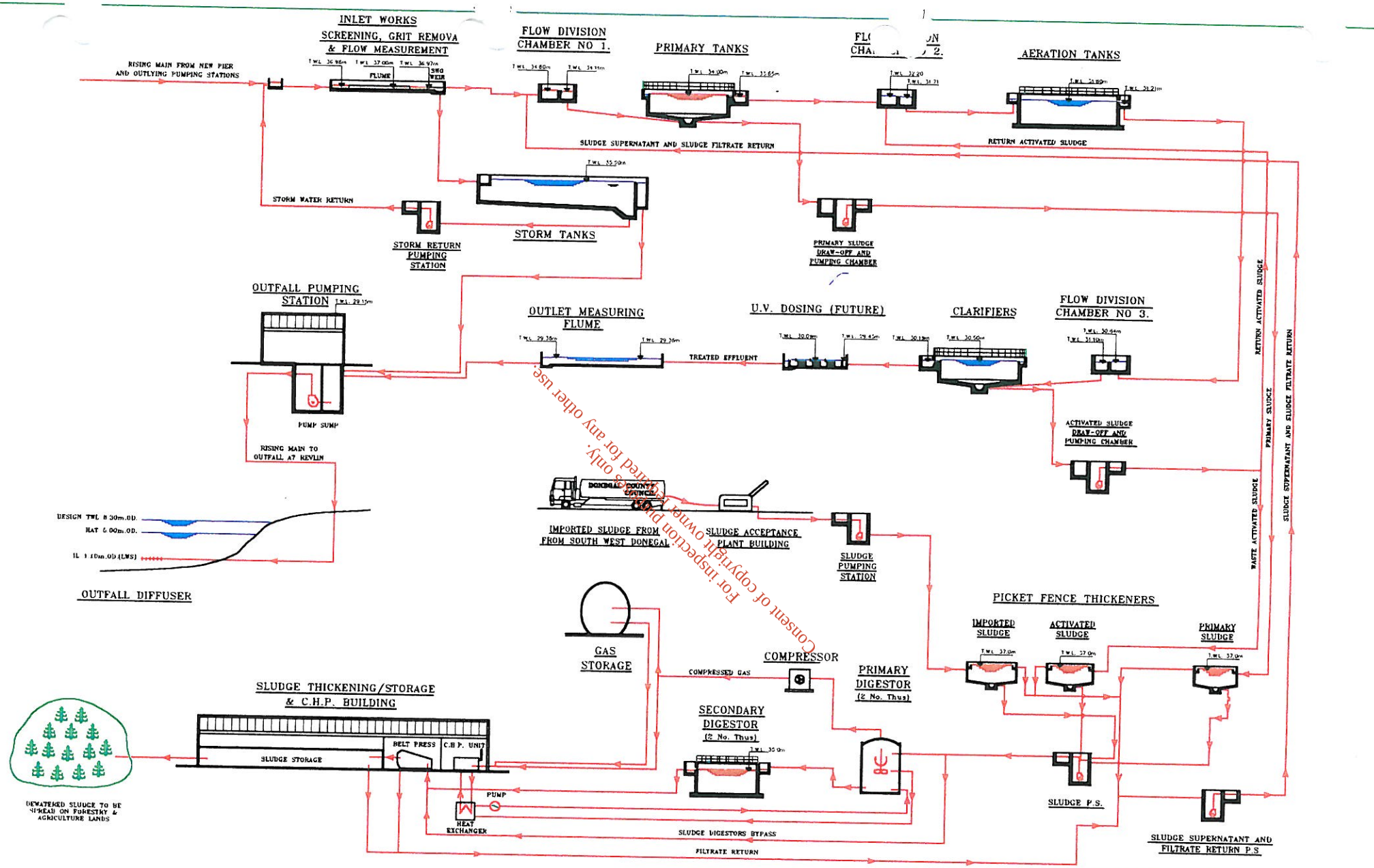


DONEGAL WASTE WATER TREATMENT WORKS AND SLUDGE TREATMENT FACILITY FOR SOUTH WEST DONEGAL

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Figure Nr. 3.5

Project
ENVIRONMENTAL IMPACT STATEMENT
DONEGAL MAIN DRAINAGE

Title
Treatment Works
Schematic Flow Diagram
And Hydraulic Profile

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Donegal WWTW:

May,

Average Daily Influent Flow = 1,060 m3/d
BOD Loading = 282.45 kg/d
Estimated Population Equalivant = 4708 pe

June:

Average Daily Influent Flow = 1,414 m3/d
BOD Loading = 394 kg/d
Estimated Population Equalivant = 6566 pe

July:

Average Daily Influent Flow = 1,765 m3/d
BOD Loading = 311.5 kg/d
Estimated Population Equalivant = 5191 pe

Pier Pumping Station Flow would be similar to the daily average Influent flow at Donegal WWTW

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Pier Pumping Station, general overview.
Extract taken from the Donegal Pumping Control Philosophy

1.1 General

The Pumping Stations will transfer sewage to the Donegal Town Treatment plant. The foul pumps can pump flows of 6DWF to the main plant. At the main plant a maximum of 3DWF can flow to full treatment and an additional 3DWF can be directed to storm tanks. Plant Flows in excess of 6DWF are screened and pumped by the storm pumps to the Storm Water Outfall at the pumping station.

The main pumping station is located underground at the New Pier. A 500mm diameter rising main runs from the New Pier Pumping Station to the Waste Water Treatment Plant. It has been designed to cater for an ultimate population equivalent of 12000pe in the 20th year of operation.

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2 Plant Control System

2.1 General

Donegal Town Pier Pumping Station is designed so that it can operate with the minimum of operator input. This is achieved using programmable logic controllers (PLC's) located within the control panel, and a plant supervisory control computer located at Donegal Town WWTP.

A PLC unit located within the control panel will monitor and control various items of plant connected to the panel. The PLC is linked by radio to the PLC located at the Donegal Town WWTP. Process information will be displayed on the SCADA computer at the Donegal Town WWTP. The control panel is fitted with a number of intelligent devices, which communicate with the PLC. Each control panel contains a HMI, which will be used by the operator to interrogate all MCC sections in the panel.

As the Donegal Pier Pumping Station is remote from the SCADA a small number of plant screens will be available on the HMI. These screens will show the overall status of the Foul Sump, Storm Sump, RBI, Surge Vessel, Odour Control plant and the Generator. All variables and setpoints required for controlling the plant will be available at the MCC HMI.

This SCADA PC is provided with a fully configured supervisory control and data acquisition software package (SCADA) to monitor the plant's performance / progress; display equipment status / alarms and allows an operator to modify parameter set points and control the plant as detailed later in this document. The SCADA software system used is InTouch version 9.5 running under Microsoft Windows XP Professional.

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A similar SCADA computer is provided in Donegal County Council Offices, with a link to the SCADA computer in the treatment plant. The operator of this computer has “view only“ privileges when connected to the treatment plant. Plant mimics, trending and alarm reporting are available at this computer. This is a common remote access computer which will allow the operator to view any of the three sites, Donegal Town, Rossnowlagh or Ballyshannon.

2.2 Common Features

A number of features are common to all instrumentation and control, as follows:

- All parameters available from each instrument are displayed on the local HMI and on the SCADA system.
- All engineering values are logged historically for trending purposes.
- All flows are totalised in PLC and copied to SCADA CSV file for further analysis and are also printed at the start of each day.

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- Each process instrument has a minimum of HiHi, Hi, Lo & LoLo alarms configured on the local HMI & the SCADA system. These set points are adjustable by the operator.
- All Levels will be % and all flow will be m3/hr
- All PID loops and process set points are adjustable from the local HMI & SCADA system.
- If a set point is indicated as an alarm, this is displayed both as an active alarm and historically logged to the SCADA system.
- Drives are monitored for, where applicable, run, trip, fail to start, e-stop, seal fail, Klixon trip, thermistor trip, pump stator over temp, pump outlet pressure high, no flow.
- No flow alarms are suppressed when the associated propellant e.g. pump, fan, valve, etc. is not operating/open and for a preset time delay after restart.
- Drives with a standby swap duty at every second start request or on failure of the duty drive.
- Each drive will be monitored for failure to start.
- Each drive hours run will be available and logged.
- Each network drive will have current monitoring. There will be alarms for undercurrent and overcurrent.
- Drives with a standby, running from VSD's, swap duty after a preset time period, adjustable from the local HMI & SCADA system, or on failure of the duty drive.
- An option to set any drive for permanent duty is to be included.
- All flows are totalised in the in PLC and copied to SCADA system. If the flow meter has an output pulse, this is used for totalising, if no pulse is available, the total is calculated by flow integration in the SCADA system. Operator will also be able to update total to correct any discrepancy between meter and HMI/SCADA
- The complete SCADA/PLC/network must recover unaided to full working status after a power outage.
- All actuated valves with feedback will be monitored for failure to open and failure to close. They position will be settable on HMI/SCADA in Hand.
- All alarm conditions will be suppressed for a time delay (settable on HMI/SCADA) after power is restored.
- Radio Comms failure with the Donegal Town WWTP will cause alarm on HMI. This alarm will be reflected in the Donegal Town PLC and will activate a callout after a time delay settable on HMI/SCADA.

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3 Pumping Station

3.1 General

Wastewater gravitates to the Donegal Pier Pump Stn foul sump and is pumped forward to the Main Pumping Station using Foul Pumps. If the flow rate exceeds 6DWF the level in the sump will rise to storm overflow level, the storm screen will start and the wastewater will overflow into the storm sump. A surge vessel absorbs any surges on foul pumping shutdown. The storm sump will be emptied by the storm pumps to the Storm Water Outfall.

There is an Odour Removal Unit which consists of a fan that transfers the odorous air through an activated carbon filter. There is also a gas detection system on the foul sump and an O2 monitor on the stairwell which is for monitoring purposes only.

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Ballyshannon WWTW

March:

Average Daily Influent Flow = 1,343 m3/d
BOD Loading = 98.84 kg/d
Estimated Population Equalivant = 1647 pe

April:

Average Daily Influent Flow = 735 m3/d
BOD Loading = 69.1 kg/d
Estimated Population Equalivant = 1,151 pe

May:

Average Daily Influent Flow = 574 m3/d
BOD Loading = 123.6 kg/d
Estimated Population Equalivant = 2,060 pe

June:

Average Daily Influent Flow = 675 m3/d
BOD Loading = 180 kg/d
Estimated Population Equalivant = 3,000 pe

July:

Average Daily Influent Flow = 694 m3/d
BOD Loading = 122.3 kg/d
Estimated Population Equalivant = 3,038 pe

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Bally Shannon Pumping Stations, general overview.
Extract taken from the Ballyshannon Control Philosophy.

4 Northbank Pump Station

4.1 General

Wastewater gravitates to North Bank Pump Stn and is pumped forward to the Main Pumping Station using Foul Pumps. If the flow rate exceeds 7DWF the level in the sump will rise to overflow level, the overflow screen will start and the overflow rate will be monitored. There is an Odour Removal Unit which consists of a fan that transfers the odorous air through an activated carbon filter. There is also a Methane gas detection sensor which is for monitoring purposes only. The Northbank Pump Stn Control Panel has its own PLC and HMI and has a Radio link to Main Plant. The Control Panel is fitted in kiosk.

5 Main Pump Station

General

Wastewater gravitates to Main Pump Stn and is pumped forward to the treatment plant. If the flow rate exceeds 7DWF the level in the sump will rise to overflow level, the overflow screen will start and the overflow rate will be monitored. There is an Odour Removal Unit which consists of a fan that transfers the odorous air through an activated carbon filter. There is also a Methane gas detection sensor which is for monitoring purposes only. The Main Pump Stn Control Panel has its own PLC and HMI and has a Radio link to Main Plant. The Control Panel is fitted in kiosk.

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PT_CD	PT_TYPE	LA_NAME	RWB_TYPE	RWB_NAME	DESIGNATION	EASTING	NORTHING	VERIFIED
(P) SW1	Primary	Donegal County Council	River	Eske Estuary	SAC, SPA, Proposed NH	192032	377897	No
SW2	Storm Water Overflow	Donegal County Council	River	Eske Estuary	SAC, SPA, Proposed NH	192560	379082	No

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Donegal Town Outlet		Round 1	Round 2	Round 3	Average
Lab Ref		**3737**	**4369**	**5095**	
Date		**12/06/2008**	**10/7/08**	**11/08/2008**	
pH		6.83	7.11	7.1	7.01
Temperature	Degree C	17	16	15.8	16.2
Electrical Conductivity (@25 degrees C		3980	3250	1207	2902
Suspended Solids	(mg/l)	20	21	193	77
Ammonia (as N)	(mg/l)	24.4	8.72	9.43	14.2
Biochemical Oxygen Demand	(mg/l)	8.72	6.26	22.85	12.61
Chemical Oxygen Demand	(mg/l)	120	34	261	138
Total Nitrogen (as N)	(mg/l)	39	11	32	27.3
Nitrite (as N)	(mg/l)	<0.01	.04	<0.01	0.01
Nitrate (as N)	(mg/l)	<0.05	.08	<0.05	0.07
Total Phosphorus (as P)	(mg/l)	0.658	0.24	3.89	1.59
Orthophosphate (as P)	(mg/l)	0.1	0.2	0.48	0.26
Sulphate (SO4)	(mg/l)	241	145	40.9	142.3
Phenols (sum) (ug/l)	ug/l	<0.7	<0.5		<.6
Atrazine	ug/l	<0.014	<0.01		<0.01
Dichloromethane	ug/l	<5.0	<5.0	<5.0	<5.0
Simazine	ug/l	<0.014	<0.01		<0.01
Toluene	ug/l	<0.1	<0.1	<0.1	<0.1
Tributyltin	ug/l	<0.02	<0.02	<0.02	<0.02
pm Xylene	ug/l	<0.1	<0.1	<0.1	<0.1
o Xylene	ug/l	<0.1	<0.1	<0.1	<0.1
Arsenic	ug/l	<2.0	<2.0	<2.0	<2.0
Chromium	ug/l	10.1	<10.0	<10.0	6.7
Copper	ug/l	<0.03	<30.0	31.97	15.6
Fluoride	Mg/l	<0.1	<0.1	<0.1	<0.1
Lead	ug/l	<3.0	<3.0	7.63	3.5
Nickel	ug/l	<5.0	<5.0	<5.0	<5.0
Zinc	ug/l	109.2	<10.0	196	103.4
Boron	Mg/l	<0.2	<0.2	<0.2	<0.2
Cadmium	ug/l	<1.0	<1.0	<1.0	<1.0
Mercury	ug/l	0.83	<0.2	<0.2	0.34
Selenium	ug/l	<2.0	<2.0	<2.0	<2.0
Barium	ug/l	27.1	<10.0	32.5	21.5
Cyanide - Total	ug/l	<50	<50	<50	<50

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PT_CD	PT_TYPE	MON_TYPE	EASTING	NORTHING	VERIFIED
(P) SW1	Primary	Sampling	192032	377897	No

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Donegal Town

Location	Lab. Ref	Date	pH	BOD (mg/l)	C.O.D (mg/l)	S.S (mg/l)	NH3 (as N) (mg/l)	NO3(as N) (mg/l)	NO2(as N) (mg/l)	Ortho P(mg/l)	Total P(mg/l)
Donegal Town - main sewer	072501492	31/01/2007	7.78	278.8	500	120	50	0.144492	0.164949	4.429163	0.571205
Donegal Town - main sewer	072501884	22/02/2007	6.63	344	1592	128	11.8759	0	0.080382	0.63996	1.621
Donegal Town - main sewer	072502314	20/03/2007	7.2	141.8	420	114	16.25685	0.046	0	1.419	2.835
Donegal Town - main sewer	072502958	27/04/2007	9.66	329.8	1612	192	6.829	0.133	0	0.405	1.44
Donegal Town - main sewer	072503860	28/05/2007	8.21	151.2	1568	294	16.515	0	0	1.808	4.206
Donegal Town - main sewer	072504198	18/06/2007	8.5	191.2	489	350	48.9	0.045	0	5.08	9.907
Donegal Town - main sewer	072505245	31/07/2007	8.27	162	515	222	46.04	0	0.42	5.5	8.08
Donegal Town - main sewer	072505642	20/08/2007	8.04	41.1	186	50	14.35	0	0	1	AR
Donegal Town - main sewer	072506312	24/09/2007	6.77	100	323	86	14.268	0.111	0.012	1.42	3.12
Donegal Town - main sewer	072506900	23/10/2007	6.97	185	307	462	30.97	0	0	3.23	5.33
Donegal Town - main sewer	072507351	19/11/2007	7.64	129.6	229	148	10.13	0.15	0.05	1.36	9.93
Donegal Town - main sewer	072507987	12/12/2007	7.73	138.7	453	522	30.91	0.06	0.08	4.32	10.17

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12.1 PRINCIPLE OF METHOD.

