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Ms Caroline Murphy
Office of Climate Licensing and Resource,
Environmental Inspection Agency,
PO Box 3000,
Johnstown Castle Estate,
County Wexford.

8th December 2015

Re; Application for Waste Licence (W0-140-04) Nurendale Limited, Panda Waste Services, Beauparc, Co Meath

Dear Ms Murphy,

I refer to the Agency's letter dated the 02nd November 2015 in accordance with Regulation 10(2)(b)(ii) of the EPA (Industrial Emissions)(Licensing) Regulations 2013. The requested information is set out herein.

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1. *The installation and operation of the constructed wetland is required to be agreed with the Agency as part of the test programme required by condition 6.20 of the current licence. The discharge will be required to meet the emission limit values set out in Schedule B.2 of the current licence and monitoring of this discharge in accordance with Schedule C.2.2. It was confirmed in your correspondence of the 4th Sep 2015 that the wetland has been planted but that it was not yet operational.*

i. *Confirm if the wetland is currently treating the facility's storm water and whether any effluent from this system is being discharged.*

The wetland has been constructed but is not yet operational and no effluent from this system is being discharged.

ii. *The analysis of the Waste Treatment BREF provided and specifically BATCs No 42-56 has not factored in the planned usage of the constructed wetland as a treatment process for rainwater run-off. Please clarify how the constructed wetland meets BAT.*

An amended Table 1.8 on BAT Conclusions for Waste Treatment, which clarifies how the constructed wetland meets BAT is in Attachment 1.

*Cont'd*



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iii. *Confirm if the final discharge is proposed to meet the emission limit values set out in Table 9.1 (inclusive of phosphorous and nitrogen) of the EIS.*

The ICW is designed to achieve the emission limit values set out in Table 9.1 of the EIS. The design did not specifically address the achievement of the phosphorous and nitrogen values referred to in the EIS. The reason for this is that there was a change in the design, the grounds for which are discussed in the response to Item 1 (iv).

iv. *A final report on the Stormwater Constructed Wetland Design was provided in Appendix 8 of the EIS on May 2014. Design conclusions were provided in Section 3 of this report. Provide details on the constructed wetland as built including its dimensions and principal design parameters (including design throughout and treatment objectives).*

The report provided in the EIS was prepared in June 2006 and the company that prepared the report are no longer in business. PANDA commissioned another company to compete the detailed design and supervise the installation of the wetland.

Although there was no significant changes to the design principles, PANDA submitted the report to OEE for approval before commencing the installation. A copy of the design report, which includes details of the proposed design and method of construction and a description of site investigations conducted to confirm the ground conditions were suitable is in Attachment 2. Also in the Attachment is the OEE approval for the revised design.

The installation of the wetlands was supervised by the designer, who is currently conducting the test programme specified in Condition 6.20.

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2. *Confirm how the treatment of off-gasses in the biomass boiler is BAT in accordance with section 4.6 of the Waste Treatments BREF and meets BATCs No 35-41 where applicable.*

The bio-mass boiler is a combined combustion system, as referenced in Section 4.6.15 of the BREF. Polluted air from inside Building 4 will be injected into the primary air in the furnace. An amended Table 1.8 on BAT Conclusions for Waste Treatment, which clarifies how the treatment of off-gases in the biomass boiler meets BAT, is in Attachment 1.

3. *A screening for Appropriate Assessment was undertaken on the 29th October 2015 and the Agency determined that an Appropriate Assessment of the activity is required.*

*You are thereby required to submit a Natura Impact Statement, as defined in Regulation 2(1) of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011).*

*You are furthermore advised to refer to the document 'Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities', issued in 2009 by the Department of the Environment, Heritage and Local Government, and revised in 2010. This document is available at:*
hhttp://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_GUIdance.pdf.

*Cont'd*



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A Natural Impact Statement is in Attachment 3.

*In addition to the above please also provide an updated non-technical summary to reflect the information provided in your report*

An updated non-technical summary is in Attachment 4.

