WATER SERVICES DEPARTMENT

ODOUR CONTROL POLICY

FINGAL COUNTY COUNCIL

ODOUR CONTROL POLICY FOR WASTE WATER TREATMENT WORKS

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Rev	**Changes Made**	**Prepared By**		**Checked By**		**Approved By**	
		KAG	**Date**	**NMcD**	**Date**	**JM**	**Date**
A	Draft Issue	KAG	30/05/06	NMcD	30/05/06	JM	May 06
B	Draft Issue	KAG	24/07/06	NMcD	24/07/06	JM	July 06
C	First Issue 09/11/06						
D	Final Issue	KAG	28/3/07	NMcD	28/03/07	JM	Mar 07

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1.0 INTRODUCTION

One of the responsibilities of the Fingal County Council Water Services Department is the collection and treatment of wastewater in the Fingal area. Water Services maintain a drainage network, operate two large wastewater treatment facilities at Swords, Malahide and a number of smaller treatment plants serving Portrane/Donabate and the smaller villages (Ballyboughal, Naul, Garristown, Oldtown, Colecot (reed bed) and Toberburr). The major population centre in Dublin 15 drains to the Dublin City Wastewater Treatment facility at Ringsend.

The focus of this Odour Control Policy (OCP) is on the prevention of odour nuisance. In the past, the general public tolerated the odours that were associated with Wastewater Treatment Plants (WWTP). This is no longer the case and odour control at WWTPs is the single most important issue with the public. This document applies to odour nuisance from WWTP rather than to the wider drainage network.

This Policy applies to all WWTPs in the Fingal County Council (FCC) Administrative area, whether FCC staff or Operating Contractors operate them.

There are many different methods of preventing, reducing or controlling odour nuisance from WWTPs. The aim is to provide an Odour Control Policy under which FCC and its agents can operate to minimise the impacts of odours from its wastewater treatment plants.

The objective to achieve zero emissions of odour from these facilities is very challenging for Fingal County Council. Good planning and adherence to the guidelines in this odour control policy should greatly minimise the occurrence of such emissions at these WWTPs.

Traditionally, WWTPs have been designed by Local Authority Engineers or an external Consulting Engineering firm and then constructed by a Contractor on behalf of the Local Authority. The WWTP would then be handed over to and operated by the Council. In recent years, schemes have been procured under the Design Build Operate form of contract where a single service provider carries out the design, construction and operation of the plant. The service contract is generally for a period of 20 years.

Odour treatment is required to prevent nuisance to the local community. The successful service provider/Contractor needs to be provided with boundary odour standards from FCC in order to provide a suitable treatment process. Odour modelling is usually the first stage in assessment of the particular wastewater treatment process indicated by the Contractor. The odour impact of the WWTP is then assessed to determine the boundary odour standard achievable. In this policy document FCC must indicate the boundary odour standard expected for WWTPs. This is covered in later sections.

2.0 GLOSSARY of ABBREVIATIONS

FCC	Fingal County Council
PS	Pumping Stations
WWTP	Wastewater Treatment Plant
OCP	Odour Control Policy
UWWTD	Urban Wastewater Treatment Directive
DoEHLG	Department of the Environment, Heritage and Local Government
OMP	Odour Management Plan
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
Ou_E/m^3	European odour unit
Odour Concentration	The amount of odour present in a cubic metre of sample gas at standard conditions. It is measured in European odour units (Ou_E/m^3).
Odour Unit	The amount of odourant that when evaporated into one cubic metre of neutral gas at standard conditions, brings out a physiological response from a panel (detection threshold) equivalent to that elicited by one EROM evaporated in one cubic metre of gas at standard conditions.
EROM	European Reference Odour Mass
PE	Population Equivalent
SHC	Sludge Hub Centre

3.0 OVERVIEW OF ODOUR NUISANCE PROBLEM

The treatment of wastewater has developed at distinct locations to which it is delivered via a system of sewers. Wastewater is a liquid waste that is 99.9% water and 0.1% solid waste. It originates from houses, schools, hospitals, industry, businesses and infiltration. Human waste, food particles, grease, oils, soap, salts, metals, detergents, plastic, sand and grit constitute the solid portion of wastewater. The organic portion of solid waste is comprised of proteins, carbohydrates and fats, which are constituents of the human diet. Naturally occurring bacteria is excreted with waste and undigested food in the food digestion process. These bacteria continue the process of breaking down the undigested food in the pipes and at the wastewater treatment plant until all the food source is gone. As a consequence of the digestion, process gas is produced and this gas is often malodorous. The concentration of these gases is not harmful however the smell may be offensive.

Historically, sewage was discharged to the nearest river and in the case of coastal areas to the sea. This can lead to pollution if carried out in an uncontrolled manner. The Urban Wastewater Treatment Council Directive (91/271/EEC) of 21st May 1991 concerning urban wastewater treatment was transposed into Irish Law on 14th December 1994 by S.I. No. 419/1994 Environment Protection Agency Act, 1992 (Urban Wastewater Treatment Regulations, 1994). This precipitated the need to upgrade sewerage systems to meet in full the requirements of the EU UWWTD. There has been an increase in the development of new WWTP, improvements to quality/location of discharges and upgrading of existing WWTP to comply with the UWWTD and various other EU and National Legislation and to allow for new development in Fingal.

Complaints about the problem of odour nuisance have been steadily increasing over the years. Housing has also encroached on the land around WWTPs and this leads to an increase in the number of people who are likely to be affected. Proactive management together with ongoing contact with local residents can greatly minimise the risk of odour emissions.

Sewage can also be pumped further and this can lead to septicity, which can in turn increase the risk of odour nuisance. There are a number of additional pieces of legislation, which can require higher levels of treatment than the UWWTD. These include

- Directive on Freshwater Fish
- Bathing Waters
- Shellfish Waters
- Surface Water Abstraction
- Water Framework Directive

This can lead to higher treatment of wastewater and longer treatment times, which can increase the possibility of odour nuisance.

4.0 LEGISLATION

The Minister for the Environment, Heritage and Local Government published statutory instrument *S.I. No. 787 of 2005 EUROPEAN COMMUNITIES (WASTEWATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS 2005* in December 2005. The Water Services Project Office of Fingal County Council has prepared this policy document in accordance with these regulations.

Fingal County Council reserves the right to revise this Policy Document where necessary as legislation or current knowledge changes.

The Explanatory Note at the end of the Regulations sets out what the odour control policy is setting out to achieve.
"The Regulations require that wastewater treatment plants are so designed, constructed, operated and maintained as to avoid causing nuisance through odours or noise and that the operators of such plants maintain records in this regard and provide a report each year to the Environmental Protection Agency indicating all necessary steps have been taken to comply with these Regulations during the year to which the report relates and detailing any incidents arising from odours or noise in respect of any wastewater treatment plant provided by it or on its behalf."

It should be noted in Article 8 of S.I. No 787 of 2005, European Communities (Wastewater Treatment) (Prevention Of Odours And Noise) Regulations 2005 that *"Not later than the 28th day of February after the end of each year, a sanitary authority shall provide to the Agency, in a format to be specified by the Agency, a report in respect of that year indicating all necessary steps taken during the year to which the report relates to comply with Article 3(b) of these Regulations and shall include in the report details of any incidents arising from odours or noise in respect of any wastewater treatment plant provided by it or on its behalf during that year."*

Article 3 of the above Regulations states that *"a sanitary authority shall ensure that –
in formulating and approving plans for a wastewater treatment plant to be provided by the authority or on its behalf the plant is so designed and constructed as to ensure that it avoids causing nuisance through odours or noise,
any wastewater treatment plant under the sanitary authority's control is so operated and maintained as to ensure that it avoids causing nuisance through odours or noise."*
Article 9 of the above Regulations states that
"A sanitary authority shall, in operating and maintaining a wastewater treatment plant, satisfy the requirements set out in the Schedule to these Regulations."

"SCHEDULE"

Operation of Wastewater Treatment Plants to avoid causing nuisance through noise or odours

1. *A sanitary authority shall maintain a record of all mandatory environmental standards, including those relating to odours and noise, that apply to each wastewater treatment plant provided for under any enactment, permission or order.*

2. *A sanitary authority or its agent shall record all environmental complaints related to the operation of wastewater treatment plants.*

3. *Records shall include:*

    - *The complainant's name and address,*
    - *The date of the complaint,*
    - *The reported date, time, nature and duration of the incident to which the complaint refers,*
    - *The date of acknowledgement by the authority to the complainant and author,*
    - *The action taken on foot of the complaint and the results of any such action,*
    - *The cause of the complaint as determined,*
    - *Details of any response made to the complainant.*

On request from the Agency, a sanitary authority shall forward copies of all complaint records to the Agency, in a format specified by the Agency, for any specific plant over any specified period."

