Odour Management Plan

Ellesmere Port WwTW

Date: January 2020

Version: 4

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AMENDMENT SUMMARY

Issue no.	Date	Brief description of amending action	Prepared by:	Reviewed/ authorised by:
1	August 2006	N/A	Paul Tipper	Ian Evans, Jamie Hogg
2	February 2013	N/A	Chris Maggs / Neil Wilkinson	Laura Farrant
3	October 2016	N/A	Neil Wilkinson/Alex Ranley	
4	January 2019	Annual review	Neil Wilkinson	Neil Wilkinson

March 2021 - Continued operation of all the installed Odour Control Units has not found to be necessary to this point. We intend to conduct a review of the existing odour control assets over the next 12 months with regard to their necessity and performance. We will issue details of proposed operation and monitoring requirements or changes to operation to the Environment Agency as part of a 12 month review of this OMP.

ABBREVIATIONS

BAT	Best Available Techniques
BPM	Best Practicable Means
BTEC	Business and Technology Education Council
CoP	Code of Practice
Defra	Department for Farming and Rural Affairs
FTFT	Flow to Full Treatment
GBT	Gravity Belt Thickener
MARS	Mobile Asset Resource Scheduling
OCU	Odour Control Unit
OMP	Odour Management Plan
PPC	Pollution Prevention and Control
SBC	Submerged Biological Contractor
UKWIR	United Kingdom Water Industry Research
UU	United Utilities
WwTW	Wastewater Treatment Works
ORP	Oxidation reduction potential
PID	Photo ionisation detector
SCADA	Supervisory Control & Data acquisition
STOC	Sludge Treatment & Odour Control (Building)

SCOPE OF Ellesmere Port ODOUR MANAGEMENT PLAN

The objective of this odour management plan (OMP) is to provide guidance to all Operations and Maintenance staff with regard to practices that will minimise the risk of odour emissions being discharged from the Ellesmere Port site. This document describes the odour management practices that have been considered as part of the design of the works and those that must be adhered to during the operation of the treatment plant.

Adherence to the practices indicated below is vital to ensure that the plant complies with the relevant permit conditions within the (PPC) EP Installation boundary and also the wider site boundary in terms of the statutory nuisance provisions outlined in the DEFRA code of practice on odour nuisance from sewage treatment works.

As part of the odour management plan the application of best available techniques (BAT) has been used in the design process in the selection of odour treatment technology to minimise the risk of odour nuisance being caused to the local community.

In effect United Utilities is working with dual regulation in terms of its odour obligations.

This is a “live” document and will be subject to further review and updating over the operational life of the site as part of the on-going monitoring and review programme focused upon improved performance, via input from all stakeholders this includes, but is not limited to, Site Operations, regulatory bodies and the local community.

This Odour Management Plan (OMP) is an operational document that is developed following the identification and review of risk areas for odour release. It details operational and control measures appropriate to the reduction or elimination of the impact of odours from a wastewater treatment works (WwTW) site. It provides detail to allow operators and maintenance staff to understand the operational procedures for both normal and abnormal conditions.

It considers a range of issues including:

- A summary of the sites odour sources and the location of receptors
- Formation, transfer and dispersal of odour from source to receptor
- Suitable monitoring for odours
- Contingencies and responsibilities when problems arise
- Identifying maintenance needs, replenishing consumables
- Odour-critical plant operation and management procedures (e.g. correct use of plant, process, materials; checks on plant performance, maintenance and inspection)
- Staff training
- Anticipated performance of installed odour control units
- Spillage and incident procedures
- Record keeping – format to be used, responsibility for completion and location of records
    - Odour complaint investigation, recording and reporting

The above issues are discussed regularly as part of the sites team brief agenda and individually at Process Controllers and Operators monthly 1 to 1’s.

INTRODUCTION TO UNITED UTILITIES

United Utilities (UU) is the UK’s largest operator of wastewater systems. In the Northwest UU owns, maintains and operates a 39,000 km network of sewers and 600 WwTW to collect and treat 2,200 million litres of wastewater from homes, commerce and industry every day, before returning it safely to the environment.

WASTEWATER ASSET STRATEGY AND PLANNING AND WASTEWATER OPERATIONS AND MAINTENANCE

UU is structured such that the Wastewater Asset Strategy and Planning division, under Asset Management and Regulation is responsible for the management of the wastewater asset base, producing and delivering regional investment and operational strategies. The Water Operations and Maintenance Division, under United Utilities Utility Solutions is responsible for operating and maintaining the water and wastewater asset base. The organisation applies a structured and co-ordinated approach to systems and procedures that prioritise and monitor wastewater operations, asset management and both capital and operational investment.

