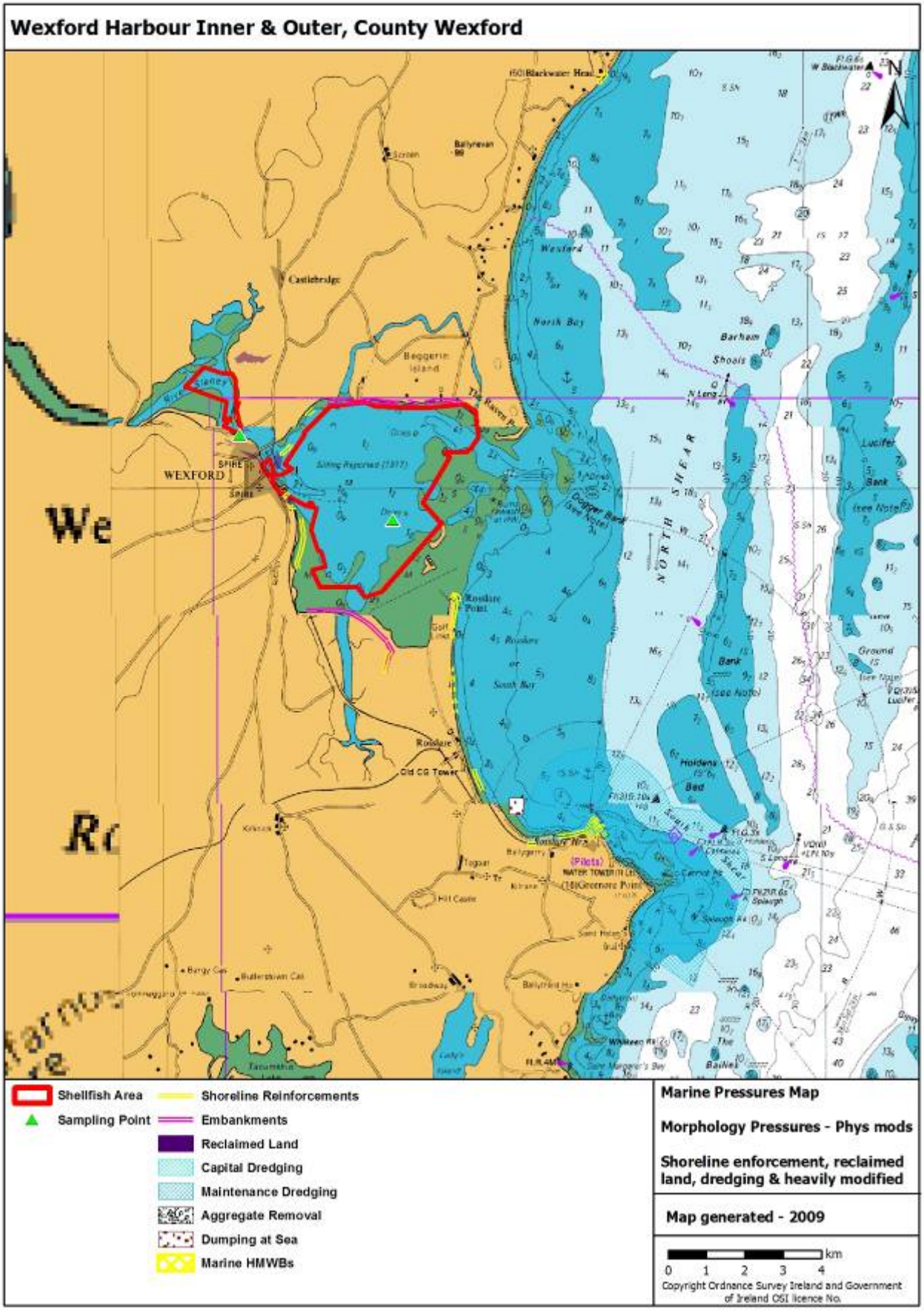
MAP 15 - Fishing gear activity



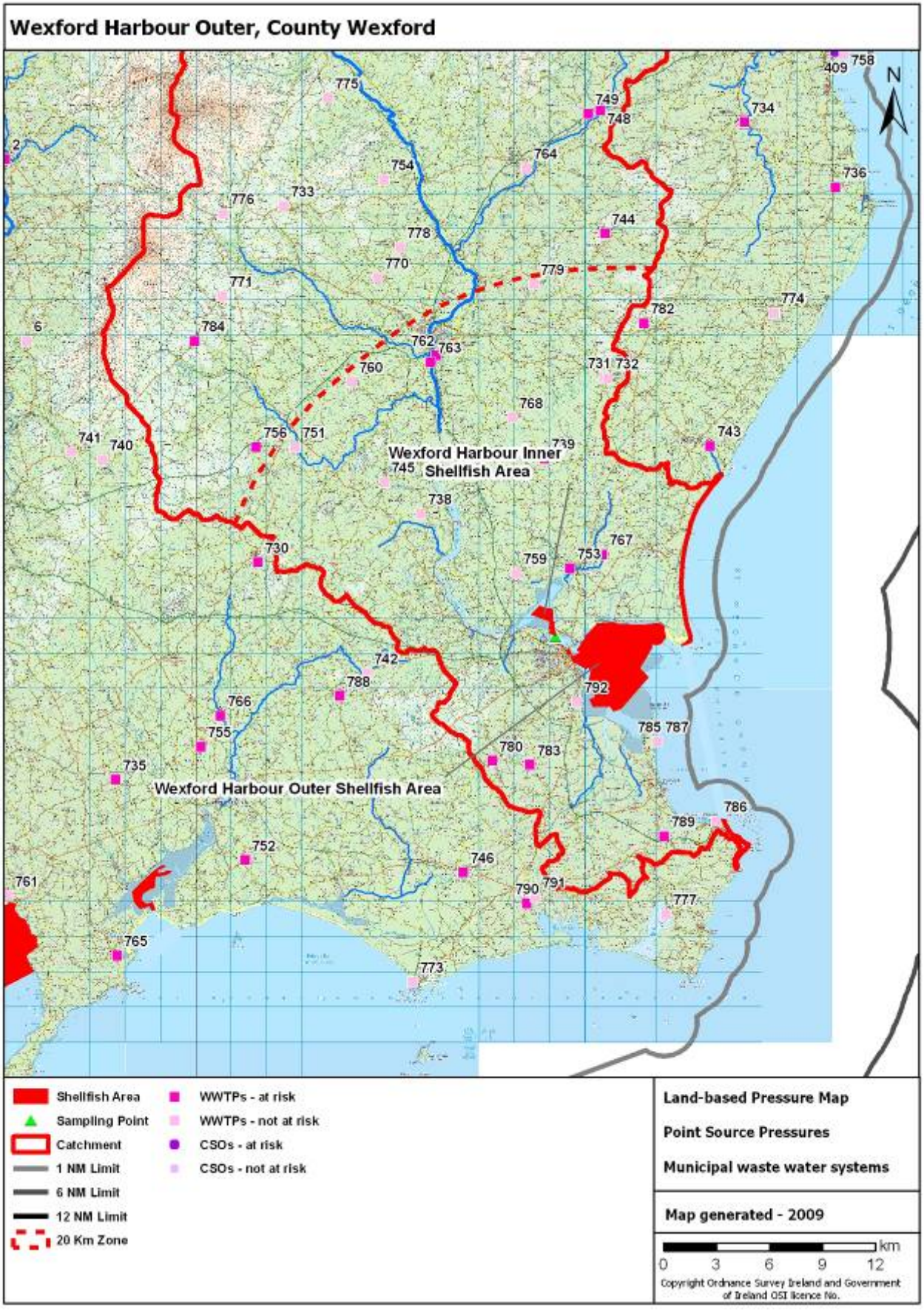
MAP 16 - Marine structures



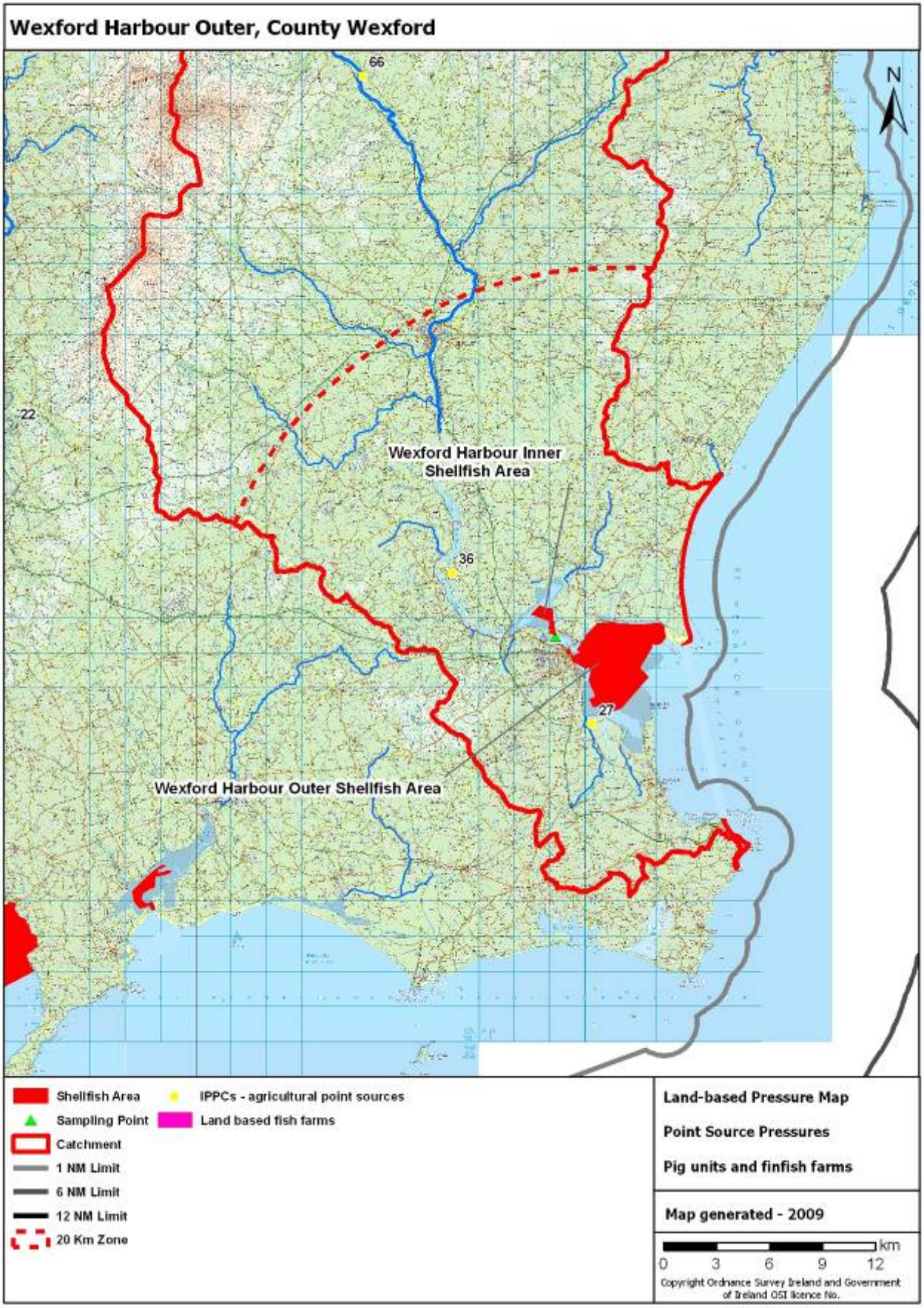
MAP 17 - Marine physical modifications