The SI does not refer to a numerical value for the odour limit at the boundary of WWTPs.

5.0 WASTE WATER TREATMENT PROCESS OVERVIEW

5.1 Introduction

A wastewater treatment process is dependent on a number of factors namely:

- Influent to the WWTP,
- Location of the WWTP
- Volume and condition of receiving water for the treated effluent

A WWTP has three principal purposes:

- Treatment of sewage to enable safe discharge
- To remove toxic pollutants and retain reusable material
- Sludge treatment and disposal

Primary, secondary and tertiary treatments are usually carried out at a WWTP.

Primary treatment separates solids mechanically. Secondary treatment is a mainly biological process and tertiary treatment is a polishing step for further purification of the effluent from specific impurities.

Treatment is mainly to reduce the pollutant load, i.e. Suspended Solids (SS) and Biochemical Oxygen Demand (BOD), to acceptable levels. This is accomplished by solid removal and aeration to meet with the oxygen demand of the wastewater. There are various methods of doing this.

The final effluent produced at a WWTP should conform to the following standards:

- BOD_5 standard of 25mg/l
- COD standard of 125mg/l
- Suspended Solids standard of 35 mg/l
- Faecal coliform level of 2,000 per 100ml.

Whatever treatment process is used, a sludge is produced that will require treatment for its beneficial reuse. The Fingal County Council “Sludge Management Plan” looks at these options in detail.

6.0 DEFINITION OF ODOUR NUISANCE

An odour can arise from a single substance or from a combination of substances. Odour from a combination of substances changes as the mixture becomes diluted and the concentration of each component falls below its odour threshold. Odours from a substance or mixture of substances can be pleasant when diluted or offensive when concentrated. Odours that are pleasant or acceptable to one person can be offensive to another.

6.1 Assessment of Odour Nuisance

The presence of an odour itself does not necessarily constitute a nuisance.

The characteristics of an odour that are taken into account when assessing nuisance are

- Odour type (pleasantness or offensiveness),
- Odour strength,
- Frequency and
- Duration of release,
- Persistence in the environment and
- The extent of interference with enjoyment of the amenity of a neighbourhood.

There are also cases when, although the control measures put in place by the operator are in accordance with the standards set out in the Environmental Impact Statement (EIS) odours are present. This may be due to circumstances beyond the control of the operator (such as unforeseen breakdown, adverse weather conditions).

6.1.1 Atmospheric dispersion of odours

When an odorous emission is released into the atmosphere environment, it is carried by the wind and diluted by wind turbulence. This is known as dilution and dispersion. Odours released high up undergo better dispersion than those odours that are released near the ground (including those odours released from leaving doors open).

6.2 Measurement of Odour Nuisance

Dynamic Olfactometry
It is possible to measure the odour strength using a standard method known as dynamic olfactometry in accordance with BS EN13725. It is harder to specify how offensive an odour is. This is carried out using numerical ranking however this can be very subjective.

The nose is very sensitive to odours. It can respond to small variations in concentration over periods of a few seconds and at concentrations of fractions of a part per billion. There are many issues that influence the perception of an odour including:

- Subjectivity of the persons nose,
- Dispersion of odour due to local meteorological conditions and
- Variations in the generation of process odour due to raw materials and cycle operations in the process.

In general, there is very little difference between the offensiveness of an odour and its potential to cause nuisance. The assessment of offensiveness of odour remains a subjective sensory olfactory response of observers. However, all odours have the potential to be offensive and cause annoyance.

Odour Concentration Units
Odour concentration is expressed in odour units. This Policy refers to European Odour Units only. There can be some confusion between European odour units and Dutch odour units. 1 European odour unit (Ou_E/m^3) is equivalent to 2 Dutch odour units (Ou_E/m^3).

The technical definition of a European Odour Unit (Ou_E/m3) is the amount of odourant that when evaporated into one cubic metre of neutral gas at standard conditions, brings out a physiological response from a panel (detection threshold) equivalent to that elicited by one European Reference Odour Mass (EROM) evaporated in one cubic metre of gas at standard conditions. The accepted reference value for the European odour unit is the European Reference Odour Mass (EROM) which is equal to a defined mass of a certified reference material. This is defined in CEN TC264 Draft. The panel is a group of assessors used to analyse an odorous sample by olfactometry. The standard conditions are - Room temperature (293K) and normal atmospheric pressure (101.3 kPa) on a wet basis. Standard conditions are defined in ISO 10780.

The numerical value of odour units is expressed as the number of dilutions with clean air required to meet the lowest odour concentration which is detectable by half the members of a test panel (i.e. half of the panel smell something and the other half do not). An odour concentration of $1Ou_E/m^3$ is the concentration at which there is a 50% probability under laboratory conditions, using a panel of qualified observers, an odour may be detected i.e. 50% of the panel will detect an odour.

A percentile is included in the odour standard to account for the periods when the meteorological conditions provide little or no dispersion to dilute the odour emissions. The exposure is typically quantified in terms of a frequency of occurrence of hourly average concentrations above a certain limit odour concentration, e.g. 5 odour units per metre cubed (Ou_E/m3) as a 98-percentile of hourly averages of odour concentration for a year with average meteorology.

This measure of exposure is calculated from an estimated or measured odour emission from the source, using an atmospheric dispersion model. It should also be noted that not only are averaging periods in the order of 1-hour, but they are expressed as percentiles. The 98^{th} percentile is the hourly odour concentration that is achieved for 98% of the year.

6.3 Determination of Extent of an Odour Nuisance

The following matters should be considered when determining the degree of potential offence or the existence of an odour nuisance:

- NATURE; this refers to both strength and character of the odour.
- FREQUENCY; odours that are released frequently or continuously from the process are more likely to be determined to be a nuisance. However, in some circumstances odours that are released periodically can be more intrusive and the odour frequency is often assessed in conjunction with the odour's persistence in the environment.
- PERSISTENCE; odours which are continuously released from processes or those which are emitted on a frequent basis but persist in the environment for a long period are more likely to be judged as a nuisance.
- METEOROLOGICAL CONDITIONS; as the majority of odour control techniques finally rely on dispersion for minimisation of odour effects, the meteorological conditions will be of prime importance.
- LOCALITY AND SENSITIVITY; the potential for amenity interference is largely related to the character of the neighbourhood and the time that the odour occurs. The number of persons affected and the degree of intrusion will depend upon the proximity of the source and receptor. Odours are often subjectively more annoying during periods when members of the public are outdoors (for example daytime periods during summer months).

7.0 DESCRIPTION OF ODOUR FROM WWTP

The primary odours from WWTP are the result of biological degradation of organic matter by micro-organisms under anaerobic conditions. The development of anaerobic conditions in sewage is often referred to as 'septicity'.

Anaerobic activity leads to the production of methane and hydrogen sulphide (H_2S), ammonia (NH_3), organic sulphur, thiols (mercaptans), amines, indole and skatole. During the fermentation phase of anaerobicity, volatile fatty acids, alcohols, aldehydes and ketones can be produced. However, odour, which is not typical of anaerobic conditions, can also be generated by other mechanisms in a treatment works.

7.1 Hydrogen Sulphide

Hydrogen sulphide (H_2S) is often highlighted as the cause of odour from WWTP. Hydrogen sulphide is a toxic gas and can be a health hazard especially in confined spaces. However, the concentrations typically encountered around WWTP are substantially below the levels at which health effects may occur. Because it is relatively easy to measure, H_2S is often used as a target indicator for odour. However, H_2S is not a good indicator for industrial effluents, secondary treatment odours and dryers/incinerators, as it is proportionally less important as an odorous component in these sources. Also, the odour threshold for a sewage treatment odour is frequently 5 times larger than the value that would have predicted based upon the H_2S concentration alone. Therefore while it is a valuable indicative target pollutant, careful evaluation of data from H_2S measurements alone is essential.