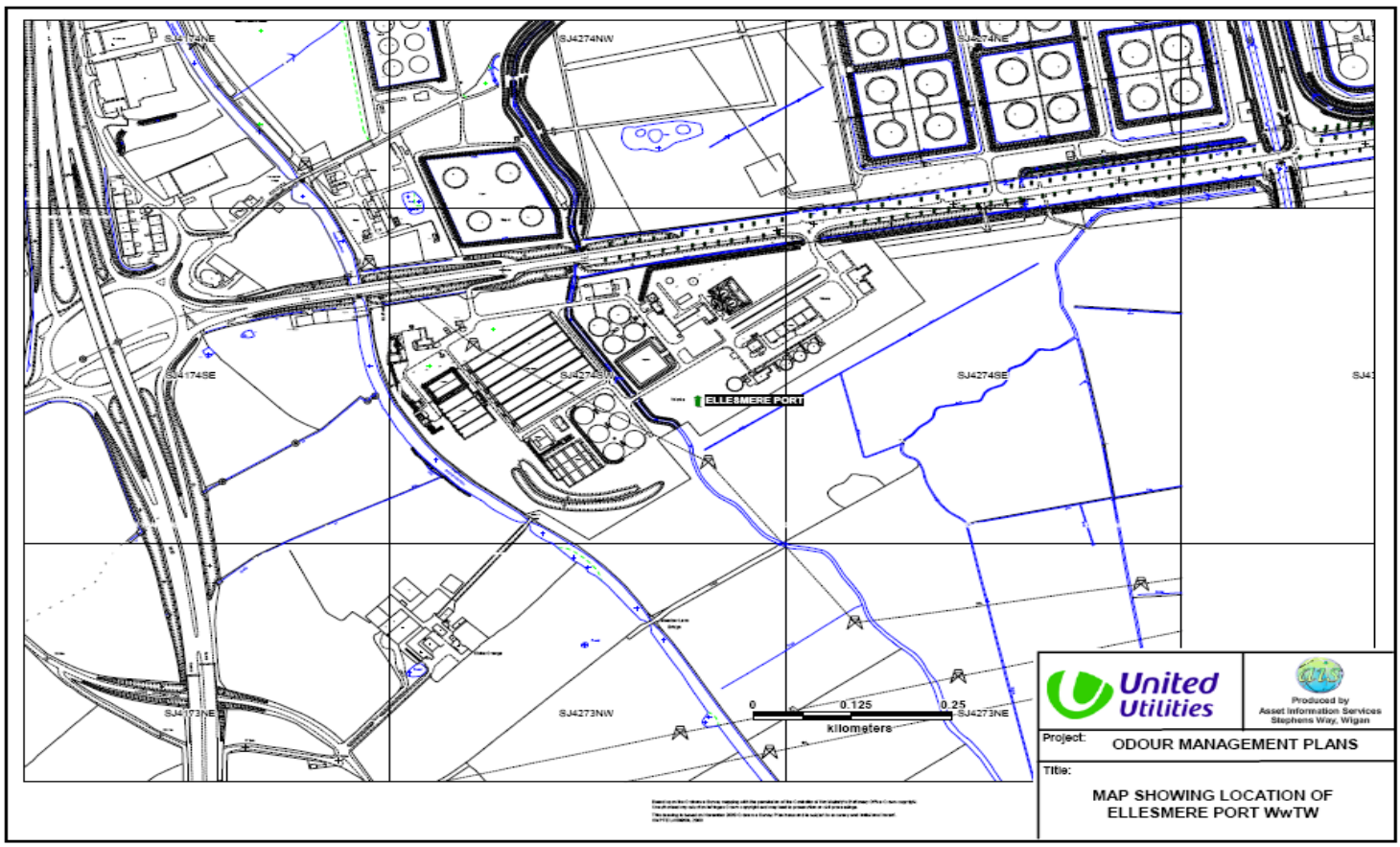
Wastewater Asset Strategy and Planning manages the asset base through its relationship with Wastewater Operations and Maintenance, ensuring that all operational tasks are undertaken in accordance with best practice. It is also responsible for the development of standards and policies covering the design and operation of wastewater assets.

SUMMARY OF Ellesmere Port WWTW'S LOCATION AND TREATMENT PROCESSES

Ellesmere Port WwTW is located to the south of Ellesmere Port town, close to the Cheshire Oaks retail and leisure developments. Essar UK's. . Stanlow Oil Refinery is located to the north east of the site. There is predominately farm land to the east, south and west of the site. The Works serves a combined PE of 127,000 of which 48,000 is trade effluent and 35,000 of the trade effluent are discharged from SCUK. The works treats a maximum flow to full treatment of 54 Ml/d and a maximum flow from Essar of 19.2 Ml/d. In addition storm flows over and above consented FTFT receive settlement in storm tanks before discharge to river or returning to full treatment on cessation of a storm.
The existing wastewater treatment process at Ellesmere Port consists of screening, grit removal, primary settlement, surface aeration, intermediate final settlement tanks, tertiary biological trickling filters and associated humus settlement tanks.
The sludge is thickened and then digested in thermophilic anaerobic digesters (TAD) for pathogen removal followed by primary sludge digesters. The sludge is subsequently further dewatered via centrifuges prior to off-site sludge recovery.

Figure 1: Ellesmere Port WwTW location plan

Ellesmere Port WwTW
Little Stanney
Nr Chester
CH2 4HZ



A process flow diagram for the works is provided (see figure 1), however Ellesmere Port WwTW consists of the following treatment stages /process areas

- Preliminary Treatment consisting of:
  - 2 Escalator screens & associated screenings dewatering, and storage
  - Grit removal comprising of one Dorr Oliver Detritor complete with grit rake, washing and storage
  - Pump Station with 3 No Archimedes Screw Pumps

- Primary Treatment consisting of:
  - 4 Rectangular primary tanks
  - Auto-desludge facilities

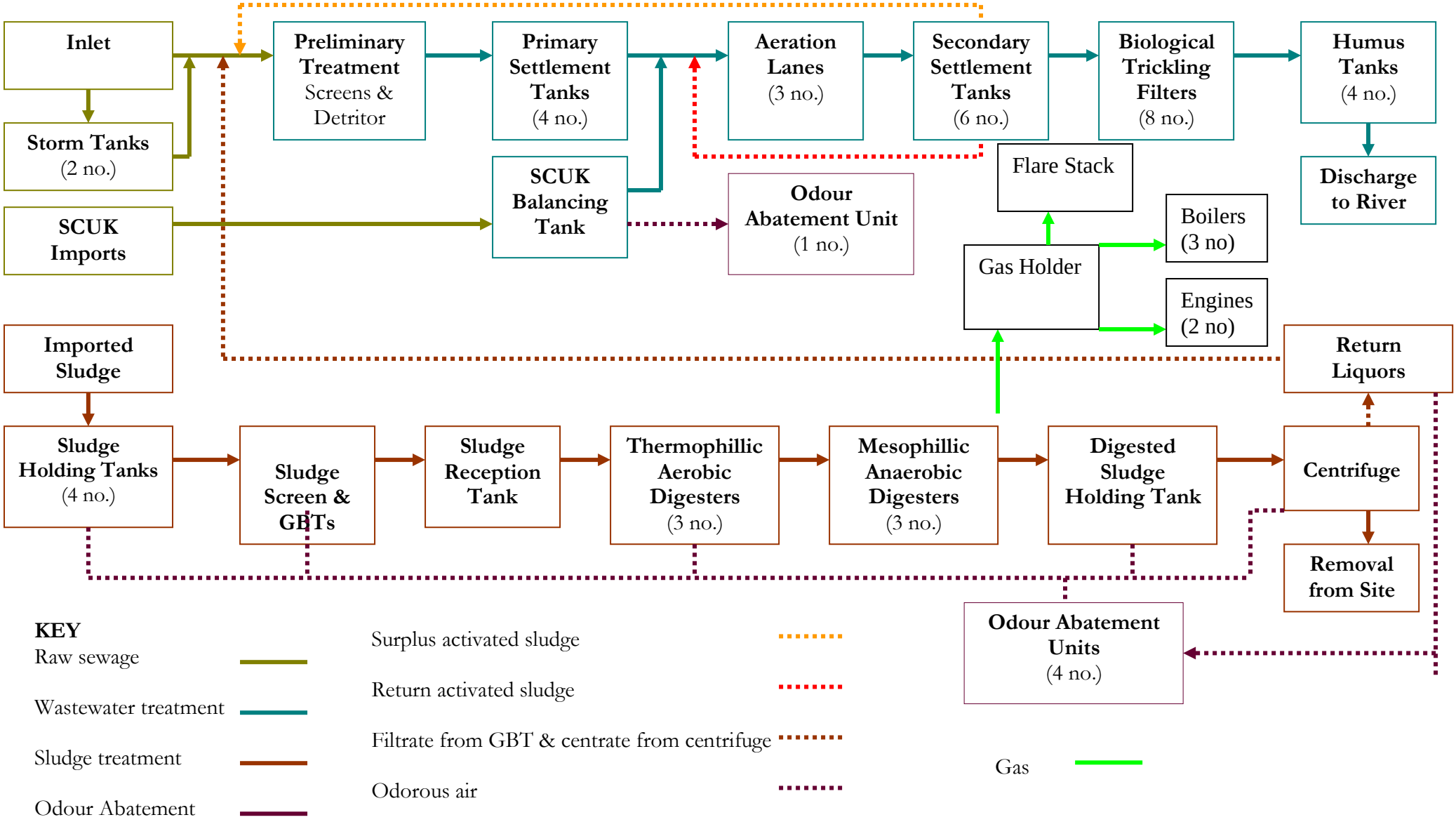
- Storm Treatment consisting of:
  - 2 Storm tanks
  - Auto emptying
  - Washwater clean down jet system