Yours sincerely

Jim O' Callaghan

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# ATTACHMENT 1

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**Table I.8 (i) CONCLUSIONS ON BAT**

| **Title of Document** | | | |
|---|---|---|---|
| **BAT reference Number** | **BAT Description** | **Applicability Assessment**<br>State "applicable" if the technique applies to your installation.<br>State "not applicable" if not, and provide a comprehensive explanation[1]. | **Status of technique at installation**<br>If applicable, state "in place" if the technique is in place at your installation.<br>If not, state "not in place", the date it will be in place and a comprehensive explanation[1]. |
| **BAT 1** | BAT is to implement and adhere to an environmental management system (EMS)…. | Applicable | EMS specified in Condition 2 of the Licence is in place |
| **BAT 2** | BAT is to ensure the provision of full details of the activities carried out on-site. | Applicable | In place. Provided in Licence Application and EIS |
| **BAT 3** | BAT is to have a good housekeeping procedure in place, which will also cover the maintenance procedure, and an adequate training programme, covering the preventive actions that workers need to take on health and safety issues and environmental risks | Applicable | Operational procedures in place: Training programme in place; Health & Safety Policy in place |
| **BAT 4** | BAT is to try to have a close relationship with the waste producer/holder | Applicable | In place. PANDA regularly liaises with its commercial customers and waste contractors that deliver wastes to the facility |
| **BAT 5** | BAT is to have sufficient staff available and on duty with the requisite qualifications at all times. All personnel should undergo specific job training and further education | Applicable | In place. Site Manager and/or Deputy Manager have appropriate qualifications and are on site at all times. Staff training programme in place |
| **BAT 6** | BAT is to have a concrete knowledge of the waste IN | Applicable | Waste acceptance procedure in place that specifies the wastes that can be accepted |
| **BAT 7** | BAT is to implement a pre-acceptance procedure | Not Applicable | Given the nature of the wastes accepted and the types of processing carried out, pre-acceptance procedures are not required for all of the wastes. PANDA has a procedure (SOP 18) on Third Party Customer Profiling |

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[1] If necessary, use attachments numbered according to the relevant BAT, e.g. "Attachment BAT 1".

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| | | | |
|---|---|---|---|
| **BAT 8** | BAT is to implement a waste acceptance procedure | Applicable | Waste acceptance procedures in place (SOP 8 and 13) |
| **BAT 9** | BAT is to implement different sampling procedures for all different incoming waste vessels | Not Applicable | Given the nature of the wastes accepted and the types of processing carried out, sampling procedures are not required |
| **BAT 10** | BAT is to have a reception facility that includes inter alia a quarantine area; | Applicable | In place. Quarantine areas provided |
| **BAT 11** | BAT is to analyse the waste OUT according to the relevant parameters important for the facility. If RDF is manufactured the processed materials will be tested to confirm they meet customer/regulatory requirement | Applicable | In place. All wastes consigned are recorded using EWC codes |
| **BAT 12** | BAT is to have a system in place to guarantee the traceability of waste treatment | Not Applicable | Given the nature of the wastes accepted and the types of processing carried out, traceability of waste treatment is not required |
| **BAT 13** | BAT is to have and apply mixing / blending rules | Not applicable | Given the nature of the wastes accepted and the types of processing carried out, mixing and blending rules are not required. |
| **BAT 14** | BAT is to have a segregation and compatibility procedure in place | Applicable | In place. Waste acceptance procedures (SOP 13) to remove and store non suitable wastes in quarantine area |
| **BAT 15** | BAT is to have an approach for improving waste treatment efficiency | Applicable | In place. PANDA regularly reviews performance efficiency |
| **BAT 16** | BAT is to produce a structured accident management plan | Applicable | In place. Accident Prevention Policy and Health & Safety Statement prepared (Ref Attachment J). |
| **BAT 17** | BAT is to have and properly use an incident diary. | Applicable | In place. Incident diary maintained. |
| **BAT 18** | BAT is to have a noise and vibration management plant in place as part of the EMS | Not Applicable | Noise and vibration are not an issue at the site |
| **BAT 19** | BAT is to consider future decommissioning | Applicable | Decommissioning Management Plan prepared and submitted to the OEE. |
| **BAT 20** | BAT is to provide a breakdown of the energy consumption and generation | Applicable | In place. Energy consumption recorded and reported in the AER |