7.2 Other Odour Components

There are many chemicals, which have been detected in WWTP odours. In addition to hydrogen sulphide and other pollutants such as ammonia, there are a wide variety of organic sulphides and organic nitrogen-based compounds along with some oxygenated organic compounds and organic acids. The range of contaminants potentially present in industrial effluent is extensive but those that are likely to be of concern are already odorous liquids (such as wastewater from food production), warm effluent which may accelerate anaerobic conditions and volatile organic compounds such as solvents and petroleum derivatives.

7.3 Odour Sources at a WWTP

This Policy document focuses on WWTP and does not review the issue of odour in the sewerage transport system. The conditions within the drainage system will have a significant impact on the odour generation of the process due to septicity. The odour sources at any particular plant will be specific to that site and operation, however, the following are key sources which should be reviewed at all WWTPs:

- Inlet works – strong odours in influent may be affected by unfavourable sewer conditions (long retention times, brackish water infiltration, poor maintenance, industrial discharges) and long pressure mains – also the inlet works effectively vent any sewer gases
- Imported sludge and septic tank waste – the off-loading and storage of such materials prior to treatment can lead to odours
- Storm water storage – usually due to storage for excessive periods leading to septicity or due to infrequent or insufficient flushing of the tanks after emptying
- Primary settlement – highly odorous feeds or excessive sludge accumulation which goes septic – emissions can be caused by excessive turbulence of wastewater at overflow weirs
- Secondary treatment – if highly loaded or odorous feed
- Storage and treatment of sludge – especially non-stabilised sludge
- Biogas leaks (from anaerobic digestors and gasholders, and at the first point of discharge of digested sludge

- Odours can be transported through the system and become airborne at turbulent locations – recycling can increase odour (such as sludge thickening).

7.4 Assessment of Odour Impact

Impacts can be determined by a number of methods, however many of these only assess the effective odour concentration and do not take account of the other parameters which are involved in determining potential nuisance of an odour. In addition, direct measurement of ambient odour concentrations is not practicable. There are three things that are helpful when assessing impact, including:

1. Public complaints monitoring of the level of complaint and the nature of the odour described.
2. Direct measurement of emissions at source
3. Odour Dispersion Modelling

8.0 COMPLAINTS INVESTIGATION AND ASSESSMENT

In accordance with the EUROPEAN COMMUNITIES (WASTEWATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS 2005, *"a sanitary authority or its agent shall record all environmental complaints related to the operation of wastewater treatment plants."*

8.1 Environmental Complaints Record

The Environmental Complaints Record shall include the following:

- Name and address of the Complainant
- Complaint Date

The reported date, time, nature and duration of the incident to which the complaint refers
The date of acknowledgement by the authority to the complainant
Any action taken as a result of the complaint and the results of the action
The findings of the investigation into the complaint
Details of any response made to the complainant.

8.2 WWTP Operational Report

In accordance with Article 8 of S.I. No 787 of 2005, European Communities (Wastewater Treatment) (Prevention Of Odours And Noise) Regulations 2005, at the end of every year a Local Authority has to submit a report to the Environmental Protection Agency (EPA) on all the actions taken during the year to ensure that all WWTP are operated to avoid causing odour nuisance.

This report has to be submitted no later than 28th February of the following year. The EPA is to specify the format of the report. Complaints arising from incidents at the WWTP should be included in this report.

9.0 DIRECT MEASUREMENT OF EMISSIONS AT SOURCE

9.1 Assessment of Odour Emissions

There are a number of methods for the assessment of emission rates and odour potential from WWTP. This Section briefly reviews the methods for direct measurement of odours and also methods for assessing emission rates.

9.1.1 Odour Monitoring

The primary problem with the measurement of odours is that most odours are mixtures of compounds and knowledge of the chemical compounds present in a mixture does not necessarily give an indication of the human response. A subjective view - what it smells like to those who are actually exposed (i.e. what people may actually complain about) - can be obtained by using olfactometry. The collection of meaningful samples of ambient air (e.g. at an affected area in the community, or at the installation boundary) for assessment by olfactometry is carried out using the European standardised method BS EN13725. It is also used for measuring the performance of odour abatement equipment. In this case the odour concentration is measured on the inlet and outlet of the abatement equipment simultaneously and gives a very good measure of odour abatement efficiency.

9.1.2 Odour Potential and Emission Rates

Odour sources can also be classified into two distinct categories:

- Discrete point sources (e.g. stacks), and
- Diffuse area sources (e.g. open tanks).

It is possible to measure odour concentrations in the air but it is difficult to measure the odour emission rate for diffuse sources such as tanks and lagoons where there is no controlled flow of the pollutant from the tank. Diffuse sources are those with defined dimensions, mostly surface sources, that do not have a defined waste airflow. It is useful to be able to assess the likely odour emissions from diffuse sources and also the potential for a liquid to generate odour when analysing possible odour sources. There are two main methods for determining the likelihood of odorous emissions:

Odour Potential – odour concentration in air that has been brought to equilibrium with the liquid sample by blowing air through the sample in a standard apparatus – Ou_E/m^3
Odour Emission Rate – this defines the total emission of odour from source and is expressed as the odour concentration multiplied by the flow rate – Ou_E/s. The odour emission rate can be used to review the relative importance of sources in terms of odour transport and can also be used in dispersion modelling. In cases where the flow rate and odour concentration cannot be measured directly for example because there is no vent point it is necessary to generate data by other means.

There are currently three methods for predicting odour emissions:-

1. Floating Hoods/Lindvall Box – (for liquids without flows/static liquid surfaces) In this method, air is blown into the end of a box on the surface of an odorous liquid at 0.5 – 1.0m/s and a sample of the air at the outlet of box is taken for odour concentration measurement. The product of the odour concentration and airflow rate gives the odour emission rate. The method is relatively low cost but the sampling method does interfere with normal flow conditions in tank and hence alters the true odour emission.
2. Micrometeorological measurements – measure the mean odour concentrations in ambient air at increasing distances from the source. Combined with wind speed, temperature and solar heating it will allow modelling of emissions. However, the sensitivity of test methods for ambient air monitoring means that this is only really applicable for strong odour sources.
3. Extrapolation of Wind tunnel studies – allows data derived from studies to be used to model emissions based upon odour potential. It allows the impact of various control options to be reviewed and allows true emission modelling based upon measured or

predicted odour emission rates. Also, some of the emission estimation and impact modelling techniques have a particular role in assisting with the design and impact of new WWTP.

9.2 Evaluation of Odour Impact Potential for Existing WWTP

Carry out a detailed process review to identify possible odour generation and process related controls. Identify where, how and why odour emissions occur and measure or estimate emission rates. Specific compound analysis and odour potential measurement in the liquid streams will identify formation of odours whilst air samples can be taken to identify odour sources. The use of odour or H2S mapping may help. Hydrogen sulphide gas (H_2S) is commonly used as an indicator of overall odour strength because it is easily measured and it is one of the most common odorants associated with wastewater. This is known as H_2S Mapping. Odours from certain stages of the process may be less dependent upon H2S for example aerobic odours, stripped organics and ammonia. Mass emissions of odour can occur from low odour concentrations because of the size of the source area, such as the primary sedimentation tanks. The measurement data can be used as input to a dispersion model to assess potential odour impact at sensitive receptors for each source.

10.0 ODOUR DISPERSION MODELLING

10.1 The Role of Odour Dispersion Modelling

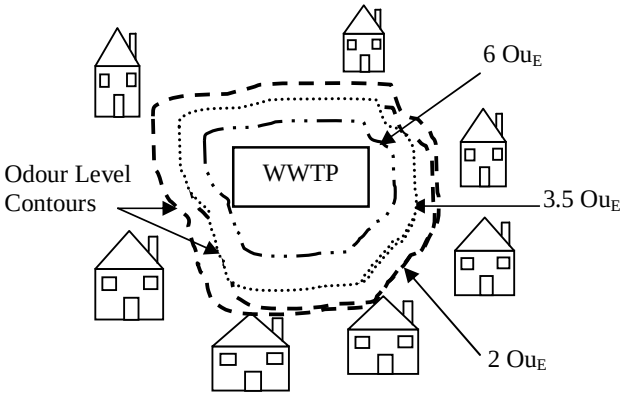
When a material is discharged into the atmosphere, it is carried by the wind and diluted by wind turbulence. Dispersion Modelling can model the 'plume' of odourous air as it travels. Where the odour emission rate from a source is measured or estimated, the odour concentration in the surrounding area can be predicted by means of dispersion modelling. The odour dispersion computer model predicts the odour contour around the plant beyond which an odour nuisance is unlikely to occur in normal circumstances.

