

# ATTACHMENT A.1

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The Monasteraden WWTP is located on the periphery of Monasteraden Village, in the townland of Tawaymucklagh. Treated effluent is discharged from the Monasteraden WWTP into a local unnamed stream.

The Monasteraden WWTP was completed in 2002 for a design PE of 400. All flows up to 3 DWF receive full treatment. The WWTP consists of a package plant comprised of a circular inner tank (settlement tank) and concentric circular outer tank (aeration tank) and includes facilities for chemical dosing and downstream flow measurement. The WWTP includes the following:

- Inlet pumping station.
- Wastewater is pumped to the aeration tank.
- The tank contains “activated sludge” or “mixed liquor” which is a mixture of wastewater undergoing treatment and microorganisms (in flocs) which facilitate the removal of organic material from the wastewater.
- The mixed liquor undergoes periodic aeration to ensure that the contents of the tank remain uniformly mixed and to ensure provision of sufficient oxygen for biodegradation of the organic material by the microorganisms.
- Mixed liquor is displaced into the internal, circular, conical settlement tank. The microorganisms which are agglomerated in flocs, settle to the bottom of the tank and the clear, treated water is discharged from the settlement tank by gravity. The settled flocs (sludge) are returned to the aeration tank by a sludge pump at the base of the settlement tank, so as to be in contact with the incoming wastewater.
- The microorganisms utilise the organic material in the wastewater as a source of food, therefore continual treatment of wastewater results in an increase in the quantity of biomass in the system.
- Periodically biomass is removed from the plant to maintain the process in a balanced state whereby the wastewater can be efficiently treated.
- The treated water is discharged from the settlement tank to the filter beds.
- Effluent from the filter beds is collected at the downstream end of the filter beds and discharged to a local stream at the WWTP boundary.
- The WWTP is designed for removal of phosphorous from the wastewater by means of ferric dosing.

Currently the WWTP is visited a number of times each week to ensure that it is operating satisfactorily.

The final effluent from the WWTP discharges to a local unnamed stream, just outside the WWTP boundary. The local stream appears to eventually discharge to Lough Gara approximately 750m downstream of the WWTP. The main site of conservation importance in the area is the Lough Gara proposed Natural Heritage Area (pNHA) and Special Protection Area (SPA).

An Environmental Monitoring Programme is in place at the Monasteraden Wastewater Treatment Plant. Effluent from the primary discharge point is sampled and analysed a number of times a year, the average value recorded for the discharge indicated compliance when compared with the Urban Wastewater Treatment Regulations, 2001. Possible exceedences were recorded in the discharge for Cadmium and Mercury when compared to the Surface Waters Regulations, 2009.

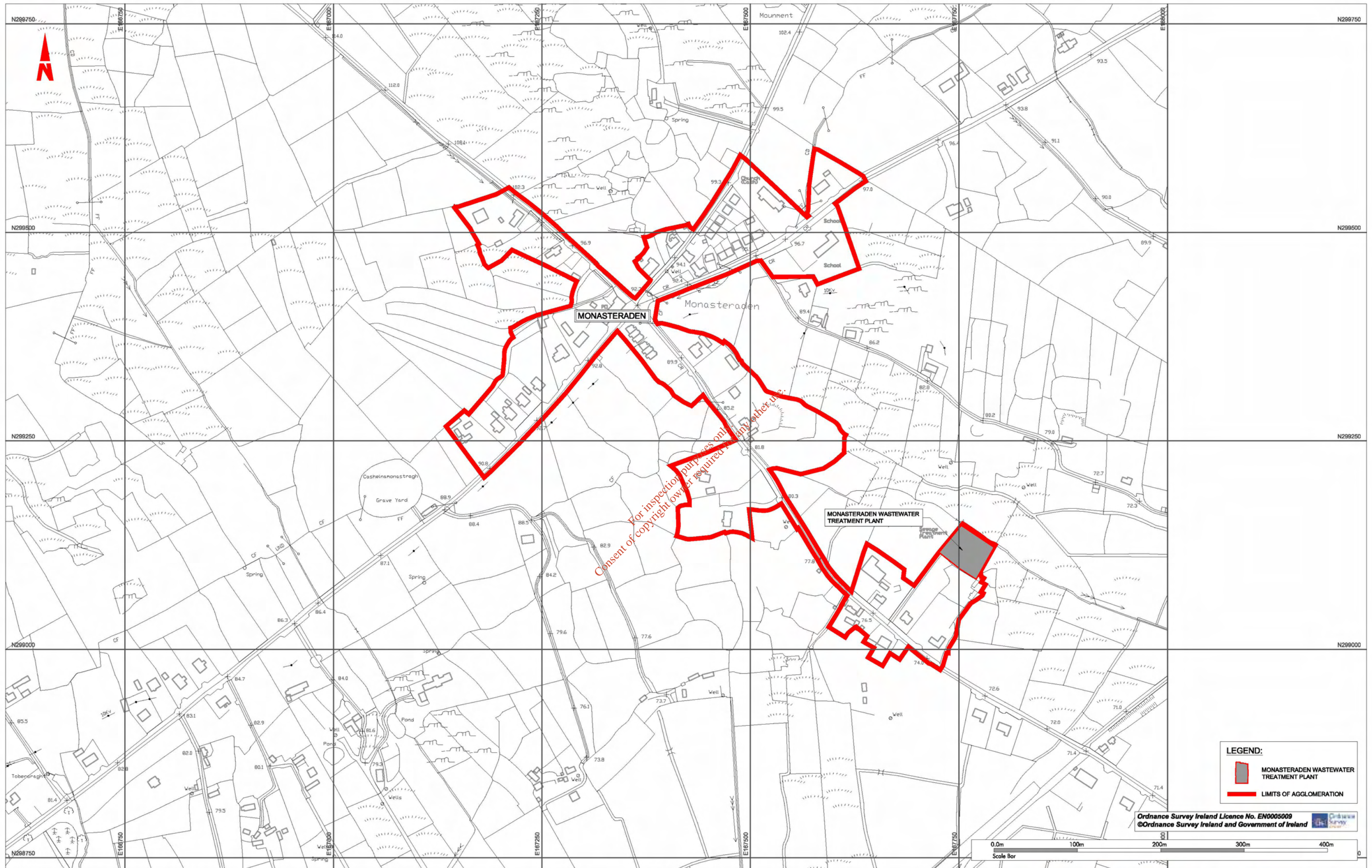
The recorded levels for BOD, Orthophosphate, and Zinc exceeded the relevant standards both upstream and downstream of the WWTP discharge. Exceedences were recorded for Lead downstream of the discharge point. A level of <1ug/l Cadmium was recorded both upstream and downstream of the discharge point similarly a level of <0.2ug/l Mercury was recorded both upstream and downstream of the discharge point. However due to the limits of quantitation it is unclear if the levels of Cadmium and Mercury exceed the maximum levels. Lough Gara, downstream of the Discharge Point, was given a target of retaining its Good Status. Receiving waters downstream of the WWTP comply with the recommended limit of 0.035mg/l Orthophosphate as set out in the Surface Waters Regulations, 2009 for waters with a "Good Status" target

There are no public water supplies or group water scheme abstraction points located downstream of the WWTP. Other than the non-compliances discussed above, the water quality is of relatively good quality.

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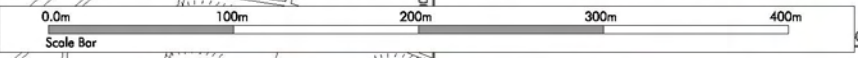
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**LEGEND:**

- MONASTERADEN WASTEWATER TREATMENT PLANT
- LIMITS OF AGGLOMERATION

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F01	18.12.09	P.C.	FINAL ISSUE	
No.	Date	App	Amendment / Issue	

**Client**  
 Sligo County Council  
 Comhairle Chontae Shligigh  
 County Hall,  
 Riverside,  
 Sligo,  
 Co. Sligo.

**RPS**  
 Lym Building  
 ICA Business &  
 Technology Park  
 Mervue, Galway  
 T +353 91 400200  
 F +353 91 400296  
 W www.rpsgroup.com/ireland  
 E ireland@rpsgroup.com

**Drawing Number**  
 01  
**Rev**  
 F01

**Project**  
 MONASTERADEN WASTEWATER  
 DISCHARGE LICENSE APPLICATION

**Title**  
 LIMITS OF AGGLOMERATION &  
 MONASTERADEN WASTEWATER  
 TREATMENT PLANT LOCATION

**Drawing Status**  
 FINAL

**Sheet Size**  
 A3

**Scale**  
 1:4000

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No.	Date	By	Amendment / Issue
F01	16.12.09	SG	FINAL ISSUE

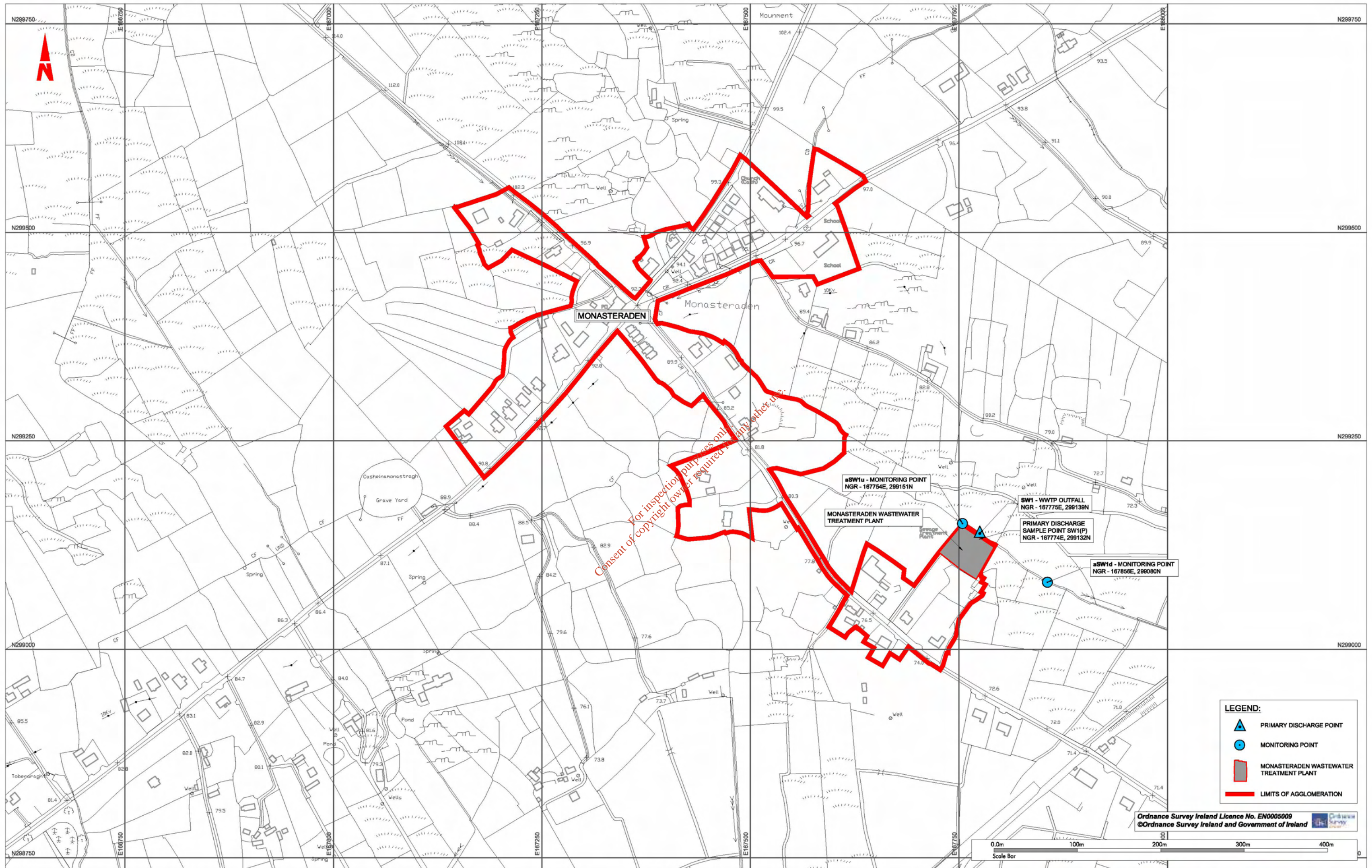
Client	Drawn By	Checked By	Approved By	Date
Sligo County Council Comhairle Chontae Shligigh County Hall, Riverside, Sligo, Co. Sligo.	M.F.	M.C.	P.J.S.	DEC. 09

Project	Drawing Status	Sheet Size	Scale
MONASTERADEN WASTEWATER DISCHARGE LICENSE APPLICATION	FINAL	A3	1:400

Drawing Number	Rev
02	F01

## **ATTACHMENT B.3**

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F01 18.12.09 P.C. FINAL ISSUE		No. Date App		Drawn By P.C.		Checked By M.C.		Approved By P.J.G.		Date NOV. '09	
Drawing Status FINAL		Sheet Size A3		Scale 1:4000		Title <b>LOCATION OF PRIMARY DISCHARGE POINT &amp; MONITORING POINTS</b>					

# ATTACHMENT B.8

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**B.8 (i) Population Equivalent of Agglomeration**

In order to calculate the population equivalent contributing to the Monasteraden WWTP, Sligo County Council provided the results of a survey conducted by their Planning Department in 2009 on the Monasteraden agglomeration. The survey was only carried out on the residential units in the agglomeration. Therefore to calculate the total contributing population to the WWTP (residential and non-residential) this survey was used in conjunction with other data collected which includes the commercial and industrial loadings within the Monasteraden agglomeration. The information provided by Sligo County Council is included at the end of this attachment.

The wastewater loading for Monasteraden WWTP includes: residential and commercial/other loadings. The following table provides an estimate of the current load (111 PE) that is domestic, non domestic and industrial or commercial.

**Table B.8.1: Existing Domestic, Non-domestic and Industrial or Commercial Loadings**

Category	Design Hydraulic Loading (m <sup>3</sup> /day)	Design BOD Loading (Kg/day)	PE* (Hydraulic)	PE* (BOD)
Residential	17.58	4.69	78	78
Industrial	0.00	0.00	0	0
Commercial/Others	5.13	1.98	23	33
<b>Total</b>	<b>22.71</b>	<b>6.67</b>	<b>101</b>	<b>111</b>

\*1 PE has been approximated as 225 litres hydraulic load, with a BOD of 267 mg/l.

At the time of the survey conducted by Sligo County Council there was a house that was vacant and also a number of houses that were being constructed the following table provides an estimate of the predicted load arising from these houses.

**Table B.8.2: Uninhabited Domestic Dwellings within the Monasteraden Agglomeration**

Category	Design Hydraulic Loading (m <sup>3</sup> /day)	Design BOD Loading (Kg/day)	PE* (Hydraulic)	PE* (BOD)
Uninhabited Dwellings	0.63	0.17	3	3
Dwellings under Construction	4.39	1.17	20	20
<b>Total</b>	<b>5.02</b>	<b>1.34</b>	<b>22</b>	<b>22</b>

\*1 PE has been approximated as 225 litres hydraulic load, with a BOD of 267 mg/l.

**B.8 (ii) Pending Development**

In order to calculate the potential additional waste water contributing to the Monasteraden WWTP, Sligo County Council compiled a list of the number of planning applications that have been granted but had not commenced at the date of compilation in mid 2009.

The information provided by Sligo County Council indicated that there are no planning applications that have been granted planning permission and have not yet commenced.

**Conclusion**

The calculated additional flow to the treatment works from the uninhabited dwelling and the dwellings under construction is 5.02m<sup>3</sup>/day. The total possible loading from existing units, vacant units and units under construction will result in a total PE of approximately 133 PE which is well within the plant’s operating capacity of 400 PE. Therefore this additional flow should not have a significant impact on the waste water works and there will be minimal resultant environmental impact.

### Monasteraden PE Count

28/06/06

Details	Houses	PE
Existing dwellings	18	51
Under Constr.	9	26
<b>Schools</b>		
National school with 75 pupils + 4 Staff		
@ 20g BOD/pupil per day	26	
@ 0.04m <sup>3</sup> /h/day	15.8	15.8/ 26
<b>Public houses &amp; Hotels</b>		
1 no. public house @ 1.5 hse.	1.5	4
<b>Shops &amp; Supermarkets</b>		
1 no. shop @ 1 hse.	1	3
<b>Total</b>		<b>99/ 110</b>

Design PE for this plant is 400.

<b>Future PE</b>					
PL 01/639	1 House	Gareth Casey		2.85	CN
PL 03/123	1 House	Liz Walsh		2.85	G
PL 03/639	13 Houses	John Murray		37	CN
<del>PL 03/811</del>	<del>1 House</del>		<del>Outline</del>	<del>0</del>	<del>G</del>
PL 03/824	18 Houses & Pumping St.	Brian O'Grady		51.3	CN
<del>PL 04/1183</del>	<del>3 Houses</del>	<del>G. Murray</del>		<del>8.55</del>	<del>R</del>
PL 04/1235		Ann Dodd	Outline	0	CN
PL 05/330	1 House	Liz Walsh		2.85	CN

Future Development PE	= 97 PE
Existing house Count	= 110PE
	<u>= 207PE</u>

**Note:** PL 03/824 was not constructed.

	Aclare	B'carrow	Ballinafad	B'togher	B'anaddan	C'baldwin
Population 2002 (CSO)	n/a	n/a	n/a	n/a	n/a	n/a
Population 2006 (CSO)	n/a	n/a	n/a	182	n/a	n/a
Population growth 02-06 %	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
No. of existing residential units (20	60	85	44	125	64	56
No. of occupied units	46	60	42	103	51	31
No. of vacant units	14	25	2	22	13	25
Vacancy rate %	23.33333333	29.41176471	4.545454545	17.6	20.3125	44.64285714
Estimated 2009 pop	128.34	167.4	117.18	287.37	142.29	86.49
Growth 06-09 %	#VALUE!	#VALUE!	#VALUE!	57.8956044	#VALUE!	#VALUE!
Growth 02-09 %	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Target population for 2017 (approx	150	200	150	300	150	200
Units under construction in 2009	1	4	0	2	0	0
Units permitted but not commence	8	25	20	35	59	61
No. of vacant units	14	25	2	22	13	25
Total no. of 'pipeline' units	23	54	22	59	72	86
Potential 'pipeline' population	46	108	44	118	144	172

	Cl'cool	Cool-Rock	Culfadda	Curry	Drumcliff	Geevagh	Mnastrdn
Population 2002 (CSO)	n/a	167	n/a	n/a	n/a	n/a	n/a
Population 2006 (CSO)	n/a	208	n/a	n/a	n/a	n/a	n/a
Population growth 02-06 %	#VALUE!	24.5508982	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
No. of existing residential units (20	51	449	29	51	29	81	29
No. of occupied units	47	392	28	49	28	63	28
No. of vacant units	4	57	1	2	1	18	1
Vacancy rate %	7.843137255	12.69487751	3.448275862	3.921568627	3.448275862	22.22222222	3.448275862
Estimated 2009 pop	131.13	1093.68	78.12	136.71	78.12	175.77	78.12
Growth 06-09 %	#VALUE!	425.8076923	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Growth 02-09 %	#VALUE!	554.8982036	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Target population for 2017 (approx	150	1200	125	200	125	200	100
Units under construction in 2009	5	45	2	6	1	0	7
Units permitted but not commence	1	80	18	2	0	2	0
No. of vacant units	4	57	1	2	1	18	1
Total no. of 'pipeline' units	10	182	21	10	2	20	8
Potential 'pipeline' population	20	364	42	20	4	40	16

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# ATTACHMENT B.9

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## B.9 Capital Investment Programme

There are currently no proposals to upgrade the Monasteraden WWTP.

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## B.10 Significant Correspondence

Sligo County Council confirms that there has not been any correspondence resulting from a Section 63 notice (Environmental Protection Agency Acts, 1992 – 2007).

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# ATTACHMENT C.1

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## C.1 Operational Information Requirements

### Design Capacity

The Monasteraden WWTP was designed for a population equivalent of 400PE. Based on a dry weather flow rate of 250l/head/day and a diurnal peaking factor of 3, the current hydraulic capacity of the plant is 300m<sup>3</sup>/day. The plant was designed for a BOD loading of 24kg/day. This was based on a typical BOD loading of 0.06kg/PE/day.

### Plant Description

The Monasteraden WWTP was completed in 2002 for a design PE of 400. All flows up to 3 DWF receive full treatment. The WWTP consists of a package plant comprising of a circular inner tank (settlement tank) and concentric circular outer tank (aeration tank) and includes facilities for chemical dosing and downstream flow measurement. The WWTP includes the following:

- Inlet pumping station.
- Wastewater is pumped to the aeration tank.
- The tank contains “activated sludge” or “mixed liquor” which is a mixture of wastewater undergoing treatment and microorganisms (in flocs) which facilitate the removal of organic material from the wastewater.
- The mixed liquor undergoes periodic aeration to ensure that the contents of the tank remain uniformly mixed and to ensure provision of sufficient oxygen for biodegradation of the organic material by the microorganisms.
- Mixed liquor is displaced into the internal, circular, conical settlement tank. The microorganisms which are agglomerated in flocs, settle to the bottom of the tank and the clear, treated water is discharged from the settlement tank by gravity. The settled flocs (sludge) are returned to the aeration tank by a sludge pump at the base of the settlement tank, so as to be in contact with the incoming wastewater.
- The microorganisms utilise the organic material in the wastewater as a source of food, therefore continual treatment of wastewater results in an increase in the quantity of biomass in the system.
- Periodically biomass is removed from the plant to maintain the process in a balanced state whereby the wastewater can be efficiently treated.
- The treated water is discharged from the settlement tank to the filter beds.
- Effluent from the filter beds is collected at the downstream end of the filter beds and discharged to a local stream at the WWTP boundary.
- The WWTP is designed for removal of phosphorous from the wastewater by means of ferric dosing.

