



WFD Surface Water Point Source Discharges Risk Assessment Methodology

GUIDANCE ON THRESHOLDS AND METHODOLOGY TO BE APPLIED IN IRELAND'S RIVER BASIN DISTRICTS

Paper by the Working Group on Characterisation and Risk Assessment

Surface water guidance document

This is a guidance paper on the application of a proposed Surface Water Point Source Discharges Risk Assessment methodology. It documents the principles to be adopted by River Basin Districts and authorities responsible for implementing the Water Framework Directive in Ireland. This is a working draft describing a method that will evolve as it is trialed, and will be amended accordingly.				
REVISION CONTROL TABLE				
Status	Approved by National Technical Coordination Group	WFD Requirement	Relevant EU Reporting sheets	<i>Date</i>
Final	12 th November 2004	Impacts and Pressures	SWPI 3 Significant point source pollution on surface waters	November 2004

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1 INTRODUCTION

1.1 Background

Article 5 of the Water Framework Directive requires, inter alia, a review of the impact of human activity on the status of surface waters and groundwater. The review must be undertaken in accordance with Annex II 1.4 – 2.5, and requires an assessment of the likelihood that water bodies in river basin districts will fail to meet the Directive’s environmental objectives.

The results of the analyses will be used in:

- Targeting the monitoring programmes required under Article 8
- Setting objectives required under Article 4
- Designing targeted and proportionate measures in accordance with Article 11

Guidance has been produced on how this may be achieved by the EU through the Common Implementation Strategy (CIS) IMPRESS guidance and in the UK through the UK technical advisory Group (UKTAG).

1.2 Point Source Discharges

The following methodology to assess the risk from point source discharges to surface waters has been developed following a review of the CIS Guidance documents, the UK TAG guidance document 7d(01) ‘draft guidance on point source discharges (v2 6/6/03)’, and Northern Ireland’s Environment and Heritage Service’s (EHS) ‘draft risk assessment for pressures from point source pollution’. A significant data collection exercise was undertaken to test the application of the methodology. In common with the EHS document, the methodology uses the approach suggested in the UKTAG guidance document 7d, within the limits of the available data.

1.3 Risk categories

The Risk Assessment Working Group in Ireland has agreed to the adoption of a four-category risk classification scheme:

- 1a at risk
- 1b probably at risk
- 2a probably not at risk
- 2b not at risk

2 WASTE WATER TREATMENT PLANTS

2.1 General

The risk assessment for Waste Water Treatment Plants (WWTPs) is undertaken by assessing compliance with discharge standards and compliance with monitoring requirements, as stipulated in Urban Waste Water Treatment Regulations 2001 (SI 254 of 2001).

Compliance with discharge standards and monitoring requirements can be determined from the latest monitoring results or recent Local Authority (LA) returns to the Environmental Protection Agency (EPA) and can be checked against the EPA publication ‘Urban Waste Water Discharges in Ireland (2000-2001)’. It is noted that the above publication only details WWTPs with secondary treatment; WWTPs with preliminary and/or primary treatment will be assessed using the LA returns. The EPA reporting threshold of 500 PE is adopted for the point source risk assessment. Data received on WWTPs below this threshold will be retained for future use.

2.2 Data Requirements

- WWTP Name
- Population Equivalent
- Discharge Location (Eastings, Northings)
- Plant Code (Currently identical set for each county – use ‘number plate’ prefix)
- Monitoring Frequency
- Sampling Type
- Influent and Effluent measurements:
 - Date of sample
 - BOD
 - COD
 - TSS
 - Total Phosphorus
 - Total Nitrogen

2.3 Discharge Standards

The required discharge standards are stipulated in the second schedule of the Urban Waste Water Treatment Regulations 2001 (UWWTR 2001). The second schedule is reproduced in Appendix A and summarised in the tables below. In line with DEHLG guidelines and the EPA publication ‘Urban Waste Water Treatment Regulations - A handbook on implementation for sanitary authorities’, the risk assessment adopts the concentration limits rather the percentage reduction approach for the relevant parameters. The regulations also state that ‘*the parameters.....must not deviate from the parametric values by more than 100% but, for the parametric value in concentration relating to total suspended solids, deviations of up to 150% may be accepted*’; i.e. whilst certain instances of slight non conformity are allowable (detailed in the following section) there is an absolute threshold of allowable concentration, as summarised in Table 1 below.