The output from the modelling process is compared with the guideline value given by the Local Authority for control of odour nuisance.

These are statistical means of linking the mass odour emission from a process to the impact as a ground level concentration, in terms of probability of occurrence, taking frequency of occurrence into account.

10.2 Odour contour plots

To visualise the extent of odour impact it is useful to produce contour plots showing odour concentrations around the source or highlighting where concentrations exceed the appropriate guideline value or odour exposure criterion.



Odour contour plot around a source (Example Only)

10.3 Odour Modelling Packages

FCC cannot specify one particular modelling package however the software used must have the following:

- Gaussian plume and new generation models – such as ISCST3, ISC Prime, Aermod, Aermod Prime and ADMS
- It must represent conditions for an "average year" hourly meteorological data for a period of at least three, preferably five
- One-hour average concentrations should be calculated for all hours in the meteorological data-set
- Exposure to be expressed as the concentration corresponding with the 98th percentile of the distribution of hourly values
- Incorporate critical receptors as discrete receptors
- The ability to account for the effects of buildings and topography on the plumes from point sources.

The following guidelines should be followed when constructing a model:

- The model used and the inputs to the model should be agreed between the local authority and the WWTP operator
- Intermittent sources are to be considered (such as the operation of storm tanks) when carrying out an assessment.
- A consistent approach should be adopted between models. The experience gained from the previous use of various modelling techniques for WWTP should form the basis of any decision on model and parameter selection.

11.0 CONTROL OF ODOUR NUISANCE

11.1 Prevent, Contain and Control

The location of a WWTP site will have an effect on the assessment of the odour nuisance potential impact.

As a general principle, preventing odour releases is preferred to their control. Where it is not practicable to prevent the odour releases they should be minimised to a level that will not cause odour nuisance. There is a wide range of control measures that can be used, including:

- the general management of the WWTP (including influent and sludge management)
- the design, installation and maintenance of plant, buildings and structures
- the operation of the WWTP and its processes
- engineering solutions, e.g. containment, enclosure with venting and end-of-pipe treatment (dilute and disperse or abatement)

Control options must be considered in the following order of preference before escalating to the next level:

1. Site management and housekeeping
2. Operational and process changes
3. Containment
4. Enclosure with end-of-pipe treatment of excess air

12.0 ODOUR CONTAINMENT & REDUCTION TECHNIQUES

12.1 Odour Containment using Plant and Tank Covers

- The most effective way of controlling odour released during the various process stages is to either fully enclose the plant within a building or to provide localised tank covers.
- Consultation with Fingal County Council is to be carried out at the planning stage. At the design stage of new or upgraded works, it is essential that systems are designed to be free from leaks and offer good source containment of odours.

12.2 Odour containment using Ventilated Buildings

A more traditional approach to containment is the use of ventilated buildings for certain plant and equipment and covers for tanks. In general the following sources will require containment at source and venting:

- Sludge digestion plants, dewatering facilities and tanks
- Entire inlet works (pre-primary stage) - low concentration large volume
- Grit removal, coarse screens, and skips (leakproof and enclosed).

12.3 Design of Tank Covers

They have to be designed to allow for adequate support, to support wind, snow and personnel loads and to give sufficient clearance from process equipment and may have to incorporate walkways. The materials of construction need to be resistant to light and corrosion and are often constructed from either glass re-enforced plastic or aluminium. In addition to loads, the covers need to be designed to allow for bridge scrapers (can use rotating roofs), access, inspection and vents.

The following are some key design requirements:-

- Minimise head space under covers to reduce the volume of air vented due to displacement
- Any inspection hatches or access points should be sealed and any pipework openings should be sealed
- The design of tanks and covers should minimise the need for regular access for maintenance and inspection as confined space entry systems will be required
- The vent volumes need to be adequate to ensure no odour escape
- The design shall take account of the fill and empty rate, maximum rate of change in headspace, likely gaps and leakage
- Allowance should be made for emergency ventilation of the tanks

One problem with tank covers is that they cannot be easily inspected therefore tend to be poorly maintained. Additionally, guidance on the design of wastewater treatment plants in BS EN 12255 advises designers to:

Locate sources requiring abatement close together to optimise abatement options and minimise costs
Consider explosion risk, corrosion, access and health and safety.

12.4 Odour Reduction Equipment

The air, which is exhausted from enclosures usually, requires scrubbing to avoid odour nuisance. There is a wide range of odour reduction equipment that can be used to treat emissions of contained air from WWTP.

There are many factors which will affect the choice of equipment including required odour removal efficiency, flow rate and inlet odour concentration, type of chemical species in the odour, variability in flow and load, space requirements and infrastructure (power, drainage etc.).

The odour reduction equipment is to be approved by Fingal County Council and must comply with the following conditions:

- The equipment must be fit for purpose and specific to the WWTP stage of treatment.
- It must have a proven track record
- The equipment must be independently verified during commissioning to ensure compliance with odour control specifications
- Should be designed to allow ease of maintenance
- Both capital and operating expenditure of the proposed equipment should be minimised far as is reasonably possible
- The most environmentally sustainable technique should be selected
- Provide back up odour control facilities in case of unit breakdown or malfunction e.g. 2-stage odour treatment unit with bypass

12.4.1 Odour Reduction Plant Capacity

As odour reduction plant usually has little spare capacity, all other measures must be correctly used – covers, doors, chemicals replenished etc. This therefore becomes a key management issue that should be included in the Odour Management Plan.

The location and number of the odour reduction plant systems must be carefully designed. All options are to be considered bearing the following in mind
Location restraints
A centralised odour reduction plant versus smaller odour reduction plant systems
Different odour reduction technology appropriate to the process stage

12.4.2 Odour Reduction Equipment and its Efficiency

Odour control plant design and layout should be optimised to allow for standby capacity. FCC requires 100% duty and standby odour reduction equipment and a system where both duty and standby are regularly alternated so that both are fully functional. Odour producing processes should be grouped together as much as is reasonably possible and two-stage scrubbing is to be provided.

13.0 RECOMMENDATIONS APPLICABLE TO ALL WWTP

The following are measures that should be put in place at all WWTP, as a matter of good practice, to minimise the risk of odour nuisance occurring. These good practice measures should be implemented regardless of whether complaints are received or not.

13.1 Basic Odour Control Techniques

- The basic odour control techniques which should be put in place at all new and existing WWTP include:
- Select locations of major sources away from sensitive receptors at the design stage
- Good housekeeping and raw material handling practices
- Closed door policy
- Control and minimisation of odours from residual materials and waste (including imported sludge or septic tank waste)
- Preparation of an Odour Management Plan
- Maintain an aerobic effluent except where processes are specifically anaerobic
- Avoiding anaerobic conditions and prevent septicity
- Containment of strong odour sources and treatment in odour control equipment.
- Provision of back up odour control facilities in case of unit breakdown or malfunction e.g. 2-stage odour treatment unit with bypass
- Design and operation of the process steps to minimise odour, including:
- minimise sludge retention time in primary settlement
- Consider avoiding primary settlement by applying extended aeration
- For new and upgraded WWTP, cover (or allow for covering at a later stage where odour effects are difficult to quantify prior to commissioning)

13.2 Odour Management Plan (OMP)

An Odour Management Plan (OMP) should be prepared for all WWTP Plant Managers. This essential document should contain details of operational and control measures appropriate to management and control of odour at the particular WWTP site.

13.2.1 Format of the OMP

The format of the OMP should provide sufficient detail on operational procedures for both normal and abnormal conditions. The OMP should also include sufficient feedback data to allow site management (and local authority inspectors) to audit site operations. Items to be included in the OMP are as follows:

- A summary of the site, WWTP, odour sources and the location of receptors
- Details of the site management responsibilities and procedures for reporting faults, identifying maintenance needs, replenishing spare parts and consumables
- Complaints procedure
- Odour-critical plant operation and management procedures (e.g. correct use of plant, process, materials; checks on plant performance, maintenance and inspection)
- Operative training
- Maintenance and inspection of plant (both routine and emergency response)
- Spillage management procedures
- Record keeping – format, responsibility for completion and location of records
- Emergency breakdown and incident response planning including responsibilities and mechanisms for liaison with the local authority.