- Biological Secondary Treatment consisting of:
  - 3 Activated sludge lanes
  - 3 fixed speed aerators per lane
  - Essar UK balancing tanks
  - Essar UK odour control unit
  - 6 circular clarifiers

- Tertiary Treatment consisting of:
  - Filter feed pumping station with 3 No centrifugal pumps
  - 8 rock media filters
  - 4 winch houses

- Sludge Treatment consisting of
  - 4 Raw sludge buffer tanks
  - 2 Strain press feed pumps
  -
  - 1 CD Enviro screen
  - 1 Mono muncher
  - 2 GBTs
  - 1 Thickened sludge reception tank
  - 2 Raw sludge holding tanks
  - 2 Digested sludge holding tanks
  - 2 TAD feed pumps
  - 3 Thermophillic aerobic digesters
  - 3 Mesophilic Anaerobic Digesters with mixing
  - 1 Digested sludge holding tank
  - 1 Floating Bell Gas Holder
  - 2 637 KWh CHP Engines
  - 3 Dual Fuel Boilers
  - 1 Gas Oil Storage tank
  - 1 Bio Gas Flare Stack
  - 4 Odour Control Units with associated equipment
  - 1 Sludge Storage Lagoons, only 1 in operation.
  - 3 Centrifuges with associated equipment
  - 1 Centrate holding tank with associated equipment

Figure 2: Ellesmere Port WwTW process flow diagram



KEY CONTACTS

1.1 United Utilities Key Personnel and Contact list

Production Manager:	Diane Mason	07771 838229
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Technical Officer:	Neil Wilkinson	07712 774316
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	Heath Jones	07750 849284
Catchment Manager:	Laura Doyle	07917 008020
Area Business Manager:	Jo Matzen	01925 537207
Wastewater Treatment Planning Manager:	Luke Pearson	01925 537164
United Utilities Customer Contacts Centre:		0845 746 2200

Technical Support to United Utilities Site Operations

Process Technology Team:	Phil Banks	01244 300572
Process Engineering Department:	Paul Kynaston	01925 463972

FORMATION OF ODOUR NUISANCE PATHWAYS

In order for an odour nuisance to occur the following conditions must be achieved

1. The formation of odorous compounds in the wastewater
2. Transfer of compounds from the wastewater to the atmosphere
3. Transport of compounds from source to receptor, and the degree of dispersion/dilution achieved during the transport process

1.2 Odour Generation in Wastewater Treatment Systems.

The presence of odorous compounds in a predominantly domestic wastewater is as a result of anaerobic conditions within the system which occurs whenever all dissolved oxygen has been utilised by bacterial respiration. Under such conditions sulphate is reduced to sulphide by the sulphate reducing bacteria (SRB).

Anaerobic fermentation in wastewater also produces other odorous compounds such as organo-sulphide compounds which includes mercaptans, and dimethyl sulphide. In addition both domestic and industrial discharges will result in the release of a variety of odorous compounds collectively termed volatile organic compounds (VOCs).
The release of odours into the atmosphere is controlled by the conditions within the wastewater treatment system, which are:

- Solubility of the dissolved gas
- Odour compound concentration in both gas and liquid phases
- Turbulence within the system (highest odour emission rates usually occur under high turbulent conditions)
- Wastewater temperature
- Wastewater pH

1.3 Transfer and Dispersion of odour from source to receptor

In general the transfer and dispersion of odour from source to receptor is governed by meteorological conditions (wind speed and direction), and geographical conditions (hilly/complex terrain and the physical distance separating the receptor from the source).

Odour released under windy conditions will disperse quickly and in some cases may have no effect on the local residences while under calm conditions less dispersion of the odour plume occurs before reaching the receptor.
With regard to the distance between source and receptor, in general the greater the distance between source and receptor the greater the probability of the odour plume being subject to mixing and dispersion with the atmosphere, and hence a greater degree of dilution is achieved.

Identification of Site Odour Sources and Source Materials at Ellesmere Port WwTW

Table 1 Summary of site odour source materials

Source Material	Source Area	Odourous Compound	Most Common Cause	Odour Characteristics
Wastewater Raw biosolids (liquid sludge & sludge cake)	Preliminary Treatment Area Primary Treatment Area Biosolids Processing Areas	Hydrogen Sulphide	Anaerobic Conditions within wastewater/biosolids Industrial discharge	Rotten eggs
Wastewater Raw Biosolids (liquid sludge & sludge cake)	Preliminary Treatment Area Primary Treatment Area Biosolids Processing Areas	Mercaptans	Anaerobic Conditions within wastewater/ biosolids	Decayed cabbage
Wastewater Raw Biosolids (liquid sludge & sludge cake)	Preliminary Treatment Area Primary Treatment Area Biosolids Processing Areas	Dimethyl Sulphide	Anaerobic Conditions within wastewater/biosolids	Decayed vegetables
Wastewater Raw Biosolids (liquid sludge & sludge cake) Unwashed Screenings Unwashed Grit	Preliminary Treatment Area Primary Treatment Area Biosolids Processing Areas	Miscellaneous VOCs	Industrial discharge	Varies
Odour neutralising/masking agent	All areas	Chemical product	Site Operation	Varies

SITE ODOUR MITIGATION AND CONTROL MEASURES

1.3.2 Selection of Odour control Technologies at Ellesmere Port WwTW

Where required and when plant design alone cannot prevent the formation or release of odour, treatment can be provided. Methods of treatment can take a variety of forms and can be broadly characterised into:

Liquid phase treatment: - where the wastewater or biosolids are subject to chemical addition to either prevent the in-situ formation of odours compounds, or to prevent their release into the atmosphere.