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| **BAT 21** | BAT is to continuously increase the energy efficiency of the installation | Applicable | In place. PANDA reviews energy usage annually and has carried out energy audit (Ref Attachment G) to identify where efficiencies can be made. |
| **BAT 22** | BAT is to carry out an internal benchmarking (e.g. on an annual basis) of raw materials consumption | Applicable | In place. PANDA monitors material consumption and reports on same annually in the AER. |
| **BAT 23** | BAT is to explore the options for the use of waste as a raw material for the treatment of other wastes | Not Applicable | Given the nature of the wastes accepted and the types of processing carried out, the use of waste as a raw material is not applicable. |
| **BAT 24** | **Storage and Handling** | | |
| **a)** | BAT is to ensure storage areas are away from watercourses and sensitive perimeters, and located to eliminate or minimise the double handling of wastes within the installation | Applicable | In place |
| **b)** | BAT is to ensure that the storage area drainage infrastructure can contain all possible contaminated run-off and that drainage from incompatible wastes cannot come into contact with each other | Applicable | In place. Contaminated run-off not generated inside the buildings. Run-off from open yards passes through attenuation tank and oil interceptor. |
| **c)** | BAT is to ensure use of a dedicated area/store equipped with all necessary measures related to the specific risk of the wastes for sorting and repackaging laboratory smalls or similar waste. | Not applicable | Laboratory wastes not accepted or generated at the site. |
| **d)** | BAT is to handle odorous materials in fully enclosed or suitably abated vessels and storing them in enclosed buildings connected to abatement | Not Applicable | This relates to odorous liquid wastes, which are not accepted at the site |
| **e)** | BAT is to ensure that all connections between the vessels are capable of being closed via valves. | Not Applicable | No waste liquid storage vessels on-site |

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| **f)** | BAT is to ensure measures are available to prevent the building up of sludges higher than a certain<br>level and the emergence of foams that may affect such measures in liquid tanks, | Not Applicable | No liquid waste tanks on site. |
| **g)** | BAT is equipping tanks and vessels with suitable abatement systems when volatile emissions may be generated. | Not Applicable | Liquid organic wastes not accepted at the site |
| **h)** | BAT is to store organic waste liquid with a low flashpoint under a nitrogen atmosphere to keep it inertised | Not Applicable | Organic waste liquids not accepted at the site |
| **BAT 25** | BAT is to separately bund the liquid decanting and storage areas using bunds which are impermeable and resistant to the stored materials | Applicable | In place. Diesel and gas oil storage tank bunds |
| **BAT 26** | **Tank and Process Pipework** | | |
| **a)** | BAT is to clearly label all vessels with regard to their contents and capacity | Applicable | In place. Diesel and gas oil tanks labelled. |
| **b)** | BAT is to ensure the label differentiates between wastewater and process water; combustible liquid and combustible vapour and the direction of flow. | Applicable | In place. Surface water gullies and foul water inspection chambers colour coded |
| **c)** | BAT is to keep records for all tanks, detailing the unique identifier; capacity; its construction, including materials; maintenance schedules and inspection results; fittings; and the waste types which may be stored / treated in the vessel, including flashpoint limits | Not Applicable | |
| **BAT 27** | BAT is to take measures to avoid problems that may be generated from the storage/accumulation of waste | Applicable | In place. Licence limits on site storage of waste to 72 hours. |
| **BAT 28** | **Waste Handling Techniques** | | |