### Emergency Overflows

There is currently no emergency overflow or stormwater overflow at the Monasteraden WWTP.

## Pumping Stations

The inlet pumping station at Monasteraden WWTP receives flow from the sewer network which serves the Monasteraden village. The pumping station pumps the sewage from the inlet pump sump to the head of the treatment plant. There are two number pumps are installed in the inlet pump as a duty/standby arrangement. There is no emergency overflow or stormwater overflow from the pumping station.

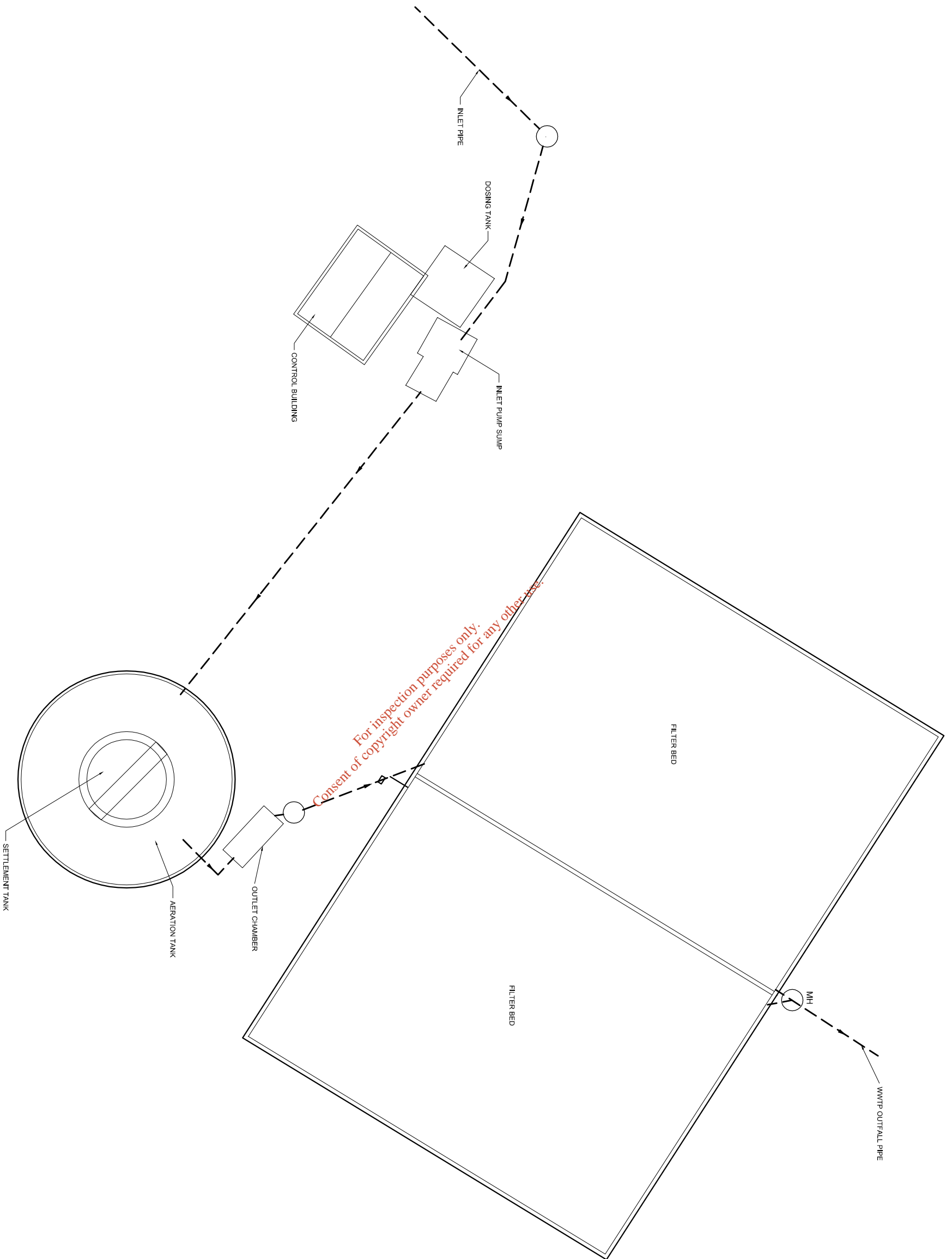
## Laboratory Facilities

There are no laboratory facilities on-site at the Monasteraden WWTP. At present the effluent from the WWTP is sampled a number of times throughout the year. The results that have been obtained are attached in Attachment E.4.

## Wastewater Treatment Plant

Refer to Drawing No. 2 for all details in relation to the Monasteraden WWTP.

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  - Drawn:** Catherine Sweeney, Design Engineer  
**Checked:** David O'Connell, Design Engineer  
**Approved:** David O'Connell, Design Engineer

No.	Date	Amendment / Issue
F01	16.12.09	FINAL ISSUE

No.	Date	Amendment / Issue

Client	Sligo County Council Councillor Chortae Shighigh County Hall, Riverside, Co. Sligo.
Drawn By	M.F.
Checked By	M.C.
Approved By	P.J.S.
Date	DEC. 09

Project	MONASTERADEN WASTEWATER DISCHARGE LICENSE APPLICATION
Drawing Status	FINAL
Sheet Size	A3
Scale	N.T.S.

Drawing Number	04
Rev	F01
Title	MONASTERADEN WASTEWATER TREATMENT PLANT PROCESS FLOW DIAGRAM

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# ATTACHMENT D.1

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## D.1 Discharges to Surface Water

### SW1 – Monasteraden WWTP Outfall

Treated effluent is discharged from the works via an outlet pipe to a small stream at the boundary of the WWTP. At present the quantity of treated effluent that is discharged from the Monasteraden WWTP is 24.975m<sup>3</sup>/day (0.00029m<sup>3</sup>/sec) based on population calculations.

### D.1 (ii) Discharges to Groundwater

NOT APPLICABLE

### D.1 (iii) Private Wastewater Treatment Plants

There are no independently owned/operated private WWTPs operating within the agglomeration.

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# ATTACHMENT D.2

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## D.2 Tabular Data on Discharge Points

**Table D.2**

<b>PT_CD</b>	<b>PT_TYPE</b>	<b>LA_NAME</b>	<b>RWB_TYPE</b>	<b>RWB_NAME</b>	<b>Designation</b>	<b>EASTING</b>	<b>NORTHING</b>	<b>Verified</b>
SW1	Primary	Sligo County Council	Stream/River	Unnamed Stream	None*	167775	299139	N

\*Although the stream has no designation it most likely flows to Lough Gara which is approximately 600m downstream of the outfall location. Lough Gara is a designated NHA and SPA.

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# ATTACHMENT E.2

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## E.2 Monitoring and Sampling Points

An Environmental Monitoring Programme is in place at the Monasteraden Wastewater Treatment Plant.

Effluent from the primary discharge point is sampled and analysed a number of times a year in accordance with the Fifth Schedule of the Urban Waste Water Treatment Regulations, 2001.

Information provided by Sligo County Council indicates that for agglomerations with a population equivalent less than 2000PE the sampling frequency has been calculated as follows:

- 500-1999PE - 6 samples/year
- 200-499PE - 4 samples/year
- <200PE - 2 samples/year
- Untreated Discharge - Not sampled

Additional sampling and analysis was carried out on the Primary Discharge Point, along with upstream and downstream sampling of the outfall, by BHP, New Road, Thomondgate, Limerick on 10/11/09.

The samples were taken at the following points:

- SW1(P) (Primary Discharge Sample Point),
- aSW1u, upstream ambient monitoring point (100m upstream of Primary Discharge Point on the local stream), and
- aSW1d, downstream ambient monitoring point (100m downstream of the Primary Discharge Point on the local stream).

The locations of these sampling points are shown on Drawing 03 in Attachment B.3.

**Environmental – Monitoring Program for Sligo Wastewater Treatment Plants**

Location	Sampling Frequency	Sampling Type	Parameters Analysed	QC Procedures	Receiving Water
Rockfield	4 samples per Year	Grab	BOD, COD, S.Solids	QC Procedures are in place for all the tested parameters. Equipment calibration, check standards, QC charts are all used in testing of the parameters listed. The Ensen laboratory also partakes in the EPA intercalibration programme.	Surface Water
Ballintogher	4 samples per Year	Grab	BOD, COD, S.Solids		Surface Water
Castlebaldwin	4 samples per Year	Grab	BOD, COD, S.Solids		Percolation
Drumcliffe	2 Samples per Year	Grab	BOD, COD, S.Solids		Estuarine discharge
Geevagh	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water
Ballinacarrow	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water
Culfadda	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water
Ballinafad	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water/ Percolation
Monasteraden	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water
Curry	2 Samples per Year	Grab	BOD, COD, S.Solids		Surface Water

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Parameter	Method	MDL
BOD	Apha Method 5210 B	<2 mg/l
COD	Hach Method 8000	<2 mg/l
S.Solids	Apha Method 2540 D	<2 mg/l

External Lab is ENSEN



# CHEMISTRY DEPARTMENT SOP

BHP/CEM/011

## PROCEDURE FOR SAMPLING SURFACE WATER AND GROUNDWATER

### 1.0 INTRODUCTION

This procedure presents methods for sampling surface water and groundwater from standard monitoring wells and water wells.

### 2.0 GROUNDWATER SAMPLING

#### 2.1 Preparation of Well for sampling

2.1.1 Remove the well cap and allow the well to hydrostatically equilibrate for five minutes. At contaminated sites toxic vapours may be present. Do not attempt to identify the contaminant by inhaling vapours from the well.

2.1.2 Plastic sheeting should be placed around the well to protect the sampling equipment from potential contamination. Groundwater sampling during rainfall is not recommended.

2.1.3 The preliminary information requested in the well sampling log (site location, project number, well number, etc) should be recorded at this time.

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#### 2.2 Measuring the Static Water Level

- 2.2.1 Prior to sampling the water level in the well and the volume of standing water in the well should be calculated. An electronic water level indicator can be used for water level measurement. The procedure is as follows:
- 2.2.2 Clean the electrical tape with detergent solution, rinse with distilled water and dry with a clean cloth.
- 2.2.3 Lower probe unit into well until a contact with the water surface is indicated and record the measurement from the top of casing.

#### 2.3 Measuring the Well Depth

- 2.3.1 The tape should be lowered to the bottom of the well and a measurement taken from the top of casing. It will be necessary to add the length of the probe (0.10 meters) to the indicated measurement on the tape.

#### 2.4 Measuring Stick Up

- 2.4.1 The height of the top of casing above the land surface should be recorded.

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#### 2.5 Purging the Well

2.5.1 Prior to collecting the groundwater sample the well should be purged by evacuating three times the well volume with a decontaminated submersible pump, bailer or interial pump. If the well has a sand pack around the screen the volume purged should be 3 times the volume of the casing and the sandpack void. The water level should be allowed to stabilise after purging. Such a procedure is intended to ensure that the groundwater samples are representative of the aquifer.

#### 2.6 Collecting the Groundwater samples

2.6.1 Care should be taken to ensure that the sampling device is securely tied on before lowering it into the well. The water sample should be taken 2-3 meters below the water surface. When finished sampling the sampling device should be decontaminated using a laboratory detergent, then rinsed with clean water and distilled water.

#### 2.7 Decanting the Groundwater samples

2.7.1 The containers should be inspected to ensure that they are the correct type and number, then affix the labels to the containers. The samples are decanted into the containers directly from the sampling device avoiding agitation or turbulence, which would result in the loss of volatile organic compounds or excessive oxygenation of the samples. The container caps should not be removed before necessary and then only for sufficient time to allow the container to be filled.

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#### 3.0 Surface water sampling

##### 3.1 General Considerations

- 3.1.1 The following points apply to the collection of samples
- 3.1.2 All equipment and instruments are kept clean, calibrated and in good working order.
- 3.1.3 Repairs, re-calibrations and modifications to equipment are documented and kept on file.
- 3.1.4 Field technicians ensure that samples are protected from contamination and deterioration.
- 3.1.5 Field observations (unusual conditions, weather, streamflow) and field measurements (pH, dissolved oxygen, conductivity and temperature) are recorded as accurately as the measuring devices allow.

##### 3.2 Sampling Procedures

- 3.2.1 A variety of techniques can be used to collect water quality samples. Sampling techniques employed in the sampling programme are dependent on the intended use of the water sample. These techniques include:
- 3.2.2 **Grab samples:** Either discrete, from one point within the stream of depth integrated, at one location but over the depth of the entire water column.

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- 3.2.3 **Composite Samples:** Either periodic, taken at regular intervals, regardless of changes in streamflow or flow proportional, taken at a frequency determined by changes in the streamflow rate.
- 3.2.4 To take a grab sample a bottle or pail is placed in the stream or river and raised to the surface at a constant rate so that the bottle is just filled with water on reaching the surface. This procedure results in the collection of a sample which approximates a theoretical depth-integration sample. Where wading is possible, depth integration may be done by hand holding the bottle or using a sampling rod which holds the bottle.

#### **4.0 Sample Containers and Preservations**

- 4.1 When sampling the number of bottles necessary depends on the analyses being conducted. This will generally be determined before fieldwork begins. Several of the sample bottles will have preservatives already added and therefore bottles are not to be washed out before sampling.
- 4.2 It is essential when sampling for volatile organic compounds (including BTEX) that no headspace or bubbles are left in the bottle. It is good practice to allow no headspace in any of the bottles when sampling with the exception of samples for bacteria. A headspace of approximately  $\frac{1}{4}$  of the sample volume would be allowed in bacteria samples.

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4.3 Samples for metals and cations in groundwater must always be pre-filtered with pressure filtering apparatus, if the goal is to determine dissolved concentrations. The filter housing and syringe must be thoroughly rinsed in the water to be sampled before sampling. Filter paper must be transferred to the housing without being touched by bare hands. This is facilitated by paper covers above and below each new filter which must be removed after placing the filter on the housing. Once the filter has been placed and the housing secured, the housing should be purged through with at least 20 ml from the syringe to remove any suspended matter introduced during washing.

4.4 If no apparatus is available for filtering then the sample should be collected in a bottle with no preservatives and kept cool until it can be filtered in the lab.

4.5 Sample filtering is not required if total concentration of cations and metals are to be determined. Standard sample preservation, holding times and required volumes should be adhered to.

## 5.0 Field Analysis

5.1 Measurements of pH, temperature and specific conductance of the well water must be taken at the time of sampling as such chemical properties can change during storage. Approximately two litres of well water must be decanted into a clean glass container from which the field measurements are recorded.

5.2 **Temperature:** The temperature can be measured at the surface or down the well with a rapidly equilibrating mercury Celsius thermometer.

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- 5.3 **pH:** The pH is determined using a glass hydrogen ion electrode and compared against a reference electrode of known potential by means of a pH meter. At the beginning of each sampling day the pH meter must be calibrated according to the manufacturers instructions. Before a measurement is made the probe should be completely rinsed with a stream of distilled water. The probe should be lowered into the container of well water and allowed to equilibrate. To facilitate equilibration, the probe is used to gently stir the water. A pH measurement is recorded as soon as the reading on the meter equilibrates. Between measurements the probe must be immersed in potable or deionised water or a buffer solution to prevent the electrode drying out.
- 5.4 **Specific Conductance:** A battery-powered meter is used to take the conductivity measurements. The probe must be kept clean and calibrated daily using a conductivity standard solution, usually potassium chloride. The probe should be lowered into the sample, stirring gently. The meter equilibrates rapidly therefore a measurement can be taken within seconds of immersion. Before each use, the probe must be rinsed under a stream of distilled water.

## 6.0 **Quality Assurance/Quality Control**

- 6.1 **Travel blanks and Field Duplicates:** It is good practice to analyse a travel blank which is distilled water in the same container as being used for the samples of groundwater and surface water. The travel blank should be analysed for the same suite of parameters as the water samples. The container of distilled water is opened during sampling at one location and subsequently capped and stored and handled under the same conditions as the groundwater and

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surface water samples. A field duplicate should also be taken and analysed for every 10 sets of analyses. A field duplicate is obtained by splitting a larger volume of water in the field prior to filling the container. The field duplicate can be a blind duplicate if it is labelled differently. A blind duplicate serves as a check of the results of the analytical of the analytical laboratories.

6.2

**Sampling Labels:** Sample labels are necessary in order to properly identify the samples. The labels must be affixed to the sample containers prior to sample collection. Do not affix labels to lids or caps. The labels must be completed at the time of sample collection. The labels should include the following information:

- Sample Number
- Initials of sampler
- Date and time of sample collection
- Project Number
- Analytical schedule for container

6.3

**Sampling Logs:** Sampling staff must prepare a sampling log at the time of sampling in order to record information about each sample collected. In addition to project information and well excavation data, such logs should record the following:

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- Physical appearance of samples
- Field observations
- Results of field analysis
- Sampling method and material
- Constituents sampled
- Sample container and preservation
- Sampling personnel

6.4

**Chain of custody:** the sampling staff should complete a chain of custody record in order to track sample possession from time of collection to analysis, thus maintaining sample integrity. Information provided in this form includes:

- Project identification or location
- Laboratory identification
- Shipping container information
- Sampling personnel
- Sample identity
- Date of sampling
- Delivery Method

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- 6.5            **Equipment Decontamination:** Prior to finished sampling, all equipment should be decontaminated and disposable equipment discarded in an appropriate manner. Following decontamination the equipment should be stored in plastic bags. Decontamination should consist of rinsing equipment in clean water with a mild detergent, cleanwater and then distilled water.

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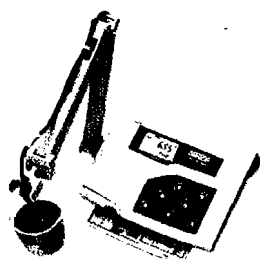
**BHP/CEM/021 PROCEDURE FOR THE DETERMINATION OF  
pH VALUE IN WATERS USING CYBERSCAN 510 METER.****1.0 INTRODUCTION AND SCOPE**

Measurement of pH is one of the most important and frequently used tests in water chemistry. Practically every phase of water supply and wastewater treatment. e.g. acid-base neutralisation, water softening, precipitation, coagulation, disinfection, and corrosion control, is pH is used in alkalinity and carbon dioxide measurements and many other acid-base equilibria.

This method is used to determine pH values in the range of 4.00 to 10.00 in any sample of water. This operating procedure is based on Standard Methods for the examination of water and wastewater 4500 - H+. This procedure refers only to measurements made in the Laboratory.

**2.0 PRINCIPLE OF THE METHOD**

The basic principle of the electrometric measurement of pH is the determination of the activity of the hydrogen ions by potentiometric measurement using a glass electrode and a reference electrode (Silver: Silver - Chloride) that provides a constant electrode potential. The pH instrument is calibrated using buffer standards having assigned values.



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#### **3.0 REFERENCE MATERIALS**

- 3.1 Certified Buffer Solution pH 4.00
- 3.2 Certified Buffer Solution pH 7.00
- 3.3 Certified Buffer Solution pH 10.00
- 3.4 Certified buffer Solution pH 7.0 Traceable to NIST.

#### **4.0 REAGENTS**

- 4.1 De-ionised water.

#### **5.0 CONSUMABLES**

- 5.1 50ml glass beakers.
- 5.2 Magnetic TFE-coated stirring bar.
- 5.3 Magnetic retriever.
- 5.4 Laboratory paper.
- 5.5 Wash bottle with de-ionised water.

#### **6.0 EQUIPMENT**

- 6.1 Cyberscan pH/Ion 510 meter - BHP-CLE-139.
- 6.2 Dr. Lange Stirrer – BHP-EM-82.

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#### **7.0 ENVIRONMENTAL CONTROL**

- 7.1** The pH standards are to be stored in the laboratory at  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .
- 7.2** The air temperature of the Laboratory must be  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . This temperature is checked each morning and recorded in the Laboratory Temperature Control Form. If the Laboratory temperature is not within this band, no analysis may proceed and consult the Laboratory Manager.

#### **8.0 INTERFERENCES**

- 8.1** A pH measurement cannot be more accurate than the standards, which is  $\pm 0.01$ -pH unit.
- 8.2** A junction potential exists at the porous plug near the bottom of the electrode. If the ionic composition of the analyte solution is a different from that of the standard buffer, the junction potential will change even if the pH of the two solvents is the same. This factor gives an uncertainty of at least  $\sim 0.01$  pH unit.
- 8.3** When  $[\text{H}^+]$  is very low and  $[\text{Na}^+]$  is high, the electrode responds to  $\text{Na}^+$  as if  $\text{Na}^+$  were  $\text{H}^+$ , and the apparent pH is lower than the true pH. This is called the alkaline error, or sodium error. This will only apply at  $\text{pH} > 10$ .
- 8.4** In strong acid, the measured pH is higher than the actual pH.
- 8.5** The electrode needs time to equilibrate with each solution. In a well-buffered

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solution, equilibration takes just seconds with adequate stirring. In a poorly buffered solution (such as near the equivalent point of a titration), it could take minutes.

- 8.6** Temperature variation causes mechanical (pH drift caused by thermoequilibration time) and chemical (chemical equilibrium) effects.

**9.0 SAMPLING PREPARATION**

- 9.1** The samples can be collected in either glass or plastic containers.
- 9.2** The minimum volume of sample required is 50mls.
- 9.3** pH measurement should preferably be done on site. If this is not possible the sample must be analysed in the laboratory.