The Lachat QC 8000 Flow injection Analyzer is used in the analysis of Low levels of Ammonia, orthophosphate, nitrate and nitrite. The analyzer has 4 channels for the simultaneous analysis of these parameters. A small volume of the sample is injected into each of the channels of the analyzer, which have a unique set up based on different chemical reactions, which give rise to a colour change, whose magnitude is dependant on the concentration of the parameter in the sample under analysis. By measuring the level of color change associated with each of the calibration standards, which contain known quantities of the parameters, the instrument is able to determine calibration graphs for each parameter. These calibration graphs are then used to determine the levels in unknown samples.

Ammonia

The sample containing ammonia is injected into a carrier stream by means of an injection valve, and is mixed with a continuously flowing stream of alkaline solution. The ammonia is separated from the matrix in a diffusion cell over a hydrophobic semi-permiable membrane and taken up by a flowing recipient stream containing a pH indicator. The resulting pH shift causes a colour change, which is measured at 590 nm in the flow photometer.

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Nitrite

The nitrite is determined by diazotization with sulfanilamide under acidic conditions to form a diazonium ion, which is coupled with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting pink dye absorbs at 520 nm.

Nitrate.

Nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (made up of reduced nitrate plus original nitrite) is then determined by diazotization with sulfanilamide under acidic conditions to form a diazonium ion, which is coupled with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting pink dye absorbs at 520 nm. Nitrate concentrations are obtained by subtracting nitrite values, which have been determined from the nitrite + nitrate values.

Orthophosphate

The orthophosphate ion (PO_4^{3-}) reacts with ammonium molybdate and antimony potassium tartrate under acidic conditions to form a complex. This complex is reduced with ascorbic acid to form a blue complex, which absorbs light at 880 nm. The absorbance is proportional to the amount of orthophosphate in the sample.

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12.2 SCOPE

This method is used for the analysis of surface waters and drinking waters and, simultaneously, analyses for Ammonia, orthophosphate, nitrite and nitrate. The range of calibration standards is as follows.

Ammonia	1 mg/l as N – 0.1 mg/l
Orthophosphate	0.5 mg/l as P - 0.01 mg/l
Nitrite	0.1 mg/l as N – 0.01 mg/l
Nitrate.	2 mg/l as N – 0.1 mg/l.

12.3 SAMPLE COLLECTION, PRESERVATION & STORAGE.

Samples should be collected in plastic or glass bottles. The volume collected should be sufficient to insure a representative sample, allow for replicate analysis and to minimise waste disposal.

Samples to be analysed within 24 hours should be stored overnight in a fridge. Samples to be stored for a longer period of time should be stored in a freezer at -18 ^{o}C.

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12.4 INTERFERENCES.

Ammonia

If the sample is strongly acidic the required pH shift in the chemifold may not occur. If the sample pH is below 3, it should be adjusted to between 3 and 5.

Nitrate

Turbidity can interfere therefore it is necessary to pass the sample through a 0.45 micron filter before analysis.
High concentrations of iron, copper & other metals can create a positive error.

Nitrite

Sample Turbidity may interfere. Remove turbidity by filtration with a 0.45 um filter prior to analysis.

12.5 EQUIPMENT

- Balance–analytical, capable of accurately weighing to the nearest 0.0001g
- Flow injection analysis equipment designed to deliver and react sample and reagents in the required orders and ratios.
- Sampler
- Multi-channel proportional pump.

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- Chemistry manifold, (*chemifold*)
- Sample processing Module
- Data System.

12.6 REAGENTS

Reagent make-up is documented in ChemSOP9.02.

12.7 PROCEDURE

FIA Analyser Set up

Filters.

Ammonia Manifold	- 590
Orthophosphate manifold	-880
Nitrate manifold	- 520
Nitrite/Nitrate manifold	- 520

Sample Loops

Ammonia Manifold	- 50 cm
Orthophosphate manifold	-.028 " * .058.
Nitrate manifold	- 150 cm
Nitrite/Nitrate manifold	- 150 cm

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12.8 SAMPLE ANALYSIS.

i. Turn on instrument.
ii. Turn on computer.
iii. Turn on pump.
iv. Pump de-ionised water through the manifolds for 10 min.
v. Degas reagents by applying vacuum for 15 minutes.
vi. Place all reagent lines into the reagent bottles and allow 5 minutes for flow through manifold.



vii. Click on the **Omnion Fia** icon.
viii. Click **Ok** to initialise the instrument.
ix. Input user identity & password.

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x. The Omnion FIA data system screen then appears.
xi. Click on **Flow injection analyser** to run the instrument.
xii. The most recent tray to have been worked on will then appear on the screen.
xiii. Click on **Tray** and **Temp** to bring up a blank template tray for running a tray of low level samples. The calibration standards have already been inputted into the tray. It is necessary to position the working standards into the calibration standards rack on the auto-sampler. Working standard A is placed in position 1, working standard B is placed into position 2 and so on.



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xiv. Input the sample reference numbers of the samples to be tested into the tray with the associated location of the filtered sample in a test tube in the relevant auto-sampler position. The sample is filtered using a 0.45 µm syringe filter.
xv. To save the tray press -**File – Save Tray**.
xvi. To run the samples click on the yellow **run** icon in the centre of the tool bar.
xvii. Select the method for analysis of low level nutrients, method –**1234.**
xviii. Select **Tray** – named as previously saved.
xix. Then select a filename for the results data file, YYMMDDletter, (A,B,C etc).
xx. Click **Run** to begin the analysis.
xxi. The calibration will be run and if successful the instrument will proceed with the analysis of the samples. The calibration graph will be platted and an **r** value worked out for the graph. If this r value is less than 0.999 the calibration is deemed to be unsuccessful and will need to be repeated.

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xxii. The auto-analyser will then work its way through the sequence of samples as detailed in the Tray.

xxiii. ***Shut down***.

- Place the reagent pump lines into deionised water
- pump the system through for 10 minutes.
- Remove the tubes from the water and allow air to be pumped through
- Turn off the pump and release the tighteners.

12.10 QUALITY CONTROL STANDARDS

A QC check mixed standard is made up as standard C. This check standard should be analysed to check the accuracy of the calibration graph. The analysis should be repeated 21 times to determine within batch standard deviation.

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12.9 REPORTING OF RESULTS.

When the analyser has completed the analysis of the tray of samples a hard copy is printed by clicking on the Custom icon and printing the result sheet. This sheet should be retained in the hard copy results file. An electronic file of the sample run is retained in the computer.

- Ammonia to be expressed as NH_3-N mg/l.
- Orthophosphate to be expressed as PO_4^{3-} mg/l.
- Nitrite to be expressed as NO_2-N mg/l.
- Nitrate is expressed as NO_3-N mg/l.

The result for Nitrate is determined by subtracting the result for the Nitrite channel from the result of the Nitrite/Nitrate channel.

Transfer of results to Excel File

When analysis is complete, click on

- **File**
- **Export Data**, (Save Export Data As)
- Save file as type – select **Text(*.csv)** & click **OK**.

The file or files may then be copied onto a floppy disk and moved or e-mailed to a networked PC.

- Click on the file and open as a csv file in Excel.
- Copy data & paste into the Lachat Excel file under the data already present.

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- Adjust data, as required, taking out dilution notes and putting into the comments column, format to 3 decimal places, drag down formula for calculating nitrate from the nitrate/nitrite figure.
- Re-sort data by Lab reference.

Transfer of results to LabInfo from Excel File

- Ensure that all samples to be transferred are logged into LabInfo, (so that the Lab reference number correlates with the data from the Lachat)
- Open Excel file & add columns to get into the correct format.

12.11 REFERENCES.

- Instruction Manual for Lechat QC 800 Flow injection Analyser.
- Lechat Quickchem Method 10-107-06-1-A Determination of Ammonia by Flow injection Analysis.
- Lechat Quickchem Method 10-115-01-1-A Determination of Orthophosphate in waters by Flow injection Analysis colorimety.
- Lechat Quickchem Method 31-107-05-1-A Determination of Nitrite by Flow injection Analysis.
- Lechat Quickchem Method 31-107-04-1-C Determination of Nitrate + Nitrite by Flow injection Analysis colorimetry.

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Compiled by: Joe Ferry Date: 3/12/2004

Approved by: Patrick Gallagher Date: 3/12/2004

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2.1 INTRODUCTION, SCOPE AND PRINCIPLE OF METHOD

The $B.O.D._5$ test is defined as " the mass of dissolved oxygen required by a specific volume of liquid for the process of biochemical oxidation, under prescribed conditions, over 5 days at 20^o C in the dark" (DoE, 1983). The result is expressed as milligrams of oxygen per litre of sample.

Biochemical Oxygen Demand ($B.O.D._5$) is a standard quality test for the presence of natural or introduced organic matter, including pollutants, in waters and effluents. B.O.D. is a test in which standardised laboratory procedures are used to determine the oxygen requirements of bacteria and other micro-organisms which, in the presence of oxygen, cause the biodegradation of organic matter (carbonaceous oxygen demand). The test will also measure the oxygen used to oxidise inorganic material such as sulphides and ferrous iron where these are present. It may also measure the oxygen used to oxidise reduced forms of nitrogen, unless an inhibitor reduces their oxidation.

A 250 to 300ml sample of water or waste water (diluted, as appropriate) is incubated at 20^o C in the dark for 5 days. Sufficient micro-organisms and nutrients must be present in the sample or diluted sample to allow for the biodegradation of the organic matter present; hence for some samples, the dilution water will need to be seeded with micro-organisms. The dissolved oxygen in the sample is measured at the beginning and end of the test period. The reduction in D.O. during the incubation period yields a measure of the B.O.D. Dissolved oxygen must be present throughout the test with a recommended minimum of 2mg/l Oxygen remaining after 5 days, samples with a BOD greater than 7mg/l must be diluted using dilution water.

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2.1.1 Type of Application: This method is applicable for determining B.O.D. in clean and polluted surface waters, and in municipal, agricultural and industrial effluents.

2.2 SAMPLE STORAGE AND PRESERVATION

Analyse within 24 hours of sampling. Samples may be preserved for up to 48 hours by cooling to 2-4 ^{o} C. in the dark, (refrigerated).

2.3 EQUIPMENT

a) Glass BOD bottles 250 – 300 ml and stoppers
b) B.O.D. stopper P.V.C. covers or tin foil or *parafilm*.
c) Calibrated dissolved 0xygen meter and probe with stirrer.
d) Incubator set to 20^o C $\pm$ 1 ^{o}C.
e) 1000ml graduated cylinder and other assorted glassware.
f) Air pumps with air stones attached to the polyethylene tubing.
g) 25 litre or 50 litre P.V.C. graduated container with tap for dilution water
h) Thermometer

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i) Auto pipette 0 to 5 mls or disposable syringes 0-1 ml, 0-5 ml & 0-10 ml.
j) Disposable gloves.
k) One Large Black Bin Bag.

2.4 REAGENTS

a) Phosphate Buffer solution – purchased from an Approved Vendor, (E.g- Reagecon, product no. WTR5005)
b) Magnesium Sulphate solution 0.09M – purchased from an Approved Vendor (E.g.- Reagecon product no. MS0091).
c) Calcium Chloride solution 0.01M – purchased from an Approved Vendor (E.g.- Reagecon, product no. CA20011)
d) Ferric Chloride Solution 0.001M – purchased from an Approved Vendor, (E.g-Reagecon, product no. F00011)
e) Dilution Water – Mains water is distilled into a PVC container no. 1. The distilled water is drawn from PVC Container no. 1 to PVC graduated container no. 2. Nutrients are added to the distilled water in no. 2. The container (no. 2) is then agitated, using the airpump, by immersing the ends of the PVC tubing, with the airstones attached, into the distilled water and agitate for 15mins. When required, add nitrification inhibitor (see 2.4.f) and/or seed material (see 2.4.h) after adding the nutrients and then proceed to agitate for 15 mins. The container of dilution water is usually made up 24 hours before it is required, the container covered with a black plastic bag and left on the lab. bench overnight. On occasion, the dilution water is used one hour after being made up.
f) Nitrification Inhibitor, purchased from an Approved Vendor (E.g.-Hach product purchased from Celtic Engineering – Formula 2533, Cat. No. 2533-34) – Use 0.16g per 300ml sample, 5.3g per 10 litres dilution water, 8g per 15 litres dilution water, or 10.6 g per 20 litres dilution water.
g) Glucose Glutamic Acid Solution – This may be produced by two methods.

(1) Vials: This is purchased from an Approved Vendor (E.g.- a Hach product, ex Celtic Engineering, Cat. No. 14865-10). The vial is broken and the contents added to dilution water (see procedure section below)
(2) The solution may be prepared directly from Glucose (BDH Analar) and Glutamic acid (Merck for biochemistry) powder. These materials must be dried prior to use by placing a suitable quantity of both materials into beakers and drying at 103^{o} C for one hour. The beakers and their contents are then allowed to cool in the desiccators. Add 150mg of each to a 1 litre volumetric flask and make up to the mark with deionised water. Place magnetic stirrer into volumetric flask. Place flask onto magnetic stirring plate. Stir well for one hour.