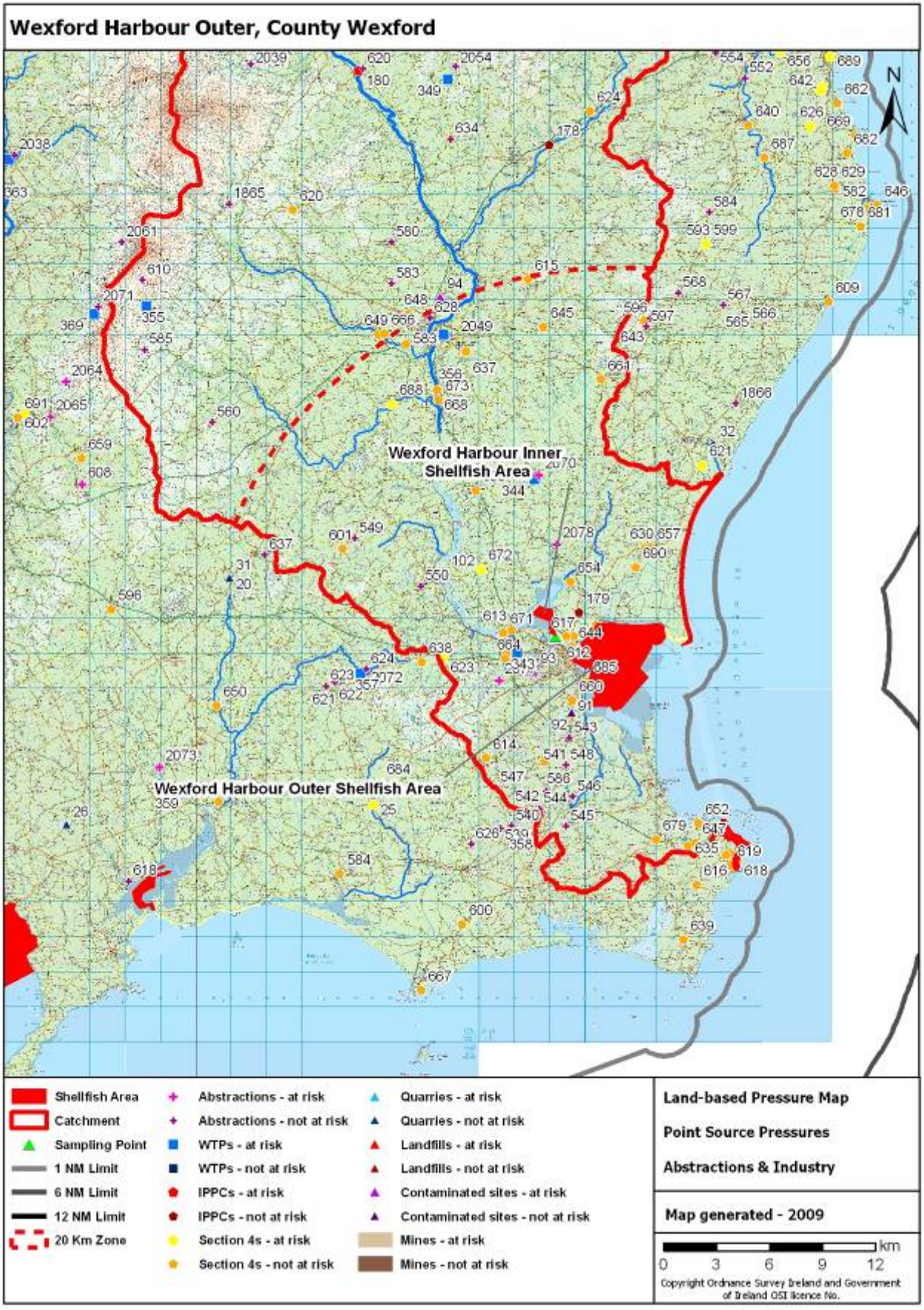
MAP 18 - Municipal waste water systems



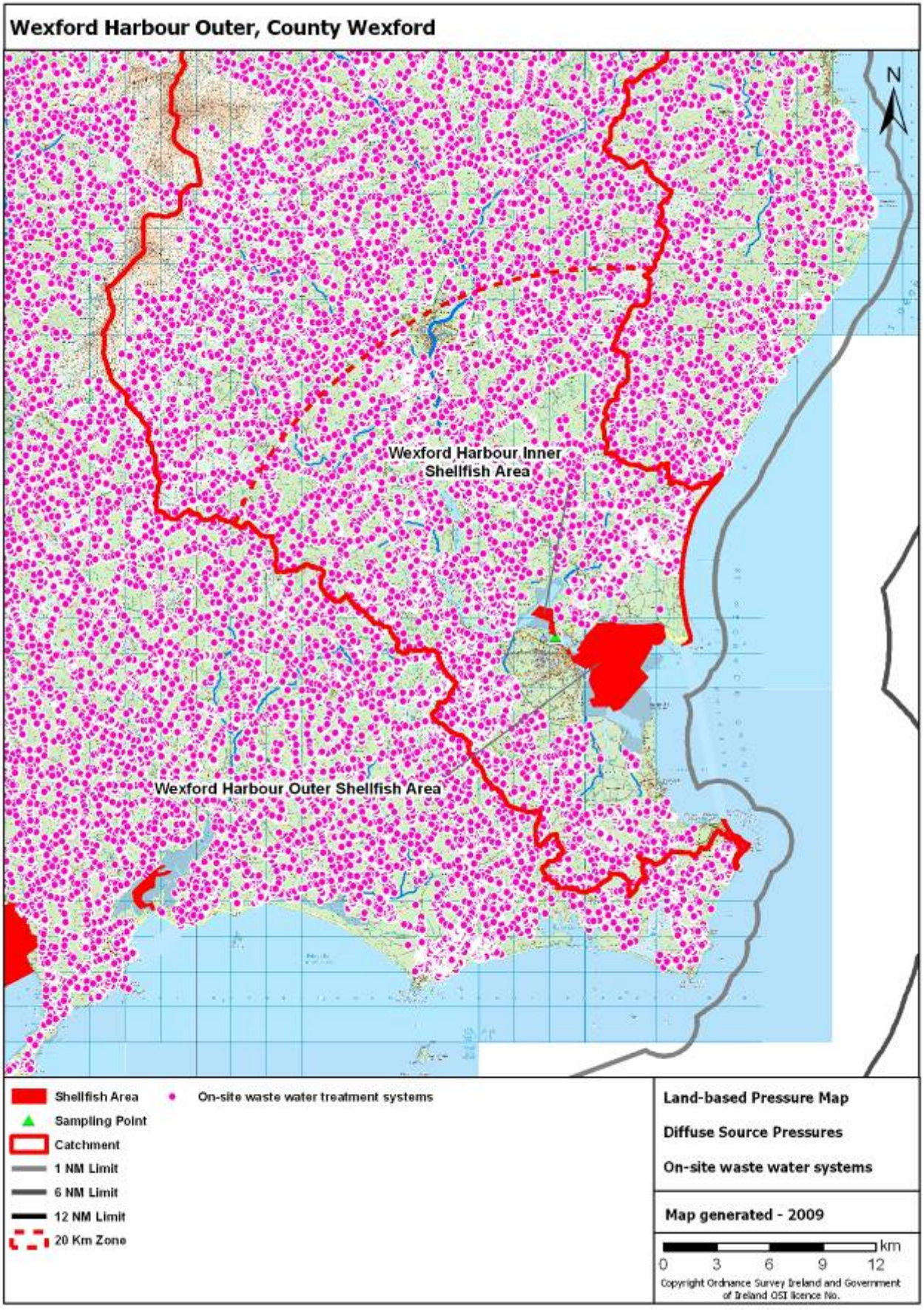
MAP 19 - Pig units and finfish farms



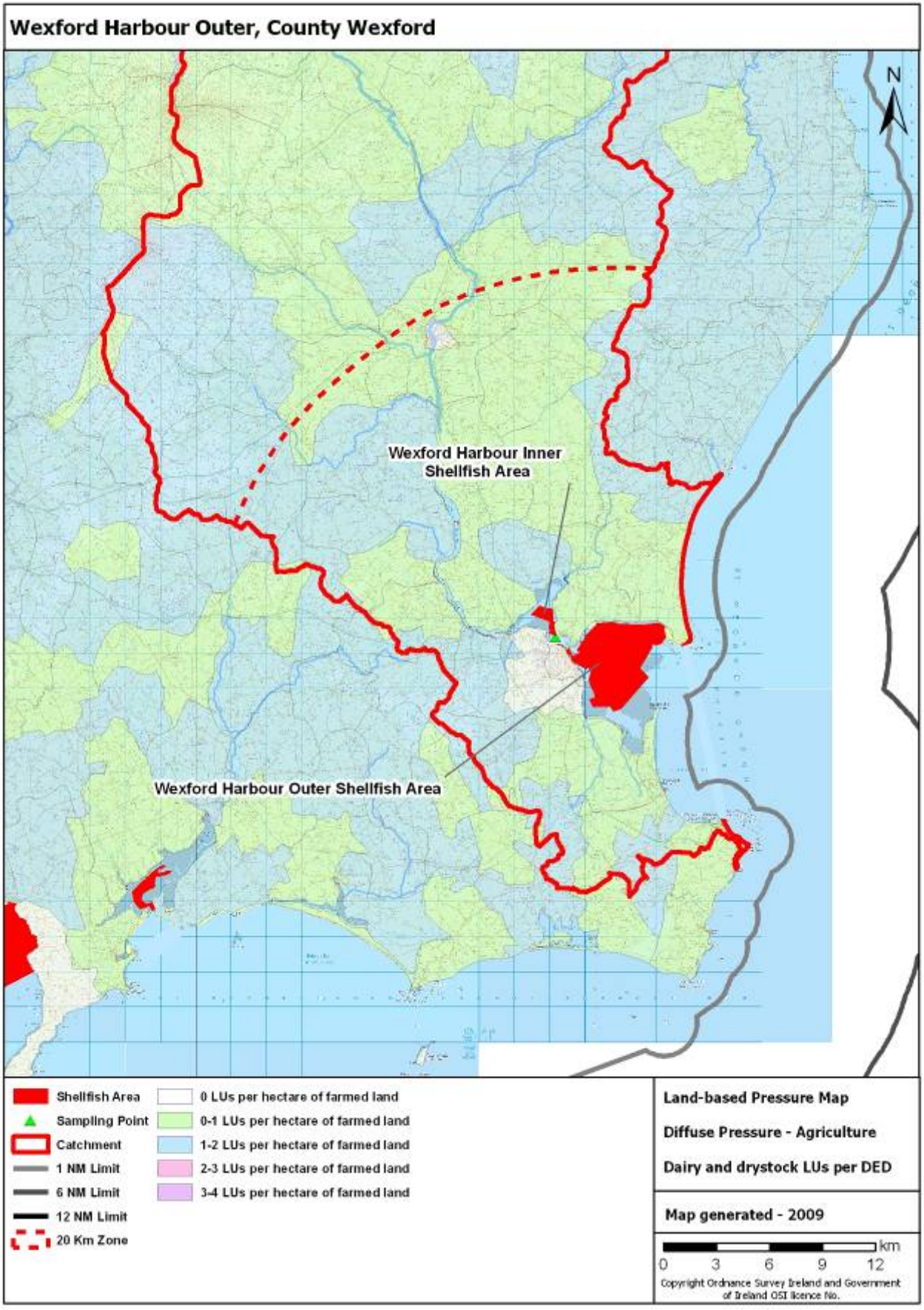
MAP 20 - Industrial point source pressures