The Odour Management Plan is a living document and should be regularly reviewed and upgraded by the Plant Manager

13.2.2 Good housekeeping at WWTP

Lack of good housekeeping can result in elevated levels of residual odour, and at times more serious sources of odour. The majority of good housekeeping is, in any case, good working practice and additional costs for odour control are minimal.

13.2.3 Location of odour sources

So far as is practicable, sources of odour shall be located at positions on the site that are likely to minimise the odour impact on nearby receptors. Account should be taken of distance, prevailing wind direction and obstructions. In practice, this will often mean locating the source of odour as far as practicable from the site boundary.

Tanks

The build up of scum or foam on tank surfaces can at times lead to odour and should generally be avoided. (However, a stable scum layer can reduce odour in some instances, e.g. sludge storage). Draining tanks for cleaning has been implicated as a source of odour complaints. This should be scheduled to minimise impact. Where practicable, appropriate chemicals should be used to minimise this impact.

Storage of sludge

Storage of sludge product on site should be minimised.

Storage of screenings and grit

Screenings should preferably be washed and 'bagged' and grit should be washed to reduce odour potential. Skips containing screenings and grit should be fully enclosed or at a minimum, covered, and removed from site as soon as is practicable.

Spillages

Spillages are usually due to plant failure but sources of possible spillage should be considered and avoided at the design stage. Often, spillages involve sludge: an interruption to continuous sludge processing could lead to spillage from a storage tank or cause sludge levels to build up in settlement tanks, one of the known risk factors for odour at WWTP.

13.2.4 Odour Complaints Administrative Procedure

The WWTP operator shall have in place a procedure specifying how any complaints will be administered and progressed. This will show who is responsible for dealing with the different aspects of the complaint and should be integrated in the Odour Management Plan.

It is recommended that complaints that are made to the WWTP operator are forwarded to the local authority. The procedure for notifying such complaints should be detailed in the Odour Management Plan and it is recommended that the WWTP operator submits regular summaries of complaints but only notifies the local authority immediately when incidents are significant and further complaints are likely.

13.2.5 Plant performance, maintenance, inspection and operator training

Sometimes odour problems at WWTP can be because of problems with plant maintenance and proper operation of odour abatement equipment. These problems can be due partly to difficulties in operation, lack of training and poor aftersales service. Plant performance, maintenance, inspection and operator training are therefore crucial in maintaining the effectiveness of odour control measures.

13.2.6 Emergency breakdown response

The operator should include in the Odour Management Plan a section documenting the response for emergency breakdown of odour-critical plant. This should include the foreseeable situations, which may compromise his ability to prevent and/or minimise odorous releases from the process and the actions to be taken to minimise the impact. It is intended to be used by operational staff on a day-to-day basis and should detail the person responsible for

initiating the action. The plan should also include clear timescales for response to odour incidents.

13.3 Quality Assurance at WWTP

Quality Assurance at WWTP is assisted by the following:

1. Procedural and management systems;

- *Odour Management Plan* – this formalises odour-critical management procedures, operative training, and operational procedures (e.g. correct use of plant/process/materials; checks on plant performance, maintenance and inspection). Specific reference should be made to methods for the control and management of works, which are unmanned for all, or part of their operating period.
- *Maintenance, inspection and plant operator training* – these are crucial in maintaining the effectiveness of odour control measures.

2. Technical measures;

- Monitoring of odour emissions (e.g. from stacks, vents, ducts and odour abatement plant) is to be carried out. This can be either periodic or continuous or a mixture of both. Periodic monitoring checks odour abatement efficiency whereas continuous monitoring gives an immediate indication of performance. This can be also be linked to an alarm.

13.4 Enhanced Odour Control Measures Applicable to WWTP

When wastewater arrives at the WWTP, exposure to the air during treatment releases much of its odour. WWTPs can be built with specific odour containment and odour processing systems. Wastewater tanks can be fitted with covers to capture the odours. Large pipes can carry these off-gases and air to odour control buildings. There, chemical and biological reactions remove the odours. The following are measures that are applicable to all WWTP that can reduce odour nuisance:

13.4.1 New Plant Design

Good design practice can greatly reduce the potential for odour releases and can also ensure that plants are provided with sufficient odour control systems to avoid offensive odours in the locality. It can also greatly reduce the costs of retrofitting odour control systems. Odour problems can occur at almost any stage of a WWTP depending upon influent and plant location, operation and design.

The areas where odour nuisance can occur are the inlet works, primary sedimentation, high-rate secondary treatment processes and all stages of unstabilised sludge handling and storage.

One stage in particular is primary settlement. As the tanks are usually large, there is a significant surface area to emit odours at this stage. It may be more effective to use a low-rate biological treatment step such as extended aeration of crude sewage or a high-rate process within a building to avoid primary treatment. During design dispersion models can be used to select plant and process location and also for evaluation of the need to cover primary tanks. Guidance on the design of wastewater treatment plants can be found in BS EN 12255. In particular, BS EN 12255 – 9 of 2002 deals specifically with odour control and ventilation. This should be strictly adhered to in the design of new WWTP.

13.4.2 Sewerage Transport System

This Policy Document concentrates on odour control options for WWTP and will not specifically address the potential odour issues associated with the sewerage transport system (drains, sewers). If the influent to the treatment works is already septic and undergoing anaerobic activity, it will have significant impact on the WWTP. Therefore all sewers should include good design, operation and maintenance to avoid septicity. The guidance in European Standard EN 752-4 on the design of sewer systems to minimise septicity will assist in minimising anaerobic conditions. Measures that can be taken to reduce septicity and minimise the retention time of sewage in transport under anaerobic conditions, include:

- Minimise the length of pumped sections
- Ensure that the slope of gravity sections prevents sediment accumulation
- Minimise intermediate storage
- Prevent seawater intrusion
- Avoid siphons
- Avoid untreated putrid and warm wastes from industrial sources
- Regular cleaning to remove accumulations
- Improve ventilation
- If septic conditions are developed, chemical dosing may reduce the amount of odour
- Air stripping at the inlet works and treatment of the stripped air.

13.4.3 Inlet Works

The inlet works are potentially a considerable source of odour from incoming sewage particularly if it is septic sewage at the inlet, odorous imported wastes (such as the emptying of septic tanks), storm conditions and storage and handling of screenings and grit. In the case of WWTP that are subject to odour complaint, a common solution that can be used is the covering of the inlet works and venting to odour abatement equipment. Measures that should be taken to minimise odour releases from this source, include:

- Regular cleaning and flushing of screens and influent channels
- Grit and screenings transfer and storage in a manner to prevent spillage.Ideally screenings should be dewatered and bagged after washing (or
- Lowering discharge points to minimise turbulence and volatilsation of odours
- Balancing the flow of sludge liquors to even the load over the day

13.4.4 Primary Sedimentation

The principal odour sources in primary tanks are excessive turbulence in the inlet distribution channel, the overflow weir and the tank surface. Minimisation of the sludge retention time in the primary tanks can reduce the odour. However, if there is anaerobic activity before or during the primary sedimentation operation, the size of these tanks can make them a significant source. Measures that should be taken to minimise odour releases from this source, include:

- Pre-treatment of incoming septic sewage or possible chemical dosing with nitrate or iron salts
- Reducing hydraulic retention times,
- Improving desludging both in efficiency and frequency and regular cleaning of the tanks, sumps, scum and grease removal equipment – aim to ensure that sludge is not held on the base of the tanks for more than 1-hour
- Reduce turbulence at the weir overflow by reducing the drop height from the weir
- Recirculation of nitrified final effluent during low flow and avoiding the recirculation of secondary sludge

13.4.5 Secondary Aerobic Treatment

Ensure that conditions remain aerobic. Maintenance and inspection of the air diffusion system and liquid irrigation are of great importance. Measures that should be taken to minimise odour releases from this source, include:

For trickling filters

- Media should be kept wet and hydraulic overloading or blockage should be avoided

- Clogging or ponding of the filter as a result of organic overloading, inadequate aeration or mixing, blocking of aeration vents or media breakdown may result in anaerobic conditions and odours
- Avoid sludge and solids settling due to low turbulence in the liquor especially close to any recirculated sludge return

For activated sludge plants

- Increased aeration by methods which minimise the generation of aerosols (for example sub-surface diffuse aeration) and maintain the activated sludge flocs in suspension
- Shrouding of the mechanical aerators to reduce aerosol formation
- Covering the inlet distribution chamber and anoxic zone may be sufficient in cases where odours occur

13.4.6 Final Settlement and Tertiary Treatment

At this stage the effluent and sludges should be oxidised and provided sludge retention times are carefully managed, odour release should not be a problem. Denitrification may be a problem with fully nitrified effluents giving rise to rising sludge and surface solids. This can be avoided by minimising sludge retention periods in the final tank.