Gas phase treatment: - where compounds released into the air/gas phase as a result of liquid or biosolids processing are removed prior to the treated gas being discharged into the atmosphere. A variety of gas phase treatment methods are generally classified into one of the following: - chemical, biological or thermal treatment.

In many instances liquid and gas phase treatment are used in conjunction with each other, and a variety of gas phase treatments may be used in combination to achieve the desired level of odour removal.

Table 2 summarises the technologies used at Ellesmere Port WwTW and their dedicated purpose

Table 2 Summary of odour control technologies used at Ellesmere Port WwTW

Technology Type	Purpose
Activated carbon/Impregnated Media	Absorption of sulphide based odours and sparingly soluble/non soluble VOCs within the foul air stream
Biological woodchip media filled units consisting of FE dosing and cooling system	Absorption and oxidation of sulphide based odours
Peat, heather and coconut fibre filled unit	Absorption and oxidation of sulphide based odours

1.3.3 Description of Gas Phase Odour Control Technologies

Essar Treatment Area OCU

The Odour control system is designed to continuously remove odours from the air expelled from the SCUK inlet and Settled Sewage splitter channels. This is achieved by continuously drawing foul air off the covered areas and biologically removing the gases by drawing it through the media filled unit.

The gas leaving the OCU is expelled to atmosphere via an inline stack.

Sludge Area Odour Control
The Odour control system is designed to continuously remove odours from the air expelled from the Sludge Storage and process areas. This is achieved within an existing, bark media biological odour control units and activated carbon units. Fresh final effluent is constantly added to irrigate the bed and wash the media of waste chemicals produced by the bacteria. The water phase is refreshed at a high rate to assist in stabilising the pH ensuring that it does not become too acidic and negatively affect the efficiency of the unit.

The main odour control extraction fans are used to extract air out of the odour control units and push it up the stacks.

1.3.4 Provision of Operational Security and Contingency as part of odour control plant design

As the provision of containment and odour treatment is the primary measure used to minimise the risk of odour nuisance/pollution at Ellesmere Port WwTW, a variety of methods have been employed to provide operational security, these include, but are not limited to : -

- Standby equipment

- Multiple stages of treatment
- Bypass ductwork

Equipment critical to the operation of the odour control plant have standby units built in to the design which will automatically start in the event of plant failure

All odour control technologies require down-time at some point, be it for maintenance, media replacement or unplanned work. To ensure that odour treatment is provided during such times on the primary and sludge control units bypass ductwork is installed around each stage to enable any stage to be taken out of service whilst still allowing ventilation of the covered/enclosed process units and also providing some odour treatment.

All odour control units installed on site consist of multiple treatment stages or are used in combination with each other, so that in the event that a single stage is out of service, some degree of odour treatment is provided.

1.4 Operational Management of Odour

1.4.1 Overview

As untreated wastewater and associated biosolids is inherently odourous, good operational practice focuses upon effectively treating and then discharging/disposing of the wastewater and biosolids as effectively and as rapidly as possible.

As wastewater is received on a continuous basis, and extensive odour containment and treatment is employed it is not advantageous to store biosolids on site, as this may result in increases in the 'odour load' on the associated odour control units and may exceed their design capacity- resulting in odour complaints/pollution.

As the provision of containment and odour treatment is the primary measure used to minimise the risk of odour nuisance/pollution at Ellesmere Port WwTW and as odour containment is maximised through the mechanical extraction of air from the covered process units, airflow must be maintained to ensure air is directed to treated and then discharged via the OCUs stack to ensure maximum treatment and dispersion, even under 'calm' atmospheric conditions.

If mechanical ventilation is not maintained this can lead to the escape untreated odours, the release of potentially explosive gases/atmospheres in addition to the development of corrosive environments within the covered process units.

1.5 Odour Risk Assessment Procedure

1.5.1 Stage 1 Risk Assessment

United Utilities has implemented a staged approach to assessing odour risk at WwTW.

This is a desktop exercise using a series of 30 questions on an Excel spreadsheet. The questions assess the potential for septicity and odorous emissions potentially generated from normal and intermittent operations. It also assesses risk in terms of customer involvement i.e. customer complaints, media interest.

This assessment generates an odour risk score and the following action limits apply: -

Table 3 Stage 1 odour risk scores

SCORE	COMMENT
0 – 6	Low odour risk, no further action required
7 – 14	Medium odour risk, collate data and monitor site performance
> 14	High odour risk, move onto stage 2 site audit for OMP
'Y' to any of the questions related to customer involvement	Customer involvement significant. Carry out stage 2 site audit for OMP.

The results for Ellesmere Port WwTW are contained in Appendix B.

1.5.2 Stage 2 Assessment

The need for a Stage 2 audit and an odour management plan over and above the baseline measures is triggered by the Stage 1 risk assessment in Table 4. It involves a detailed site audit that reviews and identifies potential odour risks. The whole WwTW process stream is reviewed in-terms of operation and potential for odour release
The detailed risk assessment is contained within Appendix B.

1.6 Site Housekeeping

A lack of good housekeeping can result in elevated levels of residual odour, and at times more serious sources of odour. The majority of housekeeping is good working practice and this approach should be implemented regardless of whether complaints are received or not.

The following section identifies areas where particular focus should be made with respect to house keeping

1.6.1. Preliminary Treatment Area Screenings and Grit Handling

Screens and grit removal detritors ensure grit and screenings are washed to remove organic matter, and skips containing them should be removed from site as soon as is practicable. At Ellesmere Port WwTW screenings are washed and compressed, then stored in skips outside of the buildings Grit is also washed and stored in skips outside of the buildings
The skips which collect grit and screenings are removed in a timely manner, the agreement being next day removal where required.