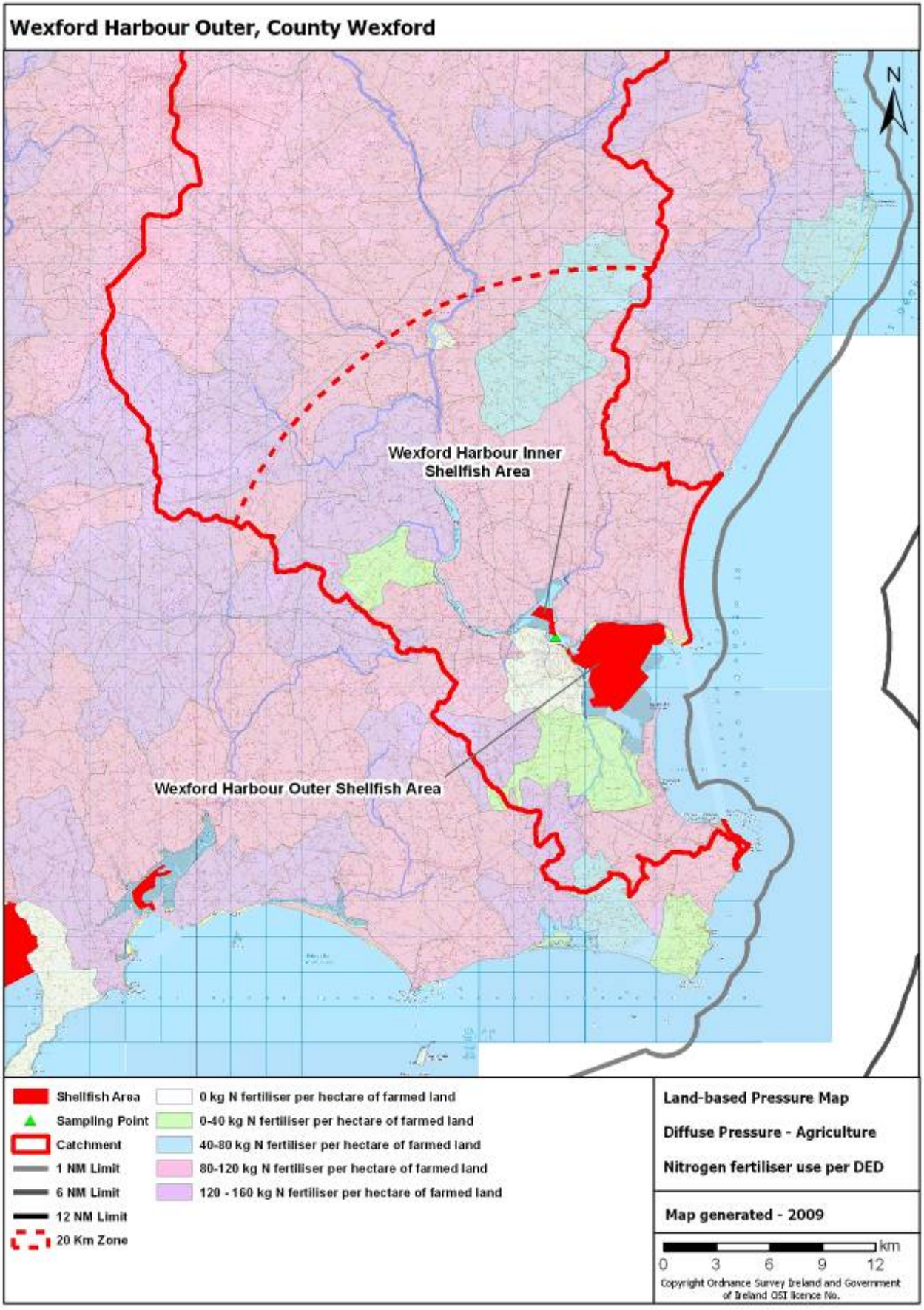
MAP 21 - On-site waste water systems



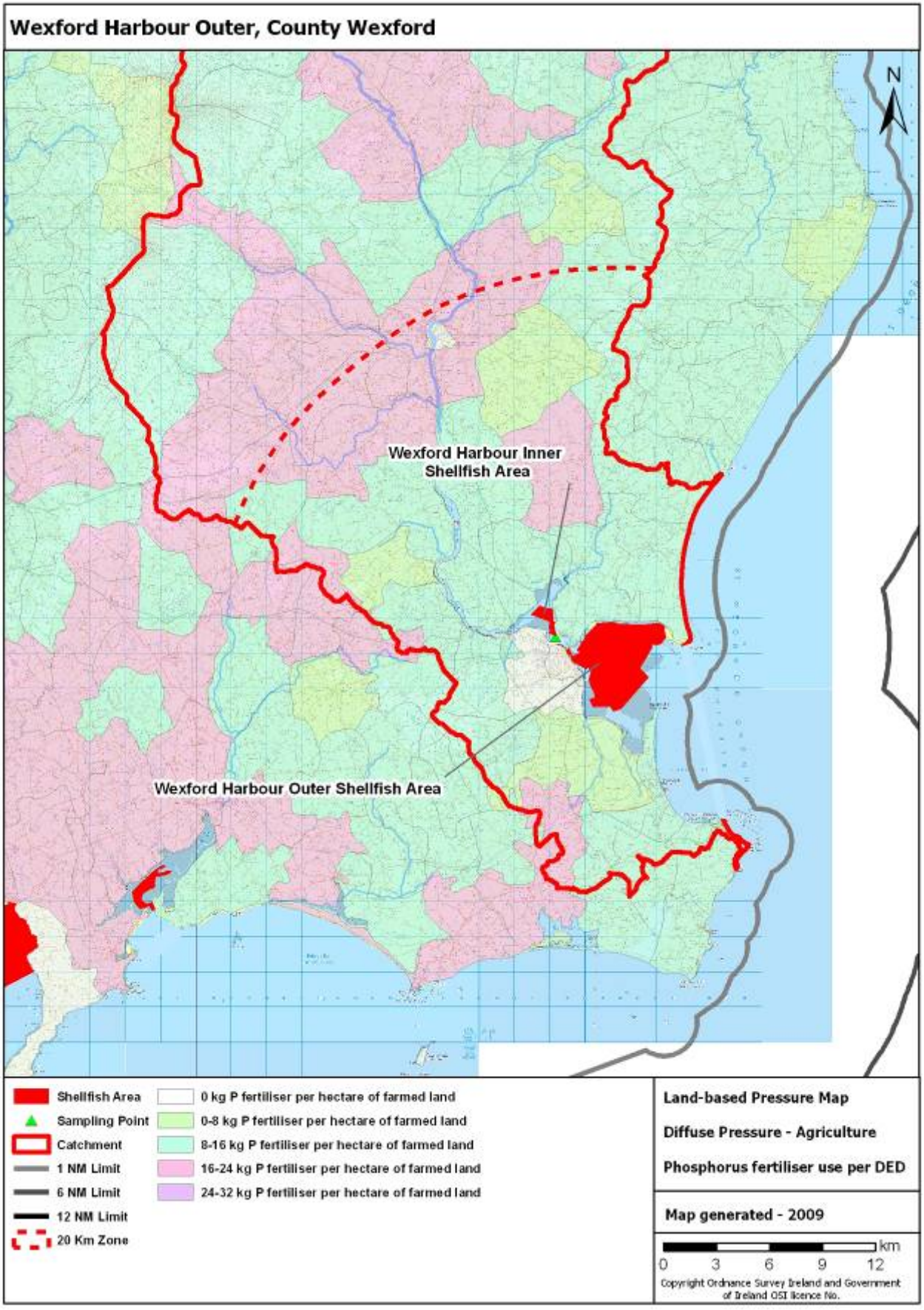
MAP 22 - Dairy and drystock livestock units