**10.0 PROCEDURE**

**Note:** All new calibrations will override existing stored calibration data.

- 10.1** Remove the pH buffers from their storage area and place beside the pH meter. This will include calibration pH buffer solutions 4, 7 and 10 and the Laboratory control standard of pH 7.0. Select the dedicated pre-labelled clean 50ml glass beakers. Decant approximately 50 mls of each buffer solution into its respective glass beaker.

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**10.2** Press **ON/OFF** key. All the LCD segments will be displayed momentarily. The LCD switches to pH measurement mode.

**Note:** The meter starts in the same measurement mode that it was switched off.

**10.3** The customised LCD display will indicate the following:

<b>Display</b>	<b>Remark.</b>
<b>MEAS</b>	Measurement mode is selected.
<b>Ph</b>	Unit of measurement.
<b>°C</b>	Measurement temperature reading.
<b>ATC</b>	Automatic Temperature Compensation.

**10.4** Rinse the pH electrode well with deionised water. When using the ATC function with a separate probe, thoroughly rinse the temperature probe with deionised water also.

**Note:** Do not wipe the electrode or the temperature probe as this may cause a build up of electrostatic charge and will create calibration and measurement instability.

**10.5** Remove the probes, which is attached to its telescopic arm from its storage solution (pH 7 solution/ deionised water). Select the wash bottle containing deionised water and rinse the probe.

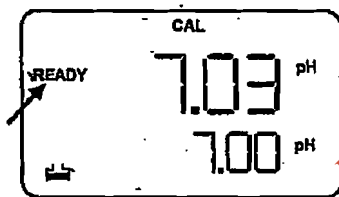
**10.6** Select the first buffer, pH 7 buffer solution. Place it on the magnetic stirrer and add a clean dry stirring bar. (rinse the bar using deionised water). Set the stirring rate to 1 or thereabouts to ensure a reasonable stirring rate.

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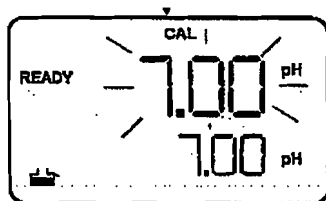
- 10.7 Dip both probes into the pH 7 standard calibration buffer solution. The end of the probe must be completely immersed into the buffer.
- 10.8 Press **CAL/MEAS** key to enter into the pH calibration mode. The annunciator (**CAL**) appears on the top of the LCD to indicate the meter is in the pH calibration mode. The upper display will show the measured reading while the lower display indicates selected pH standard buffer solution being used i.e. pH 7.
- 10.9 Wait for the measured pH value to stabilise (when the **ready** indicator displays in the left-hand corner). Record the calibration value and the temperature of the solution into the pH laboratory notebook.

#### Example 1:



- 10.10 Press the **ENTER** key. The upper display flashes the calibration value momentarily. The calibration point is successfully stored in the meter.

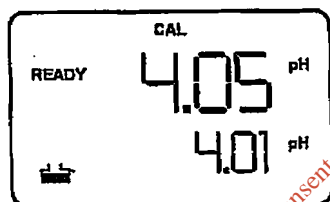
#### Example 2:



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- 10.11** Rinse the probes with deionised water to avoid cross contamination. Place the pH 4 buffer solution onto the magnetic stirrer and add a clean stirring bar. (rinse the bar using deionised water). Set the stirring rate to 1 or thereabouts to ensure a reasonable stirring rate.
- 10.12** Dip both probes into the pH 4-calibration buffer. The end of the probe must be completely immersed into the buffer. The meter automatically switches to the next pH buffer solution (i.e. pH 4) visibly in the lower display
- 10.13** Wait for the measured pH value to stabilise (when the **ready** indicator displays in the left-hand corner). Record the calibration value and the temperature of the solution into the pH laboratory notebook.

**Example 3:**

- 10.14** Press the **ENTER** key. The upper display flashes the calibration value momentarily. The calibration point is successfully stored in the meter.
- 10.15** Rinse the probes with deionised water to avoid cross contamination. Place the pH 10 buffer solution onto the magnetic stirrer and add a clean dry stirring bar. Set the stirring rate to 1 or thereabouts to ensure a reasonable stirring rate.
- 10.16** Dip both probes into the pH 10-calibration buffer. The end of the probe must be

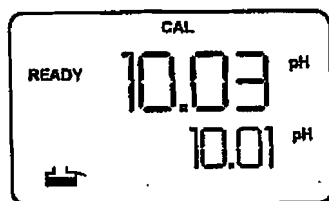
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completely immersed into the buffer. The meter automatically switches to the next pH buffer solution (i.e. pH 10 buffer) visible in the lower display

- 10.17** Wait for the measured pH value to stabilise (when the **ready** indicator displays in the left-hand corner). Record this calibration value and the temperature of the solution into the pH laboratory notebook.

**Example 4:**



- 10.18** Press the **ENTER** key. The upper display flashes the calibration value momentarily. The calibration point is successfully stored in the meter. The meter automatically returns to the pH measurement mode after the three-point calibration is performed.

- 10.19** Remove the probes by raising the telescopic arm. Rinse the probe again using the deionised water.

- 10.20** Select the LCS pH 7 buffer solution and place it on the magnetic stirrer. Add a clean stirring bar. Set the stirring rate to 1 or thereabouts to ensure a reasonable stirring rate.

- 10.21** Dip the probes into the LCS pH 7 buffer solution that is used as the quality

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control check.

**10.22** Observe the display until the reading reached equilibrium. This is indicated by the 'Ready' sign flashing and also by a stable pH reading. Record the reading and the temperature into the pH laboratory notebook as the 'LCS' for pH.

**10.23** Go to the computer in the wet chemistry laboratory. If off, turn it on. On the desktop.

- Select Global on "bhpsrv" (z).
- Select 'Bhp Systems'
- Select 'Quality System'.
- Select 'Laboratory Technical'.
- Select 'CEM'.
- Select 'Quality Control'.
- Select 'Quality Control' again.
- Select 'pH'.

**10.24** Select 'pH Control Chart', for the period in question. The pH 7 buffer standard is used to determine whether the system is in control. In the control chart enter the date and result in the spaces provided. If the result goes green accept the result and save. If the result goes either yellow or red consult the laboratory manager immediately. Do not process the results any further. If the control is okay, save and close the program. The analysis of samples may proceed if the quality control check is acceptable.

**10.25** The analysis of samples will follow the schedule as shown:

LCS (Ph 7.0 buffer traceable to NIST).

Sample 1

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Sample 2

Sample 3

Sample 4

Sample 5

Sample 6

Sample 7

Sample 8

Sample 9

Sample 10

Sample 10 (Accuracy check)

LCS, pH 7 Buffer (Precision check)

(Or repeat the last sample if there is less than 10 samples being analysed).

**10.26** Select the first sample and homogenise the bulk sample by manually shaking it.

Decant approximately 40 mls into a clean dry 50ml beaker.

**10.27** Place the sample on the magnetic stirrer. Add a clean dry magnetic stirring bar.

Set the stirring rate to 1 or thereabouts to ensure a reasonable stirring rate. Dip the probes into the sample.

**10.29** Observe the display until the reading reaches equilibrium. This is indicated by the

'Ready' sign flashing and also by a stable pH reading. Record the pH reading and the temperature into the pH laboratory notebook beside the sample identification number.

**10.30** Remove the probe by raising the telescopic arm. Rinse the probe again using the

deionised water.

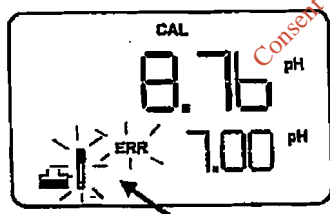
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- 10.31** Continue with the rest of the sample sequence as outlined in 10.25. Remember to follow steps 10.23 to 10.24 for the control standard reading. Record all results in the pH Laboratory Notebook.
- 10.32** After analysis is completed return the electrode to its storage solution. Return the pH buffer solutions to their storage area. Ensure that the work area has been tidied up before proceeding with any other analysis.

**Procedural Notes:**

If the upper measured display is not within the buffer acceptable window an error message and the electrode icon flash upon pressing the **ENTER** key. Check electrode condition and recalibrate. Press **CAL/MEAS** key to exit calibration and resume to the measurement mode.

**Example 5:****11.0 CALCULATION OF RESULTS**

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N/A

**12.0 QUALITY CONTROL**

**12.1** The Laboratory Control Standard result is used to determine whether the method is in control. Record this result in the Laboratory Notebook. Plot this result in the pH Control Chart. If the figure is within the higher and lower warning limits the method is in control. If not consult the Laboratory Manager. The Laboratory Manager will access the data and determine whether the result means rejection of the batch.

**12.2** The last sample is repeated for a precision check. Precision is the difference between the two sample readings and this result must be recorded into the Ph Laboratory Notebook.

**12.3** The difference between the two control recoveries acts as an Accuracy Check. Record the accuracy result into the pH Laboratory Notebook.

**13.0 REPORTING OF RESULTS**

**13.1** The pH results are recorded in the Laboratory Notebook and they are reported to

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the nearest 0.01 pH unit.

- 13.2** The pH results are transferred from the Laboratory Notebook to the relevant Job Ticket, which is stored in the Job Ticket Folder.

**14.0 SAFETY**

Before conducting this procedure the analyst must be wearing proper safety glasses and have a clean buttoned up lab coat. The analyst should also wear disposable latex gloves. It is the responsibility of the laboratory manager to provide all safety equipment.

**15.0 TRAINING**

Initial training, ongoing training and competence shall be in accordance with BHP/QP/8.

**16.0 QUALITY RECORDS****16.1 Laboratory Temperature form (BHP/CL/09/A)**

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- 16.2 Ph laboratory notebook.
- 16.3 pH control Chart.
- 16.4 Job Ticket.

#### **17.0 REFERENCES**

- 17.1 Eutech pH/Ion Meter operating manual (BHP-CLE-160).
- 17.2 Standard Methods for the Examination of water and wastewater, 20<sup>th</sup> Edition.
- 17.3 Quantitative Analytical Chemistry, D.C Harris, 2<sup>nd</sup> Edition.

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## CHEMISTRY DEPARTMENT SOP

BHP/CEM/054

### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

#### 1.0 INTRODUCTION

Determination of the common anions such as bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulphate often is desirable to characterise a water and/or assess the need for specific treatment. Only ion chromatography provides a single instrumental technique that may be used for their rapid, sequential measurement. Ion chromatography eliminates the need to use hazardous reagents and it effectively distinguishes among the halides ( $\text{Br}^-$ ,  $\text{Cl}^-$  and  $\text{F}^-$ ) and the oxy-ions ( $\text{SO}_4^{2-}$ ,  $\text{NO}_2^-$  and  $\text{NO}_3^-$ ). This method is applicable after filtration to remove particles larger than  $0.2\mu\text{m}$  to surface, ground and wastewater as well as drinking water. Some industrial process water such as boiler water and cooling water may also be analysed by this method. This procedure complies with Standard Methods for the examination of water and wastewater 4110. The standard operating range is from each anions LOD to  $20\text{mg/l}$ . This procedure is applicable to Laboratory measurements only.

#### 2.0 PRINCIPLE OF THE METHOD

A water sample is injected into a stream of carbonate-bicarbonate eluent and passed through a series of ion exchanges. The anions of interest are separated on the basis of their relative affinities for a low capacity, strongly basic anions exchanger (guard and separator columns). The separated anions are directed through a micro-membrane suppressor bathed in continuously flowing sulphuric acid (regenerant solution). In the suppressor the separated anions are converted to their highly conductive acid forms and the carbonate-bicarbonate eluent is

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converted to weakly conductive carbonic acid. The separated anions in their acid forms are measured by conductivity. They are identified on the basis of retention time as compared to standards. Quantification is by measurement of the peak area.

### **3.0 REFERENCE MATERIALS**

- 3.1** Fluoride Stock Solution (Reagent/501).
- 3.2** Chloride Stock Solution (Reagent/502).
- 3.3** Nitrate Stock Solution (Reagent/503).
- 3.4** Bromide Stock Solution (Reagent/504).
- 3.5** Nitrite Stock Solution (Reagent/505).
- 3.6** Phosphate Stock Solution (Reagent/506).
- 3.7** Sulphate Stock Solution (Reagent/507).
- 3.8** Reference Multi-Anion Stock Solution.
- 3.9** Set of working Standard Solutions (Reagent/524).
- 3.10** IC Control Solution (Reagent/525).

### **4.0 REAGENTS**

- 4.1** De-ionised water.
- 4.2** Eluent Solution for IC (Reagent/508).

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### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

#### 5.0 EQUIPMENT

- 5.1 Ion Chromatograph - Dionex 4500I or equivalent with a 50 $\mu$ l injection loop.
- 5.2 A set of columns consisting of a separator column and a guard column.
- 5.3 Conductivity cell.
- 5.4 Conductivity detector.
- 5.5 Computer with the Jones Chromatography system.
- 5.6 *Electronic suppresser unit.*
- 5.7 *Whatman Filter Paper.*
- 5.8 5ml disposable plastic syringes.
- 5.9 Disposable Pasteur pipettes.
- 5.10 *Plastic sample vials.*
- 5.11 Cassio FX 992 calculator.
- 5.12 Rack.
- 5.13 10ml disposable test tubes.

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#### 6.0 ENVIRONMENTAL CONTROL

- 6.1 The laboratory air temperature must be  $20 \pm 2^{\circ}\text{C}$ . The temperature in the laboratory is monitored daily and recorded in the Laboratory Temperature Log.
- 6.2 No analysis should proceed if the Laboratory Temperature is not between these limits.

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### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

#### 7.0 INTERFERENCES

- 7.1 Any substance with a retention time coinciding with that of any anion to be determined and which produces a detector response may interfere.
- 7.2 A high concentration of any one ion also interferes with the resolution and sometimes retention of others. Sample dilution or gradient solution overcomes many interference's.
- 7.3 Spurious peaks may result from contaminants in reagent water, glassware or sample processing apparatus. As small volumes are used, scrupulously avoid contamination.
- 7.4 Fluoride is difficult to quantify at low concentrations because:
- A water dip occurs at a retention time just before fluoride.
  - Organic acids such as formic, acetic, carbonic etc. may also elute close to fluoride and may be difficult to separate.

#### 8.0 SAMPLE PREPARATION

- 8.1 The samples may be taken in glass or plastic bottles.
- 8.2 The minimum sample volume required is 50mls.

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### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

8.3 Analysis for individual anions vary. No preservation is required. The sample should be refrigerated on receipt and the maximum storage times prior to analysis for each anion is shown.

ANION	MAX STORAGE TIME
Bromide	28 days.
Chloride	28 days.
Fluoride	28 days.
Nitrate	28 days.
Nitrite	As soon as possible.
Phosphate	2 days.
Sulphate	28 days.

## 9.0 PROCEDURE

### 9.1 Instrument Set-up.

9.1.1 Set the nitrogen head pressure to 100psi in the gas bunker.

9.1.2 Turn the Dionex 4500 on. Switch power on to the reservoir module. Switch the computer on and switch the SRS unit on if off. The computer is normally on. If on, reboot. This is to ensure correct time and date settings appear on each chromatogram. Ensure cell, auto-offset and start button are on.

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### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

- 9.1.3 Select reservoir 1 and switch to on.
- 9.1.4 Switch mode to sparge and set the pressure gauge between 5 and 10 psi.
- 9.1.5 Select programme 1 (default setting) which uses the following conditions:  
Flow Rate: 1.5mls/min  
Eluent 1: 100%
- The flow rate can be adjusted if there are problems with co-elution of compounds. Flow rate adjustment is an indication that the column may need maintenance.*
- 9.1.6 *After sparging for 5-10 minutes change the system to pressurise by changing the switch. Allow the gauge to settle.*
- 9.1.7 Prime the instrument using a 5ml disposable syringe on the prime block to draw eluent through until all the air bubbles have disappeared.
- 9.1.8 Allow the conductivity to stabilise to  $< 18\mu\text{s}/\text{cm}$ . If the conductivity fails to reach this level, then fresh eluent may be required. If so refer to Reagent/508 and prepare fresh eluent. *After the fresh eluent has been prepared, select reservoir 1 and switch off. Unscrew the cap of the reservoir and pour out the eluent. When empty refill with the fresh eluent. Close the cap and tighten. Select reservoir 1 and switch on. Then repeat steps 9.1.6 to 9.1.8.* If the problem persists consult the Laboratory Manager.

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**9.2 Calibration of Instrument.**

**9.2.1** Once the instrument is running properly then the series of calibration standards made up from the procedure outlined in Reagent/524 may be analysed.

**9.2.2** *If the computer is off go to 9.2.2.1. If the computer is on in the JCL6000 software package go to 9.2.3.*

**9.2.2.1** *Turn on the computer by pressing the power buttons.*

**9.2.2.2** *Wait for windows to boot up.*

**9.2.2.3** *Select 'Start' and select 'Shutdown'.*

**9.2.2.4** *Select 'Restart the computer in MS-DOS mode'.*

**9.2.2.5** *Select 'Yes'.*

**9.2.2.6** *The computer will revert to DOS and display C:\Windows>.*

**9.2.2.7** *Type in cd\ and press return.*

**9.2.2.8** *The computer displays C : \ >. Type in JCL6000 and press return.*

**9.2.2.9** *The computer starts the JCL6000 Chromatography Data System. The software displays a main menu.*

**9.2.3** *In the main menu, select 'Acquire / Reprocess' and press enter.*

**9.2.4** *The software displays the 'Acquire / Reprocess' menu. Using the directional keys select 'Acquire Data' and press enter.*

**9.2.5** *The software displays the 'Run / Integration Parameters' page.*

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9.2.6 *On the page are displayed several parameters some which are fixed and some that are variable. The following list is a guide to filling out correctly for Ion Chromatography analysis.*

<i>Parameter</i>	<i>Value</i>
<i>Sample Name</i>	<i>Enter as appropriate</i>
<i>Run Time (mins)</i>	<i>Variable, usually 10</i>
<i>Sample rate</i>	<i>2</i>
<i>Run Delay (mins)</i>	<i>0</i>
<i>Trigger (Key/External)</i>	<i>External</i>
<i>1<sup>st</sup> derivative</i>	<i>0.08 (Variable)</i>
<i>2<sup>nd</sup> derivative</i>	<i>0.6 (Variable)</i>
<i>No. of baseline points</i>	<i>10</i>
<i>Min. peak. Height (mV)</i>	<i>0.01</i>
<i>Min. peak. Width (secs)</i>	<i>5</i>
<i>Minimum peak area</i>	<i>200</i>
<i>Skim ratio</i>	<i>0</i>
<i>Delay to integration</i>	<i>0</i>
<i>Valley-valley baseline</i>	<i>No (Variable)</i>
<i>Full scale def (mV)</i>	<i>50</i>
<i>Gain</i>	<i>5</i>
<i>Offset (mV)</i>	<i>0</i>
<i>Channel Description</i>	<i>Leave blank</i>

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- 9.2.7 *Use the directional keys to set the parameters by scrolling down through the list. Record any changes in the variables over the set values in the Laboratory Notebook. Once finished the message 'Are values correct (Y/N) ?' is displayed.*
- 9.2.8 *If the values are correct press T for yes. If not, press 'N' for no where the system will return to the 'Run / Integration Parameters' page. If Y is pressed the system displays the chromatographic data gathering page.*
- 9.2.9 *Fill a 5ml disposable syringe with the blank (de-ionised water).*
- 9.2.10 *Inject into the external detection part on the front wall of the Dionex 4500i. Inject approximately 1ml of the sample.*
- 9.2.11 *Press 'Run' on the front wall of the Dionex 4500i and press 'Alt' and 'I' simultaneously on the keyboard. This starts data acquisition.*
- 9.2.12 *The blank should be a straight line with a water dip occurring at the start of the chromatogram. No data analysis is required.*
- 9.2.13 *Select the first standard of interest. Inject into the external detection port on the front wall of the Dionex 4500i. Inject approximately 1ml of the sample.*
- 9.2.14 *Press 'Run' on the front wall of the Dionex 4500I and press 'Alt' and 'I' simultaneously on the keyboard. This starts data acquisition. Wait for acquisition to complete.*
- 9.2.15 *When acquisition has complete, press 'Hold' on the front wall of the Dionex 4500I and press 'RST', the reset button which returns the time to 0.*

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- 9.2.16 *The display automatically displays a 'Save File' dialog box. Select 'Save File' using the directional keys. Give the file name the same name as the run description and press return.*
- 9.2.17 *The system will then display the prompt 'Adjust baseline (Y/N)? Press Y for Yes.*
- 9.2.18 *The system will then display the number of peaks detected. It will also have a box for zooming in on particular peaks of interest. The system will display the prompt 'Press return to expand or Esc to quit'.*
- 9.2.19 *Position the blue box over the peaks of interest using the directional keys and enlarge the box if necessary using the directional keys on the number pad on the keyboard. Press return when finished.*
- 9.2.20 *The system will display the zoomed in portion of the chromatogram. Using the directional keys, position the little red arrow directly under the peak of interest and press return.*
- 9.2.21 *Using the directional keys, position the little red arrow to where you wish the peak to start. Press return. This marks the peak start.*
- 9.2.22 *Using the directional keys, position the little red arrow to where you wish the peak to finish. Press return. This marks the peak end.*
- 9.2.23 *If this procedure does not result in the area being calculated from the baseline, repeat steps 9.2.20 to 9.2.22. Then press 10 to Disable Valley. The system should now display a normal peak with a flat baseline.*
- 9.2.24 *Repeat steps 9.2.21 to 9.2.23 for all other peaks of interest.*
- 9.2.25 *Press Escape when finished. This brings you back to the original chromatogram (un-zoomed). Press Escape, which displays the integration results.*

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- 9.2.26 *Fill in the concentration retention time and the area of the standard in the IC Results Sheet for the anion of interest.*
- 9.2.27 *Repeat steps 9.2.13 to 9.2.26 for all the remaining standards used for calibrating anions of interest.*
- Note: The 20ppm standards for Fluoride and Chloride are usually not run due to overloading. The 1.25ppm Phosphate standard is also usually not run as it is close to the LOD.*
- 9.2.28 *At this stage all the calibration data should be written in the appropriate section of the IC Results Sheet. The section is titled 'Calibration Points' and includes the subsections 'Conc', 'RT' and Area. Once this has been filled out, the analyst will then go to the departmental computer.*
- 9.2.29 *Go to the departmental computer and double click the icon labelled 'I.C. Calibration', which is on the desktop. This opens an Excel Programme for Ion Chromatography Calibration.*
- 9.2.30 *First enter the data of calibration and the Ion of interest. Then fill in the concentration and Area data. Leave the origin data i.e. 0 for concentration and 0 for Area. The programme will automatically generate a graph of Area versus concentration (mg/l). The slope, intercept and Pearson coefficient (regression) is also displayed. Enter the regression figure onto the IC Results Sheet.*
- 9.2.31 *Repeat steps 9.2.28 to 9.2.30 for all other anions of interest.*
- 9.2.32 *If the line regression is  $\geq 0.98$  then the calibration for that anion is accepted. If it is  $<0.98$  reject the calibration and repeat the procedure outlined in 9.2.13 to 9.2.30. If it still fails the regression criteria consult the Laboratory manager.*

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- 9.3** Inject and evaluate the IC Control Solution using the procedure outlined in steps **9.2.13 to 9.2.30**.
- 9.4** Calculate the % recovery of the IC Control Solution (5ppm) (See Reagent Preparation 525) from its peak area using the calculator following the procedure outlined in BHP/EM/500. For example a result of 4.97ppm for any anion will result in a recovery of 99.4%.
- 9.5** This result is written onto the IC results sheet in the space provided. The result is then plotted in the IC Control Chart for that anion. Ensure that the result falls between the upper and lower warning limits. If the result falls outside these limits repeat steps 9.3 to 9.5. If the result still fails the warning limit consult the Laboratory Manager. If the system is in control proceed to 9.6.
- 9.6** Assemble the samples for analysis from their respective fridges. Select a rack and fill it with the appropriate number of 10ml disposable plastic test tubes. Label each test tube using the following sequence as a guideline.