1.6.2 Primary settlement tanks

The build-up of scum and fats on primary settlement tank surfaces can/may lead to odour and should generally be avoided. Odour generation from the primary settlement tanks is minimised at Ellesmere Port WwTW by monitoring sludge blanket levels and aiming to remove sludge from the hopper within 12 hours of it entering.
Final settlement tanks

The build-up of scum or foam on final settlement 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). Odour generation from the final settlement tanks is minimised at Ellesmere Port WwTW by monitoring sludge blanket levels and aiming to remove sludge from the hopper within 24 hours of it entering.

1.6.3 Sludge handling

The sludge handling facilities at Ellesmere Port WwTW are operated as follows:

Unthickened raw Sludge – Unthickened raw sludge is stored in 4 sludge storage tanks with a total volume of 660m3 s. Unthickened/unscreened imported sludge is discharged into tank 1 admixed with the indigenous sludge before screening and thickening. All sludge tanks are covered. Hatches on tanks or other possible sources of odour are closed at all times other than for maintenance and access. Air is extracted from these tanks to the biological scrubber odour control unit (OCU).

Thickened raw sludge – Thickened raw sludge from the sites GBTs is fed into the thickened sludge reception tank and admixed with screened/thickened sludge imports for pre digestion. Foul air is extracted off this tank and treated in the biological and carbon scrubber OCU.

1.6.4 Spillages

Spillages at Ellesmere Port WwTW are usually due during maintenance of assets Sources of possible spillage should be considered and avoided at the design stage where possible.

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 WwTW's.

At Ellesmere Port WwTW the site is monitored for spillages as part of routine inspections. If a spillage occurs, it is washed into site sealed drainage system as soon as possible, where it's returned to the head of the WwTW for full treatment.

If spillages are a recurring incident, investigations in to the cause of such occurrences will be undertaken, and action taken to minimise these occurrences.

The following table summarises the identifies potential odour sources at Ellesmere Port WwTW, the primary mitigation methods employed, and contingencies measures are provided, in addition to the roles and responsibilities of key personnel.

Table 1: Risk assessment of potential odour sources

Process Unit Description/Area	Potential Source material of Odour	Identify cause of potential odour releases or abnormal situations	Primary Control Measures	Contingency Measure	What actions are taken and who is responsible
Preliminary treatment Inlet flow	Septic wastewater	Seasonal effects-elevate temperature/low rainfall Illegal trader discharge on network	Regular monitoring at WwTW inlet for unusual sewage conditions Trade effluent control on network. Routine operation checks and maintenance to ensure plant is functioning as per design-ventilation being achieved , access hatches closed, cover in good condition	Odour monitor the network based on hot spots of odour reported to Ellesmere Port Consider provision of masking sprays around area Consider provision of chemical dosing into network	Production Manager to request network monitoring as required. Process Controller will be responsible for the monitoring of inlet flow. If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including PM, TO, FSE's PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM
Preliminary treatment Grit Removal	Septic wastewater Residual Organic material retained within grit	Obstructions in channel Grit stored on site for prolonged periods	Routine operation checks and maintenance to ensure plant is functioning as per design Channels inspected and kept clear of obstruction	Arrange for more frequent removal of grit skips Consider provision of masking sprays around area	Process Controller will be responsible for the monitoring of odours. If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including PM, TO, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM

Preliminary treatment Inlet screens screenings handling	Septic wastewater Residual organic material retained within screens and conveyance system	Unwashed screenings containing organic matter. can turn odorous Screenings stored on site for prolonged periods	The screenings are washed and inspected, and any malfunction in washing facility will be rapidly repaired. Identified spares will be stored on site to enable rapid repairs Routine operation checks and maintenance to ensure plant is functioning as per design The service agreement for screening removal is for next day removal. Routine operation checks and maintenance to ensure plant is functioning as per design	Arrange for more frequent removal of screenings skips Consider provision of masking sprays around area	Process controller will be responsible for monitoring screenings; initiating maintenance; and requesting their removal. If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including DPM, TO, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM
Primary treatment primary settlement tanks and associated structures	Septic wastewater Raw sludge Floating fats oils grease (FOG)	Failure of desludge system resulting in bio solids accumulating with in tank Storm surges resulting in loading of tanks Seasonal Effects- warm conditions and low rainfall resulting in more septic conditions and longer retention times within tanks Excessive scum build up on tank surface	Routine operation checks and maintenance to ensure plant is functioning as per design Provision of scum removal on tanks. Scum directed to sludge treatment via wet well forwarding pumping station Regular Desludge of all PST to keep on top of levels	Ferric dosing could potentially provide addition benefit of precipitating sulphide out of the wastewater preventing release to atmosphere Consider provision of masking sprays around area	Process Controller will be responsible for inspections of the tanks; initiating maintenance; arranging cleaning. If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including PM, TO, MM, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM
Secondary Treatment Activated Sludge	Septic wastewater Excessive biological build up on surface of lanes	Failure of aeration equipment or upstream primary treatment process	Dissolved oxygen (DO) is monitored with 3 DO probes to maintain oxygen levels. DO probes are monitored	Consider provision of masking sprays around area	Process Controller will be responsible for the monitoring of dissolved oxygen.

	Organic material accumulating on walls VOCS being stripped from wastewater	resulting in overloading and anaerobic conditions Seasonal Effects- warm conditions and low rainfall resulting in more septic conditions and longer retention times within tanks Discharge of 'industrial/trade waste'	every working day and recorded in the on-site logs. All DO probes are linked to SCADA where it is logged. Trade effluent control on network.	Removal of excess foam build up from surface of lanes	If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including PM, TO, MM, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM
Sludge Treatment Raw Sludge Holding Tanks & Strain Press	Raw Sludge's Accumulation of sludge within tanks Spillages	Failure of downstream sludge processing plant will result in prolonged storage period in wells Failure of pump system Process units covers left open/damaged	Hatches are kept shut except for inspections or maintenance. Routine operation checks and maintenance to ensure plant is functioning as per design	Consider provision of masking sprays around area	Process Controller will be responsible for ensuring raw sludge storage times are minimised; the monitoring of storage tank condition; monitoring the odour abatement kit performance; initiating maintenance. If a problem is identified that has no obvious appropriate actions then a meeting between interested parties including PM, TO, MM, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM
Sludge Treatment Thickened, Digested Sludge Holding Tanks & associated equipment	Raw sludge's (normal condition) Accumulation of sludge within tanks Spillages	Process units covers left open/damaged Failure of downstream sludge processing plant will result in prolonged storage period Failure of tank mixing system Tank Failure or Overtopping	Sludge tanks are enclosed with air extraction and odour controlled. Hatches are kept shut except for inspections or maintenance. Routine operation checks and maintenance to ensure plant is functioning as per design	Consider provision of masking sprays around area	Process Controller will be responsible for ensuring raw sludge storage times are minimised; the monitoring of storage tank condition; monitoring the odour abatement kit performance; initiating maintenance. If a problem is identified that has no obvious appropriate actions then a meeting

					between interested parties including PM, TO, MM, FSE's & PC's instigated by the PC will take place ASAP. The ultimate responsibility for resolving the issue falls to PM

1.7 Contingency Measures and Maintenance Conditions

1.7.1 Temporary / Mobile Contingency Equipment

In the event of failure of one or more of the existing fixed assets within the sludge treatment process the site will bring emergency contingency temporary / mobile equipment onto the installation. These units shall be operated until such time that the fixed units are repaired and can be brought back into the process stream.