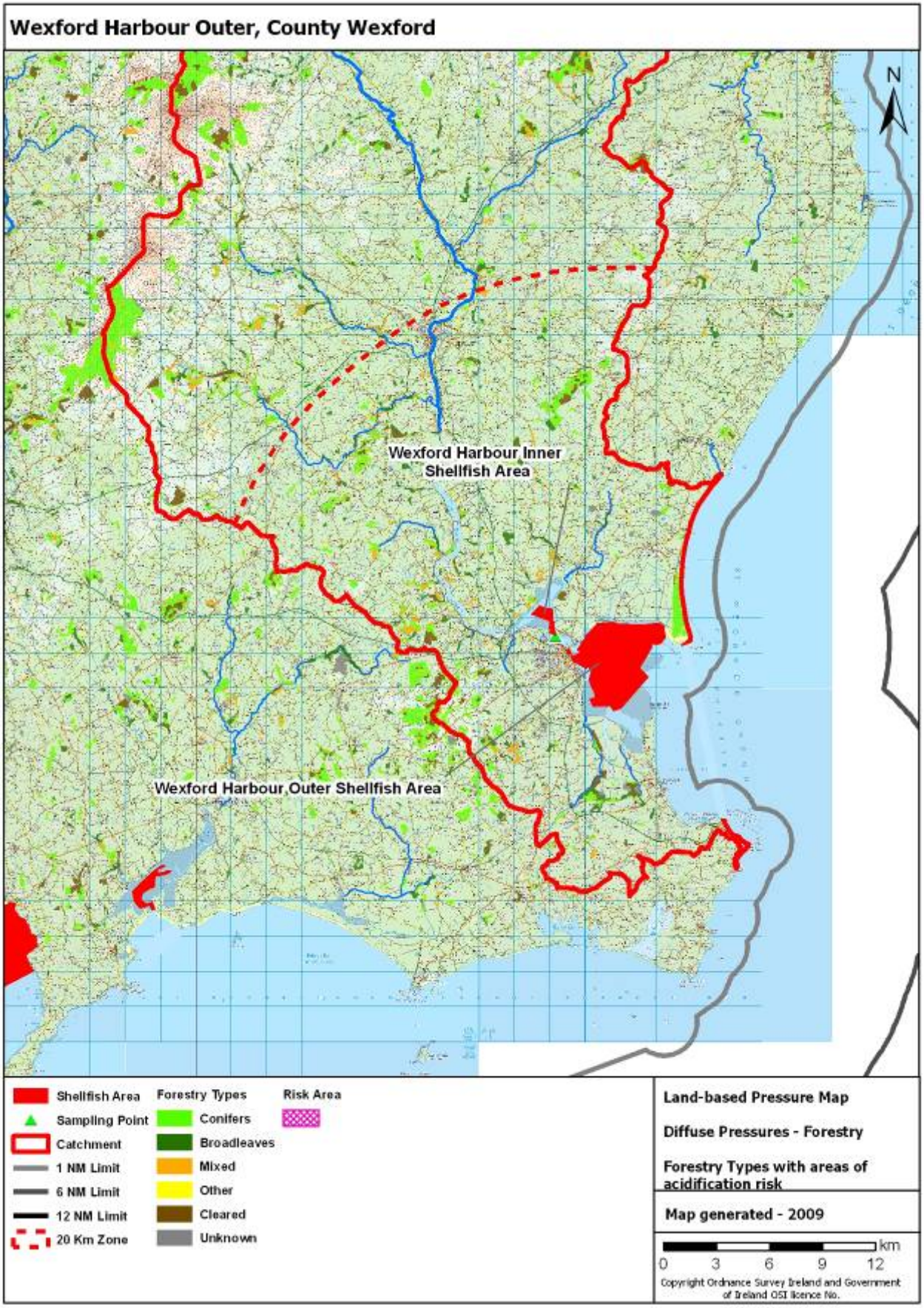
MAP 23 - Nitrogen fertiliser usage



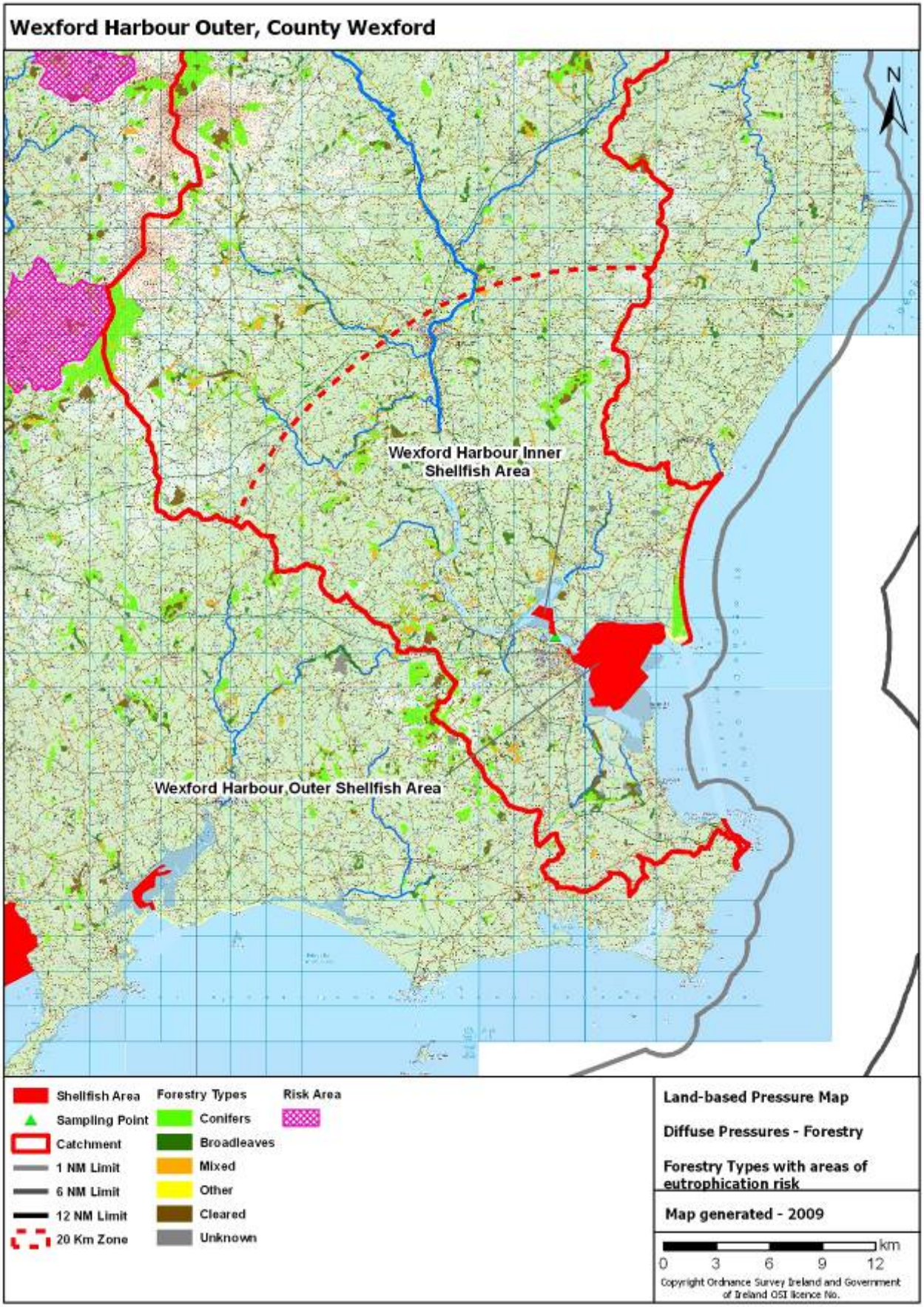
MAP 24 - Phosphorus fertiliser usage



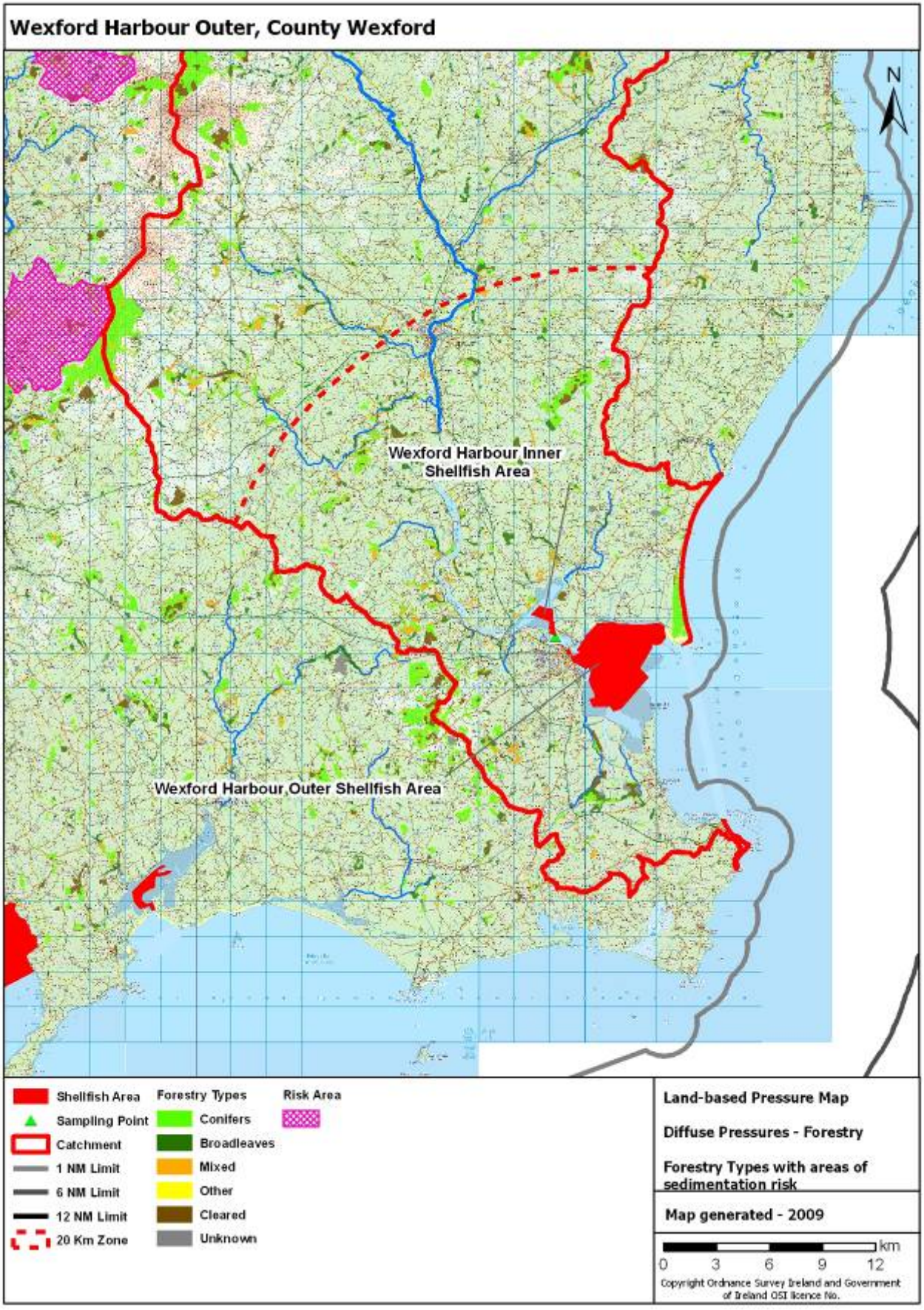
MAP 25 - Forestry types with acidification risk areas



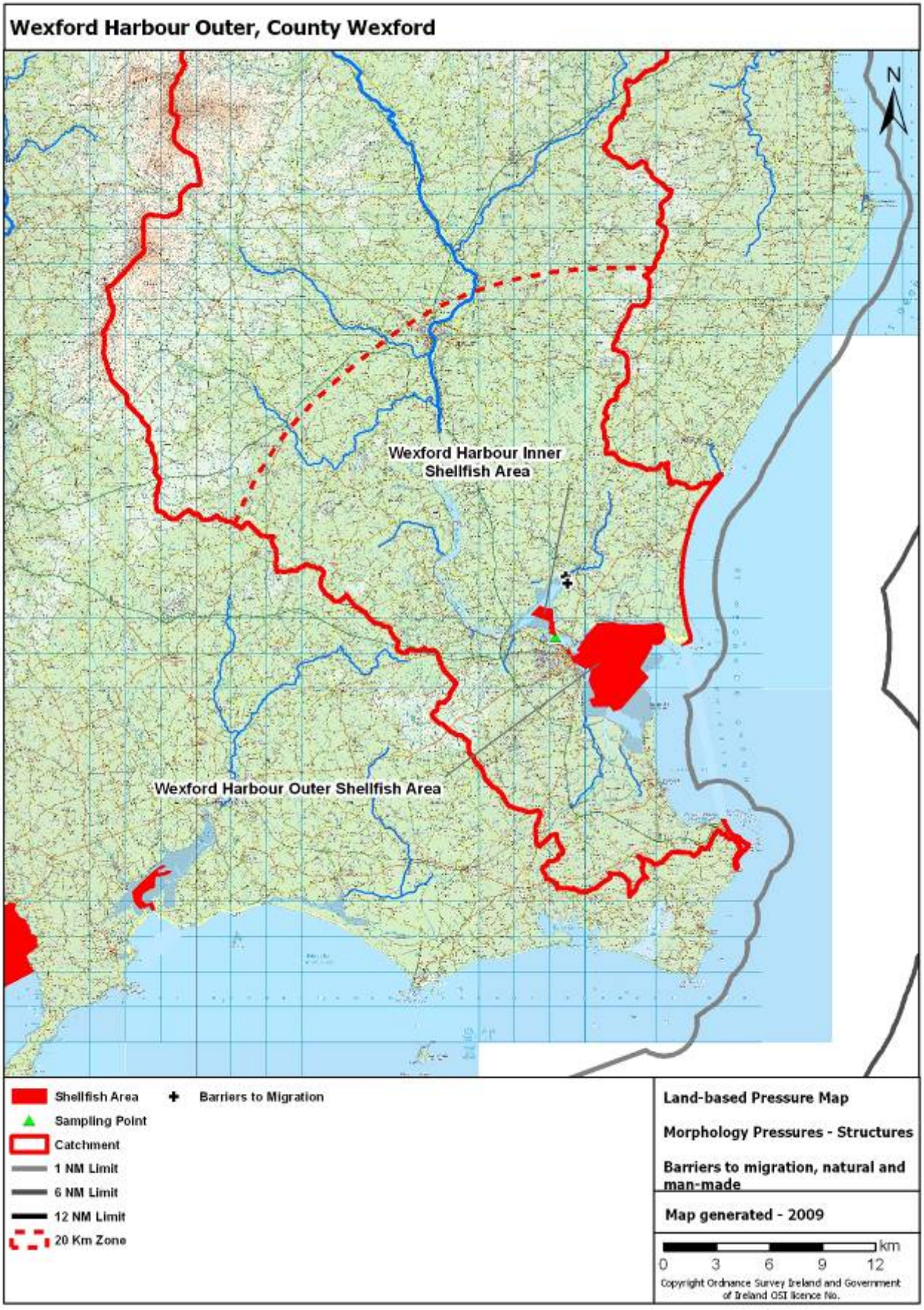
MAP 26 - Forestry types with eutrophication risk areas