Table 1 Discharge Standards

Parameter	Concentration mg/l	‘Absolute fail’ if concentration >mg/l
BOD	25	>50
COD	125	>250
TSS	35	>87.5

For the purpose of the risk assessment, it is assumed that the sample fails if any of the relevant parameters fail to conform or are not recorded.

The regulations also give the ‘*requirements for discharges from urban waste water treatment plants to sensitive areas. One or both parameters may be applied depending on the local situation*’. The application of one or both parameters is determined by expert judgement. The third schedule of the Regulations, reproduced in Appendix A, lists the sensitive areas.

Table 2 Additional Discharge Standards if Designated Sensitive

Parameter	Concentration mg/l	Notes
Total Phosphorus	2	10,000-100,000 pe
	1	>100,000 pe
Total Nitrogen	15	10,000-100,000 pe
	10	>100,000 pe

2.4 Sampling

Sanitary authorities are required to ensure that a monitoring method is applied which corresponds with the level of requirements described in the fifth schedule of the UWWTR 2001.

Flow-proportional or time-based 24-hour samples are required to be collected at the same well-defined point in the outlet and if necessary in the inlet of the treatment plant, in order to monitor compliance with the requirements for discharged waste water specified in the Regulations.

The minimum annual number of samples is determined according to the size of the treatment plant as outlined in the table below.

The maximum number of samples which are allowed to fail the requirements, expressed in concentrations in Part 1 of the Second Schedule, is set out in the Table to the Schedule and summarised in the Table below. The permitted number of failures increases with additional sampling, up to 25 failures for 365 samples.

The Regulations do not apply to WWTPs with a population equivalent of less than 2000; for these plants the EPA recommendation, that a minimum of 6 samples are taken, is adopted.

Table 3 Sampling

Pe	Samples per year	Permitted No. of samples which fail to conform	Notes / Comments
500 - 2,000	6	1	EPA recommended figure
2,000 – 9,999	4	1	12 in first year and any year following a failed sample
9,999 – 49,999	12	2	
>50,000	24	3	

2.5 WWTP Risk Assessment

The initial risk assessment is summarised in the table below.

Table 4 Initial Risk Assessment for WWTPs

Not at Risk		At Risk	
2b	2a	1b	1a
Complies with discharge standards and is monitoring compliant	Complies with discharge standards and is monitoring non compliant	Does not comply with discharge standards and is monitoring non compliant	Does not comply with discharge standards and is monitoring compliant

A WWTP is considered compliant with the monitoring requirements if the stipulated number of samples is taken using flow-proportional or time-based 24-hour samples. Grab sampling is not considered sufficient to comply with the UWWTR. However, for WWTPs under 2000PE, grab sampling may be appropriate; for the purpose of the risk assessment, expert judgement should be applied.

A WWTP is considered compliant with the discharge standards if number of samples failing (the concentration limits set out in Tables 1&2) is less than the

maximum permitted number of samples which fail to conform (Table 3) and the degree of failure is less than the allowable deviation set out in Table 1.

The initial risk assessment is then considered in the context of the receiving water allowing expert judgement to be applied. For discharge to rivers and lakes, it is envisaged that the risk category will generally remain unchanged (see section 7).

The risk assessment for WWTP discharges to surface waters within 500m of a lake, transitional water or coastal water is carried out on the lake, transitional water or coastal water.

3 COMBINED STORM OVERFLOWS

3.1 General

For the purpose of the risk assessment any intermittent discharge from a foul sewer network is considered as a combined storm overflow CSO; this includes discharges to surface waters resulting from foul flooding as well as from designed CSOs.

3.2 Data Requirements

- CSO location (Eastings & Northings)
- Frequency of operation above or below 6 spills per annum

The location of CSOs for networks serving a pe of 2000 or greater is available from the National Urban Wastewater Study (NUWWS); this threshold of 2000 pe is adopted for the risk assessment.

3.3 CSO Risk Assessment

The CSO risk assessment is determined using a conservative design standard for combined storm overflows of 6 spills per annum; a CSO with discharges in excess of this number is considered to be at risk. It is recognised that the optimum number of spills should only be determined through a detailed design process and that 6 spills per annum is a level normally associated with bathing waters or sensitive waters. In this context, the threshold value is used only for the purpose of risk assessment, which will in turn be used to target a monitoring programme.

Where the number of spills is unknown the precautionary principle is applied and the '1b' category is given to the CSO, as detailed in the table below.