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| **a)** | BAT is to have systems and procedures in place to ensure that wastes are transferred to the appropriate storage safely. | Applicable | In place (SOP 13) |
| **b)** | BAT is to have a management system for the loading and unloading of waste in the installation, which also takes into consideration any risks that these activities may incur. | Applicable | In place. Waste handling procedure SOP 13 and risks assessed as required by Health and Safety Statement |
| **c)** | BAT is to ensue that a qualified person attends the site to check the laboratory smalls, the old original waste, waste from an unclear origin or undefined waste (especially if drummed), to classify the substances accordingly and to package into specific containers. | Not Applicable | The site does not have a laboratory and does not accept hazardous waste |
| **d)** | BAT is to ensure that damaged hoses, valves and connections are not used | Not Applicable | The site does not accept liquid wastes |
| **e)** | BAT is to collect exhaust gas from vessels and tanks when handling liquid waste | Not Applicable | The site does not accept liquid wastes |
| **f)** | BAT is to unload solids and sludge in closed areas which are fitted with extractive vent systems linked to abatement equipment when the handled waste can potentially generate emission to air (e.g. odours, dust, VOCs) | Applicable | Proposed. Given proximity to sensitive receptor (private dwelling 30m south of boundary) the building handling the residual waste and food waste will be provide with an active odour control system. |
| **g)** | BAT is to use a system to ensure the bulking of different batches only takes place with compatibility testing | Not Applicable | Given the nature of the wastes accepted and the types of processing carried out, compatibility testing is not required. |
| **BAT 29** | BAT is to ensure that the bulking /mixing to or from packaged waste only takes place under instruction and supervision and is carried out by trained personnel | Applicable | In place. All waste handling, including baling, is carried out by trained personnel. |
| **BAT 30** | BAT is to ensure that chemical incompatibilities guide the segregation required during storage | Not Applicable | Chemically incompatible wastes are not accepted at the site. |
| **BAT 31** | **Handling of Containerised Waste** | Not Applicable | Wastes are not stored in drums or other containers. |

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| **BAT 32** | BAT is to perform crushing, shredding and sieving operations in areas fitted with extractive vent systems linked to abatement equipment when handling materials that can generate emission to air (e.g. odours, dust, VOCs) | Not Applicable | Wastes are not crushed, shredded or sieved at the site |
| **BAT 33** | BAT is to perform crushing/shredding operations under full encapsulation and under an inert atmosphere for drums/containers containing flammable or highly volatile substances. | Not Applicable | Wastes are not crushed, shredded or sieved at the site |
| **BAT 34** | **Washing Processes** | | |
| **a)** | BAT is to identify the components that may be present in the items to be washed (e.g. solvents) | Not Applicable | |
| **b)** | BAT is to transfer washings to appropriate storage and then treating them in the same way as the waste from which they were derived | Not Applicable | Waste are not washed at the site |
| **c)** | BAT is to use treated waste water from the WT plant for washing instead of fresh water | Not Applicable | No on-site WT plant. |
| | **Air Emission Treatment** | | |
| **BAT 35** | BAT is to restrict the use of open topped tanks, vessels and pits | Not Applicable | There are no open topped tanks, vessels or pits at the site. |
| **BAT 36** | BAT is to use an enclosed system with extraction, or under depression, to a suitable abatement plant. This technique is especially relevant to processes which involve the transfer of volatile liquids, including during tanker charging/discharging | Applicable | Proposed. Building 4 will be fully enclosed and maintained under negative air pressure. The odorous air extracted from the building will be treated in the biomass boiler which also functions as an odour abatement plant. |
| **BAT 37** | BAT is to apply a suitably sized extraction system which can cover the holding tanks, pre-treatment areas, storage tanks, mixing/reaction tanks and the filter press | Applicable | In Place and Proposed A suitably sized extraction systems is installed in Building 3 and a suitable extraction system will be installed in Building 4. |

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| | areas, or to have in place a separate system to treat the vent gases from specific tanks | | |
| **BAT 38** | BAT is to correctly operate and maintain the abatement equipment, including the handling and treatment /disposal of spent scrubber media. | Applicable | Proposed. An operational maintenance programme will be put in place for the odour control system. |
| **BAT 39** | BAT is to have a scrubber system in place for the major inorganic gaseous releases from those unit operations which have a point discharge for process emissions | Not Applicable | Process will not generated major inorganic gaseous emissions. |
| **BAT 40** | BAT is to have leak detection and repair procedures in place in installations a) handling a large number of piping components and storage and b) compounds that may leak easily and create an environmental problem | Not Applicable | The site does not handle a large number of piping components or use compounds that leak easily to air. |
| **BAT 41** | BAT is to reduce air emission to the following levels VOC 7-20mg/$Nm^3$and PM to 2-20mg/$Nm^3$ | Not Applicable | The site does not have point emission sources for either VOC or PM |
| | **Wastewater Management** | | |
| **BAT 42** | Reduce the water use and the contamination of water | | |
| **a)** | BAT is to apply site waterproofing and storage retention methods. | Applicable | In place. The site is covered by paved yards and buildings. Bunds provided around oil storage tanks. |
| **b)** | BAT is to carry out regular checks of the tanks and pits especially when they are underground | Applicable | In place. Waste licence requires regular checks and integrity testing of bunds, tanks and containers. |
| **c)** | BAT is to apply separated water drainage according to the pollution load (roof water, road water, process water) | Applicable | In place. Separate collection systems provided for sanitary waste water, surface water run-off from building roofs, and surface water run-off from operational yards.<br><br>. |