- 1**     **Sample 1**
- 2**     **Sample 2**
- 3**     **Sample 3**
- 4**     **Sample 4**
- 5**     **Sample 5**
- 6**     **Sample 6**
- 7**     **Sample 7**
- 8**     **Sample 8**

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- 9 *Sample 9*
- 10 *Sample 10*
- 11 *Sample 10 (Precision Check).*
- 12 *5ppm (Accuracy Check 1).*

The essence of the sequence is that each batch contains 10 samples. The 10<sup>th</sup> sample is repeated as a precision check while the *5ppm* working standard acts as a precision check.

- 9.7 Homogenise the bulk samples by manually shaking them. Using a disposable 5ml syringe draw up the first sample of the sequence. *Filter samples if they are dirty. Use a whatman filter paper (541 or 542 grade) as required.*
- 9.8 Inject each sample onto the Ion Chromatography column following the procedure outlined in steps *9.2.13 to 9.2.26 and fill in the name of the sample, retention time and area in the IC Results Sheet.* Collect all the data and review.
- 9.9 If some of the samples have peak areas outside the calibration, the sample must be diluted by an appropriate factor to bring it on scale. This is at the analyst's discretion 1/10, 1/50 and 1/100. It is advisable to follow the dilution procedure outlined in Reagent/524. *The dilution factor should be noted on the IC results sheet.*

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- 9.10 Assemble the diluted samples and re-inject as outlined in steps 9.2.13 to 9.2.26.
- 9.11 When the results for the batch are written on the IC results sheet, calculate the concentration from the peak areas as outlines in BHP/EM/500. Take into account any dilution factors, which may have taken place. *Store the IC Results Sheet with their respective calibration graph in the IC Results Sheet Folder.*

#### 10.0 CALCULATION OF RESULTS

The concentration of each anion is calculated from the procedure outlined in BHP/EM/500. Each result is written onto the IC Results Sheet.

#### 11.0 QUALITY CONTROL

- 11.1 The IC Control and Control Chart have already been outlined.
- 11.2 If the number of samples allow it every 10<sup>th</sup> sample is to be repeated for a precision check. The difference between the two readings is to be plotted in the IC Precision Control Chart. Record this result in a Laboratory Notebook. If there are less than 10 samples repeat the last sample in the batch. The upper and lower warning limits indicate the criteria of acceptability as regards precision.

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11.3 *The 5ppm working standard is run after the precision check. This acts as an accuracy control. The difference between the control reading is plotted in the Accuracy Control Chart. The upper and lower warning limits indicate the criteria of acceptability as regards accuracy in the Accuracy Control Chart.*

11.4 If either the precision or accuracy controls fail their respective controls, The batch must be repeated. Consult with the Laboratory Manager if this occurs. If the results are acceptable proceed to section 12.0.

#### 12.0 REPORTING OF RESULTS

12.1 The anion results are recorded in individual IC results sheets and are reported to the nearest .01 of a milligram.

12.2 The anion results are transferred from the IC results sheets to the relevant Job Ticket which is stored in the IC Job Ticket Folder.

#### 13.0 SAFETY

Before conducting this procedure the analyst must be wearing proper safety glasses and have a clean buttoned up lab. Coat. The analyst should also wear disposable latex gloves. It is the responsibility of the Laboratory Manager to provide all safety equipment.

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### PROCEDURE FOR THE DETERMINATION OF ANIONS BY ION CHROMATOGRAPHY IN WATER AND WASTEWATER BY MANUAL INJECTION

#### 14.0 TRAINING

Initial training, ongoing training and competence shall be in accordance with BHP/QP/8.

#### 15.0 QUALITY RECORDS

15.1 Job Ticket.

15.2 Laboratory Notebook.

15.3 IC Results Sheet.

15.4 IC Control Chart.

15.5 IC Precision Control Chart.

15.6 *IC Accuracy Control Chart*

#### 16.0 REFERENCES

16.1 Standard Methods for the examination of water and wastewater, 20<sup>th</sup> Edition.

16.2 Quantitative Chemical Analysis, 2<sup>nd</sup> Edition, 1987.

16.3 Dionex Series 4500 Chromatography System Manual.

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## 1.0 INTRODUCTION

This operating procedure outlines the type of control charts used in the department and their interpretation. The construction of the control limits is part of method validation (BHP/CEM/065). The definitions and terms in this SOP are taken from Standard Methods for the analysis of water and waste water, 20<sup>th</sup> Edition. The more usual control charts present consist of

- Control Charts (based on results or % recovery)
- Accuracy Control Charts
- Precision Control Charts

Other control charts may exist for individual methods (e.g. Nernstian Slope control chart for pH). Control charts are essential instruments for quality control. Each type of chart is described.

### (a) Control Chart (Means Chart).

The control chart for standards is constructed from the average and standard deviation of a standard. It includes upper and lower warning limits and upper and lower action limits. Common practice is to use  $\pm 2\delta$  and  $\pm 3\delta$  for the warning and action limits respectively. More detail may be found in BHP/CEM/065 and in the Validation File. The results are entered immediately after analysis. Examples are shown.

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**(b) Accuracy Control Chart.**

The Accuracy Control Chart is based on the difference between reference standards run at the front and end of a batch of analysis. This acts as a check for bias in the analysis. The chart is constructed as per BHP/CEM/065.

**(c) Precision Control Chart.**

The precision Control Chart is based on the difference between duplicate measurements in a batch of analysis. This monitors the precision of analysis. The Chart is constructed as per BHP/CEM/065.

**2.0 PROCEDURE (INTERPRETATION)**

**2.1** The SOP outlines only the interpretation of the control measurement. The recording and positioning of control measurements is outlined in each method SOP.

**2.2** If the warning limits are at the 95% confidence level, 1 out of 20 points on average would exceed that limit while 1 out of 100 would exceed the action limits (99% confidence). Based on these statistical parameters the following action should be taken.

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- 2.3 If a measurement exceeds an action limit consult with the laboratory manager. The laboratory manager will initial the point which is outside the limit and instruct that the measurement be repeated. If the repeat measurement is within the action limit the analysis may continue. If the repeat measurement exceed the action limit, discontinue the analysis and consult with the Laboratory manager until the problem is corrected.
- 2.4 If two out of three successive points on the control chart exceeds the warning limit consult with the Laboratory manager. The laboratory manager will initial the points which are outside the warning limit and instruct that the measurement be repeated. If the repeat measurement is less than the warning limit, the analysis may continue. If the repeat measurement exceeds the warning limit, discontinue the analysis and consult the laboratory manager until the problem is corrected.
- 2.5 If four out of five successive points are in decreasing or increasing order consult with the laboratory manager. The laboratory manager will instruct that the measurement is repeated. If the repeat measurement changes the order the analysis may continue. If the repeat measurement does not change the order, discontinue the analysis and consult with the laboratory manager until the problem is corrected.

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- 2.6 If six successive samples are above or below the mean consult with the laboratory manager. The laboratory manager will instruct that the measurement be repeated. If the repeat measurement changes the direction of the analysis to the opposite side of the mean, the analysis may continue. If not discontinue the analysis and consult with the laboratory manager for the appropriate action to take. The laboratory manager will note any changes on the Control Chart.
- 2.7 An important function of control charts is their assessment of method precision. If measurements never or rarely exceed warning limit. Remember 1 in 20 should statistically; Then consult the Laboratory manager who will instruct a recalculation of the limits using 20 most recent data points.
- 2.8 Once control charts have been filled, submit to the laboratory manager. The laboratory manager will assess the data for trends in the analysis. The laboratory manager will sign off each completed control chart.

### 3.0 TRAINING

Initial training, ongoing training and competence shall be in accordance with BHP/QP/8

### 4.0 QUALITY RECORDS

4.1 Laboratory Notebook.

4.2 Control Charts

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## 1.0 INTRODUCTION

The work carried out by the CEM Laboratory shall be covered by a test report which accurately, clearly, unambiguously and objectively presents the test results and all relevant information.

## 2.0 PROCEDURE

2.1 The test report shall include the following information.

- a) Name and address of testing laboratory and location where the test was carried out when different from the address of the testing laboratory.
- b) Unique identification of report and of each page and total number of pages of the report.
- c) Name and address of client, and client's order number or reference if available.
- d) Description and identification of the test items.
- e) Date of receipt of test items, date(s) of performance of test, as appropriate, and date of issue of report.
- f) A statement to the effect that the test report relates only to the item tested.
- g) Identification of the test specification, method and procedure.
- h) Description of sampling procedure, where relevant.
- i) Any deviations from, additions to, or exclusions from the test specification, and any other information relevant to a specific test.
- j) Disclosure of any non-standard test method or procedure used.

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- k) Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified.
  - l) A statement of measurement uncertainty where relevant.
  - m) Signature of an authorised member of the laboratory staff accepting responsibility, on the laboratory's behalf, for the test report.
  - n) A statement that the report shall not be reproduced except in full, without the approval of the testing laboratory.
- 2.2** The test report may also incorporate additional factual statements relating to the test procedure or results, such as whether or not the test items conform to specification requirements, and the nature of any non-conformance, but shall not include any expressions of opinion (e.g. with regard to the suitability of the tested items for particular purposes).
- 2.3** Corrections or additions to a Test Report after issue shall be made only by a further document marked "Supplement to Test Report Serial Number.... (or as otherwise identified)" and shall meet the relevant requirements of the preceding statements..
- 2.4** The CEM Laboratory shall notify the client promptly, in writing, in the event of circumstances coming to light which cast doubt on the validity of results given in a test report or supplement..

Issue No:	02	Issued By:	Gillian Collins
Issue Date:	July 2006	Approved By:	Pat O' Sullivan
Edition:	04	Page:	2 of 3



# CHEMISTRY DEPARTMENT SOP

BHP/CEM/007

TEST REPORTS

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## 3.0 REFERENCES

- 3.1 General criteria of competence for testing laboratories, P1, The Irish National Accreditation Board, July 1997.

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Issue No:	02	Issued By:	Gillian Collins
Issue Date:	July 2006	Approved By:	Pat O' Sullivan
Edition:	04	Page:	3 of 3

# Accreditation Certificate

## BHP Laboratories

Enterprise Centre, New Road, Thomondgate, Limerick.

Testing Laboratory

Registration number: 005T

is accredited by the Irish National Accreditation Board (INAB) to undertake testing as detailed in the Schedule bearing the Registration Number detailed above, in compliance with the International Standard **ISO/IEC 17025:2005 2<sup>nd</sup> Edition** "General Requirements for the Competence of Testing and Calibration Laboratories"  
**(This Certificate must be read in conjunction with the Annexed Schedule of Accreditation)**

---

Date of award of accreditation: **04:11:2002**


Date of last renewal of accreditation: **01:04:2008**

Expiry date of this certificate of accreditation: **04:11:2012**

---

This Accreditation shall remain in force until further notice subject to continuing compliance with INAB accreditation criteria, ISO/IEC 17025 and any further requirements specified by the Irish National Accreditation Board.

Manager:   
Mr Tom Dempsey

Chairperson:   
Dr Máire Walsh

Issued on 04 April 2008

Organisations are subject to annual surveillance and are re-assessed every five years. The renewal date on this Certificate confirms the latest date of renewal of accreditation. To confirm the validity of this Certificate, please contact the Irish National Accreditation Board.

The INAB is a signatory of the European co-operation for Accreditation (EA) Testing Multilateral Agreement (MLA) and the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement.

# Schedule of Accreditation



(Annex to Accreditation Certificate)

Permanent Laboratory:  
Category A & B

## BHP LABORATORIES LTD

### Chemical, Construction Materials Testing Laboratory

**Initial Registration Date** 3-February-1989

**Chemical :**

**Initial Registration Date** 4-November-2002

**Construction Materials :**

**Initial Registration Date** 3-February-2003

**Mechanical :**

**Initial Registration Date** 3-February-1989

**Postal Address:**

(Address of other locations  
as they apply)

BHP Laboratories  
Enterprise Centre  
New Road  
Thomondgate  
Limerick

BHP Laboratories

Unit D  
Campbell Warehouse  
Kileely Road  
Limerick

**Telephone:**

+353 (61) 455 399

**Fax:**

+353 (61) 455447

**E-mail:**

**Contact Name:**

Mr B. O' Brien

**Facilities:**

Public testing service

# Schedule of Accreditation



Permanent Laboratory:  
Category A & B

THE IRISH NATIONAL ACCREDITATION BOARD (INAB) is the Irish body for the accreditation of organisations including laboratories.

Laboratory accreditation is available to testing and calibration facilities operated by manufacturing organisations, government departments, educational institutions and commercial testing/calibration services. Indeed, any organisation involved in testing, measurement or calibration in any area of technology can seek accreditation for the work it is undertaking.

Each accredited laboratory has been assessed by skilled specialist assessors and found to meet criteria which are in compliance with ISO/IEC 17025 or ISO/IEC 15189 (medical laboratories). Frequent audits, together with periodic inter-laboratory test programmes, ensure that these standards of operation are maintained.

## Testing and Calibration Categories:

- Category A:** Permanent laboratory calibration and testing where the laboratory is erected on a fixed location for a period expected to be greater than three years.
- Category B:** Site calibration and testing that is performed by staff sent out on site by a permanent laboratory that is accredited by the Irish National Accreditation Board.
- Category C:** Site calibration and testing that is performed in a site/mobile laboratory or by staff sent out by such a laboratory, the operation of which is the responsibility of a permanent laboratory accredited by the Irish National Accreditation Board.
- Category D:** Site calibration and testing that is performed on site by individuals and organisations that do not have a permanent calibration/testing laboratory. Testing may be performed using
- (a) portable test equipment
  - (b) a site laboratory
  - (c) a mobile laboratory or
  - (d) equipment from a mobile or site laboratory

## Standard Specification or Test Procedure Used:

The standard specification or test procedure that is accredited is the issue that is current on the date of the most recent visit, unless otherwise stated.

## Glossary of Terms

### Facilities:

- Public calibration/testing service:** Commercial operations which actively seek work from others.
- Conditionally available for public calibration/testing:** Established for another primary purpose but, more commonly than not, is available for outside work.
- Normally not available for public calibration/testing:** Unavailable for public calibration/testing more often than not.

Laboratory users wishing to obtain assurance that calibration or test results are reliable and carried out to the Irish National Accreditation Board criteria should insist on receiving an accredited calibration certificate or test report. Users should contact the laboratory directly to ensure that this scope of accreditation is current. INAB will on request verify the status and scope.

To all participants:

Draft Register

19/03/2008

Dear Colleague,

In accordance with our procedure for annually updating the register of quality controlled laboratories under Section 66 of the EPA Act please find enclosed an updated draft register with laboratories identified by code only. Inclusion in the register is based on performance of the participating laboratories in the Agency's intercalibration programme during 2007 according to the criteria which operated for last year's register and which are summarised again below. Every effort has been made to ensure that the draft register has been drawn up accurately according to these criteria and also that the type of limited flexibility to cover unusual situations as envisaged in the circular of 25/10/96, has been exercised. In order that we can publish the final register as soon as possible, please examine your entries in the enclosed draft carefully and if you have comments or observations you must make them to me on or before **April 7 2008**.

If your laboratory is accredited under the National Accreditation Board (NAB) scheme, you should note that the enclosed draft register is based solely on performance of the participating laboratories in the 2007 intercalibration programme. Please note that accredited laboratories should also be included in the final register for those tests for which they hold accreditation, regardless of performance in the programme. **If you held accreditation in 2007 and are not listed below for the test in question, you should notify me of such accreditation status by the above date.**

We expect that the final register will be in place shortly after the above date and will be available for public inspection at the Agency's headquarters in accordance with the EPA Act. It will also be accessible, as before, on the EPA website <http://www.epa.ie>. If possible please comment using email, [c.concannon@epa.ie](mailto:c.concannon@epa.ie), with "**register**" in the subject title. I will acknowledge all email messages.

NOTE: Participants who joined the scheme relatively recently need not concern themselves with the register until next year as they would not have made sufficient returns in 2007.

Yours Sincerely

Colman Concannon.

**DRAFT REGISTER for QUALITY APPROVED LABORATORIES SUBMITTING DATA to EPA.  
2007 Data**

**Criteria for compliance:** 4 good returns from 5 or 3 good returns in consecutive rounds or current accreditation.  
Criteria for pH as above but 3 returns within 0.2 pH units of ref. conc. & 1 return within 0.3 units

Laboratories which have not returned sufficient or any intercalibration data for a particular parameter during 2007 are not included for that parameter.

Laboratories which do not normally return monitoring data for a particular parameter to the EPA are not included for that parameter.

Laboratories which are accredited under NAB are also eligible for registration for those tests for which they hold such accreditation.