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h) Seed material – either from the outlet of an activated sludge sewage treatment plant or polyseed capsules. Empty one polyseed capsule into 500mls of dilution water. Aerate solution for 30mins or stir with magnetic stirrer. For best results, the Polyseed should be used within 6 hours of re-hydration. When using the outlet of an activated sludge treatment plant, add either 0.2ml of the outlet sample to 800ml of dilution water in the graduated cylinder or 1.25 ml of the outlet sample to 5 litres of dilution water.
i) Sodium Thiosulphite granules
j) Alkali and Acid solutions 1N for neutralisation of waste samples when required. H_2SO_4 1N - add slowly, while stirring, 28mls conc. Sulphuric acid to distilled water in a volumetric flask and dilute to 1 Litre. NaOH 1N – Dissolve 40g NaOH in distilled water and dilute to 1 litre in a volumetric flask. Alternatively the 1N acid and alkali solutions may be purchased.

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2.5 PROCEDURE

2.5.1 Pre-treatment

a) pH Adjustment – if the pH of the sample is outside the range 6.5-8.5, neutralize to pH 6.5-7.5 with a solution of H_2SO_4 or NaOH of such strength that the quantity of reagent used does not dilute the sample by more than 0.5%.
b) Removal of Residual Chlorine – Residual chlorine may dissipate by standing the sample in the light for one to two hours. If the residual chlorine does not dissipate on standing, add about 5-6 granules of Sodium Thiosulphate to the B.O.D. bottle containing the sample. Dilution water used for testing chlorinated/de-chlorinated samples must be seeded, or the samples must be seeded directly into the BOD bottle.
c) Saline samples – Add about 5-6 granules of Sodium Thiosulfate to each B.O.D. bottle, record salinity and, when possible, adjust D.O. meter for the salinity.
d) Removal of Algae – Remove algae by filtration or centrifugation. Report the results as BOD (filtered) or BOD (centrifuged).
e) Samples saturated with Dissolved Oxygen – Samples containing more than 9 mg/l D.O. at 20^o C may be reduced to saturation by vigorous shaking/agitation in a partially filled corked sample bottle.

2.5.2 Calibration

a) Turn on Dissolved Oxygen Meter (YSI).
b) Wait 15 minutes.

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c) Press Calibrate
d) Press D.O. Cal.
e) Press up or down as necessary to achieve 100%
f) Press enter
g) Press Mode – calibration is now complete.

2.5.3 Test Procedure

a) Check that samples are at $20^oC \pm 1^o C$
b) Check that the pH is within required range.
c) Place BOD bottles in a row on the bench in front of the DO Meter
d) Mark each sample identification log number on each bottle; also mark dilution on each BOD bottle.
e) Fill two BOD bottles with dilution water from each batch and call Blank 1 & Blank 2. When batches of dilution water are seeded, blanks are put on of each batch.
f) Mark one BOD bottle A/C. Pour dilution water into a 1000ml graduated cylinder to 990mls. Break **acid check** vial and pour into cylinder.
g) Place gloved hand, (clean disposable plastic glove), on top of cylinder and gently rock the cylinder from side to side about six times until mixing occurs without allowing air entrapment. The sample is then poured into a B.O.D. bottle.
h) or, use pipettor/ syringe and put 10mls of glucose glutamic **acid** standard (as made up in volumetric flask – see 2.4.g) into cylinder.
i) When samples do not require dilution, pour sample into BOD bottle gently without allowing air bubbles to form. Samples with an expected BOD of <7 do not require dilution.
j) For dilution purposes, the BOD's of effluents are estimated at 0.7 times the C.O.D. demand and dilutions are prepared accordingly. C.O.D. results are not often available when doing large numbers of B.O.D's, so through experience the analyst learns what dilutions to give the various effluents. The relevant amount of dilution water is poured into a 1000ml graduated cylinder, the required amount of sample is added using a pipettor or syringe, e.g., when doing a 1/100 dilution pour the dilution water into the graduated cylinder to 990 mls, then using a pipettor or syringe add 10mls of the sample. Place gloved (clean disposable plastic glove) hand on top of cylinder and gently rock the cylinder from side to side about six times until mixing occurs without allowing air entrapment. The sample is then poured into a B.O.D. bottle.
k) Ensure the D.O. meter is calibrated as per 2.6.1. The D.O. probe is placed into each B.O.D. bottle and the D.O. is recorded.
l) The B.O.D. bottles are placed in the incubator, which is set to 20^o C.
m) After 5 days, the B.O.D. bottles are removed from the incubator.

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n) The D.O. meter is calibrated and the D.O. level of each sample, in each bottle, is measured.

2.6 REPORTING OF RESULTS

a) The D.O. reading on day 1 minus the D.O. reading on day 5 gives the B.O.D. in mg/l
b) For diluted samples, the difference in the D.O. readings, minus the blank, multiplied by the dilution factor gives the B.O.D. in mg/l. Where samples had been seeded, subtract the seeded blank value before multiplying by the dilution factor.

2.7 PRECISION

As this test is a biological test, there are many parameters, which are outside the analyst's control. The glucose/glutamic acid standard should give a result of 198mg/l B.O.D. $\pm$ 30.5. The results of this test are plotted on a Control Chart in the Lab.

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2.8 TROUBLESHOOTING

In the event that DO readings are lower than expected, or results for blanks differ significantly from the initial readings, it is imperative to check the physical condition of the membrane cap and to change the tip if there is any concern about its reliability. The stirrer paddle must be removed prior to unscrewing the old membrane cap. The probe tip should then be rinsed with deionised water to remove any contaminants. The new membrane cap is half filled with electrolyte solution, (KCl – purchased), prior to screwing on to the probe, (moderately tight), and a small amount of electrolyte should overflow. This excess is rinsed off with DI water and the paddle re-fitted. Ensure that the membrane is not wrinkled or torn and does not contain air bubbles >1/8". The average replacement interval is 1-2 weeks, depending on use.
A complete troubleshooting guide may be found in the Probe Instruction Manual.

2.9 REFERENCES

Standard Methods for the examination of water and wastewater, 19th edition 1995.
YSI 5905/5010 BOD Probe Instruction Manual
YSI

Compiled by:	Shirley McMenamin	Date:	5th July 2005
Authorized by:	Joe Ferry	Date:	5th July 2005

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1 PRINCIPLE OF METHOD

The Chemical Oxygen Demand (COD) test is used widely to estimate the amount of organic matter in water and wastewater. It is a measurement of the oxygen equivalent of the materials present in the wastewater that are subject to oxidation by a strong chemical oxidant, in this case dichromate.

In the reactor digestion method test, the COD procedure is greatly simplified. Small volumes of the water samples are pipetted into vials containing the pre-measured reagents, including catalysts and chloride compensator. The vials are incubated until digestion is complete and cooled; then the COD determination is made with the spectrophotometer.

2 SCOPE

2.1 Range: Three ranges are available - 0-150 mg/l, 0-1500 mg/l and 0-15000 mg/l. Please note that there are different determination procedures according to the range selected. The range should be selected based on the expected COD level of the sample.

2.2 Type of Water: This method is applicable for water, wastewater and seawater.

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3 SAMPLE STORAGE AND PRESERVATION

Analyse within 24 hours of sampling.

4 INTERFERENCES

Ensure the glass cells are free from any marks or water droplets. Wipe outside of glass cell with absorbent tissue paper prior to placing in cell holder of spectrophotometer (this is to remove any water droplets on the exterior, which may cause interference with the reading). Caution should be taken when placing the COD vials into the heating mantle

5 EQUIPMENT

Dry- bath block heater, 150°C +/- 1 °C
Hach DR/3000
Transpipette
Pipette tips

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6 REAGENTS

COD vials
Deionised Water

The vials should be covered or preferably placed behind a shield while heating (fume cupboard).

Health and Safety act advises to WEAR SAFETY GLASSES OR GOGGLES.

7 PROCEDURE

7.1 Digestion of samples.

1.Turn on the COD reactor block and preheat to 150 ^{o}C.
2.Remove the cap from a COD digestion reagent vial and add 2 mls of de-ionised water to the vial to prepare the blank.
3.Add 2 mls of the sample to be tested to a new COD digestion vial. This is the prepared sample.
4.Invert the vials several times to mix and then place in the preheated COD reactor block.
5. The vials should remain in the heated block for two hours after this time the block should be turned off and the vials allowed to cool.
6. Remove the vials from the block and invert several times to mix before placing in a rack to allow to cool.
7. Once cool the samples can be tested using the Colorimetric Determinaton procedures as detailed below.

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7.2 Colorimetric Determination Procedure for COD vial range 0-150 mg/l.

i. Switch the DR/ 3000 on and leave for 15 minutes.

ii. To begin the stored program initiate the program mode by making the following key strokes:

Press: **4** **5** **Stored Program**

The STORED PROGRAM light will come on and a wavelength setting of 420.0 for colour testing will appear in the display. The SET WAVELENGTH and ZERO prompting lights will flash.

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Turn the wavelength selector dial, located on the upper right corner of the instrument, to a setting of 420.

Press: **Clear**

The SET WAVELENGTH prompting light will turn off and the display will read 0. The ZERO prompting light will continue to flash until the instrument is zeroed in Step iv.

iii. Place the COD Vial adapter in the cell holder of the spectrophotometer with the groove in the adapter facing the front of the instrument. Wipe the vial containing the reagent blank clean with a wet towel followed by a dry one. Insert the vial in the COD holder and cover with the light shield.

iv. The reagent vial blank is used to set the zero concentration point. Zero the instrument as follows:

Press: **Zero** **Conc**

The ZERO, CONCENTRATION and AUTO UPDATE lights will come on and a concentration value of O will appear in the display.

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v. Wipe the vial containing the test sample with an absorbant tissue paper Insert the sample vial in the COD holder and cover with the light shield and read the mg/l COD from the display. Record this value for the sample tested.

7.7.3 Colorimetric Determination Procedure for COD vial ranges 0-1500 mg/l and 0-15000 mg/l.

i. To begin the stored program for, initiate the program mode by making the following key strokes:

Press: **4** **6** **Stored Program**

ii. The STORED PROGRAM light will come on and a wavelength setting of 620.0 for colour testing will appear in the display. The SET WAVELENGTH and ZERO prompting lights will flash.

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iii. Turn the wavelength selector dial, located on the upper right corner of the instrument, to a setting of 620.

Press: **Clear**

iv. The SET WAVELENGTH prompting light will turn off and the display will read 0. The ZERO prompting light will continue to flash until the instrument is zeroed in Step iv.

iii. The reagent blank is used to set the zero concentration point. Zero the instrument as follows:

Press: **Zero** **Conc**

The ZERO, CONCENTRATION and AUTO UPDATE lights will come on and a concentration value of O will appear in the display.

vi. Wipe the vial containing the test sample with an absorbant tissue paper Insert the vial in the COD holder and cover with the light shield and read the mg/l COD from the display.

If a pure green colour is obtained in the reacted sample, all the dichromate has been reduced to the chromic state. It will be necessary to repeat the digestion with a diluted sample. For the best accuracy, dilute and repeat those determinations that approach 140-150 mg/l for low range and 1400- 1500 mg/l COD for the high range.

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7.8 REPORTING OF RESULTS

The results should be reported as mg/l Chemical Oxygen Demand .

7.9 REFERENCES

Hach DR/3000 Procedure .
Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995

Compiled by: **Margaret O'Neill** **Date: 17th December 2004**

Authorized by: **Joe Ferry** **Date: 17th December 2004**

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QUALITY MANUAL



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Donegal County Council Laboratory

Magheranan

Letterkenny

Issued by: **Joe Ferry**

Executive Scientist

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SECTION 1: CONTROL, REVIEW AND MAINTENANCE OF MANUAL

1.1 The Quality Manager, (Executive Scientist), is responsible for the upkeep of the manual. It shall be renewed as required and reviewed at annual intervals.

1.2 When the manual is completely revised, the new version shall be numbered consecutively to the previous version and the new issue shall supersede any previous issue.

New or altered text shall be identified by shading the appropriate paragraph, as in this example.

1.3 INAB shall be notified immediately of any revisions to the manual, changes in staff or scope of activities that could affect the Laboratory's compliance with INAB regulations.

1.4 Copies of the manual may be inspected at the DCC Laboratory premises at the discretion of the Executive Scientist or Senior Executive Chemist. The Laboratory shall hold an INAB copy on behalf of INAB. This shall be made available to INAB upon request.

1.5 Controlled copies of manual:

No. 1 *Master copy*

No. 2 *Laboratory copy*

No. 3 *INAB copy*

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SECTION 2: QUALITY POLICY

2.1 Quality Policy Statement

The management of Donegal County Council, (DCC), Laboratory are committed to good professional practice in order to ensure quality is achieved in all aspects of work, complying specifically with all INAB requirements, for those tests where INAB accreditation has been sought, and, so in far as is practicable, for all other tests carried out by the laboratory.

The Quality Assurance criteria applied shall be in accordance with the International Standard ISO/IEC 17025:2000

This policy will be implemented by the Senior Executive Chemist of DCC Laboratory, (who also assumes the role of Deputy Technical Manager).

The Analytical work carried out shall be in accordance with INAB criteria.

Where appropriate, tests shall be traceable to National Standards, with stated uncertainties of measurement and certified by an approved signatory.

All analytical staff shall be aware of the content of the quality manual and shall appreciate the necessity to comply with its policies and procedures.

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Signed …… Donal Casey (Senior Executive Chemist)

Date: ……..

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2.2 Accreditation and Approval Bodies

DCC Laboratory is currently working towards accreditation for Nutrient Analysis.

2.3 Aims and Form of Quality System

2.3.1 The Quality Manual

This is the key document used to ensure that all procedures are conducted in the appropriate manner to achieve the required standard. The Quality Manual has been prepared in accordance with the International Standard ISO/IEC 17025:2000. The Quality Manual and associated documentation (regulations, standard operating procedures, test methods, manuals etc), identify the scope of operation, organisation, facilities and equipment, analysis procedures and document control that apply within DCC Laboratory. All such documentation is controlled as described in section 3.5.7. All staff must adhere to the Quality System, defined in the Quality Manual.

2.3.2 The Quality Manager

The Quality Manager is responsible for:

- the efficient operation of the quality system.
- the implementation of specific policy and procedures.
- the authorisation, compilation, distribution, maintenance and revision of the Quality Manual and associated documentation. (***On no account should any document be altered unless authorised by the Quality Manager or Deputy Quality Manager).***

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2.3.3 The Technical Manager

The Technical Manager is responsible for the overall control of the quality policy, system and associated staff. On the occasion of extended absence of the Technical Manager, a Deputy Technical Manager shall assume the Technical Manager's duties as described above and in 3.3.1.

2.3.4 Departures from Authorised Procedures

Except where specified by the customer, all analysis must be undertaken using proper documented procedures. Any departure from these procedures must be authorised by the Quality Manager or Technical Manager and recorded as a non-conformance. If, for any reason, there have been unauthorised departures from documented procedures that may affect the quality of testing, then the work must be halted immediately and the reason for the departure investigated with action taken to correct the situation before resuming. Where there is cause to suspect the validity of completed work that has already been reported to a member of the public, they must be notified, the work returned for authentication, if necessary retested, and a new analysis report issued, as detailed in the standard operating procedure file.