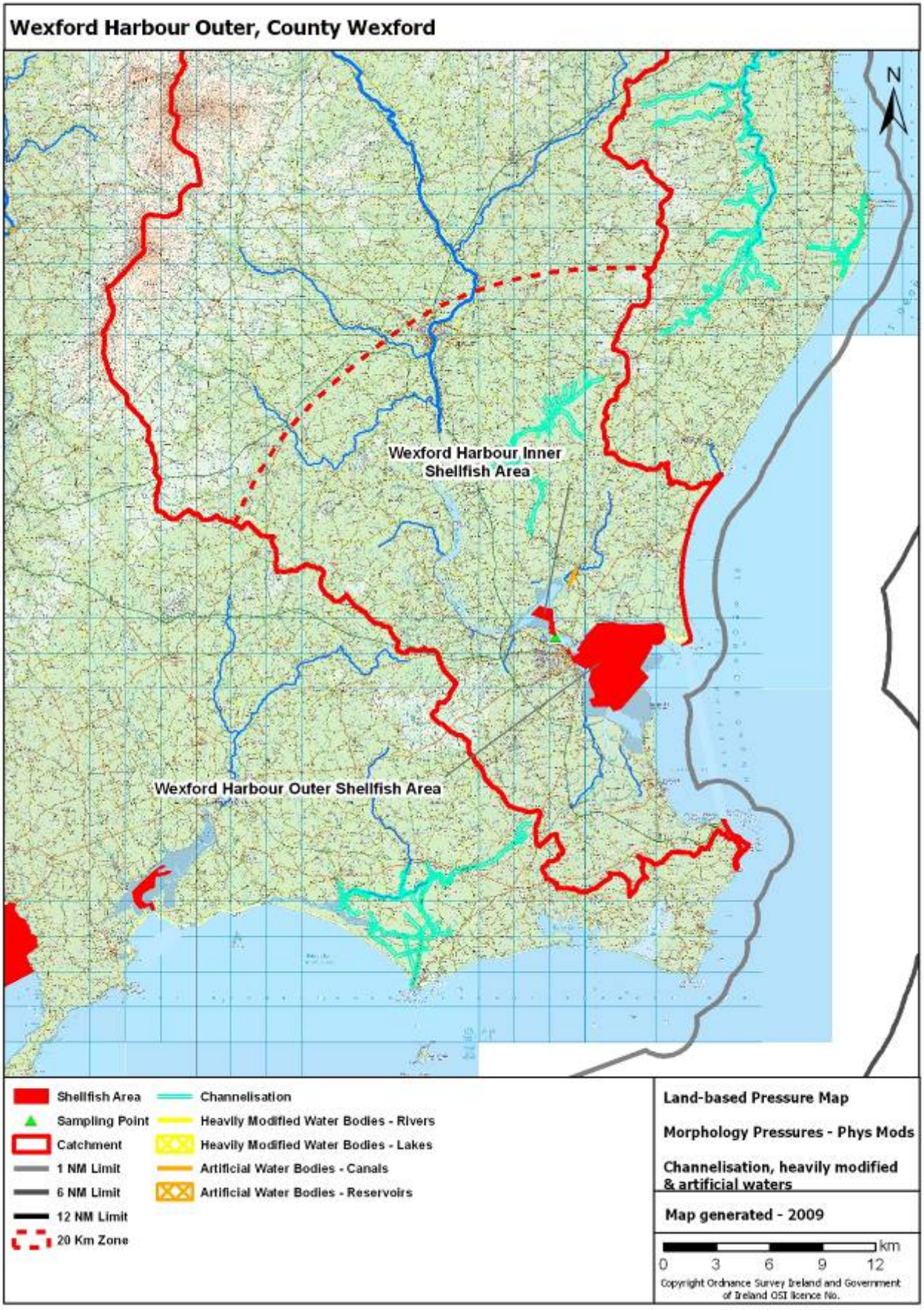
MAP 27 - Forestry types with sedimentation risk areas



MAP 28 - Freshwater structures



MAP 29 - Freshwater physical modifications



5.0 PRESSURES

This section of the characterisation report provides a tabular overview and inventory of the marine and land-based pressures in the vicinity of the designated shellfish area and within the contributing catchment up to a distance of 20 kilometres from the shellfish area. The pressure data has been derived from existing inventories. The pressures considered most likely to be related to any measured impacts on shellfish water quality parameters in this shellfish area have been estimated in order to focus management efforts towards the protection and improvement of the water quality in this shellfish area.

The available information considered when determining the likelihood of the pressures to cause impacts includes:

- pressure type

The pressure types, be it marine or land-based, point, diffuse or morphological, vary in terms of: their likelihood to impact on shellfish water quality; the water quality parameters they are likely to affect; and the severity of the impacts. The results of monitoring can therefore provide an indication of which pressure types are likely to be causing impacts.

- pressure magnitude

The magnitude of the pressures acting on a shellfish area can affect the overall potential impact. For marine pressures, the magnitude depends on the number and scale of the pressures but also on the exposure of the shellfish area to the pressures which in turn depends on how open or sheltered the shellfish area is and on water circulation. For land-based pressures, the magnitude depends on the number and scale of the pressures but also on the remoteness of the pressures from the shellfish areas which in turn depends on the distance of the pressures from the shellfish area, the topography of the catchment and the presence of lakes downstream of pressures which can act as pollution sinks.

- WFD risk designations

A series of risk assessments relating to the main pressures on waters were carried out during the WFD implementation process to identify pressures ‘at risk’ of impacting the surrounding water environment. These were originally carried out in 2004 and 2005 in accordance with Article V of the directive but many of them were subsequently updated in 2008 to feed into draft River Basin Management Plans. A lot of information about the pressures was collected to undertake these assessments and some of that information is summarised in this section where it is useful in screening which pressures are most likely to impact on shellfish water quality. In all cases, the most up-to-date risk assessment information available was used. Full details of the WFD risk assessments can be found at www.wfdireland.ie.

Whilst the risk designations under the WFD provide a useful screening tool for pressures, their relevance in terms of any water quality issues measured in Shellfish Waters has to be assessed in further detail to identify key pressures at a particular site.

For example, the main issue to be addressed in the Wexford Harbour Outer Pollution Reduction Programme is microbial contamination of the shellfish growing waters. Available monitoring data does not suggest, for example, metal contamination of shellfish.

Table 4 lists all of the pressures considered in the development of the characterisation report and indicates their presence or absence within the shellfish area, within the marine waters in the vicinity of the shellfish area or within the contributing catchment. Those pressures that are present are discussed later in this section.

TABLE 4 - Summary of pressures

Pressure type	Pressure type	Pressures	Present
Marine	Point	Marine finfish farms	No
	Morphology	**Fishing gear activity**	**Yes**
		Structures and associated activities	
		Ports	**Yes**
		Flow/Sediment manipulation structures	**Yes**
		Piled structures	**Yes**
		Causeways	**Yes**
		Physical modifications	
		Shoreline reinforcement	**Yes**
		Embankments	**Yes**
		Reclaimed Land	**Yes**
		Capital dredging	No
		Maintenance dredging	No
		Aggregate removal	No
		Disposal at sea	No
		Marine heavily modified waters	No
Land-based	Point	Urban wastewater systems	
		Urban waste water treatment systems	**Yes**
		Combined sewer overflows	No
		Agricultural and aquacultural point sources	
		Pig units	**Yes**
		Freshwater finfish farms	No
		Industrial point sources	
		Abstractions	**Yes**
		Water treatment plants	**Yes**
		IPPCs	**Yes**
		Section 4s	**Yes**
		Quarries	No
		Landfills	**Yes**
		Mines	No
		Contaminated lands	**Yes**
		Other	No
	Diffuse	**On-site waste water treatment systems**	**Yes**
		Agriculture	
		Livestock density	**Yes**
		Nitrogen fertiliser usage	**Yes**
		Phosphorus fertiliser usage	**Yes**
		Forestry	**Yes**
	Morphology	Structures	
		Barriers to migration	**Yes**
		Physical Modifications	
		Channelisation	**Yes**
		Heavily modified waters	No
		Artificial waters	**Yes**

5.1 Marine Pressures

Marine pressures are considered up to a distance of 5 kilometres from the shellfish area. Marine pressures situated further away or in adjacent waterbodies are also mentioned if they are considered significant. Marine pressure types include point source pressures (marine finfish farms) and morphological pressures including fishing gear activity, structures (ports, bridges, piers, slipways etc) and physical modifications (shoreline reinforcement, embankments, dredging etc). The potential impacts associated with these pressures are as follows:

- Point source pressures

Marine finfish farms can be associated with increased nutrient levels in waters, arising from fish excretion and excess feed input.

- Morphological pressures

Fishing activity can be associated with increased suspended sediment levels arising from disturbance of the seabed. The potential severity of the impacts varies depending on the type of fishing gear used and the extent, frequency and duration of the activity. The impact of boats is dealt with in association with marine structures below.

Structures (such as ports, harbours, bridges, slipways and piers) alter natural processes such as flow and silt movement and can therefore affect levels of suspended sediment in marine waters. The activities associated with these structures, for example shipping and boating, are associated with effects on the levels of general physico-chemical parameters, faecal coliforms, metals and chemicals.

Physical modifications (such as shoreline reinforcement, embankments and dredging) can alter natural processes such as flow and silt movement and can therefore affect levels of suspended sediment. However, once these modifications are established or the activities have ceased, the surrounding environment can acclimatise and impacts do not necessarily continue.

The following tables summarise the nature and extent of marine pressures up to a distance of 5 kilometres from the designated shellfish area. The likelihood for these pressures to impact on shellfish water quality parameters is discussed. The potential severity of the impacts of marine pressures is most closely associated with the activity type, magnitude and proximity and therefore the discussions in this section focus on these factors.

5.1.1 Point source pressures

There are no marine point source pressures in the vicinity of this designated shellfish area.

5.1.2 Morphology pressures

An assessment of the risk posed to marine waters from marine morphology pressures was carried out during the WFD implementation process. The results of this assessment show that the marine waters in and around this shellfish area are considered to be 'at risk' from morphological pressures.

Fishing gear activity

TABLE 5 - Fishing gears

Fishing gear types	Type	Present	Comment
Pots	Static	Yes	Large area to the east of the shellfish area
Tangle Nets	Static	No	NA
Bottom Set Gill Nets	Static	No	NA
Draft Nets	Static	No	NA
Drift Nets	Static	No	NA
Line Fishing	Static	Yes	Widespread throughout the area
Box Dredge	Mobile	No	NA
Cockle Dredge	Mobile	No	NA
Mussel Dredge	Mobile	Yes	Widespread throughout the area
Hydraulic Dredge	Mobile	No	NA
Scallop Dredge	Mobile	No	NA
Oyster Dredge	Mobile	No	NA
Otter Trawl	Mobile	Yes	Large area to the east of the shellfish area
Beam Trawl	Mobile	Yes	Large area to the east of the shellfish area
Digging	NA	No	NA
Gathering	NA	No	NA
Rake	NA	No	NA

Table 5 provides a summary of the fishing gear activity occurring within 5 kilometres of the designated shellfish area. Map 15 illustrates these pressures. Boat movements are dealt with below in association with marine structures such as ports and piers.