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| **d)** | BAT is to apply a security collection basin | Not Applicable | |
| **e)** | BAT is to performing regular water audits, with the aim of reducing water consumption and preventing water contamination | Applicable | In place and proposed. PANDA reviews water consumption annually as part of the preparation of the AER. Rainwater form the roofs of the new building will be harvested for use as grey water. PANDA also carries out regular inspections of the drains |
| **f)** | BAT is to segregate process water from rainwater | Applicable | In place(ref BAT 42c) |
| **BAT 43** | BAT is to have procedures in place to ensure that the effluent specification is suitable for the on-site effluent treatment system or discharge | Not Applicable | No on-site effluent treatment system and no on-site discharge to sewer. Integrated Constructed Wetland (ICW) will treat surface water run-off from operational yards. When commissioned, the discharge will be monitored to confirm it complies with the ELV set in the licence. |
| **BAT 44** | BAT is to avoid the effluent by-passing the treatment plant systems | Applicable | No by pass on the surface water drainage system that connects to the ICW. No other on-site effluent treatment system. |
| **BAT 45** | BAT is to have in place and operate an enclosure system whereby rainwater falling on the processing areas is collected along with tanker washings, occasional spillages, drum washings, etc. and returned to the processing plant or collected in a combined interceptor | Not Applicable | All waste processing is carried out inside the buildings. |
| **BAT 46** | BAT is to segregate the water collecting systems for potentially more contaminated waters from less contaminated water | Applicable | In Place. Separate surface water collection systems for run-off from the building roofs and the operational yards. Roof water from the new buildings will be harvested and diverted from the surface water drainage system |
| **BAT 47** | BAT is to have a full concrete base in the whole treatment area that falls to internal site drainage systems which lead to storage tanks or to interceptors that can collect rainwater | Applicable | In place. All waste processing carried out inside the buildings. Drainage from operational yards passes through an attenuation tank and oil interceptor. |

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| | and any spillage. Interceptors with an overflow to sewer usually need automatic monitoring systems, such as pH checks, which can shut down the overflow | | |
| **BAT 48** | BAT is to collect the rainwater in a special basin for checking, treatment if contaminated and further use | Not Applicable | |
| **BAT 49** | BAT is to maximise the re-use of treated waste waters and use of rainwater in the installation | Applicable | In Place. Rainwater is collected and used on site for dust suppression. Rainwater from the new building roofs will be harvested and used to reduce demand on the well. There is no is no on-site WT plant. |
| **BAT 50** | BAT is to conduct daily checks on the effluent management system and to maintain a log of all checks carried out, by having a system for monitoring the effluent discharge and sludge quality in place | Not Applicable | In Place. There is no on-site effluent waste water treatment plant. The ICW will be subject to regular inspection and maintenance to ensure it operates effectively and record of the inspections will be maintained. |
| **BAT 51** | BAT is to firstly identify waste waters that may contain hazardous compounds, secondly segregate the previously identified wastewater streams on-site and thirdly, specifically treat waste water on-site or off-site | Applicable | In Place. The process does not generate a process waste water. Sanitary wastewater is separated from the surface water drainage system and sent off site or treatment. Run off from the operational yards will be treated in the ICW once it has been commissioned. |
| **BAT 52** | BAT is to ultimately after the application of BAT number 42, select and carry out the appropriate treatment technique for each type of waste water | Applicable | In place. Sanitary waste water is sent to a municipal wastewater treatment plant. Run-off from the operational yards will be treated in the ICW once it has been commissioned. |
| **BAT 53** | BAT is to implement measures to increase the reliability with which the required control and abatement performance can be carried out. | Applicable | No on-site WT plant. The ICW will be subject to regular inspection and maintenance. |

