



26 March 2015

NORTHWOOD & WEPA LT

**Bridgend Paper Mills
Llangynwyd
Maesteg
Mid Glamorgan
CF34 9RS**

**Victoria Seller
NRW Permitting Service (Cardiff)
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP**

**Tel: 01656 684650
Mob: 07779 116823**

Dear Victoria

With reference to your letter of the 1st December 2014, please find enclosed our permit review document as required by yourselves under Regulation 60(1) of the Environmental Permitting (England and Wales) Regulations 2010 (as amended).

I have enclosed the permit review together with associated appendices as hard copy but this is also available electronically should you require it.

Please contact Steve Barwick, the E, H & S Manager on the above details should you require any further information or clarification.

**Yours sincerely
On behalf of Northwood & Wepa Ltd**

**Bob McGraa
Mill Manager**

A handwritten signature in black ink, appearing to read 'Bob McGraa', written over a large, faint, circular outline.

PERMIT REVIEW DOCUMENT

REGULATION 60 NOTICE

Permit reference: EPR/EP3738NG

Operator: Northwood & Wepa Ltd

Facility: Bridgend Paper Mill, Llangynwyd, Maesteg, Mid-Glamorgan CF34 9RS

This document forms the response from Northwood & Wepa Ltd located at Bridgend Paper Mills to the letter received from NRW on the 1st December 2014. The letter contained an information notice issued under Regulation 60(1) of the Environmental Permitting (England & Wales) Regulations 2010 as amended and it related to the above permit.

Under the notice, the NRW has requested a review of the EPR Permit against the BAT conclusions contained in the Commission Implementing Decision (The Production of Pulp, Paper and Board BAT conclusions) published in Sep 2014.

This document and its appendices were written following the review of the permit by the undersigned.

Steve Barwick (E, H&S Manager)



Richard Mordecai (Senior Process Engineer)



John Barr (Mill Chemist)



Hiram Mullan (Energy Manager)



It was completed on March 25th 2015 and delivered to the NRW on March 27th 2015 as requested.

General BATC	Environmental Management Systems
BATC	BAT 1
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Bridgend Mill has had an Environmental Management System in place for many years and since 2008 it has been certificated by BSI under the ISO 14001 standard. The current certificate (EMS 602885) is attached as BAT 1 Appendix 1 and the latest audit from BSI is attached as BAT 1 Appendix 2.

General BATC	Materials management & good housekeeping Chemical management
BATC	BAT 2
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Attached in BAT 2 Appendix 1 is a spread sheet which shows our chemical management process in summary. This is supported via further appendices which illustrate that our process, which is audited under ISO 14001 is best practice and complies with BAT 2.

General BATC	Water and waste water management. Water usage
BATC	BAT 5
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

BAT 5 AEPL is 3.5 – 20 m³/t for a Non-integrated paper mill. Our water usage over the last 14 months averages 14.7 m³/t. Data for this is attached as BAT 5 Appendix 1.

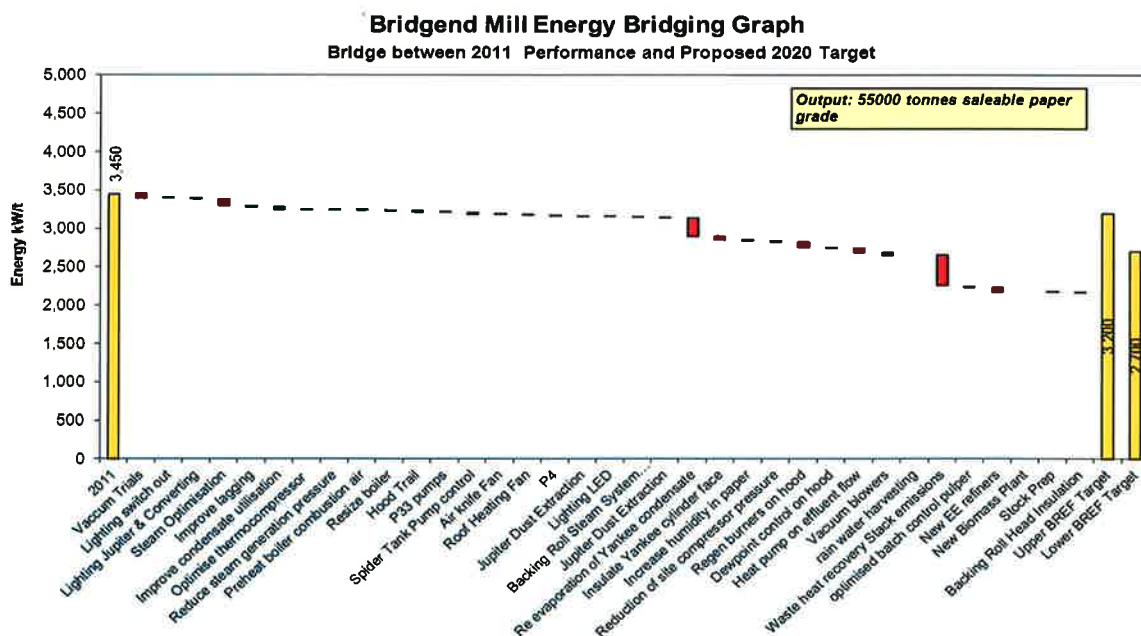
General BATC	Energy consumption and efficiency
BATC	BAT 6
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

General BATC	Energy consumption and efficiency
BATC	BAT 53
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Northwood and WEPA take the generation and conservation of energy seriously; it is one of the major facets in our armoury to improve our standing in the market place. Due to the size of the business we will fall under the requirements of ESOS and as such have made inroads into the facility becoming ISO 50001 accredited. The initial step of this process was the completion of an ISO 50001 Lead Auditors course for the Energy Coordinator, thus allowing for the building blocks to be put into place for the standards roll out.

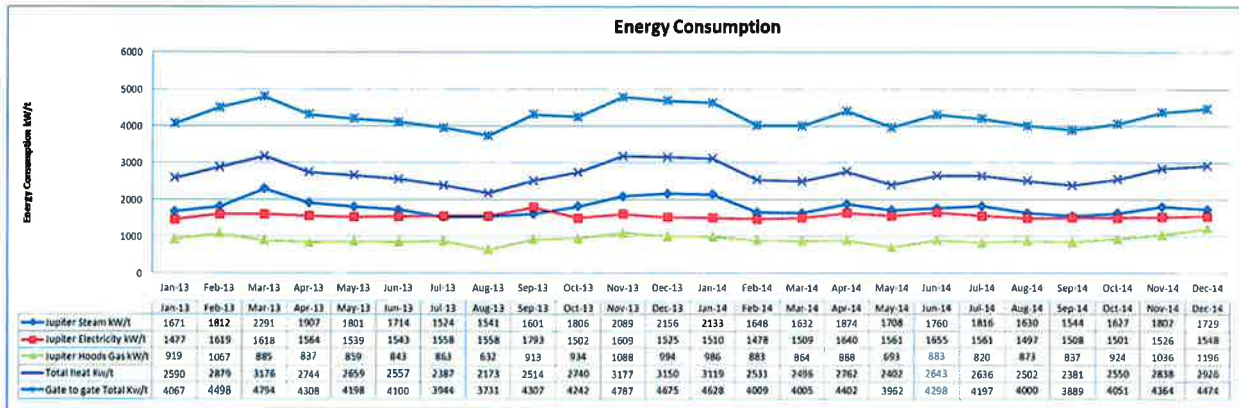
The company has also undertaken several external audits from business consultants looking into areas of energy efficiency. This has yielded several undiscovered potentials that will be added to the existing energy reduction opportunities list.

This list is used as a decision making tool on the potential investment opportunities available to the company. See Fig below



We currently run a CHP plant which generates approximately 40% of our electrical needs and 100% of our steam requirements.

Energy in its differing forms is one of the businesses major KPI's and as such is tracked closely and reported on monthly bases through the variance meeting, attended by site senior management. See fig below



General BATC	Emissions of odour
BATC	BAT 7
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

No substantiated complaints of odour have been received by the mill in the last 10 years. Odour testing is carried out at routine intervals within the boundary but again no odour is detected. The Olfactory Observation Procedure is attached for reference as BAT 7 Appendix 1. All elements of the BAT that are applicable are complied with.

General BATC	Monitoring of key process parameters and of emissions to water and air. Emissions to water.
BATC	BAT 8
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

BAT 8 Section II: all requirements under this section that are applicable to the site are currently met by the mills test regime.

This is detailed below as follows:

Water flow	Continuous	Bat 8 Appendix 1
Temperature	Continuous	Bat 8 Appendix 2
PH	Continuous	Bat 8 Appendix 3
P&N content in biomass	Weekly	Bat 8 Appendix 4/5
Sludge volume index	Weekly	Bat 8 Appendix 6
Ortho phosphate in effluent	Weekly	Bat 8 Appendix 7
Microscopy checks of biomass	Weekly	Kept in site log
Ammonia	Daily	Bat 8 Appendix 8

We are therefore equal to or better than the BAT in this aspect.

General BATC	Monitoring of key process parameters and of emissions to water and air. Monitoring.
BATC	BAT 10
Applicability	Yes
Compliant	No
Compliance by 2018	Yes

Currently all site monitoring complies with BAT 10 parameters with the exception of the COD monitoring which is carried out monthly.

Listed below are the current test regimes carried out at the site:

COD	Monthly	BAT 10 Appendix 1
BOD	Continuously by automatic monitoring and manually once a week	BAT 10 Appendix 2
TSS	Continuously by automatic monitoring	BAT 10 Appendix 3
Total Nitrogen	Weekly	BAT 10 Appendix 4
Total Phosphorus	Weekly	BAT 10 Appendix 5
EDTA, DTPA	N/A	

To comply with this requirement a new COD meter system would need to be installed but capital has not been applied for yet. It is planned that this will form part of the 2016 capital plan with installation in 2017.

AOX monitoring is currently carried out monthly even though there is not currently a discharge limit. However under Table 20 the AOX limit for the site is set at 0.05kg/t and our current discharges are well below this. Data from 2007 to the current date is included as BAT 10 Appendix 6.

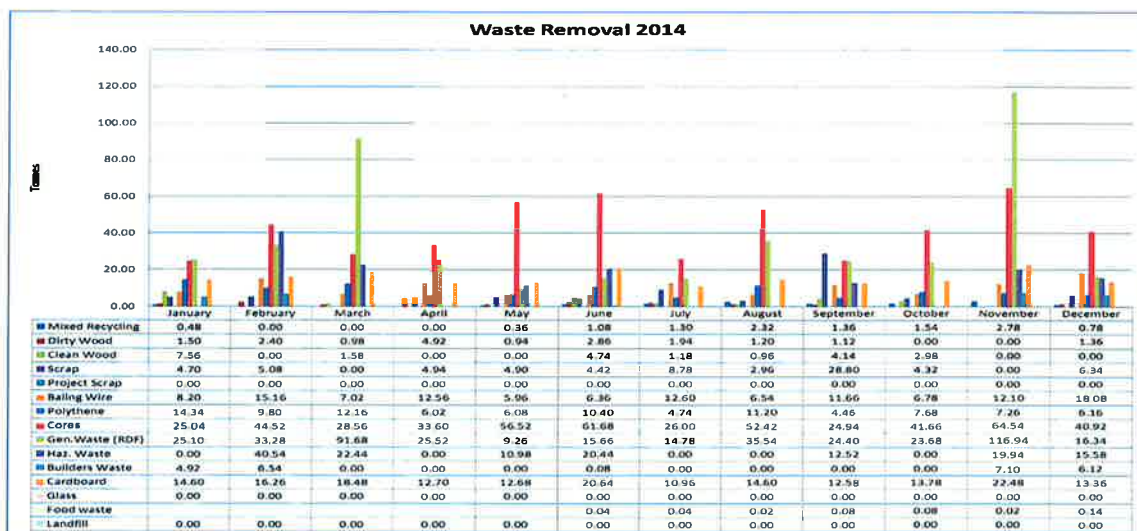
General BATC	Monitoring of key process parameters and of emissions to water and air. Waste management.
BATC	BAT 12
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Currently all waste management is handled by an outside contractor (SiteServe) managed by a team of N&W employees who are the E,H&S manager, the Mill Chemist and the senior Process Technician.

Waste streams are identified in line with the waste hierarchy and are illustrated below in the list:

1. Paper sludge – land spread
2. General Waste – Treated (Recyclables segregated from general waste) or Recovered (Refuse Derived Fuel Plant)
3. Metals – Recycled
4. Oils – Recovered
5. Cardboard and Polythene – Recycled after separation by waste contractor.
6. Building rubble – Recycled
7. Polythene – Recycled
8. Wood –Recycled
9. Non-standard waste, which includes both hazardous and non-hazardous and have varying disposal routes. These wastes typically include:

Batteries
Hazardous wastes
Paints and solvents
Process and other chemicals
PC monitors (W.E.E Waste)
Fluorescent tubes etc. etc.



Virgin pulp is dewired automatically by a dewiring machine and broke bales are not wired. Bought in waste is dewired manually before point of entry into the sec-fibre pulper. All wire removed in this process, is collected by our waste collection contractors and transported off site for recycling. There is no cross contamination with fibre or other rejects in this process.

Fibre recovery is achieved using the screw press installation following treatment in the primary effluent clariflocs. This removes all fibre from the effluent waters and transfers it for onward movement to land spread. Clarity of outgoing effluent waters is monitored by our laboratory technician on a daily basis measuring turbidity and BOD. COD is measured monthly. Instruments that are currently installed measure in addition, Flow, temperature, PH, suspended solids and BOD. We manually test for ammonia on a daily basis.

Improvements are planned over the next 2 years for the segregation of waste streams from the converting plant. Small balers will be installed next to each converting line and these will be bespoke to polythene, paper and cardboard. This will improve segregation of these waste streams and allow for their disposal in compressed bales rather than in loose waste in skips. This will reduce transport costs significantly as the bales will require less transport trips to remove a given quantity. This will improve the carbon footprint of the waste process, reduce road haulage and the consequent effect on outlying villages as well as improve the quality of the waste produced.

General BATC	Emissions to water. Nitrogen and phosphorus emissions
BATC	BAT 13
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Both Nitrogen and Phosphorus are monitored weekly and both are within the discharge consents. All additives are subject to our New Substance Review where the Nitrogen and Phosphorus content is reviewed prior to use.

Nutrient use is monitored weekly and balanced according to the needs of the plant.

General BATC	Emissions to water Primary and secondary treatment
BATC	BAT 14
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

All effluent from the mill is treated in an effluent plant that involves Primary (physico-chemical) treatment and also Secondary (biological) treatment in line with BAT 14.

A schematic of the effluent plant at Bridgend is attached as BAT 14 Appendix 1.

General BATC	Emissions to water Tertiary treatment
BATC	BAT 15
Applicability	N/A
Compliant	N/A
Compliance by 2018	N/A

Tertiary treatment is not considered necessary due to the low emissions of organic substances, nitrogen and phosphorus.

General BATC	Emissions to water Correct operation of the treatment plant.
BATC	BAT 16
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

BAT 16 Appendix 1, references the document "EPR 04 ETP Manual". This details the operating instructions used to correctly operate the treatment plant.

General BATC	Emissions of noise
BATC	BAT 17
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

The last noise survey carried out was in 2011 and that is attached as BAT 17 Appendix 1. The next environmental noise survey will be carried out in May 2015. There has been one complaint during this period which was identified as a vent fan bearing. This was changed for a new device and the complaint resolved. All elements of the BAT have been complied with.

General BATC	Decommissioning
BATC	BAT 18
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

With reference to the original IPPC application BJ5805, decommissioning in the future, either part or in full, will take full account of the techniques stated in BAT 18 and incorporate them in any decommissioning plan.

General BATC	Waste water and emissions to water. Design of water systems
BATC	BAT 47
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

The paper machine was first commissioned in 1970. The design of the stock approach and white water system dates from this time although the machine has been heavily modified and there have been many detail changes made to the systems on the machine.

BAT 47a would be incorporated in the event of a rebuild of any of the tanks or chest although this is not envisaged within the next 3 to 5 years at least.

BAT 47b was considered as part of a project carried out over a period of 3 years. The goal was to optimise white water use and reduce as far as possible the reliance on abstracted water and town's water. This project was successful in reducing the water per ton consumption from approx. 45m³/ton to approx 13 m³/ton. This is detailed in BAT 47b Appendix 1 which shows water consumption from 2009 to present day.

The then owners of the company Georgia-Pacific presented an Environmental Award for this achievement to the environment team at the mill. This was considered best practice in the whole of the Georgia-Pacific organisation which at the time was extensive and included 74 mills worldwide.

General BATC	Waste water and emissions to water Data tables
BATC	BAT 50
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes
Derogation Likely	No

Data for Table 20 is attached as the following

COD	BAT 50 Appendix 1
TSS	BAT 50 Appendix 2
Total Nitrogen	BAT 50 Appendix 3
Total Phosphorus	BAT 50 Appendix 4
AOX	BAT 50 Appendix 5

General BATC	Waste generation. Recovery of waste materials
BATC	BAT 52
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

Compliant - reference BAT 12.

General BATC	Energy consumption & Efficiency
BATC	BAT 53
Applicability	Yes
Compliant	Yes
Compliance by 2018	Yes

This BAT is covered by the submission for BAT 6.

List of BAT conclusions that are not applicable

BAT 3	No chelating agents used
BAT 4	No wood storage
BAT 9	Chemical pulping only
BAT 11	Chemical pulping only
BAT 19-39	Chemical pulping only
BAT 40-41	Mechanical pulping
BAT 42-46	Process paper for recycling
BAT 48	Speciality mills only
BAT 49&51	Coating mills



Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2004

This is to certify that:

Northwood & Wepa Ltd
Bridgend Paper Mills
Llandynwyd
Bridgend
CF34 9RS
United Kingdom

Holds Certificate Number:

EMS 602885

and operates an Environmental Management System which complies with the requirements of ISO 14001:2004 for the following scope:

The manufacture and conversion of tissue paper in a range of consumer products, manufactured to in-house and/or customer specification and the storage and distribution of manufactured products.

For and on behalf of BSI:

Gary Fenton, Global Assurance Director

Originally registered: 13/08/2013

Latest Issue: 03/02/2014

Expiry Date: 19/02/2017



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Assessment Report.

Northwood & Wepa Ltd

Introduction.

This report has been compiled by Sali Davies and relates to the assessment activity detailed below:

Visit ref/Type/Date/Duration	Certificate/Standard	Site address
8062545 Continuing Assessment (Surveillance) 08/10/2014 2.5 day(s) No. Employees: 231	EMS 602885 BS EN ISO 14001:2004	Northwood & Wepa Ltd Bridgend Paper Mills Llangynwyd Bridgend CF34 9RS United Kingdom

The objective of the assessment was to conduct a surveillance assessment and look for positive evidence to ensure that elements of the scope of certification and the requirements of the management standard are effectively addressed by the organisation's management system and that the system is demonstrating the ability to support the achievement of statutory, regulatory and contractual requirements and the organisations specified objectives, as applicable with regard to the scope of the management standard, and to confirm the on-going achievement and applicability of the forward strategic plan and where applicable to identify potential areas for improvement of the management system.

The scope of the assessment is the documented management system with relation to the requirements of ISO 14001:2004 and the defined assessment plan provided in terms of locations and areas of the system and organisation to be assessed.

Management Summary.

Overall Conclusion

The objectives of this assessment have been achieved.

I would like to thank all the audit participants for their assistance and co-operation which enabled the audit to run smoothly and to schedule

Based on the objective evidence detailed within this report, the areas assessed during the course of the visit were generally found to be effective.

Corrective actions with respect to nonconformities raised at the last assessment have been reviewed and found to be effectively implemented.

A minor nonconformity requiring attention was identified. This, along with other findings, is contained within subsequent sections of the report.

A minor nonconformity relates to a single identified lapse, which in itself would not indicate a breakdown in the management system's ability to effectively control the processes for which it was intended. It is necessary to investigate the underlying cause of any issue to determine corrective action. The proposed action will be reviewed for effective implementation at the next assessment.

Areas Assessed & Findings.

General :

Overview

The organisation has installed a new document management system and a new electronic management system for the maintenance system. All the contaminated land remediation work has been completed.

Incidents/ Breaches/ Complaints

The organisation has had one breach associated with their mercury limits, this was due to high mercury levels in the river water when extracted. The organisation notified the NRW but no further actions have been requested by the NRW. There have been no other incidents, breaches or complaints.

Communication with Regulator

The organisation has had two recent visits from different NRW officers, on their permit officer and one from the forestry side of NRW looking at potentially taking some of their pulp waste for a new wood they want to plant locally. The visit from their permit officer covered a number of issues including the maintenance of the tanks in site in terms of integrity check, the accident management plan and operating techniques currently used being different to those identified in the original application.

The organisation has received a letter on the 8/8/14 stating that the NRW do not intend to take the fish kill incident any further.

Scope

The scope was seen to be appropriate for the nature of the activities seen during the visit.

Risk Level

As part of BSI's internal process, an environmental risk rating is assigned to each client based on the industry sector, the level of regulation within the industry and the environmental complexity of the business. This is not related to the perceived risk of an incident occurring in any individual company.

From a review of the business activities, the risk rating is determined to be Medium.

As a result of this risk rating it is recommended that a specialist visits at least once during a cycle.

There have been no changes in the number of personnel on the site since the last visit as such the number of days is still correct in accordance the scheme.

The T code of T38E is seen to be suitable for the activities seen during the visit.

Emergency preparedness and response :

The Spill Control Procedure - EPR11 - 16/09/14 was viewed as well as Control of Run Off Waters from a major fire - EPR24 - 12/11/12. The procedures were detailed and include flowchart to facilitate understanding.

There have been some spillages over the last 6 months which have been captured within the EAM system. The corrective actions taken were documented within the system and are used as testing of the spillage procedure.

Observations.

Type	Area/Process	Clause
Observations	Emergency preparedness and response	
Scope	EMS 602885	
Details:	It has been identified that there is a need to carry out refresher training for emergency spillage response, which is due to be completed in 2015. This will be followed up during the next assessment and may be raised as a minor non-conformity if progress has not been made.	

Type	Area/Process	Clause
Observations	Emergency preparedness and response	
Scope	EMS 602885	
Details:	A glue spillage kit viewed within the converting area was half empty and it was not clear what the kit was expected to contain. Consideration may be given to setting up an inventory to verify what should be contained within the kit.	

Type	Area/Process	Clause
Observations	Emergency preparedness and response	
Scope	EMS 602885	
Details:	Monthly checks are carried out on spill kits to ensure that they continue to be replenish on a regular basis. The checks for July, August and September 14 were viewed and were found not to be fully completed and therefore could not fully demonstrate that all kits had been checked.	

Internal audits, management review, complaints, objectives and targets, continuous improvement :

The internal audit process has changed slightly since the last assessment and a single large audit has been carried out. This was found to be very detailed and generally covered housekeeping on the site. A number of corrective action requirements were identified during this audit and have been closed.

The management review is now to be carried out on an annual basis and is due to be carried out on 20/11/14. This will be looked at during the next assessment.

The objectives for 2014 have been reviewed and has not changed since the last assessment. These include:

OT1/14 - Energy project - a project has been carried out by students to identify areas for improvement and savings on the site. The conclusions of the project is due to be presented over the coming weeks.

OT2/14 - Environmental awareness training - due to the large amount of change on site currently this has stagnated - progress will be followed up during the next assessment.

OT3/14 - Waste management area - improvements are planned to the yard drainage - quotes are currently being obtained.

OT4/14 - 90% waste recycling - this target was not consistently met during 2013 due to impurities within the secondary fibre plant which caused an increase in waste going to landfill. Improvements have been made.

OT5/14 - Installation of a converting waste baler - the spend has been approved.

A new process of continuous improvement has been implemented. 4/5 project are chosen every 10 weeks and a team are put together to identify and implement improvements. Reviews are carried out on the 2 weeks, 6 weeks and on completion. The project viewed during the assessment was the QC documentation as well as the implementation of the new documentation system Roxtra.

The trial of the new Roxtra system has been completed and it is planned to be rolled out over the coming months.

Site Tour :

During the site tour the following areas were visited:

Converting process

Including the chopping and packing area

Dust compacting area

In general the level of house keeping in the areas were seen to be good. Spill kits were strategically located. The organisations was seen to be segregating the majority of the waste with only one small general waste seen in the production area. The organisation is now compacting dust into bricks for line 17 and the lighting in the areas are slowly being replaced with new more efficient lighting systems.

The organisation is currently reviewing with a customer the possibility of reducing the length the rolls.

Maintenance is undertaken on a planned preventative maintenance programme, at the time of the visit the kitchen roll line was down for maintenance.

Observations.

Type	Area/Process	Clause
Observations	Site Tour	
Scope	EMS 602885	
Details:	It was noted that there had been a small kemiclean spill next to the IBC in converting hall 3, consideration could be given to using a small bucket or drip tray to reduce the amount of materials having to be used to clean the spill up. It was noted that there are 3 small waste containers next to the waste glue IBCs. Consideration could be given to putting a partial lid on the waste dust collection point which bricks are put into.	

Aspects and Impacts :

The organisation has been maintaining their aspects registers, during the visit this was seen in the the converting aspects register and the site wide register. As a minimum registers are reviewed on an annual basis. The registers are held on the PI process book system and are accessible to all the organisation. The Converting aspects register identified a few high/ significant aspects, namely dust emissions and emissions through their scrubber water. The organisation has captured the change in size of the core of some of their toilet rolls in the site wide register. There were no aspects seen during the site visit that were not captured within the register, this element of the system was seen to be effective.

Observations.

Type	Area/ Process	Clause
Observations	Aspects and Impacts	
Scope	EMS 602885	
Details:	Consideration could be given as to how products are captured within the aspects system. It was noted that the slow roll out of new lighting systems has not been captured within the aspects register.	

Legal and Other Requirements :

Identification of Legal and Other Requirements

The organisation uses Waterman's to keep them up to date with changes in legislation, on a monthly basis the organisation receives an update via email which is reviewed. In the background Watermans updates the organisations register including how it impacts the organisation. This was seen to be effective as the most recent legislation was seen from the sample taken during the visit.

Evaluation of Legal and Other Requirements

Watermans also undertake a bi annual compliance audit which was last done on the 21/11/13, the results of which are held on the online system embedded within the register. In addition to organisation gets a visit annually for a light touch compliance check and the findings reported in the legal register.

Specific legal compliance audits are also undertaken through the internal auditing programme.

The organisation has a waste management company on site permanently to manage their non hazardous waste, the waste is weighed on the way out and the transfer notes are signed by the security. Security were trained in the waste transfer process in April the training pack was seen during the visit. Transfer notes, weighbridge tickets are collated and reported back to the organisation on a monthly basis.

The organisation has a duty of care folder with copies of all the waste management sites permits and carrier broker licences. In addition the land spreading sites are kept electronically and recorded on a spreadsheet.

The organisation is currently in discussions with the council regarding the possible installation of a bailer and compactor for their non hazardous waste.

The organisation is has put into their new document management system information about each of the waste streams and where they go. There is also a CIP programme to reduce the waste from the process.

F Gas

The organisation maintains an F Gas register listing all the air conditioning units that are on site, their quantity of gas and their cooling coefficient. The organisation uses a third party to undertake their servicing of the units, copies of the engineers qualifications and the company's fgas registration was seen during the visit.

The organisation had a level 3 inspection under the energy performance of building regulations on the 15/8/13.

Packaging

The organisation has changed packaging compliance scheme to Paperpak compliance scheme in May 2013. Quarter 2 submissions and receipt were seen during the visit for 545 tonnes. The organisation includes one 'other' material which is for glue..

Observations.

Type	Area/Process	Clause
Observations	Legal and Other Requirements	
Scope	EMS 602885	
Details:	It was noted that the quantities on the weigh bridge tickets were not being transferred onto the transfer notes. It was noted that the transfer note on the 1/8/14 had the final destination of the waste changed, it is unclear when this change was made and by who. Consideration could be given to documenting a packaging returns procedure. It was noted that some of the information has not transferred through on to the service reports properly.	

Top management Commitment :

The new Plant Manager kindly made himself available for the assessment and discussed the main objectives over the next few years. Objectives are established by the management team within the management reviews which are carried out on an annual basis. Progress is then reviewed on a weekly and monthly basis.

Communication to the workforce is carried out through 6 monthly "townhall" meetings. There are also return to work meetings and there is a plan to extend the current health and safety newsletter to include broader issues.

There has been a good example of communication with the public recently with the invitation to the local fisheries to come on site to see how the site is uses the water from the river and cleans it before placing back into the river. Good feedback was received from them and there are plans to communicate with them further in future.

There have been a number of improvements over recent years. One of their main customers, Sainsburys, have been working with them to make improvements including the reduction in the core size as well as reducing the micron on the packaging film.

The continuous improvement process was also discussed and one of the main areas of focus currently is energy usage. There is a CI team currently looking at improvements. The lagging of the yankee head is due to be carried out over the coming months which will ensure significant reduction in heat loss. Sustainability is another area of focus with improvements planned within the effluent plant and CHP plant. Reduction in raw materials and further improvements in waste handling and segregation will also be looked at over the coming 24 months.

There are plans to put further leading indicators in place which will ensure a proactive approach to ensuring environmental management. These will be followed up during the next assessment.

During the course of the visit logos were found to be used correctly.

Minor Nonconformities Raised at Last Assessment.

Ref	Area/Process	Clause
1043628N4	Warehousing	4.4.7
Scope	EMS 602885	
Details:	Spill kits had not been placed in the yard as identified within the aspects register.	
Requirements:	Emergency preparedness and response The organization shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them. The organization shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts. The organization shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations. The organization shall also periodically test such procedures where practicable.	
Objective Evidence:	The aspects register identified that spill kits should be provided within the yard area to be used in the event of a spillage from the HGV's. The map within procedure EPR11 Spillage control procedure issue 6 did not however identify this need and none were available during the site tour.	
Actions:	The spill kits have now been added to the yard area and the spill map has been updated to reflect these changes. This minor non-conformity has now been closed.	
Closed?:	Yes	

Minor Nonconformities Arising from this Assessment.

Ref	Area/Process	Clause
1109052N1	Legal and Other Requirements	4.5.4
Scope	EMS 602885	
Details:	There has been a minor lapse in meeting the requirements of the standard.	
Requirements:	Control of records The organization shall establish and maintain records as necessary to demonstrate conformity to the requirements of its environmental management system and of this International Standard, and the results achieved. The organization shall establish, implement and maintain a procedure(s) for the identification, storage, protection, retrieval, retention and disposal of records. Records shall be and remain legible, identifiable and traceable.	
Objective Evidence:	The organisation was able to demonstrate that the waste management companies that are being used are authorised to take the waste, but the duty of care checks on the carrier brokers were out of date.	

Assessment Participants.

On behalf of the organisation:

Name	Position
Richard Lewis	Enviromental Manager
Bob McGraa	Plant Manager
Sefano Lelli	Converting Supervisor

The assessment was conducted on behalf of BSI by:

Name	Position
Mary Archer	Technical Expert
Sali Davies	Team Leader

Continuing Assessment.

The programme of continuing assessment is detailed below.

Site Address	Certificate Reference/Visit Cycle	
Northwood & Wepa Ltd Bridgend Paper Mills Llangynwyd Bridgend CF34 9RS United Kingdom	EMS 602885	
	Visit interval:	6 months
	Visit duration:	2.5 Days
	Next re-certification:	01/10/2016

Re-certification by Strategic Review will be conducted on completion of the cycle, or sooner as required. The review will focus on the strengths and weaknesses of your Management System.

Certification Assessment Plan.

NORTHW-0047481455-001|EMS 602885

		Visit1	Visit2	Visit3	Visit4	Visit5	Visit6
Business area / Location	Date (mm/yy):	04/14	10/14	04/15	10/15	04/16	10/16
	Duration (days):	2.5	2.5	2.5	2.5	2.5	2.5
Scope and Policy		X		X		X	
Leadership and Commitment			X				X
Management System Support		X		X		X	
Planning and Resources			X		X		
Human Resource Management			X		X		
Control of Documents and Records				X		X	
Objectives / Performance Monitoring & Measurement		X	X	X	X	X	X
Management Review		X	X	X	X	X	X
Supply Chain				X			
Internal Audits			X		X		X
Actions / Non-Conformity / Incidents / Complaints		X	X	X	X	X	X
Aspects and impacts			X		X		X
Legal and Other Requirements			X		X		X
Improvement		X	X	X	X	X	X
Evaluation of compliance			X		X		X
Emergency preparedness and response			X		X		X
CHP				X			X
Converting Process			X		X		
Effluent and Influent Plant		X		X		X	
Engineering Workshops and Other Buildings				X			
Paper Making Process		X			X		X
Warehousing		X		X		X	
Technical expert			X		X		X
Strategic review							X

Next Visit Plan.

Visit objectives:

The objective of the assessment is to conduct a surveillance assessment and look for positive evidence to ensure the elements of the scope of certification and the requirements of the management standard are effectively addressed by the organisation's management system and that the system is demonstrating the ability to support the achievement of statutory, regulatory and contractual requirements and the organisations specified objectives, as applicable with regard to the scope of the management standard, and to confirm the on-going achievement and applicability of the forward strategic plan.

The scope of the assessment is the documented management system with relation to the requirements of ISO 14001:2004 and the defined assessment plan provided in terms of locations and areas of the system and organisation to be assessed.

Date	Assessor	Time	Area/Process	Clause
14/04/2015	Sali Davies	09:00	Opening Meeting - review of any changes to the site processes and Structure. Review of communications with regulators, interested Parties etc... Confirmation of scope and visit plan	
		09:15	Review previous report findings - corrective and preventive actions	
		09:30	Internal audit, management review, complaints, corrective actions, Objectives / Performance Monitoring & Measurement/management programme	
		12:30	Lunch	
		13:00	CHP	
		15:00	Report Preparation	
		16:00	Interim Meeting	
15/04/2015		09:15	Effluent and Influent Plant	
		12:30	Lunch	
		13:00	Warehousing	
		15:00	Report Preparation	
		16:00	Interim Meeting	
16/04/2015		09:15	Supply Chain	
		10:00	Report Preparation	
		12:15	Closing Meeting	

Please note that BSI reserves the right to apply a charge equivalent to the full daily rate for cancellation of the visit by the organisation within 30 days of an agreed visit date. It is a condition of Registration that a deputy management representative be nominated. It is expected that the deputy would stand in should the management representative find themselves unavailable to attend an agreed visit within 30 days of its conduct.