Temporary /Mobile equipment will be utilised for the task required and will be positioned within the installation boundary whenever feasible. The units will be positioned on impermeable hardstanding when required. The sludge will be transferred between fixed and temporary / mobile assets through suitable flexible hosing where appropriate. Any accidental spillages shall be washed down into the sealed installation drainage system, to be returned to the head of the on-site, off-installation drainage system, downstream of the storm overflow, for treatment. Any process effluent discharges, such as centrate will be discharged into site drainage and returned to the head of the works.

Other mobile equipment that could be required can include.

- Mobile Boiler
- Mobile Heat Exchanger
- Mobile Screening/Gritting Unit
- Mobile Odour Unit
- Mobile centrifuge

Use of these extra mobile kits would be agreed with the EA prior to use and risk assessments and plans for operation would be agreed beforehand.

MAINTENANCE

Records of maintenance requirements, including prioritisation and consideration of criticality for individual assets form part of the maintenance strategy within United Utilities. All EP assets are flagged as a priority as are scheduled inspection tours. All work completed are held on United Utilities' asset inventory and work planning system, MAMS. The MAMS work order system schedules the frequency of inspection tours and the preventative maintenance tasks carried out as part of these tours, this schedule is agreed between the Resource Coordinators and the Production Manager, it is reviewed and amended as deemed necessary. Further maintenance and control parameters of the processes at Ellesmere Port WwTW are kept within the site "Odour Control Unit" SOP as part of the sites Quality Works System. Best endeavours will be used to maintain suitable critical spares and consumables as indicated below

Odour abatement kit – critical spares and consumables

Table 5: critical spares and consumables

Equipment	Re-order level	Time remaining at re-order	Responsibility

Odour control units are currently not operational. This is being addressed in AMP5 project

MONITORING

1.8 Site Supervisory, Control, and Data Acquisition (SCADA) system

The site makes extensive use of SCADA technology, which allows plant operations personnel to monitor, control and record the status and performance of key equipment in the various plant areas. The system also provides alarms in the event of an equipment failure.

Levels of chemical stored on site

A review of the information held on the SCADA system can be used in identifying/preventing potential odour nuisance/pollution occurring. Chemicals have a designated storage area that is bunded, covered and enclosed and locked with access to key site personnel

1.9 Monitoring site hydrogen sulphide emissions

Hydrogen sulphide (H2S) is the most commonly monitored odour component, and is often used as a surrogate or indicator of “odour” because it is almost always present under septic conditions.

For the purpose of monitoring site odour, as opposed to those installed for Health and Safety purposes H2S analysers are installed at key locations within the plant.

These are:

- **Sludge Treatment Area OCU outlets – measures the off gas H2S concentration and will provide an indication of OCU performance**

Under normal operation it is expected that The H2S concentrations recorded by these analysers should always remain below the maximum/peak design levels. Should they record higher concentrations, the cause of the higher concentrations should be promptly investigated to ensure that an odour nuisance is not caused. Likewise extended periods of values being above design average conditions (excluding seasonal effects) should also be investigated to identify if an operational issue or plant failure has led to an increase in sulphide emissions.

During service and maintenance of the online H2S monitors, Ellesmere Port WwTW has use of a hand held Mobile H2S monitor that can be used to cover any downtime experienced.

Monitoring Odour Control Critical Operating parameters

Table 6 Summary of routine odour control monitoring activities and frequencies under normal operation (Currently not operational)

Site	Equipment / Activity	Daily[$]	Week	Month	Quarter	6 Month	Annual	Greater	Expected Range	Comment
Ellesmere Port	**Unit 1 – Biofilter /Bioscrubber (Thickened & Digested Sludge)**									
	Liquid drain quality		✓							Visual observation of drain
	Irrigation system functional	✓								Basic functionality check
	Drain pH		✓						5 - 9	May be extended if pH remains stable
	Visual inspection of extraction system	✓								Site “walk-around” reporting anything “unusual”
	Test bark for % ds content						✓		>40 %	
	Replace media							✓		Manufacturers recommendations
	Unit 2 – Biofilter/Bioscrubber (Unthickened Sludge, strain press)									
	Liquid drain quality		✓							Visual observation of drain
	Irrigation system functional	✓								Basic functionality check
	Drain pH		✓						5 - 9	May be extended if pH remains stable
	Visual inspection of extraction system	✓								Site “walk-around” reporting anything “unusual”
	Replace media							✓		Manufacturers recommendations
	Unit 3 – Biofilter (TAD)									
	Liquid drain quality		✓							Visual observation of drain
	Irrigation system functional	✓								Basic functionality check
	Drain pH		✓						5 - 9	May be extended if pH remains stable
	Visual inspection of extraction system	✓								Site “walk-around” reporting anything “unusual”
	Test bark for % ds content						✓		>40 %	
	Unit 4 – Bioscrubber (Centrifuge)									
	Visual inspection of extraction system	✓								Site “walk-around” reporting anything “unusual”

Replace media		✓	Manufacturers recommendations
Unit 5 – Biofilter (Essar UK)			
Visual inspection of extraction system	✓		Site “walk-around” reporting anything “unusual”
Replace media		✓	Manufacturers recommendations

Alarms	**Alarm Set Point**	**Response Time**	**Impact on OCU**
No alarms, local or remote configured on any of the sites units	NA	NA	Daily observations only (Mon – Fri)

Notes

Unit No 1 OCU Has been emptied of bark to use for removal of odourous compounds so as to not infringe on PEAZ regulations. One side of the Biofilter roof has imploded. The activated carbon in the scrubber will have been spent so no part of the OCU is at present functional.