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| **BAT 54** | BAT is to identify the main chemical constituents of the treated effluent and to then make an informed assessment of the fate of these chemicals in the environment | Applicable | No on-site WT plant. The discharge from the ICW when it is operational will comply with the ELVs set in the licence. In setting the ELVs the Agency will take into consideration the impact on the environment. |
| **BAT 55** | BAT is to only discharge the waste water from its storage after the conclusion of all the treatment measures and a subsequent final inspection | Applicable | The sanitary wastewater collected in the storage tank is routinely tested to confirm it is suitable for treatment in the off-site municipal wastewater treatment plant. |
| **BAT 56** | BAT is to achieve the following water emission values before discharge Water parameter Emission values associated with the use of BAT (ppm)<br>COD 20 – 120<br>BOD 2 – 20<br>Heavy metals (Cr, Cu, Ni, Pb, Zn)<br>0.1 – 1<br>Highly toxic heavy metals:<br>As <0.1<br>Hg 0.01 – 0.05<br>Cd <0.1 – 0.2<br>Cr(VI) <0.1 – 0.4 | Applicable | No on-site WT plant. The discharge from the ICW, when it has been commissioned, will comply with the ELVs set in the licence, which are BOD 5mg/l. SS 25mgl and ammonia 1.0mg/l. |
| | **Management of Process Related Residues** | | |
| **BAT 57** | BAT is to have a residue management plan as part of the EMS including a) basic housekeeping techniques and b) internal benchmarking techniques | Applicable | In place. PANDA has procedures to manage waste arising from site activities, which include canteen and office waste and waste oils |
| **BAT 58** | BAT is to maximise the use of re-usable packaging (drums, containers, IBCs, palettes, etc.) | Applicable | In place. |
| **BAT 59** | BAT is to re-use drums when they are in a good working state. In other cases, they are to be sent for appropriate treatment | Not Applicable | The site does not accept drums |

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| **BAT 60** | BAT is to keep a monitoring inventory of the waste on-site by using records of the amount of wastes received on-site and records of the wastes processed | Applicable | In place. PANDA keeps records of all of the wastes accepted and consigned from the site. |
| **BAT 61** | BAT is to re-use the waste from one activity/treatment possibly as a feedstock for another | Not Applicable | Given the nature of the wastes accepted and the type of processing carried out, there is no opportunity to re-use waste on-site. |
| | **Soil Contamination** | | |
| **BAT 62** | BAT is to provide and then maintain the surfaces of operational areas, including applying measures to prevent or quickly clear away leaks and spillages, and ensuring that maintenance of drainage systems and other subsurface structures is carried out | Applicable | In place/Proposed. All operational and waste storage areas will be paved. PANDA has a procedure to deal with spills (SOP 14) Licence requires regular inspection of drainage systems. |
| **BAT 63** | BAT is to utilise an impermeable base and internal site drainage | Applicable | In place/Proposed. All operational and waste storage areas will have an impermeable base. Surface water and foul drainage systems provided. |
| **BAT 64** | BAT is to reduce the installation site and minimise the use of underground vessels and pipework | Applicable | In place. There is one underground tank used to store sanitary wastewater and one attenuation tank on the surface water drainage system. |

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# ATTACHMENT 2

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Alvin Morrow

# Reed bed wastewater treatment systems

## design, installation and maintenance

Alvin Morrow
Abbey
Ballyshannon
Co. Donegal

***General design rationale for reed bed surface flow constructed wetlands:***

*The following is a design rationale for a reed based (phragmites australis) wetland system for the treatment of domestic , agricultural, commercial and industrial wastewater applications as clarified with the Dept of Agriculture.*