Notes.

The assessment was based on sampling and therefore nonconformities may exist which have not been identified.

If you wish to distribute copies of this report external to your organisation, then all pages must be included.

BSI, its staff and agents shall keep confidential all information relating to your organisation and shall not disclose any such information to any third party, except that in the public domain or required by law or relevant accreditation bodies. BSI staff, agents and accreditation bodies have signed individual confidentiality undertakings and will only receive confidential information on a 'need to know' basis.

'Just for Customers' is the website that we are pleased to offer our clients following successful registration, designed to support you in maximising the benefits of your BSI registration - please go to www.bsigroup.com/j4c to register. When registering for the first time you will need your client reference number and your certificate number (47481455/EMS 602885).

This report and related documents is prepared for and only for BSI's client and for no other purpose. As such, BSI does not accept or assume any responsibility (legal or otherwise) or accept any liability for or in connection with any other purpose for which the Report may be used, or to any other person to whom the Report is shown or in to whose hands it may come, and no other persons shall be entitled to rely on the Report.

Should you wish to speak with BSI in relation to your registration, please contact our Customer Engagement and Planning:

Customer Services
BSI
Kitemark Court,
Davy Avenue, Knowlhill
Milton Keynes
MK5 8PP

Tel: +44 (0)845 080 9000 Fax +44 (0)1908 228123

Email: MK.Customerservices@bsigroup.com

Regulatory Compliance.

BSI conditions of contract for this visit require that BSI be informed of all relevant regulatory non-compliance or incidents that require notification to any regulatory authority. Acceptance of this report by the client signifies that all such issues have been disclosed as part of the assessment process and agreement that any such non-compliance or incidents occurring after this visit will be notified to the BSI client manager as soon as practical after the event.

BAT 2 Appendix 1 Chemical handling process

BAT 2.

Demonstration of Good Housekeeping/ minimizing of Env. Impacts by a combination of methods (a : g)

(a) Careful selection & control of chemicals & additives

*NSR Procedure
REACH Matrix*

(b) Input-Output analysis with a chemical inventory, including quantities & toxic properties

*Weekly physical chemical stock.
On line System monitoring (PI)
BOD Plant monitoring*

(c) Minimise use of chems. to the minimum level required by the quality specs. of the final product

*On line real time flow metering (PI)
Centralised dosing where possible.*

(d) Avoid use of harmful substances (npe's, cleaning agents, surfactants) & substitution by less harmful alternatives.

*npe's previously banned from Site, no cleaning agents/ surfactants used.
Regular Chem. supplier reviews*

(e) Minimise input of substances into the soil by leakage, aerial deposition & inappropriate storage of raw material, product or residue

*All materials banded.
Above ground Storage tank management, ex G-P compliance*

(f) Establish a spill management programme & extend the containment of relevant sources, thus preventing contamination of soil & groundwater.

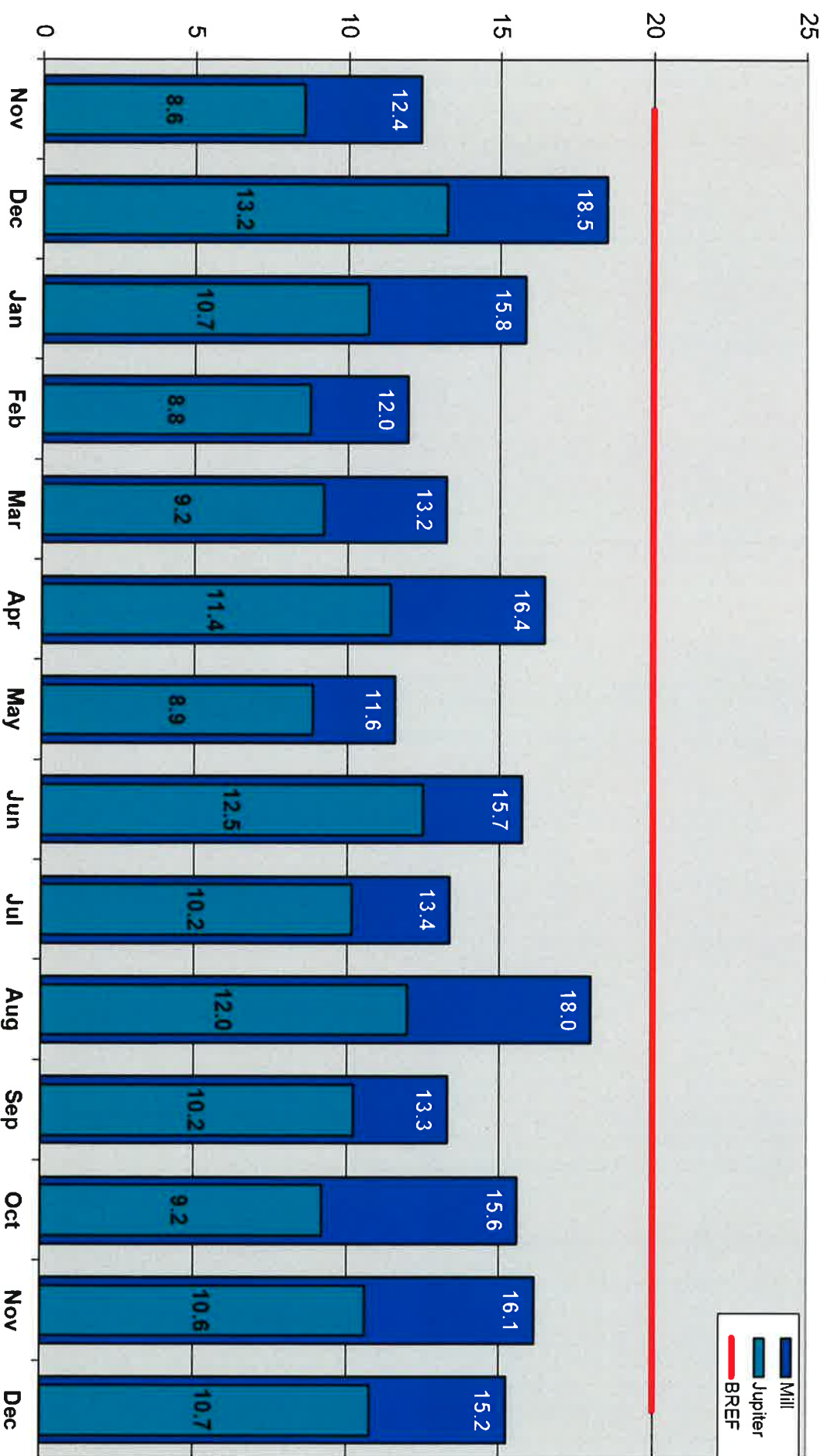
*EPR I1-Spillage Management
Spill Management training
Drainage system & bund maps*

(g) Proper design of the piping & storage systems to keep surfaces clean to reduce the need for washing & cleaning.

All materials of construction, Piping, dosing equipment etc, as specified by Chem. Supplier.

BAT 5 Appendix 1 Water usage table
m³/tonne

Average River Water Use Per Tonne of Paper 2014





NORTHWOOD & WEPA LTD

BRIDGEND PAPER MILL

DOCUMENT STATUS RECORD

DOCUMENT REF NUMBER: EPR 21

DOCUMENT TITLE: Olfactory Observation Procedure

ISSUE NUMBER	CHANGE DETAILS	ISSUED DATE	APPROVED BY
1	Creation of the Procedure	01/06/05	IG
2	Removal of Environmental Officer	13/05/09	DWL
3	Change location to more accessible points	17/02/11	DWL
4	Addition of Environmental officer	20/02/2012	AJM
5	Addition of responsibility for checking and use of Anemometer	20/04/2012	AJM
6	Change from Environmental Officer to Manager (company name change)	16/05/2013	RCL

Valid at date of print 26/03/2015	REF No: EPR 21	
TITLE: Olfactory Observation Procedure	DATE OF ISSUE: 16/05/2013	
APPROVED BY: RCL	ISSUE: 6	Page 1 of 4

Introduction

The aim of this document is to outline the olfactory observation procedure, detailing the responsibility, the location of the record and any remedial action required.

The requirement to carry out this observation is made under our IPPC Permit. The permit requires that all emissions shall be free from offensive odours outside the installation boundary. A regular olfactory observation shall be made along the installation boundary and an operational record made of all observations and actions taken. The record shall also record wind strength, estimated general direction and weather conditions at the time of the observation.

Responsibility

The inspection will be carried out by a subcontractor or a member of the Environmental department. The Environmental Manager ensures that it takes place and stores the records.

Inspection Procedure

1. The inspection is carried out on a regular basis. The date and time to be recorded on the sheet, along with the inspector's name. The following environmental conditions to be recorded on the sheet:

- Wind strength observation
- Weather conditions, i.e. drizzle, rain, heavy rain, mist, fog, ice, snow, sunny, etc
- Olfactory Observation
 - No Smell/None
 - Minor Smell
 - Moderate Smell
 - Strong Smell
- Estimated general Direction of prevailing wind

2. Inspection of Area's 1 to 6, as follows

Area	Location – please see site plan
1	Main car park
2	Personnel car park
3	Near abstraction point
4	East of aeration tank
5	Contractors area
6	Dispatch yard

3. Record all observations during the inspection as listed previously.
4. If smell is deemed problematical to inspector, then inspector to ascertain root cause of nuisance smell. Pending on the source remedial measure to be taken to remedy situation.
5. Record any remedial action taken if nuisance smell noted on observation sheet. Submit the form to the Environmental Manager.
6. The Environmental Manager will maintain log of observation(s).

Valid at date of print 26/03/2015	REF No: EPR 21	
TITLE: Olfactory Observation Procedure	DATE OF ISSUE: 16/05/2013	
APPROVED BY: RCL	ISSUE: 6	Page 2 of 4

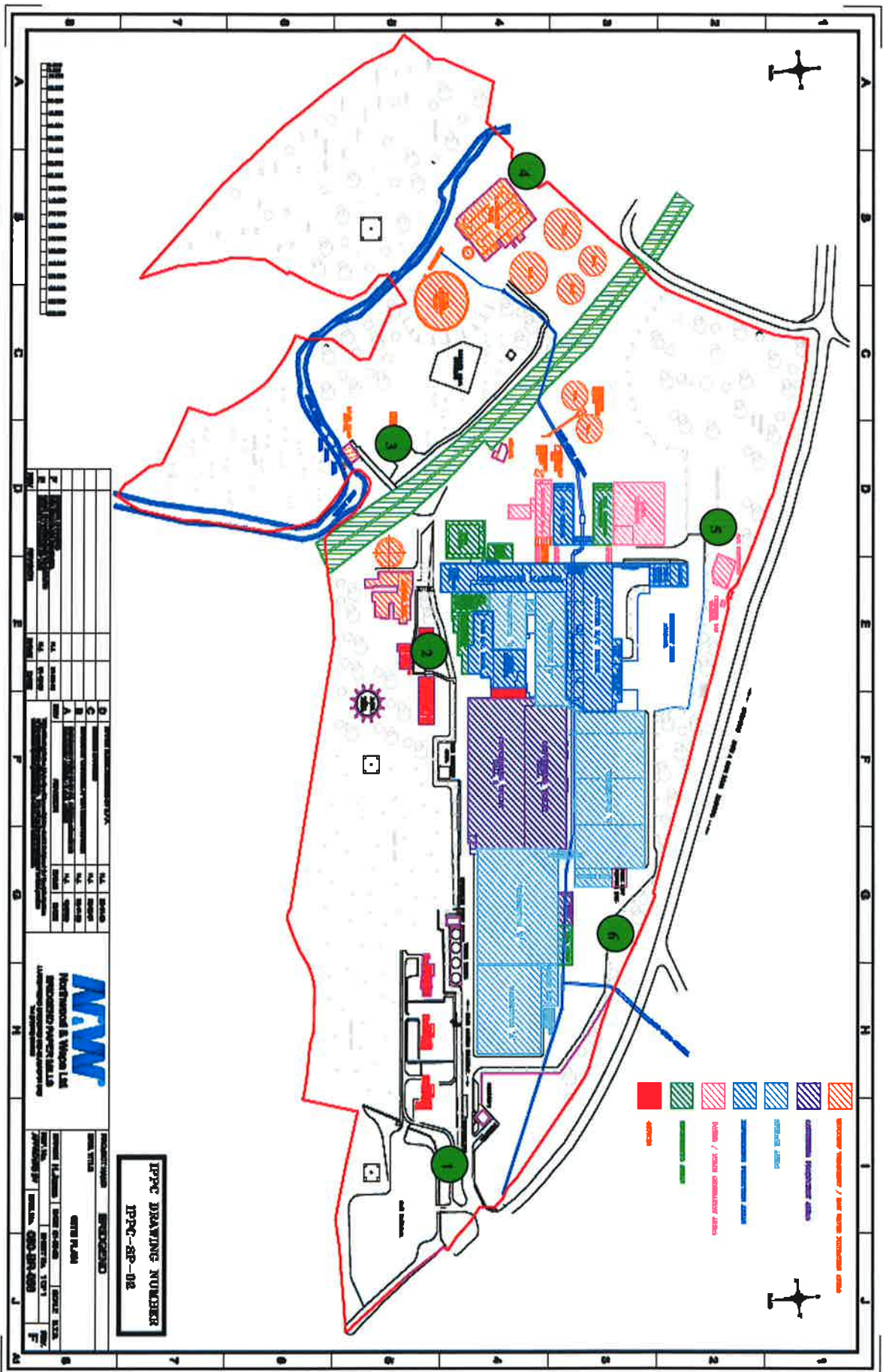
Olfactory Observation

Name: _____ Date: _____ Time: _____

General Observations & Details of Remedial Work Required:

Area	Wind Strength	Weather Conditions	Olfactory Observation	Wind Direction
1				
2				
3				
4				
5				
6				

Valid at date of print 26/03/2015	REF No: EPR 21		
TITLE: Olfactory Observation Procedure	DATE OF ISSUE: 16/05/2013		
APPROVED BY: RCL	ISSUE: 6	Page 3 of 4	



Valid at date of print 26/03/2015

TITLE: Ofactory Observation Procedure

APPROVED BY: RCL

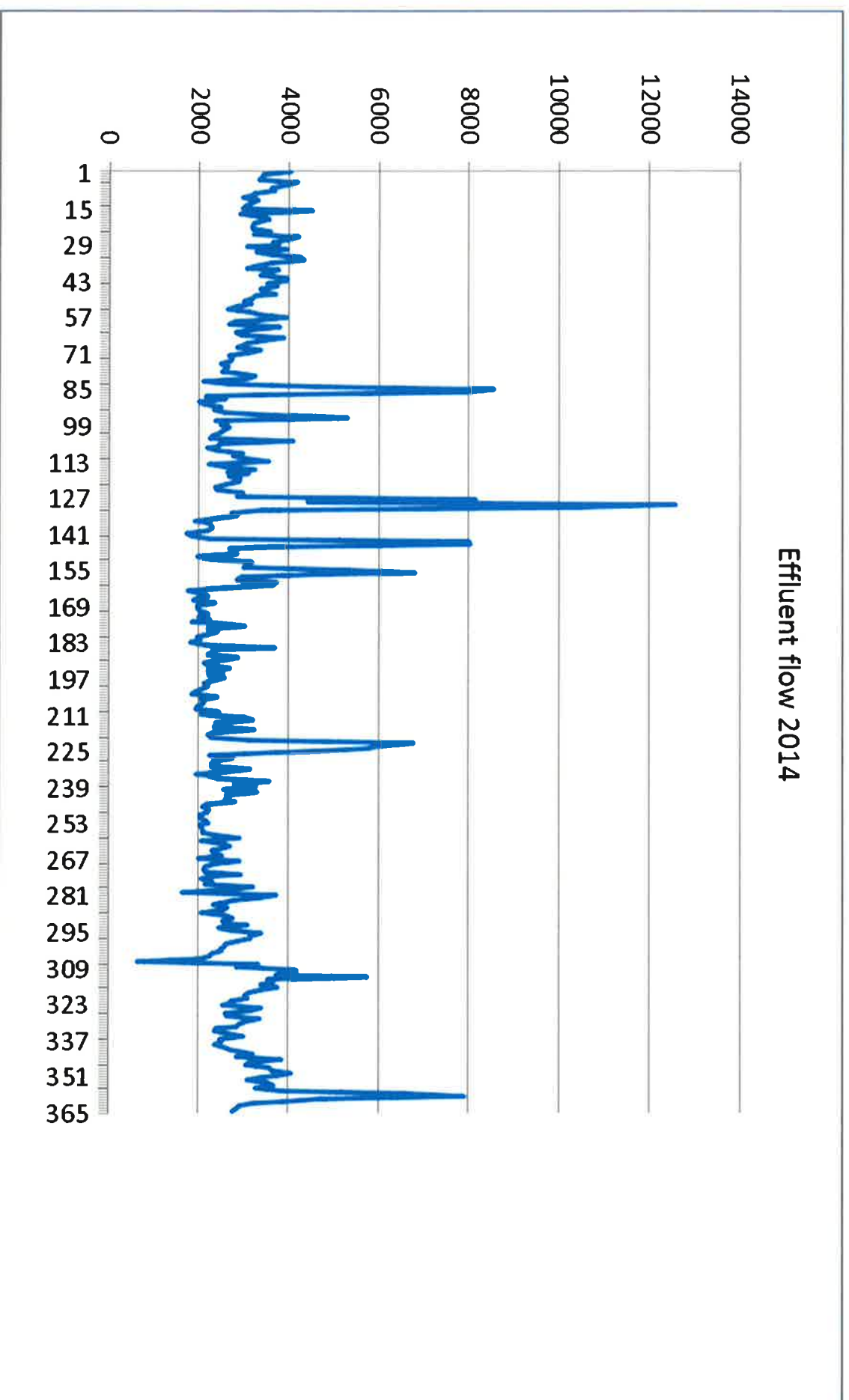
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DATE OF ISSUE: 16/05/2013

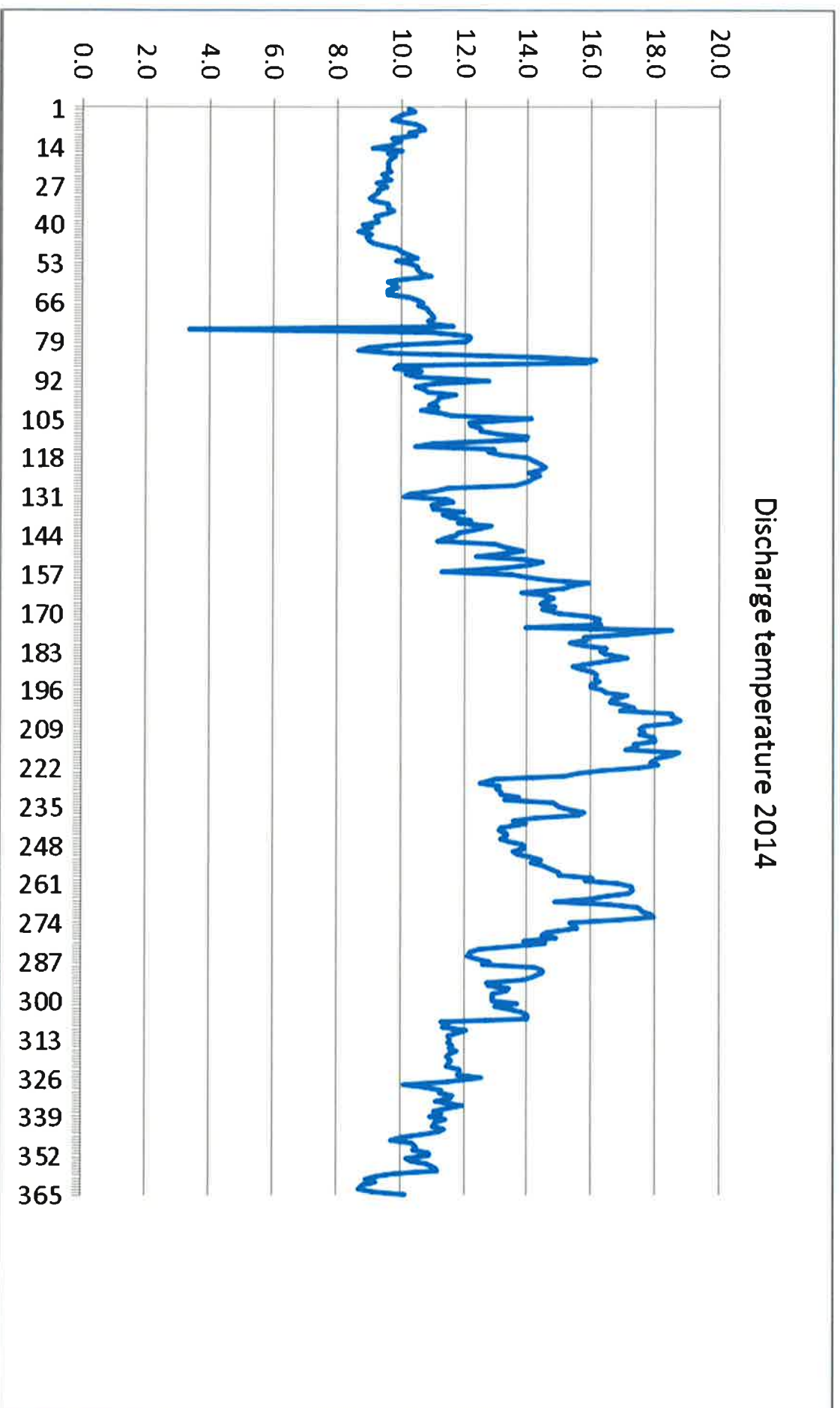
ISSUE: 6

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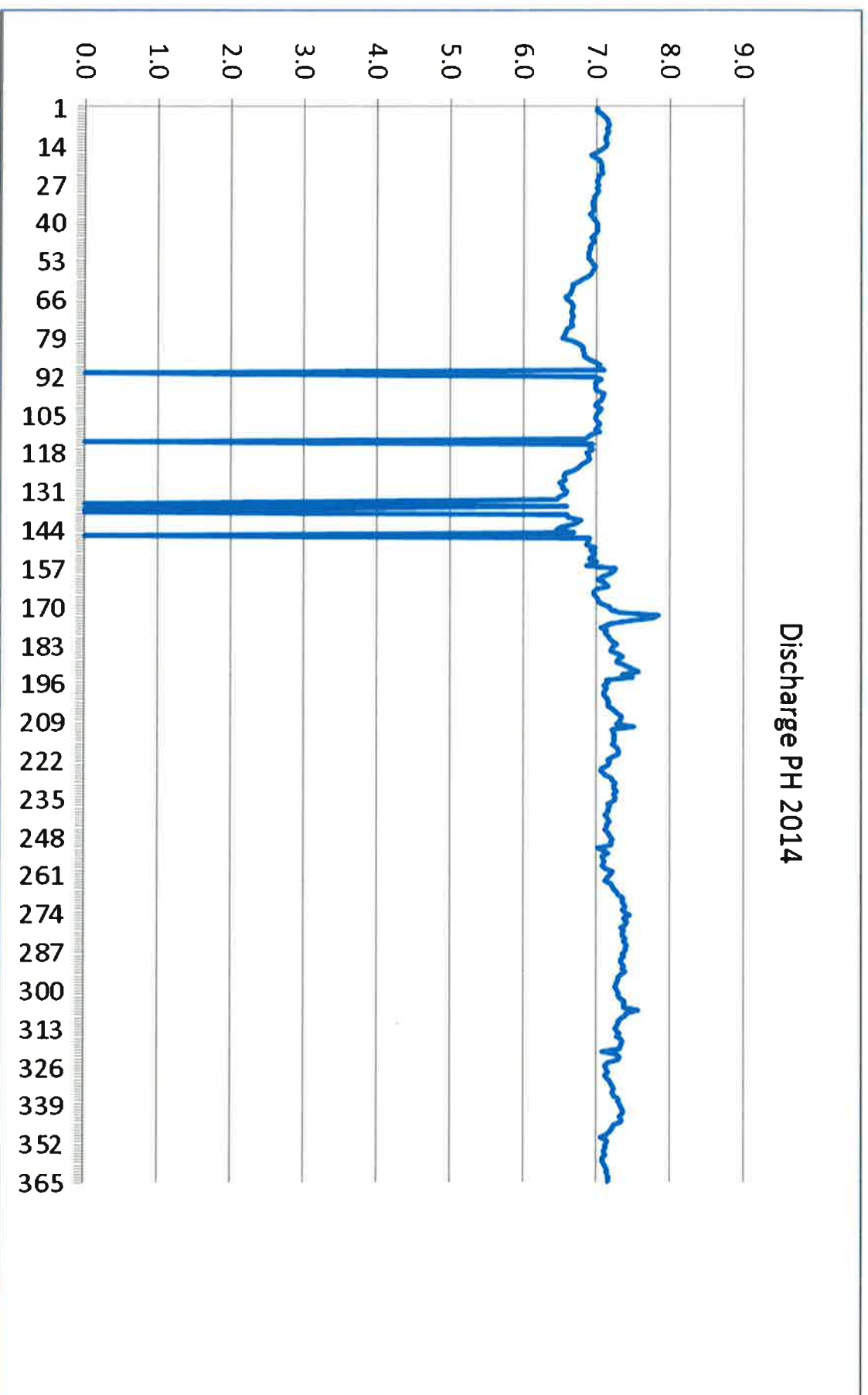
BAT 8 Appendix 1 Effluent flow 2014