Static fishing gear types generally would not be expected to impact on shellfish water quality. Mobile fishing gears however disturb the seabed and can therefore affect the levels of suspended sediments in marine waters with the severity of the impacts depending on the frequency, intensity and extent of the fishing activity.

Static fishing gear activity in the area includes widespread line fishing (lines set on the seabed with bated hooks at intervals) and the use of pots (bated traps set on the seabed targeting crustaceans).

Mobile fishing gear activity includes the use of mussel dredges (metal blades which dig into the seabed to harvest shellfish) and the use of otter trawls and beam trawls (nets towed along the seabed) in use to the east of the shellfish area. Monitoring in the vicinity of the shellfish area does not indicate any water quality issues which are likely to arise from this activity. Also, though the area has been designated as 'at risk' from morphological pressures, the morphological status in the area is 'high'. Therefore, this activity is unlikely to be affecting shellfish water quality in this shellfish area.

Structures and associated activities

TABLE 6 - Marine morphology structures

Marine morphology structures	Direct	0-5km	Comment
Ports	0	1	Wexford harbour
Flow and sediment manipulation	4	21	Concrete structures
Piled structures	1	0	NA
Causeways	0	1	Railway causeway

Table 6 provides a summary of the marine morphology structures located within 5 kilometres of the designated shellfish area. Map 16 illustrates these pressures. Flow and sediment manipulation structures include piers, breakwaters, groynes, flow deflectors and training walls. Piled structures include bridge and pier supports and wind turbines. Causeways include roads and railway lines. These structures affect flow and sediment movement and can therefore impact on levels of suspended sediments, though these impacts can settle down once the structures are well established in an area. The activities associated with marine structures, including shipping and boating, can affect a wide range of water quality parameters including general physico-chemical parameters such as suspended sediment, dissolved oxygen and nutrient levels. Faecal coliform levels can also be affected as well as the levels of harmful substances such as metals and pesticides. Boat movements can lead to erosion and sedimentation effects as well as pollution from fuels.

Wexford harbour is situated a couple of kilometres to the west of the shellfish area. There are 4 pier structures directly adjacent to the shellfish area and 21 additional pier structures within 5 kilometres of the shellfish area. There is also 1 piled structure directly adjacent plus 1 causeway within 5 kilometres. Monitoring in the vicinity of the shellfish area does not indicate any water quality issues which are likely to be associated with the structures themselves or. Also, though the area has been designated as 'at risk' from morphological pressures, the morphological status in the area is 'high'. Therefore, the structures themselves are unlikely to be affecting shellfish water quality in this shellfish area. However, shellfish monitoring indicates faecal contamination in this shellfish area and the boat movements in the area are a possible source. Therefore, this activity could possibly be affecting shellfish water quality in this shellfish area.

Physical modifications

TABLE 7 - Physical modifications

Physical modifications	Direct	0-5 km	Comment
Shoreline reinforcement	1	17	Boulders, sea walls, rock

Physical modifications	Direct	0-5 km	Comment
			armour, revetments
Embankments	5	6	NA
Reclaimed land	5	6	NA
Capital dredging	0	0	NA
Maintenance dredging	0	0	NA
Aggregate removal	0	0	NA
Dumping at sea	0	0	NA

Table 7 provides a summary of the physical modifications occurring within 5 kilometres of the designated shellfish area. Map 17 illustrates these pressures. These modifications can affect flow and sediment movement though these impacts can cease once the modifications are established.

There is 1 instance of shoreline reinforcement and 5 embankments directly adjacent to the shellfish area. A further 17 instances of shoreline reinforcement and 6 embankments occur within 5 kilometres of the shellfish area. There are 5 areas of reclaimed land directly adjacent to the shellfish area and a further 6 within 5 kilometres. Monitoring in the vicinity of the shellfish area does not indicate any water quality issues which are likely to be associated with these modifications. Also, though the area has been designated as ‘at risk’ from morphological pressures, the morphological status in the area is ‘high’. Therefore, these modifications are unlikely to be affecting shellfish water quality in this shellfish area.

5.2 Land-based Pressures

The contributing catchment is used to identify the land-based pressures that could potentially be impacting on shellfish water quality and therefore the size of the contributing catchment can be important in determining the magnitude of the pressures. Contributing catchment sizes vary considerably; however, pressures are only considered up to a distance of 20 kilometres from the shellfish area and are, where appropriate, divided into four zones: direct, 0 to 5 kilometres, 5 to 10 kilometres and 10 to 20 kilometres. Pressures within the catchment, but further than 20 kilometres from the shellfish area, are also included if they are considered significant. In addition significant land-based pressures acting in adjacent waterbodies which may have an impact due to tidal influences are also considered where relevant.

Land-based pressure types include point source pressures, diffuse source pressures and morphology pressures. The shellfish water quality parameters potentially impacted by these pressures are as follows:

- Point source pressures can affect the whole suite of shellfish water quality parameters. For example, waste water treatment plants, CSOs and agricultural point sources can impact on the levels of faecal coliforms, nutrients, bacteria and other harmful substances in receiving waters while IPPC licensed industries, mines, quarries and landfills can impact on the levels of polluting substances in receiving waters such as petroleum hydrocarbons, organohalogenated substances and metals. Abstractions are included under this heading and can impact on salinity levels, though not to an extent likely to lead to non-compliances with shellfish water salinity standards, as well as reducing the dilution available for polluting discharges.

- Diffuse source pressures affect many of the shellfish water quality parameters. Agricultural activity and on-site waste water treatment systems (OSWTS) can impact on faecal coliform levels as well as general physico-chemical parameters such as the levels of suspended sediments and dissolved oxygen. Forestry activity can impact on the pH of receiving waters as well as on the levels of suspended solids and nutrients and it is also associated with the use of pesticides which can contain organohalogenated substances.

- Land-based morphology pressures, and associated activities, are not generally associated with impacts on water quality in marine areas. Their impacts are usually associated with the loss of natural freshwater features and habitats and changes to the behaviour of freshwater systems including sediment movement. Channelisation activities however, if occurring close to shellfish areas, can impact on shellfish water quality, particularly the levels of suspended sediment.

The following tables summarise the nature and extent of land based pressures within the catchment up to a distance of 20 kilometres from the designated shellfish area. The likelihood for these pressures to impact on shellfish water quality parameters is discussed. All of the factors discussed at the beginning of this chapter can affect the likelihood for land-based pressures to impact on shellfish waters.

5.2.1 Point Source Pressures

Urban Wastewater Systems

Table 8 lists the urban waste water treatment plants in the catchment up to a distance of 20 kilometres from the shellfish area. Map 18 illustrates these pressures and map references link the map and table. The information in the table was compiled by the WFD Municipal and Industrial Regulation Study in 2008 and includes:

- the distance of the plants from the shellfish area
- the WFD status of the water body within which the plants are located
- the level of treatment available at the plants
- whether the plants are included in the current Water Services Investment Programme 07-09
- the design capacity (in terms of population equivalents (P.E.)) of the plants
- the percentage at which the plants are operating above or below their design capacity currently
- the percentage at which the plants are likely to be operating above or below their design capacity in 2015 based on population projections
- the WFD risk designations associated with the plants and the reasons behind the risk designations

The WFD risk assessment in relation to urban waste water treatment plants was updated in 2008 to feed into the draft RBMPs with a further update currently underway (due for completion by November 2009). The plants were designated as 'at risk' for a variety of reasons including:

- A Insufficient WWTP capacity – existing load
- B Insufficient WWTP capacity – future load
- C Insufficient assimilative capacity for BOD – existing load
- D Insufficient assimilative capacity for BOD – future load
- E Insufficient assimilative capacity for nutrients – existing load
- F Insufficient assimilative capacity for nutrients – future load
- G Historical deterioration in downstream Q value where the Q station is within 3 kilometres of the outfall
- H Downstream Q value is less than 4 where the Q station is within 3 kilometres of the outfall
- I Deterioration in upstream to downstream Q value were the distance between Q stations is less then 3 kilometres
- J Exceedance of bathing water quality within 1 kilometre of the outfall
- K Exceedance of shellfish water quality within 1 kilometre of the outfall
- L Expert opinion

Waste water discharges from waste water treatment plants can contain a wide range of potentially polluting components originating from households, industry and urban areas. These discharges can affect the levels of faecal coliforms, nutrients, dissolved oxygen, suspended sediment, organic wastes and harmful chemicals in receiving waters.

The 2008 risk assessment identified 23 urban waste water treatment plants within the catchment with 8 of them 'at risk' for a range of reasons including insufficient plant capacity, insufficient assimilative capacity in receiving waters and deterioration in downstream water quality. The WFD risk assessment was reviewed by experts in November 2009 with regard to the Water Services Investment Programme and waste water licensing actions. The most significant plants were identified on the basis of proximity, plant performance, population equivalent and level of treatment. In this review, only the plant at Wexford town was identified as significant in terms of the risk to shellfish water quality in this shellfish area.

The plant at Wexford town has a capacity of 45,000 P.E. and incorporates secondary treatment with nutrient removal and UV disinfection.

TABLE 8 - Urban waste water treatment plants

Name	Map Ref	Dist km	Status	Treatment level	WSIP 07-09	Capacity PE	% surplus existing	% surplus future	At Risk
Ballagh Village	731	10-20	Good	nd	No	68	nd	nd	No
Ballaghkeen	732	10-20	Good	nd	No	500	0 %	0 %	No
Ballyhogue	738	10-20	Poor	nd	No	250	0 %	0 %	No
Ballymurn	739	5-10	Moderate	Secondary & nutrient removal	No	600	0 %	0 %	Yes – G/H
Bree	745	10-20	Poor	nd	No	300	0 %	0 %	No
Carnew	751	10-20	Poor	Secondary	No	nd	nd	nd	No
Castlebridge	753	0-5	Moderate	Secondary	Yes	2,000	0 %	-52 %	Yes - B
Crossabeg	759	5-10	Moderate	None	No	75	71 %	71 %	No
Davidstown	760	10-20	Poor	nd	No	150	47 %	47 %	No
Enniscorthy (Kilgoley)	762	10-20	Moderate	Primary	No	850	-76 %	-76 %	Yes – A/B
Enniscorthy	763	10-20	Moderate	Secondary	Yes	16,000	10 %	-32 %	Yes – B/C/D
Galbally	767	0-5	Moderate	nd	No	50	nd	nd	Yes - H
Glenbrien	768	10-20	Moderate	nd	No	150	20 %	20 %	No
Monageer	779	10-20	Moderate	nd	No	300	81 %	81 %	No
Murrintown	780	5-10	Good	nd	No	144	-203 %	-403 %	Yes - D
Piercetown	783	5-10	Poor	Secondary & nutrient removal	Yes	800	0 %	-42 %	Yes – B/C/D/E/F
Rosslare Harbour	786, 785	5-10	nd	Secondary	Yes	9,383	68 %	61 %	No
Rosslare Strand	787	0-5	nd	Secondary	No	7,500	47 %	47 %	No
Tagoat	789	5-10	Moderate	nd	No	500	0 %	0 %	Yes – C/D/E/F
Wexford	792	0-5	Moderate	Secondary & nutrient removal & UV disinfection	Yes	45,000	47 %	21 %	No

Name	Map Ref	Dist km	Status	Treatment level	WSIP 07-09	Capacity PE	% surplus existing	% surplus future	At Risk
Oilgate	-	0-5	nd	Primary	Yes	280	-	-	
Ballyhine	-	0-5	nd	Primary	No	< 500	-	-	
Barntown	-	0-5	nd	Primary	No	< 500	-	-	

NOTE: A minus figure in the percentage surplus columns means that the plant is working above its design capacity, nd denotes 'no data' where for example plants are located in areas with no WFD status information

Agricultural IPPCs and land-based finfish farms

TABLE 9 - Agricultural IPPCs and land-based finfish farms

License No	Map Ref	Distance	Status	Nature	Note
P0429-01	27	0-5	Moderate	Pig farm	860 units, 12.5km spreading radius
P0453-02	36	5-10	nd	Pig farm	9,743 units, 14km spreading radius

Note: 'nd' means 'no data' where operations are located in areas with no WFD status information

Table 9 lists the agricultural IPPCs and finfish farms in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 19 illustrates these pressures and map references link the map and table. Information provided in the table in relation to the agricultural IPPCs and land-based finfish farms includes:

- the distance of the units from the designated shellfish area
- the WFD status of the water bodies within which the units are located.
- Any available additional information e.g. the spreading radius for spreading of slurry

Slurry from pig farms is usually landspread and can affect levels of faecal coliforms, nutrients, dissolved oxygen and organic wastes if it is lost to waters. Land-based finfish farms can be associated with elevated nutrient levels due to fish excretion and excess feed input.