Table 5 CSO Risk Assessment

Not at Risk		At Risk	
2b	2a	1b	1a
No CSOs	CSO operates < 6/year	CSO operation frequency unknown	CSO operates > 6/year

4 INDUSTRIAL DISCHARGES

4.1 Integrated Pollution Control Licences

The risk assessment for discharges to surface waters under Integrated Pollution Control Licences (IPCL) is undertaken in a similar manner to WWTPs.

The Environmental Protection Agency has provided each river basin with national data on the compliance of licensed activities. It is important to note that the data is provided only for the purpose of risk assessment which will in turn be used to target a monitoring programme. Where the data on compliance with discharge standards and monitoring is incomplete, expert judgement should be applied following consultation with the local EPA inspector. The risk assessment is summarised in Table 6 below.

Table 6 IPC Risk Assessment

Not at Risk		At Risk	
2b	2a	1b	1a
Complies with discharge standards and is monitoring compliant	Complies with discharge standards and is monitoring non compliant	Does not Comply with discharge standards and is monitoring non compliant	Does not Comply with discharge standards and is monitoring compliant

4.2 Section 4 Discharge Licences

Discharges to surface waters under Section 4 of the Water Pollution Acts are licensed by the Local Authorities. Section 9 of the Act requires the Local

Authority to keep a register of licences granted. The following data is required for the risk assessment.

- Licence Reference/Activity Name/Description
- Discharge Location (Eastings, Northings)
- Discharge Consent Parameters
- Monitoring Frequency Requirements
- Compliance Data

Whilst developing and testing the methodology significant ‘gaps’ were experienced in the Local Authority data. Furthermore, the data was not always readily accessible for retrieval and analysis; although every effort was made to obtain data in order to test the methodology, it is recognised that this will not be practical on a national basis within the required timeframe. Consequently, the risk assessment will rely on a greater level of expert judgement, following consultation with Local Authority staff, than with the forgoing risk assessments.

The risk assessment is again undertaken in a similar manner to WWTPs as detailed in the table below.

Table 7 Section 4 Risk Assessment

Not at Risk		At Risk	
2b	2a	1b	1a
Complies with discharge standards and is monitoring compliant	Complies with discharge standards and is monitoring non compliant	Does not Comply with discharge standards and is monitoring non compliant	Does not Comply with discharge standards and is monitoring compliant

5 WATER TREATMENT PLANTS

5.1 General

Discharges from Water Treatment Plants are not currently licensed or monitored. The risk assessment for Water Treatment Plant discharges will be undertaken in consultation with Local Authority staff using expert judgement. The location of Water Treatment Plants and the population equivalent served can be obtained from

the National Drinking Water Monitoring Programme. As with the risk assessment for WWTPs, a threshold of 500pe is adopted.

6 OTHER POINT SOURCE DISCHARGES

6.1 General

The risk assessment for point source discharges to surface waters from other sources and activities identified in the IMPRESS guidelines (such as mining; landfill contaminated land; agriculture point (slurry, silage and other feeds, sheep dip use and disposal, manure depots, farm chemicals, agricultural fuel oils); waste management and aquaculture) will be undertaken using expert judgement.

The data required for the above risk assessments was not found to be readily available, although a number of the activities are covered by industrial discharge licences. In this assessment, the following guidance from the UK TAG document 7d is useful, “A water is at risk at such point sources if there is a record of occasional incidents of pollution from these sources (one per year on average) that are sufficient to warrant serious attention in terms of established systems for the classification of incidents.”

7 COASTAL AND TRANSITIONAL WATERS

7.1 General

For transitional and coastal waters, expert judgement is applied to take account of the location and depth of discharge, prevailing currents and available dilution. In this assessment, the guidance from option 2 of the UK TAG document 7d is useful, as indicated in the table below.

Table 8 Point Source Discharge to Transitional Waters.

Not at Risk		At Risk	
2b	2a	1b	1a
-	Total volume of discharge <5% of tidal water volume	Total volume of discharge ≥5% of tidal water volume	-

The data required to conduct a risk analysis for coastal waters was generally not available; given the size of coastal water bodies and the available dilution, the

default position was not to place the coastal water bodies at risk from point source discharges. However, if the scale of point source discharge is of significant magnitude to cause concern the “probably at risk category” was adopted.

Whilst the data for transitional waters was also generally not available, expert judgement was applied to assign an appropriate risk category.

A further stage of analysis will be to apply a risk assessment to coastal embayment. This will require the creation of additional coastal water bodies and as such; coastal embayments have not been considered as a separate entity in this risk assessment.