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SECTION 3 ORGANISATION

3.1 History

The Donegal County Council Laboratory was formed about 25 years ago to provide the essential analytical techniques to service the work of the council, primarily in water/sewage treatment. As concern over the environment has increased over the last twenty years, the laboratory has widened its scope to service the monitoring needs for the surrounding land, rivers, lakes, beaches, and to a lesser extent, air, in the region. It now has the authority to issue and revoke pollution licences to those factories in the region, which release potentially harmful substances into the environment and is responsible for ensuring these companies stay within the restrictions imposed by the licence.

3.2 Organisation and Job Titles of Key Staff

A chart showing the basic organisation of the Lab and identifying the staff responsible for the provision of the INAB accredited service(s) can be obtained on request from any of the Executive Technicians.

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3.3 Staff Responsibilities

3.3.1 Technical Manager/Chief Technician (Hugh Kerr)

The Technical Manager reports to the Executive Scientist & Senior Executive Chemist of DCC Laboratory and is responsible for the implementation and overall control of the sampling and analysis system and associated staff, while ensuring that all relevant INAB requirements are met.

Objectives

1. To ensure the integrity of the Laboratory, equipment and operation.

2. To ensure that sampling and analyses are carried out in accordance with standard operating procedures, in line with INAB requirements.

3. To assume full responsibility for all matters relating to Drinking Water

Duties and Responsibilities

1. To liase closely with all of the Technicians and report regularly to the Executive Scientist & Senior Executive Chemist of DCC Laboratory.

2. To manage and control all Laboratory personnel.

3. To ensure contractual commitments are met.

4. To interview, appoint and audit analytical personnel, as required.

5. To assist the Quality Manager with the revision of analytical procedures as and when required, to comply with changing standards.

6. To ensure correct processing of results.

7. To investigate and deal with client complaints in accordance with the appropriate standard operating procedure.

8. To act as one of the signatories recognised by INAB to sign the Laboratory's analysis reports and to take technical responsibility for their content. (Section 3.6)

Deputy Technical Manager

On the occasion of the extended absence of the Technical Manager, the Deputy Technical Manager shall take responsibility for the Technical Manager's duties as described in 3.3.1.

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3.3.2 Laboratory Manager

Responsible to the Executive Scientist.

Duties and Responsibilities

1. Administration and operation of the Lab.
2. Assessing the forward needs of the Lab in respect of equipment, space, apparatus and its integration within the Lab.
3. Ensuring that absolute confidentiality is maintained at all times.
4. Supervision of all the laboratory technical staff.
5. Allocation of responsibilities to ensure effective performance.
6. Allocation of workload within the unit.
7. Collation of results from completed analyses and preparation of reports for submission to clients.
8. To investigate and deal with client complaints in accordance with the appropriate standard operating procedure.

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Deputy Laboratory Manager
On the occasion of the extended absence of the Laboratory Manager, the Deputy Laboratory Manager shall take responsibility for the Laboratory Manager's duties as described in 3.3.2.

3.3.2 Quality Manager

Responsible to the Senior Executive Chemist

Duties and Responsibilities

1. To introduce and maintain documentation and to standardise procedures in accordance with the requirements of INAB.
2. To ensure that quality standards are maintained.
3. To plan quality audits carried out in accordance the Laboratory's Audit Programme *(as detailed in the appropriate Controlled Document)* and to liase closely with the Technical Manager on the carrying out of such audits.

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4. To investigate and deal with client complaints in accordance with the appropriate standard operating procedure.

5. To carry out performance appraisals and arrange training necessary to maintain standards

Deputy Quality Manager

On the occasion of the extended absence of the Quality Manager, the Deputy Quality Manager shall take responsibility for the Quality Manager's duties as described in 3.3.3.

Assistant Quality Manager

DCC Laboratory will appoint an assistant Quality Manager who will visit the laboratory on occasions to provide assistance, advice and guidance to the management in the design and execution of the Quality System. The person appointed has substantial experience in design and adaptation of Laboratory Quality Systems and in Laboratory accreditation requirements. He will also carry out external audits as required by DCC Laboratory.

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3.3.4 Nutrient Analyst

The Nutrient Analyst is responsible to the Technical Manager.

Duties and Responsibilities

1. The safe handling of all relevant analytical equipment.

2. Ensuring that all relevant equipment is "in calibration".

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3. Carrying out all analysis and calibrations in accordance with the relevant SOP(s).

4. Ensuring that all routine maintenance is carried out, as necessary, e.g. replacing consumables.

5. Ensuring that all non-routine maintenance is carried out quickly and efficiently, in the event of a breakdown.

6. Ensuring that the Technical Manager is informed of any situations that deviate from the standard procedure and could have a direct bearing on the quality of the service provided by the Laboratory.

7. Liaison with suppliers, manufacturers, etc.

8. Ensuring that there is an acceptable turnaround time between sample submission and reporting results.

9. Ensuring that all documents are updated and available for consultation by authorised personnel.

10. Ensuring that other authorised operators have adequate up to date training.

11. Ensuring that Health and Safety Regulations are adhered to at all times.

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Deputy Nutrient Analyst

On occasion of extended absence of the Nutrient Analyst, the Deputy Nutrient Analyst shall assume the Nutrient Analyst's duties as described in 3.3.4.

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3.4 Training

The determination of the competence of those carrying out testing is the responsibility of the Technical Manager. The Training Manager is responsible for identifying additional training needs and ensuring that the training records are adequate and maintained up-to-date.

The Laboratory's policy is to ensure that existing and new staff have and maintain the relevant technical skills, professional qualifications and professional expertise.

Staff qualification and training records will be held and maintained by the Training Manager.

3.4.1 Staff Entry Requirements

All DCC Laboratory technical staffs are graded according to qualifications, experience, and demonstrated competence. Entry requirements depend on the level of ability considered necessary to carry out the specific job being offered.

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3.4.2 Trained Staff

Since much of the work carried out in the Laboratory is specialised, in-house training is paramount.

All documented procedures carried out in the Laboratory have been assigned to one or more members of staff. These are to be detailed in a document entitled *Authorised Operators and Training Records for All Standard Operating Procedures*.

These procedures cannot be carried out by anyone other than those authorised to do so in this document, which is cross-referenced with the current training record for each named member of staff.

3.4.3 Untrained Staff

Staff undergoing training must be assigned to a supervisor who will oversee their work until an acceptable level of competence has been consistently demonstrated. This must include the successful use of reference materials and chemical standards where applicable. The person is allowed to carry out the work unsupervised only when the Training Manager and Technical Manager have given written authorisation for them to do so by transferring their name to the 'Trained Staff' list for the appropriate procedure reference(s) on the document described above. ('*Authorised Operators and Training Records for All Standard Operating Procedures*').

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3.4.4 *Students on work experience schemes*

Students on work experience schemes are permitted to undertake some basic analyses of samples, under the supervision of a fully trained technician. All students must have attained a minimum of 2 years 3rd level experience in an appropriate field *(either Environmental Engineering/Chemistry).*

3.4.5 *Setting of Staff Training Goals*

It is the policy of DCC Laboratory to ensure that all staff appointed by the Laboratory receives adequate training to enable them to fulfil their full potential for the benefit of both DCC Laboratory and the member of staff concerned.

To this end, the annual staff training programme will be developed which sets staff training goals with respect to education, training and skills.

3.5 Administrative Procedures

3.5.1 *Dealing with Enquiries*

The Senior Executive Chemist, Executive Scientist, the Chief Technician and the Executive Technicians handle general enquiries from the general public and specific complaints about pollution from the Public. This enables technical or commercial queries to be discussed and agreed quickly. On occasions, when none of these are available, DCC Laboratory personnel will follow procedure: *'Dealing With New Clients'* and *'Dealing with Public Complaints'*. This ensures that all information relating to the enquiry/complaint is documented and arrangements are made for contact to be made at a later stage.

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A member of the public may wish to consult directly with the member of the technical staff who is carrying out the work or vice-versa. This can only be done by arrangement with DCC Laboratory Management.

3.5.2 *Sample Collection*

The Technician undertaking the analysis normally collects the samples on site. On receipt in the laboratory, their details are entered into the Sample Register (as detailed in the appropriate standard operating procedure). Each sample is given a numerical identity code, specific to that sample.

Where possible, the samples are analysed immediately by the appropriate technician. If this is not possible, they are placed in short term storage. Those samples to be analysed for nutrients are stored in the freezer or refrigerator. Any samples required for pending Court cases are kept in a locked refrigerator. Only the Analyst concerned has keys to this.

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3.5.3 Contract Policy

3.5.3.1 Form of Contract

Two forms of contract are identified:

i. A formal contract entered into only at the specific request of an external client. The format of such a contract will be as specified by the client. It is DCC Laboratory policy not to require such a formal contract unless the client specifically requests this. A record of all such contracts will be kept in a Contract Log.

ii. Information recorded in the Sample Log. This will generally be in the form of oral and/or written instruction in relation to the analysis of a sample or set of samples, transcripted to the log or referenced in the log and held in the clients file. Generally, the client leaves it at the discretion of DCC Laboratory, as to which analysis will be performed on the samples.

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3.5.3.2 Contract Review

If a client requests a change in a formal contract, or the Laboratory deems it necessary to perform analysis not already detailed in the formal contract, a contract review must be performed. The Senior Executive Chemist or Chief Technician must carry out this review.

In case of a formal contract, any actions taken following the contract review are noted in the contract log.

Changes to the contract are designated as ‘major’ or ‘minor’.
A minor change is one that does not significantly change the nature of the original instruction e.g. an increase or decrease in the number of samples or the additional or removal of a related type of analysis.
A major change is one that significantly changes the original instruction, e.g. a cancellation of all or part of the work, the additional of unrelated tests or a change in timescales.

3.5.3.3 Contract Modification

A formal contract may only be modified after consultation with the client and with the client’s written instruction. Only the Senior Executive Chemist or Chief Technician may authorise the modification of a formal contract. The original contract must be clearly marked “Contract Changed/Cancelled” as relevant and the details must be recorded in the Contract Log.

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3.5.4 *Security of Confidential Information*

It is the policy of the Laboratory to ensure confidentiality of information by restricting the release of information both through technological communications and the physical security of the Laboratory. Any information relating to a client or sample may be released to the Public by applying to the main Council office in Lifford through the Freedom of Information Act.

Entry to computer systems in which confidential information is stored must be restricted by the use of a password.

Security keys that cannot be copied without written authorisation lock the Laboratory and offices. All existing keys have been assigned to DCC Laboratory staff.

Only those who hold a permanent position on the staff, hold keys to the premises.

3.5.5 *Sub-contracting of Analysis*

It will be the Unit's policy that, where possible, tests for which it will eventually hold INAB accreditation are carried out by the Laboratory.
If the occasion should arise where this is not possible, (because of prolonged instrument failure for example) it may be appropriate to sub-contract to another Laboratory holding INAB accreditation for that particular test. In such a case, the subsequent report must clearly indicate that the work was subcontracted.

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The Quality Manager shall maintain a record of all sub-contracted work and a register of all sub-contractors used.

The Laboratory accepts responsibility for the quality of sub-contracted work unless the client has specified which sub-contractor is to be used.

3.5.6 *Purchasing of Equipment, Materials and Services*

It is the Lab's policy to purchase equipment, material and services from reputable suppliers. Purchasing procedures are governed by the Council's guidelines.

In the case of INAB accredited tests, the certification/accreditation status of all suppliers of equipment / materials and services will be recorded and monitored at least annually as part of the internal auditing programme.

The Laboratory generally uses chemicals, reagents, glassware etc. that are either supplied or recommended by the manufacturer of the equipment with which they will be used. Where this is not the case, all supplies must be checked for their compliance with the specifications stated in the associated

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Standard Operating Procedures. Preference must be given to suppliers with documented evidence of accreditation by a recognised certification body. Where no independent assurance is available, purchases shall not be used until inspected or otherwise verified to comply with required specification.

The Laboratory can make no purchases without authorisation from the Senior Executive Chemist. All supplies received are checked, and their suitability documented before being added to stock. (See Standard Operating Procedure *'Control of Stock Levels of Consumables in the Laboratory')*. *(To be compiled)*

These records will be kept in 'Equipment Files' at the appropriate analysis workstation. They are specific to each piece of equipment used and are maintained by the Analyst and checked by the Quality Manager.

3.5.7 Document Control and Document Review

The Quality Manual and associated documentation (regulations, standard operating procedures, test methods, manuals etc) which identify the scope of operation, organisation, facilities and equipment, analysis procedures and document control that apply within DCC Laboratory, are controlled as follows:

All internally generated documentation must include the following minimum information:

- designated procedure and revision number
- date of compilation
- approved signatories
- page number and title
- statement and purpose
- description of steps involved
- procedure history

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No controlled document may be issued until it has been approved and reviewed by the Senior Executive Chemist.

The existence of all copies of controlled documents will be recorded and monitored. Every copy will be assigned to a named member of staff who has accepted responsibility for its use. All obsolete copies of controlled documents must be destroyed with the exception of the master copy, which is marked 'obsolete' and maintained for reference purposes only. Uncontrolled copies of documents may be issued with authorisation by the Technical Manager. Such issues are recorded and marked accordingly. This procedure is to be detailed in SOP reference; 'Compiling and Controlling Standard Operating Procedures and Other Documentation'.

No person is allowed to alter any controlled document unless authorised by the Quality Manager or Deputy Quality Manager. However all staff are encouraged to suggest corrections or improvements to the Quality system.

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Standard operating procedures will be put in place for the purpose: 'Requesting a New SOP; 'Revising an Existing SOP; 'Revising the Quality Manual'.

It is the policy of DCC LABORATORY that the Document Review process will ensure that each Controlled Document is reviewed not less than once a year, so that any changes in Laboratory Policy or Practise, the ISO/IEC Standard, or appropriate legislation are fully reflected in the Controlled Documents. It is the responsibility of the Quality Manager to ensure that such Reviews are incorporated into Laboratory Quality System. A Document Review programme is currently included in the agenda for Quality Review Meetings.

3.6 Analysis Reports

Analysis reports are used for issuing results to all clients. Analysis reports are compiled as detailed in the SOP entitled *Compiling Analysis Reports*, unless requested in a different format by the client.

Such results must be reported with the utmost accuracy, clarity and objectivity, in such a manner as to minimise the possibility of misuse or misunderstanding.

Reports are issued as hard copy or by electronic data transfer. When reported by electronic data transfer, they are deemed as draft results only and must be followed by an authenticated hard copy.

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Every effort must be made to ensure client confidentiality. The company's aim is to report results in the manner prescribed by the client. Electronic data transfer and telephone must be used only when prior notice has been given to the client and only by staff authorised to do so, as detailed in the SOP entitled *'Telephoning and Faxing Results to Clients.'*

Where a party other than the Laboratory has carried out sampling an appropriate disclaimer must be included.

Unless the client has specified otherwise, each analysis report will contain the following minimum information:

1. Name and address of Laboratory.
2. Name, company and full address of client
3. Unique identification number with page numbers
4. Title

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5. DCC Laboratory reference and Client reference

6. Sample description

7. Any date written on the sample or accompanying documentation.

8. The date when the sample(s) arrived at the DCC Laboratory

9. The member of the Laboratory personnel who received the sample(s)

10. The analysis performed on the sample(s)

11. The date the analysis was completed

12. Reference to the test method used. Any deviations, additions or exclusions from the standard operating procedure must be recorded

13. The signature of the person(s) responsible for compiling the analysis report and the signature of the person(s) responsible for approving the analysis report must be included.