*The principles for this type of wetland design correlates with the equation and effluent strengths and are based on figures from the WRc manual: Reed beds and Constructed Wetlands for Wastewater treatment. It has also been developed with reference to the guidance document produced by the Dept. Of the Environment, Heritage and local Governments Guidance document for farmyard soiled water and domestic wastewater applications: Integrated constructed wetlands.*

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*Met Eireann figures (in mm/year) are used to calculate the flow figures in m3/day.*
*Washing parlours: ~2000mg/litre bod5*
*Dirty yards: ~2500mg/litre bod5*
*Clean yards/highway runoff: 0.5% – 5% of catchment area to wetland.*

*Using the Kickuth equation x 4.*

$$\frac{Qd\ (\ln Co - \ln Ct)}{Kbod} \times 4$$

*Where,*
*Qd = flow per day in m3*
*Co = influent bod concentration in mg/litre e.g. 2000mg/litre for washing parlours.*
*Ct = required effluent bod concentration in mg/litre e.g. 5mg/litre for discharge to surface waters. (For efficiency purposes in all scenarios, it is good practice to aim to achieve <5mg bod5 when designing the wetland).*
*Kbod = constant i.e. 0.1*



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Alvin Morrow

# Reed bed wastewater treatment systems

## design, installation and maintenance

Alvin Morrow
Abbey
Ballyshannon
Co. Donegal

***General design rationale for reed bed surface flow constructed wetlands:***

*This equation derives from the equation for sub surface horizontal flow, gravel based, reed bed systems. So as to relate it to surface flow constructed wetlands the design is multiplied by four, as wetlands are a maximum four times shallower than reed bed horizontal flow gravel based systems. This assumption is also supported by the notion that domestically designed systems have a 5m2/pe for subsurface horizontal flow (gravel based) systems, while wetlands have a 20m2/pe design comparison.*

*Comparing the Dept design with reed based wetland design; the dept wetland design requires a ratio of 2:1 wetland to dirty yard. Although dependant on rainfall the reed based wetland require ~1:1 wetland to dirty yard. The anomaly between the two designs is due to the better efficiency of phragmites. ICW's utilise various aquatic plant species which grow in 'clumps', whereas reeds (phragmites australis) are extremely invasive and create a thick stand of plants invading every available space.*

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*Furthermore each cell depth has been stated as being 0.15m deep. However in practical terms, each cell has an average depth of 0.2m (0.15m to 0.25m) which provides a 25% buffer incorporated into its design. (Phragmites are known to grow beyond depths of 0.5m in free surface flow systems as in nature).*

*For reed based wetlands an additional 0.5m of topsoil shall be lain/provided/maintained on top of the impervious layer for use as rooting material. This shall be done so as to alleviate any concerns with respect to the vigorous growth nature of the root network of the phragmites, opening pathways to the groundwater. This additional design feature shall be adopted, as it is assumed that a phragmites root system can grow down to a depth of 0.5m.*

***While this design rationale is not relevant to the design of this system, it is hoped that the principle of the design shows the increased potential of such a system as compared to ICW methodologies.***



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# Reed bed wastewater treatment systems

## design, installation and maintenance

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***Designing, supplying, installing and maintaining reed bed and wetland systems since 2003, ensuring quality professional service and proven system design.***

***Flexible single and multiple domestic designs for secondary and tertiary treatment prior to discharge available.***

*Domestic reed bed prices start at €1570 + vat for kit supply only, for a 30m2 system i.e. 6pe (3 bedroom) secondary treatment (20/20) after a septic tank.*
*Comprehensive installation and maintenance guides*
*Supervised installations provide 3 year guarantee and maintenance. Prices start at €2226 + vat for a 30m2 system.*
*Ideal and easy upgrade add-on treatment to old septic tank systems.*
*Wetlands/ponds and/or willow beds can be used after tertiary (5/5) treated effluents to reduce contaminants further, if and where necessary.*

***Commercial, Industrial and agricultural designs also available.***

*Applications include for example: highways, airports, storm/drain, road, urban and yard runoffs, agricultural sector lechates/wastewaters/runoffs, quarry, landfill lechates hydrocarbon, composting and sawdust resins, food processing coastal bathing water protection, recreation and amenity, golf clubs and numerous other agri, commercial and industrial wastewaters. Lined and in situ applications available*
*Wetland system prices start at €5/m2 + labour/supervision of works.*