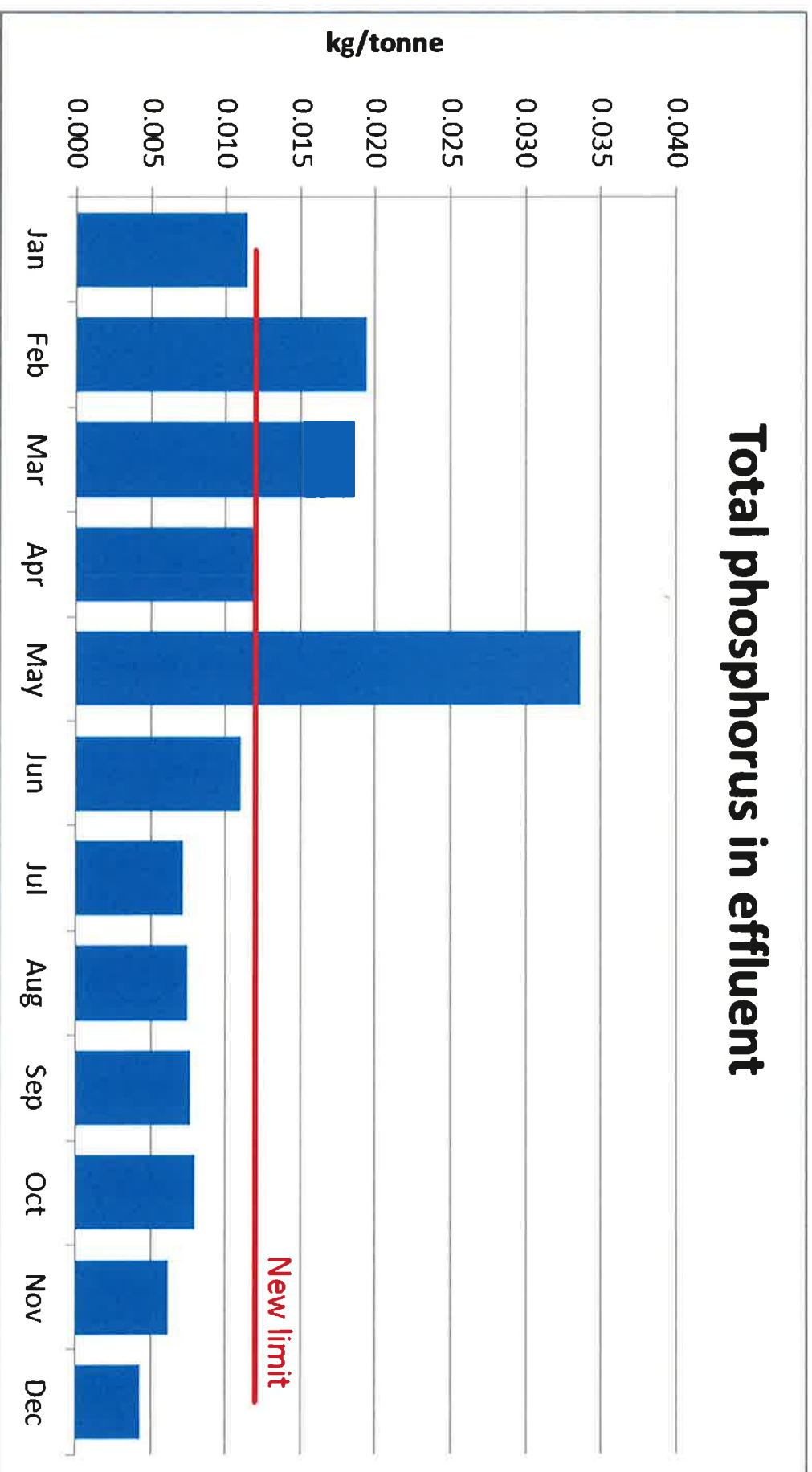


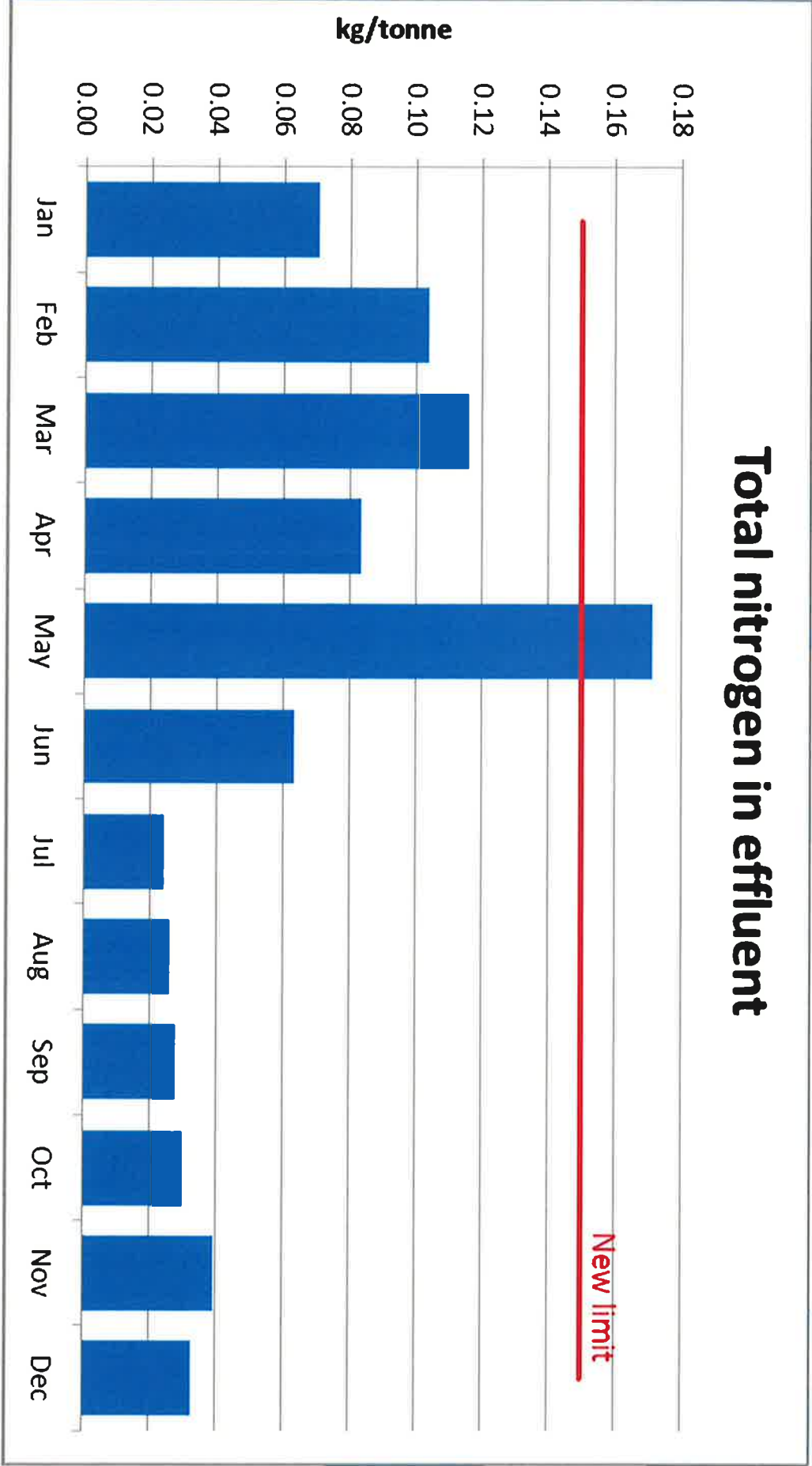
BAT 8 Appendix 2 Discharge flow 2014



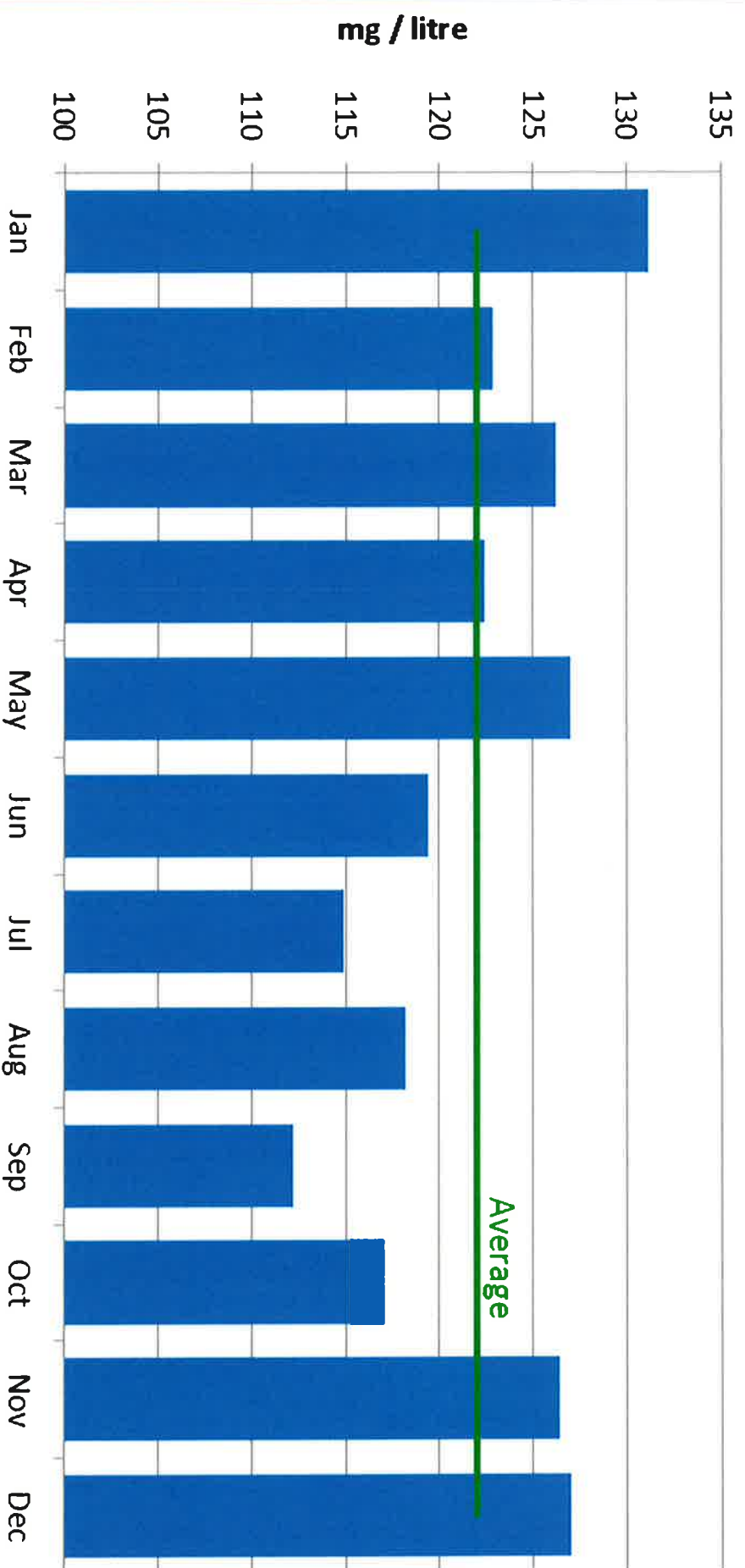
BAT 8 Appendix 3 Discharge PH 2014



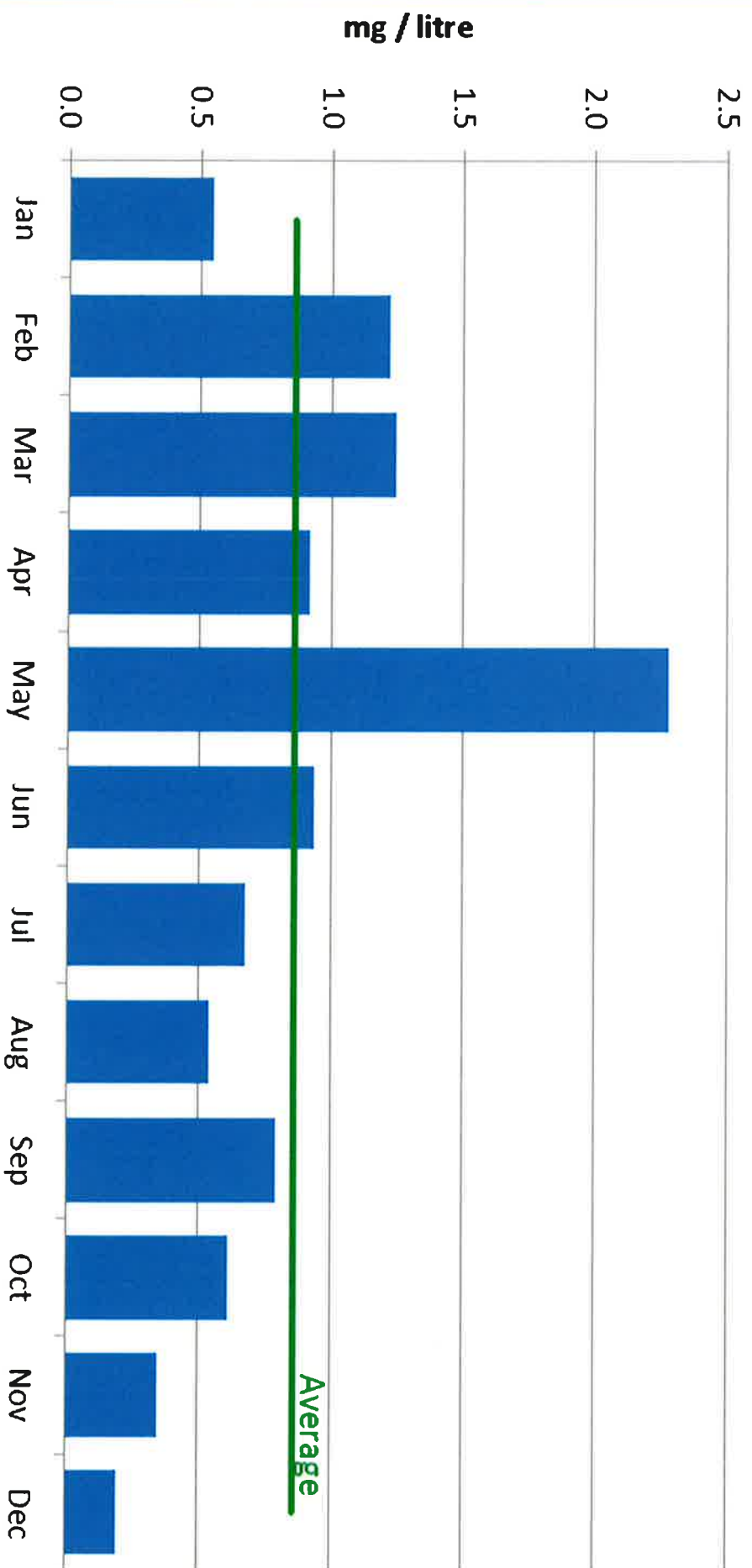




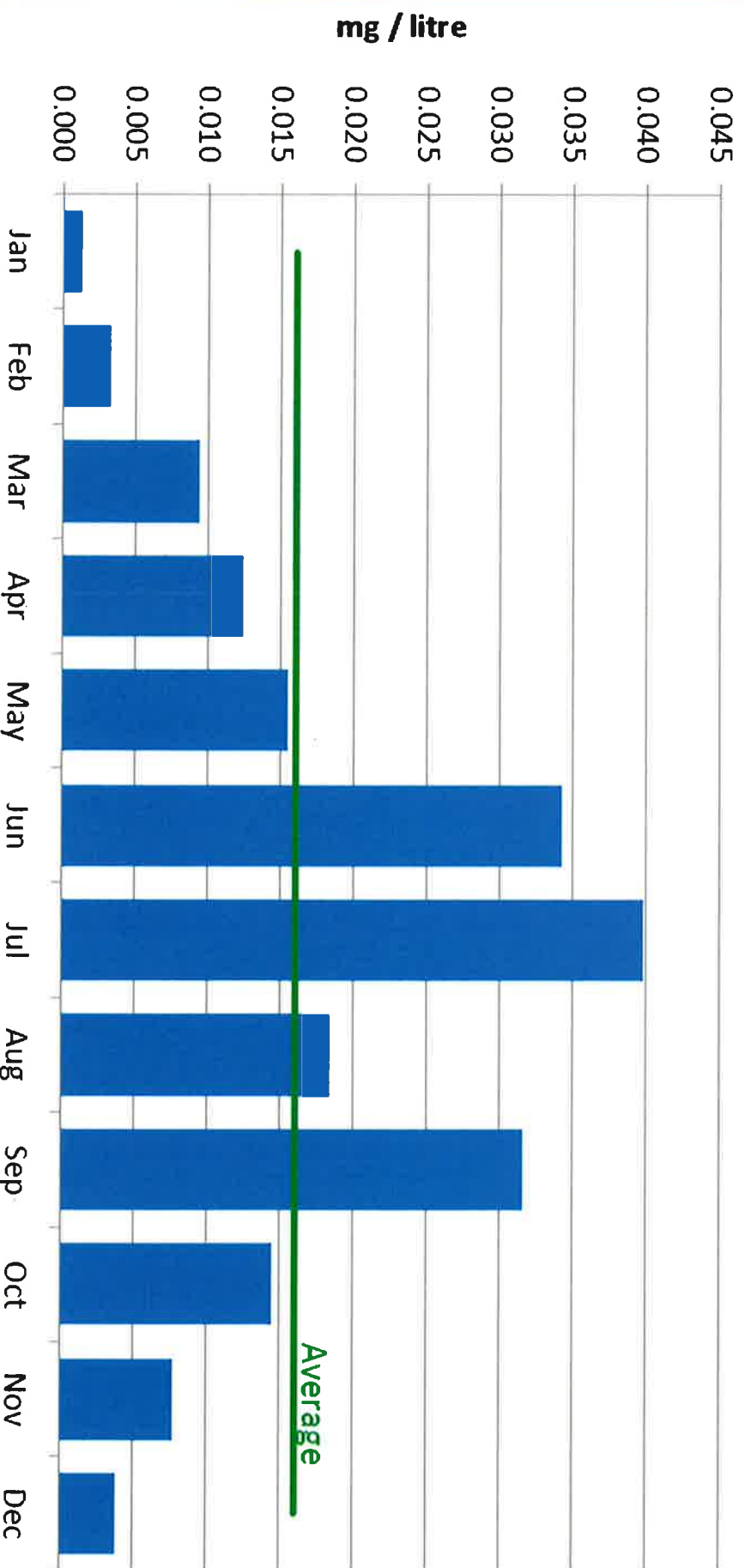
Sludge Volume Index



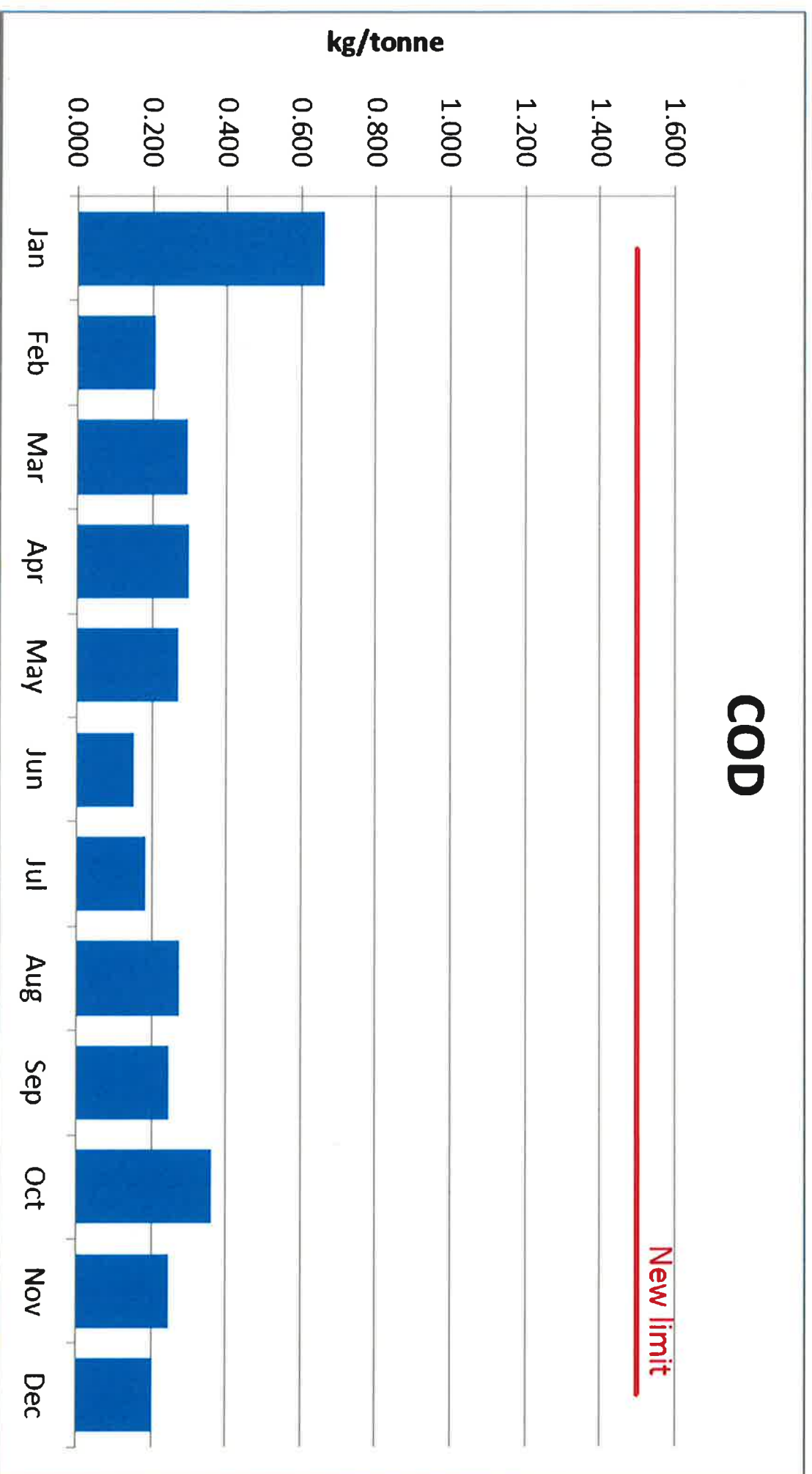
Orthophosphate in effluent



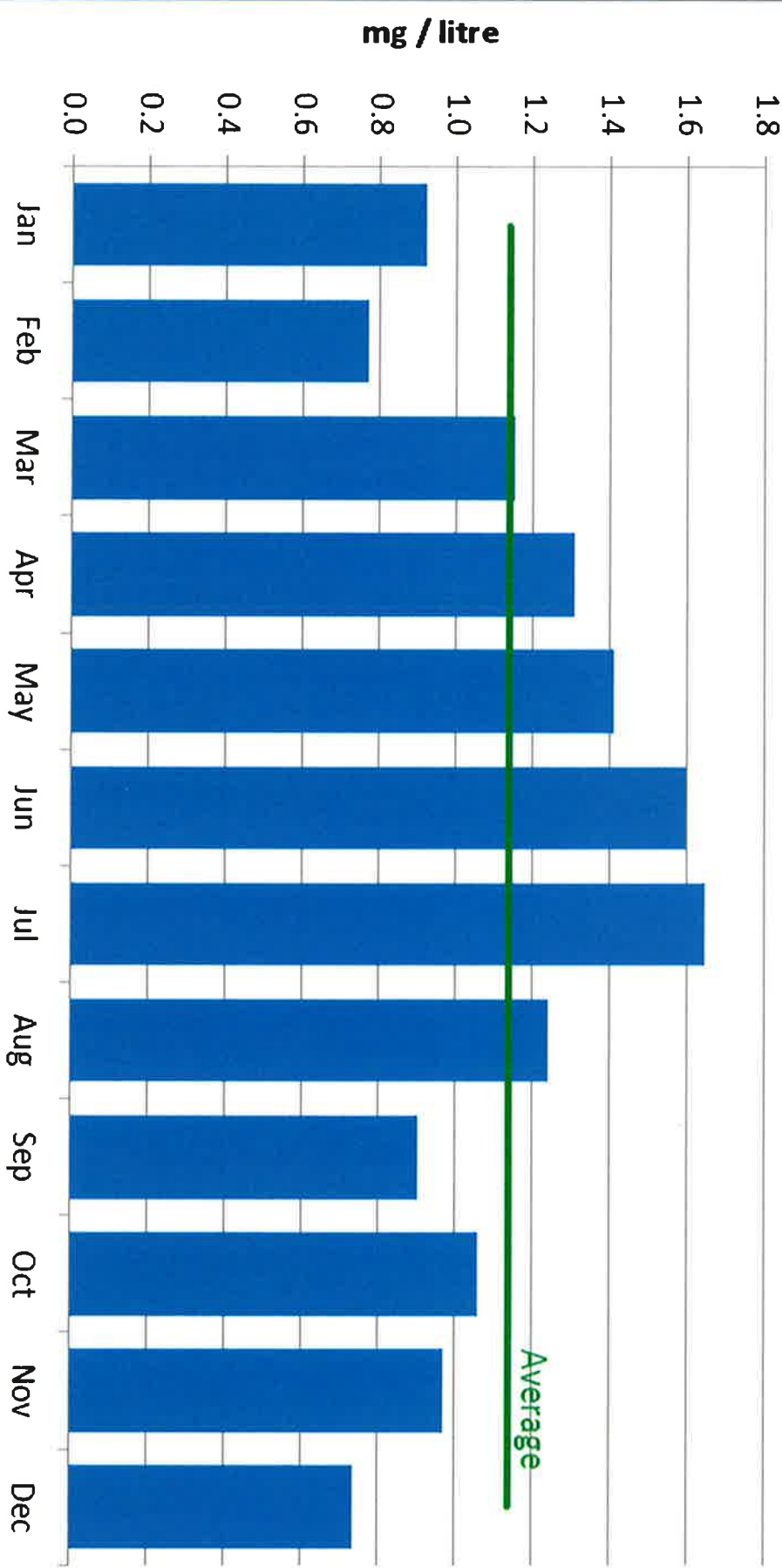
Ammonia in effluent



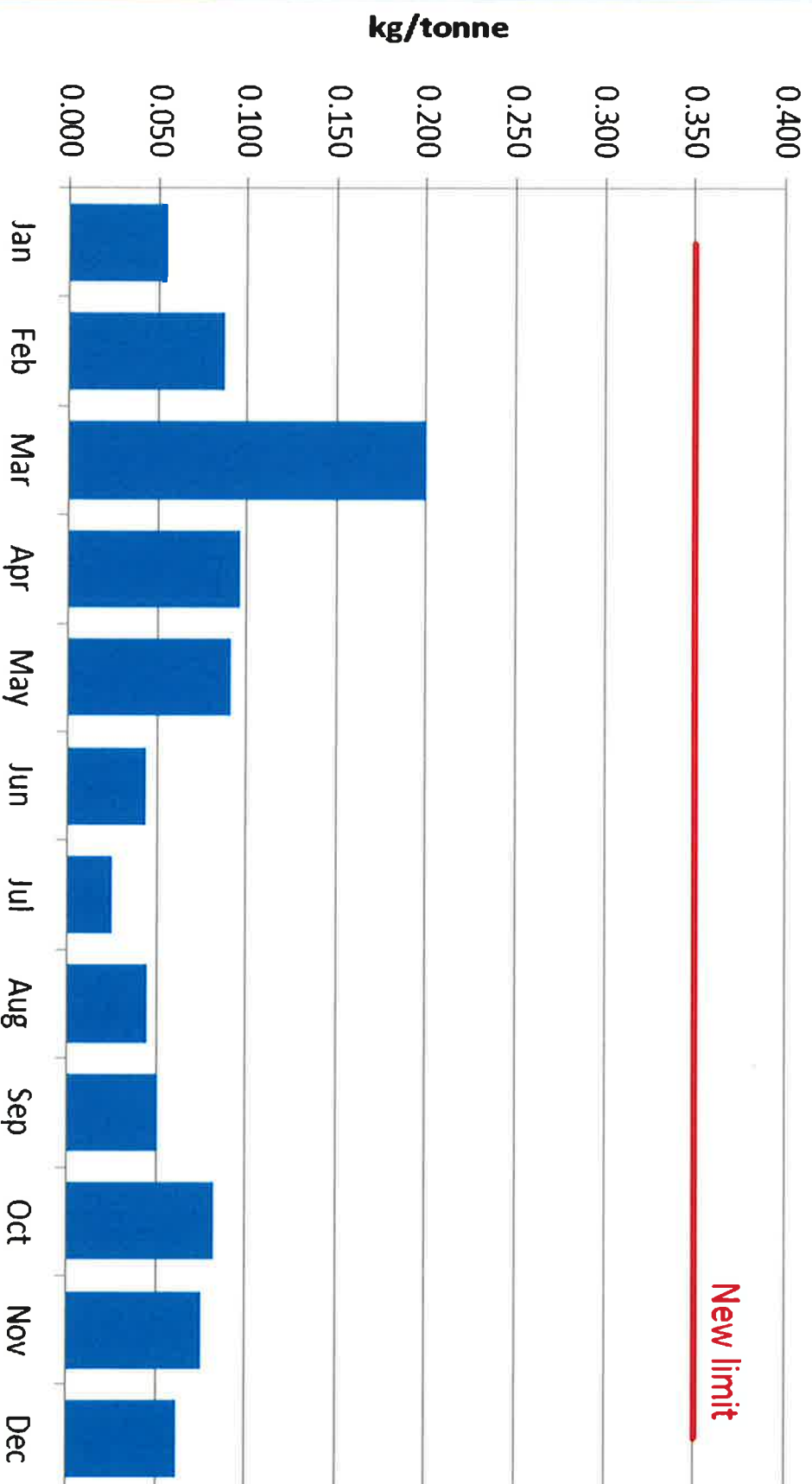
COD



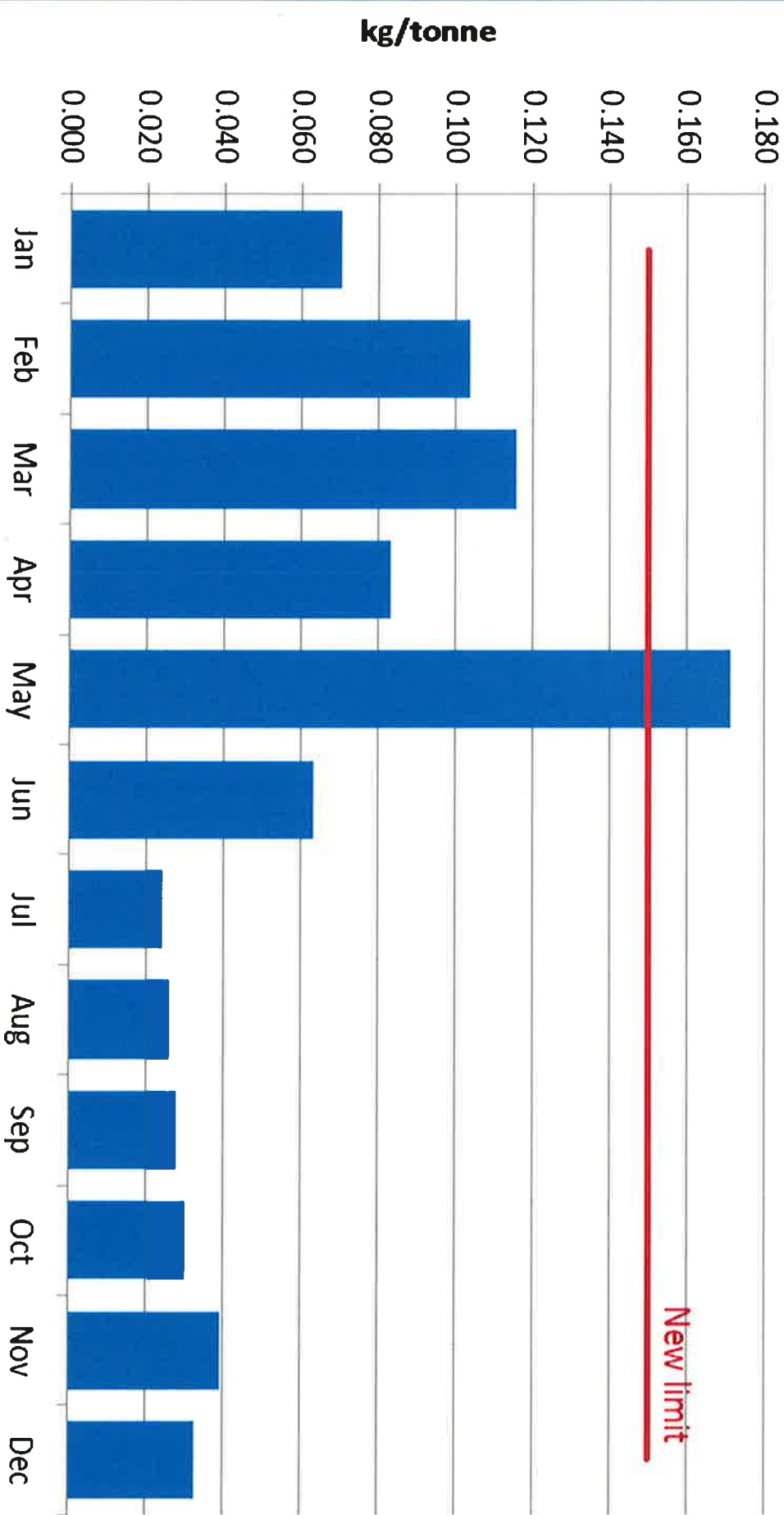
BOD in effluent



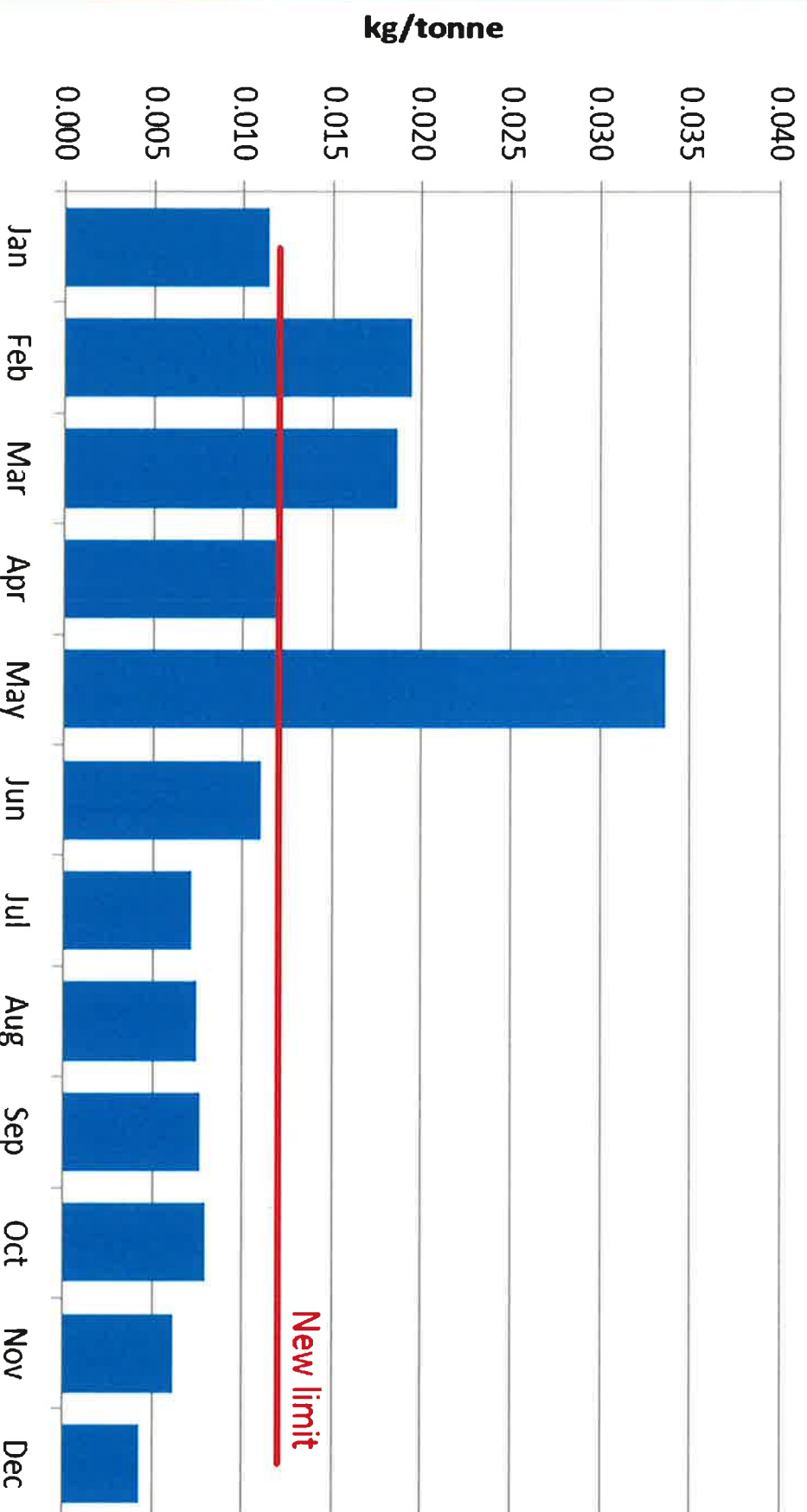
Suspended solids



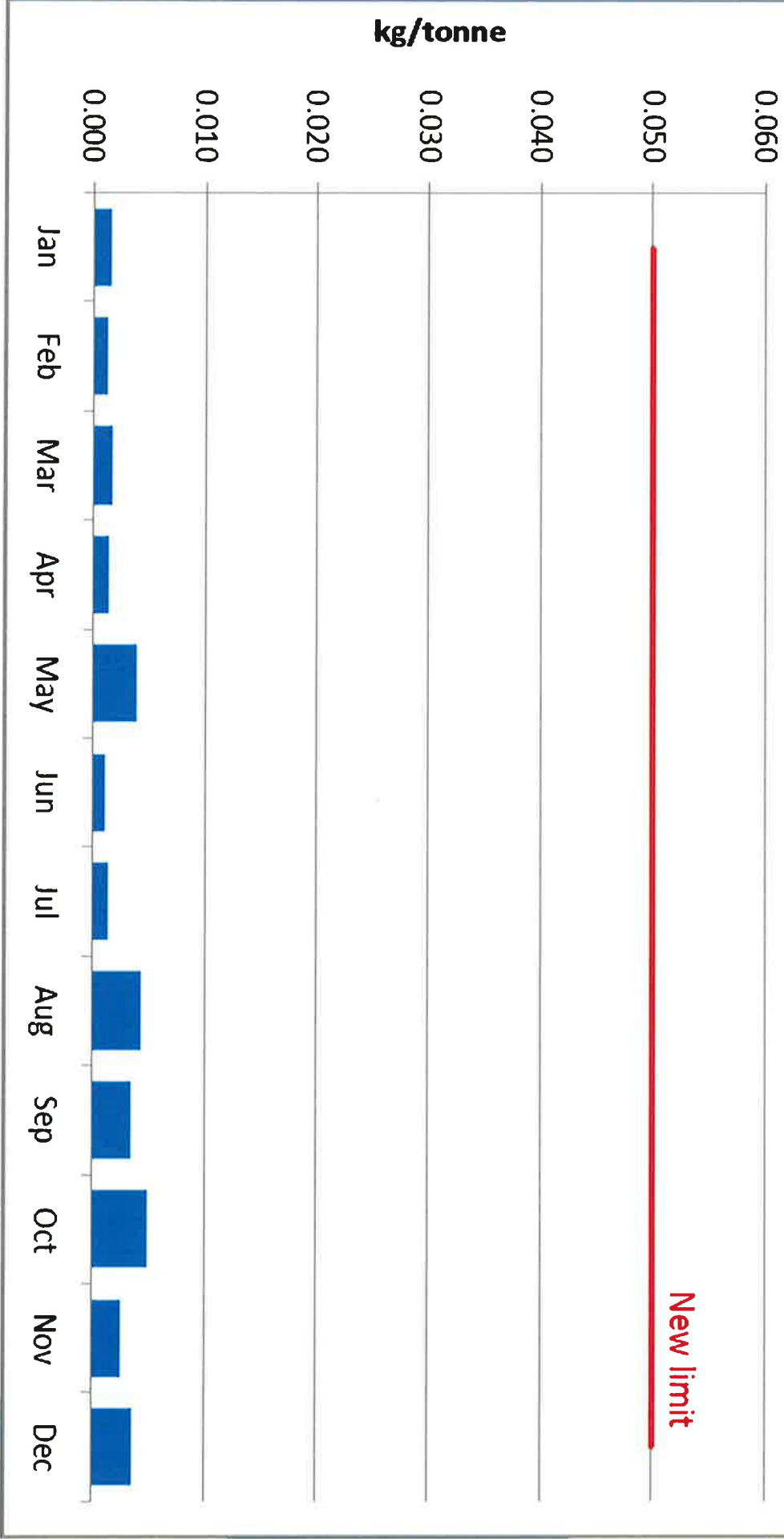
Total nitrogen



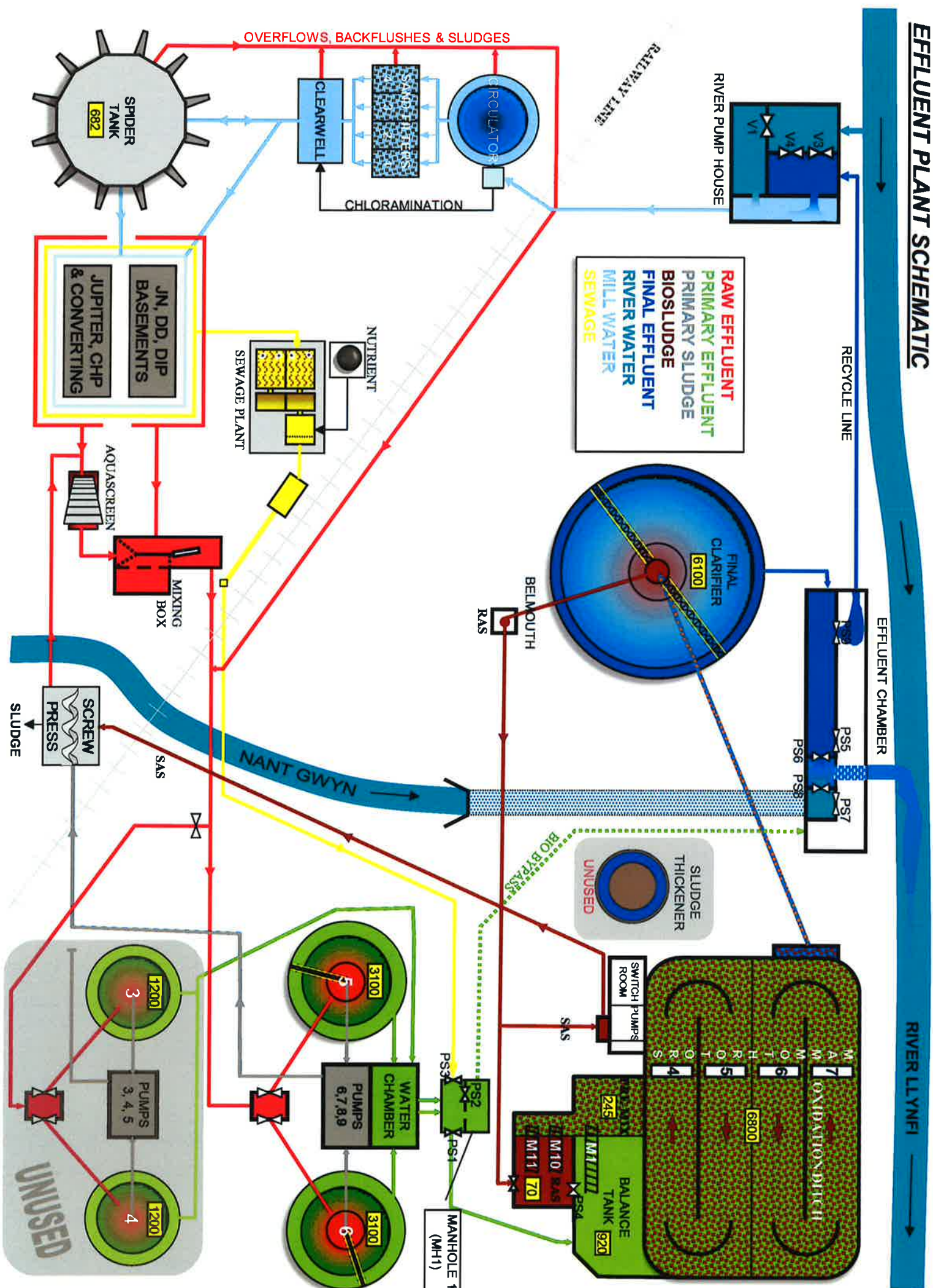
Total phosphorus



AOX



RIVER LLYNFI





NORTHWOOD & WEPA LTD

BRIDGEND PAPER MILL

DOCUMENT STATUS RECORD

DOCUMENT REF NUMBER: EPR 04

DOCUMENT TITLE: Effluent Treatment Plant System Manual

ISSUE NUMBER	CHANGE DETAILS	ISSUE DATE	APPROVED BY
1	Creation of the Procedure	01.6.05	IG
2	Update consents & consents page added	26.6.06	IG
3	Hyperlinks Added	21.7.06	IG
4	High Sludge Blanket procedure added	24.7.06	IG
5	Procedure for start up after power dip added	25.9.06	IG
6	Security alarms added	24.10.06	IG
7	Emergency Power Supply added	02.11.06	IG
8	Mixing box high level added	18.01.08	IG
9	De-ink/Jonathan references voided. Bracket screen status updated. Molasses info added. PI references added. Responsibles/contacts updated.	18.8.08	DWL
10	All ETP test methods added	24.03.09	DWL
11	Tests updated	24.06.10	DWL
12	Sludge blanket lift procedure updated	09.02.12	RLM
13	Screw press inclusion, consents, links, ETP schematic, fire run-off updated.	14.11.12	RLM
14	ETM 007 updated, ammonia working range updated, responsible persons updated throughout.	22.10.13	RLM
15	Effluent Test Methods removed and referenced. Recycling of effluent flow chart updated	22.11.13	RLM

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TITLE Effluent Treatment Plant Manual	DATE OF ISSUE: 22/11/13	
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Contents (move cursor over required heading, press CTRL & click)

4.	Introduction and system overview
8.	Consents
13	Operating procedure
14	Sludge settlement
15	Nutrients
17	ETP test methods
18	Ammonia
19	Microbiology of BOD plant
20	Plant start and shut procedure
21	Recycling of effluent
25	Sludge blanket lift procedure
27	Major fire run off waters
30	Problem solving
33	Monitoring system reboot
34	Responding to system alarms
35	Sludge identification
53	Schematic of BOD plant
55	Start up after power dip
56	Security gatehouse alarm summary
57	Running from emergency generator (house set)
58	Quick guide for shift manager BOD
59	Quick guide shift manager suspended solids
60	Quick guide shift manager pH (high/Low)
61	Quick guide shift manager high discharge
62	Quick guide shift manager high temperature
62	High mixing box level

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BRIDGEND PAPER MILL

EFFLUENT TREATMENT SYSTEM MANUAL

Introduction

The Effluent treatment system at Bridgend Paper Mills is described in detail below and is presented together with plant discharge records, performance charts versus consents and maintenance strategies.