Unit No 2 OCU Has been out of service due to no replacement of the media

Unit No 3 OCU has been deemed not fit for purpose and is at present not in service

Unit No 4 OCU has imploded and the carbon removed to not infringe on PEAZ regulations

Unit No 5 OCU has been deemed not fit for purpose and is at present not in service

It is anticipated that all the OCU's will be replaced in AMP 6

ODOUR MONITORING AND COMPLAINT INVESTIGATION PROCEDURES

1.10 Odour status investigation (sniff testing)

Ellesmere Port staff priority will be to deal with the potential ongoing performance of the relevant OCU and bring it back to efficient odour reduction. When resources' allow, staff will then complete an odour mapping exercise, as per site specific instructions, to determine whether or not Ellesmere Port is complying with the Sites permit in the event that site sludge OCUs reach the outlet hydrogen concentrations stated below:

Sludge Area OCUs – >90 ppb for a continuous period greater than 60mins

Ellesmere Port staff will investigate the OCU, to determine the remaining treatment capacity within the bed, to ensure that the OCU media is replaced prior to becoming completely exhausted.

As part of the required response to an odour complaint Ellesmere Port staff will carry out an odour investigation using the template below, along with site specific information such as performance of the odour control unit, the containment of any potential odours in terms of closed doors, appropriate fans operating, cake wagons located inside building, spills etc. (Odour complaints report form)

If the Production Manager deems it appropriate he will liaise with the local community via the local forum and council meetings and request a representative number of the community complete the details requested in an Odour diary.

This approach taken by United Utilities can be very valuable with regard to collating useful data based on staff proactively odour monitoring around the Sites receptors and neighbourhood. Positive information is also collated due to staff complaint investigations and engaging with the community in terms of their assistance to fill in odour diaries.

The site uses these reactive assessments to build up a picture of the impact the odour has on the surrounding environment over time.

Staff normally exposed to the odours may not be able to detect or reasonably judge the intensity of odours off-site. Whenever possible Ellesmere Port uses non site based staff (i.e. network staff) and also the local neighbours and receptors in terms of Odour diaries.

The location where staff carries out the required monitoring will depend on whether they are responding to a complaint, wind direction, or whether the staff are proactively checking the sites state of compliance as a result of the above trigger levels.

The assessment may involve staff walking along an agreed route that the site has determined takes in the nearest or most common receptors. Another option is to choose specific fixed points as opposed to a route this enables staff to evaluate the changing situation over several weeks or months.
Staff record and report any external activities that could be either be the source of the odour, or contribute to the odour.

See Odour complaint report form in Appendix A

STAFF TRAINING

Competence assessments are carried out as part of the UU appointments procedure and all staff receives bi-annual performance reviews. Process Controllers receive externally accredited training to gain competence on treatment process units. In addition all staff receives general training in the maintenance and operation of the OCUs and any additional training as identified through personal development plans.

Odour complaint training that includes monitoring, investigating and reporting of odour issues is also provided to all staff. This training details the legislative background to odour pollution including the relevant H4 and DEFRA guidance. The role and importance of the Sites odour management plan is covered in briefing and training that all staff receives.

OMP REVIEW AND UPDATE

The OMP is to be reviewed every year or sooner if any of the following occur:

- There is an increase in public interest e.g. Local Authority /EA requests an update or a local action group is set up and/or requests an update
- Regulations or guidelines are updated
- If the internal audit dictates an update

If there are significant changes on site e.g. due to capital spend

This update is to be led by the Wastewater Operations Technical Team in conjunction with WwTW operations staff.

Production Manager Sign-off:	Date:
Process Controller sign-off:	Date:
Catchment Manager sign-off	Date:

APPENDIX A

Odour Compliant Form Pro-forma

Odour Report Form

Odour Diary Pro-forma

Odour Complaint Report Form			
Time and date of complaint:	Name and address of complainant:		
Telephone number of complainant:			
Date of odour:			
Time of odour:			
Location of odour, if not at above address:			
Weather conditions (i.e., dry, rain, fog, snow):			
Temperature (very warm, warm, mild, cold or degrees if known):			
Wind strength (none, light, steady, strong, gusting):			
Wind direction (e.g. from NE):			
Complainant's description of odour: • **What does it smell like?**			
• **Intensity (see below):**		•	
• **Duration (time):**		•	
• **Constant or intermittent in this period:**		•	
• **Does the complainant have any other comments about the odour?**		•	
Are there any other complaints relating to the installation, or to that location? (either previously or relating to the same exposure):			
Any other relevant information:			
Do you accept that odour likely to be from your activities?			
What was happening on site at the time the odour occurred?			
Operating conditions at time the odour occurred (e.g. flow rate, pressure at inlet and pressure at outlet):			
Actions taken:			
Form completed by:	Date	Signed	

Intensity (Detect ability

1 No detectable odour
2 Faint odour (barely detectable, need to stand still and inhale facing into the wind)
3 Moderate odour (odour easily detected while walking & breathing normally)
4 Strong odour
5 Very strong odour (possibly causing nausea depending on the type of odour)

Odour Diary	Sheet No
Name: Telephone Number:	Address:

Date of odour:							
Time of odour:							
Location of odour, if not at above address:							
Weather conditions (dry, rain, fog, snow etc.):							
Temperature (very warm, warm, mild, cold or degrees if known):							
Wind strength (none, light, steady, strong, gusting):							
Wind direction (e.g. from NE):							
What does it smell like? How unpleasant is it? Do you consider this smell offensive?							
Intensity – How strong was it? (see below 1-5):							
How long did go on for? (time):							
Was it constant or intermittent in this period:							

What do believe the source/cause to be?

Any actions taken or other comments:							

APPENDIX B

Ellesmere Port WwTW

Odour Risk Assessment

Ellesmere Port WwTW Odour Risk Assessment Odour Management Plan

Category 1 - Odour Risk Assessment

GUIDANCE:

- Complete the general site information below
- Answer all the questions on the following worksheets within the yellow shaded boxes. Please answer using one of the options given in the brackets. If the question is not applicable put N/A.
- This will generate an odour risk given below and next steps to be taken

General Site Information

SITE NAME: Ellesmere Port WwTW

Domestic Population	66000
Population equivalent	130000
Consented flow (FTFT, FTW etc.)	54 Ml/d FTFT 19.2 Ml/s Essar UK
Average daily flow	29 Ml/d
Design biological loading rates	0.15 – 0.18
Actual biological loading rates	0.3

19.5

CUSTOMER INVOLEMENT SIGNIFICANT. CARRY OUT STAGE 2

SEPTICITY RISK ASSESSMENT

Ellesmere Port WwTW

SEWAGE

Q1.How does crude sewage arrive at works (Gravity/Pumped/Both?)	
Both	0.5
Q2.High proportion of TE or imported wastes (Y/N)?	
Y	
Q3.If yes to Q2 is there septicity control (Y/N)?	
N	
	0.5