There are 2 pig farms within the catchment, 1 of which is situated quite close to the shellfish area. Having regard to the scale of the pig farms and their proximity to the shellfish area, it is unlikely that they are affecting shellfish water quality in this shellfish area.

Abstractions

TABLE 10 - Abstractions

Name	Map Ref	Type	Distance	Status	Abs Rate $m^3\ day^{-1}$	At Risk (Ratio)
Ballykillane	537	Groundwater	0-5	Good	0	No
Ballyfinogue	541	Groundwater	0-5	Moderate	0	No
Rathmacknee	542	Groundwater	5-10	Poor	0	No
Rowestown	543	Groundwater	0-5	Moderate	0	No
Bushertown	545	Groundwater	5-10	Poor	0	No
Orristown	546	Groundwater	5-10	Moderate	0	No
No name	548	Groundwater	0-5	Good	0	No
No name	549	Groundwater	10-20	Good	60	No
No name	550	Groundwater	5-10	Good	150	No
No name	628	Groundwater	10-20	Moderate	550	No
Clonhasten	2049	River	10-20	Moderate	4,300	No
River Sow	2070	River	5-10	Moderate	3,400	Yes (> 40 %)
Coolree Reservoir	2077	Lake	0-5	Moderate	2,400	Yes (> 40 %)

Name	Map Ref	Type	Distance	Status	Abs Rate m^3 day^{-1}	At Risk (Ratio)
River Sow Edenvale	2078	River	0-5	Moderate	7,600	Yes (> 40 %)

Table 10 lists the abstractions in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 20 illustrates these pressures and map references link the map and table. Information provided in the table in relation to abstractions includes:

- the type of abstraction (river, lake or groundwater)
- the distance of the abstraction from the designated shellfish area
- the WFD status of the water body within which the abstraction is located
- the abstraction rate, expressed in cubic metres per day
- the WFD risk designations associated with the abstractions and the reasons behind the designations

The WFD risk assessment in relation to abstractions was updated in 2008 to feed into the draft RBMPs. Abstractions are deemed to be 'at risk' if they account for a significant proportion (>10%) of the resource. For river abstractions, the net abstraction is expressed as a proportion of the Q95 flow (i.e. the flow that is exceeded 95% of the time). For lake abstractions, the net abstraction is expressed as a proportion of the Q50 inflow to the lake (i.e. the long term median inflow). For groundwater abstractions, the net abstraction is expressed as a proportion of recharge volume (i.e. long term average recharge across the groundwater bodies).

Generally it is very unlikely that abstractions would lead to non-compliances with the shellfish standards for salinity in shellfish areas. Abstractions that represent a large proportion of their corresponding resources can decrease available dilution capacity but this is also unlikely to affect shellfish areas.

There are 14 abstractions in the catchment, 3 of which are 'at risk' due to the high ratio of the abstraction to river flow/lake inflow. As these abstractions represent a large proportion of their corresponding resources, they may be decreasing available dilution capacity downstream. However, it is unlikely that they are affecting shellfish water quality in this shellfish area.

Water Treatment Plants

TABLE 11 - Water treatment plants

Name	Map Ref	Distance	Status	Risk	Risk
Wexford Treatment Plant	343	0-5	nd	Yes	expert judgement
Kilmallock Water Works	344	5-10	Moderate	Yes	expert judgement
Vinegar Hill Treatment Works	356	10-20	Moderate	Yes	expert judgement

Note: 'nd' means 'no data' where plants are located in areas with no WFD status information

Table 11 lists the water treatment plants in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 20 illustrates these pressures and map references link the map and table. Information provided in the table in relation to the water treatment plants includes:

- the distance of the plants from the designated shellfish area
- the WFD status of the water bodies within which the plants are located
- the WFD risk designations associated with the plants and the reasoning behind the designations

The WFD risk assessment for water treatment plants dates back to the Article V characterisation process which was undertaken in 2004 and 2005. At that time expert opinion within the Local Authorities was used to indicate whether plants were 'at risk' of impacting on their surrounding water environment.

Discharges from Water Treatment Plants (WTPs) can affect the levels of suspended solids, algae and pathogens in receiving waters. Aluminium can also be present from the treatment process.

There are 3 water treatment plants in the catchment, all of which have been designated as 'at risk'. Monitoring in the shellfish area does not indicate any water quality issues which are likely to be associated with these plants and therefore they are unlikely to be affecting shellfish water quality in this shellfish area.

Integrated Pollution Prevention and Control Industries

TABLE 12 - Integrated Pollution Prevention Control Licenses

Name	Map Ref	Distance	Status	Risk
Kent Manufacturing Wexford Ltd	179	0-5	Good	No

Table 12 lists the IPPC licensed industries in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 20 illustrates these pressures and map references link the map and table. Information provided in the table in relation to the licensed industries includes:

- the distance of the industries from the designated shellfish area
- the WFD status of the water bodies within which the industries are located
- the WFD risk designations associated with the industries and the reasoning behind the designations

The WFD risk assessment in relation to IPPC licensed industries was updated in 2008 to feed into the draft RBMPs. The industries were designated as 'at risk' for a variety of reasons which are outlined on page 58.

Discharges from IPPC licensed industries are diverse and can affect the levels of faecal coliforms, nutrients, suspended sediments, dissolved oxygen as well as a wide range of chemicals in receiving waters.

There is 1 IPPC licensed industry within the catchment and this has been deemed to be 'not at risk'. It is located quite close to the shellfish area but it is within a water

body of 'good' WFD status so it is unlikely to be impacting on its surrounding water environment and, in turn, it is unlikely to be affecting shellfish water quality in the shellfish area.

Section 4 Licensed Industries

TABLE 13 - Section 4 Licenses

Name	Map Ref	Distance	Status	Risk
Al Uisce, Shigaun	583	10-20	Good	No
Archdale Construction	586	0-5	Good	No
Ardcavan Developments	587	0-5	nd	No
B. J. Murphy, Como Lodge	589	0-5	nd	No
B. J. Murphy	594	0-5	nd	No
Crosbie Bros	598	0-5	nd	No
Denka Construction	601	10-20	Good	No
Eamon Mernagh	605	10-20	nd	No
Eamonn Maguire	606	0-5	Good	No
Ferrigcarrig Hotel	611	0-5	nd	No
Ferrybank Motors Ltd	612	0-5	nd	No
Ferrycarig Hotel	613	0-5	nd	No
Foxcove Developments	614	5-10	Good	No
Francis Fenlon & Michael Goff	615	10-20	Moderate	No
Frenchchurch Properties	617	0-5	nd	No
James O'Brien	623	5-10	Moderate	Yes – C/D
John Hanrahan, Hotel Curracloe	630	0-5	Good	No
John Jo Byrne Car Sales	632	0-5	nd	No
Kilbride Construction	635	5-10	Moderate	No
Liam & Conor Brett	637	10-20	Moderate	No
Michael & Adrienne Tierney	644	0-5	nd	No
Michael Nolan	645	10-20	Moderate	No
Michael Tierney, Newtown, Ferricarrig. Co. Wexford	647	5-10	Moderate	No
National Vehicles Deliveries Ltd	652	5-10	Moderate	No
Noonan Dev.	654	0-5	Moderate	No
Pat Furlong	657	0-5	Good	No
Philip Stafford	660	0-5	Moderate	No
P. J. Farrell	661	10-20	Good	No
Quality Hotel Barntown	664	0-5	nd	No
Roadstone Ltd.	668	10-20	Moderate	No
Sean O' Reilly, The Oak Tavern	671	0-5	nd	No
Shelmaliere Developments	672	5-10	nd	Yes – C/D/E/F
South Eastern Health Board, Wexford General Hospital	673	10-20	Moderate	No
Tierra Investments	679	5-10	Moderate	No
Wexford Creamery, Cow & Gate Ltd.	685	0-5	nd	No
William Hassey	688	10-20	Poor	Yes – G/H

Name	Map Ref	Distance	Status	Risk
Wm Gordan, Ballinamorragh	690	0-5	Good	No

Note: 'nd' means 'no data' where industries are located in areas with no WFD status information

Table 13 lists the Section 4 licensed industries in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 20 illustrates these pressures and map references link the map and table. Information provided in the table in relation to the industries includes:

- the distance of the industries from the designated shellfish area
- the WFD status of the water bodies within which the industries are located
- the WFD risk designations associated with the industries and the reasoning behind the designations

The WFD risk assessment in relation to Section 4 licensed industries was updated in 2008 to feed into the draft RBMPs. The industries were designated as 'at risk' for a variety of reasons which are outlined on page 58.

Discharges from Section 4 licensed industries are diverse and can affect the levels of faecal coliforms, nutrients, suspended sediments, dissolved oxygen as well as a wide range of chemicals in receiving waters.

There are 37 Section 4 licensed industries in the catchment. Three of them have been designated as 'at risk' due to insufficient assimilative capacity in the receiving waters for BOD and nutrients as well as deterioration in downstream water quality. However, having regard to the nature of the industries and their distance from the shellfish area, it is unlikely that they are affecting shellfish water quality in this shellfish area.

Quarries, mines, landfills and contaminated lands

TABLE 14 - Quarries, mines, landfills and contaminated lands

Name	Map Ref	Distance	Status	Risk	Notes
Killurin Landfill	102	5-10	nd	Yes	Landfill is unlined
Wexford Weaving	91	0-5	Moderate	No	Contaminated land
Pierce Engineering Ltd	92	0-5	Moderate	No	Contaminated land
Sola ADC Lenses Ltd	93	0-5	Moderate	Yes	Contaminated land

Note: 'nd' means 'no data' where operations are located in areas with no WFD status information

Table 14 lists the quarries, mines, landfills and contaminated lands in the catchment up to a distance of 20 kilometres from the designated shellfish area. Map 20 illustrates these pressures and map references link the map and table. Information provided in the table in relation to the plants includes:

- the distance of the industries from the designated shellfish area
- the WFD status of the water bodies within which the plants are located
- the WFD risk designations associated with the industries

Some of the WFD risk assessments in relation to these point sources were updated in 2008 to feed into the draft RBMPs but some of the assessments date back to the WFD characterisation process in 2004 and 2005. Expert opinion within Local Authorities was used to assign risk designations to quarries and landfills but monitoring data was used for mines and contaminated lands.