13.4.7 Sludge Handling , Storage and Thickening

Sludge and bio-solids handling are usually the most significant source of odour release and good sludge management is a key issue. All raw sludge and bio-solids will release odour largely dependent upon age. In general, sludge handling, storage and processing should be enclosed or covered and provided with ventilation to odour-abatement equipment.

Measures that should be taken to minimise odour releases from this source, include:

- Unstabilised liquid sludges imported to WWTP should be transported in tankers or (if in solid form) enclosed lorries and should be transferred to enclosed storage tanks which are vented to odour abatement equipment
- Sludge which has been lime treated can generate odour, particularly ammonia, and should be stored under cover to prevent odour generation (including avoiding re-wetting of sludge cake)
- Sludges should be processed (thickened, digested or dewatered) as soon as possible after generation as retention will lead to anaerobic conditions. It is good practice to minimise the potential storage of sludge before treatment and storage for unstabilised sludge should be limited to a maximum capacity of 24-hours production
- All tanks and plant for unstabilised sludge storage and processing should be enclosed or covered and vented to odour abatement equipment
- Replacement of lagoons and drying beds with mechanical dewatering plant will help minimise retention and contain odours
- Avoid open storage of sludges or sludge cakes

13.4.8 Anaerobic Digestion

The gas produced in an anaerobic digestor will be odorous. It should not be released to air in an uncontrolled manner and will only usually be vented untreated in the case of an emergency activation of a safety device. Normally the gas will be used as a fuel in boilers to heat the digestor or used for fuel a combined heat and power system. In some cases an excess of gas production necessitates the operation of the pressure-relief valve and burning-off the surplus through a flare. Measures that should be taken to minimise odour releases from this source include:

- Routinely drain condensate traps to remove water and avoid back pressure
- Ensure that the digester system is balanced in respect of pressure to reduce emergency

- Pressure relief operation
- If the gas is vented to a combustion unit for energy recovery, a stand-by flare should be provided in case of combustion system malfunction
- Regularly inspect the operation of the flare to check in particular that the pilot will light the flare even if the flare has been overloaded
- Avoid turbulence of the sludge after digestion
- Secondary digestors are often not covered and they can lose up to 11% of methane
- Generated and obviously also any odour associated with the sludge. The operation of the primary digester should reduce the risk of odour generation at the secondary stage. In cases where the operation of the primary digester leads to odour release in the secondary stage, the secondary digester may require covering and venting to an odour and methane treatment facility (it is essential to consider possible explosion hazards associated with this)
- Covering of digested-sludge feed channels, mixing wells and overflow take-offs
- Regular inspection of the seals of floating gasholders
- Any covers or abatement equipment provided for this source will require careful evaluation in relation to safety and explosion control

13.4.9 Thermal Drying of Sludge

Thermal dryers release a large volume of water during the drying and there are two options for odour emission treatment:

1. Maintain the conditions in the exhaust treatment plant to ensure that the moisture did not condense. This would result in a wet emission with odour control provided by thermal oxidation
2. Condense the water and use a more traditional odour treatment system such as a biofilter, scrubber or adsorber. There would be concern that by condensing the moisture any solids present would be rewetted and may liberate more odour and also the generation of potentially odorous liquors.

13.4.10 Storm Water Balancing tanks

The problem with storm water tanks is that if they are not emptied soon after filling they can go anaerobic. The other major issue relates to the frequency and efficiency of flushing and cleaning of the tanks after use. These tanks are very large and are rarely covered. Implementation of the following measures should largely avoid odours from the storm tanks:

Storm tanks should not be used to increase the hydraulic capacity of the WWTP, they should only be used for storm conditions
If the tanks are to be used for balancing influent flows under normal flow conditions, septic conditions should be avoided either by the use of chemical additives or by maintaining solids in suspension by controlled aeration
The tanks should be emptied within the shortest possible time once the hydraulic load has reduced to allow the treatment of the storm flow and should be within no more than 72 hours. This requires that the design hydraulic load allows the storm water flow to be treated within this timescale
The tanks should be operated on a system to ensure that tanks are continually refreshed to avoid liquor standing and also that the tanks are emptied in order of the age of the storm water within them

The tanks should be desludged and cleaned as soon as possible after use. Allowing the sludge to stand in the tanks will rapidly lead to odour generation. Consideration should be given to the provision of automatic flushing and desludging equipment in these tanks.

14.0 CONCLUSIONS

The procedures to be followed for design of new WWTP and upgrading of existing WWTP in terms of odour abatement are set out below.

14.1 New WWTP

- FCC to provide successful service provider/Contractor with boundary odour standards (Odour boundary Limit and Total WWTP odour emission rate).
- Contractor to carry out preliminary design of wastewater treatment process.
- Assess the odour impact of the particular wastewater treatment process indicated by the Contractor by carrying out Odour dispersion modelling. FCC to specify the dispersion modelling package to be used.
- Does the WWTP achieve the boundary odour standard as set out by FCC.
- If standards achievable then proceed with detailed design of WWTP, if not achievable revisit the preliminary design in terms of odour abatement equipment.

14.2 Upgrading of WWTP

- FCC to engage a specialist odour monitoring consultant and provide / discuss boundary odour standards to be achieved at upgraded WWTP (Odour boundary Limit and Total WWTP odour emission rate).
- Specialist odour monitoring consultant to carry out odour sampling and measurement at WWTP over defined period of time (e.g.3 months).
- Odour monitoring consultant to assess the odour impact of the upgraded WWTP by carrying out Odour dispersion modelling. FCC to specify the dispersion modelling package to be used.
- Odour monitoring consultant to provide odour assessment report to FCC and include recommendations for odour abatement equipment to achieve boundary odour standards at upgraded WWTP.
- If standards achievable then proceed with detailed design of upgraded WWTP, if not achievable redesign upgrade in terms of odour abatement equipment.

14.3 Monitoring of Operating Contractors

A continuous long-term monitoring policy and a sampling regime at all WWTPs has to be put in place.

14.4 Odour Annoyance Criterion

All future WWTPs must achieve the following limits:

- Odour levels from the wastewater treatment plant shall not exceed $1.5 Ou_E/m^3$ on a 98^{th} percentile basis and $3.0 Ou_E/m^3$ on a 99.5^{th} percentile basis at the site boundary.
- An odour emission rate limit (Ou_E/s) value shall be placed upon each stack in order to ensure the total WWTP odour emission rate limit value is being achieved. This figure is determined from the odour dispersion model for each individual WWTP.

14.5 Wastewater Treatment Plant Layout

Consideration should be given to the layout of the WWTP in relation to the odour producing processes. In as far as is reasonably possible, Odour producing processes should be located at the centre of the WWTP site and the non-odourous buildings located around them nearer to the perimeter.

14.6 Odour Equipment Maintenance Records

Odour Equipment Maintenance Records must be in accordance with Procedure RP14 Procedure for Reporting Odour Equipment Maintenance Records from the Performance Management System – Volume 1 Wastewater Treatment Plant.

14.7 Dispersion Modelling

Odour impact assessment is to be carried out in accordance with the following documents:

- Irish EPA guidance document 'Odour impacts and Odour Emissions from Intensive Agricultural Facilities' and Parts 1 & 2 of the H4 Horizontal Guidance Note on Odour
- The measurement of odour strength is to be carried out using dynamic olfactometry in accordance with BS EN13725 2003.

14.8 Odour Reduction Equipment

- FCC require 100% duty and standby odour reduction equipment on major components of the system eg. Pumps, fans etc.
- Both duty and standby are to be regularly alternated so that both are fully functional.
- A minimum of two-stage scrubbing is to be provided.

14.9 Stack Height

Stack height calculation is best undertaken by a specialist and needs to consider the following:

- The emission concentration and the rate of emission,
- The temperature,
- The local topography and
- The location of receptors
- Adjacent building heights
- Good Engineering Practice Guideline for Stack Heights.