The plant was commissioned in 1991 and remains a preferred effluent treatment process for Bridgend Paper Mills and the paper industry as a whole. The plant continuously produces a good quality effluent with few process problems.

It has built in systems to give maximum plant flexibility. The system was when designed, and continues to be, best practice for effluent treatment of a large paper mill. Testing regimes are in place to ensure that all consents set out in our operating permit are met at all times.

Bridgend paper mills operates a two stage effluent treatment system, comprising of primary treatment via 4 Dorr Oliver clarifloculators and 1 aquascreen filter. Secondary treatment consists of a Biwater activated sludge plant and a final settlement clarifier.

System Overview

Pre-treatment

There are initially two effluent streams that flow into the effluent mixing and distribution box.

The main stream from Jupiter machine passes through an Aquascreen, which removes any solid material such as plastic and wood. There is a bypass around the screen in case of blockage. The second stream, which is the ex-Jonathan machinehouse drain, goes straight to the effluent plant via the mixing box, but has very little flow.

The effluent then carries forward to the mixing box.

The mixing box is a central collecting point for all mill effluent drains. A series of valves and slides allows the distribution of flow into the clarifloculators.

Effluent exiting the mixing and distribution box is then gravity fed to any one of, or combination of 4 Dorr Oliver Clarifloculators.

No.1 and No.2 clarifloculators are now redundant.

No. 5 & 6 are used to collect and treat the effluent distributed via the mixing box. No. 3 & 4 can be used in an emergency.

Effluent from the mixing box is further distributed prior to the clarifloculators at the inlet to inspection chambers 1 & 2.

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Primary Treatment

Primary settlement tanks 2 off 1200m³ (3, 4) and 2 off 3100m³ (5 & 6).

Dorr Oliver design clarifloculators using half bridge rotating outer scraper and central flocculation zone with inner rake and paddles.

Settled sludge removal is via 4 off Willet ram pumps

Supernatant liquor removal is via peripheral launder to manhole 1 collection chamber of concrete construction.

Balance tank

Concrete buffering tank collecting all effluent at start of secondary treatment.

Associated items:-

- a. 1 off Archimedian Screw pump (M1), max flow - 316l/s, with screw failure alarm alarming at security gatehouse.
- b. Penstock 4 effluent diversion valve.
- c. Overflow mechanism to RAS pump station.
- d. High level float alarm linked to the security gatehouse.

RAS pump station.

Receiving Return Activated Sludge via 825mm pipe into 730m³ collecting tank.

Associated items:-

- a. 2 off Archimedian screw pumps (M10 & M11), max flow 475l/s, one duty and one standby working off--
- b. High and low level float switches.
- c. High sump level warning float alarm, alarming at security gatehouse.

Premix tank

Clarified primary effluent pumped via M1 screw pump is mixed with RAS pumped via M10 or M11 by the injection of air through 2 off aerators.

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Oxidation Ditch.

Main aeration tanks 1 and 2 split into two by central separating wall with 2.5m x 2.5m linking hole.

Each tank is 55m long, 17.7m wide and has a depth of 3.5m, total volume of 6800m³.

Two 37kW mammoth brush rotor per ditch, with two rotors (M4 & M7) running constantly, drive the liquors around the tanks and introduce additional oxygen to liquors. M5 & M6 rotors are operated on oxygen concentration. Each rotor has a maximum oxygenation capacity of 9Kg O₂/m of rotor length /hour. Dissolved oxygen is measured by Endress and Hauser Oxygen transmitter and recorded at the switch room recorder and on PI system.

Liquor level is controlled by a moveable weir system, which controls the oxygen input via the mammoth rotors.

Mixed liquor from the oxidation ditch flows over the weir and through a 900mm concrete pipeline to the centre of the final settlement tank.

Final Settlement Tank

45m diameter, 1591m² surface area, 6100m³ volume.

A sludge blanket clarifier with central skirt distribution. Full bridge scraper with standard trailing scraper arrangement. Continuous draw off from the clarifier from central hopper of tank via hydrostatic head. The sludge flow is manually controlled back to the RAS pump station by a telescopic valve fitted at end of draw off pipe.

Lower drain valve fitted to bottom of telescopic valve.

Sludge blanket level is monitored by Bestobell Mobrey sludge blanket detector, which alarms at the security gatehouse when sludge is detected.

The peripheral launder is cleaned by high pressure spray system attached to the circulator arm bridge and can be run off timer or continuously.

Clarified water passes over the peripheral launder V weir plates with facility for +/- 50mm adjustment and flows by gravity to the final effluent chamber.

Final Effluent Chamber

A distribution chamber for effluent and Nant Gwyn stream flows of concrete construction with a series of plastic penstock valves to adjust effluent and Nant Gwyn stream flows as desired and as dictated by stream and effluent conditions.

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Sludge Handling (activated)

Surplus activated sludge (SAS) is removed from the RAS line at the surplus activated sludge pit by 2 off positive displacement pumps, (M3 & M4) 1 duty and 1 standby.

Flowrate variable up to 20m³/hr

The SAS is pumped to the screw press.

Associated items:-

- a. Low-level float switch in SAS pit connected to M3 & M4 SAS pumps.

Picket Fence Thickener (taken out of service)

Thickening tank for sludge received from RAS system at ~ 0.7% solids.

8m diameter, SWD 3.5m. Full diameter fixed access bridge, central drive tube, picket fence, scraper mechanism, tilting valve assembly and inlet deflector drum.

Drain and overflow mechanism to RAS line.

Sludge Handling (Primary)

Settled sludge collected in the primary clarifloculators is fed to the screw press at a consistency of approximately 3% via Willet reciprocating pumps (see above) and pressed to approximately 50% dryness.

The sludge collects in a holding tank and enters an integral flow distributor which directs it into the disc thickener. This raises the consistency to about 20%. Filtrate is returned to effluent drain.

This thickened sludge is fed into the screw press via an inlet chute. The screw then propels the material towards the pressing zone, which builds up a counterpressure and drives the free water of the material treated through the basket. Solids are retained and expelled by the screw through the press exit aperture at a consistency of about 50%. Filtrate from the press re-enters the sludge holding tank.

Sludge generated is collected from the floor below the drum by mechanical means, loaded onto open top truck and disposed of via land-spreading.

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Responsibilities

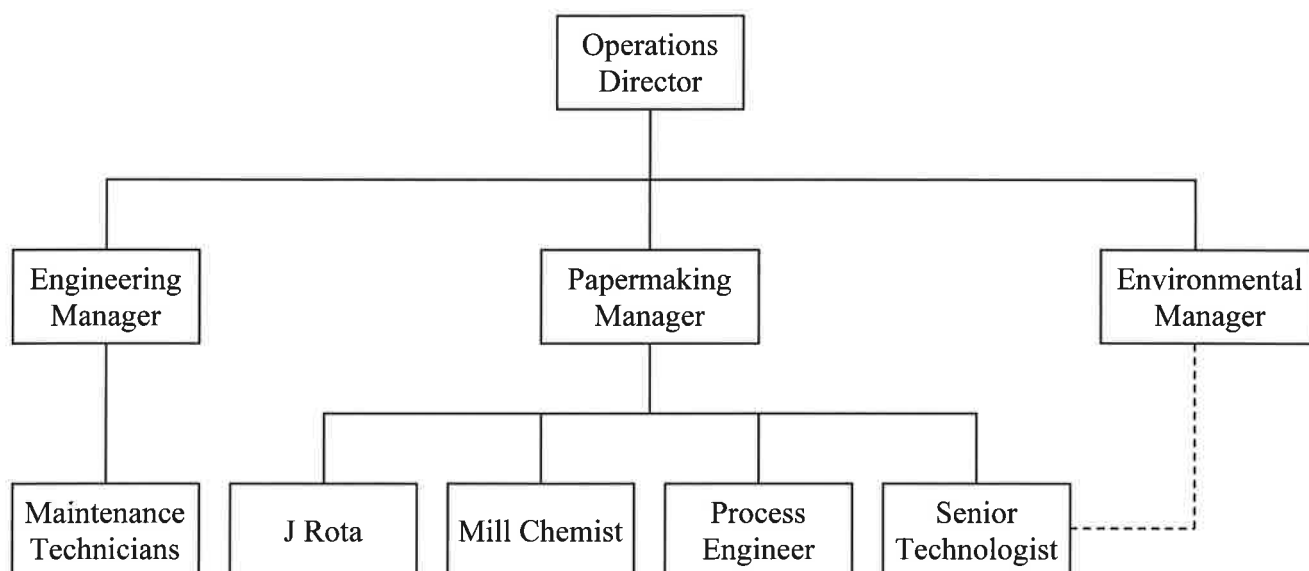
Senior Technologist – see current RR&Es

Mill Chemist - see current RR&Es & deputises for Technologist re effluent sampling

J Rota Operatives – see current RR&Es

Manning

Organogram for effluent plant responsibility



The effluent plant is continuously monitored by the PI system, which reports all major problems. Periodic manning is by 3 J Rota day operatives for the primary treatment system and Stockdale plant, and by the Technical Department for the secondary treatment. Plant inspection is performed at least once per day, every day.

Cover is provided 24hrs a day and 7 days per week. Out of normal hours cover is provided by the Shift Manager.

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Chemical Addition

Nutromex

Nutrient addition, based upon a liquid mix, supplies nitrogen and phosphorus supplement to the activated sludge process.

Storage of the nutrient is in a bunded vented tank of 25m³ capacity.

Nutrient is pumped into the sewage stream to maintain predetermined nitrogen and phosphorus levels.

Adjustment is done manually under the direction of the Technical Department.

Sodium Hypochlorite

Used to control filamentous bulking. Fed from semi-bulk container by gravity into the RAS pit, the feed rate is varied according to the degree of bulking and plant viability.

Plant loading

Based on 917Kgs/ day

BOD

0.11Kg BOD per m³ Aeration tank volume

0.03KgBOD per Kg Sludge Solids

Plant design capabilities

Average flowrate	-	18200m ³ /day
Maximum flowrate	-	27300m ³ /day
Peak hourly flowrate	-	1136m ³ /hr
Average BOD loading	-	1273Kg/day
Maximum BOD loading	-	3363Kg/day
Average Suspended Solids	-	546Kg/day

Current Environment Agency consents (2011)

Maximum flow	17500m ³ /day 729m ³ /hr
BOD	10mg/l
Suspended Solids	40mg/l
pH	6.5 – 8.0
NH ₃	1.0mg/l
Max Temp	25°C

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Effluent Plant controls

Personnel - 24hr coverage via day operative, technical department and shift manager.

Flow Control

Flow into the plant is by gravity and buffered by the balance tank to maintain a constant flow to the oxidation ditch via the Archimedian screw pump.

Flows from the effluent treatment plant are monitored continuously by Endress and Hauser ultrasonic flow meter (Type. FMU 861). Flows are registered locally on the meter, logged on the Water Filtration Plant control computer and trended on the PI system.

Oxygen Level

Both oxidation ditches have Endress and Hauser DO transmitters linked to Mammoth Rotors M5 and M6 that bring in a rotor when the oxygen level falls below 1ppm.

DO level probes are set to control between 0.5 and 2ppm.

Sludge Blanket Level

Monitored by Bestobell Mobrey sludge blanket detector and set at 0.45m. Alarmed locally in the main switch room and at the security gatehouse.

Remote Monitoring

The BOD plant has a computer system dedicated to the monitoring of the plant remotely at the Jupiter machine control room.

The following pages are monitored:-

Plant Overview

Colour coded plan of plant that monitors plant status.

Green - running or okay

Yellow – warn

Red – Out of consent or pump/motor breakdown.

Level Alarms

Description of area of plant and status e.g. sump levels, DO (Dissolved Oxygen) levels etc.

Trend Menu

Trends BOD, Suspended Solids, pH, Temperature, DO levels, Influent and Effluent flows.

Status Menu

All pump and motors electrical status.

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In the event of total power failure to the system the system will require rebooting as described in effluent monitoring system start up procedure (appendix 1)
Response to active alarms is described in

Sampling regime

The following samples are taken as and when required:-

Primary Outfall

BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), Suspended Solids and nutrient levels.

Secondary Aeration

Mixed liquor solids
Stirred Settled Sludge Volume Index
Nutrient levels
Microscopic analysis of sludge

Final Settlement Tank

Sludge blanket level.
RAS solids
Nutrient levels

Final Effluent Outfall

Suspended Solids
pH
BOD
COD
Nutrient levels
Total N & P

Primary Sludge

Moisture
Ash
Fibre fractionation

Monthly Sampling Regime

Influent and Effluent samples are taken on a monthly basis for independent evaluation for the following determinands.

Mercury, Cadmium, pH, COD, BOD, AOX (Adsorbable Organic Halides), suspended solids, microtox, pentachlorophenol, tributyltin, triphenyltin, phosphate and Total nitrogen.

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Plant Failure

All pumps are doubled up as Duty/Standby. Pumps are linked to level sensors that start the standby pump if levels increase in tanks due to pump failure.

Rotors for aeration are also Duty/Standby and are started when Oxygen concentration falls below 1mg/l.

In the event of a total power failure to the plant, there is a backup 'House Set' that can be activated to provide power to essential plant and prevent spill of untreated effluent to river. Indication of power failure is registered at the security gatehouse alarm panel and relayed via radio to all relevant personnel.

In the event of effluent being below discharge specification, there is a facility on site to recycle all effluent generated by the mill, via a series of penstocks situated at the final distribution box.

Effluent is returned to the Water Filtration Plant via the River Pump House and all water is retained within the mill water courses.

Isolation of the River Pump House from the river is also possible by the closing of valves situated within the pump house.

In the event of a total plant failure due to power, mechanical breakdown or biomass problems, there is facility to bypass the BOD plant and recycle primary treated effluent back to the mill.

Abnormal working

Abnormal working occurs during mill cleaning operations or at shut periods.

Highly alkaline liquors flushed through the papermaking system as a cleaner are segregated from all other effluent streams and collected in a previously prepared clarifloculator.

Effluent held in this tank is pH adjusted to neutral by manual addition of an acid solution.

Once neutralisation has been achieved the effluent is discharged into the main effluent stream.

There is a procedure for total mill periods to run the BOD plant on oxygen and level controls only, to maintain a viable biomass for mill start up.

Effluent Recycle

Treated effluent from the mill can be either discharged to the River Llynfi or recycled by gravity to the River Pump House and pumped to the Water Filtration Plant, where it is reused in the process.

Generally the mill runs with a recycle flow of ~35%, though this can range from 0 – 100% dictated by process conditions and River Llynfi flow and effluent quality.

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Responsibility for recycle/discharge flows is taken by the technical department or day operator. Out of hours responsibility is assumed by the shift manager. Flow through the recycle channel is monitored using a Endress and Hauser ultrasonic flow meter and recorded locally on the meter and also at the Water Filtration Plant.

Maintenance

The design of the plant allows minimal regular maintenance due to the flexibility of the plant. Generally, the plant can be allowed to run to failure because of the back up systems. There are however, regular lubrication regimes in place to ensure that all critical plant is kept in optimum condition.

The Esso lubrication system produces a job ticket at set intervals to ensure that the routine lubrication takes place. Records of lubrication are maintained on the Esso lubrication system database.

Visual integrity checks are carried out as part of the daily routines on the plant and faults or concerns logged on the BOD plant log and acted upon using the PTM system.

For general repairs a PTM Request is submitted and scheduled for repair at the earliest opportunity.

Records of general repair maintenance are maintained on the mill SAP maintenance system. Instrumentation maintenance is carried out on a weekly basis in accordance to a (PWR) ticket being produced. Records of instrument repair and calibration are maintained for inspection at the BOD plant 'Biox' cabin.

There is an ongoing programme to replace original plant equipment with equipment of improved design and capability. This is done when failure of existing plant occurs.

Measurement

All measurements on consents are monitored continuously and the instruments used are serviced and calibrated according to the manufacturers recommendations.

Records of servicing and calibration are maintained at the BOD plant cabin.

Flow monitoring equipment and methodologies of discharge and recycle flows are MCERTS accredited and subject to independent audits every 2 years.

Continuous BOD measurement instrument BIOX 1010 is serviced and calibrated to manufacturer's guidelines. These records are maintained in the wet laboratory IPPC file.

Environmental Benchmarks

Substance	Benchmark mg/l
Mercury	0.0001
Phosphorous	0.065
Cadmium	0.005
Pentachlorophenol	0.002
Tributyltin	0.00002
Triphenyltin	0.00002
BOD 5	3.0

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Operating Procedures

The first stage of the effluent treatment at Bridgend is by physical means, the second stage effluent treatment utilises both physical separation and conversion processes.

Operating procedure for BOD plant

Biological Controls

There are several elements to the correct and proper operation of the activated sludge Biochemical Oxygen Demand (BOD) plant, each of which interrelates with the other. Due to these interactions reference must be made to the other prior to making any decision to make changes to the plant.

The sections of the BOD plant have been described in detail earlier in the overview of the plant.

The primary design of the plant is to remove soluble organic biodegradable compounds that remain after the primary settlement treatment stage.

The plant relies on two main elements:

1. Water loading (referred to as Hydraulic load)
2. BOD load (the dissolved organics in the water)

The plant which is made up of several tanks is filled with aerobic bacteria which uses the BOD content as a source of food, the water phase effectively being the transportation for the food, so in simple terms it's a balancing act between the amount of load (food) entering the plant and the mass of the solids (activated sludge in the plant). Maintaining a proportionate balance will give good conversion:-

Effluent (soluble organics) + Oxygen → Bio-conversion = Extra Biomass + Carbon Dioxide

It is important to maintain a constant flow with as few spikes or surges of flow as possible and a constant BOD loading.

The feed of organics to the plant is supplemented by a dose of nutrient that contains nitrogen and phosphorus, this is added to promote biomass growth.

F/M Ratio

The biological loading for the plant is expressed as:

Activated sludge loading or Food to Biomass F/M ratio

$$F = \text{Kg BOD fed to plant per day} = \frac{\text{BOD(mg/l)} \times \text{flow (m}^3\text{/d)}}{1000}$$

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$$M = \text{Kg Biomass in the bioplant} = \frac{MLSS (mg/l) \times V(m^3)}{1000}$$

where V = volume of oxidation ditch (6800m³).

Typically activated sludge plants would run at an F/M ratio of 0.2 – 0.4

Bridgend mill activated sludge plant typically runs on a ratio 0.02.

The plant will run efficiently at what would be seen as a critically low F/M ratio, but biomass growth is much slower than if F/M was higher

Sludge Production

As the activated sludge is a living plant, the plant will continually produce sludge due to the conversion processes involved

Higher sludge production occurs at high f/m ratios and conversely low sludge production occurs when the F/M ratio is low.

To maintain sludge levels in the plant consistent with the loading of the effluent entering the plant (F/M ratio) the sludge is 'wasted' when the levels reach a point where the plant is either saturated (too much sludge) or if the loading on the plant reduces (not enough food). These results are obtained from weekly measurements of the solids content of the MLSS (mixed liquor suspended solids) and RAS (return activated sludge).

Biomass wasting is done via P3 or P4 SAS (surplus activated sludge) pumps. Sludge is pumped off the plant until the sludge levels reduce enough to achieve a suitable F/M ratio.

The sludge ratio is traditionally maintained between the RAS and MLSS with a ratio of 2:1 being ideal for a good plant balance. Plant design is for RAS 0.8% and MLSS 0.4%, though typical results would be 0.45 and 0.35 (1.3:1) respectively.

The ratio between RAS and MLSS is controlled via the telescopic valve (Bellmouth) at the top of the FST (final settlement tank) draw off chamber. The rate of return is approximately equal to the flow into the plant.

It is important that the rate of RAS return from the FST is sufficient as not to hinder the settlement of sludge in the tank and not too high as to disintegrate the sludge blanket in the tank.

Sludge Settlement

The sludge within the FST must settle to produce a clear supernatant liquor or final effluent.

Settlement varies and is dependent on a number of factors.

1. Concentration of the sludge.
2. Biological make up of the sludge
3. Hydraulic load on the plant
4. Rate of RAS draw off from The FST
5. Nutrient level
6. Sludge age

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There are three stages to sludge settlement:

1. Free settlement. - Initial settlement where sludge particles/flocs are free to settle easily
2. Hindered settlement. – As the flocs get closer and the sludge thickens, they interfere with each other and slow down the rate of settlement.
3. Compaction. – When flocs are clumped with little space between them they continue to concentrate slowly.

Controlling the level of the sludge blanket in the FST is crucial to prevent the solids building up to a point where the blanket could rise to the top of the FST and overflow to river. The blanket is continually monitored by the HSB probe which will alarm at the security gatehouse at 0.45 metres below the surface of the water.

Very high residence time in the FST can lead to the sludge becoming anaerobic. This should be avoided as this sludge will eventually rise to the surface of the clarifier and potentially break suspended solids consents.

A typical reason for poor settlement could be 'Bulking'. This must be closely monitored by regular microscopic evaluation of the sludge.

Determination of settlement is by SSD or Stirred Sludge Density (see test methods).

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Nutrient Dosing

Macronutrients in effluent will vary due to activities in the mill (chemicals/furnish etc), the effluent process conditions and the operation of the effluent treatment plant. Nutrient addition has to overcome these variations so control is necessary. Deficiencies can lead to an overall reduction in plant performance and undesirable changes in the bacterial ecosystem as more adaptable species dominate e.g. Filamentous bacteria

Rule of thumb for dosing of nutrients to an activated sludge plant is a ratio of:

100 BOD: 5 Nitrogen : 1 Phosphorous

Bridgend mill uses Omex Nutromex P as a source of nitrogen and phosphorus.

The majority of the nutrient will be taken up by the biomass and is so removed from the system in the surplus sludge.

Excess nutrient can lead to breach of ammonia consent and denitrification at the FST, which can lead to nitrogen build up in the flocs of the blanket, which will in turn cause the flocs to rise to the surface of the FST.

Dosage is via P1 or P2 nutrient dosing pump and is increased or decreased according to laboratory results of primary and final effluent testing.

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Increase and decreases in nutrient addition should be done in small steps of 5 – 10% of existing dose, as small changes to dosing can lead to significant changes in residual levels

A small residual of Ammonia is required in the final effluent test to ensure that the biomass is receiving enough supplements ~0.01 – 0.1Mg/l

Consent on Ammonia is 1.0mg/l

Action should be taken to reduce dosage at 0.6mg/l

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ANALYTICAL TEST METHODS

The following test methods are available in [S:\Environmental\Environmental Mgt System \(EMS\)\4.4 Implementation and Operation\4.4.6 Operational Control\Effluent Test Methods](#)

- **ETM001** – Ammonia concentration
- **ETM002** – Nitrate concentration
- **ETM003** – Phosphate concentration
- **ETM004** – Iodine concentration
- **ETM005** – Bromine concentration
- **ETM006** – Free Chlorine concentration
- **ETM007** – Oil & Grease contamination of watercourses
- **ETM008** – Stirred Specific Volume (SSV)
- **ETM009** – Mixed Liquor Suspended Solids (MLSS)
- **ETM010** – Free Halogen concentration
- **ETM011** – Determination of suspended solids in effluent

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Ammonia

To comply with the variation to our IPPC permit No. BJ5805 Bridgend paper mill is required under the amended permit (commencing 02.11.11) to conduct a daily test on the final effluent from the plant to ascertain ammonia concentration (in the form ammoniacal nitrogen). Maximum values are reported to the EA within the quarterly returns report.

Note

The permit has a consent level of **1.0mg/l** over the weekly rolling average.

The operating levels are set between 0.01mg/l and 0.6mg/l

The laboratory normally takes care of ammonia testing and controlling, but in the event of the results being higher than 0.6mg/l at weekends, inform the mill manager, who will take measures to reduce the ammonia levels to normal operating range.

Check List

Check the ammonia level of the incoming waters i.e. River Llynfi at the abstraction point and Nant Gwyn (if it is being used).

Measure the Nutromex (nutrient) dosing

Check the BOD plant for any pump and or motor malfunction

Check the MLSS (mixed liquor suspended solids) and RAS (return activated sludge levels

Current and historic results are stored on the mill computer system:

[S:\Green Dragon\Supereffluent \(year\)](#)

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Microbiology of the BOD plant

The microbes that make up the activated sludge are too small to be seen with the naked eye and must be viewed using a microscope. The organisms used at the BOD plant are mainly Bacteria (bugs) they are widespread and diverse and are the 'workhorse' of biological wastewater (effluent) treatment.

Activated sludge organisms derive both their energy and carbon from food i.e. organic contaminant of the effluent.

Microbes grow very quickly if conditions are correct. They reproduce by binary fission i.e. they split in half and make two identical copies. The time taken to grow then split into two identical copies under good conditions is usually around 15-45 minutes. One of the factors constraining this exponential growth is source of food. If the food is scarce growth slows (f/m ratio).

The condition of activated sludge can be established by simple microscopic investigation. To investigate sludge floc structure a microscopic magnification of 100x or 200x is adequate. The characterisation of sludge tends to be subjective, so regular microscopic investigations are important to become familiar with the microbiology of the plant and become receptive to subtle changes within the system.

Information obtained from such investigation can be:-

- Form and structure of flocs
- Type and quantity of filamentous organisms
- Number and type of protozoa and higher life forms

Activated sludge floc comprises of:-

- Living organisms (mainly bacteria)
- Dead cells
- Undigested large organic fragments e.g. paper fibres trapped in the flocs
- Inorganic materials – grit, chalk, clays etc.

A good sludge would have a diverse life forms with a mixture of protozoa and metazoa with a variety of filamentous bacteria that will effectively bind the floc structure.

For microbial identification refer to appendix 3.

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Mechanical and Electrical controls

PROCEDURE BOD PLANT SHUT DOWN AND START UP

The BOD plant normally operates in full automatic mode. Each major function has back-up facility to preclude, as far as possible, the accidental shut down of the plant. However, the plant requires an orderly shut down for extended periods of zero effluent flow e.g. holidays of more than 7 days. During such times it is important that the activated sludge is kept 'healthy'.

SHUT DOWN PROCEDURE

1 Switch the Main inlet screw pump M1 to AUTO for the duration of the shut. This will ensure that any extraneous waters entering the system will not overflow the default level and discharge to river via the ditch bypass.

2. Switch off the two duty rotors and switch on the two standby rotors to keep the sludge mixed and aerated.

3. Switch of Blowers.

4 Leave RAS pumps in Auto Mode –M10 and M11.

5. Leave Final settlement tank bridge running – M8 and M9.

6 Turn off the nutrient pumps -PI and P2.

7. Switch off SAS pumps, Pumps 3,4

8. Switch off any other chemical dosages to plant (if being used)

The Biox will continue to run until the final effluent chamber is empty whereupon the low water protection switch will trip the unit.

NB

When the plant is shut, ensure that the effluent is switched to 100%recycle at the effluent distribution box

START UP PROCEDURE

1. Allow mill effluent to flow through the plant.

2. Return MI to 'MANUAL' operation.

3. Return rotors M4 and M7 to 'Manual' and M5 and M6 to 'AUTO' mode.

4. Restart air blowers

5. Switch on Nutrient pumps PI or P2. (Manual Mode).

6. Start up the BIOX 1010 unit

7 Restart chemical dosing if necessary

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Leave the effluent on 100% recycle until the plant has settled and all parameter are within consents

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Procedure For Recycling Effluent at Bridgend Paper Mill ETP

Bridgend Paper Mill aims to reduce overall water use at the mill.

To keep in line with the IPPC (Integrated Pollution Prevention and Control) guidelines and a benchmark of 20m³/te, (based on effluent discharged to the river Llynfi), the recycling or closing up the water system is the simplest way of reducing water figures to within the benchmark figure.

Reasons for recycling

There are two main reasons for recycling;

1. To reduce overall water consumption
2. To protect the river from contamination when the effluent is out of consent, set out in our licence to discharge.

Recycling more than 50% for prolonged periods can cause process issues within the plant and must be monitored closely.

Restrictions

Closing the system (recycling) increases the demand on the disinfection systems and extra vigilance is required to ensure that biocide residual levels are maintained within the set limits. Conductivity, hardness, alkalinity and COD of mill water are likely to increase and should be monitored frequently.

Normal running

During 'normal' running, effluent should be recycled back to the River Pump House at a rate that ensures that:

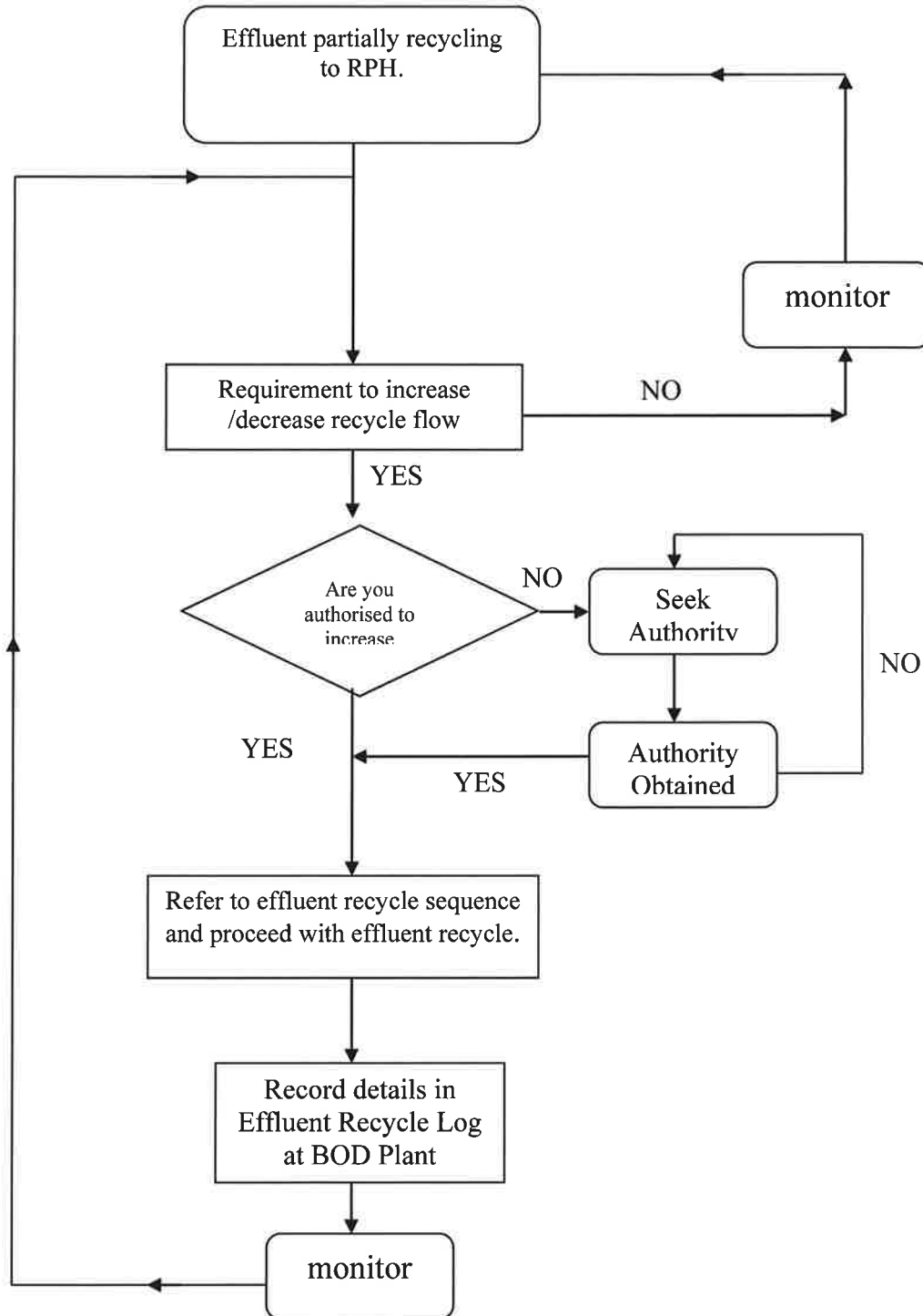
The overall discharge from the plant to the river Llynfi does not exceed the 17500m³/day i.e. average flow of 730m³/hour

Procedure

Refer to flow chart.