Mining and quarrying operations can impact on levels of suspended solids and metals in receiving waters whilst landfills and contaminated sites can be more diverse and impact on the levels of nutrients, suspended sediments and oxygen levels as well as metals and other chemicals.

There is 1 landfill and 3 contaminated sites within the catchment. The landfill and 1 of the contaminated sites have been designated as ‘at risk’. The contamination associated with the contaminated site is from tetrachloroethylene (TCE). This substance has not been picked up by monitoring in the vicinity of the shellfish area and therefore the contaminated site is unlikely to be affecting shellfish water quality in this shellfish area. The landfill is also unlikely to be affecting shellfish water quality in this shellfish area due to its distance from the shellfish area.

5.2.2 Diffuse Source Pressures

On-site waste water treatment systems

TABLE 15 - On-site waste water treatment systems

Risk	Number	% of total
Total number	23,208	-
Number per km^2 in the catchment	11.64	-
Number per km^2 nationally	1.4	-
Number that are high risk to surface waters from pathogens	19,830	85.44%
Number that are high risk to groundwaters from pathogens	7,267	31.31%
Number that are high risk to surface waters from phosphorus	13,979	60.23%
Number that are high risk to groundwaters from phosphorus	6,893	29.70%
High likelihood of inadequate percolation of leachate	13,433	57.88%

Table 15 summarises the numbers of on-site waste water treatment systems (OSWWTS) within the catchment up to a distance of 20 kilometres from the designated shellfish area and outlines how many of them are located in areas of high risk to surface and groundwaters from pathogens and phosphorus and how many of them are located in areas where the likelihood of inadequate percolation of leachate is high. Map 21 illustrates the locations of the OSWWTSs while Maps 6 to 10 illustrate the risk to surface and groundwaters and the likelihood of inadequate percolation, all of which is based on soil, sub-soil and geological characteristics. Generally, systems located in areas where effluent cannot get away underground pose a risk to surface waters while systems located in areas where the effluent moves too quickly through the subsoil pose a risk to groundwaters. OSWWTS effluent can impact on the levels of faecal coliforms, suspended sediments, nutrients and dissolved oxygen in receiving waters. In addition, the use of household cleaning products can introduce a range of harmful chemicals to the water environment.

There are 23,208 systems in the contributing catchment and their density is much higher than the national average. The risk to surface water from pathogens and phosphorus is high throughout much of the catchment as is the likelihood of inadequate percolation. The majority of the systems are therefore located in hydrologically unsuitable conditions. Other factors which affect the likelihood of these systems to impact surface and groundwaters are whether suitable types of systems are selected, whether they are installed correctly, whether they are properly maintained and whether they are situated close to the designated shellfish area or to ditches, drains, watercourses, wells or boreholes. Therefore, it is likely that a substantially smaller number than the total number of systems in the catchment are posing a risk to surface and groundwaters. Monitoring indicates faecal contamination and unsatisfactory levels of nutrients, dissolved oxygen and biological oxygen demand in this shellfish area which could be arising from this source. These systems therefore could possibly be affecting shellfish water quality in this shellfish area.

Agriculture

TABLE 16 - Livestock units and chemical fertiliser usage

Indicator	Catchment (per ha of farmed land)	National Average (per ha of farmed land)
Livestock units	0.96 LU	1.20 LU

Indicator	Catchment (per ha of farmed land)	National Average (per ha of farmed land)
Nitrogen fertiliser usage	102.96 kg	92.09 kg
Phosphorus fertiliser usage	12.63 kg	9.74

Nitrates Directive limit = 170 kg N per hectare = approx. 2 LU per hectare
Nitrates Directive derogation = 250 kg N per hectare = approx. 3 LU per hectare.

Table 16 provides an estimate of the average number of dairy and drystock livestock units and the average loadings of nitrogen and phosphorus chemical fertiliser per hectare of farmed land within the contributing catchment area. Maps 22, 23 and 24 illustrate this. The figures beneath the table express the nitrate limit (and Ireland's derogation) under the Nitrates Directive in terms of livestock densities. Discharges related to agriculture can affect the levels of faecal coliforms, suspended sediments, nutrients and dissolved oxygen in receiving waters. In addition, the use of pesticides and herbicides can introduce a range of harmful chemicals to the water environment.

Over 75% of the area of this catchment is farmed land and the estimate of livestock density is equal to the national averages whereas the estimates of fertiliser usage are higher than the national averages. The EPA's diffuse model risk assessment, which investigates the relationship between catchment attributes (percentages of diffuse land cover including agriculture), water chemistry and ecological status, identifies many diffuse risk areas in the catchment (Map 13). The soils in the catchment are predominantly dry (Map 5) and the catchment is generally low lying (Map 4) so the risk of runoff from agricultural land is low. However, agriculture is a likely source of the faecal contamination and other water quality issues indicated by monitoring in the area and, therefore, agriculture could possibly be affecting shellfish water quality in this shellfish area.

Forestry

TABLE 17 - Forestry types

Type	Area	Percentage of area
Conifers	126.64 km^2	6.2 %
Broadleaves	21.02 km^2	1.0 %
Mixed	14.81 km^2	0.7 %
Other	0 km^2	0 %
Cleared	27.26 km^2	1.9 %
Unknown	5.01 km^2	0.2 %
Total	194.75 km^2	9.5 %
Nationally	6,795 km^2	10.0 %

Table 17 presents the area and percentage area of the catchment under the various types of forest cover. Maps 25, 26 and 27 illustrate this. Forestry activity can impact on the pH of receiving waters as well as on the levels of suspended solids and nutrients. It is also associated with the use of pesticides which can introduce harmful chemicals to the water environment.

There is nearly 200 km^2 of forested land in this catchment and the percentage area under forest cover is similar to the national average. Unlike agriculture, the location of forestry activity is known and the forestry activity does not occur in close proximity

to the shellfish area. The EPA's diffuse model risk assessment, which investigates the relationship between catchment attributes (percentages of diffuse land cover including forestry), water chemistry and ecological status, highlights diffuse risk areas in the catchment (Map 13). However, the more recent risk assessment, undertaken by the WFD Forest and Water study, does not highlight any areas of acidification, eutrophication or sedimentation risk within the catchment (Maps 25, 26 and 27). Though forestry is a possible source of the slightly elevated pH levels in this shellfish area, the distance of the forestry from the shellfish area and the fact that Wexford Harbour Inner is not affected suggests that forestry is unlikely to be affecting shellfish water quality in this shellfish area.

5.2.3 Morphology Pressures

Structures

TABLE 18 - Natural and man-made barriers

Freshwater morphology structures	Number	Dist	Comment
Barriers to migration	2	0-5 km	Artificial

Table 18 summarises the occurrences of morphological structures within the contributing catchment area up to a distance of 20 kilometres from the designated shellfish area. Map 28 illustrates this. Any impacts associated with barriers, which could include impacts on flow, sediment movement and fish migration, are likely to be localised.

There are 2 artificial barriers to fish migration at the mouth of the Slaney River, some distance upstream of the shellfish area. Therefore, these are unlikely to affect shellfish water quality in this shellfish area.

Physical Modifications

TABLE 19 - Channelisation

Physical modification	Extent	Comment
Channelisation	31 km	NA

Table 19 summarises the occurrences of channelisation within the contributing catchment area up to a distance of 20 kilometres from the designated shellfish area. Map 29 illustrates this. Channelisation, if it occurs reasonably close to a shellfish area, can affect suspended sediment levels in the shellfish area while it is taking place.

There is over 30 kilometres of channelisation within the catchment on the River Sow. However, it does not occur close to the shellfish area and is therefore unlikely to affect shellfish water quality in this shellfish area.

TABLE 20 - Freshwater artificial waters

HMWB Name	Type	Extent
Castlebridge Canal	Canal	1 km

Table 20 lists the freshwater artificial waters within the contributing catchment area up to a distance of 20 kilometres from the designated shellfish area. Map 29 illustrates these. Artificial waters can affect flow and sediment movement locally.

There is 1 canal within the catchment at the bottom of the Slaney River. It is unlikely that this canal is affecting shellfish water quality within this shellfish area as it is located several kilometres away.

5.3 Summary of Key Pressures

Information from existing data sources has been used to identify all of the pressures acting on the shellfish area and to assess their likelihood to be affecting shellfish water quality in this shellfish area.

The status at this site is impacted by faecal coliforms which are indicative of sewage related key pressures. Dissolved oxygen, biological oxygen demand and pH status issues are also identified in the general area.

This summary section highlights:

- **key pressures**

The key pressures are those identified as most likely to be affecting shellfish water quality. The final PRP will confirm and focus on these key pressures.

- **potential secondary pressures**

These pressures are identified as possibly affecting shellfish water quality. The final PRP will either confirm them as key pressures or eliminate them from further consideration.

5.3.1 Key Pressures

1. Urban wastewater systems

The 2008 risk assessment identified 23 urban waste water treatment plants within the catchment with 8 of them 'at risk' for a range of reasons including insufficient plant capacity, insufficient assimilative capacity in receiving waters and deterioration in downstream water quality. The WFD risk assessment was reviewed by experts in November 2009 with regard to the Water Services Investment Programme and waste water licensing actions. The most significant plants were identified on the basis of proximity, plant performance, population equivalent and level of treatment. In this review, only the plant at Wexford town was identified as significant in terms of the risk to shellfish water quality in this shellfish area.

The plant at Wexford town has a capacity of 45,000 P.E. and incorporates secondary treatment with nutrient removal and UV disinfection.

2. On-site waste water treatment plants

There are 23,208 systems in the contributing catchment and their density is much higher than the national average. The risk to surface water from pathogens and phosphorus is high throughout much of the catchment as is the likelihood of inadequate percolation. The majority of the systems are therefore located in hydrologically unsuitable conditions. Other factors which affect the likelihood of these systems to impact surface and groundwaters are whether suitable types of systems are selected, whether they are installed correctly, whether they are properly maintained and whether they are situated close to the designated shellfish area or to

ditches, drains, watercourses, wells or boreholes. Therefore, it is likely that a substantially smaller number than the total number of systems in the catchment are posing a risk to surface and groundwaters. Monitoring indicates faecal contamination and unsatisfactory levels of nutrients, dissolved oxygen and biological oxygen demand in this shellfish area which could be arising from this source. These systems therefore could possibly be affecting shellfish water quality in this shellfish area.

3. Agriculture

Over 75% of the area of this catchment is farmed land and the estimate of livestock density is equal to the national averages whereas the estimates of fertiliser usage are higher than the national averages. The EPA's diffuse model risk assessment, which investigates the relationship between catchment attributes (percentages of diffuse land cover including agriculture), water chemistry and ecological status, identifies many diffuse risk areas in the catchment (Map 13). The soils in the catchment are predominantly dry (Map 5) and the catchment is generally low lying (Map 4) so the risk of runoff from agricultural land is low. However, agriculture is a likely source of the faecal contamination and other water quality issues indicated by monitoring in the area and, therefore, agriculture could possibly be affecting shellfish water quality in this shellfish area.

5.3.2 Potential Secondary Pressures

4. Port Activities

Wexford harbour is situated a couple of kilometres to the west of the shellfish area. Shellfish monitoring indicates faecal contamination in this shellfish area and the boat movements in the area are a possible source. Therefore, this activity could possibly be affecting shellfish water quality in this shellfish area.