APPENDIX A

ODOUR CONTROL CHECKLIST FOR WASTE WATER TREATMENT PLANTS

- Ensure Good housekeeping at all WWTPs
- Operate the WWTP within the design specifications
- Don't allow build up of scum in tanks and remove floating waste
- Minimise Storage of sludge
- Wash screenings and grit
- Ensure Storage units are fully enclosed
- Close all doors
- Avoid Spillages
- Monitor and Action Odour Complaints
- Ensure operator training up to date
- Have clear Emergency breakdown response
- Cover all tanks to capture odours.
- Pipe off all odours to odour control units
- Have a maintenance programme for all odour abatement equipment
- Extract headspace air from specified odourous process buildings for odour scrubbing

APPENDIX B

BEST PRACTICE GUIDELINES TO ENSURE MAXIMUM ODOUR REDUCTION

1.1 Inlet Works

- Clean and flush regularly
- Grit and screenings transfer and storage in a manner to prevent spillage.
- Lowering discharge points to minimise turbulence and volatilsation of odours
- Balancing the flow of sludge liquors to even the load over the day
- Imported sludges to go straight to sludge storage tanks and not through inlet works

1.2 Primary Sedimentation

- Pre-treatment
- Reduce retention times,
- Aim to ensure that sludge is not held on the base of the tanks for more than 1-hour
- Reduce turbulence
- Avoid recirculation of secondary sludge

1.3 Secondary Aerobic Treatment

- Ensure aerobic conditions.

1.4 Final Settlement and Tertiary Treatment

- At this stage odour release should not be a problem by minimising sludge retention periods.

1.5 Sludge Handling , Storage and Thickening

- Transport unstabilised liquid sludges in tankers or enclosed lorries (if in solid form) and should be transferred to storage tanks which are vented to odour abatement equipment
- Sludge which has been lime treated must be kept covered as it can generate odour,
- Sludges should be processed ASAP
- minimise the potential storage of sludge before treatment (Max 24 hours)
- All tanks and plant for unstabilised sludge storage and processing should be enclosed or covered and vented to odour abatement equipment
- minimise retention and contain odours
- Avoid open storage of sludges or sludge cakes

1.6 Anaerobic Digestion

- The gas produced in an anaerobic digestor will be odorous. It should not be released to air in an uncontrolled manner except in the case of an emergency

- Routinely drain condensate traps to remove water
- Ensure that the digester system pressure is balanced to reduce emergency
- pressure relief operation
- If the gas is vented to a combustion unit for energy recovery, a stand-by flare should be provided in case of combustion system malfunction
- Regularly inspect the operation of the flare to check in particular that the pilot will light the flare even if the flare has been overloaded
- Avoid turbulence of the sludge after digestion
- Cover Secondary digestors
- Covering of digested-sludge feed channels, mixing wells and overflow take-offs
- Regular inspection of the seals of floating gasholders
- Any covers or abatement equipment provided for this source will require careful evaluation in relation to safety and explosion control

1.7 Thermal Drying of Sludge

Thermal dryers release a large volume of water during the drying and there are two options for odour emission treatment:

- Maintain the conditions in the exhaust treatment plant to ensure that the moisture did not condense. This would result in a wet emission with odour control provided by thermal oxidation
- Condense the water and use a more traditional odour treatment system such as a biofilter, scrubber or absorber. There would be concern that by condensing the moisture any solids present would be re-wetted and may liberate more odour and also the generation of potentially odorous liquors.

1.8 Storm Water Balancing Tanks

- Only use Storm tanks for storm conditions
- Empty tanks as soon as normal conditions resume(max72 hours)
- Refresh Tanks continually and empty in order of the age of the storm water within them
- The tanks should be desludged and cleaned as soon as possible after use. Provide automatic flushing system

1.9 Odour Management Plan

Prepare and regularly review & upgrade Odour Management Plan. Please see Appendix C for guidance on the preparation of an OMP.

APPENDIX C

GUIDANCE ON THE PREPARATION OF AN ODOUR MANAGEMENT PLAN

Preparation of an Odour Management Plan

An Odour Management Plan is a summary, provided by the operator, of the foreseeable situations which may compromise his ability to prevent and/or minimise odorous releases from the process and the actions he will subsequently take to minimise the impact. This will include operational and control measures for normal as well as abnormal conditions. It is intended to be used as a reference document for operational staff on a day-to-day basis and shows what actions should be taken to minimise the instances of odour emissions and who is responsible for authorising or undertaking the action. The plan is intended primarily to detail operational and control measures appropriate to management and control of odour. It should also document foreseeable emissions, which are outside of the control of the operator. However the operator may wish to include types of failure that are preventable, for example pump failure, biofilter compaction or filter breakthrough in order to highlight the need for the appropriate maintenance work to be undertaken before the failure occurs. It is recommended that the Odour Management Plan becomes the primary odour control document and should therefore include the odour complaints administration procedure.

Format for the Odour Management Plan

The Odour Management Plan should be a written document, which is available, on-site and should be available to the local authority and all site personnel.

The operator should address the following issues in the Plan:-

- the activity which produces the odour and the point of odour release
- possible process or control failures or abnormal situations
- potential outcome of a failure in respect of the likely odour impact on local sensitive receptors
- what actions are to be taken to mitigate the episode, timescales and details of the persons responsible for the actions at the site
- record keeping.

Issues which may have to be considered in an Odour Management Plan (1-4)

1. Those which have potential to affect the process and the generation of odour

Examples of factors, which the operator should normally have made arrangements for, are:

- Materials input (seasonal variation in weather may affect odour of influent and
- intermittent discharge of odorous substances to the sewerage system)
- Process parameters (changes in temperature, aerobic conditions)
- Rate of throughput or increased hours of operation
- Development of anaerobic conditions
- Routine maintenance and inspection.

2. Those which affect the ability to abate/minimise odour

Examples of factors which might be considered to be outside of operator's control and best dealt with by management actions:

- Start-up and shut-down of key plant and equipment
- Power failure (although the provision of backup facilities should be considered)
- Poor performance of biofiltration or poisoning (if not the result of poor maintenance or maloperation)
- Flooding of the biofilter due to abnormally high rainfall
- External failure of other utilities, e.g. water supply (This should also be considered where the operator has signed up to an interruptible gas supply).

Examples of factors, which the operator should normally have made arrangements for, are:

- Mechanical breakdown of abatement equipment such as pumps, fans etc
- Power failure
- Compaction of the biofilter or surface fissures
- Saturation of a carbon filter bed and subsequent breakthrough of odours
- Below optimum temperature of a thermal oxidiser or boiler etc
- Saturation of scrubber liquor, blocked injection nozzles etc.
- Routine maintenance and inspection.

3. Those which affect the ability to contain odour (where releases are not normally permitted)

Examples of factors which might be considered to be outside of the operator's control and best dealt with by management actions:

- Building damage which affects integrity due to for example storms
- Power failure

Examples of factors, which the operator should normally have made arrangements for, are:

- Failure of automatic doors, i.e. in open position
- Failure in procedures to maintain containment (human error)
- Routine maintenance and inspection.

4. Those affecting dispersion between the source and sensitive receptors (for permitted release points such as vents, stacks or biofilters):

Examples of factors which might be considered to be outside of the operator's control and best dealt with by management actions:

- Short term weather patterns which fall outside of the normal conditions for that area (i.e. highly unusual, not just the normal meteorological pattern - for example inversions and other conditions unfavourable to dispersion should have been considered in designing the process).

Examples of factors, which the operator should normally have made arrangements for, are:

- Weather – wind direction, temperature, inversion conditions if these are normal variants of local weather
- Loss of plume buoyancy/temperature

Note: many of the above are design issues to a large extent – the process should be designed to prevent/minimise odour to the required level (a level of acceptability) which takes the range of meteorological conditions into account.

APPENDIX D

LEGISLATION

- Circular WSP8/05
- Statutory Instrument S.I. No. 787 Of 2005

  European Communities (Waste Water Treatment) (Prevention of Odours and Noise) Regulations 2005

20th December 2005

Circular WSP8/05

To each sanitary authority

Re. EUROPEAN COMMUNITIES (WASTE WATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS 2005

A Chara,

I enclose for your information a copy of the European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations 2005 which were recently made by the Minister for the Environment, Heritage and Local Government.