14. Any other available information helpful to or requested by the client. Where results arise from sub-contracted analysis this shall be clearly indicated on the analysis report.

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Any revisions of an analysis report after issue must be made only as a further document that includes the statement "Certificate of Analysis - Supplementary".

The Laboratory will notify clients promptly in writing if there is any cause to doubt the validity of any reported results. A standard procedure must be followed when an error has been identified, as detailed in the SOP: '*Dealing with Reported Erroneous Results.'*

The end of an analysis report is marked by the inclusion of signatures. Approved signatories who take technical and legal responsibilities for the report provide these. They are the Senior Executive Chemist, Executive Scientist, Chief Technician, and Executive Technicians. Where another technician has carried out the work, they may sign the report but it must be countersigned by one of the above.

3.7 Conditions for the Use of INAB Accreditation Mark

The INAB Accreditation Mark will be displayed on analysis reports containing only test results for which the Laboratory is accredited.

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3.7.1 *Use of INAB Accreditation Mark on Publicity Material*

The INAB Accreditation Mark will be displayed in publicity material that refers to accredited services. This will clearly indicate what activities are accredited.

It is clearly understood that the INAB Accreditation Mark or any reference to INAB accreditation does not imply that INAB accepts responsibility for the accuracy of an analysis result or any opinion or interpretation derived there from.

3.7.2 *Disclaimer for Non-accredited Results*

Where the INAB Accreditation Mark is displayed on analysis reports, which contain both accredited test results and results which are outside the scope of the Laboratory's accreditation, the following disclaimer will be clearly stated.

"Tests marked "Not INAB accredited" are not included in the INAB Accreditation Schedule of this Laboratory".

Where non-accredited test results are reported they shall be marked "Not INAB Accredited".

When a test report contains opinions, interpretations or other material relating to investigational activities, the following disclaimer shall be stated:

"Opinions and interpretations expressed herein are outside the scope of INAB Accreditation".

When information relating to sampling is included in a test report, the following disclaimer shall be stated:

"Information relating to sampling expressed herein is outside the scope of INAB Accreditation".

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3.8 Handling of Complaints and Anomalies

The Laboratory strives to minimise the possibility of error and ensure client satisfaction. When a complaint is received, it must be dealt with thoroughly and efficiently in accordance with the standard operating procedure.

Receiving and Processing Client Complaints.

It is the responsibility of the Chief Executive Chemist to ensure that complaints are resolved fully to the satisfaction of all concerned and that every effort is made to ensure that the incident cannot be repeated.

A record must be maintained of all complaints and of subsequent action taken by the Quality Manager. This may include carrying out a specific audit on the affected area, depending on the nature of the complaint as indicated below:

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Minor complaint (A specific audit is not necessary.) An isolated incident such as typographical error or a misunderstanding affecting only one sample or group of samples.

Major complaint (A specific audit is required.) Repeated minor complaint or one affecting more than one sample or group of samples. An incident that raises doubt concerning the Laboratory's compliance with its policies or procedures, or with the requirements of the International Standard ISO/IEC 17025:2000. If an error has been identified in reported test results, the Laboratory must immediately carry out Standard Operating Procedure, '*Dealing With Reported Erroneous Results'*. *(To be compiled).* This includes alerting the affected client(s) immediately by telephone and as soon as practicable in writing. Other action to be taken is described in Standard Operating Procedure, '*Quality Audit.'(To be compiled).* Every effort must be made to prevent further error or minimise delays if an operation has been suspended.

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3.9 Influence and Inducement

It is the Unit's policy not to accept any influence or inducement in respect of the reporting of results. Any member of staff becoming aware of or suspecting such pressure from a client must advise the Quality Manager immediately. Where the Quality Manager is satisfied that a client is seeking to exert any such influence or inducement, they must advise the Senior Executive Chemist, who will advise the client of the Unit's policy and ask the client to desist. Any repetition will lead to the immediate withdrawal of services from that client. Should a member of staff fail to report any such approach from a client or be suspected of complying with such an approach, disciplinary procedures will be invoked.

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SECTION 4: LABORATORY ACCOMMODATION, EQUIPMENT AND RECORDS

4.1 Laboratory Accommodation

The Lab is committed to the provision of an environment and accommodation that are suitable for conducting chemical analysis whilst ensuring safe working conditions for staff.

There are no activities currently being carried out in the Laboratory requiring specialised environmental conditions that cannot be met through the use of local exhaust ventilation systems. The performance of these facilities will be monitored annually.

Any deviations from the above should be reported to the Laboratory Manager.

4.2 Equipment used for Analysis

The Laboratory uses suitable equipment that is capable of achieving the accuracy required in compliance with the specification relevant to the analysis concerned.

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An inventory number will be issued to each item of equipment after it has been fully checked for compliance with safety regulations, at the time of receipt. This inventory number, which is attached to the equipment, uniquely identifies it and can be used to trace its safety compliance history. Safety compliance records are held in the individual equipment files.

All equipment must be checked prior to use to ensure that it is capable of achieving the accuracy required and that it complies with standard specifications relevant to the tests concerned. The criteria for these checks are based on the agreed specifications as to be detailed in the associated Standard Operating Procedures.

Only authorised staff can use Accredited equipment.

An Equipment Record must be completed for each item received. This must contain the following information:

1. name of the item of equipment
2. name of the manufacturer and any model or type identification
3. any serial number allocated by the manufacturer
4. inventory number
5. date when received
6. condition when received
7. date when placed in service
8. current location

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An 'Equipment File' must be prepared. See Standard Operating Procedure *'Equipment Files', GENSOP8.01*. This must contain:
-the Equipment Record
-a list of authorised users including a named primary person responsible and a secondary person responsible
-reference code and location of applicable Standard Operating Procedures
-title and location of relevant operating and maintenance manuals
-records of routine maintenance
- details of any breakdown/failure
-calibration records
-list of all consumables required for the operation of the equipment including location, storage conditions, minimum stock level, reordering information.
-details of suppliers of consumables and services including their accreditation status.

Each Equipment File is stored in a location convenient to the equipment itself. It is the responsibility of the operators of the equipment to ensure that once a file has been prepared, it is kept complete, up-to-date, and available on request. It must be checked at regular intervals as part of the Laboratory's Quality Audit programme and can be consulted at any time by any authorised personnel.

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Equipment must be maintained regularly to ensure proper functioning. Where applicable the equipment manufacturers' instructions are available to authorised staff.

Where relevant, equipment that is in constant use is checked between regular re-calibrations. Where an instrument is operating outside the documented specifications or its performance is questioned as a result of damage, mishandling or interference of any kind, operation of the instrument must be suspended. It must be clearly labelled to this effect and a statement provided to advise users of possible delays. The instrument cannot be returned to service until it has been repaired if necessary and its performance checked in accordance with the documented re-calibration and re-validation criteria.

For equipment requiring calibration, each record must include calibration reports, certificates and other relevant documents. Wherever practicable, all equipment requiring recalibration must be labelled so that the status of calibration and recalibration dates is obvious.

Records must include details of any equipment that may be out of service for a period and subsequently require re-calibration and re-commissioning for future use.

Where computers or other electronic equipment is used for the collection and processing of data, such equipment must be satisfactorily maintained.

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Any non-commercial software being utilised must be fully documented and validated before use.

4.3 Control and Traceability

The Laboratory adheres to the mandatory requirements for the calibration control of all measuring instruments. It is the responsibility of the primary operator of each piece of equipment to check that it is 'in calibration' and that calibration records are maintained. This will be checked as part of the Laboratory's Quality Audit Programme.

The Laboratory obtains all primary standards and calibrations for INAB accredited tests from bodies that possess INAB accreditation, with the required facilities to ensure traceability to national standards and accepts the reported associated uncertainties.

Reference standard materials are reserved for calibration purposes only and cannot be accessed by any person unauthorised to do so. They must be stored in the Laboratory in accordance with the conditions and shelf life recommended by the suppliers.

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The Technician using it calibrates the balances on a regular basis using reference weights. An external accredited body also calibrates the balances annually.

All analysis equipment, whether new, modified or reconditioned, must be calibrated and checked for conformance to the relevant specifications.

The frequency of calibration is regulated by any mandatory requirement, the type of equipment, calibration history and the amount of usage to which the equipment is subjected.

All analysis equipment must be labelled clearly to indicate required calibration dates.

4.4 Records

The Lab will maintain a systematic and documented record of all information of practical relevance to all work carried out in the Laboratory. This records system is operated so as to facilitate identification of the sources of error.
All records relating to an analysis / calibration or related process must be prepared in accordance with standard operating procedures. Records will consist of a combination of the following:

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Logbooks/ Maintenance records: These are designed and issued as a standardised method for recording specific information in relation to a standard procedure. Each book / record should have a title, reference code and issue number and the pages are numbered sequentially in each.

Computer printouts: The original printouts must be stored after processing for future reference. These show all work carried out including preparations, calibrations etc. The identity code of the operator is included in the information provided on the printout.

A copy of issued results must be kept in the manner described in the appropriate Standard Operating Procedure.

All information must be entered in permanent ink and any corrections must be made clearly beside the original entry, which should be crossed out without making it illegible. The member of staff making it must sign the correction. Major errors must be brought to the attention of management.

All records must be retained so that work can be reviewed and, if necessary repeated at a later stage. This includes workbooks, printouts ('raw data'), as well as copies of reported material. All information should be stored for a minimum of six years. All records are protected from loss, damage or misuse in accordance with the general security/ confidentiality policy of the Laboratory; see section 3.5.4 of this document.

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4.5 Analysis Report Distribution

Original - To the client, if external

Copy - Laboratory Manager/Customer File

Copies of analysis reports will be maintained for a minimum of six years.

Records can only be destroyed with the permission of the Senior Executive Chemist.

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SECTION 5: QUALITY CONTROL SYSTEM

5.1 Quality Control Policy

All of the Laboratory's activities must be carried out according to the relevant Standard Operating Procedures in a manner that ensures the quality of the data produced, following the general protocols set out in this manual. In so far as is practical, all activities must be audited on a regular basis to ensure that this policy is being followed. In any case, all activities relating to an accredited procedure must be audited following the protocols set out below.

5.2 Authorised Auditors

The Quality Manager shall plan and organise audits and the Quality Manager or a competent auditor, designated, must carry out audits.

5.3 Audit Procedure and Preventative Action

Audits must be carried out in accordance with Standard Operating Procedure '*Quality Audit*'. This has been prepared specifically to cover the activities of this Laboratory and includes all aspects of the quality system. A basic audit plan has also been prepared for each area to be audited. It is the responsibility of the Quality Manager to add to this or modify it to highlight key areas to be reviewed. These will be based on problems or potential problems, which have been identified through complaints (see section 3.8), audits in other areas and Quality Review findings etc.

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Auditors are instructed to adopt a pre-emptive approach in their work and all staff are encouraged to look for, and report any potential problems or opportunities to improve the quality system. This is facilitated by the use of the procedure; entitled: '*Revision of, or preparing a new Standard Operating Procedure"*

This will be incorporated into the Laboratory's policy on " Preventative Action" *(to be written)* which aims to prevent any future quality failures or mitigate the effects of any such failures by using the knowledge and intelligence obtained through auditing, or through the investigation of quality failures, anomalies, or client complaints.

It will be the policy of the DCC Laboratory to document any such "Preventative Action" taken and to retain records of such "Preventative Action" in a "Preventative Action" binder. Its existence is made known to all staff, who are encouraged to refer to the documents contained therein. All relevant documents, including any modifications to procedures or analytical methods are to be included with the filed and completed " Preventive Action forms.

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5.4 Frequency of Audits ***Does not yet apply – subject to change***

All designated activities and responsibilities must be audited at least once a year. In addition, two vertical audits must be conducted in the first and second halves of each year in association with an external auditor from another INAB accredited Laboratory. An Audit Programme has been prepared to provide a visual indication of the current audit status in all areas of the Quality System.

The Quality Manager is responsible for ensuring that audits are carried out within the time scale specified, either in the audit programme or Quality Review Meeting. They may authorise an audit to be carried out at any time in any area of the Laboratory.

5.5 Audit Findings ***Does not yet apply***

The Quality Manager is responsible for verifying and reviewing audits. Where an audit reveals non-compliance with the Laboratory's policy or procedure, corrective action must be taken within an appropriate time scale. This time scale must be agreed by both the Quality Manager and the person responsible for carrying it out at the time of the audit. The Quality Manager must verify monitoring and completion of corrective action. A record of Quality Audits and findings together with any non-compliance raised and the corrective action taken are kept on file for the required mandatory time period and for inspection by INAB as and when required.

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5.6 Quality Review ***Does not yet apply***

The quality system operated by the Laboratory must be reviewed when required or at least once a year, so that compliance with on-going requirements of INAB is maintained. The review will follow an agenda as detailed in appendix 12. This takes account of the findings of internal audits and external assessments, the results of Measurement Audits or Inter-Laboratory comparisons, complaints from clients or other relevant factors.

Review findings must be recorded including any action required. All staff will be expected to attend the annual Quality Review Meeting with the exception of the Director of the Laboratory.

Quality meetings are held at least monthly. The quorum for the monthly meetings will consist of three of the following: Technical Manager, Quality Manager, Deputy Quality Manager, Laboratory Manager and Training Manager A number of clients carry out audits of the Laboratory, the results of which are incorporated into the Quality Review.

5.7 Other Quality Checks

The Laboratory makes use of standard reference materials and sub-reference materials as to be detailed in the SOPs relating to specific analytical methods.

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SECTION 6: ANALYSIS SYSTEM

6.1 Standard Traceability

It is recognised that INAB requirements for the Laboratory's analysis programme apply not only to the analysis that the Laboratory offers as a service for which it holds accreditation but also to all subsidiary analysis, such as environmental conditions that could affect the accuracy or validity of such analysis or tests.

The Laboratory's procedures in relation to analysis or tests for reference standards meet the requirements of the International Standard ISO/IEC 17025:2000.

Reference standards are only used for calibration purposes.

The Laboratory's system of calibration and analysis is designed and operated so as to ensure that calibrations and analysis are traceable to National Standards or through evidence of correlation of calibration by regular use of reference materials.

The Laboratory offers an analysis service and holds reference standards and other items of analytical equipment required to cover the range of analysis performed. The analytical equipment and reference standards will be calibrated at intervals. *To be implemented*

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Official calibration certificates obtained from INAB accredited laboratories will be retained in the equipment file for each item of equipment.

6.2 Analysis Procedures

Due to the specialised nature of the work undertaken, the Laboratory must prepare 'in-house' standard procedures. The format of these procedures will be specified in the standard operating procedure for compiling and controlling documentation. This will state that all standard operating procedures must include the following minimum information:

- designated procedure and revision number
- date of compilation
- approved signatories
- page number and title
- statement and purpose
- description of steps involved
- procedure history

Procedures will be compiled and reviewed by experienced staff after consultation with technical experts and appropriate internationally recognised

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standards, where relevant e.g. International Standards, USEPA Methods, Manufacturers Technical Specifications, etc.