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EFFLUENT RECYCLE FLOW CHART



Authorised Personnel

Papermaking manager
 Process Technologist
 Mill chemist
 Process engineer
 Shift manager
 Water filtration plant operators

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VALVE SEQUENCE FOR EFFLUENT RECYCLE AND DISCHARGE

Sequence for 100% Recycle

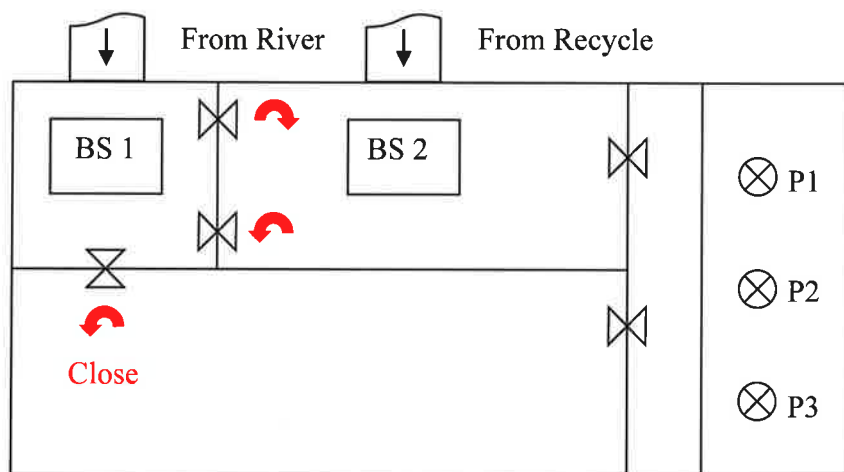
Open Penstock 9
Close Penstock 6

At the River Pump House

To ensure that no recycled water backflows into the river at the River Grid (abstraction point), the following procedure must be adhered to.

Close all 3 valves around Brackett Screen 1.

See Below:



If Nant Gwyn flowing to River pump house

As Above **plus** divert Nant Gwyn flow to River Llynfi as follows:-

Open Penstock 8
Close penstock 7

Partial Recycle (normal running)

Penstock 9 partially open (approximately 2½ turns)
Penstock 6 open full

Nant Gwyn may or may not be flowing through recycle channel. If too much flow for both flows, divert Nant Gwyn flow to River Llynfi as above.

Increase to Partial Recycle

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If partial recycle is required open Penstock 9 in increments of ¼ turn of the valve.

Discharge to River

If an increase in discharge or 100% discharge is required, the above procedures should be followed, but the sequence for the penstock adjustments reversed.

Emergency Procedure

In the event of a major spillage, or when effluent is out of consent, e.g. sludge blanket lift, high or low pH or high suspended solids and high BOD, the priority is to contain the effluent within the mill regardless of conditions at the mill.

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Emergency Procedure

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BOD PLANT BLANKET LIFT PROCEDURE

If a HSB (High Sludge Blanket) alarm is activated at the security gatehouse, a visual inspection of the BOD plant is necessary to determine whether the clarifier sludge blanket has lifted.

Security officers must contact one the following:

Between 08:30 and 16:30

	Extension	Mobile
Technical manager	4595	07967 124 572
Mill chemist	4615	07968 086 834
Process technologist	4519	07891 537 190
Day operator	4584	07967 886 139
Shift manager	4613	07974 768 648

Outside these hours, the shift manager is responsible for the operation of the plant

If on inspection from the FST bridge, no blanket is visible, remove and clean the sensor in the clarifier then reset the HSB warning light in the switch room. No other action is required. However if the blanket has lifted significantly or indeed has overflowed the clarifier launder and is being discharged to river, then the following procedure should be implemented **immediately**, as our priority in this situation is to protect the river from pollution.

1. Recycle final effluent 100%, ensuring that the river is isolated. Make sure Nant Gwyn discharges to river as normal. These actions will protect against polluting the river.
2. Stop the flow into the balance tank at MH1, this will automatically start the primary effluent bypassing the plant and in turn recycling via the recycle channel.
3. For reducing the level in the oxidation ditches quickly, shut off M1. Be aware that M1 can only remain off until the balance tank is full to ground level.
4. If necessary, increase the RAS flow by opening the bell mouth.
5. Isolate the RPH from the river to prevent unauthorised discharge from the mill at the RPH.
6. A detailed inspection of the plant is now required, to ascertain the cause of the blanket lift before any remedial action can be taken as there can be several causes of blanket lift.

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PARAMETERS TO CONSIDER WHEN ASSESSING PLANT

1. Flow – has the plant become unstable due to excessive hydraulic load
2. Nutrient levels – Is the clarifier denitrifying and causing the sludge to lift with the gas
3. MLSS/RAS ratio / concentration – Is the plant overloaded with sludge or is there enough sludge to form a blanket?
4. Sludge make up – What type of bacteria is the sludge made up of ? Is there an excess of filamentous?
5. DO levels. What is the oxygen concentration of the oxidation ditch?
6. Toxic shock – Has anything been released to drain from the mill that may have killed off the plant or caused the sludge to rise
7. F/M ratio – Is the plant being underfed or overfed?
8. Mechanical / electrical breakdown.- Is there a breakdown or malfunction of any part of the plant that may give rise to the poor settlement?
9. Recent historical data – what has been happening on the plant during the past month?

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Standard Procedure for Control of Run off Waters from a Major Fire at Bridgend Paper Mill

1. INTRODUCTION

In the event of a major fire, it is imperative that the watercourses within the mill and its immediate boundaries are protected from contamination by the run off water from fire fighting.

All steps must be taken to ensure that run off waters are contained within the mill effluent system.

In the event of there being a risk of run off water contaminating the Nant Gwyn, the following two stage procedure must be implemented.

2. SCOPE

This procedure covers any such incident within the Bridgend Mill site.

3. RESPONSIBILITY.

The Mill Controller (Normally the Shift Manager) is responsible for ensuring that this procedure is followed. He will call for the support of other personnel as required.

4. PROCEDURE

Procedure 1 - Amber Alert

1.a. The mill controller will monitor the run off water from fire-fighting activities.

b. If after assessment there is a risk of contamination.

2. Inform the Environment Agency of the situation (EA incident hotline 0800 807060). Inform Technical Manager, Effluent Plant Supervisor and J Rota operatives (if incident occurs during the day).

4. Instruct the shift technician to divert the Nant Gwyn flows to the River Pump House, using the following method: -

At the diversion box at the BOD Plant. (diag.1)

- i. Shut Penstock 9
- ii. Open Penstock 6
- iii. Shut Penstock 8
- iv. Open Penstock 7

(All effluent will now be discharged leaving higher capacity for capturing total Nant Gwyn flow)

Flows to be monitored at the final effluent outfall and River Pump House abstraction grid.

Procedure 2 must be implemented if: -

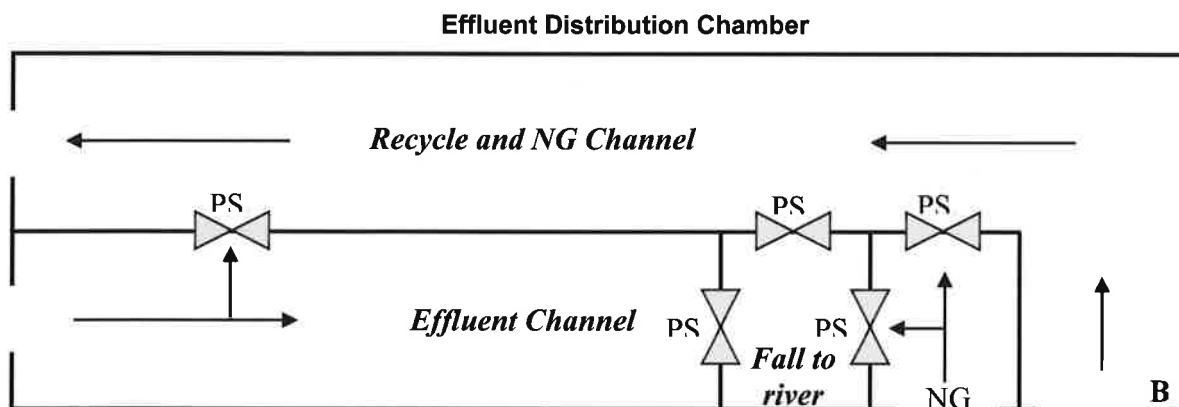
- i. The fire is deemed to be major and fire fighting extensive with risk of contamination of both Nant Gwyn and River Llynfi.
- ii. After procedure 1, there is further risk of contamination of the River Llynfi by fugitive emissions.

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Procedure 2 – Red Alert

1. Switch the river pumps to manual control to override level controllers (see river pump override procedure below)
2. Ensure that all Nant Gwyn water is pumped through the mill influent and effluent systems
3. Monitor flows until fire fighting has ceased and all risk of contamination has subsided.

Diag.1



River pump override procedure

Override inverter-driven river pump P3

1. Select Main menu
2. Select F2 – River Pump House
3. Select F1 Pump control
4. Select Pump P3, Click MANUAL
5. Increase set point (S/P) to 100% using the + icon

Monitor evacuation of water from river pump house. If insufficient, start river pump P2:

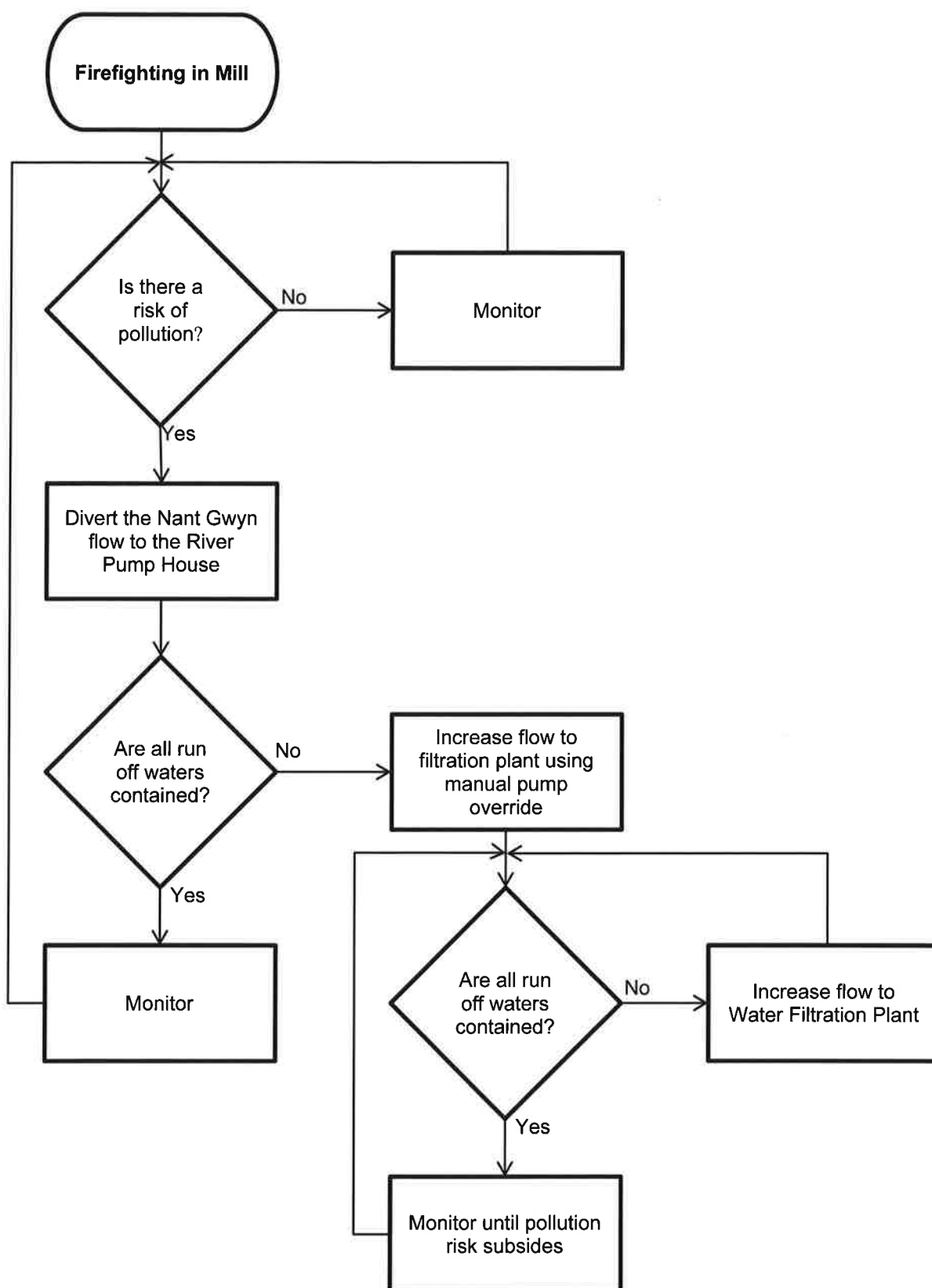
Start river pump P2

1. Select Main menu
2. Select F2 – River Pump House
3. Select Pump P2
4. Click START (The RUNNING box will flash red).

Pump P2 is not inverter-driven and pulls a fixed flow of 6000 l/m. Pump P3 may need its set-point lowered after starting P2. Monitor and adjust regularly throughout the incident.

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5. Procedure in event of Firefighting



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Problem Solving

What can go wrong?

Since the BOD plant is a dynamic living system, there can be a delay from the initial cause to seeing an effect and consequences within the plant. The time delay can be as long as a few weeks, with a gradual change in mixed liquor populations or as sudden as when the plant is subject to toxic shock.

Problems on the plant follow the path:



If the plant performs badly, the final effluent will eventually suffer. BOD, Suspended Solids, pH and Ammonia levels are all likely to be affected.

If poor performance is noticed, the effluent must be put onto 100% recycle until such time that the effluent is within consents and settled

Toxic Shock

Some chemicals used in the papermaking process could have a serious effect on the activated sludge plant if they were released to drain in large quantities or even at a lower release rate over a longer time, though the latter is unusual.

There is potential for the biomass of the plant to be either inhibited or even killed off. In either case the final effluent quality is likely to suffer. If the biomass is inhibited BOD removal decreases with a subsequent effect on effluent quality. In the event of a total kill of the plant, the plant would require reseeded with activated sludge.

Accidental spills in the mill will cause problems at the plant and all steps must be taken to ensure that any such spill is cleaned up and disposed of in a correct manner and not washed to drain.

If poor performance is noticed due to toxic shock, the effluent must be put onto 100% recycle until such time that the effluent is within consents and settled

Foaming

Two types of foam can occur at the BOD plant:-

1. Foaming caused by chemical applications at the mill
2. Biological foaming caused by the growth of certain filamentous micro-organisms.

Chemical foaming caused by process activities can be controlled by the use of defoamers at the balance tank that will suppress foam production and dissipate any foam that may have built up.

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Foams are generally chemical initiated and foam up as a white froth at the balance tank and in severe cases at the final effluent.

Slight foaming on the river is normal. This is due to the mixing effect as the effluent hits the river. Normally this will dissipate at 20 – 30metres downstream of the discharge. If foaming becomes more severe defoamer must be used (described below).

If foaming is left untreated the foam becomes brown in colour as the activated sludge organisms become trapped. This can stabilise the foam and lead to significant problems. It is possible for filamentous organisms to grow in the foam and could lead to high suspended solids as the foam breaks up in the final effluent.

Defoamer Use

To add defoamer to the ETP, an IBC of suitable defoamer is set up on a bund near the ditch weir. There are 110v power sockets at that location for a small, outdoor chemical pump. Defoamer is pumped into the weir.

The defoamer pump should be started at a low setting and adjusted accordingly based on the status of the foam.

Denitrification

Can be caused when too much Nitrogen is present in the waste water or produced from ammonia by nitrifying bacteria.

Denitrification can occur in the FST. The Nitrogen gas bubbles become attached to the biomass and can cause the sludge to rise. This can give rise to pinfloccing in the final effluent or worse can cause the biomass to lift in the FST.

Control of Denitrification

1. Control of nutrient addition
2. Maintain a good oxygen level in the mixed liquor flow to the FST

Filamentous Bulking

The most troublesome microbial problem for the BOD plant is filamentous bulking. Filamentous bulking is a gross change in the bacterial ecology of the plant whereby the filamentous bacteria dominate such as *Mithothrix parvicella*, *Sphaerotilus natans* and *Halocomenabacter hydrosis*.

These types of bacteria prevent the usual floc forming. As a result, the sludge becomes difficult to settle and 'bulks'. This is seen in very high SSVI levels and ultimately the FST blanket can reach the top of the tank and can potentially overflow to the final effluent.

There are several causes of filamentous bulking, but it generally occurs when conditions in the plant are poor. The shape of the floc, long and thin (like cotton) and has a large surface area. This large surface area enables it to absorb food and nutrient much easier than protozoa and metazoa or round floc forming bacteria. In poor conditions the filaments will grow and multiply at a faster rate changing the ecology of the plant.

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Some common causes of increased filamentous growth:-

1. Nutrient imbalance – Nitrogen and phosphorous deficiencies
2. Low dissolved oxygen – Oxygen is a vital nutrient and should be maintained at 1 – 2mg/l
3. Slow degrading carbon sources – e.g. starch or paper fibres. High starch uses at the mill could lead to a carry over into effluent streams. Inefficient sludge removal at the primary treatment stage could again lead to carry-over into the BOD oxidation ditch.
4. Intermittent flow and load– If the load varies to the plant it could lead to periods of overloading or under-loading.

Remedial Actions and Controls in the event of filamentous bulking

Long term control of filamentous bulking can be achieved if the cause is identified, but short term control can be gained by the following:

1. Lower the mixed liquor suspended solids to achieve more settlement in the FST
2. Treat the plant with sodium hypochlorite, as the filamentous are primary feeders and more exposed the kill can be effective
3. Treat plant with selective biocides i.e. biocides that will only kill the filamentous.
4. Dose with coagulants such as PAC (Polyaluminiumchloride) to increase settlement.
5. Bio-augmentation

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Appendix 1

Start up Procedure for Effluent Treatment Monitoring System

If the power is lost to the monitoring system, the system will require manual rebooting.

Procedure

1. Press the on/off button on the front of the computer
2. Enter User name: User Password: User

The system will automatically find the RS View application

If the system appears to lock when in the main page then:-

3. Click on security
4. Enter Username: Ian Password: Ian

The system should now be active

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Appendix 2

Procedure for Responding to Effluent Monitoring System Alarms

The effluent monitoring system situated at Jupiter machine control room is a comprehensive monitoring system for overseeing the process activities. There are several pages that show Plant overview, process trends, plant status and plant alarms. In addition to this, all trends and alarms are captured in the PI system.

In order to comply with the IPPC permit No. BJ5805ix, Bridgend Paper Mill **must** monitor the effluent treatment plant 24 hours a day seven days a week. During normal working hours this is overseen by day personnel. Out of hours monitoring is done by shift personnel. **All** problems with the system must be reported immediately

Records of alarms are automatically recorded in PI.

Note - Alarms are stored on the PC, but **do not** alert the user to an active alarm.

Procedure

1. F12 main menu
2. Scroll through Trends, Status and Alarm pages noting any alarms or high/low levels, trips or adverse trends
3. If an alarm, tripped motor is identified, or a trend is nearing consent, visit effluent treatment plant and take appropriate action.
4. Make notes of alarm and action taken in the monitoring log
5. If further action/backup is required, contact day personnel on emergency contact numbers (These numbers are held by the mill shift manager).

Permitted levels

	<u>Minimum</u>	<u>Maximum</u>	<u>95%ile</u>
BOD mg/l	n/a	10mg/l	5mg/l
Suspended Solids mg/l	n/a	40mg/l	25mg/l
pH	6.5	8.0	n/a
Temperature ° C	n/a	25	Daily Average
Discharge Flow m ³ /day	n/a	17500	n/a
Ammonia mg/l	n/a	1.0	n/a

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Sludge Identification

6 Protozoa and metazoa

Protozoa, and frequently also metazoa, are almost always present in activated sludge. Some species are attached to the flocs whereas others are free in the water between the flocs. These organisms are (much) larger than bacteria, their 'length' varying from 10 to 10,000 μm (table 2). In addition, they also possess a characteristic shape. On account of the combination of characteristics, they are very conspicuous on a microscopic slide.

Table 2 Order of magnitude of (micro-)organisms in activated sludge

Group	Cell length (μm)	Remarks
bacteria	1–5	occasional colonies or filaments
protozoa		
-flagellates	10–30	occasional colonies
-amoeba	30–400	
-testate amoeba	30–200	
-heliozoa	40–200	
-ciliates	25–400 ¹⁾	occasional colonies
metazoa		
-rotifers	100–500	
-nematodes	500–3,000	
-tardigrades	200–1,200	
-worms	3,000–10,000	

¹⁾ A few species are much longer (up to 1000 μm)

Many protozoa/metazoa mainly feed on bacterial cells which are present free in the liquid or at the edges of the flocs. In this manner they remove many bacterial cells that are not firmly bound to the flocs. Free bacterial cells cannot be separated from the treated water through settling in the final clarifier. Protozoa are also indispensable for a far-reaching COD reduction, viz. a clear effluent.

Furthermore, protozoa/metazoa that consume sludge flocs (~ reduction of the sludge production) or consume other protozoa also exist.

The presence of certain species is relevant for the process conditions in the treatment plant. Assessing the composition of the population is, therefore, an important aspect of microscopic sludge investigation. This indicator function is further referred to in paragraph 6.3.

More than 200 different strains can be observed in activated sludge. Identification of these organisms is not really very easy and requires specialist knowledge. It is also unnecessary to identify all of these species for the purpose of process monitoring, distinguishing the most important main groups is sufficient. The following paragraphs contain a short description of these main groups, referring to several species that are regularly observed in activated sludge.

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6.1 Protozoa

Like bacteria, protozoa are single celled organisms. As long as the sludge loading level is not extremely high, they are present in practically every activated sludge. Their population is always much smaller than that of the bacteria. The biomass of protozoa present in the treatment plant comprises, at most, a few percent of the total biomass.

Protozoa are divided into four groups:

- . ciliates
- . flagellates
- . amoeba;
- . testate amoeba;
- . heliozoa

6.1.1 Ciliates

Ciliates are characterised by the presence of cilia (= vibrating hairs) on their cell surfaces. For some ciliates, the surface is completely covered with cilia whereas other species are only partly covered. Ciliates also exist which cilia are only present during a certain phase of their lives.

For many species, the cilia are arranged in a certain manner around the mouth openings. As a result, these cilia make the water flow in their vicinity. They fan, as it were, the food towards their mouth openings. These nutrient particles are subsequently taken up from the water by filtration. In addition, cilia contribute to the locomotion of several species.

Ciliates take in food particles by means of their mouth openings. According to the type of organism, this food can comprise organic fragments as well as bacterial cells or other protozoa. Therefore, predation plays an important part within such a mixed population. Some examples are given below:

- . ciliates that mainly eat bacteria: *Aspidisca*, *Blepharisma*, *Carchesium*, *Colpidium*, *Chilodonella*, *Epistylis*, *Opercularia*, *Vorticella*;
- . omnivorous species that consume bacteria as well as flagellates and small ciliates: *Euplotes*, *Stentor*;
- . carnivorous species that mainly eat other ciliates: *Litonotus*, *Trachelophyllum*, *Hemiphrys*, *Suctorea*.

Bacterial cells transported with the influent form an important source of nourishment for ciliates. Sewage contains some tens of mg/l of bacterial cell material, a level that can also vary markedly according to the type of sewer, the weather conditions, the time of year, etc. The number of cells that are consumed is closely linked to the format of the organism. In this manner, small ciliates consume ca. 10 cells/min., larger ones (e.g. *Opercularia*) more than 10 times as much whereas some nematode strains consume 5000 cells/min. Ciliates mainly exploit their food for the production of new cells. Movement costs little energy. As a rule of thumb, it is reckoned that 50% of the available food is used for cell synthesis.

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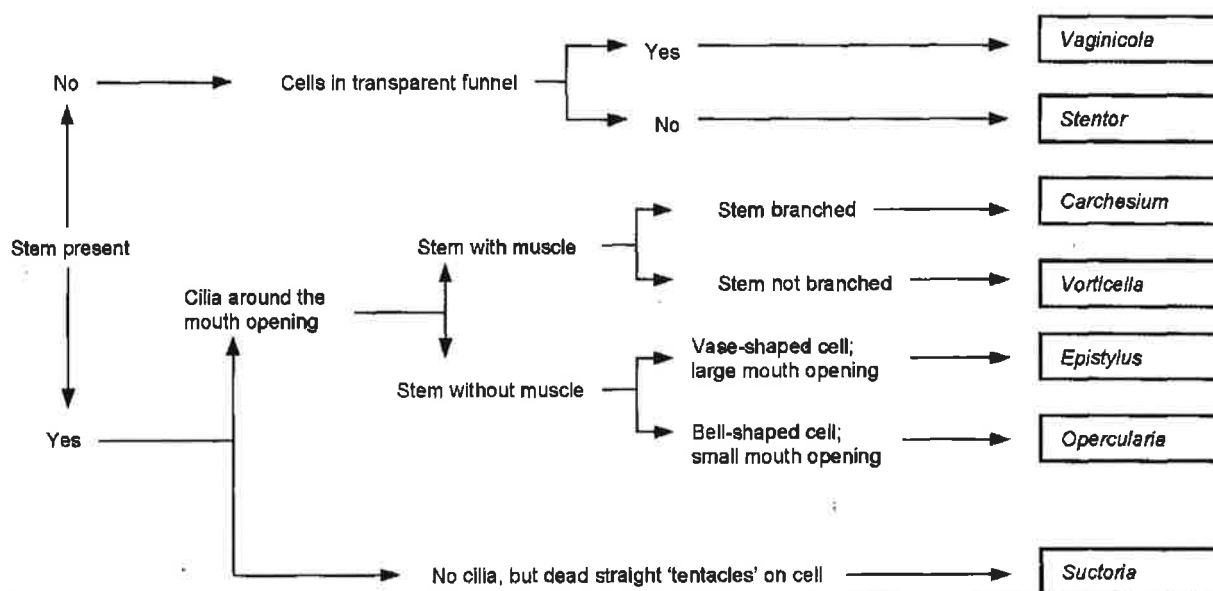
If the oxygen concentration is adequate, the size of the population is principally determined by the sludge load applied and the related sludge age. The population is at its maximum at a sludge load of ca. 0.3 kg BOO/kg MLSS.day (order of magnitude: 10^3 - 10^4 cells per ml). Fewer bacterial cells are available at lower sludge loading levels (floc more robust and relatively less transport with the influent), leading to a smaller ciliate population. At higher sludge loading levels, the sludge age is so short that the relatively slow-growing ciliates cannot be maintained in the sludge any more.

Quantities of thousands of specimens per millilitre are very suggestive of, and lead easily to, an over-estimation of the contribution of the ciliates to the total treatment process. The influence of a given group of organisms is not actually determined by quantity, but in terms of its contribution to the total amount of biomass in the treatment plant. The mass of several strains that frequently occur in activated sludge can vary from 0.1 ng to 10 ng, with peaks to 80 ng for *Stentor roesili*, a 'giant' among the ciliates. With 1 ng and 5000 specimens/ml and a total sludge concentration of 4 g/l, only 0.5% of the total biomass will comprise ciliates. The actual contribution of ciliates (and that of the other protozoa) to the total treatment performance is consequently very subordinate to that of bacteria.

Ciliates are subdivided into sessile (= attached), crawling and free-living species.

6.1.1.1 Sessile ciliates

The cells of sessile ciliates are usually positioned on a stem which is often attached to a sludge floc. The stems are branched in some strains, through which colonies of sometimes numerous cells arise. Fig. 68 represents an identification key for distinguishing sessile ciliates commonly occurring in activated sludge.

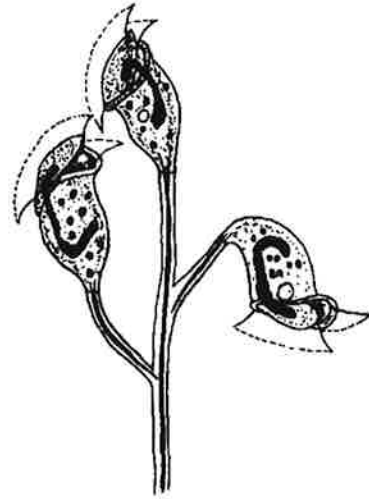


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Carchesium

Carchesium is a sessile ciliate with bell-shaped cells. These cells have a diameter of 50-125 μm . There is a wreath/ring of cilia around the mouth opening and the rest of the cell surface is bare. The stem contains a contracting 'muscle'. The stems are mostly branched, thereby creating colonies. These colonies can reach a diameter of a few mm. The 'muscle' in the stem is interrupted at the points where branching occurs.

Carchesium sp. commonly occur in activated sludge at a sludge load less than ca. 0.2 kg BOD/kg MLSS.day.



Epistylis

Epistylis has somewhat 'vase' -shaped cells. They have a diameter of 70-100 μm . The stem is usually branched, which causes colonies to arise, but does not contain a 'muscle'. Therefore, the stems cannot contract (the cell actually does). The colonies can reach macroscopic dimensions (mm).

Epistylis sp. occur commonly in activated sludge, especially at sludge loading levels of 0.1 to 0.2 kg BOD/kg MLSS.day.



Opercularia

Opercularia has somewhat bell-shaped cells. The cell diameter is approximately 140 μm . The stems are branched, causing colonies to form. A non-contracting 'muscle' is present in the stem. In comparison with the other sessile ciliates, *Opercularia* has a small mouth opening.

Opercularia sp. mainly occur at higher sludge loading levels (0.2 to 0.3 kg BaD/kg MLSS.day).

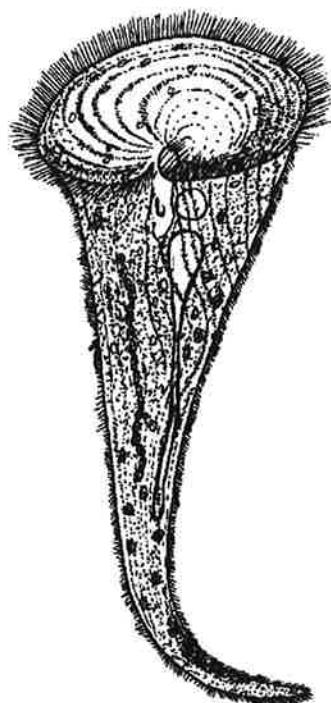


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Stentor

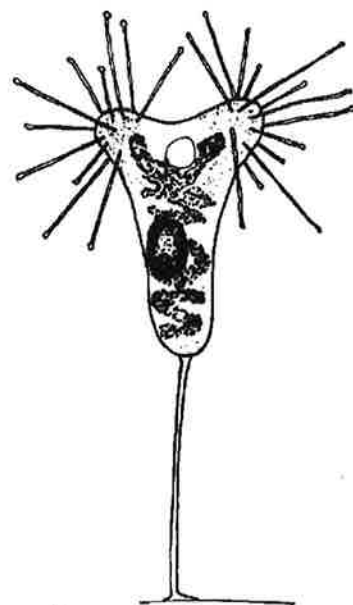
Stentor is a ciliate with a very characteristic trumpet-shaped cell. It is usually, but not always, attached to a sludge floc. A wreath of cilia for transporting water and nutrient particles to the mouth opening is present at the broad extremity. The cell length can vary from 150 to 500 μm . It is, therefore, a large ciliate. *Stentor* does not possess a stem.

Stentor is chiefly observed in low-loaded treatment plants.



Suctoreans

Suctoreans are ciliates, although cilia are absent on adult cells. The cilia disappear when the cell forms a stem with which the organism can attach itself to a surface, e.g. an activated sludge floc. Adults are therefore sessile. Some very characteristic, dead straight tentacles are present on the cell surface. These tentacles are thicker than the straight pseudopoda of the heliozoa. For most suctoreans, a small knob is present at the extremities of all the tentacles. This is a type of mouth for catching protozoa, which are sucked empty. Protozoa form the most important source of food for suctoreans. Depending upon the strain, both round and vase shaped cells can be observed in activated sludge. The cells in activated sludge usually measure 50-100 μm in length.



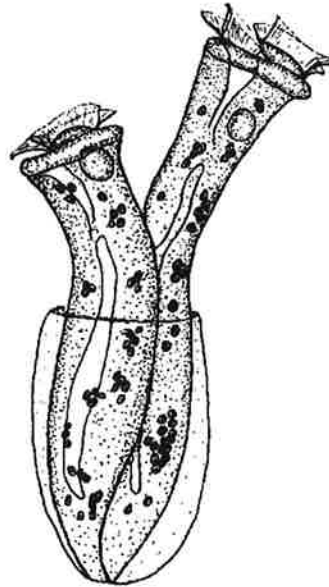
Suctoreans are regularly observed in activated sludge. The population is generally always small.