ALKALINITY 11 12 15 19 21 27 28 31 33 34 35 36 38 39 41 43 45 46 49 50 51 52 53 61 62 64 68 69 71 73 75 76 77 78 79 80 83 84 85 87 88 95 99 100 101 106 107 108 111 116 119 124 125

ALUMINIUM 12 15 19 21 24 27 29 31 33 39 46 47 49 50 51 52 53 57 73 77 78 79 83 84 94 97 99 100 107 110 111

AMMONIUM 11 12 14 15 18 19 22 24 27 28 29 30 31 33 34 35 36 38 39 41 43 46 48 49 50 52 54 55 56 58 59 60 62 64 68 69 72 73 74 75 76 77 78 79 80 81 83 84 85 87 90 95 97 99 101 105 106 107 108 110 111 114 115 124 129 130 131 132 133 135

BOD 11 12 14 15 17 18 19 20 22 23 24 26 27 28 30 33 34 36 37 38 39 41 43 46 47 48 49 50 52 54 55 56 57 58 59 60 62 63 64 68 69 71 73 74 76 77 78 80 83 84 87 88 89 92 93 94 97 101 105 106 107 109 112 113 116 117 118 119 124 126 128 129 131 132 133 137

CALCIUM 12 33 36 38 39 43 46 49 50 52 54 60 64 69 71 77 78 79 84 85 90 99 100 107 108

CADMIUM 12 18 19 28 31 33 36 38 43 49 50 52 64 69 71 77 78 79 83 84 85 97 99

CHLORIDE 11 12 17 18 19 23 27 28 31 33 34 36 38 39 41 43 46 49 50 52 54 58 60 61 64 68 69 73 76 77 78 79 84 85 87 88 94 95 97 99 101 107 119 124 125 133

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CONDUCTIVITY 11 12 14 15 17 18 19 21 23 24 26 27 28 29 31 33 34 35 36 39 41 43 45 46 47 48 49 50 51 52 53 54 56 57 58 60 61 62 63 64 68 69 73 76 77 78 79 80 81 83 84 87 95 99 100 101 107 108 111 116 119 124 125 136

CHROMIUM 12 18 19 28 31 33 36 38 43 49 50 52 69 71 77 78 79 83 84 85 97 99 100

COPPER 12 18 19 28 31 33 36 39 43 46 49 50 52 60 61 64 69 71 77 78 79 83 84 85 94 97 99 100

FLUORIDE 11 12 15 17 19 21 24 27 29 31 34 36 39 41 43 45 46 47 49 50 51 52 53 54 57 60 61 64 69 73 78 83 84 97 99 107 119 125

IRON 12 15 17 18 19 23 24 27 28 31 33 36 38 39 46 49 50 52 61 64 69 73 78 79 83 84 85 94 95 97 99 100 107

MAGNESIUM 12 28 33 36 38 39 43 46 49 50 52 54 60 64 69 77 78 79 83 84 85 97 99 100 107

MANGANESE 12 15 18 19 24 28 31 33 36 38 39 43 46 49 50 52 60 61 64 69 71 77 78 79 83 84 85 94 95 97 99 100 107

NICKEL 12 18 19 28 31 33 38 43 49 50 52 64 69 71 77 78 79 83 84 85 97 99 100

NITRATE 11 14 15 17 19 22 23 24 27 28 29 31 33 36 38 39 41 43 46 48 49 50 52 54 55 56 58 59 60 61 62 64 68 69 71 72 73 74 76 78 79 80 83 84 85 87 94 97 99 100 101 105 107 110 115 124 125 133

LEAD 12 18 19 28 31 33 36 38 43 49 50 52 69 71 77 78 79 83 84 97 99 100

pH 11 12 15 17 18 19 21 23 26 29 31 33 34 35 41 43 45 46 47 48 49 50 52 53 54 56 57 58 61 62 64 68 71 73 75 76 77 78 79 80 82 84 85 87 88 95 97 100 101 107 109 110 111 113 115 119 124 125 132 136

PHOSPHATE 11 12 14 15 18 19 20 23 26 27 28 30 33 34 35 36 39 40 41 43 46 48 49 50 52 54 55 56 58 59 60 62 63 64 69 71 73 75 76 77 78 80 83 84 85 87 88 95 97 99 100 101 104 105 106 107 108 110 111 113 115 116 118 124 128 129 131 132 133

POTASSIUM 12 28 33 36 38 39 43 46 49 52 60 64 69 71 77 78 79 83 84 85 97 99 100 106 107

SODIUM 12 19 28 31 33 36 38 39 43 46 49 50 52 54 60 64 69 71 77 78 79 83 84 85 97 99 100 107 119

SULPHATES 11 12 18 19 28 31 33 34 36 38 39 41 43 46 49 50 52 54 58 64 68 69 71 73 77 78 83 84 85 95 97 99 100 101 104 107 108 110 111 114 116 124 125 133

SUS\_SLDS 11 12 14 15 17 18 19 20 22 23 24 26 27 28 30 31 33 34 35 36 37 38 39 40 41 43 46 47 48 49 50 52 54 55 56 57 58 59 62 63 64 68 69 71 72 73 74 75 77 78 79 80 83 84 85 87 89 92 93 94 95 96 97 98 100 101 104 105 106 107 108 109 110 111 112 113 115 116 117 118 119 123 124 125 126 127 128 129 130 131 132 133 135

TOT\_HARDNS 11 12 15 19 23 27 31 33 36 38 39 41 43 46 49 50 52 54 61 62 64 68 69 71 73 75 76 77 78 79 83 84 85 87 88 90 95 97 99 100 101 106 107 108 111 116 124

ZINC 12 18 19 28 31 33 36 38 39 49 50 52 60 61 64 69 71 77 78 79 83 84 94 97 99 100

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# ATTACHMENT E.3

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**Table E.3**

<b>PT_CD</b>	<b>PT_TYPE</b>	<b>MON_TYPE</b>	<b>EASTING</b>	<b>NORTHING</b>	<b>VERIFIED</b>
aSW1u	Primary	M	167754	299151	N
SW1(P)	Primary	S	167774	299132	N
aSW1d	Primary	M	167856	299080	N

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# ATTACHMENT E.4

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### E.4 Monasteraden WWTP Sampling Data

Station Name	Sample Date	Ammonia (N)	BOD	COD	Conductivity @ 20°C	Nitrates (N)	Nitrites (N)	Ortho-phosphate	pH	Total Phosphorous	Suspended Solids	Total Oxidised Nitrogen	Temperature	Total Nitrogen	Sulphate	Total Phenols
Outlet	12/02/2008		8.23	23	408			0.339	7.69		19					
Outlet	21/08/2008		13.4	71	425			0.571	7.88		43					
Outlet	28/05/2009		3.4	58	401				7.98		12					
Outlet	17/06/2009		18.6	37	545	4.243	0.557	0.85	7.58		3	4.8				
Outlet	16/07/2009		8.08	46	369	1.244	0.126	0.595	7.47		2	1.37				
Outlet	10/11/2009	0.11	4	30	343	1.83	0.1	0.32	7.56	0.34	3		10	3	29.36	0.002
<b>Average =</b>		<b>0.11</b>	<b>9.29</b>	<b>44.17</b>	<b>415.17</b>	<b>2.44</b>	<b>0.26</b>	<b>0.54</b>	<b>7.69</b>	<b>0.34</b>	<b>13.67</b>	<b>3.09</b>	<b>10.00</b>	<b>3.00</b>	<b>29.36</b>	<b>0.002</b>

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# ATTACHMENT F.1

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## Introduction

The Monasteraden WWTP is located on the periphery of Monasteraden Village, in the townland of Tawaymucklagh. Treated effluent is discharged from the Monasteraden WWTP into a local unnamed stream.

## Receiving Water – Local Unnamed Stream

The final effluent from the WWTP discharges to a local unnamed stream, just outside the WWTP boundary. The local stream appears to eventually discharge to Lough Gara approximately 750m downstream of the WWTP.

The main site of conservation importance in the area is the Lough Gara proposed Natural Heritage Area (pNHA) (Site Number 000587) and Special Protection Area (SPA) (Site Number 004048) (See Figure F.1)

Lough Gara is a shallow (maximum depth 16 m), medium-sized lake which overlies Carboniferous limestones and shales, and Devonian sandstone. The main inflowing river is the River Lung while the main outflow is the Boyle River. There are two main sections to the lake, a larger northern basin and a smaller southern basin, joined by a narrow channel. The lake is classified as a mesotrophic system, with reduced planktonic algal growth noted in a recent sampling period (1998-2000). The shoreline is convoluted and has receded substantially from its original level due to various drainage schemes since the mid-19th century. The site includes several low-lying islands.

The shallow lake margins have extensive swamps dominated by Common Reed (*Phragmites australis*) and Bottle Sedge (*Carex rostrata*) with occasional Bulrush (*Typha latifolia*). In the southernmost part of the lake, clumps of Common Club-rush (*Scirpus lacustris*) are particularly abundant. The old lakeshore is mostly clearly visible, below which a sedge-rich marsh occurs – this includes such species as Black Bog-rush (*Schoenus nigricans*), Devil's-bit Scabious (*Succisa pratensis*), Creeping Bent (*Agrostis stolonifera*) and Wild Angelica (*Angelica sylvestris*), with willows (*Salix* spp.) colonising some areas. The upper part of the shore is frequently colonized by scrub, which includes willows, Alder (*Alnus glutinosa*) and Hawthorn (*Crataegus monogyna*). Raised bog occurs outside of the site to its south and south-west.

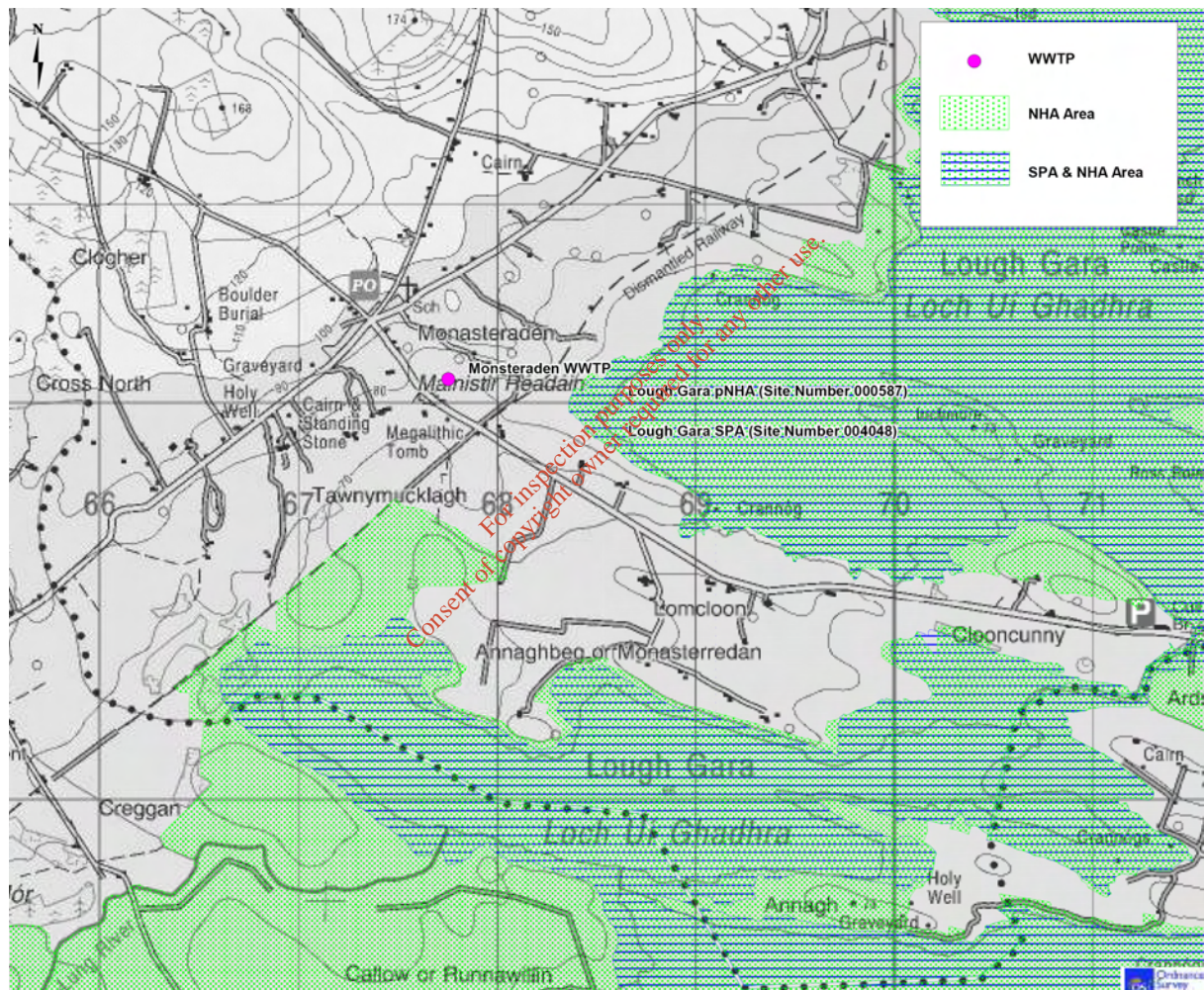
Lough Gara is a regularly used site by an internationally important Greenland Whitefronted Goose population (average flock size of 510 individuals over the five winters 1994/95 to 1998/99). The geese feed mainly on intensively-managed grasslands bordering the lake. When disturbed the geese use an island in the site or the lough itself. An important Whooper Swan population also uses the site (average mean peak of 382 for two of the winters in the 1995/96 to 1999/00 period), with numbers of international importance being present in the winter of 1996/97 (peak of 654). A range of other species occurs, though all in relatively low numbers; species present include Great Crested Grebe (32), Mute Swan (38), Wigeon (593), Teal (44), Mallard (157), Shoveler (18), Pochard (41), Tufted Duck (49), Goldeneye (20) and Golden Plover (270) - figures are average peaks for two of the winters in the period 1995/96-1999/00.

There are currently no activities taking place within the site which significantly affect the birds. Part of the site is a Wildfowl Sanctuary.

Lough Gara SPA is of high ornithological importance principally on account of the internationally important Greenland White-fronted Goose population that is associated with the lake and also the high numbers of Whooper Swan. The occurrence of these species,

along with Golden Plover, is of particular note as they are listed on Annex I of the E.U. Birds Directive.

Water quality monitoring carried out by BHP on the 10/11/2009 on behalf of Sligo County Council upstream and downstream of Monasteraden WWTP indicated that the local Stream had non-compliances in relation to BOD, Orthophosphate and Zinc both upstream and downstream of the WWTP discharge. A level of <math><1\text{ug/l}</math> Cadmium was recorded both upstream and downstream of the discharge point similarly a level of <math><0.2\text{ug/l}</math> Mercury was recorded both upstream and downstream of the discharge point. However due to the limits of quantitation it is unclear if the levels of Cadmium and Mercury exceed the maximum levels. Exceedences were also recorded for Ammonia and Lead downstream of the discharge point. Other than the non-compliances discussed above, the water quality is relatively of good quality.



**Figure F.1: Map of Designated Areas in the vicinity of Monasteraden WWTP Discharge Point**

Figure F.2 shows that the risk category for the Local Stream at the discharge point is “Probably Not at Risk”. Figure F.3 shows that the status for the Local Stream at the discharge point is “Good”.

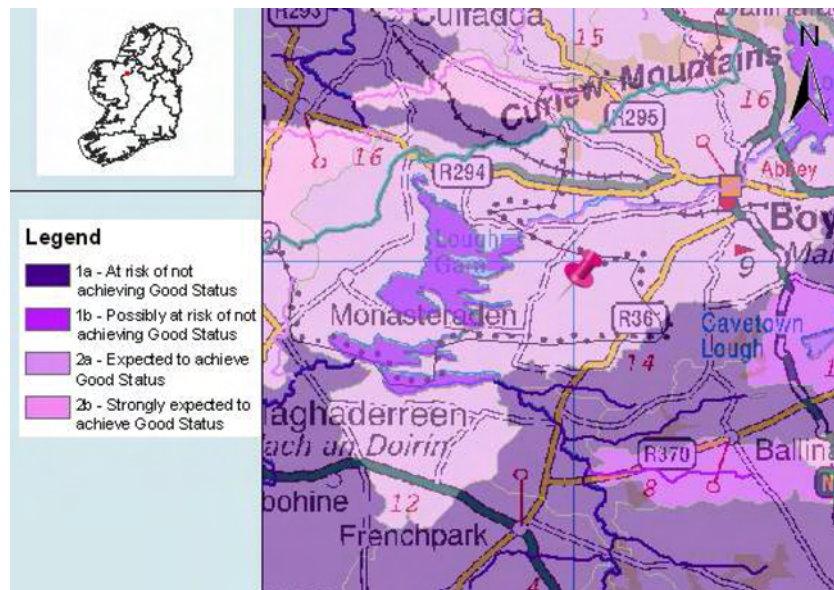


Figure F.2: Risk Category for the Local Stream at the Discharge Point.

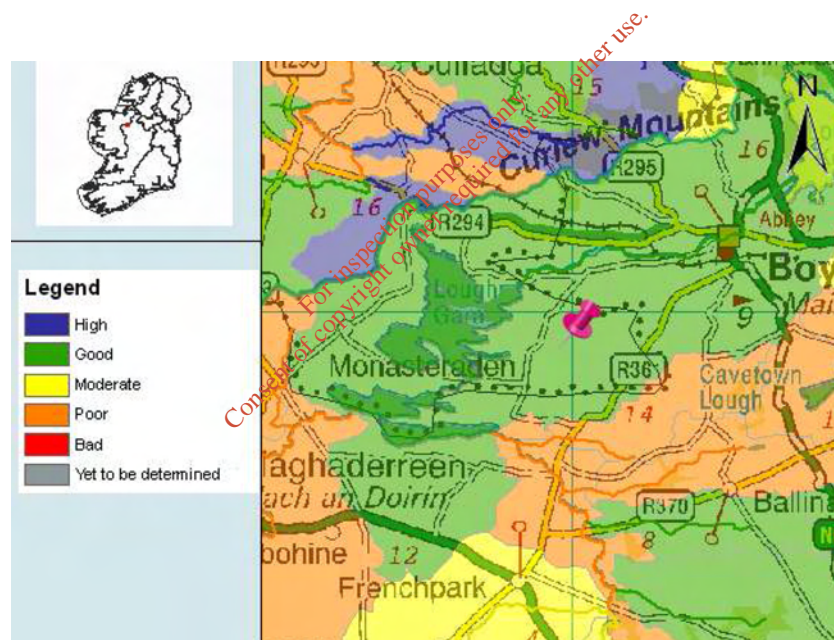


Figure F.3: Status for the Local Stream at the Discharge Point.

**Potential Impacts**

Potential impacts from the discharge of effluent from the Wastewater Treatment Plant include:

- Eutrophication due to discharge of Phosphorus and Nitrogen. The primary effect of eutrophication is to stimulate algal growth. Excess algal growth can create problems by de-oxygenating the water and killing fish and invertebrates. Nitrogen is mainly limiting only in marine environments but it can have some effect in freshwater.

- Contamination of the entire aquatic food chain with a variety of pollutants in particular heavy metals. Heavy metals can bio-accumulate in plants and invertebrates and can be toxic to fish.

These potential impacts could lead to a general impoverishment of aquatic flora and fauna downstream of the WWTP.

**Primary Discharge – Quality**

The final effluent standards under the Urban Wastewater Treatment Regulations are set out in **Table F.2:**

**Table F.2: Standards for Final Effluent/Primary Discharge**

Parameter	Unit	Monasteraden WWTP Design Standards	Standards*	Reference
BOD	mg/l	20	25	UWWT Regulations, 2001
Total Suspended Solids TSS	mg/l	30	35	UWWT Regulations, 2001
Total Nitrogen	mg/l	-	15	UWWT Regulations, 2001
Total Phosphorus	mg/l	2	2	UWWT Regulations, 2001
COD	mg/l	-	125	UWWT Regulations, 2001

\*UWWT Regulations require “appropriate treatment” for a RE<2000 the above standards are used for comparative purposes.

**Table D.1 (i) (b)** outlines the monitoring results over a number of sampling occasions for the final effluent/primary discharge. In comparison with the standards in **Table F.2**, the average value of the parameters complied with the relevant standards.

On the one occasion that sampling was carried out for dangerous substances in the WWTP discharge a level of <1ug/l Cadmium was recorded in effluent from the WWTP which may be outside the required Maximum Allowable Concentration (MAC) limit of 0.45ug/l as stated in the Surface Waters Regulations, 2009 for “inland surface waters”. Similarly a level of <0.2ug/l Mercury was recorded in the effluent from the WWTP which may be outside the required MAC limit of 0.07ug/l as stated in the Surface Waters Regulations, 2009 for “inland surface waters”. However due to the limits of quantitation it is unclear if the levels of Cadmium and Mercury exceed the maximum levels.

**Assimilative Capacity**

The capacity of the local stream to assimilate the discharge from the treatment works was calculated for Ammonia, BOD and SS based on the 95%ile flow in the river, and for Orthophosphate based on the median flow in the river.

**Local Stream – Relevant Flows**

- 95% Flow in the Local Stream = 0.009m<sup>3</sup>/s
- 50% Flow in the Local Stream = 0.063m<sup>3</sup>/s

**WWTP – Current Discharge Rate**

- Current Discharge (111PE); Discharge = 0.000289m<sup>3</sup>/s

**Local Stream – Upstream Quality Data**

- Orthophosphate Median concentration = 0.13mg/l
- BOD 95% concentration = 3.00mg/l
- Ammonia 95% concentration = 0.04mg/l
- Suspended Solids 95% concentration = 23.00mg/l

**Local Stream Assimilative Capacity****Orthophosphate Assimilative Capacity Calculation**Design Criteria:

The assimilative capacity calculation for Orthophosphate is analysed for compliance with the requirements of the 2009 Surface Waters Regulations. The requirement downstream of the WWTP site for Lough Gara is to retain “Good Status”, meaning a maximum Molybdate-Reactive Phosphate Median Concentration of 0.035mg/l. The upstream background levels in the November 2009 sampling showed an Orthophosphate level of 0.13mg/l which is in excess of the regulations. It is therefore proposed that an increase of 0.010 mg/l Orthophosphate be allowed when calculating the WAC for the stream.

$$C_{\max} - C_{\text{back}} = 0.01\text{mg/l}$$

$$50\% \text{ Flow in River} = 0.063\text{m}^3/\text{sec}$$

Assimilative Capacity Calculation

$$WAC_{\text{Current}} = 0.055 \text{ kg/day}$$

$$\text{Allowable Orthophosphate concentration} = 2.19 \text{ mg/l}$$

Comment

The WWTP has been designed to achieve a discharge standard of 2mg/l Total Phosphorous, therefore the Orthophosphate concentration will be less than 2.19mg/l.

**BOD Assimilative Capacity Calculation**Design Criteria:

BOD level in stream should not exceed 2.6mg/l and should not rise by >1mg/l. The upstream background levels in the November 2009 sampling showed a BOD level of 3.0 mg/l which is greater than the maximum allowable concentration. Therefore it is proposed that an increase of 1.00mg/l BOD be allowed when calculating the WAC.

$$C_{\max} - C_{\text{back}} = 1.0 \text{ mg/l}$$

$$95\% \text{ Flow in Stream} = 0.009\text{m}^3/\text{sec}$$

Assimilative Capacity Calculation

$$WAC_{\text{Current}} = 0.80 \text{ kg/day}$$

Allowable BOD concentration = 32.14 mg/l

#### Comment

The WWTP is designed to achieve a BOD discharge standard of 20mg/l.