Standard Operating Procedures will be prepared for most of the activities carried out in the Laboratory and for **all** those upon which any accredited work is dependent. These procedures are to be maintained and controlled by the Quality Manager. Instruction must be given in sufficient detail and clarity to ensure proper implementation and consistency of application from one occasion to another. A Standard Operating Procedure cannot be circulated for use until it has been approved by an authorised signatory i.e. the Senior Executive Chemist of the Laboratory, as to be defined in the appropriate Standard Operating Procedure.

All Standard Operating Procedures should be controlled by applying a coloured stamp to every page. This will also states the copy number and date of issue. Staff are not allowed to hold any copies other than those stamped with their unique identity number.

The Laboratory uses current methods and procedures that are recognised as standard.

In addition to methods and procedures for analysis and related activities, the Laboratory has access to, and maintains on record any further information necessary for the proper performance of the analysis.

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The integrity of analysis is protected at all times. All data are filed in a secure system of storage. Data processing by computer will be performed only under secure access password control and is hard copied and filed.*(To be implemented)*

The Laboratory will only commence work on behalf of a client after the analysis to be performed has been agreed on by the Senior Executive Chemist, Chief Technician or Senior Executive Technicians and the client.

The analyst carrying out Nutrient analysis must adhere to the procedure as to be specified in the Nutrient Analysis Standard Operating Procedure and in compliance with the relevant Standards/ Specifications.

6.3 Uncertainty in Measurement

It is the Unit's policy not to provide an estimate of the uncertainty associated with any measurement unless specifically requested to do so by a client.

In that case, an uncertainty budget must be established for each sample. This is usually taken to be two standard deviations about the mean.

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In the case of Nutrient Analysis, the various associated potential sources of errors are:

a. the uncertainty caused by weighing out the test material
b. random variation in the repeatability of results when analysing a reference material of known composition
c. random variation in the repeatability of the results of the samples analysed.

6.4 Availability

Analysis will be carried out to the latest issue of any given specification unless requested otherwise by the client.

All Standard Operating Procedures and any other relevant information is made available to all associated staff.

Arrangements for analysis to non-standard methods can be negotiated. The reports issued will clearly state the area of deviation or special method of analysis used.

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6.5 Responsibility

The Senior Executive Chemist and the Chief Technician are responsible for the authorisation of analysis procedures.

All procedures must be endorsed with Date of Compilation/Revision Number. Obsolete copies must be withdrawn and destroyed.

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SECTION 7: SAMPLE HANDLING STORAGE AND DISPOSAL

All test samples received into the Laboratory must be handled in accordance with the Standard Operating Procedure (*see section 3.5.3*). If the sample is from a known source and/or has documentation indicating it is safe and non-hazardous, it can be opened at the laboratory bench. If the source of a package is unknown and/or no documentation is available or it is known to be hazardous, the package is opened in a fume cupboard and the samples are checked for leakage or any other form of damage. A separate procedure is followed for damaged samples, see *'Handling Samples Damaged in Transit'*. This involves assessing the integrity and quantity of the remaining sample and consultation with the client.

There are no test items curently accepted by the Laboratory that require specialised storage or handling conditions that cannot be met through the use of local exhaust ventilation systems (fumehoods), refrigerators etc. The performance of all fumehoods is monitored regularly and all other facilities are monitored when their performance could effect the result of any test being carried out.

Having been accepted for analysis, all samples are logged into the DCC Laboratory Sample Register, and each sample received is uniquely identified. Every sample in the batch is individually marked with an individual Lab Reference number which is;

- quoted on all documentation, analysis records, reports, and disposal records relating to it.
- Quoted on all correspondence with other bodies that have reason to deal with the analysis or processing of the sample,
- Quoted on all portions of samples.

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Currently, due to constraint of space, samples are not retained after analysis. It is hoped that the new premises will have adequate facilities to enable samples to be kept for a minimum of two months after sampling. The conditions of storage and transportation where required are as directed by the client or, in the absence of such directions, as recommended by DCC Laboratory management.

Test samples are currently disposed of safely through the existing sewage treatment plant at the facility, as will be detailed in the appropriate Standard Operating Procedure.

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SECTION 8: SECURITY OF LABORATORY PREMISES

The Central Laboratory is located on the top floor of a new 3-storey building, comprising the laboratory areas and office space. Access to the building can only be achieved through a main door, dedicated to the Laboratory, which is protected by a keypad during working hours and locked outside normal working hours. Visitors to the Lab must report to the Reception area, via the intercom, and entry to the building may be granted by pressing a door switch in Reception. Security cameras monitor the front door and sides of the building, and all visitors may be seen on screens in Reception. On entering into Reception visitors must pass through a second door protected by a keypad in order to enter into the main laboratory and office areas.

Only established members of staff hold keys, for which they are responsible. Loss or misplacement of a key must be promptly reported to the Senior Executive Chemist. A list of all current key holders is posted in the reception area of the Laboratory.

Visitors can enter either the Laboratory or office areas by invitation only and are accompanied at all times by a member of staff.

Responsibility for DCC Central Laboratory site security lies with the Senior Executive Chemist. All key holders are responsible for ensuring that the Laboratory is never left unlocked and unattended.

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Appendix I

Quality System Organisational Structure

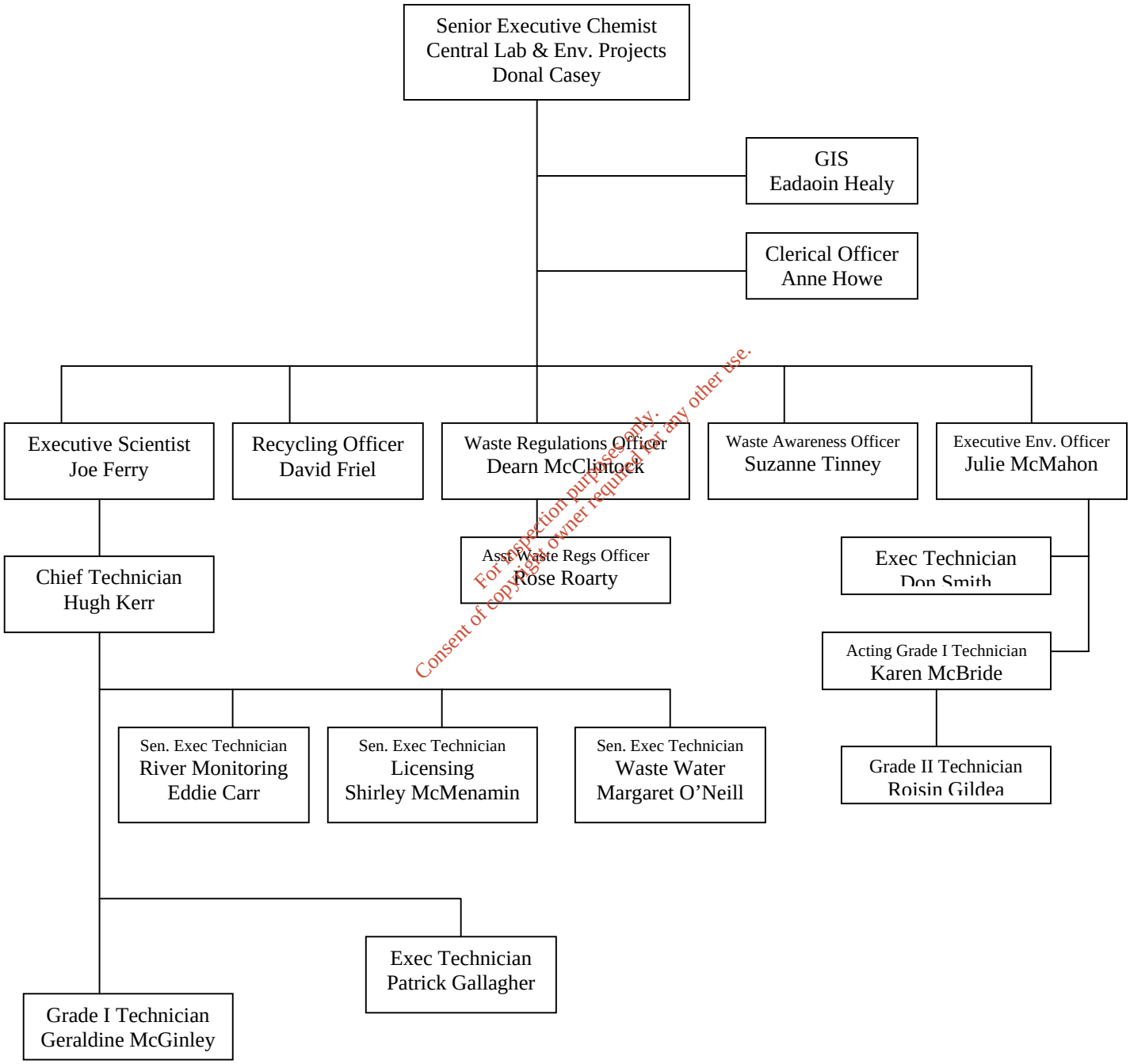
Position	Designated Staff member	Deputy
Quality Manager	Executive Scientist	Sen. Executive Technician
Technical Manager	Chief Technician	
Training Manager	Senior Executive Technician	

Position	Designated Staff member	Deputy
Quality Manager	Joe Ferry	Shirley McMenamin
Technical Manager	Hugh Kerr	Geraldine McGinley
Training Manager	Margaret O'Neill	Patrick Gallagher

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Appendix II – Water & Environmental Services Organisation Chart



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REGISTER of QUALITY APPROVED LABORATORIES SUBMITTING DATA to EPA (2006 Data)

This register has been compiled in compliance with Section 66 of the EPA Act 1992.

Explanatory Note Section 66 of the Environmental Protection Agency Act 1992 provides for the establishment of an intercalibration programme for the purpose of assessing analytical performance and ensuring the validity and comparability of environmental data for laboratories which submit data to the Agency. It also provides for the establishment of a register of quality approved laboratories which would normally be expected to send data to the Agency. This register lists, on a parameter by parameter basis, the laboratories which performed satisfactorily in the EPA intercalibration programme for the previous year. The register is updated annually. The objective criteria for inclusion in the register are listed below. Criteria for compliance 4 satisfactory returns from 5 or 3 satisfactory returns in consecutive rounds or current laboratory accreditation Criteria for pH require 3 returns within 0.20 pH units of reference concentration and 1 return within 0.30 units.

Note to above Only laboratories which provide data to the Agency, either directly or indirectly, are eligible to participate in the intercalibration programme. Some laboratories do not routinely carry out all of the tests listed on the register or may not have returned sufficient intercalibration data during 2006 to allow an assessment based on the above criteria for a particular parameter. It should not be inferred therefore, that the absence of a laboratory from the listing under a particular parameter necessarily implies unsatisfactory performance for that parameter. The parameters along with the laboratories which are deemed to have complied according to the above criteria are set out in the attached schedule:

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Dublin City Council (Ballyboden)
Dublin City Council (Ballymore Eustace)
Dublin City Council (Central Laboratory)
Dublin City Council (Roundwood)
Dublin County Council (Leixlip)
Enterprise Ireland
Envirolab
Environmental Laboratory Services
Envirotech
EPA (Castlebar)
EPA (Cork)
EPA (Monaghan)
EPA (Richview)
EPA Kilkenny
Euro Environmental Services
FBA Laboratories
Galway City Council
General Analytical
Hensey Glan Uisce
Independent Analytical Services
Kerry County Council
Lough Derg/Ree Laboratory
Mercury Analytical
Microlabs
North Tipperary County Council (Nenagh RWSS)
Nutrisolv
Oldcastle Laboratories
Public Analyst Cork
Public Analyst Dublin
Q-Lab Ltd
Roscommon County Council
Southern Scientific Services
T.E. Laboratories Ltd.
Tipperary SR County Council
TMS Environment
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Waterford County Council
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Coillte
Cork City Council
Cork County Council (Mallow)
Cork County Council (Water)
Donegal County Council
Dublin City Council (Ballyboden)
Dublin City Council (Ballymore Eustace)
Dublin City Council (Central Laboratory)
Dublin County Council (Leixlip)
Environmental Laboratory Services
EPA (Richview)
Galway City Council
Independent Analytical Services
Kerry County Council
Limerick City Council
Limerick County Council
Meath County Council (Trim)
Microlabs
North Tipperary County Council (Nenagh RWSS)
Tipperary SR County Council
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Clare County Council
Coillte
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Consult-Us Ltd.
Cork City Council
Cork County Council (Environment)
Cork County Council (Mallow)
Cork County Council (Water)
Dairygold
Dawn Pork
Donegal County Council
Dublin City Council (Central Laboratory)
Envirolab
Environmental Laboratory Services
EPA (Castlebar)
EPA (Cork)
EPA (Monaghan)
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Longford County Council
Longford Town Council
Lough Derg/Ree Laboratory
Meath County Council (Navan)
Meath County Council (Trim)
Mercury Analytical
Microchem Laboratories
Microlabs
Monaghan County Council (Ballybay)
Neptune Laboratory Services
North Tipperary County Council (Nenagh RWSS)
North Tipperary County Council, Roscrea STP
Public Analyst Cork
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Mayo County Council Ballyhaunis
Mayo County Council Westport
Meath County Council (Navan)
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Monaghan County Council (Ballybay)
Monaghan County Council (Monaghan)
Mutton Island S.T.W
North Tipperary County Council (Nenagh RWSS)
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Meath County Council (Navan)
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EPA Kilkenny
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FBA Laboratories
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Lough Derg/Ree Laboratory
Mayo County Council Ballyhaunis
Mayo County Council Westport
Meath County Council (Navan)
Meath County Council (Trim)
Mercury Analytical
Microchem Laboratories
Microlabs
Millipore Ireland B.V.
Monaghan County Council (Ballybay)
Monaghan County Council (Monaghan)
Mutton Island S.T.W
North Tipperary County Council (Nenagh RWSS)
North Tipperary County Council, Roscrea STP
Nutrisolv
Oldcastle Laboratories
Public Analyst Dublin
Q-Lab Ltd
Roche Ireland
Roscommon County Council
SERBD
Sixmilebridge STP
Sligo County Council
Southern Scientific Services
T.E. Laboratories Ltd.
Three Rivers Project Boyne
Tipperary SR County Council
TMS Environment
Treatment Systems Ltd
Water Technology
Waterford County Council
Western Regional Fisheries Board
Westmeath County Council (Athlone)
Westmeath County Council (Mullingar)
Wicklow County Council
Wyeth Nutritionals Askeaton