SLUDGE

Q1. Desludging of PSTs - (Auto or manual)?	
Manual	0.5
Q2. Principle sludge origin - (Primary or cosettled)?	
Primary/SAS/Humus	
Q3.Tankered imports to works (Y/N)?	
y	1
	1.5

RISK OF EMISSIONS FROM NORMAL OPERATION

Ellesmere Port WwTW

SEWAGE

Q1.Is secondary treatment (under or over loaded)?	
Under	
Q2.Hydraulic loading (under or over loaded)?	
OK	
Q3.Are key processes covered and air treated (Y/N)?	
N	1
Q4.If yes, are performance tests done on the OCU	
N/a	
Q5.Is the OCU in working order (Y/N)?	
N	
Q6.Is the WwTW a coastal site (Y/N)?	
N	
Q7.If yes to the above question, is ingress an issue	
N/A	
Q8.Are there areas of high turbulence on site (Y/N)? I.e. drops of greater then 20cm are considered to increase risk.	
Y	1
	2

SLUDGE

Q1. Are sludge processes covered (Y/N/Part)?	
Part	
Q2.Are sludge processes odour controlled (Y/N)?	
N	
Q3.If yes, are performance tests done on the OCU (Y/N)?	
N/A	
Q4.Is the OCU in working order (Y/N)?	
N	
Q5.Sludge processes air mixed or evidence of other sources of excessive turbulence (Y/N)?	
Y	1
Q6.Is tanker unloading/loading odour controlled (Y/N)?	
N	1
	2

RISK OF INTERMITTENT EMISSIONS

Ellesmere Port WwTW

SEWAGE

Q1.Are PST sludge blankets regularly over 0.5m (Y/N)?	
Y	1
Q2.Are storm tanks emptied in a timely effective manner (Y/N)?	
Y	
Q3.Are there any outstanding maintenance issues that may have an impact on odour production (Y/N)?	
Y	
	1

SLUDGE

Q1.Do maintenance activities require opening of enclosed processes (Y/N)?	
Y	1
Q2.Are there any outstanding maintenance issues that may have an impact on odour production (Y/N)?	
Y	
	1

PERCEPTION OF ODOUR RISK

Ellesmere Port WwTW

Q1.Media interest (Y/N)?	
N	2
Q2.Political interest (Y/N)?	
N	2
Q3.Local action group (Y/N)?	
N	2
Q4.Is there encroachment from housing or commercial development (Y/N)?	
Y	1
Q5.Number of complaints in last 12 months	
0	
	7

Category 2 Odour Risk Proforma - Ellesmere Port WwTW

Category 2 Risk reduction assessment - Inlet works

	Y/N	Evidence/records/Comments	Action required
Is septicity an issue?	N		
Is there evidence of screenings or scum build up?	N		Visual checks to be carried out on a routine basis.
Are grit and screenings removed in a timely manner?	Y	The screening skip is removed in a timely manner, service is for next working day removal.	No action
Is the inlet channel/pipework designed to minimise turbulence?	Y		
Is the sludge return spread over the day?	N	Storm flows are returned to the inlet. This occurs intermittently during low FTFT flows. Centrate is returned gradually over the course of a day.	
Are imported sludge's taken direct to holding tanks?	Y	Diagram of sludge routes held on site	

Category 2 Risk reduction assessment - Primary Tanks

Is septicity an issue?	Y		
Are sludge levels over 0.5m (sludge depth measured at sidewall)?	Y	0.5m is the trigger level for action. See site QA	Tank dips are taken every working day to monitor sludge depths
Are distribution chamber and outlet weirs designed to minimise turbulence?	N	Medium risk from overflow weirs	The release of odour from this point is to be monitored. If a problem is identified appropriate actions will be taken.
Is there evidence of scum build up on the PST surface?	Y	Inefficient scum removal system leading To constant build up	Refurbishment of the Concentrators is ongoing

Category 2 Risk reduction assessment - Secondary Treatment

Is the plant overloaded?	N		No action
Activated Sludge			
Are there any areas prone to anaerobic conditions?	N		No action
Are aerosols an issue?	Y	A lot of the netting has come adrift	Place on problem register
Filter Plant			
Is there evidence of ponding or dry areas on filters?	N		
Are aeration vents clear?	N		
Is the media in good condition?	Y		

Category 2 Risk reduction assessment - Storm Water

Are tanks emptied within 72 hours of the end of a storm event?	Y	This is flow dependent	No action
Are tanks desludged and cleaned as soon as practicable after emptying?	N	New jet wash system insufficient	
Category 2 Risk reduction assessment - Sludge handling			
Are imported sludge's transferred to areas that are odour controlled	N	OCUs out of service	Replacement of OCUs in next AMP period
Are sludge's processed as soon as possible after generation	Y		No action
Is unstabilised sludge storage and processing covered and odour controlled	N	OCUs out of service	Monitoring on-going to ascertain if this is an area of risk.
Is the sludge treated with lime	N/A		
If sludge is dosed with lime is it controlled to prevent ammonia release	N/A		
Is stored sludge mixed with slow speed mixer	N	Air mixed	No action
Is the sludge kept aerobic	Y	Air mixing keeps sludge aerobic.	No action

Category 2 Risk reduction assessment - Anaerobic Digestion

Are condensation traps drained regularly	Y	Automatic	No action
Are measures in place to keep the digester pressure balanced	Y		No action
Is the standby flare checked to ensure it flares	Y	Records in site diary	No action
Is there excessive turbulence of sludge post digestion	N		No action
are secondary digesters uncovered	N/A	No odour issues as sludge is digested.	No action
Are secondary digesters a source of odour	N/A		No action

Category 2 Risk reduction assessment - Odour Control Units

Can inlet and outlet air samples be taken	N		Treatment Manager and Process Controller to review the operation.
Are odour removal rates calculated	N		Treatment Manager and Process Controller to review the operation.
Are H2S removal rates greater than 95%	N/A		
Have site staff been trained in the use and maintenance of odour control equipment	N	New staff since last running date on OCUs	Train when new OCUs operational
Is the odour control equipment routinely maintained	N	Out of service	Review maintenance activities when new OCUs operational
In an emergency can maintenance/supplier respond in 24hrs	Y		No action
If chemicals/reagents are required by OCU, are sufficient supplies on site or can supplier respond	N/A		No action