The Regulations include requirements for waste water treatment plants to be designed, constructed, operated and maintained so as to avoid causing nuisance from odour emissions or noise and requirements on the operators of such plants (sanitary authorities or their agents) to:

- maintain records of mandatory environmental standards, including those relating odours and noise which apply to waste water treatment plants;
- provide details of all necessary steps taken to comply with the Regulations to the Environmental Protection Agency each year;
- make an report annually to the Agency detailing any incidents arising from odours or noise in respect of any waste water treatment plant and details of any environmental complaints in relation to the operation of such plants; and
- forward copies of all complaint records to the Agency for any specific plant over any specified period, on request from the Agency.

The Regulations also provide that the Environmental Protection Agency will be

required to ensure compliance with the requirements of the Regulations.

Any queries arising from this circular may be addressed to the undersigned.

Is mise le meas,

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Liam Gleeson
Water Services Policy Section

To - Each County and City Manager and Director of Services (Water Services)

Copy to – EPA, GCCC, CCMA, AMAI, WSNTG, Ombudsman's Office and Regional Authorities

STATUTORY INSTRUMENT

S.I. No. 787 of 2005

EUROPEAN COMMUNITIES (WASTE WATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS 2005

Dublin

Published by the Stationery Office

PRN A5/2113 Price €1.27

EUROPEAN COMMUNITIES (WASTE WATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS 2005

The Minister for the Environment, Heritage and Local Government in exercise of the powers conferred on him by section 3 of the European Communities Act, 1972 (No. 27 of 1972) and for the purpose of giving further effect to the Council Directive of 15 July, 1975 (No. 75/442/EEC)[1] as amended by Council Directive of 18 March 1991 (No. 91/156/EEC)[2], and in particular of ensuring that there is other legislation covering waste waters for the purposes of Article 2(1)(b)(iv) of the said Directive, hereby makes the following Regulations:

1. These Regulations may be cited as the European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations 2005.

2. In these Regulations –

"Act of 2000" means the Planning and Development Act 2000 (No. 30 of 2000);

"appeal" has the meaning assigned to it in the Act of 2000;

"Board" means An Bord Pleanála;

"Directive" means Council Directive 75/442/EEC as amended by Council Directive of 18 March 1991 (No 91/156/EEC);

"sanitary authority" means a sanitary authority for the purposes of the Local Government (Sanitary Services) Acts 1878 to 2001;

"waste water treatment plant" means a waste water treatment plant provided and operated by or on behalf of a sanitary authority in accordance with the Urban Waste Water Treatment Regulations, 2001 (S.I. No. 254 of 2001) or otherwise and includes related pipes and accessories.

3. A sanitary authority shall ensure that –

(a) in formulating and approving plans for a waste water treatment plant to be provided by the authority or on its behalf the plant is so designed and constructed as to ensure that it avoids causing nuisance through odours or noise,

(b) any waste water treatment plant under the sanitary authority's control is so operated and maintained as to ensure that it avoids causing nuisance through odours or noise.

[1] O.J. No. L 194/ 25.07.1975
[2] O.J. No. L 078/26.03.1991

4. For the purpose of Article 3(b) of these Regulations, the Agency shall be required to ensure compliance of waste water treatment plants with the requirements of the said Article 3(b), and the provisions of section 63 of the Environmental Protection Agency Act 1992 (No. 7 of 1992) shall apply accordingly.

5. A planning authority shall, where granting permission for a development in accordance with section 34 of the Act of 2000 consisting of the provision of a waste water treatment plant, attach such conditions to the permission as may be, in the opinion of the authority and having regard to the function of the Agency under Article 4 of these Regulations, necessary to ensure that the plant is so operated and maintained as to ensure that it avoids causing nuisance through odours or noise.

6. In considering an appeal, or an application under section 175(3) of the Act of 2000 for approval for a proposed development consisting of the provision of a waste water treatment plant by or on behalf of a sanitary authority, the Board shall have regard to the requirements of Article 3 of these Regulations and, in granting any permission for development or approving any application for approval and having regard to the function of the Agency under Article 4 of these Regulations, shall include such conditions as may be necessary in its opinion to ensure that the plant is so operated and maintained as to avoid causing nuisance through odours or noise.

7. Where a sanitary authority which is also the planning authority is required to comply with the requirements of section 179 of the Act of 2000 in respect of a proposed development consisting of the provision by or on behalf of the authority of a waste water treatment plant, the authority shall have regard to the requirements of Article 3 of these Regulations and shall, where appropriate, vary or modify the proposed development in such ways as may be necessary to meet the requirements of the said Article 3.

8. Not later than the 28th day of February after the end of each year, a sanitary authority shall provide to the Agency, in a format to be specified by the Agency, a report in respect of that year indicating all necessary steps taken during the year to which the report relates to comply with Article 3(b) of these Regulations and shall include in the report details of any incidents arising from odours or noise in respect of any waste water treatment plant provided by it or on its behalf during that year.

9. A sanitary authority shall, in operating and maintaining a waste water treatment plant, satisfy the requirements set out in the Schedule to these Regulations.

SCHEDULE

Operation of Waste Water Treatment Plants to avoid causing nuisance through noise or odours

1. A sanitary authority shall maintain a record of all mandatory environmental standards, including those relating to odours and noise, that apply to each waste water treatment plant provided for under any enactment, permission or order.

2. A sanitary authority or its agent shall record all environmental complaints related to the operation of waste water treatment plants.

3. Records shall include:

   - the complainant's name and address,
   - the date of the complaint,
   - the reported date, time, nature and duration of the incident to which the complaint refers,
   - the date of acknowledgement by the authority to the complainant and author,
   - the action taken on foot of the complaint and the results of any such action,
   - the cause of the complaint as determined,
   - details of any response made to the complainant.

4. On request from the Agency, a sanitary authority shall forward copies of all complaint records to the Agency, in a format specified by the Agency, for any specific plant over any specified period.

Given under the Official Seal of the Minister for the Environment, Heritage and Local Government

Heritage and Local Government, this 7th day of December, 2005.

L.S. DICK ROCHE

Minister for the Environment, Heritage and Local Government

Explanatory Note

(This note is not part of the Instrument and does not purport to be a legal interpretation).

These Regulations require that waste water treatment plants are so designed, constructed, operated and maintained as to avoid causing nuisance through odours or noise and that the operators of such plants maintain records in this regard and provide a report each year to the Environmental Protection Agency indicating all necessary steps have been taken to comply with these Regulations during the year to which the report relates and detailing any incidents arising from odours or noise in respect of any waste water treatment plant provided by it or on its behalf.

References

1. TES Consulting Engineers, (27/09/05), Kilshane Cross Recycling Park Environmental Impact Statement (EIS) Volume II:EIS Main Text. (Contributor Dr B Sheridan, Odour Monitoring Ireland)
2. The Minister for the Department of the Environment, Heritage and Local Government, Dublin, Ireland (DoEHLG), (December 2005), S.I. No. 787 of 2005, EUROPEAN COMMUNITIES (WASTEWATER TREATMENT) (PREVENTION OF ODOURS AND NOISE) REGULATIONS.
3. Department for Environment, Food and Rural Affairs, London, United Kingdom (DEFRA), (December 2004), Consultation of the Draft Code of Practice and Local Authority Guide on Odour Nuisance from Sewage Treatment Works.
4. Scottish Environment Protection Agency (SEPA), (April 2005)Code of Practice on Assessment and Control of Odour Nuisance from Waste Water Treatment Works.
5. Fingal County Council (June 2002) Sludge Management Plan.
6. World Health Organisation (WHO) Regional Office for Europe, Copenhagen, (2000) WHO Air Quality Guidelines for Europe Second Edition, WHO Regional Publications, European Series, No. 91 .
7. Mott MacDonald Group, (February 2002), Evaluation of Odour Emission & Dispersion Report, Portrane / Donabate Wastewater Treatment Scheme.
8. Bord na Móna Environmental Ltd website
9. Van Harreveld, A.P., Jones, N., Stoaling, M., Odour Impacts and Odour Emission Control Measures for Intensive Agriculture. Part A: Odour annoyance assessment and criteria for intensive livestock production in Ireland., Environmental Monitoring, Environmental Protection Agency, Ireland
10. Casey, Dr. J., Sheridan, Dr. B., (May2006) Odour Management Plan for Swords Wastewater Treatment Plant (WWTP), Ireland
11. Sheridan, Dr B, (October 2006) Odour Monitoring Ireland Consultation Document Reference 2006A321(1)
12. Environment Agency (October 2002) Integrated Pollution Preventation and Control Draft Horizontal H4 Guidance Notes on Odour (Parts 1 & 2), United Kingdom.