TOT_HARDNS
Alcontrol
Amberley Quality & Environmental Services Ltd
BHP Laboratories Ltd.
Bord na Mona
Central Fisheries Board
Coillte
Complete Laboratory Solutions
Consult-Us Ltd.
Cork City Council
Cork County Council (Mallow)
Cork County Council (Water)
Donegal County Council
Dublin City Council (Central Laboratory)
Enterprise Ireland
Envirolab
Environmental Laboratory Services
Envirotech
EPA (Castlebar)
EPA (Cork)
EPA (Monaghan)
EPA Kilkenny
Euro Environmental Services
FBA Laboratories
Galway City Council
General Analytical
Independent Analytical Services
Kerry County Council
Lough Derg/Ree Laboratory
Meath County Council (Trim)
Mercury Analytical
Microlabs
North Tipperary County Council (Nenagh RWSS)
Nutrisolv
Public Analyst Cork
Public Analyst Dublin
Q-Lab Ltd
Roscommon County Council
SERBD
Southern Scientific Services
T.E. Laboratories Ltd.
Three Rivers Project Boyne
Tipperary SR County Council
TMS Environment
Treatment Systems Ltd
Water Laboratories
Water Technology
Waterford County Council
Wicklow County Council

ZINC
Alcontrol
BHP Laboratories Ltd.
Bord na Mona
Coillte
Consult-Us Ltd.
Cork City Council

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Cork County Council (Environment)
Cork County Council (Mallow)
Dublin City Council (Central Laboratory)
Environmental Laboratory Services
EPA (Richview)
Euro Environmental Services
FBA Laboratories
Independent Analytical Services
Kerry County Council
Mercury Analytical
Microchem Laboratories
Public Analyst Cork
Public Analyst Dublin
Southern Scientific Services
T.E. Laboratories Ltd.
Teagasc
TMS Environment

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1. **Introduction**

The aim of the calibration system is to endure that all measuring and test equipment whose accuracy influences the quality of test results shall be calibrated at regular defined intervals. This document lists the equipment which requires calibration by external contractors

2 **Schedule**

Item No.	Description	Make	Model	Serial No	Supplier	Calibration carried out by	Calibration Interval	Date of Calibration	Current location
LY002	Incubator	FTD	250	23696-LDA		AGB	Annual	February	Micro Lab
LY005	Balance	Mettler	PE1600	C96731 FNR47495		AGB	Annual	February	Lab
LY006	Balance	Mettler	AE260	SNR H56169		AGB	Annual	February	Lab
LY007	Hach Spectrophotometer	Hach	DR2010	971000005762	Celtic Eng	Celtic Eng	Annual	June	Lab
LY008	Hach Spectrophotometer	Hach	DR3000	283	Celtic Eng	Celtic Eng	Annual	June	Lab
LY011	COD Reactor	Hach	16500-01	165001	Celtic Eng	Celtic Eng	Annual	June	Lab
LY012	COD Reactor	Hach	456	010700008857	Celtic Eng	Celtic Eng	Annual	June	Lab
LY013	Hach Spectrophotometer	Hach	DR2000	950200033476	Celtic Eng	Celtic Eng	Annual	June	Lab
LY014	Convection Oven	Sanyo	MOV-212F	98100593		AGB	Annual	February	Lab
LY015	Combustible gas Indicator	MSA	40	F11509		CSL	6 months	May/Oct	Lab
LY020	Landfill Gas Analyzer	Geotechnical	GA 94	P006670		CSL	6 months	April	Field
LY024	Autoclave	LTE	Series 100	50806/1		Davidson & Hardy	Annual	January	Lab
LY025	Incubator	Sanyo	EN055	01-0115		AGB	Annual	February	Micro Lab
LY026	Incubator	Heraeus	B6030-(I)	51006829		AGB	Annual	February	Micro Lab
LY027	Incubator	Heraeus	B6030	51006830		AGB	Annual	February	Micro Lab

COMPILED BY : Joe Ferry DATE: 4th January 2005
AUTHORISED BY: Hugh Kerr DATE: 4th January 2005

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Donegal County Council Laboratory	STANDARD OPERATING PROCEDURE Reception & Handling of Samples	GENSOP 3.04 Page 1 of 1 Revision 0

1 Purpose

The progress of a sample or batch of samples through the laboratory system is recorded by the use of the DCC Register of Samples.

2 Procedure

Samples are normally collected on site by a member of DCC.

Where possible, samples are placed on a bench in the main laboratory and are immediately assigned a DCC Lab Reference number, normally the next number in the series. A test sheet must also be completed, recording,

- The lab ref no.
- The date & time of sampling
- The exact location
- The name of the Sampler
- Any results of tests carried out in the field

This sheet will then be used to record the results of all analysis carried out on the sample and is signed off by the person responsible for that area of testing when completed. The sheets are colour coded & filed as follows;

- Sewerage – yellow pages
- Landfill – green pages
- Drinking water – blue pages
- Factories/trade effluent – pink pages
- Rivers – salmon pages
- Lakes – white pages
- Miscellaneous – ivory pages

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The sheet is given a page number when filed in the appropriate section to ensure that all pages are accounted for. Each sheet lists only the analysis required for that type of sample. In some cases, a label, listing the specific analysis required, is applied to the bottle to enable progress to be tracked readily. The member of staff who collected the sample(s) must assume responsibility for storing the sample and for ensuring that the member of staff performing the analysis is aware of the sample location.

3 Procedural History

New SOP – no revisions to date.

Compiled by:	Joe Ferry	Date:	4/2/05
Authorized by:	Donal Casey	Date:	4/2/05

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1 Purpose

1.1 The purpose of this document is to describe the procedure for entering & retrieving information, including sample type, location, purpose and analytical results, from the ***LabInfo*** Laboratory Information Management System, (LIMS).

2 General Information

LabInfo is a database supplied by the LGCSB and is used by many Local Authorities across the country. It is therefore, a LIMS tailored to meet the needs of the Laboratory Service in that it has been set up to store data under the relevant headings, such as Rivers, lakes, Wastewater Treatment, Drinking Water, Licenced discharges and complaints of various types. It contains a number of report formats which are suitable for downloading into Microsoft Excel and may then be forwarded to the EPA.

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3. Procedure – start-up



Shortcut to LabInfo.exe.lnk

Click on the icon on your desktop

Select from 3 options;

Option	Function
Enquiry/Data Entry	Enter new samples, interrogate data, print data etc
Database Utilities	Not required by Lab
Configuration	Set up users, new sample purposes etc

4. Procedure – Configuration

Click on ***Configuration*** and select from the following Tabs

Tab	Function
Report Details	Once set up, doesn't need to be changed. Appears on reports
User	List of users, click on "Add New" to insert new user
Monitored Entity	Select entity type from DW, Water Bodies, Discharges or Operational. Click "Add New", as required
Station	Eg – Lake or River
Parameter Info	List of parameters, click "Add New" as required
Sample Purpose	Eg- Bathing Water- Blue Flag tests, "Add New" as reqd
Field Sheets	Not used
Audit	Tracks changes made in the system
Work List	Gives Drinking water sampling frequency

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5. Procedure – Enquiry/Data Entry

Select entity type from ***DW, Water Bodies, Discharges or Operational*** or all of these. Using the button on the bottom left hand corner, ***Enquiry Mode***, select from the following options;

Enquiry Mode	Function
Enquiry	Allows retrieval of data for selected entity type
New Sample	Enter details for a new sample using predefined Sample Purpose & Station, (ie these must be entered first)
Result Entry	Enter results for any of all parameters for a single sample or as many samples as desired
Batch Entry	Enter results for a selected parameter for a list of samples
Certification	Certify/Approve results for a set of samples, eg- DW
Field Sheets	Set up
Auto Analysers	For the importing of results from Lachat csv or Excel files
Investigations	For DW incidents

In the ***Enquiry Mode***, click on ***More Displays***, in the top right hand corner of the screen, to reveal the following options;

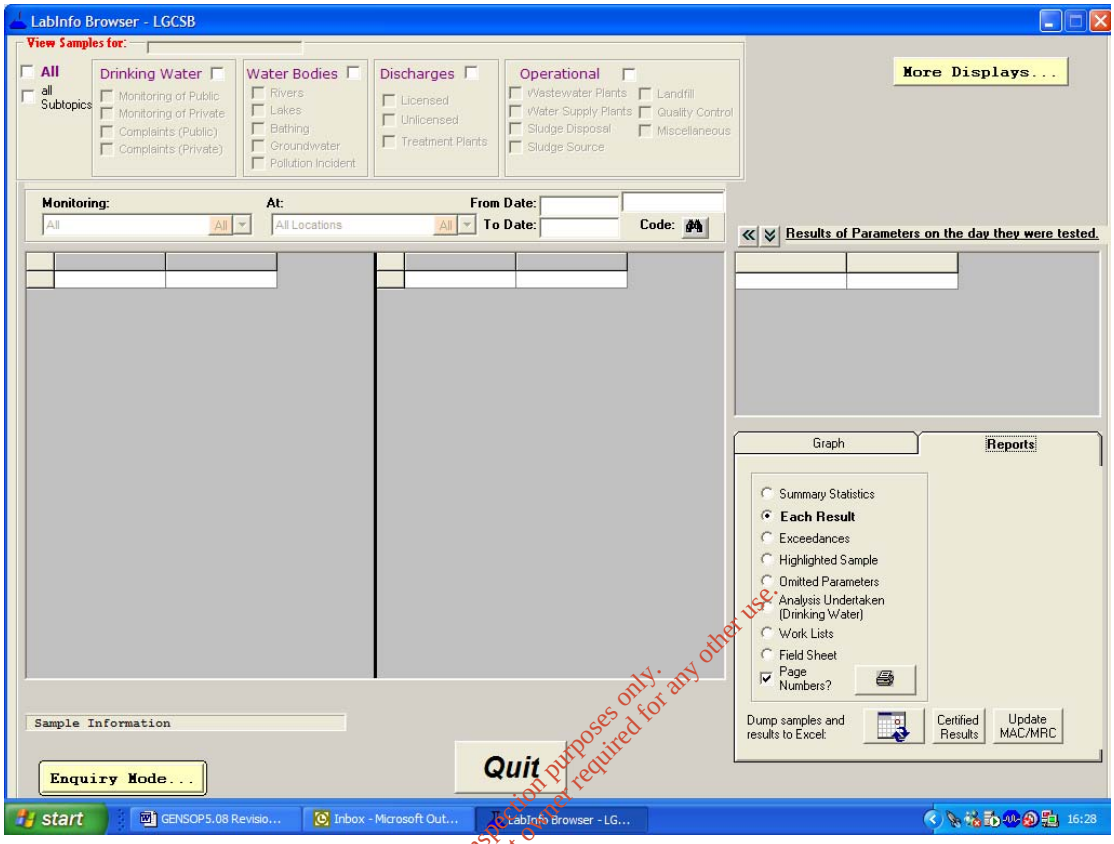
- Samples For: All Purposes or select from "Audit Monitoring Public" etc
- Exceedances For: All Parameters or select from a list of Paramaters
- Samples of Status: Awaiting Results, With Results, With Results Certified, With ResultsUncertified, Exceedances Only or All

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In the bottom right hand corner of the screen, select from

Graph	by Entity or by Station
Reports –Summary Statistics	Report with list of sample no's, min, median & max
Each Result	Cert with single results page for each sample
Highlighted sample	Cert with single results page for selected sample
Omitted Parameter	List of mandatory parameters omitted from analysis
Analysis Undertaken (DW)	Requests Start Date & End date
Work Lists	Generally not used
Field Sheet	Generally not used
Page Numbers	Generally not used
Printer icon	To print certs with results, single or Statistics
Dump to Excel	To dump selected results into Excel
Certified Results	To dump certified results into Excel
Update MAC/MRC	Generally not used

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6. Procedural History

New SOP – no revisions to date.

Compiled by:	Joe Ferry	Date:	6/2/07
Authorized by:	Donal Casey	Date:	6/2/07

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1 PRINCIPLE OF METHOD AND SCOPE

This method is applicable to the examination of wastewater from an Activated Sludge wastewater treatment plant. Degradation of incoming wastewater is achieved by micro-organisms within the Activated Sludge Aeration Basin. The biomass is expressed as Mixed Liquor Suspended Solids. The sludge is subsequently removed by clarification/settling in a clarifier with the remaining supernatent discharged as effluent. The settling properties of the sludge are therefore very important and are determined by the Cone test.

2 SAMPLE STORAGE AND PRESERVATION

Analyse within 24 hours of sample collection.

3 INTERFERENCES

Flow into sewage treatment plants increases greatly when there is heavy rainfall, particularly in towns where the surface water flows to the sewers rather than to the streams/rivers.

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4 EQUIPMENT

- 2 x Cones (0.5m deep, 0.1m diameter column) with approx. 1000ml volume
- Sampling rod and beaker
- Disposable gloves

5 PROCEDURE

i. Qualified authorised Local Authority personnel must take all samples. Sampling must be carried out taking due care to avoid personal risk or injury arising from the nature of the sample itself or the location of the sample point.
ii. Sample approximately 1 litre of activated sludge from each aeration basin.
iii. Fill each cone with respective sample to the 1000ml mark.
iv. Leave to settle for 30 minutes.
v. Record volume of solids in cone.

6 REPORTING OF RESULTS

The results are reported as ml/L.

7 REFERENCES

- Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995 pg 2-54
- Laboratory Procedures Course – NSTWG/FÁS

Compiled by: Geraldine Friel Date: 30th November 2007

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Authorized by: Hugh Kerr Date: 30th November 2007

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1 PRINCIPLE OF METHOD AND SCOPE

This method is applicable to the examination of wastewater from an Activated Sludge wastewater treatment plant.

It is important to maintain an appropriate quantity of biomass (micro-organisms) within the Activated Sludge Aeration Basin at all times so as to ensure sufficient biodegradation of incoming wastewater. The biomass is expressed as Mixed Liquor Suspended Solids. The MLSS level to be maintained in the sludge basin varies depending on changes in flows, strength and treatability of incoming sewage. The level of MLSS is varied by adjusting sludge return and sludge wastage rates.

Mixed Liquor Suspended Solids are determined by filtering a well-mixed sample through a 1μm weighed glass fibre filter. The residue retained on the filter is dried to a constant weight at 103-105 °C. The results are expressed as mg/l.

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2 SAMPLE STORAGE AND PRESERVATION

Analyse within 24 hours of sample collection.

3 INTERFERENCES

Exclude large floating particles or submerged agglomerates of non-homogenous materials from the sample, if their inclusion is not desired in the final result.

Excessive residue may form a water entrapping crust. It is therefore often necessary to limit the sample size to prevent this from occurring.

4 EQUIPMENT AND REAGENTS

- Drying oven, for operation at 103-105 °C
- Desiccator, provided with a desiccant containing a colour indicator of moisture concentration.
- Filtration apparatus and vacuum pump
- Glass fibre disc 1 µm
- Analytical balance capable of weighing to 0.0001g
- Distilled water
- Graduated cylinders
- Forceps

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5.1 PROCEDURE

5.2 The glass fibre disc

i. Switch on the vacuum pump.
ii. Write the laboratory reference number on the disc.
iii. Using forceps insert the glass fibre disc onto the funnel of the filtration apparatus.
iv. Wash the glass fibre disc with approximately 50 mls of distilled water.
v. Turn the valve to the open position. Suction is continued until all traces of water are gone.
vi. The filter paper is then removed from the filtration apparatus using forceps and placed onto aluminium foil or tray.
vii. The filter is then dried in an oven at 105°C for 1 hour. Store in a desiccator until needed.
viii. Remove disc from the dessicator.