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Vaginicola

Vaginicola is a sessile ciliate with a trumpet shaped cell. The cell is contained in a distinctly transparent funnel. Two cells are often present in this funnel. The cell can contract, meaning that it can disappear completely into the funnel. A wreath of cilia, which transports water and nutrient particles to the mouth opening, is present on the 'head' of the cell. The cell measures approximately 100 µm in length.

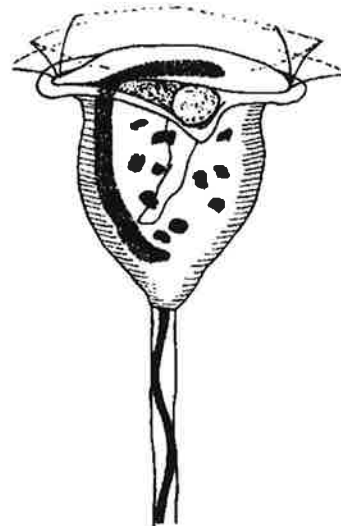
Vaginicola is chiefly observed in low loaded plants (oxidation ditch conditions).



Vorticella

Vorticella is a sessile ciliate whose cells measure 50-150 µm. These are somewhat bell shaped. A wreath of cilia is present around the mouth opening by which the organism directs water (containing nutrients) towards the mouth opening. The stem is never branched, meaning that *Vorticella* is a solitary organism. A contracting muscle is present in the stem.

Vorticella sp. commonly occur at sludge loading levels < ca. 0.4 kg BOD/kg MLSS.day.



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6.1.1.2 *Crawling ciliates*

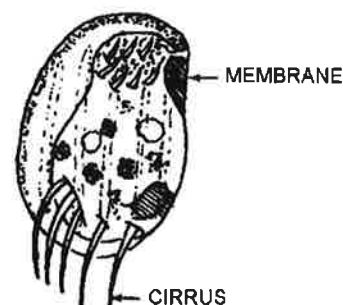
The representatives of this group 'crawl' over the sludge flocs and graze their surfaces. Bacterial cells that are not firmly attached to the flocs are removed in this manner.

Aspidisca

Aspidisca is a ciliate that crawls, often at a high speed, over the flocs. Seen from above, the cell is round whereas the side view is more oval shaped. A distinct mouth opening is absent. Five ridges are present on the 'back'. The cilia are not individually implanted on the body but are present as cirri. Cirri are small bundles of cilia that come to a point and look like small feet. There are seven cirri on the front ventral side and five or more on the back of the cell. The cilia also form a membrane! ('strips' of cilia that are stuck together).

The sizes of the different *Aspidisca* strains can vary from 30 to 50 μm . The very common species *Aspidisca costata* has a diameter of 30 μm . *Aspidisca* resembles *Euplotes*, which is larger (30-100 μm) and does not crawl over the flocs.

Aspidisca occurs very frequently. As long as the sludge load is not too high (<ca. 0.4 kg BOD/kg MLSS.day), this ciliate can be observed in almost every activated sludge.



Onderkant

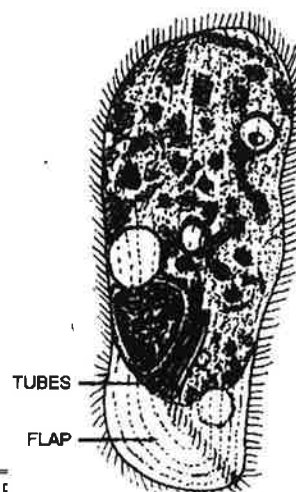


Zij-aanzicht

Chilodonella

Chilodonella is a crawling/grazing ciliate whose most important characteristic is an almost transparent flap on the front side. This flap often curls up when the organism crawls over the floc. Seen from the side, this flattened flap is also clearly recognisable. The mouth opening is surrounded by a bulge in the shape of a short tube. The cell length can vary from 40 to 125 μm .

Chilodonella commonly occurs in activated sludge if the sludge load is < ca. 0.2 kg BOD/kg MLSS.day.



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Trachelophyllum

Trachelophyllum species are characterised by their flat, elongated cells, which are completely covered with cilia. The cilia are longer around the mouth opening and are ordered in a characteristic manner (bowed 'moustache hairs').

Trachelophyllum usually move rapidly through the water between the flocs, but can also be observed crawling over them. The most common representative of this strain is *Trachelophyllum pusillum*, which has a cell length of 30 to 50 µm.

Trachelophyllum is a very commonly occurring ciliate at sludge loading levels less than ca. 0.4 kg BOD/kg MLSS.day.



6.1.1.3 Free-living ciliates

As the name suggests, these ciliates move freely in the water between the flocs. The speed at which they move is highly variable.

Blepharisma

The (light) pink cells of *Blepharisma* are very characteristic. These free moving ciliates have somewhat oval cells of 200 µm in length. A zone with strips of relatively long cilia is present near the mouth opening. The cilia transport water, containing nutrients, to the mouth opening.

Blepharisma is mainly observed at some higher sludge loading levels (0.1-0.4 kg BOD/kg MLSS.day).

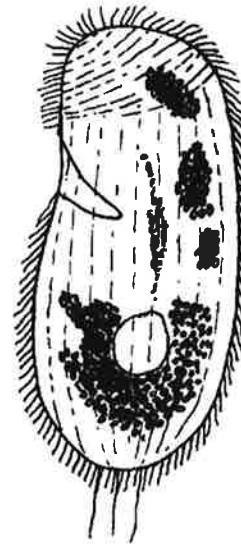


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Colpidium

Colpidium is a free-moving ciliate possessing a kidney-shaped cell. The cell surface is covered with cilia. A few long vibrating hairs are present on the back of the cell. The zone around the mouth opening is dented inwards. The most usual species (*Colpidium colpoda*) has a cell length of ca. 100 µm.

Colpidium is less frequently observed than the other free-moving ciliates. This ciliate probably occurs most commonly at sludge loading levels of 0.1-0.4 kg BOD/kg MLSS.day.



Euplotes

Euplotes is a free-swimming ciliate with oval cells. The cilia are stuck together as cirri. There are nine cirri present on the front side and five on the back. These cirri function as pseudopoda. There is also a characteristic strip of joined cilia present on the cell, which transports nutrients to the mouth opening. Six ridges are present on the upper surface of the cell. The sizes of the different strains can vary from 30 to 100µm.

Euplotes resembles *Aspidisca*, but is usually bigger and is free swimming.

Euplotes commonly occurs in activated sludge, principally at sludge loading levels of 0.1-0.2 kg BOD/kg MLSS.day.



Litonotus (Lionotus)

The cells of *Litonotus* are shaped like a bottle (amphora). The neck, which is almost as long as the rest of the cell, is slightly bowed. The total length of the cell is ca. 100 µm.. The cilia on the outside of the neck are longer than those on the remainder of the cell surface. *Litonotus* usually moves through the water in an 'elegant' manner.

Litonotus commonly occurs in sludge loading levels lower than ca. 0.4 kg BOD/kg MLSS.day.



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Paramecium

Paramecium is a free-moving ciliate whose cells slightly resemble slippers. It is a large ciliate. Cell length can vary from 180 to 300 μm . The cell surface is covered with cilia. The nucleus of the cell is large and usually clearly visible. The contractible star-shaped vacuole is very characteristic.

Paramecium is primarily observed at sludge loading levels of 0.1-0.3 kg BOD/kg MLSS.day.



Spirostomum

Spirostomum has a markedly elongated, flexible cell covered with cilia, with a characteristic vacuole present at the extremity. *Spirostomum* usually moves quickly through the liquid between the flocs. It is the largest ciliate present in activated sludge, the cell length varying from 500 to 900 μm .

Spirostomum commonly occurs in activated sludge, particularly in treatment plants with sludge loading levels less than ca. 0.2 kg BOD/kg MLSS.day.



6.1.2 Flagellates

Flagellates derive their name from the fact that they possess one or more (usually no more than eight) flagella. The flagella are longer than the cilia of ciliates. On account of their rapid movement, the flagella are quite often not clearly visible. The flagella assist the movement of the cell. Some species have a mouth opening with which they can consume nutrient particles such as bacteria cells. Other strains absorb dissolved nutrients through their cell walls. Because of their diameters of 10-30 μm , flagellates are noticeably smaller than ciliates. Therefore, a 40x objective should be used for microscopic viewing.

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Bodo

Bodo is a free-swimming flagellate, which propels itself with a characteristic jerky movement. There are two flagella present, one swimming flagellum and one trailing flagellum at the rear. The flagella are longer than the oval cell. The cell wall is dented at the point where the flagella are implanted. The flagella are not always clearly visible. The cells are approximately 15 µm in length.

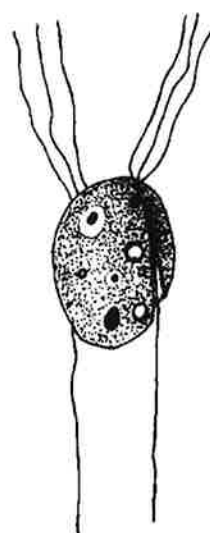
The presence of *Bodo* sp. indicates a high sludge load (> ca. 0.4 kg BOD/kg MLSS.day) and/or a lack of oxygen.



Hexamitus

Hexamitus is a free-swimming flagellate which moves rapidly in a straight line through the water (but does not rotate like *Trepomonas*). There are two groups of three flagella on the front side and two trailing flagella behind. The cell is somewhat oval-shaped and has a diameter of approximately 20 µm.

The presence of *Hexamitus* indicates a high sludge load (>ca. 0.4 kg BOD/kg MLSS.day) and/or a lack of oxygen.



Peranema

Peranema is a free-swimming flagellate with a very characteristic, long, thick flagellum. A second much thinner (trailing) flagellum is also present, but this is hardly ever visible. Only the tip of the flagellum moves when the cell is in motion. The cell is usually 20-30 µm long.

This flagellate is regularly observed in activated sludge. In contrast to most other flagellates, the presence of *Peranema* is not indicative of specific process conditions such as a high sludge load or a lack



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Monosiga

The cell is spherical to oval. A collar is present on its 'top' through which the flagellum emerges. *Monosiga* is usually fixed to a sludge floc. The cells are 1-15 μm in length.

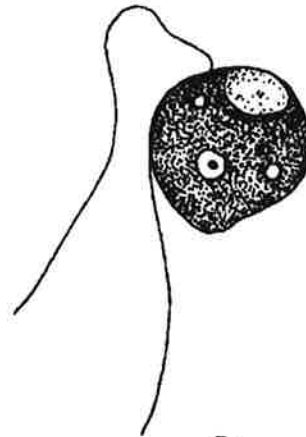
The presence of *Monosiga* indicates a high sludge load (> ca. 0.4 kg BOD/kg MLSS.day) and/or a shortage of oxygen



Pleuromonas

Pleuromonas is a flagellate that moves in a characteristically rapid and jumpy manner. The cells are usually not free-living in the water but are attached to the flocs. *Pleuromonas*, like *Bodo*, has two flagella. The cell is attached to the floc by the longest flagellum. Cell diameter is 5-10 μm .

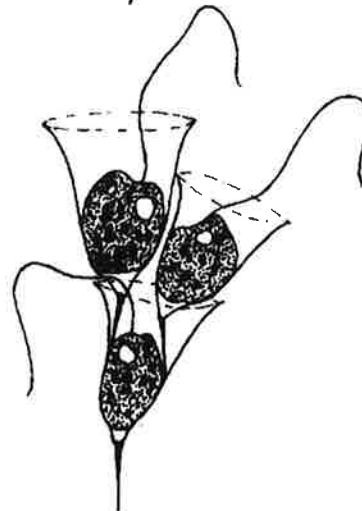
The presence of *Pleuromonas* indicates a high sludge load (> ca. 0.4 kg BOD/kg MLSS.day) and/or a shortage of oxygen.



Poteriodendron

Poteriodendron is a flagellate whose most important characteristic is that it forms colonies of cells. The cells are contained in transparent funnels. These funnels are joined together into colonies by stems on their undersides. The diameters of the individual cells are ca. 20 μm . The cells have a flagellum which allows them to move inside the funnel but they cannot leave it.

Poteriodendron colonies are regularly observed in activated sludge. It is not known if this flagellate can be used as an indicator organism.



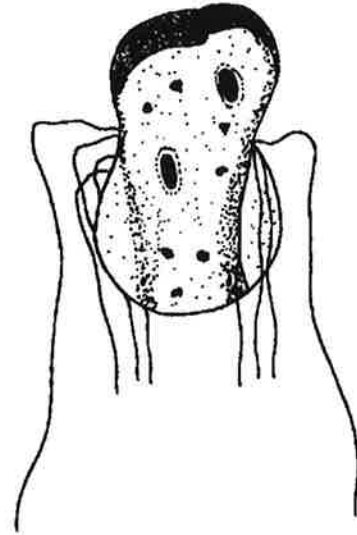
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Trepomonas

Trepomonas is a free-swimming flagellate which moves through the water in a characteristic rotating manner. Seen from above, the cell is oval and from the underside it is spherical. The cells measure approximately 20 µm in length.

Trepomonas possesses two groups of four flagella which are implanted on the side of the cell. Besides two long (20 µm).flagella, six short (8 /lm) ones are also present

The presence of *Trepomonas* indicates a high sludge load (> ca. 0.4 kg BOD/kg MLSS.day) and/or a lack of oxygen.



6.1.3 Amoeba, testate amoeba and heliozoa

These organisms have in common that they can form pseudopoda. These pseudopoda are temporary extensions of the cell content.

Amoeba

Amoeba are single-celled organisms possessing a flexible cell membrane which allows the shape of the cell to constantly change. They absorb nutrient particles (bacteria cells, other protozoa, etc.) by engulfing them. This resembles the uptake of food by a mouth opening. The sizes of the various strains range from 50 to 400 µm. Amoeba can be as big as a sludge floc and their particular structure sometimes resemble sludge flocs. Apart from the odd exception, amoeba move extremely slowly (by means of the pseudopoda).

Amoeba are characteristic of somewhat higher sludge loading levels (0.1-0.4 kg BOD/kg MLSS.day) and/or shortages of oxygen. They are seldom observed in low loaded nutrient removal plants.



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Testate amoeba

In this group of amoeba, the cell is surrounded by a type of shell. There is an opening in the shell through which the pseudopoda can protrude. These pseudopoda are seldom visible on a microscopic slide. The cell form (round, beaker shaped, etc.) depends on the species in question.

Arcella is a testate amoeba with a shell which, when seen from above, is round. The side view resembles the top of a toadstool. The shell has a clearly observable structure. In general, the shells are practically transparent, but in activated sludge they are usually coloured yellow-brown on account of the precipitation of iron compounds on their surfaces. The round opening on the underside of the shell is very characteristic.

The structure of *Euglypha* shells largely resembles that of a honeycomb. The sizes of the various testate amoeba can vary from 30 to 200 μm .

Testate amoeba are almost always present, and often in large numbers, in low-loaded activated sludge plants. *Arcella* is the most commonly occurring species. It mainly occurs under nitrifying conditions.

Heliozoa

Heliozoa belong to the amoeba. They have spherical cells which are surrounded by needle thin, dead straight, retractable pseudopoda. The pseudopoda are not used for propelling the cell but for catching bacteria and protozoa. Organisms that come into contact with the pseudopoda are 'paralysed' after which they are consumed by the heliozoa. The cell diameter can vary from 40 to 100 μm .

Heliozoa are principally observed in low-loaded activated plants. The population is usually small.

ARCELLA
Topview



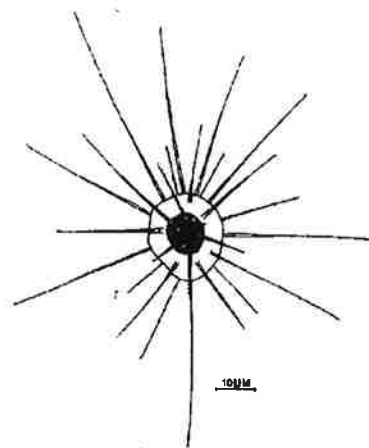
ARCELLA
Sideview



DIFFUGIA



EUGLYPHA



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6.2 Metazoa

In contrast to bacteria and protozoa, metazoa are multi-cellular micro-organisms, meaning that they are 'higher' organisms. The sizes of the different species can vary from 100 μm to sometimes as much as 1-2 cm. Most metazoa feed on free-living bacteria cells or on very small floc particles. Species also exist that can consume whole sludge flocs.

The following metazoan groups can be present in activated sludge:

- . Rotifers
- . Nematodes
- . Worms
- . Tardigrades

Apart from exceptional cases, metazoa play a subsidiary role in activated sludge treatment plants. They are mainly observed at sludge loading levels lower than ca. 0.15 kg BOD/kg MLSS.day. To register the number of metazoa, a scale varying from 0 (= absent) to 3 (= numerous organisms/slide) is used.

6.2.1 Rotifers

Rotifers are relatively large, distinctly mobile and elongated multi-celled organisms. The body length can vary from 100 to 500 μm and is surrounded by a type of armour into which the head and tail can be withdrawn. A few bunches of cilia are present on the head of the organism. These cilia can create a current in the direction of the mouth opening. They have a set of 'jaws' around their mouth openings by which they can crack particles filtered from the water. Particles larger than about 10 μm cannot actually fit in this mouth opening. Rotifers, therefore, principally consume free-living bacteria cells and small floc particles.

The tail is branched in a characteristic manner and is important to the movement of the organism. With this, a rotifer first attaches itself, after which the body is stretched. The tail is subsequently released, the head stays in place and the abdomen is drawn up. This manner of propulsion resembles the manner in which a slug moves.

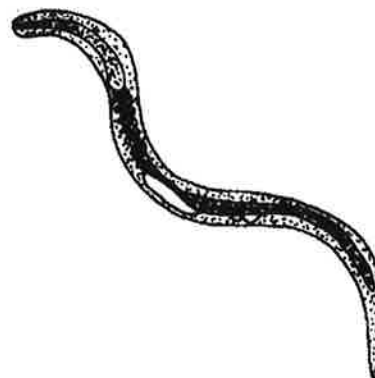
Rotifers commonly occur in activated sludge with low loading levels. The size of the population is nearly always very limited in domestic treatment plants. Large numbers of rotifers are sometimes present in plants treating waste water from the agro- industry.



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6.2.2 Nematodes

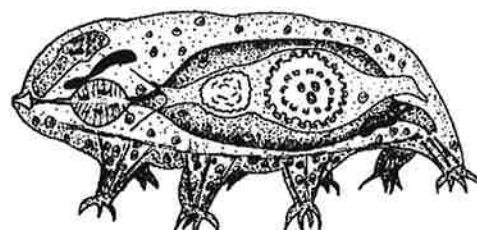
Nematodes have elongated, cylindrical and very flexible bodies. The extremities of this multicelled micro-organism are thinner than its central section. The cell length can vary from 0.5 mm to 3 mm. They are larger than most protozoa. They principally consume free-living bacteria cells and very small floc particles. They swallow/engulf food particles by contraction of the oesophagus. Owing to the fact that they do not possess 'jaws' and that their mouth openings are small, they cannot consume intact flocs. These exceptionally mobile animals are sometimes difficult to keep in focus during microscopic investigation. In addition, nematodes often 'crawl away' into the flocs and it can be a while before they reappear.



Nematodes are regularly observed in activated sludge with a low loading level, but they are almost never present in large numbers. It is not known if nematodes can be used as indicators for given process conditions.

6.2.3 Tardigrades

This is a multi-celled organism with a very striking form. A tardigrade, sometimes known familiarly (to the experts) as a water bear, has pseudopoda with small claws, with which it crawls over the flocs and grazes them. This organism moves around somewhat awkwardly when free in the water. The size can vary from 200 to 1200 μm .



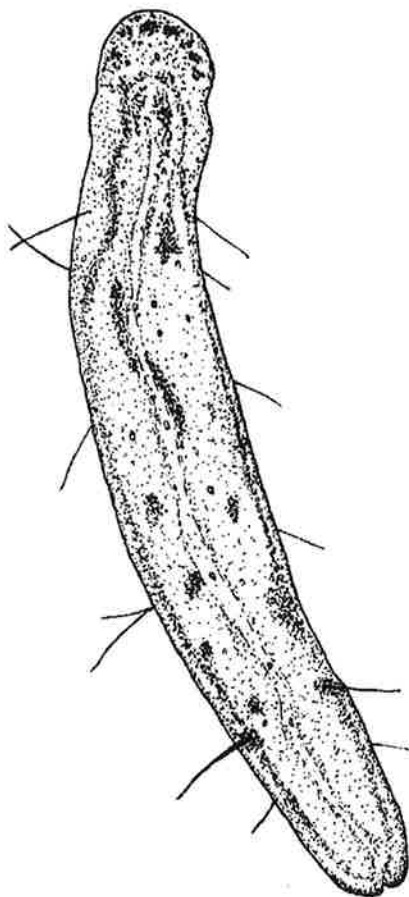
Tardigrades are occasionally observed at sludge loading levels of $< 0.1 \text{ kg BaD/kg MLSS.day}$.

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6.2.4 Worms

Worms are the largest organisms observed during the microscopic investigation of activated sludge. With diameters of approximately 0.1 mm and lengths to a maximum of 10 mm, their presence is very apparent on a wet slide. Oligochaeta are almost always involved, often *Nais elingius* and *Aelosoma* spp. Worms are able to consume sludge flocs or particles of flocs. A worm bloom (ca. 10^5 worms/l) is also connected with a reduction in sludge production.

Little is known about the growth of worms in activated sludge plants. They do not grow particularly slowly. Under the best of conditions they have a generation time of a few days. More than enough nutrients, in the form of sludge flocs, seem to be present. Consequently, one would expect worms to be present in virtually all treatment plants. However, they are not often observed at low sludge loading levels (oxidation ditch conditions). Sludges containing many worms usually originate from treatment plants with a sludge load of ca. 0.1 kg BOD/kg MLSS.day and in which the influent is pre-settled. A definite connection between their presence or absence and the process conditions is usually missing.



6.3 Indicator function

A new activated sludge plant can be started by opening the sewage supply and switching on the aeration system. Sludge flocs subsequently arise spontaneously in the aeration tank. These are removed in the final clarifier and recycled into the aeration tank. By constantly adding fresh sewage, without withdrawing the sludge from the system, the desired biomass concentration can be cultivated within a few weeks. During the start phase, the sludge loading level is constantly reduced and the treatment performance is increased.

A shift within the protozoa population takes place simultaneously, which is actually a characteristic succession of species. Many free-living bacteria cells ($> 10^8$ cells/ml) are present during the first days and the compounds, which have been transported with the sewage, are not yet fully processed by the bacterial biomass. An excess of food for

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flagellates and amoeba is created, and they also develop *en masse*. After a few days also free swimming ciliates appear. The numbers of flagellates and amoeba are reduced considerably thereafter. Because of the increase in the sludge concentration, the sludge load decreases constantly during such an initial phase. A subsequent scarcity of nutrients automatically results in a decrease in the growth rate of the free-living ciliates.

Many species disappear as soon as their population doubling rate exceeds the hydraulic retention time in the aeration tank. At this stage, the ciliates that are attached to the sludge flocs (e.g. *Vorticella*), or those that crawl over them (e.g. *Aspidisca*), appear and, therefore, are not easily washed out. This explains the domination of attached and crawling species at low sludge loading levels. Thecamoeba, and sometimes metazoa, also eventually appear with long sludge ages. By this time, a high level of treatment performance, including extensive nitrification, takes place; the number of bacterial cells that are not bound to the flocs is less than $10^6/\text{ml}$.

Therefore, other strains grow as the treatment performance rises. This fact can also be used in the opposite sense: the presence of certain strains says something about the treatment results and the process conditions.

The connection between the sludge load and the composition of the population is shown systematically in Fig. 69. During the microscopic investigation of the sludge, it should be checked that the species present are characteristic for the load applied in the treatment plant. If the sludge load is not too high, mainly ciliates, testate amoeba and occasionally some metazoa should be present. A shortage of oxygen in a low loaded plant results in a decline of the COD removal rate and causes, therefore, a shift towards flagellates and amoeba within the population

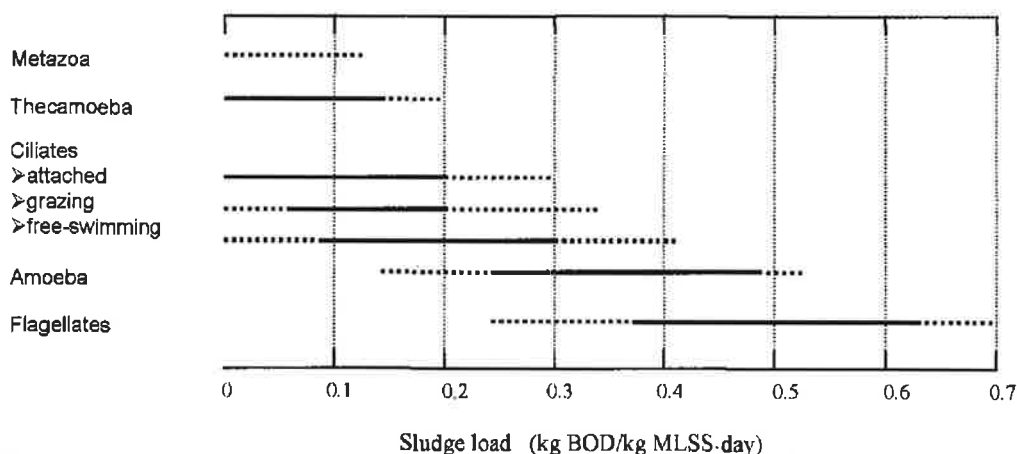


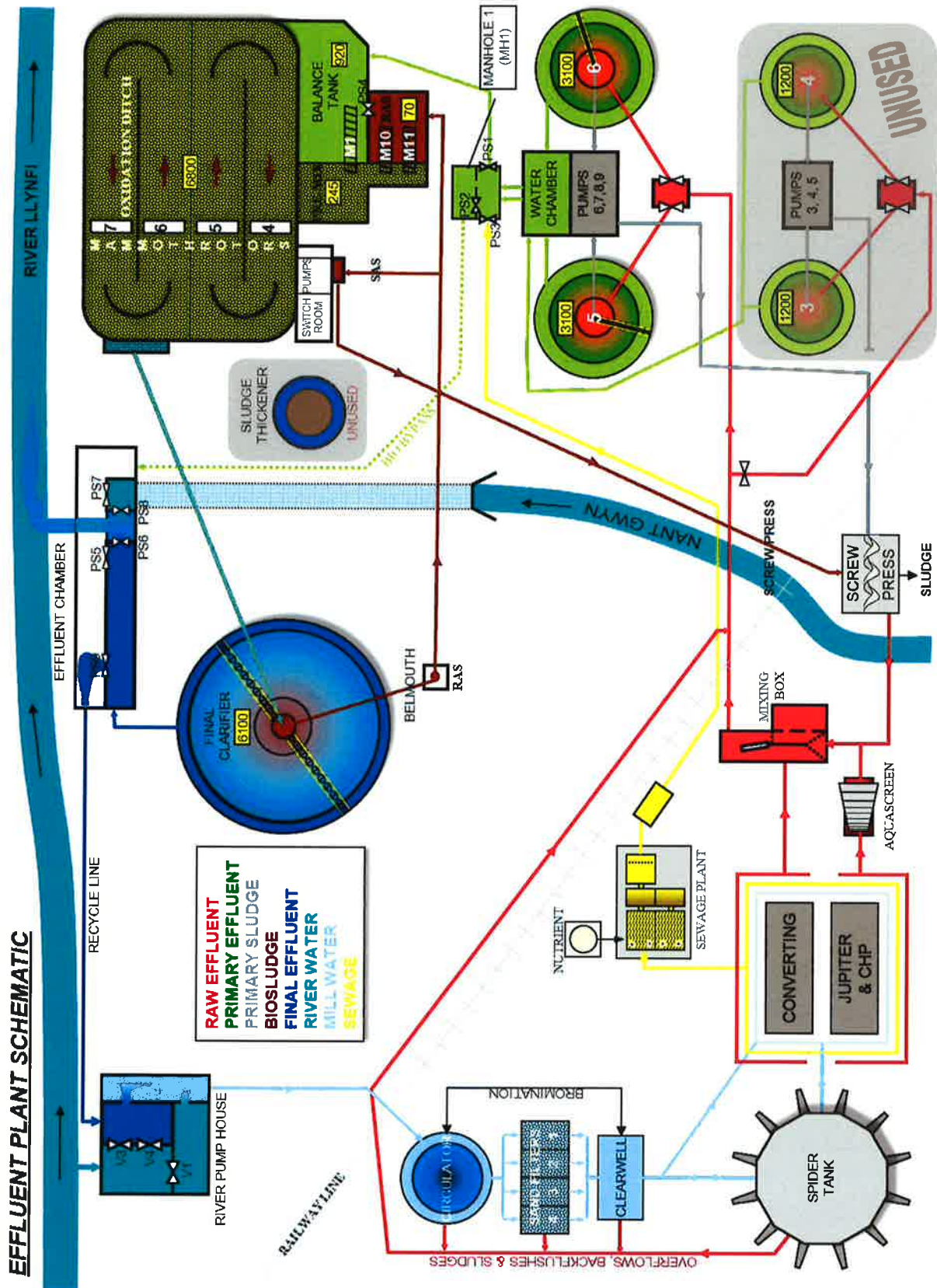
Figure 69 Effect of the sludge load on the occurrence of protozoa and metazoa (no lack of oxygen).

If protozoa and metazoa suddenly disappear, then toxic components are present in the influent. This can be followed within a few days by an explosive increase in the number of protozoa, because the number of free-living bacterial cells has considerably increased during their absence.

A strong increase in the number of worms in activated sludge can cause a decrease in the production of surplus sludge (see paragraph 9.7).

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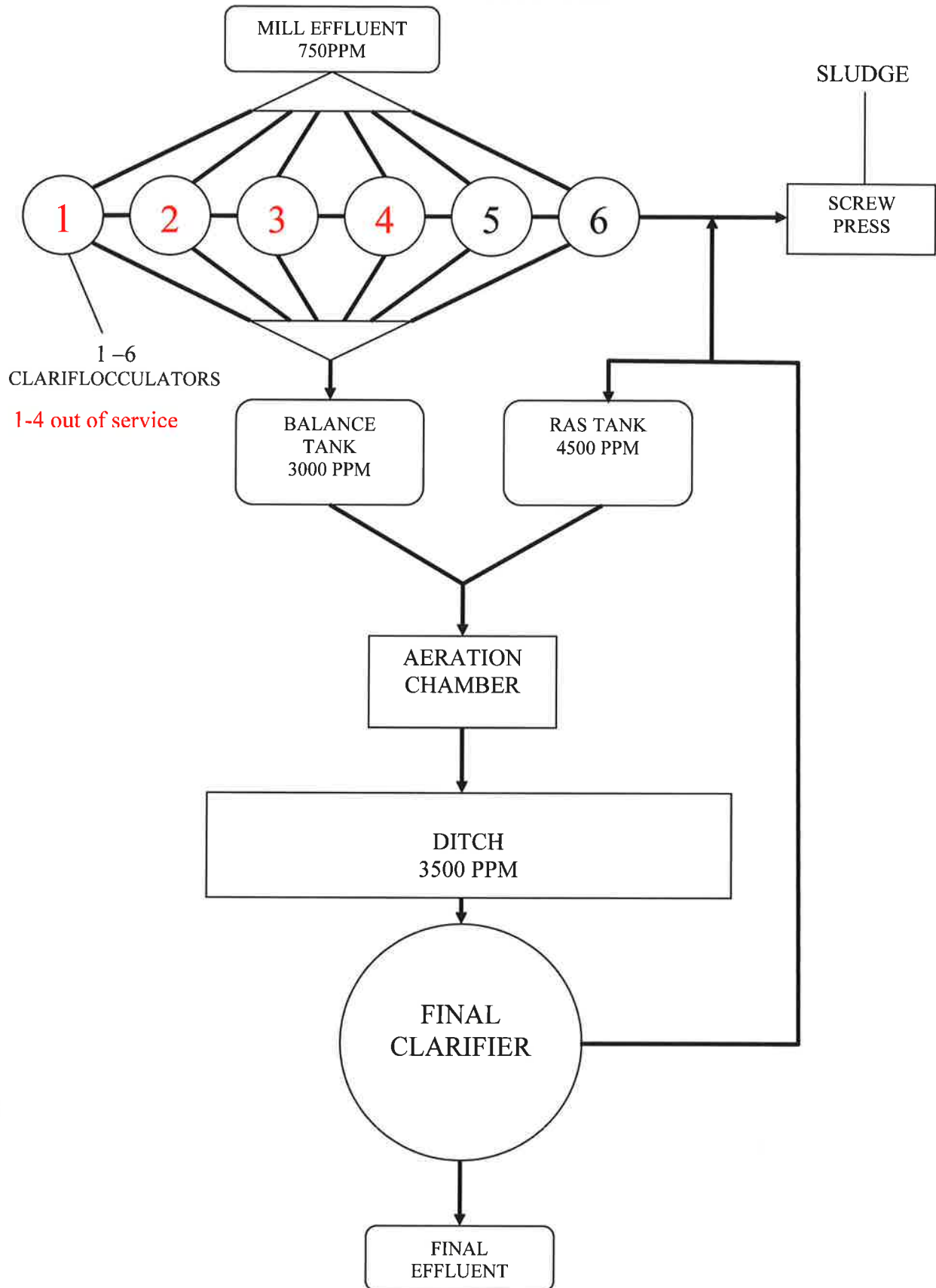
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Appendix 5 Effluent Treatment



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Appendix 6

Procedure for Restarting BOD Plant After Power Dip or Power Loss

On loss of power to the effluent treatment plant, the plant must be checked to ascertain what parts of the plant require resetting and or restarting. Refer to the table below for normal process running conditions.

Pump/Motor	Status	Mode
M1	Run	Manual
M10	Run	Manual
M11	Standby	Auto
M4	Run	Manual
M5	Standby	Auto
M6	Standby	Auto
M7	Run	Manual
M8&M9	Run	Manual
P1	Run	Manual
P2	Off	Off
P3	Off	Manual
P4	Off	Manual
FST Spray	Run	Manual
Biox 1010	Run	
Flow meters	Display value	
Turbidity meter	Display value	
Temperature monitors	Display value	
pH	Display value	
Effluent monitoring system	Reboot	
Aquacell sampler	Run	
Ammonia meter	Run	

All pumps and motors are fitted with a black reset button.
Ensure these buttons are depressed before pressing the start buttons.