APPENDIX A

Contents

Schedules extracted from S.I. No. 254 of 2001, Urban Waste Water Treatment Regulations,
2001,

Second Schedule

Part 1

The values for concentrations or for the percentage of reduction shall apply.

Parameters	Concentration	Minimum percentage of reduction ⁽¹⁾	Reference method of measurement
Biochemical oxygen demand (BOD5 at 20° C) without nitrification ⁽²⁾	25 mg/l O ₂	70-90	Homogenized, unfiltered, undecanted sample. Determination of dissolved oxygen before and after five-day incubation at 20° C ± 1° C, in complete darkness. Addition of a nitrification inhibitor
Chemical oxygen demand (COD)	125 mg/l O ₂	75	Homogenized, unfiltered, undecanted sample Potassium dichromate
Total suspended solids	35 mg/l	90	- Filtering of a representative sample through a 0,45 um filter membrane. Drying at 105°C and weighing - Centrifuging of a representative sample (for at least five mins with mean acceleration of 2,800 to 3,200 g), drying at 105°C and weighing
<p>⁽¹⁾ Reduction in relation to the load of the influent. ⁽²⁾ The parameter can be replaced by another parameter: total organic carbon (TOC) or total oxygen demand (TOD) if a relationship can be established between BOD5 and the substitute parameter.</p>			

Part 2

Requirements for discharges from urban waste water treatment plants to sensitive areas. One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage of reduction shall apply.

Parameters	Concentration	Minimum percentage of reduction⁽¹⁾	Reference method of measurement
Total phosphorus	2 mg/l (10,000 - 100,000 p.e.) 1 mg/l (more than 100,000 p.e.)	80	Molecular absorption spectrophotometry
Total nitrogen ⁽²⁾	15 mg/l (10,000 - 100,000 p.e.) ⁽³⁾ 10 mg/l (more than 100,000 p.e.) ⁽³⁾	70 - 80	Molecular absorption spectrophotometry

⁽¹⁾ Reduction in relation to the load of the influent.

⁽²⁾ Total nitrogen means the sum of total Kjeldahl nitrogen (organic and ammoniacal nitrogen), nitrate – nitrogen and nitrite - nitrogen.

⁽³⁾ These values for concentration are annual means as referred to in paragraph 4 (c) of the Fifth Schedule. However, the requirements for nitrogen may be checked using daily averages when it is proved, in accordance with paragraph 1 of that Schedule, that the same level of protection is obtained. In this case, the daily average must not exceed 20 mg/l of total nitrogen for all the samples when the temperature from the effluent in the biological reactor is superior or equal to 12⁰C. The conditions concerning temperature could be replaced by a limitation on the time of operation to take account of regional climatic conditions.

Third Schedule

Sensitive Areas

Part 1

Rivers

River Boyne, County Meath - 6.5 km section downstream of sewage treatment works outfall at Blackcastle, Navan, County Meath.

River Camlin, County Longford - from sewage treatment works at Longford to entry into the River Shannon.

River Castlebar, County Mayo - downstream of sewage treatment works outfall at Knockthomas to entry into Lough Cullin.

River Liffey - downstream of Osberstown sewage treatment works to Leixlip reservoir, County Kildare.

River Nenagh, County Tipperary - downstream of sewage treatment works outfall in Nenagh to entry into Lough Derg.

River Tullamore, County Offaly - 0.5 km section downstream of sewage treatment works outfall in Tullamore.

Lakes

Lough Derg and Lough Ree on the River Shannon.

Lough Leane, County Kerry.

Lough Oughter, County Cavan.

Part 2

Rivers

River Blackwater (Monaghan) - from the confluence of the River Shambles to Newmills Bridge.

River Brosna - downstream of Mullingar sewage outfall [opposite intersection of regional road (R400) with N52 south of Mullingar], to Lough Ennell.

River Cavan - from the bridge at Lisdarn downstream of Cavan Town to the Annalee River confluence.

River Proules - downstream of Carrickmacross sewage outfall, to confluence with the River Glyde.

River Barrow - downstream of Portarlinton sewage outfall, to Graiguenamanagh Bridge.

River Triogue - downstream of Portlaoise sewage outfall, to confluence with the River Barrow.

River Nore - downstream of Kilkenny sewage outfall, to Inistioge Bridge.

River Hind - downstream of Roscommon Town sewage outfall, to Lough Ree.

River Suir - downstream of Thurles sewage outfall, to Twoford Bridge.

River Suir - downstream of Clonmel sewage outfall, to Coolnamuck Weir.