### **Ammonia Assimilative Capacity Calculation**

#### Design Criteria:

Ammonia level should not exceed 0.14mg/l in the river. The upstream background levels in the November 2009 sampling showed an Ammonia level of 0.04mg/l. Therefore it is proposed that an increase of 0.1mg/l Ammonia be allowed when calculating the WAC.

$$C_{\max} - C_{\text{back}} = 0.1 \text{ mg/l}$$

$$95\% \text{ Flow in Stream} = 0.009/\text{sec}$$

#### Assimilative Capacity Calculation

$$WAC_{\text{Current}} = 0.08 \text{ kg/day}$$

$$\text{Allowable Ammonia concentration} = 3.2 \text{ mg/l}$$

### **Suspended Solids Assimilative Capacity Calculation**

#### Design Criteria:

The Background concentration in the River is 23.00mg/l. Although the receiving water is not a Salmonid River guidance is taken from the Salmonid Regulations in relation to the maximum allowable concentration of Suspended Solids, in accordance with these regulations the limit is 25mg/l SS. It is proposed that an increase of 2mg/l Suspended Solids be allowed when calculating the WAC.

$$C_{\max} - C_{\text{bac}} = 2.0 \text{ mg/l}$$

$$95\% \text{ Flow in Stream} = 0.009 \text{ m}^3/\text{sec}$$

#### Assimilative Capacity Calculation

$$WAC_{\text{Current}} = 1.61 \text{ kg/day}$$

$$\text{Allowable Suspended Solid concentration} = 64.27 \text{ mg/l}$$

#### Comment

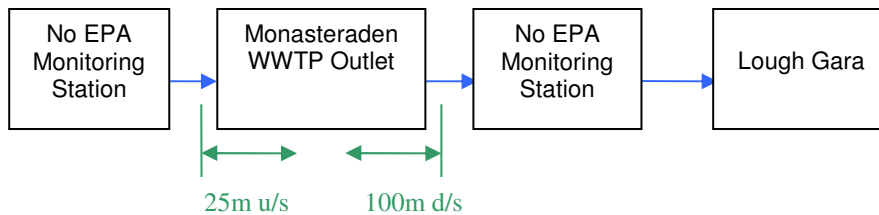
The design Suspended Solid discharge standard for Monasteraden WWTP is 30mg/l.

### **Water Quality Monitoring – Local River**

The Environmental Protection Agency conducts an ongoing monitoring programme by which river water quality is assessed with respect to biological and physico-chemical criteria. All of the major rivers and their more important tributaries are included in the programme. In

In addition to this, BHP carried out sampling upstream and downstream of the WWTP the results of which are detailed in **Table F.3**.

There are no EPA Monitoring Stations located either upstream or downstream of the Monasteraden WWTP discharge point on the receiving stream. The closest EPA Monitoring Station downstream of the discharge point is on Lough Gara (**Figure F.4**). The requirement of Lough Gara is to retain its “Good Status”.



**Figure F.4: Schematic Location Plan of Sampling Points and Relevant Discharges**

**Tables F.1** show the results from water quality monitoring carried out by BHP on behalf of Sligo County Council and a comparison with relevant legislative standards. The receiving water is not a designated Salmonid River, and so standards are instead taken from the Surface Water Regulations, 2009; however some guidance is taken from the Salmonid Waters Regulations in relation to Suspended Solids. These results are from samples taken 25 meters upstream and 100 meters downstream of the primary discharge point from the Wastewater Treatment Plant. When the results were compared with the Surface Waters Regulations, 2009 non-compliances were recorded in relation BOD, Orthophosphate and Zinc.

A level of 3.0mg/l BOD was recorded upstream of the discharge point and a level of 3.0mg/l BOD was recorded downstream on the 10/11/09, the only occasion that this parameter was sampled for these levels exceed the limit of 2.6mg/l. On the same sampling occasion the level of Orthophosphate was above the required limit both upstream and downstream of the discharge, with a level of 0.13mg/l recorded upstream and a level of 0.12mg/l recorded downstream which exceeds the limit of 0.035mg/l. Similarly on the same sampling occasion the level of Zinc was above the required limit both upstream and downstream of the discharge, with a level of 56ug/l recorded upstream and a level of 12ug/l recorded downstream which exceeds the limit of 8ug/l. A level of 13ug/l Lead was recorded downstream which exceeds the limit of 7.2ug/l. A level of <1ug/l Cadmium was recorded both upstream and downstream of the discharge point which may be outside the required Maximum Allowable Concentration (MAC) limit of 0.45ug/l. Similarly a level of <0.2ug/l Mercury was recorded both upstream and downstream of the discharge point which may be outside the required MAC limit of 0.07ug/l. However due to the limits of quantitation it is unclear if the levels of Cadmium and Mercury exceed the maximum levels.

**Table F.3** shows the results for some parameters that were sampled on the 10/11/09

**Table F.3 Water Quality – Receiving Waters (Sligo County Council)**

	<b>BOD<sub>5</sub> (mg/l)</b>	<b>Total Ammonia (mg N/l)</b>	<b>Ortho-P (mg/l)</b>	<b>Suspended Solids (mg/l)</b>
<b>25 meters u/s</b>	3.0	0.04	0.13	23.00
<b>100 meters d/s</b>	3.0	0.29	0.12	10.00
<b>Standard</b>	<b>2.6*</b>	<b>0.14*</b>	<b>0.035*</b>	<b>25**</b>

\*Surface Waters Regulations, 2009 (For "Good Status")

\*\*Salmonid Waters Regulations, 1988

The Surface Waters Regulations, 2009 prescribe standards for water quality for listed substances which include solvents (dichloromethane, toluene, xylene), metals (arsenic, chromium, copper, lead, nickel, zinc), pesticides (atrazine, simazine, tributyltin) and certain other compounds (cyanide and fluoride). Monitoring of dangerous substances carried out by BHP on behalf of Sligo County Council on the 10/11/09 on receiving waters both upstream and downstream of the WWTP indicate that exceedences for Lead and Zinc were recorded as discussed above.

**Conclusion**

As discussed above, the average value recorded for the various parameters in the discharge indicated compliance when compared with the Urban Wastewater Treatment Regulations, 2001. Possible exceedences were recorded in the discharge for Cadmium and Mercury when compared to the Surface Waters Regulations, 2009 as discussed above.

The recorded levels for BOD, Orthophosphate, and Zinc exceeded the relevant standards both upstream and downstream of the WWTP discharge. Exceedences were recorded for Lead downstream of the discharge point. A level of <1ug/l Cadmium was recorded both upstream and downstream of the discharge point similarly a level of <0.2ug/l Mercury was recorded both upstream and downstream of the discharge point. However due to the limits of quantitation it is unclear if the levels of Cadmium and Mercury exceed the maximum levels.

Lough Gara, downstream of the Discharge Point, was given a target of retaining its Good Status. Receiving waters downstream of the WWTP do comply with the recommended limit of 0.035mg/l P as set out in the Surface Waters Regulations, 2009 for waters with a "Good Status" target

There are no public water supplies or group water scheme abstraction points located downstream of the WWTP. Other than the non-compliances discussed above, the water quality is of relatively good quality.

# ATTACHMENT G.1

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## G.1 Programme of Improvements

There is currently no programme of improvements for the Monasteraden WWTP.

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# ATTACHMENT G.2

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The Phosphorous Implementation Report, 2006 for County Sligo is attached.

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## SLIGO COUNTY COUNCIL

# IMPLEMENTATION REPORT FOR THE PHOSPHORUS REGULATIONS, 1998

**For period up to July 2006**

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## SECTION 1

### WATER QUALITY IN FUNCTIONAL AREA

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## SECTION 1 WATER QUALITY IN FUNCTIONAL AREA

### 1.1 River Water Quality

Under the Phosphorous Regulations 1998 Sligo County Council are obliged to improve to satisfactory, or maintain the satisfactory water quality of 43 rivers. This includes the Garavogue River, which is part of the Lough Gill catchment which is subject to a separate measures report. This implementation report therefore deals with the remaining 42 rivers.

A full list of current river water quality stations is set out in Table 1.1 in Appendix 1. This table sets out the baseline quality, current quality and target quality to be achieved by the end of 2007, for each river station.

A summary of the current status based on biological river water quality in County Sligo is presented in Table 1 below. The biological monitoring indicates that in the monitoring period 2004-2006, 85% of the river stations monitored in Sligo are classified as having satisfactory (i.e. Q4-5 or Q5) water quality and 15% were classified as having unsatisfactory quality (i.e. Q3-4 or less).

Table 1 Summary of current river water quality in County Sligo based on biological results.

<i>Biotic Index</i>	<i>Pollution Class</i>	<i>Quality Status</i>	<i>No. Baseline Stations in Category</i>	<i>No. Stations in Category in current implementation report</i>
Q5	Class A	Unpolluted	3	4
Q4-5			45	39
Q4			35	46
Q3-4	Class B	Slightly Polluted	10	9
Q3	Class C	Moderately Polluted	11	4
Q2-3			0	2
Q2	Class D	Seriously polluted	1	0
Q1-2			0	1
Q1			0	0
Total			105	105
% Satisfactory			79%	85%
% Unsatisfactory			21%	15%

Since 1995-1997, there has been an improvement in the number of stations of satisfactory water quality, with 85% of stations currently of satisfactory water quality, compared with 79% in the baseline survey. When compared with baseline data, biological monitoring for the current reporting period indicates an increase in the number of Q5 and Q4 sites, but a decrease in the number of Q4-5 sites.

Of the stations monitored in the period 2004-2006, 69% of the stations monitored were in compliance, meeting the biological quality targets of the regulations, and 31% need improvement.

Under the Phosphorous Regulations 1998, there are currently 33 stations along 25 rivers that need improvement. A summary of the status of each of these sites is given in Table 2 below. River names and stations together with their baseline status, current status and that which has to be achieved by the end of 2007 are given in Table 3 below. Of the 33 stations that require improvement, 14 stations are of unsatisfactory water quality while the remaining 19 are of satisfactory water quality. A total of 27 stations have dis-improved from the baseline Q rating. 53 river stations have remained static and are of satisfactory water quality and 25 river stations have improved from the baseline Q rating either reaching or exceeding the target Q rating.

Table 2 Summary of biological status of stations needing improvement.

<i>Biotic Index</i>	<i>Pollution Class</i>	<i>Quality Status</i>	<i>No. Stations needing improvement.</i>
Q5	Class A	Unpolluted	n/a
Q4-5			3
Q4			16
Q3-4	Class B	Slightly Polluted	7
Q3	Class C	Moderately Polluted	4
Q2-3			2
Q2	Class D	Seriously polluted	0
Q1-2			1
Q1			0
Total			33
% Satisfactory			58%
% Unsatisfactory			42%

Table 3. Rivers and associated sites needing improvement.

	River Station	Biological Monitoring Station	Baseline Q Value	Current Q Value	Standard Q Value to be achieved by 2007
1	Feorish (26F02)	0050	4-5	4	4-5
2	Corsallagh (34C12)	0400	3	3	3-4
3	Leaffony (34L01)	0100	4-5	4	4-5
4	Moy (34M02)	0010	3	3	3-4
	Moy (34M02)	0050	4-5	4	4-5
5	Owenaher (34O01)	0100	4-5	4	4-5
6	Tubbercurry (34T02)	0050	2	1-2	3
	Tubbercurry (34T02)	0200	3	2-3	3-4
7	Bunninadden Stream (35B08)	0200	3-4	3	4
8	Buncrowey (35B09)	0500	5	4-5	5
9	Clooneen (35C01)	0500	4	3-4	4
10	Douglas (35D02)	1400	4-5	4	4-5
11	Drumcliff (35D04)	0250	4	3-4	4
12	Duff (35D05)	0250	4-5	4	4-5
	Duff (35D05)	0400	4-5	4	4-5
13	Dunneill (35D06)	0050	5	4-5	5
14	Doonbeakin (35D09)	0200	4-5	4	4-5
15	Doonowney (35D12)	0400	3	3	3-4
	Doonowney (35D12)	0800	3-4	3-4	4
16	Dunmorán (35D16)	1400	4-5	4	4-5
17	Easkey (35E01)	0010	4-5	3-4	4-5
	Easkey (35E01)	0020	4-5	4	4-5
	Easkey (35E01)	0100	4-5	4	4-5
18	Finned (35F01)	0200	4-5	4	4-5
19	Grange (35G04)	0080	5	4-5	5
	Grange (35G04)	0200	4-5	4	4-5
20	Gurteen stream (35G05)	0200	3-4	2-3	4
21	Killoran Lough Stream (35K02)	1000	4	3-4	4
22	Lugdoon Stream (35L01)	0400	4-5	4	4-5
23	Owenmore (35O06)	0020	4-5	4	4-5
24	Unshin (35U01)	0100	3-4	3-4	4
	Unshin (35U01)	0400	4-5	4	4-5
25	Willsborough	0300	3-4	3-4	4

Sligo County Council have adopted a catchment management approach to implementing the Phosphorous Regulations and is concentrating initially on the rivers of the lowest water quality rating in order to implement remedial measures at an early stage.

Sligo County Council continues to work closely with the Western River Basin District and the Shannon River Basin District to ensure monitoring and measures are implemented at appropriate locations.

## 1.2 Lake Water Quality

The four lakes covered by this implementation report are Lough Arrow, Lough Easkey, Lough Talt and Lough Gara. All four lakes are of satisfactory water quality with Lough Arrow and Lough Gara classified as Mesotrophic and Lough Easkey and Lough Talt classified as Oligotrophic. Classifications as confirmed by the EPA are based on Chlorophyll concentrations, elevated Total Phosphorus concentrations recorded during sampling were not taken into account by EPA when classifying these lakes.

Table 1.2 details the trophic status of each of the four lakes. The table sets out the baseline quality, current quality where applicable and target quality for each lake.

Sligo County Council is obliged to maintain the satisfactory baseline water quality classification of the four lakes under the Phosphorous Regulations.

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## SECTION 2

# IMPLEMENTATION OF MEASURES

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## SECTION 2 IMPLEMENTATION OF MEASURES

Table 2.1, 2.2 and 2.3 in Appendix 1 detail the specific measures which are proposed in relation to each stretch of river and each lake in County Sligo, cover by the Phosphorus Regulations.

These tables outline the actions taken since the previous implementation report and indicate the status of each measure, i.e. whether it has been completed or not. If a measure has not been completed, a revised timescale for completion is indicated.

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**SECTION 3**

**PROGRAMME OF MEASURES**

### 3.1 **PLANNING, CONTROL AND ENFORCEMENT MEASURES**

#### 3.1.1 **Progress during the reporting period**

##### 3.1.1.1 **General Measures**

- **Source Protection Plans**

Draft Source Protection Plans have been prepared for Kilsellagh PWS, Calry PWS and Lough Talt PWS.

- **Groundwater Protection Plan**

Sligo County Council has engaged the Geological Survey of Ireland to carry out a ground water protection scheme for the County. Work on an interim Groundwater protection Scheme for the County commenced in 2006.

- **Waste Management Plan**

A review of the Connaught Waste Management Plan was completed in 2006. The management of waste under the Connaught Waste Management Plan along with the enforcement of current waste management legislation should reduce the potential risk to waters from pollution from solid waste. The enforcement of waste management legislation is carried out by two dedicated Waste Enforcement Officers.

Two no. civic amenity sites for recycling are currently in operation in County Sligo. Sligo is not obliged to provide a landfill for residual waste under the plan.

- **Sligo Main Drainage Plant and Sludge Management Plan (update)**

Contractual negotiations are on-going in relation to the Sligo Main Drainage Project and it is hoped that contacts will be signed in autumn 2006.

The contract will include the provision of a Main Pumping Station, Waste Water Treatment Works, Outfall, Sludge Treatment Centre and the provision of Sludge Management Facilities at various outlying treatment plants. The Contract is a Design Build and Operate form of Contract with

an operation and maintenance period of 20 years. The treatment works will have a capacity to treat waste water for a combined domestic and commercial population equivalent of 50,000 and it has to be capable of being expanded to 80,000 at a future date.

When complete, it will not only serve Sligo City, which has Gateway Status, but also surrounding areas including:

- Ballincar/Cregg/Rosses Point
- Carrowroe
- Teesan/Lisnalurg
- Hazelwood/Ballinode
- Cummeen

In addition to contributing to the growth of the region, the scheme will ensure the protection of a quality environment in Sligo bay. The 'state of the art' treatment plant will mean the elimination of untreated discharges into Sligo Bay and will enable Sligo County Council to fulfill its obligations under EU Directives.

- **Enforcement Measures**

Enforcement measures under the Water Pollution and Waste Management legislation are ongoing. Complaints are dealt with on a priority basis based on the potential risk of pollution from the activity or incident. All cases were followed up, resulting in corrective action taken by voluntary means or by persuasive means, through legal notices and/or court action.

### 3.1.1.2 Measures for Point Source Discharges within Catchments

- **Licensed Discharges**

A total of 20 discharge licences have been issued in the county, these licences continue to be monitored and enforced on a regular basis.

An assessment of Section 16 licence requirements in the Borough and in a number of major towns around the County has been carried out and it is proposed to submit proposals to management regarding staffing requirements to carry out the necessary work.

- **Sewage Treatment Plants**

All new plants and upgrades to existing plants provide for Phosphorus removal in their design. Progress has been made with regard to the following Council Urban Waste Water Treatment Plants: -

#### Tubbercurry Urban Waste Water Treatment Plant

The preliminary report for this plant has been completed. It is hoped that this plant will be upgraded within the next two years. This plant discharges to the Tubbercurry stream, which is a tributary of the River Moy.

#### Carney Waste Water Treatment Plant

Carney Waste Water Treatment Plant upgrade is at tender approval stage with construction starting early 2007 and completion by late 2007. The plant will have a treatment capacity of 2500PE.

#### Coolaney Urban Waste Water Treatment Plant

Coolaney Waste Water Treatment Plant currently being upgraded to a treatment capacity of 2500PE. The plant should be fully operational late by 2006. This plant discharges to the Owenbeg River.

#### Dromore West Urban Waste Water Treatment Plant

Dromore West Waste Water Treatment Plant currently being upgraded to a treatment capacity of 2500PE, the plant should be fully operational by late 2006/early 2007. This plant discharges to the Dunneill River.

#### Gurteen Waste Water Treatment Plant

Gurteen Waste Water Treatment Plant upgrade is at tender approval stage with construction starting early 2007 and completion by late 2007. The plant will have a treatment capacity of 2500PE.

#### Aclare Urban Waste Water Treatment Plant

Construction of the new waste water treatment plant in Aclare is complete. This plant discharges to the Eignagh River, which is a tributary of the River Moy.

Cloonacool Urban Waste Water Treatment Plant

Construction of the new waste water treatment plant in Cloonacool is complete. This plant discharges to the River Moy.

Ballisodare Urban Waste Water Treatment Plant

Construction of the new waste water treatment plant in Ballisodare is complete. This plant discharges to Ballisodare Bay.

- **Storm Water Overflows**

It is proposed to liaise with the Water Services Section in relation to provision of storage and treatment facilities for storm water overflows.

- **Planning Applications**

The Environment Section assesses planning applications for commercial, agricultural and domestic developments with a risk of point source discharges and applies conditions to planning permission to control discharges to ensure that the proposed development does not adversely affect water quality.

**3.1.1.3 Measures for Diffuse Source Discharges within Catchments**

- **Farm Surveys**

Table 4 lists the lake/rivers/streams on which farm surveys have been carried out. The surveys incorporate details of farm management practices, the farm yard structures, the herd details; the slurry spread area topography, soil type, results of any recent soil phosphorus tests, the watercourses in the vicinity of the farm etc.

Table 4 Lakes/rivers/streams where farm surveys have been carried out.

Farm Surveys carried out '04-'06

Buncrowey Stream

Finned River

Grange River  
Gurteen Stream  
Unshin River  
Leaffoney River  
Moy River  
Feorish River  
Lough Arrow  
Lough Talt  
Calry PWS Source Catchment  
Kilsellagh PWS Source Catchment

- **On-site treatment system surveys**

Septic tank surveys have been completed in the Calry, Lough Talt and Kilsellagh PWS catchments.

A technical guidance document for on-site treatment systems was adopted and this sets out the policy for on-site wastewater treatment systems. In addition a panel of approved consultants has been set up to ensure that site suitability assessments are carried out in accordance with the requirements of the EPA manual.

- **Nutrient Management Planning**

Nutrient Management plans are being requested from intensive farmers in certain high-risk areas in the county.

- **Forestry**

All forestry developments in sensitive catchments are referred to Environmental staff for their information and input.

An Indicative Forestry Strategy is being prepared for County Sligo. A submission on the protection of water quality shall be prepared by Environmental staff.

Forestry developments in selected catchments were monitored to assess the impact of forestry on water quality.

Sligo County Council participates in the WRBD Forestry and Water Steering Group.

- **Planning Control**

The Environment Section assesses planning applications for commercial, agricultural and domestic developments with a risk of diffuse pollution and applies conditions to planning permission to control discharges to ensure that the proposed development does not adversely affect water quality.

### 3.1.2 Problems Encountered

Lack of dedicated staff has been a problem, although additional staff were recruited to deal with the Phosphorus Regulations, other staff left the Section, leaving little time for the Phosphorus Regulations staff to deal with implementation of measures. The targets and objectives of this initiative will only be realised if the required financial resources are forthcoming from central government.

Staffing Embargo has delayed the commencement of the Groundwater Protection Scheme for County Sligo.

Measures proposed under the Phosphorus Regulations have not been fully implemented due to pressures of other work commitments, resulting from increasing legislative requirements.

The programme to ensure all facilities, which discharge to sewers are identified and licensed, where required is resource constrained.

The infrastructure programme being advanced by the Water Services Section to upgrade municipal wastewater treatment plants can take up to 10 years to achieve, as they are dependant on various funding sources and priority requirements.

There is an increasing number of planning applications for large developments proposing to discharge to groundwater. Lack of policy in relation to design of percolation areas for these developments is a serious concern.

Spot check monitoring of forestry developments does not give a true reflection of the full impact of forestry on water quality.

### 3.1.3 Future Plans/New Directions

Progress priority work programmes for 2006-2008 and continue enforcement of powers where necessary.

Carry out follow up assessments on single house planning applications, to assess adequacy of effluent treatment systems.

Work and consult with the Forward Planning Section of the Planning Department in relation to formulation of Development Plans / Local Area Plans, so that cross functional issues between the Environment and Planning Departments can be addressed.