On restarting the plant, Monitor the Final Settlement Tank sludge blanket level as increased hydraulic load at start up can destabilise the plant.

In the event of a prolonged power loss (if known) refer to Emergency Power Supply Procedure. [Emergency Power Supply Procedure](#)

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Appendix 7

Security Gatehouse Alarm Summary

Bridgend Paper Mill security gatehouse is the designated area for critical alarms from the effluent treatment plant to alarm to. The alarms are monitored on the GENT system.

All alarms activated on this system must be reported to the duty shift manager immediately for further investigation and remedial action(s).

Below is a list of items from the effluent treatment plant that will alarm on the GENT system:-

HSB – High Sludge Blanket [blanket lift](#)

M1 – M1 Archimedes Screw Pump failure

RAS Sump – High Level in RAS sump indicating potential failure of M10/M11

	Alarm level	Max permitted	
BOD- High BOD level	5mg/l	10mg/l	Quick guide
Suspended Solids – High SS	25mg/l	40mg/l	Quick Guide
PH – High/Low pH	6.6 – 7.9	6.5 – 8.0	Quick Guide
High Discharge flow	15000m ³	17500m ³	Quick Guide
High Discharge Temp	24°	25°	Quick Guide

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Appendix 8

Procedure for Running the BOD plant from Emergency Generator Supply (House Set)

If all power is lost to the site, there is a back up emergency generator supply that has limited supply of power to keep critical plant running throughout the duration of the power supply failure.

The BOD plant is critical to the operation of the mill and must be run continuously to prevent untreated effluent entering the river.

Power on the emergency system is limited to 63amps or 37Kw

Procedure for changing power supply

1. Switch off all equipment at the BOD switch room
2. The Power supply must be changed over at 'Riverside' sub station (this must be conducted by an authorised person only i.e Shift Technician or Electrical Engineer).
3. Shift Technician or Electrical Engineer must then change the supply at the BOD plant switch room from the Main Incomer to Generator Supply

The power supply is now switched over

4. Switch on M1 screw pump ~25amps
5. Switch on M10 or M11 screw pump ~22amps
6. Switch on M8 & M9 ~1amp
7. Switch on M2 or M3 Blower ~3amps

If the power outage is prolonged to a point where there is no effluent flowing from the mill

8. Switch off M1, M10 and M11
9. Switch on M4 rotor

Note

If flow continues through the plants, it will be necessary to keep the screw pumps running. **DO NOT** switch the rotors on if the screw pumps are running as this will overload the emergency generator.

When power is re-established the power switch over must be reversed and plant started as per normal running ([Start up procedure](#))

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Appendix 9

Shift Managers Check /Quick Reference Sheet for Responding to Security Alarms

BOD

Check trends on the Effluent monitoring system at Jupiter control room, or via PI.

Do Trends show high BOD value?

NO.

The problem is probably the signalling between the two systems. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

YES

Check Biox 1010 unit at the BOD plant.

Is the display showing a high value i.e.>5mg/l

YES

Action: Monitor the trend. If the BOD approached 10mg/l put the Effluent to 100% recycle whilst the issue is investigated, call out if necessary and report via environmental near miss reporting system.

NO

The problem lies in the communication between the BIOX 1010 and the Effluent monitoring system. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

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Shift Managers Check /Quick Reference Sheet for Responding to Security Alarms

Suspended Solids

Check SS trends within PI system (or the Effluent monitoring system at Jupiter control room)

Do Trends show high SS value?

NO

The problem is probably the signalling between the two systems. **Action:** Request further investigation from engineering department and report via environmental near miss system.

Yes

Action: Check the probe in the discharge channel for debris (algae/plastics). If debris is found around the probe, remove and replace probe and wait for alarm to reset.

If no debris is found, check the channel for water quality. Remove a sample and examine visually.

If the sample is turbid or contains higher than normal concentrations of suspended solids, **Action:** Put the effluent to 100% recycle while the issue is investigated further and call out if necessary and report via environmental near miss reporting system.

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Shift Managers Check /Quick Reference Sheet for Responding to Security Alarms

PH High/Low

Check pH trends with PI system (or the Effluent monitoring system at Jupiter control room)

Do Trends show high or low pH value?

NO

The problem is probably the signalling between the two systems. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

YES

Check the pH meter at the BOD plant.

Does the meter at the BOD plant show a high or low pH value?

NO

The problem lies in the communication between the pH meter and the Effluent monitoring system. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

YES

Action: Take a sample and check with hand held pH meter (available from Lab)

Is pH outside consent limits? 6.5 & 8.0

YES

Action: Put effluent to 100% recycle, call out if necessary, report via environmental near miss reporting system.

NO

Action: Request further investigation from engineering department and report via environmental near miss reporting system

The pH meters have pre determined shelf lives so holding spares can be an issue. The same type of pH meter is used on the incoming river water. If issues are detected with the effluent pH meter then the incoming water meter can be used.

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Shift Managers Check /Quick Reference Sheet for Responding to Security Alarms

High Discharge flow

Check trends within PI system (or the Effluent monitoring system at Jupiter control room)

Do Trends show high discharge flow value?

NO

The problem is probably the signalling between the two systems. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

YES

Action:

1. Increase recycle rates so that the discharge flow reduces to within acceptable limits and monitor.
2. Check for excessive flows on machines and reduce as far as practicably possible.
3. Check for overflows etc from water filtration plant.
4. Report via environmental near miss reporting system

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Shift Managers Check /Quick Reference Sheet for Responding to Security Alarms

High Discharge Temperature

Check trends via PI system (or the Effluent monitoring system at Jupiter control room)

Do Trends show high Temperature value?

NO

The problem is probably the signalling between the two systems. **Action:** Request further investigation from engineering department and report via environmental near miss reporting system.

YES

Action:

1. Reduce the discharge flow to a level that the Nant Gwyn is effectively cooling the effluent to within consented limit (currently 25°C)
2. Check for sources of heat through machine systems.
3. Report via environmental near miss reporting system.

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High Mixing Box level

When the high mixing box level alarms at the security gatehouse, the shift manager must **immediately** visit the mixing box to confirm the alarm.

If the level is high, there is a danger that the mixing box could overflow to the Nant Gwyn stream.

Immediate action should be taken to reduce flows to the mill and on machine to prevent overflow.

Inspections must be made to check there are no fugitive overflows and close any drains that may be open. This includes water and stock.

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WRT/P201116/1551

1st April 2011

Georgia-Pacific GB Limited
Bridgend Paper Mill
Llangwynydd
Bridgend
CF34 9RS

For the attention of Mr. John Barr

Dear Mr. Barr

Please find enclosed an additional copy of our report on the External Boundary Noise Survey, carried out on the 7th and 8th March 2011.

If you have any queries regarding the enclosed, please do not hesitate to contact the above address.

Yours sincerely

On behalf of ESP Environmental

Robert Taylor
Managing Director

Encs.

Unit 3
Clan Llwyd
Pontardulais Industrial Estate
Swansea
SA4 8SF
01792 881770
01792 883879

Georgia-Pacific GB Limited

External Noise Survey

March 2011

Monitoring Dates: 7th and 8th March 2011

Client Organisation: Georgia-Pacific GB Limited

Client Address: Bridgend Paper Mill
Llangwyllyn
Bridgend
Mid Glamorgan
CF34 9RS

Monitoring Organisation: ESP Environmental Limited

Organisation Address: Unit 3
Glan Llwyd
Pontardulais Industrial Estate
Swansea
SA4 8SF

Date of Report: 16th March 2011

Report Approved by: Robert Taylor

Function: Managing Director

Signed: _____



DOCUMENT CONTROL SHEET

PROJECT: **Georgia-Pacific GB Limited** JOB NUMBER: **P201116**
 TITLE: **External Noise Survey**

Prepared by		Reviewed by		Approved by	
ORIGINAL	Name L. J. Williams	Name W. R. Taylor	Name P. Court	Name P. Court	
DATE	Signature 16/03/11	Signature L. J. Williams	Signature W. R. Taylor	Signature P. Court	Signature P. Court

REVISION	Name	Name	Name
DATE	Signature	Signature	Signature

REVISION	Name	Name	Name
DATE	Signature	Signature	Signature

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Georgia-Pacific GB Limited

External Noise Survey

March 2011

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APPENDIX A	Noise Contour Graphs	
APPENDIX B	Site Layout Map	
APPENDIX C	Calibration Certificates	

1. INTRODUCTION

1 INTRODUCTION

- 1.1 ESP Environmental Limited was commissioned by Georgia-Pacific GB Limited to carry out a background ambient noise survey at various locations around their facility at Llangwynyd, Bridgend. The monitoring programme was carried out in accordance with the scope of work as detailed in our proposal PC/110111, dated 18th March 2011.
- 1.2 Noise measurements were taken during the day time and at night time at the following locations around the boundary of the site.
- Location 1 East corner of site at the Effluent Plant approximately 2 metres from the River Llynfi.
- Location 2 Contractors storage area (known as Soweto) at an elevated position of 4 metres close to the tree line and approximately 80 metres from the factory facade.
- Location 3 Loading Yard in close proximity to borehole 5 at an elevated position of 6 metres close to the tree line and approximately 80 metres from the factory facade.
- Location 4 Rear of the field close to hedgerow, adjacent to the bungalow Tir-iarll, at an elevated position of 10 metres and approximately 100 metres from the factory facade.
- 1.3 In addition the following locations were selected as sensitive receptors and noise measurements taken during the same periods.
- Location 5 Bryllwarch Farm.
- Location 6 Cefn Ydfa Farm.
- 1.4 The object of the survey was to determine the current noise levels. The previous survey was carried out in January 2006.
- 1.5 The survey was carried out on the 7th March and early hours of the 8th March 2011.
- 1.6 Mr. Leighton Williams carried out the survey. Leighton has several years experience in noise level monitoring and is considered to be a competent person to carry out this task.

2. NOISE CRITERIA

2. NOISE CRITERIA

2.1 The survey was carried out in accordance with BS 4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas". This method describes the procedure for assessing whether noise levels from factories and industrial premises are likely to give rise to complaints from people residing in neighbouring buildings. In general, noise is likely to provoke complaints whenever its level exceeds the background by a specified margin.

a) The measurement of specific noise levels

This requires a measurement of the equivalent continuous sound pressure level (L_{Aeq}), at a position 3.5 metres from the façade of the affected building. The measurements should be made at a position 1.2 to 1.5 metres above the ground and at least 3.5 metres from any reflecting structure, other than the ground or façade in question. The use of a reference time interval of 1 hour during the day and 5 minutes during the night is applied, although shorter sampling times may be used where the noise is steady, cyclic or repetitive.

b) The measurement of background noise levels

The standard BS4142 details L_{90} as the background noise. This is not a measurement. Basically, the L_{90} is a statistical exceedance calculation based on a distribution of the noise level sampled during the measurement duration.

The CIRRUS CR 831B instrument used for the survey samples the sound level quickly at 256 times per second. These samples are put into a distribution bin each time a sample is taken. The CR 831B has 1400 bins, each representing 0.1 dB between 0 and 140 dB. Each time a sample is taken a count is put into the appropriate bin. If for example the sample is 50dB then a count is added to the 50dB bin.

For the L_{90} exceedance level the instrument will look to find where the boundary between 90% and 10% of the counts occur. In the case of the L_{90} , the boundary point is 23,040 samples. By counting from the start of the bins, the instrument will count the total number of samples until it has counted 23,040 samples. The bin in which this sample occurs is the L_{90} value in dB.

c) Determining the rating level

This is the specific noise, plus an addition of 5dB(A) if the character of the noise is irregular enough to attract attention or unpleasant. For example if the noise contains a whine, hiss, screech, hum or bang, clicks, clatters or thumps.

d) Assessment of the noise

Calculate the difference between the rating level and the background level. The following Table will determine the likelihood of a complaint

Difference between the rating level and background level (dB)	Assessment
-10 or less	Positive indication that complaints are unlikely
+5	Marginal significance
+10 or greater	Complaints likely

In general, the lower the value of this difference, the less likelihood of a complaint.

2.2 Since noise levels are rarely consistent with time, various methods are used to describe this level change. For this particular survey, measurements were taken using the following descriptors:-

L_{Aeq}	equivalent continuous noise level,
L_{50}	the noise level exceeded for 90% of the measured time period, a standard measure of the background noise level.

3. NOISE SURVEY RESULTS

3. NOISE SURVEY RESULTS

- 3.1 The noise survey was carried out using a CIRRUS CR 831B Type 1 Sound Level Meter. An instrument range of 40 - 110dB was selected for this site during the daytime survey and 30 - 100dB for the night time survey. The sound level meter was calibrated at the commencement of each survey and repeated at the conclusions. There was no variation in the calibration.
- 3.2 All measurements were taken using the "A" frequency and the "fast" time weighting. The noise was considered to be constant with no cyclic or prominent noise sources, therefore a period of 15 minutes was taken during the day time measurements and 5 minute periods at night time.
- 3.3 The L_{Aeq} and L_{90} values are the most relevant measurement descriptors for setting boundary noise level limits for existing plant. Tables 1 to 3 give the results of the noise measurements undertaken at the various locations detailed in Section 1.0. In addition the narrow band analysis is detailed in Appendix A.

TABLE 1

Daytime Survey
Measurements given in dB(A)

Location No.	Time Period	Specific Noise Measurement L_{Aeq}	Background Noise Calculation L_{90}	Comments
1	11:19 to 11:34	55.5	53.4	Main noise source from surface aerators. Low noise from nearby housing construction.
2	11:56 to 12:11	52.9	48.3	Low level factory noise.
3	12:23 to 12:38	57.5	51.4	Low level factory noise. Intermittent traffic noise from the A4063
4	12:58 to 13:13	59.6	53.7	Intermittent noise from steam discharge vents.
5	13:38 to 13:53	47.9	43.5	Low level factory noise.
6	14:52 to 15:07	42.5	38.0	Low level factory noise.

- 3.4 The weather conditions during the daytime survey was, dry, sunny with clear skies. The wind was approximately 3 m/sec in a south easterly direction and an ambient temperature of 6°C.

TABLE 2

Night Time Survey
Measurements given in dB(A)

Location No.	Time Period	Specific Noise Measurement L_{Aeq}	Background Noise Calculation L_{eq}	Comments
1	01:18 to 01:23	56.6	55.4	Main noise source from surface aerators. Low level factory noise.
2	01:37 to 01:42	50.6	49.1	Low level factory noise.
3	0:49 to 01:54	44.4	37.1	Low level factory noise.
4	00:57 to 01:02	66.7	63.6	Low level factory noise and continuous steam discharge from vents
5	00:29 to 00:34	68.0	64.4	Low level factory noise and continuous steam discharge from vents
6	00:08 to 00:13	55.8	45.9	Low level factory noise and continuous steam discharge from vents

3.5 The weather conditions during the night time survey was, dry with clear skies. The wind was approximately 1 m/sec in a north easterly direction and an ambient temperature of 1°C.

4. CALCULATIONS, ASSESSMENT AND CONCLUSION

4. CALCULATIONS, ASSESSMENT AND CONCLUSION

4.1 The narrow band analysis taken detailed in Appendix A gives an indication of the regularity of the noise during the survey. These analyses, together with the data taken during the survey period, enables a valid judgement to be made on the acoustic correction factor that can be applied to the specific noise level for the purpose of determining the Rating Level.

4.2 Since there was no evidence of specific noise emanating for Georgia-Pacific during the day time survey no acoustic factor has been applied. The main audible noise during the day was the intermittent release from the steam vents. During the night time survey the main audible noise was again from the steam vents but on this occasion the noise was continuous and lasted for approximately one hour.

4.3 For the four boundary locations an Acoustic Factor of zero has been used during the day and night time surveys as it would be considered that no likelihood of a complaint would prevail at these locations. The Assessment Rating for the boundary and receptor locations are detailed in Tables 3 and 4.

TABLE 3

Assessment of Noise for the four boundary locations

Location	Specific Noise Level (L_{Aeq})	Acoustic Factor	Rating Level (L_{Aeq})	Background Noise (L_{90})	Assessment Rating
Daytime					
1	55.5	0	55.5	53.4	2.1
2	52.9	0	52.9	48.3	4.6
3	57.5	0	57.5	51.4	6.1
4	59.6	0	59.6	53.7	5.9
Night					
1	56.6	0	56.6	55.4	1.2
2	50.6	0	50.6	49.1	1.5
3	44.4	0	44.4	37.1	7.3
4	66.7	0	66.7	63.6	3.1

Receptor Analysis

- 4.4 At the receptor locations no distinctive noise source from the Georgia-Pacific site was noted during the day time. However during the night survey a steam vent exhausted continuously for approximately one hour. For this reason an Acoustic Factor of 5 dB(A) has been added to the receptor locations for the night time survey only.
- 4.5 Road traffic noise from the A4063 was faint and had little effect on the measurements taken. Vehicle movement on the Georgia-Pacific site during the night time survey was noted at each receptor.

TABLE 4

Assessment of Noise for the two receptor locations

Location	Specific Noise (L_{Aeq})	Acoustic Factor	Rating Level (L_{Aeq})	Background Noise (L_{90})	Assessment Rating
Daytime					
5	47.9	0	47.9	43.5	4.4
6	42.5	0	42.5	38.0	4.5
Night					
5	68.0	5	73.0	64.4	8.6
6	55.8	5	60.8	45.9	14.9

- 4.6 In accordance with the criteria specified in Section 2.0, there is a likelihood of a complaint from Cefn Ydfa Farm during the night as a result of the continuous release of steam.

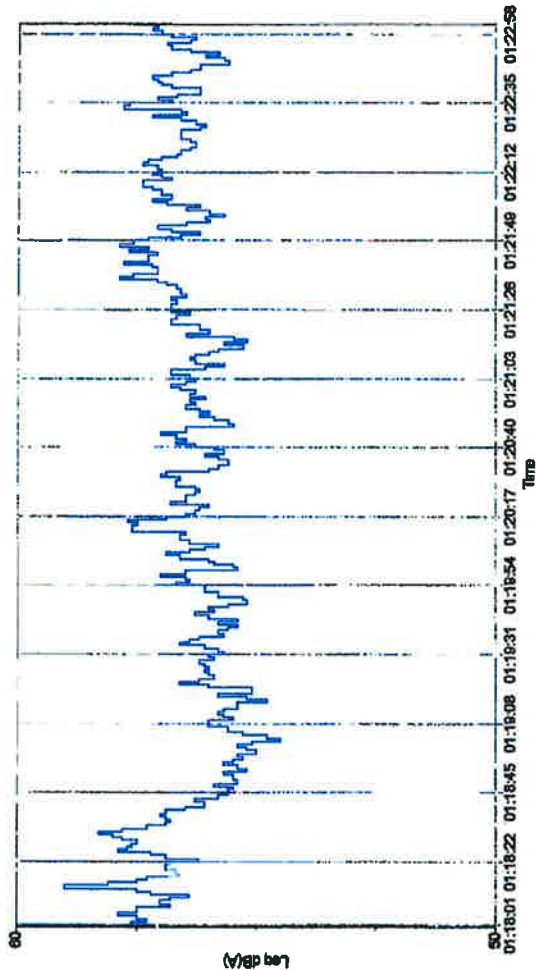
APPENDIX A
NARROW BAND ANALYSIS

Measurement Report

Measurement Details

Date and Time: 09/03/11 01:18
Sound Level Meter: Cirrus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:09:59 Wilmans
Range: 30-100 dB
Overload: no
Location: Location 1 - East corner of site at Effluent Plant

Dist	L1.0	58.3 dBA
Leq	L10.0	57.5 dBA
Lepd	L50.0	56.4 dBA
LAE	L90.0	55.4 dBA
LAFmax	L95.0	55.2 dBA
Peak	Lmin	53.9 dBA



Measurement Details

L1.0	53.6 dBA
L10.0	51.3 dBA
L50.0	50.0 dBA
L90.0	49.1 dBA
L95.0	48.9 dBA
Lynden	48.3 dBA



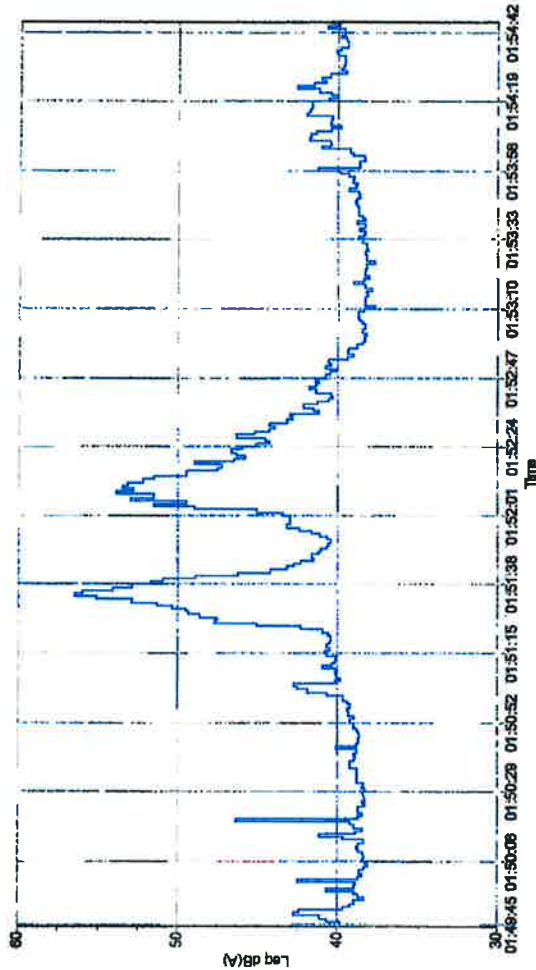
Measurement Report

Measurement Details

Date and Time: 09/03/11 01:49
Sound Level Meter: Cirrus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:05:00 Mhzmanas
Range: 30-100 dB
Overload: no
Location: Location 3 - Loading Yard

Date: 09/03/11
Leq: 44.4 dBA
Lepd: 24.8 dBA
LAE: 69.0 dBA
LAFmax: 57.0 dBA
Peak: 82.7 dBC

L1.0: 53.9 dBA
L10.0: 46.7 dBA
L50.0: 38.9 dBA
L90.0: 37.1 dBA
L95.0: 36.9 dBA
Lmin: 35.8 dBA



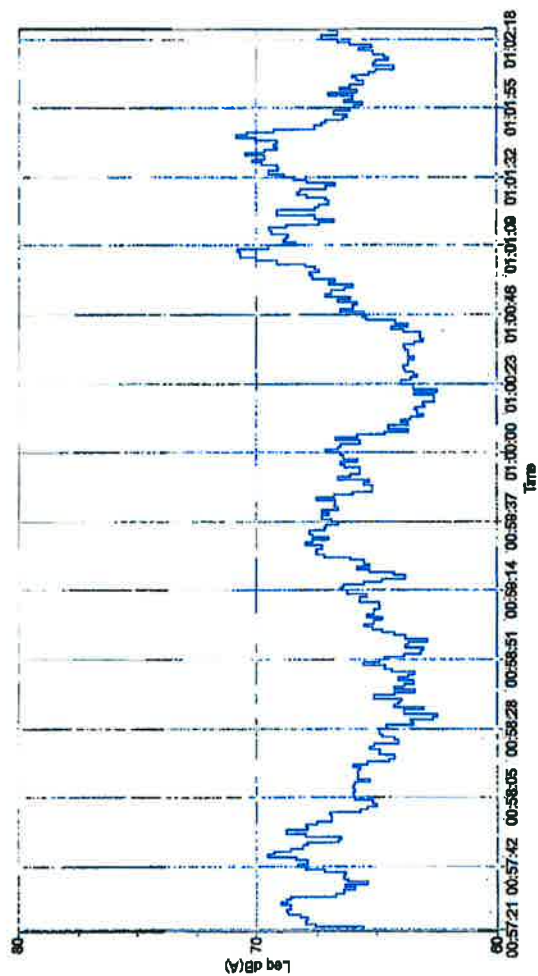
Measurement Report

Measurement Details

Date and Time: 08/03/11 00:57
 Sound Level Meter: Cms Research plc
 Recalibration Due: 31/10/11
 Run Duration: 00:04:39 hr:min:sec
 Range: 30-100 dB
 Overload: no
 Location: Location 4 - North field

Date: 08/03/11
 Leq: 68.7 dBA
 L_{eqd}: 46.8 dBA
 LAE: 81.2 dBA
 LA_{Fmax}: 72.3 dBA
 Peak: 94.4 dBC

L₁: 70.8 dBA
 L₁₀: 68.9 dBA
 L₅₀: 66.1 dBA
 L₉₀: 63.8 dBA
 L₉₅: 63.3 dBA
 L_{min}: 61.6 dBA

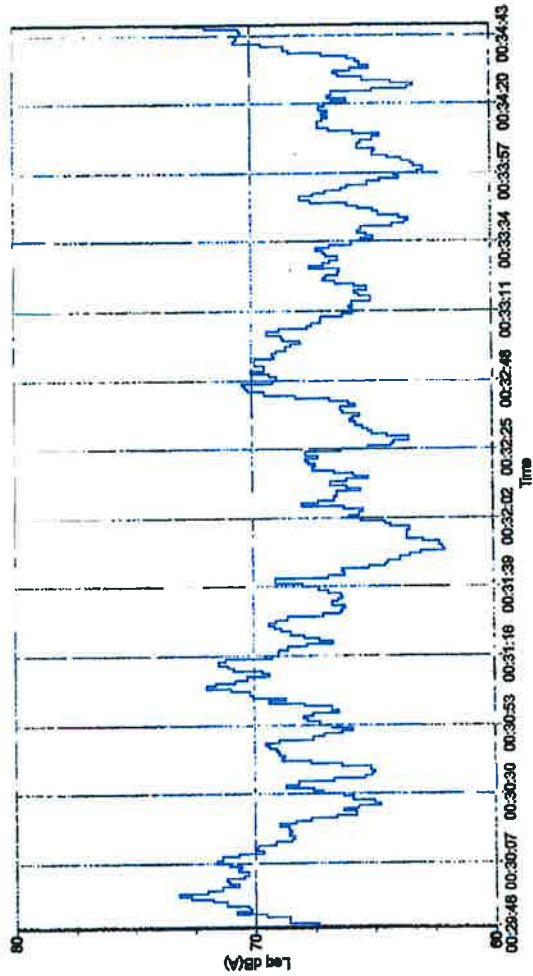


Measurement Report

Measurement Details

Date and Time: 09/03/11 00:29
Sound Level Meter: Cirrus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:09:58 Thomas
Range: 30-100 dB
Overload: no
Location: Location 5 - Brynllwarch Farm

Date:	09/03/11	00:29
Leq:	68.0 dBA	L1.0 72.3 dBA
L _{eqd} :	48.1 dBA	L10.0 70.8 dBA
L _{AE} :	52.5 dBA	L50.0 67.1 dBA
L _A Fmax:	74.1 dBA	L90.0 64.4 dBA
Peak:	83.3 dBC	L95.0 63.8 dBA
		Lmin 61.3 dBA

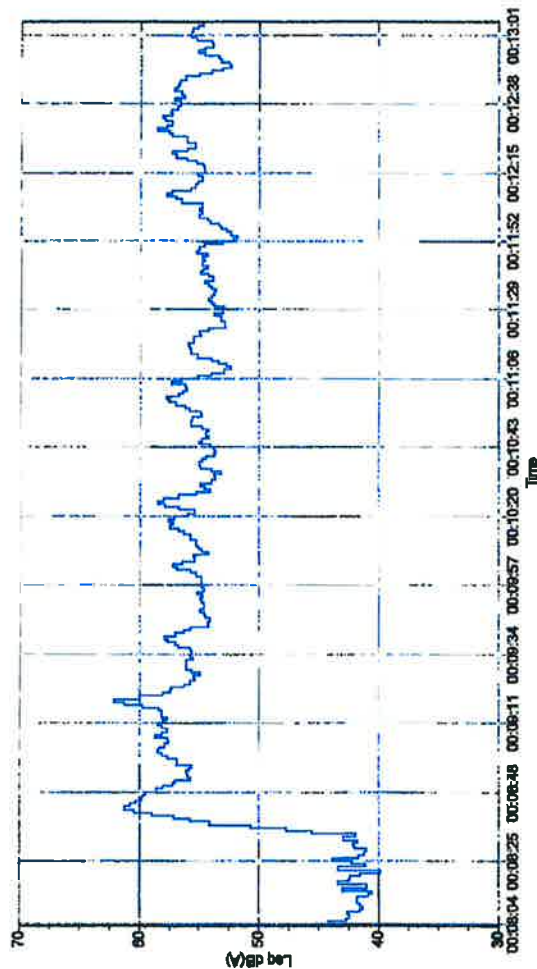


Measurement Report

Measurement Details

Date and Time: 09/03/11 00:08
Sound Level Meter: Chris Research plc
Recalibration Due: 31/10/11
Run Duration: 00:04:58 Hummus
Range: 30-100 dB
Overload: no
Location: Location 6 - Cefn Yddu Farm

Date:		
Leq:	55.8 dBA	L1.0 90.8 dBA
L _{eqd} :	36.0 dBA	L10.0 56.1 dBA
L _{AE} :	80.4 dBA	L50.0 55.3 dBA
L _A F _{max} :	62.8 dBA	L90.0 45.9 dBA
Peak:	90.0 dBC	L95.0 41.8 dBA
		Lmin 38.1 dBA

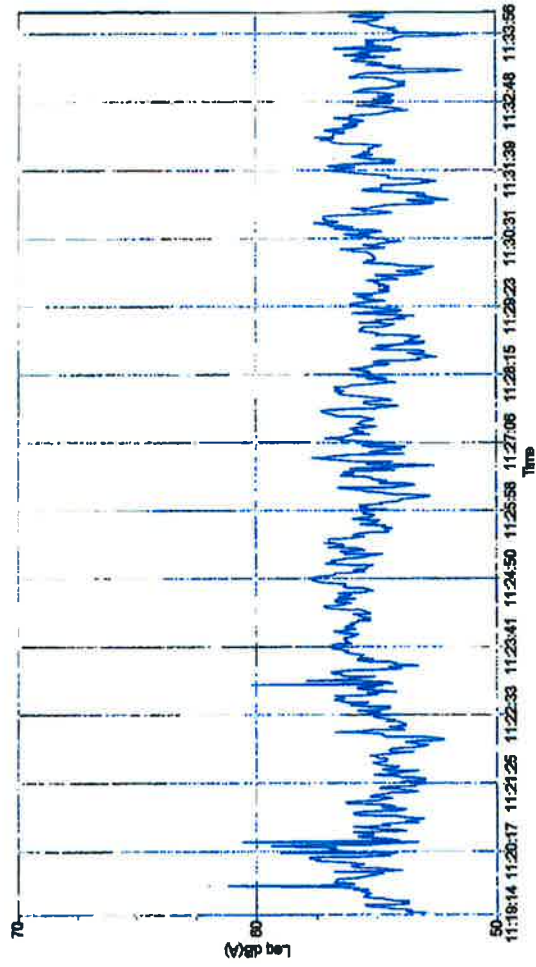


Measurement Report

Measurement Details

Date and Time: 07/03/11 11:19
Sound Level Meter: Cirrus Research plc
Recalibration Date: 31/10/11
Run Duration: 00:15:00 Nitrogen
Range: 40-110 dB
Overload: no
Location: Location 1 - East corner of site at Effluent Plant

Date:	07/03/11	55.5 dBA	L1.0	57.7 dBA
Leq	55.5 dBA	L10.0	56.6 dBA	
Lepid	40.4 dBA	L50.0	55.1 dBA	
LAE	84.8 dBA	L90.0	53.4 dBA	
LAFmax	88.0 dBA	L95.0	52.9 dBA	
Peak	91.1 dBC	Lmin	50.1 dBA	

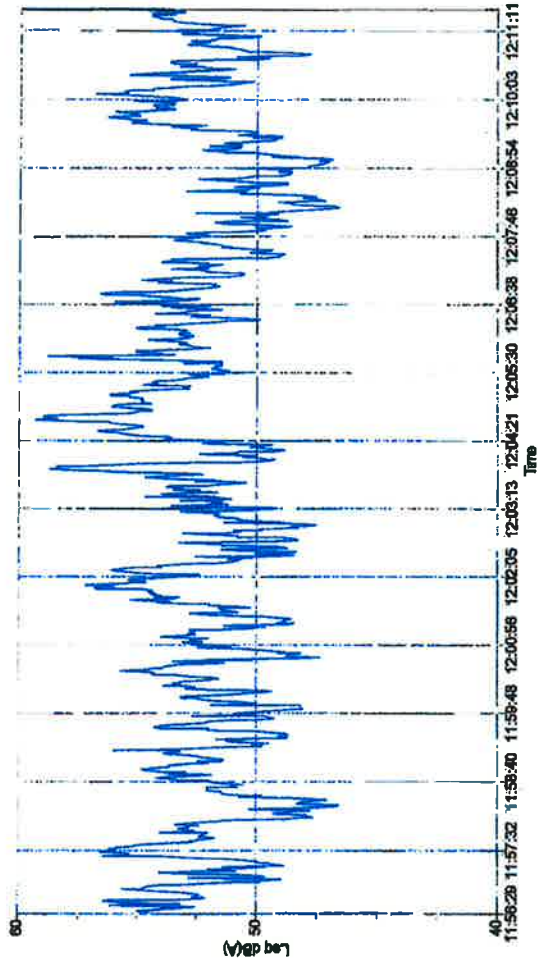


Measurement Report

Measurement Details

Date and Time: 07/03/11 11:56
Sound Level Meter: Cirrus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:14:39 Hrs:mins:secs
Range: 40-110 dB
Overload: no
Location: Location 2 - Soweto storage area

Leq	52.9 dBA	L1.0	56.3 dBA
Lepd	37.8 dBA	L10.0	55.1 dBA
LAE	82.2 dBA	L50.0	51.9 dBA
LAFmax	84.4 dBA	L90.0	48.3 dBA
Peak	91.8 dBC	L95.0	47.5 dBA
		Lmin	44.9 dBA