Little Brosna River - downstream of Roscrea sewage outfall below its confluence with the Bunow River, to the bridge near Brosna House.

River Blackwater (Munster) - downstream of Mallow railway bridge, to Ballyduff Bridge.

Lakes

Lough Ennell, County Westmeath.

Lough Muckno, County Monaghan.

Lough Monalty, County Monaghan.

Estuaries

Broadmeadow Estuary (Inner) - from the bridge west of Lissenhall (Broadmeadow River) to the railway viaduct.

Liffey Estuary - from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon.

Slaney Estuary (Upper) - from Enniscorthy railway bridge to Macmine.

Slaney Estuary (Lower) - from Macmine to Drinagh / Big Island.

Barrow Estuary - from the weir at Bahana Wood to New Ross Bridge.

Suir Estuary (Upper) - from Coolnamuck Weir to Mount Congreve.

Bandon Estuary Upper - from Inishannon Bridge to Kinsale Western Bridge.

Bandon Estuary Lower - downstream of Kinsale Western Bridge, to Money Point.

Lee Estuary Upper (Tralee) - from Ballymullin Bridge to seaward end of Tralee Ship Canal / Annagh Island.

Feale Estuary Upper - downstream of Finuge Bridge, to Poulnahaha old Railway Bridge.

Cashen / Feale Estuary - downstream of Poulnahaha old Railway Bridge, to Moneycashen.

Killybegs Harbour - Killybegs Harbour inside Kane's Rock / Carntullagh Head.

Castletown Estuary - from the weir 130 m downstream St. Johns Bridge (Castletown River) to Pile Light.

Blackwater Estuary Upper - from Bullsod Island (1 km downstream Lismore Bridge) to Dromana Ferry.

Blackwater Estuary Lower - downstream of Dromana Ferry, to near East Point, Youghal Harbour.

Fifth Schedule

Reference methods for monitoring and evaluation of results

1. Sanitary authorities shall ensure that a monitoring method is applied which corresponds at least with the level of requirements described below. Alternative methods to those mentioned in paragraphs 2, 3 and 4 may be used provided that it can be demonstrated that equivalent results are obtained.
2. Flow-proportional or time-based 24-hour samples shall be collected at the same well-defined point in the outlet and if necessary in the inlet of the treatment plant, in order to monitor compliance with the requirements for discharged waste water specified in these Regulations. Good international laboratory practices aiming at minimising the degradation of samples between collection and analysis shall be applied.
3. The minimum annual number of samples shall be determined according to the size of the treatment plant and be collected at regular intervals during the year:

2,000 to 9,999 p.e.: 12 samples during the first year: four samples in subsequent years, if it can be shown that the water during the first year complies with the provisions of these Regulations; if one sample of the four fails, 12 samples must be taken in the year that follows.

10,000 to 49,999 p.e.: 12 samples

50,000 p.e. or over : 24 samples.
4. The treated waste water shall be assumed to conform to the relevant parameters if, for each relevant parameter considered individually, samples of the water show that it complies with the relevant parametric value in the following way:
 - (a) for the parameters specified in Part 1 of the Second Schedule, a maximum number of samples which are allowed to fail the requirements, expressed in concentrations and/or percentage

reductions in Part 1 of the Second Schedule, is set out in the Table to this Schedule;

- (b) for the parameters in Part 1 of the Second Schedule expressed in concentrations, the failing samples taken under normal operating conditions must not deviate from the parametric values by more than 100% but, for the parametric value in concentration relating to total suspended solids, deviations of up to 150% may be accepted;
 - (c) for those parameters specified in Part 2 of the Second Schedule the annual mean of the samples for each parameter shall conform to the relevant parametric values.
5. Extreme values for the water quality in question shall not be taken into consideration when they are the result of unusual situations such as those due to heavy rain.

Table

Series of samples taken in any year	Maximum permitted number of samples which fail to conform
4 - 7	1
8 -16	2
17 - 28	3
29 - 40	4
41 - 53	5
54 - 67	6
68 - 81	7
82 - 95	8
96 -110	9
111 -125	10
126 -140	11
141 -155	12
156 -171	13
172 -187	14
188 - 203	15

Series of samples taken in any year	Maximum permitted number of samples which fail to conform
204 - 219	16
220 - 235	17
236 - 251	18
252 - 268	19
269 - 284	20
285 - 300	21
301 - 317	22
318 - 334	23
335 - 350	24
351 - 365	25