5.2 Sample analysis

i. Weigh the disc (W1) using analytical balance, record weight and laboratory reference number in the (Mixed Liquor) Suspended Solids register.
ii. Switch on the vacuum pump.
iii. Using forceps insert the weighed glass fibre disc onto the funnel of the membrane filtration apparatus.
iv. Ensure cork is tight on sample bottle and invert 4-6 times to mix well.
v. Pour a suitable volume of a well mixed sample into a graduated cylinder. Record volume in the (Mixed Liquor) Suspended Solids register.
vi. Turn the vacuum pump valve to the open position. Suction is continued until all traces of water are gone.
vii. Turn off the vacuum pump valve.
viii. The filter paper is then removed from the filtration apparatus using forceps and placed onto aluminium foil or tray.
ix. The filter is placed in the oven at 103 -105°C for 1 hour.
x. Filters are removed from the oven and placed in the dessicator for at least 1 hour to cool.
xi. Filters are then weighed (W2) again using analytical balance and weight is recorded in Mixed Liquor Suspended Solids register and result is calculated.

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6 REPORTING OF RESULTS

6.1 Calculation of results

1	2	3	4	5	6	7	8
Date	**Lab ref**	**Location**	**Weight 1 g (W1)**	**Weight 2 g (W2)**	**(W2-W1) g**	**Mls used**	Divide (W2-W1) by mls used & Multiply by 1,000,000. **Suspended Solids mg/l**

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6.2 Report results

Record the results in the (Mixed Liquor) Suspended Solids register to the nearest mg/l.

7 REFERENCES

- Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995 pg 2-54
- Laboratory Procedures Course – NSTWG/FÁS

Compiled by:	Geraldine Friel	Date:	30th November 2007
Authorized by:	Hugh Kerr	Date:	30th November 2007

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1 PRINCIPLE OF METHOD

pH is a measure of acidity and is defined by equation (1)

$$pH = -\log a_{H^+} \quad (1)$$

where a_{H^+} = activity of H^+ ion

Combination glass electrode: The glass membrane is in equilibrium with H^+

$$Si\text{-}O\text{-}Na + H^+ \; - \; Si\text{-}O\text{-}H + Na^+ \quad (2)$$

On each surface and Na^+ ions transport charge across the membrane so that one side still senses the other side. The response to changes in pH is nearly Nerstian and can be described by equation (3).

$$E = E^o + 0.059\log([H^+] + K[Na^+]) \quad (3)$$

Where: E = observed potential
E^o = potential dependent on the electrode system used
K = selectivity coefficient for H^+ over Na^+

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1.2 SCOPE

Working Range: pH = 2-12

1.3 SAMPLE STORAGE & PRESERVATION

Analyze within 24 hours of collection (preferably as soon as possible after sampling).

1.4 INTERFERENCES

- The glass electrode is relatively free from interferences from colour, turbidity, colloidal matter, oxidants, reductants or high salinity except for a sodium error at pH > 10 (in this case use special electrodes).
- pH measurement is affected by temperature, mechanical effects that are issued by changes in the properties of the electrodes and chemical effects caused by equilibrium changes.
- Always report temperature with pH measurements.

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1.5 EQUIPMENT

WTW pH 320, 330 or 340 meter and Sentix 41 probe with range 0-14 pH scale and temperature sensor.

1.6 REAGENTS

- Pre-prepared certified standard solutions of Technical Buffers 7.00 and 4.01
- 3 molar solution of Potassium Chloride, KCl

1.7 INSTRUMENT CALIBRATION (WTW 320, 330 and 340)

i. Remove the rubber protective seal covering the electrode.
ii. Bring the buffers to 20-25^{o}C (room temperature).
iii. Switch on meter. Ensure TP is present at bottom RHS of screen to indicate temperature sensor is connected.
iv. Press **Cal** button until CTI appears on screen (AutoCal TEC at bottom of screen).
v. Rinse electrode in distilled water and gently pat dry.
vi. Immerse electrode in pH 7.00 and allow to stabilise.
vii. Press **Run/Enter**. **AR** will flash on screen and the mV reading for pH 7.00 appears and should be within 0 $\pm$ 30 mV. Record value.
viii. **CT2** will then appear.
ix. Rinse electrode in distilled water and gently pat dry.
x. Immerse in pH 4.01 buffer and allow to stabilise.
xi. Press **Run/Enter**. AR will flash on screen and the mV reading for pH 4.01 appears and should be within 170 $\pm$ 30 mV. Record value.
xii. Meter will then give slope value (S), which must be within range of minus 57-60mV. Record slope value.
xiii. Press **pH/mV** button to convert to pH units. Record value for pH 4.01 buffer.
xiv. Rinse electrode in distilled water and gently pat dry.
xv. Immerse in pH 7.00 buffer, allow to stabilise and record pH reading for same.

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1.8 INSTRUMENT CALIBRATION (WTW 340i)

Calibration for WTW 340i is the same as that outlined in section 1.7. with the following amendments:

- (vii) is amended in that the mV reading for pH 7.00 does not appear and therefore is not recorded. pH 7.00 remains on the screen until CT2 appears.

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- (xi) is amended in that the mV reading for pH 4.01 does not appear and therefore is not recorded. pH 4.01 remains on the screen until CT2 appears.

- (xiii) is amended in that the **M** button is pressed to convert to pH units – this button has the same function of changing the measuring mode as **pH/mV** button.

1.9 SAMPLE ANALYSIS

- Analyse for pH as soon as possible after sampling ensuring that pH probe with a temperature sensor.
- Remove electrode from buffer, rinse, blot dry and immerse in sample.
- Stir sample to ensure homogeneity - stir gently to avoid entrainment of carbon dioxide.

1.10 REPORTING OF RESULTS

Report the pH values to the nearest 0.1 pH unit for samples only

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1.11 QUALITY CONTROL STANDARD

Run Q.C. standards with each batch of samples analysed. Measure the pH of the Q.C. standard buffers pH 7.00 and 4.01 (reference temperature 25°C) as outlined in section 1.7. (xiii) and (xv).

1.12 STORAGE OF pH PROBE

The pH probe may be stored in pH 7.00 buffer during the day between use but the protective cap should be half-filled with 3M KCl solution and placed on the electrode overnight or for long periods when not in use. The KCl solution should be replaced regularly.

1.12 REFERENCES

- Sentix Electrode Operating Instructions
- Instruction Manuals for WTW pH 320, 330 and 340 portable pH meter
- Standard Methods, 19th Edition, Section 4500-H+, Page 4-65

2.1.1 Procedural History

(Revision 1 compiled to include details for new WTW 340i meters

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Compiled by:	Geraldine McGinley	Date: 26th January 2005
Authorized by:	Joe Ferry	Date: 26th January 2005

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1 PRINCIPLE OF METHOD AND SCOPE

Suspended solids are determined by filtering a well-mixed sample through a 0.45 μm weighed glass fibre filter. The residue retained on the filter is dried to a constant weight at 103-105 °C. This method is applicable to the examination of drinking water, surface water and wastewater.

2 SAMPLE STORAGE AND PRESERVATION

Analyse within 24 hours of sample collection.

3 INTERFERENCES

Exclude large floating particles or submerged agglomerates of non-homogenous materials from the sample, if their inclusion is not desired in the final result.
Excessive residue may form a water entrapping crust. It is therefore often necessary to limit the sample size to prevent this from occurring.

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4 EQUIPMENT AND REAGENTS

- Drying oven, for operation at 103-105 °C
- Desiccator, provided with a desiccant containing a colour indicator of moisture concentration.
- Membrane filtration apparatus and vacuum pump.
- Glass fibre disc 1 µm
- Analytical balance capable of weighing to 0.0001g
- Distilled water
- Graduated cylinders
- Forceps

5 PROCEDURE

5.1 The glass fibre disc

i. Switch on the vacuum pump.
ii. Write the laboratory reference number on the disc.
iii. Using forceps insert the glass fibre disc onto the funnel of the membrane filtration apparatus.
iv. Wash the glass fibre disc with approximately 50 mls of distilled water.

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v. Turn the valve to the open position. Suction is continued until all traces of water are gone.
vi. The filter paper is then removed from the filtration apparatus using forceps and placed onto aluminium foil or tray.
vii. The filter is then dried in an oven at 105°C for 1 hour. Store in a desiccator until needed.
viii. Remove disc from the dessicator.

5.2 Sample analysis

i. Weigh the disc (W1) using analytical balance, record weight and lab reference number in the suspended solids register.
ii. Switch on the vacuum pump.
iii. Using forceps insert the weighed glass fibre disc onto the funnel of the membrane filtration apparatus.
iv. Ensure cork is tight on sample bottle and invert 4-6 times to mix well.
v. Pour a suitable volume of a well-mixed sample into a graduated cylinder. Record volume in the suspended solids register.
vi. Turn the vacuum pump valve to the open position. Suction is continued until all traces of water are gone.
vii. Turn off the vacuum pump valve.
viii. The filter paper is then removed from the filtration apparatus using forceps and placed onto aluminium foil or tray.
ix. The filter is placed in the oven at 103 -105°C for 1 hour.
x. Filters are removed from the oven and placed in the dessicator for at least 1 hour to cool.
xi. Filters are then weighed (W2) again using analytical balance and weight is recorded in suspended solids register and result is calculated.

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6 REPORTING OF RESULTS

6.1 Calculation of results

1	2	3	4	5	6	7	8
Date	**Lab ref**	**Location**	**Weight 1 g (W1)**	**Weight 2 g (W2)**	**W2-W1 X 1000 mg Note: multiply by 1000 to convert to mg**	**Mls used**	**Suspended Solids mg/l Note: 1. Divide 1000 by mls used to give conversion factor to litres 2. multiply column 6 by conversion factor**

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6.2 Report results

Record the results in the suspended solids register to the nearest mg/l.

7 REFERENCES

- Standard Methods for the Examination of Water and Wastewater, 19th Edition1995 pg 2-54

Compiled by:	Shirley McMenamin	Date:	20th December 2004
Authorized by:	Joe Ferry	Date:	20th December 2004

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1 PRINCIPLE OF METHOD AND SAMPLE TYPE

Two types of sample can be taken, grab samples or composite samples.

(1) Grab sample:

A sample collected at a particular time and place can represent only the composition of the source at that time and place. This involves manual sampling and minimal equipment but may be unduly costly and time-consuming for routine or large-scale sampling programs. As the name implies 'Grab samples' are simple scoops of the wastewater being sampled and are appropriate where conditions are constant or well mixed and slow to change. This type of sample can be used for instance for Balance Tank sampling or measuring sludge solids in the aeration basin (MLSS). Care should always be taken that a grab sample is representative of the whole, and should be taken from well-mixed areas on all occasions.

(2) Composite Samples:

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Composite samples are either amalgamated or made up of smaller sub samples, and can be prepared in two ways. Automatic samplers can eliminate human errors in manual sampling, reduce labour costs, provide the means for more frequent sampling, and are used increasingly.

The simplest form is time-related composites, which are made up of sub samples of equal volume taken at specific time intervals e.g. sub samples every hour composited to make a single daily sample. A ***composite sample*** representing a 24hr period is considered standard for most determinations. Under other circumstances, however, a composite representing a longer time period, or a shorter time period may be preferable. The other form is ***flow proportional*** sampling, which requires a purpose-designed sampler. These units take samples of wastewater proportional to the flow and are usually linked to an automatic flow meter. This latter form of sampling is extremely accurate and can be used to establish the total wastewater load. Because of its accuracy, flow proportional composite sampling is preferable.

2 EQUIPMENT

- Sample bottles: One litre or 2 ½ litre new PVC bottles to be used for all samples taken except samples taken for bacteriological, oil based or solvent analysis.
- Sampling hand-pump with extension tube – to be used for depth sampling at low flow. Otherwise a sampling beaker (250ml, 500ml or 1000ml) with screw-in extension rods to be used for depth sampling with sufficient flow.
- Manhole lifters
- Markers to be used to mark Identification on sample bottles
- Disposable gloves

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3 PROCEDURE

I. Qualified authorised Local Authority personnel must take all samples. Sampling must be carried out taking due care to avoid personal risk or injury arising from the nature of the sample itself or the location of the sample point.

II. Sample bottles/containers must be clearly labelled and identified. The time/date must be recorded together will all relevant details of location and sampling conditions that may be present at time of sampling , e.g. weather conditions.

III. Sample bottles must be securely sealed following sampling and stored securely for safe transport to the laboratory in cooler boxes where necessary (see relevant test SOP).

IV. Samples will be analysed within 24 hours of sample collection, as a general rule; however, there may be specific requirements for particular tests. The relevant SOP should be referred to in all cases.

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4 INTERFERENCES

I. Heavy rainfall dilutes effluent discharging from treatment plants that are not housed. Flow into sewage treatment plants increases greatly when there is heavy rainfall, particularly in towns where the surface water flows to the sewers rather than to the streams/rivers.

II. Care should be taken to avoid gross solids and to avoid disturbing sediment or materials adhering to surfaces of pipes, chambers, channels or watercourses.

5 REFERENCES

- Environmental research unit – Parameters of water quality.
- Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995.

Compiled By: ***Margaret O'Neill*** ***Date: 5th March 2004.***

Authorized by: ***Hugh Kerr*** ***Date: 5th March 2004.***

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PT_CD	PT_TYPE	MON_TYPE	EASTING	NORTHING	VERIFIED
(P) SW1	Primary	Sampling	192032	377897	No

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Donegal Town

Location	Lab. Ref	Date	pH	BOD (mg/l)	C.O.D (mg/l)	S.S (mg/l)	NH3 (as N) (mg/l)	NO3(as N) (mg/l)	NO2(as N) (mg/l)	Ortho P(mg/l)	Total P(mg/l)
Donegal Town - main sewer	072501492	31/01/2007	7.78	278.8	500	120	50	0.144492	0.164949	4.429163	0.571205
Donegal Town - main sewer	072501884	22/02/2007	6.63	344	1592	128	11.8759	0	0.080382	0.63996	1.621
Donegal Town - main sewer	072502314	20/03/2007	7.2	141.8	420	114	16.25685	0.046	0	1.419	2.835
Donegal Town - main sewer	072502958	27/04/2007	9.66	329.8	1612	192	6.829	0.133	0	0.405	1.44
Donegal Town - main sewer	072503860	28/05/2007	8.21	151.2	1568	294	16.515	0	0	1.808	4.206
Donegal Town - main sewer	072504198	18/06/2007	8.5	191.2	489	350	48.9	0.045	0	5.08	9.907
Donegal Town - main sewer	072505245	31/07/2007	8.27	162	515	222	46.04	0	0.42	5.5	8.08
Donegal Town - main sewer	072505642	20/08/2007	8.04	41.1	186	50	14.35	0	0	1	AR
Donegal Town - main sewer	072506312	24/09/2007	6.77	100	323	86	14.268	0.111	0.012	1.42	3.12
Donegal Town - main sewer	072506900	23/10/2007	6.97	185	307	462	30.97	0	0	3.23	5.33
Donegal Town - main sewer	072507351	19/11/2007	7.64	129.6	229	148	10.13	0.15	0.05	1.36	9.93
Donegal Town - main sewer	072507987	12/12/2007	7.73	138.7	453	522	30.91	0.06	0.08	4.32	10.17

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