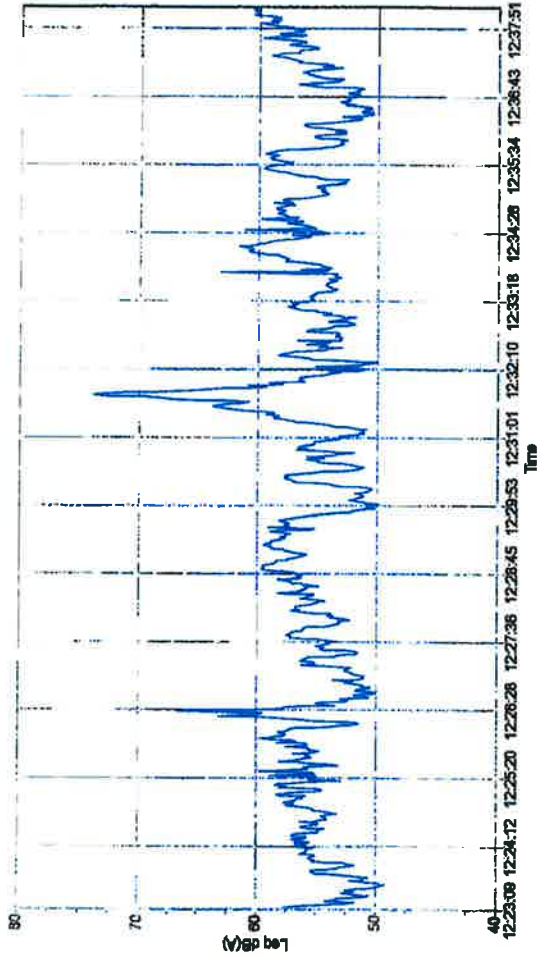
Measurement Report

Measurement Details

Date and Time: 07/03/11 12:23
Sound Level Meter: Cirrus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:15:00 Wzrmwse
Range: 40-110 dB
Overhaul: no
Location: Location 3 - Loading Yard

Data

Leq	57.5 dBA	L1.0	68.4 dBA
Leqd	42.5 dBA	L10.0	56.0 dBA
LAE	66.9 dBA	L50.0	55.4 dBA
LAFmax	75.0 dBA	L90.0	51.4 dBA
Peak	102.4 dBC	L95.0	50.7 dBA
		Lmin	48.5 dBA

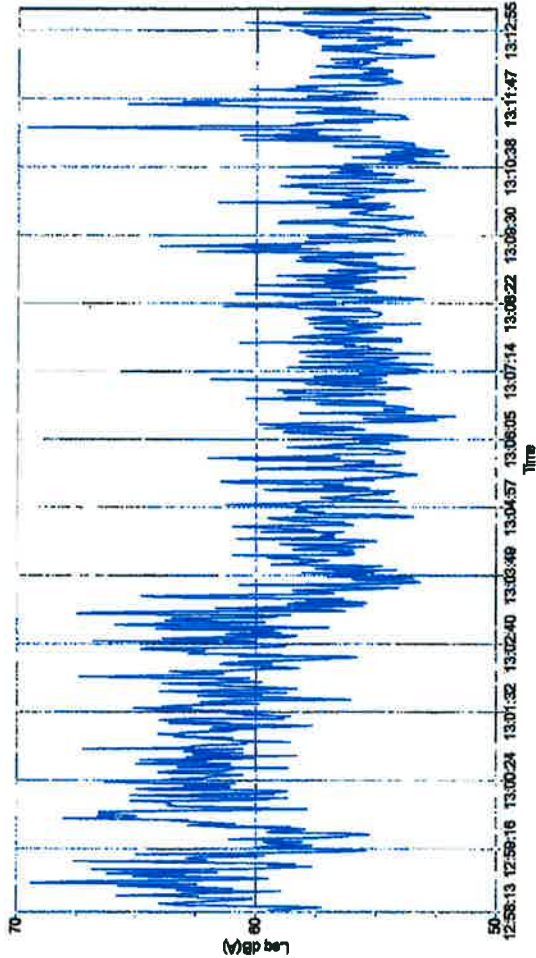


Measurement Report

Measurement Details

Date and Time: 07/03/11 12:59
Sound Level Meter: Chris Research plc
Recalibration Due: 31/10/11
Run Duration: 00:14:59 Measurement
Range: 40-110 dB
Overload: no
Location: Location 4 - North field

Date:	07/03/11	12:59
Leq:	59.6 dBA	
Lepd:	44.5 dBA	
LAE:	89.0 dBA	
LAFmax:	71.5 dBA	
Peak:	102.3 dBC	
L1:	67.1 dBA	
L10:	62.9 dBA	
L50:	57.3 dBA	
L90:	53.7 dBA	
L95:	53.2 dBA	
Lmin:	50.6 dBA	

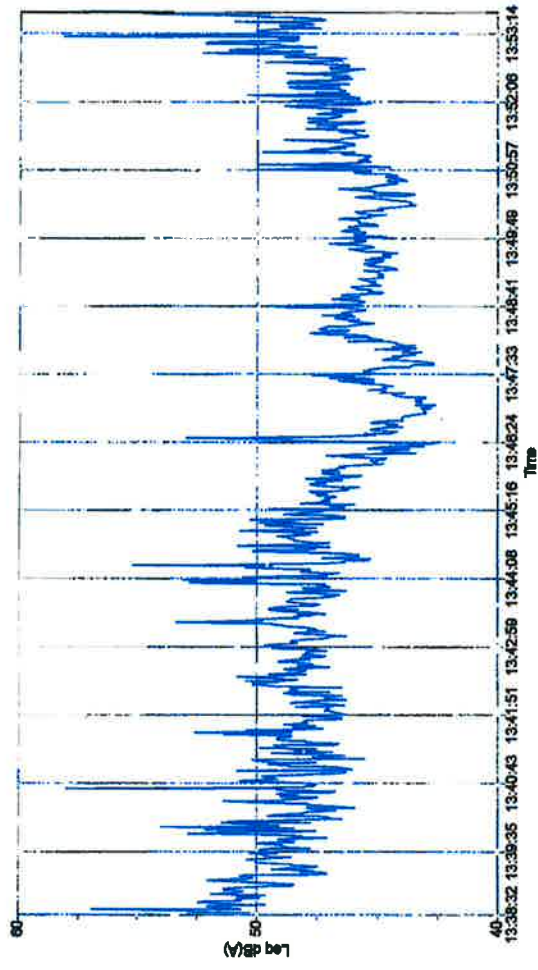


Measurement Report

Measurement Details

Date and Time: 07/03/11 13:30
Sound Level Meter: Cinas Research plc
Recallation Due: 31/10/11
Run Duration: 00:16:01 Mhzunze
Range: 40-110 dB
Overload: no
Location: Location 5 - Bryllwarch Farm

Date		
Leq	47.9 dBA	L1.0 53.0 dBA
Lepd	32.9 dBA	L10.0 48.8 dBA
LAE	77.3 dBA	L50.0 46.3 dBA
LAFmax	66.9 dBA	L90.0 43.5 dBA
Peak	81.8 dBC	L95.0 42.8 dBA
		L99.0 40.6 dBA

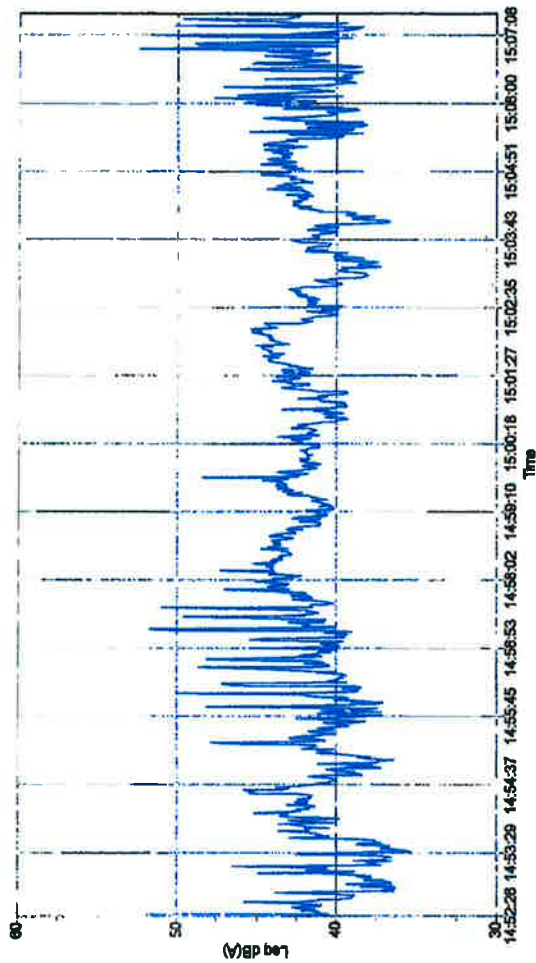


Measurement Report

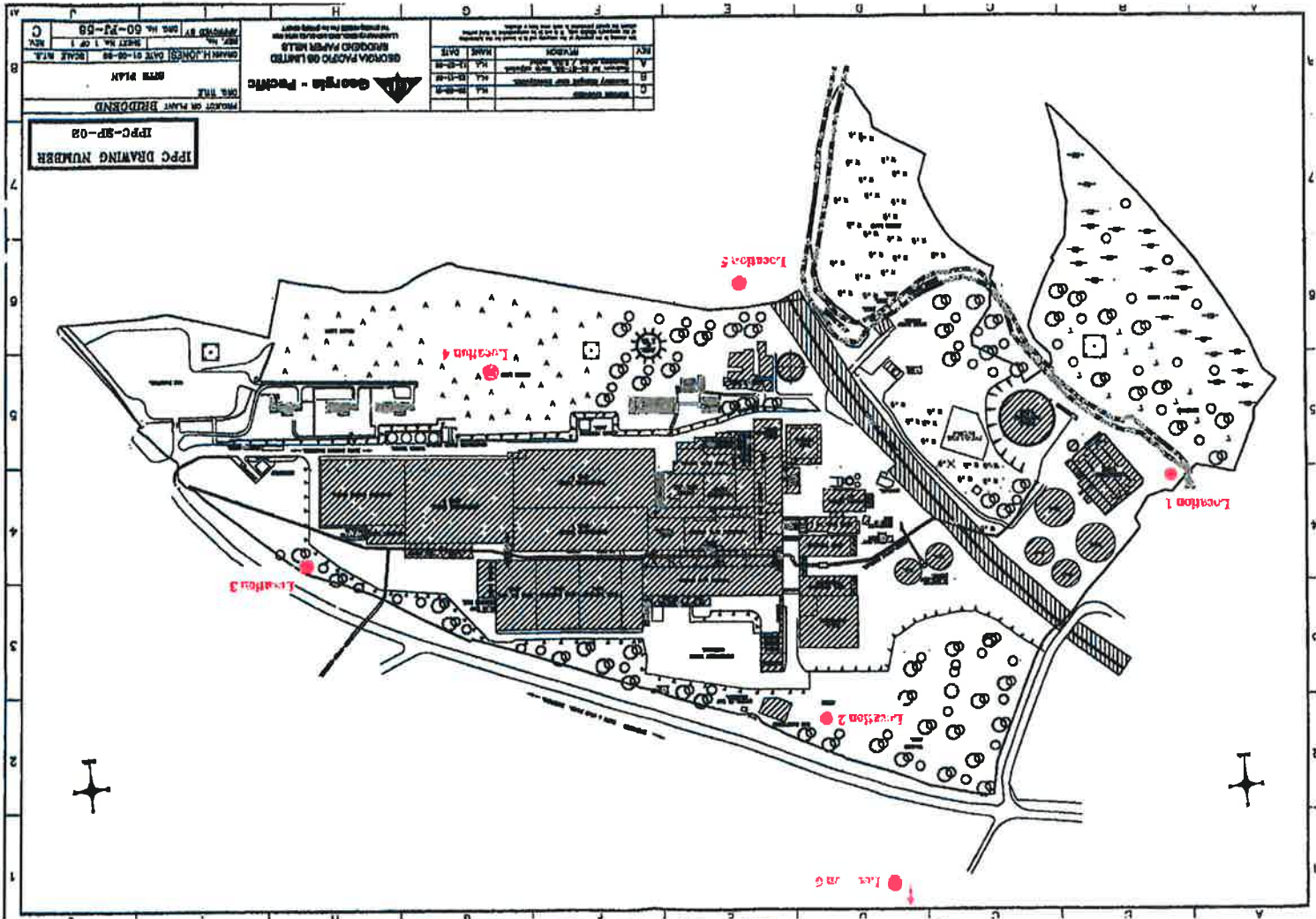
Measurement Details

Date and Time: 07/03/11 14:52
Sound Level Meter: Cirus Research plc
Recalibration Due: 31/10/11
Run Duration: 00:14:59 Nitramas
Range: 30-100 dB
Overload: no
Location: Location 6 - Cuth Yds Farm

Date:		
Leq:	42.5 dBA	L1.0 49.8 dBA
Lepd:	27.5 dBA	L10.0 44.0 dBA
LAE:	71.9 dBA	L50.0 41.1 dBA
LAFmax:	80.9 dBA	L90.0 38.0 dBA
Peak:	77.8 dBC	L95.0 37.0 dBA
		Lmin 33.7 dBA



APPENDIX B
SITE LOCATION MAP



REV	DATE	DESCRIPTION
1	11-11-88	Initial design
2	11-11-88	Revised design
3	11-11-88	Final design

Georgia - Pacific

GEORGIA PACIFIC CORP. LIMITED

BRIDGEWAY PARKWAY

BRIDGEWAY PARKWAY

IPPC DRAWING NUMBER

IPPC-SP-02

SCALE

DATE

BY

CHKD BY

APPROVED BY

DESIGN NO.

60-21-59

APPENDIX C
CALIBRATION CERTIFICATES

Certificate of Calibration



Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	Sound Level Meter
Model Number	CR-831B
Serial Number	C17520FF

Calibration Procedure

The instrument detailed above has been calibrated to the published test and calibration data as detailed in the instrument handbook, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.

Sound Level Meters: All Calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. Which are traceable to the appropriate International Standards.

The Cirrus Research plc calibration laboratory standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 5770
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5845

Calibrated by

T.A. Goodie

Calibration Date

11 October 2010

Calibration Certificate Number

181058

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration



Equipment Details

Instrument Manufacturer Cirrus Research plc
Instrument Type Acoustic Calibrator
Model Number CR:511E
Serial Number 037538

Calibration Procedure

The acoustic calibrator detailed above has been calibrated to the published data as described in the operating manual. The procedures and techniques used to follow the recommendations of the IEC standard Electroacoustics – Sound Calibrators IEC 60942:2003, IEC 60942:1997, BS EN 60942:1998 and BS EN 60942:2003 where applicable. The calibrator's main output is 94.00 dB (1 Pa) and this was set within the 0.01 dB resolution of the test system, i.e. one hundredth of a decibel. Numbers in (parenthesis) refer to the paragraph in IEC 60942.

Calibration Traceability

The calibrator above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type B&K4180 Serial Number 1893453 Calibration Ref. S 5770
Pistonphone Type B&K4220 Serial Number: 613843 Calibration Ref. S 5845

Calibration: Climate Conditions

The climatic test conditions were all maintained within the permitted limits of IEC 60942:1997

Temperature	{B.3.2}	Permitted band 15°C to 25°C
Humidity	{B.3.2}	Permitted band 30% to 90% RH
Static Pressure	{B.3.2}	Permitted band 85 kPa to 105 kPa
Ambient Noise Level	{B.3.3.6}	Max permitted level 64 dB(Z)

Measurement Results

The figures below are the Calibration Laboratory test limits for this model calibrator and have a smaller tolerance than those permitted in IEC 60942.

94 dB Output	93.99 dB	Permitted band 93.95 to 94.05 dB
104 dB Output	103.95 dB	Permitted band 103.80 to 104.30 dB
Frequency	1003 Hz	Permitted band 990 to 1010 Hz

Uncertainty

With an uncertainty coefficient of $k=2$, i.e. a 95% confidence level, the uncertainty of each measure is

94 dB Output	± 0.13 dB	104 dB Output	± 0.14 dB
Frequency	± 0.1 Hz	Level Stability	± 0.04 dB

Calibrated by

T.A. Goodie

Calibration Date

11 October 2010

Calibration Certificate Number

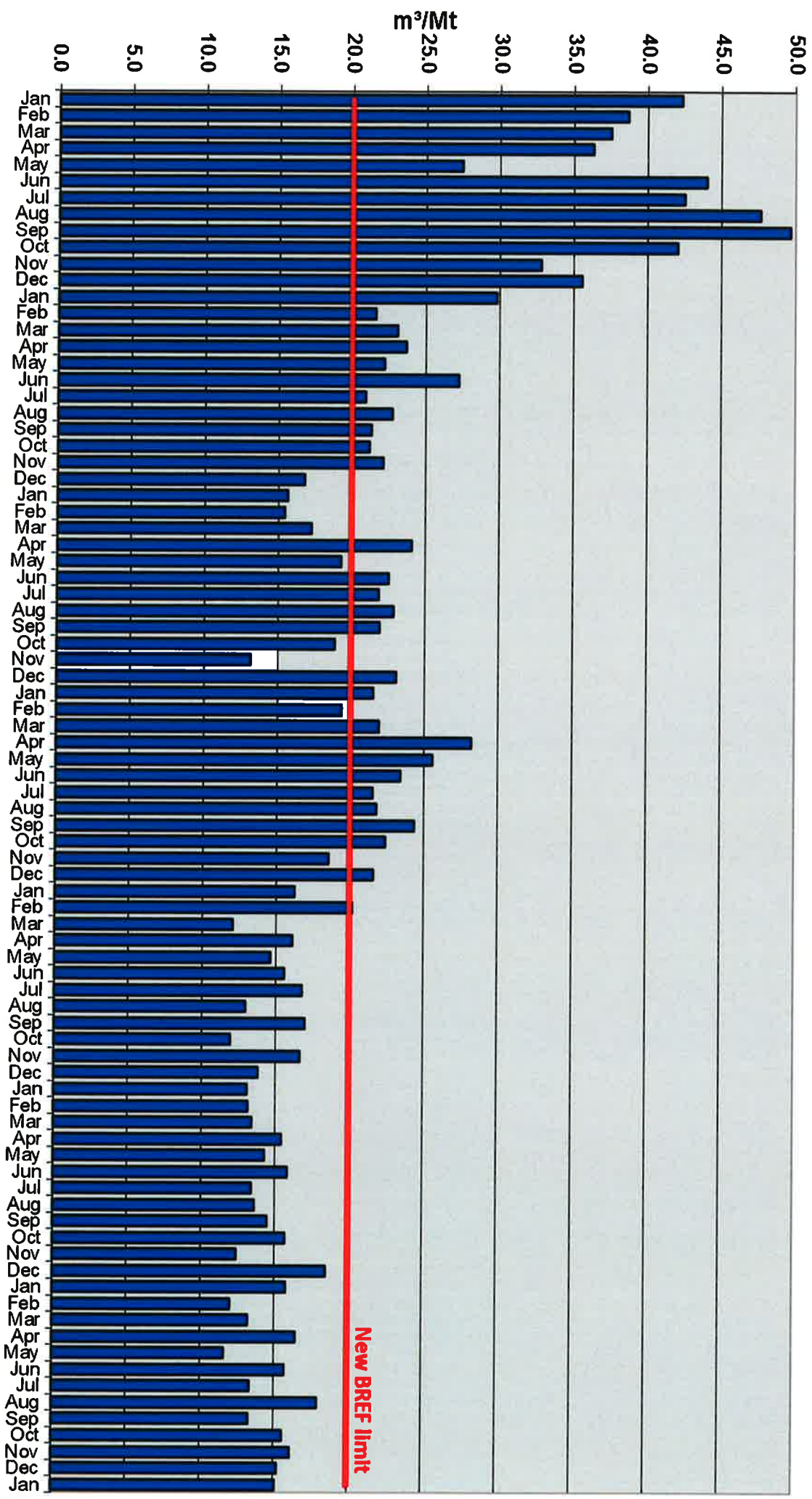
181059

This Calibration Certificate is valid for 12 months from the date above.

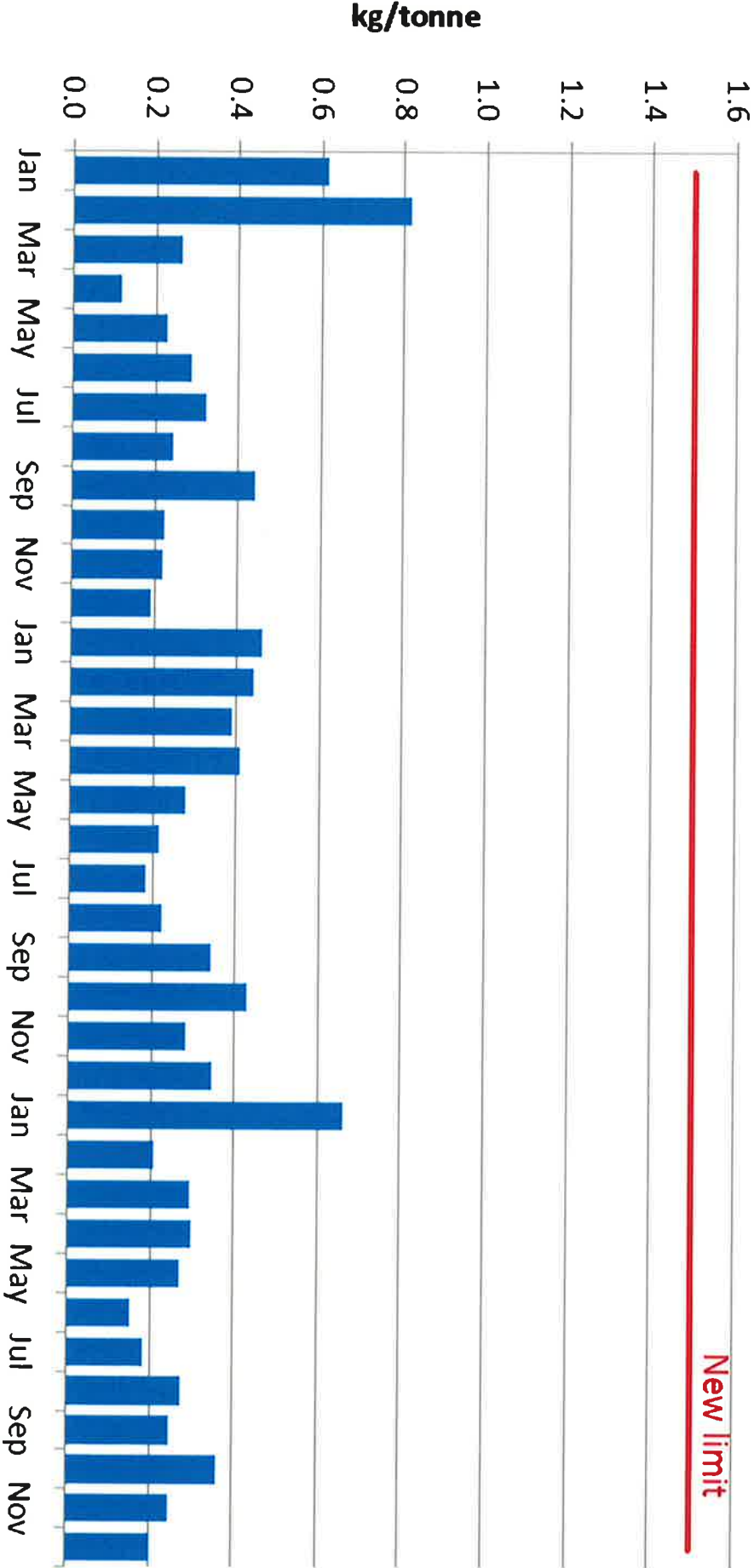
Cirrus Research plc, Acoustic House, Bridlington Road, Hummerby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Fresh water use per tonne of paper

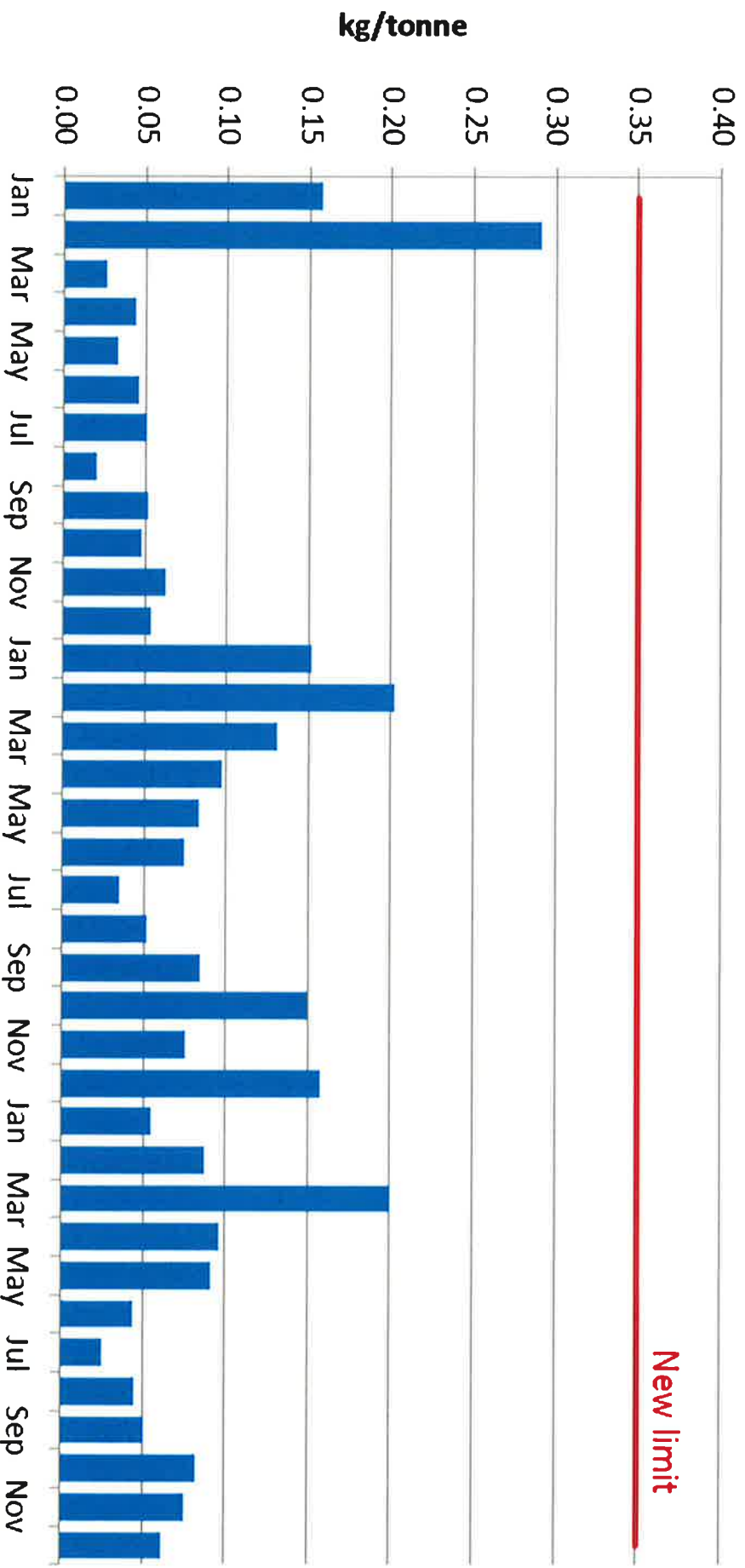
Jan 2008 to date



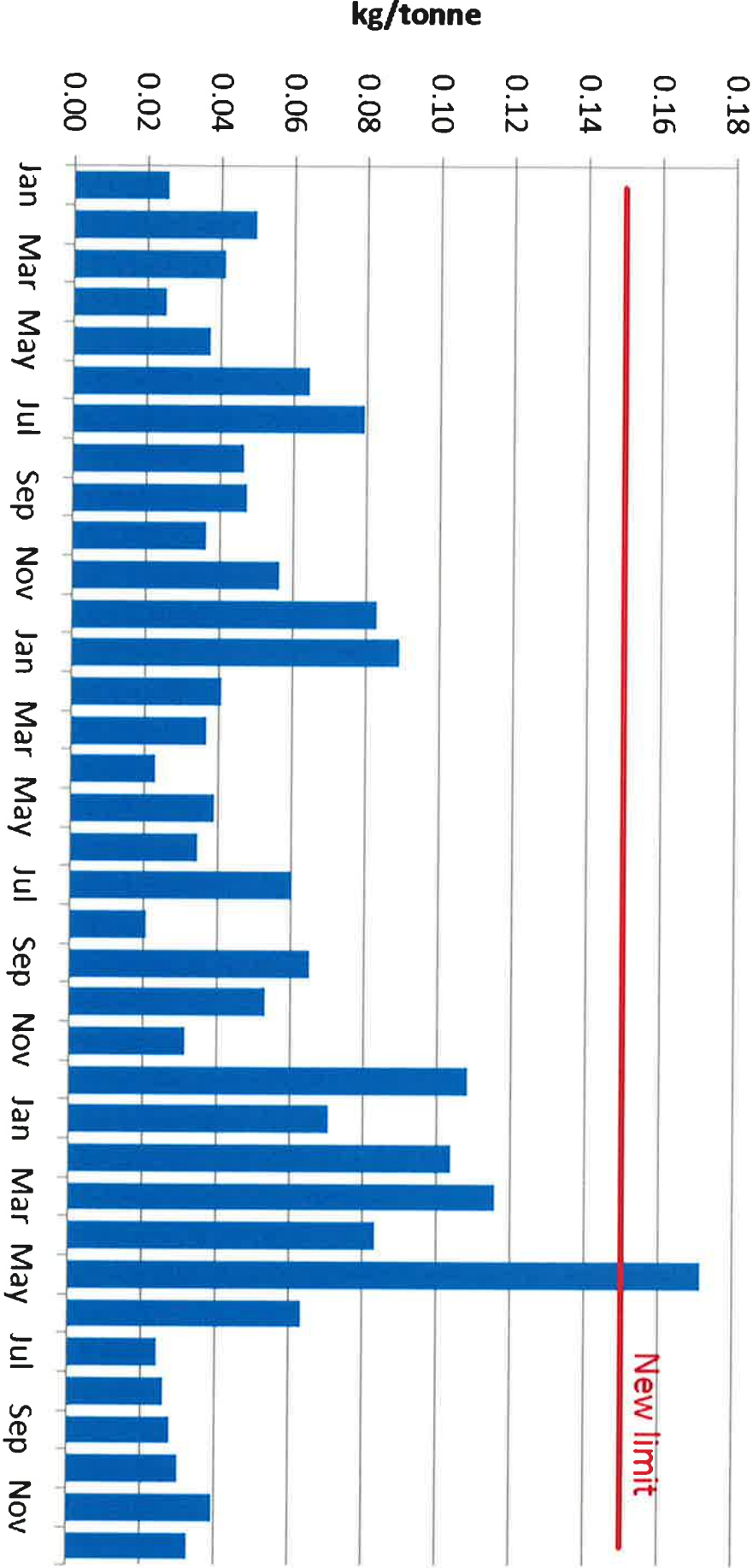
COD in effluent



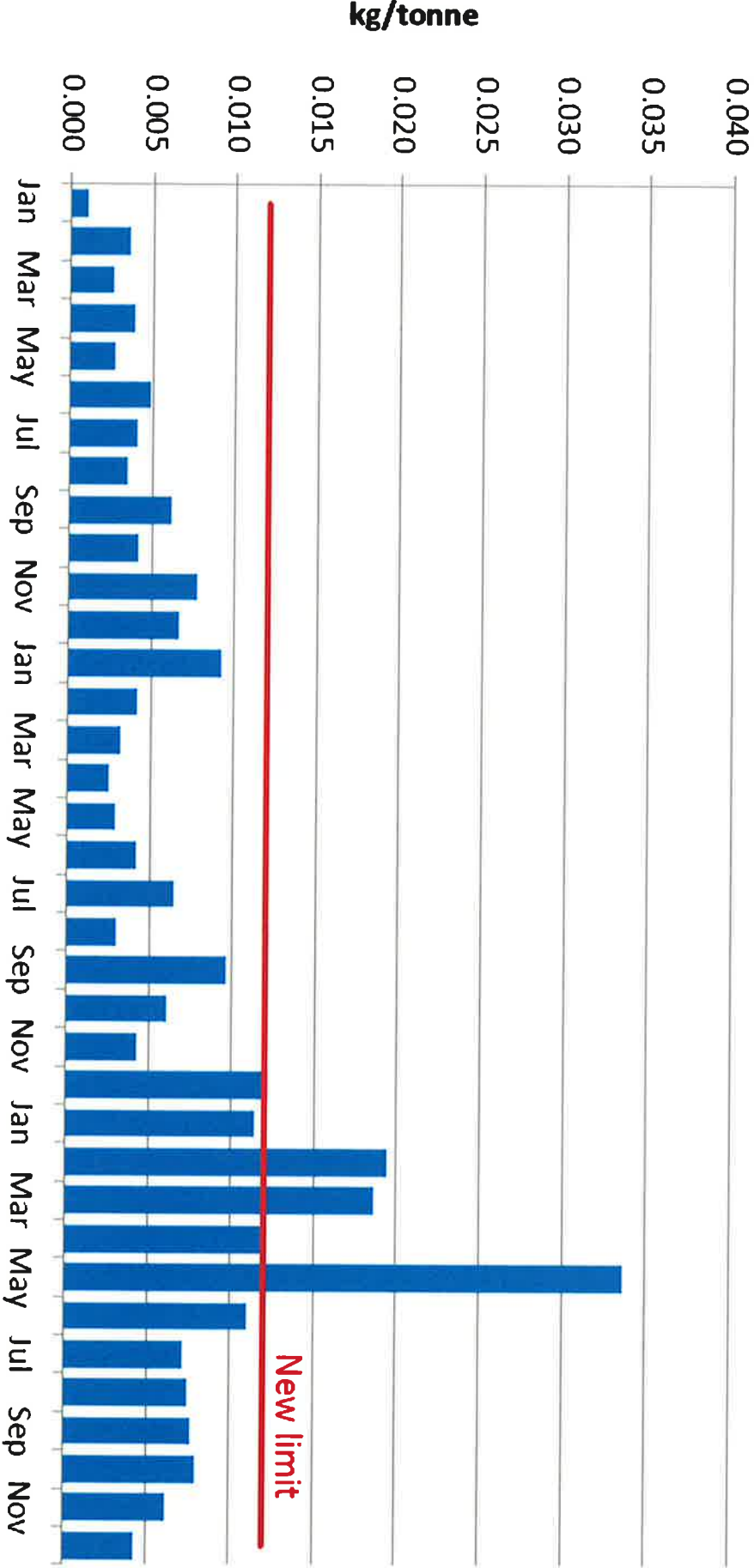
Suspended solids in effluent



Total nitrogen in effluent



Total phosphorus in effluent



AOX in effluent