Work and consult with the Capital Work Section of the Water Services Department in relation to future plans for wastewater treatment plants, so that cross functional issues between the Environment and Water Services Departments can be addressed.

It is felt that in the long-term site visits to forestry sites are required to minimise adverse impacts on water quality.

Enforce existing discharge licences and inspect other premises/industries with a view to licensing them if required.

Source Protection Plans will be prepared for three other Public Water Supply Sources.

Implement programme to review all licences greater than 10 years old to take account of the requirements of the Phosphorus Regulations.

## 3.2 CONSULTATIVE AND CO-OPERATIVE MEASURES

### 3.2.1 Progress during the reporting period

- **Catchment Management**

Sligo County Council recognise the importance of consultative and Co-operative structures in achieving successful management of catchments. County Sligo forms part of the Western and Shannon RBD, the projects enable co-operation between local authorities and all relevant stakeholders. Through steering groups and the various workshops associated with these projects, valuable working networks have been established, which in turn are used to advance measures to protect water quality.

- **Forestry**

A consultation process has been established with Coillte, and the Forest Service.

- **Farming**

A number of presentations have been given to REPS participants on good farming practice in relation to water quality issues.

An Environmental Leaflet on good farming practice which was prepared for the farming community is circulated at every suitable opportunity.

- **On-site Treatment Systems**

A number of press releases were issued in relation to on-site treatment systems. In addition, an annual seminar was held for planning agents to ensure that there is a clear understanding of Sligo County Council's policy in relation to on-site treatment systems.

### 3.2.2 Problems Encountered

Due to lack of resources Technical Management Committees were not re-established during this implementation period.

### 3.2.3 Future Plans/New Directions

Maximise the function of the Environment Strategic Policy Committee (SPC's) to develop policies within the Council to reduce eutrophication.

Participate in the River Basin District Projects. This will provide for a broad interagency and cross-sectoral co-operative programme, to ensure the development of a successful catchment management system.

A leaflet on on-site treatment systems is to be prepared.

It is proposed to update Sligo County Council's farming leaflet, entitled "Working with farmers to improve water quality", to incorporate the requirements of the Nitrates Regulations.

## 3.3 **MONITORING, AUDITING AND REVIEW**

### 3.3.1 Progress during the reporting period

- **Monitoring Programmes**

Monitoring programmes were developed annually for rivers and lakes, urban waste water treatment plants and licensed discharges. The present EPA and County Council Monitoring programme place greater emphasis on the monitoring requirements of the Phosphorus Regulations. During 2006, Sligo County Council consulted with the Western River Basin District Project in relation to the National RBD Monitoring Programme, changes to the proposed programme were made in light of local knowledge.

- **Small Streams Programme**

Sligo County Council participated in the small streams programme in consultation with the WRBD project.

- **Waste Water Discharges**

Phosphorus has been monitored at all our licensed discharges, urban wastewater treatment plants and associated receiving waters. This will

help to assess if discharges are impacting on rivers/lakes, and if phosphorus removal or stricter licensing limits are required. Additional staff were recruited in the last quarter of 2006, and it is hoped to recommence Phosphorus Monitoring again in early 2007.

- **Quality Control Measures**

Implementation of quality control procedures in the County Council Laboratory is continuing. The Council continue to participate in the EPA Inter-calibration Programme.

- **River Channel Surveys**

During this implementation period focus has been on unsatisfactory water quality stations, to investigate the cause of pollution. Stream channel surveys have been carried out on hot spot areas of the Ballymote Stream, and the Dunneil River. Stream surveys and farms surveys have been carried out on specific stretches of rivers/lakes. Table 5 below lists the river/streams/lakes where surveys have been carried out.

Table 5 Rivers/Lakes where surveys have been carried out.

**Surveys carried out 04-'06**

- Ballymote Stream
- Buncrowey Stream
- Dunneil River
- Finned River
- Grange River
- Gurteen Stream
- Unshin River
- Leaffoney River
- Moy River
- Tubbercurry Stream
- Feorish River
- Bellawaddy River
- Kilsellagh Feeder Streams
- Lough Talt Feeder Streams

- **Geographical Information Systems**

All staff have been trained to use MapInfo, and specific databases are now being developed within the Environment Section, to aid water quality management.

GPS has been used during the last implementation period to map all discharges, and survey details.

- **LabInfo**

LabInfo is used to store all water quality information generated in-house, it is hoped that the LGCSB will soon develop the system further so this information can be integrated into GIS, which will enable more informed management decisions to be made.

### 3.3.2 **Problems Encountered**

Shortfalls in biological river water monitoring have been identified.

There have been delays in obtaining copies of datasets from the River Basin Management Projects.

Waste Water monitoring programmes were suspended for a short period due to loss of staff, priority was given to monitoring drinking water supplies during this period.

### 3.3.3 **Future Plans/New Directions**

Shortfalls in biological river water monitoring have been identified and a request has been made to the EPA to revise their current programme to include 9 stations which have not been monitored since the period 1995-1997.

## 3.4 **PUBLIC EDUCATION AND ADVISORY MEASURES**

### 3.4.1 **Progress during the reporting period**

- **Water Quality in general.**

The Environmental Education Officer continues to give public talks to local community groups and schools to increase public awareness on the environment and help towards a positive change in attitude and practices. To date 78% of Primary Schools, and 93% of Secondary

Schools in the County are participating in the Green Schools Programme and efforts are now being focused on schools which are not part of the programme, in an effort to encourage them to participate.

The Communication Officer continues to be a valuable resource, helping to make information accessible through publicity campaigns such as radio, newspapers, etc.

The Council web site was updated with new water quality information.

- **On-site Treatment Systems.**

A number of press releases were issued in relation to on-site treatment systems. In addition, an annual seminar was held for planning agents to ensure that there is a clear understanding of Sligo County Council's policy in relation to on-site treatment systems.

Presentations have been made at to the Environment and Planning Strategic Policy Committees.

- **Agriculture.**

A number of REPS talks have been given to farmers, the theme of which has been preservation of water quality.

### 3.4.2 **Problems Encountered**

Other work commitments have often taken the focus off public education and advisory measures.

### 3.4.3 **Future Plans/New Directions**

Development of sectoral education programmes.

Information leaflet to be published on on-site effluent treatment systems.

Agricultural leaflet to be updated to include changes introduced by the Nitrates Regulations.

Presentations on water pollution control will be given as required.

### 3.5 OTHER NATIONAL AGRI-ENVIRONMENTAL AND MISCELLANEOUS MEASURES

#### 3.5.1 Progress during the reporting period

- **Financial Measures**

The capital expenditure required to upgrade Council Urban Waste Water Treatment Plants is detailed in Sligo County Council's revised submission on Water Services Investment Programme, Assessment of Needs Report, 2004-2006.

#### 3.5.2 Problems Encountered

As detailed in the initial measures report and subsequent implementation reports the entire programme of implementation is dependent on provision of adequate finances. New legislation is being introduced without the provision of the resources, by the DOEHLG, necessary to deal with the additional responsibilities posed by this new legislation, therefore making it difficult to concentrate resources in one particular area.

#### 3.5.3 Future Plans/New Directions

The operational plan for the Environment Section will focus on maintaining and preserving water quality in County Sligo.

# SUMMARY AND CONCLUSION

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## SECTION 3.6 - SUMMARY AND CONCLUSION

This implementation report sets out the overall management approach by Sligo County Council to implement the requirements of the 1998 Phosphorus Regulations. These regulations have provided the basis for a more focused approach to be developed towards work programmes and prioritizing of resources, within the Environment Section, however resource issues have limited progress in this area.

Biological monitoring indicates that in the monitoring period 2004-2006, 85% of the river stations monitored in Sligo are classified as having satisfactory (i.e. Q4-5 or Q5) water quality and 15% were classified as having unsatisfactory quality (i.e. Q3-4 or less).

*The 15% of unsatisfactory stations is broken down to 33 stations along 25 rivers that need improvement. Of the 33 stations that require improvement, 14 stations are of unsatisfactory water quality while the remaining 19 are of satisfactory water quality.*

The four lakes covered by this implementation report are Lough Arrow, Lough Easkey, Lough Talt and Lough Gara all have maintained their satisfactory water quality status since the last implementation report.

### **Successes**

A number of stream surveys have been carried out to identify point sources and land use within each catchment area.

The river and lake water monitoring programmes have been revised with greater emphasis now placed on rivers where poor water quality conditions have been identified. Enforcement measures are on-going under the Water Pollution Acts and Waste Management Act.

Comprehensive monitoring programmes are in place for waste water treatment plants and licensed discharges.

A number of new sewage treatment plants have been constructed within the County and plans have been drawn up to upgrade a number of others.

**A number of press releases have issued to highlight awareness of water quality issues and work been carried out in this area within the County.**

**Source protection plans have been drafted for three Public Water Supplies, and an interim groundwater protection plan is being prepared for the County.**

**A review of policy in relation to on-site treatment systems and agricultural developments took place and work is on-going in promoting awareness of these policies.**

**In addition presentations have been given to members of the farming community. The environmental leaflet prepared for the farming community which details the issues around agricultural pollution control, and some specific requirements of Sligo County Council continues to be circulated.**

Sligo County Council participates in the Western and Shannon RBD, these projects enable co-operation between local authorities and all relevant stakeholders with the aim of achieving good status in all water bodies by 2015. Through steering groups and the various workshops associated with these projects, valuable working networks have been established, which are in turn used to advance measures to protect water quality.

### ***New Initiatives Proposed***

It is proposed to progress priority work programmes under the Phosphorus Regulations during the period 2006-2008 and to continue enforcement of powers where necessary.

Carry out follow up assessments on single house planning applications, to assess adequacy of effluent treatment systems.

Work and consult with the Forward Planning Section of the Planning Department in relation to formulation of Development Plans / Local Area Plans, so that cross functional issues between the Environment and Planning Departments can be addressed.

Work and consult with the Capital Works Section of the Water Services Department in relation to future plans for wastewater treatment plants, so that cross functional issues between the Environment and Water Services Departments can be addressed.

It is felt that in the long-term site visits to forestry sites are required to minimise adverse impacts on water quality.

Enforce existing discharge licences and inspect other premises/industries with a view to licensing them if required.

Implement programme to review all licences greater than 10 years old to take account of the requirements of the Phosphorus Regulations.

Source Protection Plans will be prepared for three other Public Water Supply Sources.

### **Problems**

*Lack of dedicated staff has been a problem, although additional staff were recruited to deal with the Phosphorus Regulations, other staff left the Section, leaving little time for the Phosphorus Regulations staff to deal with implementation of measures. The targets and objectives of this initiative will only be realised if the required financial resources are forthcoming from central government.*

Measures proposed under the Phosphorus Regulations have not been fully implemented due pressures of other work commitments, resulting from increasing legislative requirements.

There is a limited amount of biological quality information available.

Delays in securing funding for major waste water infrastructural projects. Programmes to upgrade/ construct new waste water treatment systems can take a significant amount of time, as they are dependent on funding from various sources.

Lack of national protocol on many aspects of water pollution control means that a lot of resources are wasted at County level trying to develop protocols etc.

Management of problems resulting from combined foul sewer overflows is an issue.

Lack of an integrated information management tool, Local Authorities, the EPA and the HSE all use different databases to store water quality information, which makes it difficult to transfer information between organisations.

# APPENDIX 1

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County Name	River Name	River Code	Biological Monitoring Station	Station Location Name	Baseline Q-value	1995-97 Q-value	1998-00 Q-value	2001-03 Q-values	Standard to be Achieved by 2007 Q Value	MRP Value ug/l P	2001 MRP Value ug/l P	2002/3 MRP Value ug/l P	Standard to be Achieved by 2007 MRP Value	Has Either Standard Been Achieved?	Has Either Standard Been Achieved 2001?	Has Either Standard Been Achieved 2003?	Improvement or Decline 2003	LA Suspected Source of Pollution	EPA Suspected Source of Pollution	Reason for Improvement	Does an Article 3(9) Extension Apply?	If Yes, What is the revised compliance date?
Sligo	BOYLE	26B08	0100	Cuppanagh Bridge	4	4	4	4	4				30	y	y	1						
Sligo	FEORISH (BALLYFARNON)	26F02	0050	Bridge N. of Coolemoreen	4-5	4-5	4	4	4-5				20				D					
Sligo	FEORISH (BALLYFARNON)	26F02	0080	Br N of Ballyouller	4-5	4-5	4-5	4-5	4-5				20	y	y	1						
Sligo	KILMACSTRANNY	26K03	0700	2nd Br u/s L. Skean	4	4	4		4				30	y	y							
Sligo	KILMACSTRANNY	26K03	0800	First Bridge u/s Lough Skean	4	4		4	4				30			1						
Sligo	BELLANAMEAN	34B04	0200	Br 1.5 km NE of L. Naskea	4-5	4-5	4	4-5	4-5				20		y	1						
Sligo	BELLANAMEAN	34B04	0500	Bridge u/s Eignagh River	4-5	4-5	4-5	4-5	4-5				20	y	y	1						
Sligo	BELLAWADDY	34B05	0100	Bridge E. of Tullylin	3	3	4	4	3-4				50	y	y	1					I*	
Sligo	BELLAWADDY	34B05	0200	Knocknagower Bridge	4	4	4	4-5	4				30	y	y	1					I	
Sligo	CORSALLAGH STREAM	34C12	0400	Br N Corsallagh	3	3			3-4				50									
Sligo	EIGNAGH	34E01	0100	Bridge 1.5 km d/s Lough Talt	4-5	4-5	4-5	5	4-5	10			20	y	y	1					I	
Sligo	EIGNAGH	34E01	0200	Bridge in Aclare	4	4	4	4-5	4	20			30	y	y	1					I	
Sligo	EIGNAGH	34E01	0300	Bridge u/s Moy River conf	4	4	4-5	4	4	20			30	y	y	1						
Sligo	LEAFFONY	34L01	0100	Bridge N.W. of Crooknoona	4-5	4-5	4-5	4	4-5				20	y								D
Sligo	LEAFFONY	34L01	0180	Ford nr Cloonycarne	3-4	3-4	4	4	4				30	y	y	1					I	
Sligo	LEAFFONY	34L01	0260	Ford d/s Cabragh River confl	3	3	4	3-4	3-4				50	y	y	1					I	
Sligo	LEAFFONY	34L01	0300	Br NW Sraheens	4-5	4-5			4-5				20									
Sligo	LENYVEE	34L06	0300	Bridge u/s Owenaher River	4-5	4-5	4-5	5	4-5				20	y	y	1					I	
Sligo	LOUGHANABOLL	34L07	0100	Bridge u/s Owenaher River	4	4	4-5		4				30	y	y							
Sligo	MOY	34M02	0010	Branchfield Br	3			3	3-4				50									
Sligo	MOY	34M02	0050	Bridge at Cornaleck	4-5	4-5	4-5	3	4-5				20	y								D*
Sligo	MOY	34M02	0100	Bridge S.E. of Cloonacool	4-5	4-5	5	4	4-5	19	23.5	17	20	y		y (P)						D
Sligo	MOY	34M02	0300	Annagh Bridge	4-5	4-5	4-5	4-5	4-5	13			20	y	y	1						
Sligo	MOY	34M02	0400	Bridge at Banada	3	3	4-5	4-5	3-4	23			50	y	y	1						I*
Sligo	MOY	34M02	0420	Ford N. of Ballygallagart	4	4	4	4-5	4				30	y	y	1						I
Sligo	MULLAGHANOE	34M03	0100	Br WNW of Bellahy	2-3	2-3	2-3	3-4	3	41			70	y (P)	y	1						I*
Sligo	MULLAGHANOE	34M03	0190	0.2km d/s Charles Branch confl	3	3	3-4	3-4	3-4				50	y	y	1						I
Sligo	MULLAGHANOE	34M03	0200	Br at Cloonlaugh	4			4	4				30		y	1						
Sligo	MULLAGHANOE	34M03	0220	Br S.W. of Cully Cross Roads	3	3	3-4		3-4				50	y	y							
Sligo	MAD	34M04	0100	Bridge u/s Moy River confl	3	3	3	3-4	3-4				50		y	1						I
Sligo	OWENAHER	34O01	0050	Ford E. of Zion Hill	4-5	4-5	4-5	5	4-5				20	y	y	1						I
Sligo	OWENAHER	34O01	0100	Bellanagraugh Bridge	4-5	4-5	4-5	4-5	4-5	15			20	y	y	1						I
Sligo	OWENGARVE (SLIGO)	34O03	0100	Bridge in Curry	4-5	4-5	5	4	4-5				20	y								D
Sligo	OWENGARVE (SLIGO)	34O03	0200	Bridge u/s Moy River confl	4-5	4-5	3-4	5	4-5	26	35		20		y	1						I
Sligo	TUBBERCERRY	34T02	0050	Br 1 km W. of Tubbercerry	2	2	2-3	2	2				70									
Sligo	TUBBERCERRY	34T02	0200	Br just u/s Moy River	3	3	3	3	3-4				50									
Sligo	BALLYMOTÉ STREAM	35B04	0040	Ballymote, Br S E of Church	3-4	3-4	3	4	4				30			1						I
Sligo	BALLYMOTÉ STREAM	35B04	0100	Bridge S. of Emlaghfad Glebe	4	4	3	4	4				30			1						
Sligo	BALLYSODARE	35B05	0100	Ballysodare Bridge	4	4	4-5	4-5	4	22			30	y	y	1						I
Sligo	BUNNANADDAN STREAM	35B08	0200	Ford N.W. of Bunnanaddar	3-4	3-4	4	3	4				30	y	y							D
Sligo	BUNCROWEY	35B09	0100	Br near Old Shooting Lodge	3	3	3		3-4				60			1						I*
Sligo	BUNCROWEY	35B09	0400	Ford N of Fartannan	4			4	4				30			1						
Sligo	BUNCROWEY	35B09	0500	Fords just u/s Easky River	5	5	4-5		5				15									
Sligo	CLOONEEN (SLIGO)	35C01	0500	Bridge N.W. of Killavil	4	4	4	3-4	4				30	y	y							D
Sligo	CLOONEEN (SLIGO)	35C01	0600	Bridge u/s Owenmore River	4	4	3-4	4	4				30			1						
Sligo	DOUGLAS (SLIGO)	35D02	1400	Riverstown, North Bridge	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	DRUMCLIFF	35D04	0250	Ford 2.3 km d/s Samp St.0200	4	4	4-5	3-4	4				30	y	y							D
Sligo	DRUMCLIFF	35D04	0400	Ford 500 m u/s Drumcliff Br	4	4	4-5	4	4				30	y	y	1						
Sligo	DUFF	35D05	0250	Brocky Br	4-5		4-5	4	4-5				20									D
Sligo	DUFF	35D05	0400	Bunduff Bridge	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	DUNNEILL	35D06	0050	NW Dunowla (NNW L Nafullow)	5	5	4-5	4-5	5				15									D
Sligo	DUNNEILL	35D06	0100	Br NE Dunneill	4-5	4-5	5	5	4-5				20	y	y	1						I
Sligo	DUNNEILL	35D06	0200	Donaghintraine Bridge	4	4	5	4-5	4				30	y	y	1						I
Sligo	DOONBEAKIN	35D09	0200	Bridge S. of Doonbeakin	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	DOONBEAKIN	35D09	0400	Ford u/s Dunneill River	4	4	4-5	4	4				30	y	y	1						
Sligo	DOONFLIN	35D10	0400	Bridge near Doonflin Lower	4-5	4-5	4-5	4-5	4-5				20	y	y	1						
Sligo	DOONFLIN	35D10	0600	S.E. of Aughris	4	4	4	4	4				30	y	y	1						
Sligo	DRUMFIN	35D11	0500	Bridge N. of Kingsbrook	4	4	4-5	4	4				30	y	y	1						
Sligo	DRUMFIN	35D11	0800	Closkeybeg Bridge	4	4	4	4	4				30	y	y	1						
Sligo	DOONOWNEY	35D12	0400	Bridge W of Doonowney	3	3	3		3-4				50									
Sligo	DOONOWNEY	35D12	0800	Bridge u/s Drumcliff Bay	3-4	3-4	4	3-4	4				30	y	y							
Sligo	DUNMORAN	35D16	1000	Bridge N.W. of Langford House	4	4	4-5	4-5	4				30	y	y	1						I
Sligo	DUNMORAN	35D16	1400	Bridge near Toberawnaur	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	EASKY	35E01	0010	Trasgarve d/s Lough Easky	4-5	4-5	4-5	3-4	4-5				20	y	y							D*
Sligo	EASKY	35E01	0020	Bridge u/s Gowlan River	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	EASKY	35E01	0100	Bridge at Camcuill	4-5	4-5	4-5	4	4-5				20	y	y							D
Sligo	EASKY	35E01	0200	Easky Bridge	4-5	4-5	4-5	4-5	4-5				20	y	y	1						
Sligo	FINNED	35F01	0100	Bridge E.N.E. of Rathmacurkey	4-5	4-5	4-5	4-5	4-5				20	y	y	1						
Sligo	FINNED	35F01	0200	Bridge S. of Ballycummin	4-5	4-5	3	4	4-5				20									D
Sligo	FINNED	35F01	0300	Finned Bridge	4	4	4	4	4				30	y	y	1						

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TABLE 2.2 IMPLEMENTATION PROGRAMME SUMMARY TABLE FOR RIVERS IN LOCAL AUTHORITY AREA											
Local Authority Name	Reporting Year	2006									
River	Reach of River	Standard	Measures	Targets	Actions	Timeframe	Responsible for Implementation	Progress to Date	Corrective Actions	Action Completed Within Timeframe Yes/No	If No, State Revised Timeframe
Ballymote Stream	Entire River	To maintain the Q index of all stations on Ballymote Stream.	Eliminate any point sources of pollution	Maintain the Biological Quality Rating of the Stream.	Monitoring survey of stream channel and immediate catchment	By 1/1/2003 Subject to funding	SEE ES	Surveyed stream channel and immediate catchment to determine extent of point sources - discharges identified	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and 12, 4 and 16 Notices	By 1/9/2003 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Ballisodare River	Entire River	To maintain a Q index of Q4 for the Ballisodare River by 2007	Reduce point source or diffuse sources of pollution	Maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/01/2007 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Buncrowey River	Entire River	To maintain Q4 status at stn 0400 and improve the Q index of Stn 0500 to Q5 on the Buncrowey River by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Rating to satisfactory and maintain satisfactory water quality	Monitoring survey of stream channel and immediate catchment	By 1/1/2007 Subject to funding	SEE ES	Stream channel surveyed, Water monitoring carried out and farms surveyed u/s of Stn 0500.	N/A	yes	N/A
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 4 and 16 Notices if required and Issue and enforce section 3 and 12 Notices	By 1/9/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Bunnanaddan Stream	Entire River	To improve the Q index at stn 0200 to Q4 by 2007	Reduce diffuse sources of pollution	Improve the Biological Quality Ratings to a satisfactory standard	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006	SEE ES	Ongoing	N/A	N/A	N/A
Clooneen River	Entire River	To improve Q Index at station 0500 to Q4 and to maintain the Q index at 4 at Stn 0600 by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 4 and 16 Notices if required and Issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Doonbeakin River	Entire River	To improve Q Index at station 0200 to Q4-5 and to maintain the Q index at 4 at Stn 0400 by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Rating to satisfactory and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2007 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Doonfin River	Entire River	To maintain the Doonfin River in a satisfactory quality Q4 to Q 4-5 by 2007	Reduce point source or diffuse sources of pollution	Maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2006 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Doonowney River	Entire River	To improve the Q index of the Doonowney River at station 0400 to Q3-4, and stn 0600 to Q4 by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Rating to satisfactory water quality	Monitoring survey of stream channel and immediate catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 4 and 16 Notices if required and Issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
					Establish a Phosphorous monitoring station on river	01/01/2001 Subject to funding	SEE ES	Done	N/A	N/A	N/A
					Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
Douglas River	Entire River	To improve the Q value at Stn 1400 to Q4-5 by 2007	Reduce point source or diffuse sources of pollution	Improve the Biological Quality Ratings to a satisfactory standard	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2007 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Drumcliffe River	Entire River	To improve Q Index at station 0250 to Q4 and to maintain the Q index at 4 at Stn 0400 by 2007	Reduce point source or diffuse sources of pollution	Maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/01/2007 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Drumfin River		To maintain Drumfin River at Q index 4 by 2007	Reduce point source or diffuse sources of pollution	Maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006 Subject to funding	SEE ES	None	Ongoing	N/A	N/A
Dunmorari River	Entire River	To maintain the Q Index at station 1000 at Q4 and to improve the Q index to 4-5 at Stn 1400 by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Rating to satisfactory and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Dunniel River	Entire River	To maintain the Q index of the Dunniel River at Q 4 to Q 4-5 by 2007 and to improve the Q index at station 0050 to Q5 by 2007	Reduce point source or diffuse sources of pollution	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	Stream survey and monitoring carried out, farm surveys by end end 2007	set 3 revised timescale	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A

River	Reach of River	Standard	Measures	Targets	Actions	Timeframe	Responsible for Implementation	Progress to Date	Corrective Actions	Action Completed Within Timeframe Yes/No	If No, State Revised Timeframe
Easkey River	Entire River	To improve stn 00100, 0020 and 0100 on the Easkey River in a satisfactory quality Q 4-5 by 2007 and to maintain stn 0200 at Q 4-5.	Reduce point source or diffuse sources of pollution	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/01/2007 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Finned River	Entire River	To maintain stn 0100 and 0300 at Q4-5 and 4 respectively and to improve the Q index at station 0200 to Q4-5 by 2007	Reduce point source or diffuse sources of pollution	Improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	Stream survey and monitoring carried out. farm surveys vis of Ballycummin	N/A	N/A	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices if required and Issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Gowlan River	Entire River	To maintain the Gowlan River in a satisfactory quality Q 5 by 2007	Reduce point sources or diffuse sources of pollution	Maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/01/2007 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Grange River	Entire River	To improve the Q index at station 0080 to Q5 and to improve the Q index at station 0200 to Q4-5 by 2007	Reduce point sources or diffuse sources of pollution	Improve Biological Quality Ratings to a satisfactory standard	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	Stream surveyed, farm surveys and sampling carried out.	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2006 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Gurteen Stream	Entire River	To improve the Q index of the Gurteen Stream to achieve Q4 standard by 2007	Eliminate any point sources of pollution	Improvement of water quality to satisfactory standard	Monitoring and survey of stream	By 01/09/2001 Subject to funding	SEE ES	Stream channel surveyed, monitoring carried out and farms surveys vis of stn 0200	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices and Issue and enforce section 3 and 12 Notices	By 01/09/2003 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
			Revise sampling programme		Increase water quality monitoring frequency	By 01/01/02	SEE ES	Increased Monitoring stations established	N/A	Yes	N/A
Killoran Lough	Entire River	To maintain the Q index of the Killoran Lough Stream at str 0500 at Q 4 and to improve Q index at Stn 1000 to Q4 by 2007.	Reduce point sources or diffuse sources of pollution	Improve Biological Quality Rating to satisfactory and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006 Subject to funding	SEE ES	Ongoing	N/A	No	N/A
Liskeagh Stream	Entire River	To maintain the Q index of the Liskeagh Stream at Q4 and 4-5 by 2007	Reduce point sources or diffuse sources of pollution	Maintain Biological Quality Rating to satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Lugdoon Stream	Entire River	To improve the Q index of the Lugdoon Stream at stn 0400 to Q index 4-5 by 2007	Reduce point sources or diffuse sources of pollution	Improve the Biological Quality Rating to satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/01/2007 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Owenbeg River	Entire River	To maintain the Owenbeg River in a satisfactory quality Q and Q 4-5 by 2007	Reduce point sources or diffuse sources of pollution	Maintain Biological Quality Rating at satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2006 Subject to funding	SEE ES	ongoing	N/A	No	N/A
Owenmore River	Entire River	To maintain the satisfactory quality of all stations at Q4 and Q4-5 by 2007	Upgrade Urban waste water treatment plants at Gurteen, Culfadda, Ballymote, Ballincarrow and Collooney to include Phosphorus removal	Maintain the water quality in the river at a satisfactory standard	Secure finance from Central Government	By 01/01/2006 Subject to funding	SEE CW DOS Infrastructure	Gurteen-Tender recommendations awaiting approval. Ballincarrow- Expressions of interest for Clients rep received	Set revised timetable	No	31/12/2008
					Provision of P removal in existing treatment plants	By 31/12/2006 Subject to funding	SEE CW	None	Set revised timetable	No	31/12/2008
			Reduce point source or diffuse sources of pollution		Control on spread of pig slurry in catchment	By 01/01/2006	SEE ES	ongoing	set a revised timescale	No	31/12/2007
					Farm surveys in catchment	By 01/01/06 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
					Designate areas where Nutrient Management Planning is needed	By 01/01/07 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
					Establish Multi-Sectoral Management Group for catchment management	By 01/01/07 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
					Establish Environmental Education Programme with particular emphases on farming community	By 01/06/2002 Subject to funding	SEE ES	Environmental Information Leaflet produced for Agricultural Sector and presentations given to REPS participants	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices and Issue and enforce section 3 and 12 Notices	By 01/06/2002 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A

River	Reach of River	Standard	Measures	Targets	Actions	Timeframe	Responsible for Implementation	Progress to Date	Corrective Actions	Action Completed Within Timeframe Yes/No	If No, State Revised Timeframe
Unshin River	Entire River	To improve the Q index at station 0400 to Q4-5 and to maintain the Q rating in the remainder of the river at Q4 to Q4-5 by 2007	Reduce point source or diffuse sources of pollution	To improve and maintain the Biological Quality Ratings to satisfactory standard.	Farm Surveys	By 01/01/2006 Subject to funding	SEE ES	River surveyed and sampled and farm surveys carried out u/s og Lissonny bridge	N/A	yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A
Willsborough Stream	Entire River	To maintain the Willsborough stream in a satisfactory quality Q4 to Q4-5 by 2007	Eliminate any point sources of pollution	Maintain satisfactory water quality standard in the river.	Monitoring and survey of stream and immediate catchment	By 01/01/2007 Subject to funding	SEE ES	Source Protection work carried out in headwaters of this Stream	Set revised timetable	n/a	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/01/2007 Subject to funding	SEE ES	Ongoing	N/A	No	N/A
		Hydrometric Area 34 Moy and Killela Bay									
Bellanamean River	Entire River	To maintain the Q index of Q4-5 on the Bellanamean River by 2007	Reduce point source or diffuse sources of pollution	Maintain Biological Quality Ratings to a satisfactory standard.	Farm Surveys in Catchment	By 01/01/2006 Subject to funding	SEE ES	Preliminary catchment survey carried out - landuse in catchment identified	Set a revised timescale	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Bellawady Stream	Entire River	To maintain the Q rating of Q3-4 at Stn 0100 and Q4 for the remainder of the stream by 2007	Reduce point source or diffuse sources of pollution	To maintain Biological Quality Ratings at a satisfactory standard	Farm surveys in catchment	By 01/12/2004 Subject to funding	SEE ES	Done	N/A	Yes	N/A
					Revise sampling programme	By 01/01/2002 Subject to funding	SEE ES	Number of monitoring stations increased	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices and issue and enforce section 3 and 12 Notices	By 01/07/2004 Subject to funding	SEE ES	Ongoing	N/A	No	N/A
Corsallagh Stream	Entire Stream	To improve the Q Index of Corsallagh Stream from Q3 to Q3-4 at Station 0400 by 2007	Reduce point source or diffuse sources of pollution	Improvement of water quality to satisfactory standard	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	Preliminary catchment survey carried out - landuse in catchment identified	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices if required and issue and enforce section 3 and 12 Notices	By 01/07/2005 Subject to funding	SEE ES	Ongoing	N/A	No	N/A
Einagh River	Entire River	To maintain the Einagh River in a satisfactory quality Q 4 to Q 4-5 by 2007	Upgrade urban wastewater treatment plant at Aclare	Maintain water quality at a satisfactory standard	Secure finance for provision of secondary treatment plant and P removal system	Will be included in 5-year small schemes programme 2002-2007	SEE CW and DOS	Finances Secured	N/A	Yes	N/A
					Provision of treatment plant upgrade	By 01/03/2005 Subject to funding	SEE CW	STP Complete	N/A	Yes	N/A
			Reduce point source or diffuse sources of pollution		Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	Preliminary catchment survey carried out - landuse in catchment identified	Set revised timetable	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2006 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Leaffony River	Entire River	To improve the Q rating at Stn 0100 to Q 4-5 and to maintain the Q ratings of the Leaffony River at all other stations by 2007	Reduce point source or diffuse sources of pollution	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	Stream Surveyed and sampling carried out. Farm surveys u/s of Clockoon	N/A	N/A	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and 12 Notices	By 01/09/2006 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Lenvee River	Entire River	To maintain the Lenvee River in a satisfactory quality Q 4 5 by 2007	Small tributary of Owenaher see this entry	Maintain water quality at a satisfactory standard							
Loughanaboll	Entire River	To maintain the Loughanaboll stream in a satisfactory quality Q 4 by 2007	Small tributary of Owenaher see this entry								
Mad River	Entire River	To maintain the Q index of the Mad River at Q3-4 by 2007	Reduce point source or diffuse sources of pollution	Maintain water quality at a satisfactory standard	Farm surveys in catchment	By 01/01/2006 subject to funding	SEE ES	Preliminary catchment survey carried out - landuse in catchment identified	set a revised timescale	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Moy River	Entire River	To improve the Q rating at Stn 0050 to Q 4-5 and to maintain the Q ratings at all other stations by 2007	Improve water quality at Banada Bridge (station 0400)	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Survey and investigate Moy River in vicinity of 0400 station	01/06/2003 Subject to funding	SEE ES	Preliminary catchment survey carried out for entire river - landuse in catchment identified	Set revised timetable	Yes	31/12/2007
			Reduce point source or diffuse sources of pollution		Control on spread of pig slurry in catchment	By 01/01/2006 Subject to funding	SEE ES	ongoing	set a revised timescale	No	31/12/2007
					Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
					Designate areas where Nutrient Management Planning is needed	By 01/07/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
					Establish Multi-Sectoral Management Group for catchment management	By 01/07/2006 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
					Establish Environmental Education Programme with particular emphases on farming community	By 01/01/2002 Subject to funding	SEE ES	Environmental Information Leaflet produced for Agricultural Sector and presentations given to REPS participants	N/A	Yes	N/A
			Implement powers under Local Government (Water Pollution) Act, 1977 and 1990		Issue and enforce section 4 and 16 Notices and issue and enforce section 3 and 12 Notices	By 01/09/2004 Subject to funding	SEE ES	ongoing	N/A	N/A	N/A

River	Reach of River	Standard	Measures	Targets	Actions	Timeframe	Responsible for Implementation	Progress to Date	Corrective Actions	Action Completed Within Timeframe Yes/No	If No, State Revised Timeframe
			Provide urban waste water treatment plant at Cloonacool Village	Reduce impact of septic tanks in area and reduce P loading	Secure finance from Central Government	By 01/01/2002 Subject to funding	SEE CW and DOS	Included in 5-year programme	Yes	Yes	N/A
					Provide Secondary treatment plant with grass plots phosphate removal system	By 01/03/2006 Subject to funding	SEE CW	STP Completed during 2006	n/a	Yes	N/A
Mullaghane River	Entire River	To maintain the Q rating of Q3-4 and 4 in the river by 2007	Reduce point source or diffuse sources of pollution	Maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2006 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
					Investigation and monitoring of the river channel in Co. Sligo	By 01/01/2006 Subject to funding	SEE ES	Preliminary catchment survey carried out for entire river - landuse in catchment identified	set a revised timescale	Yes	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 4 and 18 Notices if required and issue and enforce section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
					Liaise with Mayo County Council re Charlestown urban wastewater treatment plant	By 01/01/2005 Subject to funding	SEE ES	None	set a revised timescale	No	31/12/2007
Owensher River	Entire River	To maintain the Q rating of Q4-5 at Stn 0050 and to improve the Q rating of STn 0100 to Q 4-5 by 2007.	Maintain water quality of subcatchment	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Survey Moy subcatchment for water quality impacts such as sheep overgrazing, forestry impact, etc.	By 01/01/2007 Subject to funding	SEE ES	Preliminary catchment survey carried out for entire river - landuse in catchment identified	Set revised timetable	N/A	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/01/2007 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Owengarve River	Entire River	To maintain the Q rating at Q 4-5 by 2007	Provide urban waste water treatment plant at Curry Village	Reduce impact of septic tanks in area and reduce P loading	Secure finance from Central Government	By 01/01/2001 Subject to funding	SEE CW and DOS	Sewage Scheme complete	N/A	Yes	N/A
					Provide Secondary treatment plant with grass plots phosphate removal system	By 01/01/2003 Subject to funding	SEE CW	Sewage Scheme complete	N/A	Yes	N/A
			Reduce point sources or diffuse sources of pollution	Maintain water quality at a satisfactory standard	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	None	Set revised timetable	No	31/12/2007
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices	By 01/09/2004 Subject to funding	SEE ES	Ongoing	N/A	N/A	N/A
Tubbercurry Stream	Entire River	To improve the water quality of the Tubbercurry Stream at STn 0500 to Q 3 and STn 0200 to Q 3-4 by 2007.	Upgrade Tubbercurry urban wastewater treatment plant	Reduce P loading to stream	Secure finance from Central Government	By 01/01/2003 Subject to funding	SEE CW and DOS	Included in Capital Works programme	Set revised timetable	No	31/12/2008
					Upgrade Plant	By 31/12/2005 Subject to funding	SEE CW and DOS	End for Clients Representative awaiting approval. Completion date 2009	Set revised timetable	No	31/12/2008
			Identify all negative impacts on stream	Improve water quality to meet Phosphate Regulations in relation to Q index	Assess impact from IPC licenced industry and from existing urban wastewater treatment plant	By 01/12/2001 Subject to funding	SEE ES EPA	Done	N/A	Yes	N/A
					Farm survey of upper reaches of stream	By 01/01/2006 Subject to funding	SEE ES	None	set a revised timetable	No	31/12/2007
					Improve stream monitoring programme where required	By 01/06/2001 Subject to funding	SEE ES EPA	increased monitoring stations	N/A	Yes	N/A
					Survey entire River Channel	By 31/12/2002	SEE ES	Intensive survey of stream carried out to identify sources of pollution	N/A	Yes	N/A
Feorish River		Hydrometric Area 25 Upper Shannon Catchment									
	Entire River	To improve the Q rating of the Feorish river at Stn 0050 and to maintain the Q ratings at Stn 0080 by 2007.	Provision of urban waste water treatment plant at Geevagh Village	Reduce impact of septic tanks in area and reduce P loading	Complete construction of secondary treatment plant with phosphate removal system	By 01/01/2000 Subject to funding	SEE CW	Construction of Geevagh UWWT Plant is complete	N/A	Yes	N/A
			Reduce point source or diffuse sources of pollution	To improve Biological Quality Ratings to satisfactory standard and maintain satisfactory water quality	Farm surveys in catchment	By 01/01/2007 Subject to funding	SEE ES	Stream surveyed, sampling carried out and farm surveys done in the vicinity of Stn 0050	n/a	yes	n/a
			Implement powers under Local Government (Water Pollution) Act. 1977 and 1990		Issue and enforce section 3 and section 12 Notices		SEE ES	Ongoing	N/A	N/A	N/A

TABLE 2.3 IMPLEMENTATION PROGRAMME SUMMARY TABLE FOR LAKES IN LOCAL AUTHORITY AREA												
Local Authority Name	Sligo County Council	Reporting Year	2006									
Lake	Standard	Measures	Targets	Actions	Timeframe	Responsible for Implementation	Progress to Date	Corrective Actions	Action Completed Within Timeframe Yes/No	If No, State Revised Timeframe		
Lough Arrow	To maintain Lough Arrow at existing status	Development of specific subcatchment monitoring programme	Monitor lake trophic status quarterly using EPA scheme	Schedule sampling dates and organise sampling team	By 01/02/2001 Subject to funding	SEE ES and EPA	Sampling programme set by EPA + Sligo Co Co	N/a	yes	N/A		
				Implement monitoring programme	Monitoring will commence in 2001	SEE ES	Lake monitoring carried out between April and Nov each year	N/a	yes	N/A		
				Monitor all feeder streams for phosphate	Schedule sampling dates and organise sampling team	By 01/06/2001 Subject to funding	SEE ES	Sampling programme set by EPA + Sligo Co Co	N/a	yes	N/A	
					Implement Sampling programme	By 01/04/2001 Subject to funding	SEE ES	Sampling has taken place	N/a	yes	N/A	
				Reduce point sources or diffuse sources of pollution	Reduce P loading into lake	Carry out Farm Surveys	By 01/01/2002 Subject to funding	SEE ES	Farm Surveys have been carried out in the immediate catchment, a risk analysis has been carried out on the results			
						Review existing water quality data for feeder streams	By 01/06/2001 Subject to funding	SEE ES	ongoing	N/a	N/A	N/A
						Survey of existing septic tanks within 300 m of shoreline	By 01/06/2002 Subject to funding	SEE ES	Septic Tanks have been surveyed a risk assessment has been carried out on the results	N/a	yes	N/A
						Assess need for Nutrient Management Planning in catchment and implement same	By 01/09/2002 Subject to funding	SEE ES	ongoing	N/a	N/A	N/A
						Survey forestry developments in catchment	By 01/07/2003	SEE ES	ongoing	N/a	N/A	N/A
						Implement powers under Local Government (Water Pollution) Act, 1977 and 1990	Issue and Enforce Section 4 and 16, and Section 3 and 12 Notices	By 01/01/2004	SEE ES	ongoing	N/a	N/A
			Establish multisectoral Management Group for catchment Management	By 01/07/2003	SEE ES	Lough Arrow Technical Committee set up	N/a	yes	N/A			
			Establish Environmental Education Programme	By 01/07/2003	SEE ES	Environmental Leaflets for Agricultural Sector published and presentations given to REPS participants	N/a	yes	N/A			
Lough Gara	To maintain Lough Gara at existing trophic status	Provision of urban wastewater treatment plant at Monasteraden Village	Reduce impact of septic tanks in area and reduce P loading	Secure finance from Local Government	By 01/01/2001 Subject to funding	SEE CW + DOS	Finance Secure	N/a	yes	N/A		
				Complete construction of secondary treatment plant with grass plots phosphate removal system	By 01/01/2003 Subject to funding	SEE CW	Construction Completed	N/a	yes	N/A		
				Reduce point source or diffuse sources of pollution	Reduce P loading into lake	Farm survey inspections	By 01/01/2005 Subject to funding	SEE ES	None	Set a revised timetable	NO	31/12/2007
						Issue and Enforce Section 4 and 16, and Section 3 and 12 Notices	By 01/09/2005 Subject to funding	SEE ES	ongoing	N/a	N/A	N/A

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# ATTACHMENT G.3

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### G.3 Impact Mitigation

The Monasteraden WWTP plant was commissioned in 2002 for a population equivalent of 400. At present the plant serves a population equivalent of approximately 111PE.

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# ATTACHMENT G.4

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## G.4 Stormwater Overflows

There are currently no stormwater overflows at the Monasteraden WWTP.

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