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***Advantages:***

*-low installation costs/minimal maintenance.*
*-once established the system requires little to no maintenance*
*-provides an aesthetically pleasing landscape feature*
*-extremely robust, copes easily with varying flows*
*-no mechanical parts, no energy requirements, no on-going maintenance or running costs.*
*-natural, reliable simple and sustainable*

***for more info contact:***

*mob: 00353 87 9440370*
*tel: 00353 7198 58170*
*web: www.alvinmorrow.com*
*email: alvinmorrow@eircom.net*



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# Constructed Wetland design for Panda waste services

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## Site at Rathdrinagh, Navan, Co. Meath

*Please find attached the site location map, site layout, EPA emission licence, tank effluent sampling results, 3 trial hole assessments, trial hole pictures, particle soil distribution (psd) test lab results and wetland system drawings at rear of report.*

Alvin Morrow B.Sc. (Env).

Reed bed and Constructed Wetland
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# REF: Panda waste

***OVERVIEW:***

*The following is a worked design for the proposed constructed wetland system for Panda waste at Rathdrinagh, Navan, Co. Meath. The national grid reference for the site is NGR 297957 268590. The site is situated on subsoil categorised as (TNSSs) - shales and sandstone till - clayey texture. This suggests, from the outset, that the on-site soils/subsoils may lend itself to the suitably high clay contents required for the impervious protective layer required for the construction of the wetland system. The site is underlain by Namurian Undifferentiated bedrock (NU). The site appears to fall within the river Boyne catchment area as a stream to the south of the site feeds the Boyne. However the river Nanny catchment area lies nearby to the south. (See site location map).*

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*Waste materials at the facility are processed indoors. Therefore the wastewaters collected are not considered to contain any lechates from the waste materials being processed. Therefore wetland design rationale for the treatment of urban/highway runoff shall be adopted. At present the roof and yard runoffs are sent to three settlement tanks (estimated capacity of ~350m3) prior to subsequent removal off site. The intention is to send the waters to the settlement tanks as usual, prior to being sent to a wetland system for treatment prior to discharging to the existing surface water drain/ditch passing adjacent to the proposed position of the wetland system. The wetland is to be a horizontal, surface flow design, divided into a three stage/cell system. The intention is then to have an overflow to the ditch/stream where it is estimated that the effluent will be of an exceptional standard (beyond a <5/5 bod5/SS standard).*

***WETLAND DESIGN RATIONALE:***

***Site area:*** *43,933.5m2. (See site layout).*
***Total area to be excluded:***
*3250m2 - unused land (i.e. land on which proposed wetland area will sit)*
*9438m2 - roofed area.*
*This equates to a total of 12,688m2*
*Therefore site area for treatment - 31,245.5m2.*

*(For design purposed roofed areas have been excluded. While the roof waters at present flow into the holding tanks, they are considered effluent neutral as the waters from the roofs are clean and provide dilution, and do not provide parameter loading on the systems design).*

***Met Eireann rainfall figures:***
*800-1000mm/year. Therefore a maximum average rainfall figure of 2.74mm/day can be assumed*



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***SIZING THE SYSTEM:***

***Using the WRc guideline manual: Reed beds and Constructed Wetlands for Wastewater treatment, when designing wetlands for urban/highway runoff, a wetland area is required to be 0.5% – 5% of the total catchment area to effectively deal with subsequent flows and pollutants gained.***

*Therefore using best practice, assuming 5% of 31,245.5m2, a wetland area of 1562.3 (1563m2) is deemed to be sufficient to ensure excellent treatment of run off. The ditch which intersects this area inhibits the area available for the construction of the wetland. It is proposed to pipe the ditch in a 24" concrete pipe so as to protect the ditch, as a 10m separation distance cannot be obtained from the edge of the proposed wetland, while trying to position the wetland system. As a result, the proposed maximum available area for the wetland on site (~2504m2) now lends itself to incorporating the wetland area, plus the additional allowance for embankments etc. The total constructed area for the wetland design is ~2178m2 (17m x 128m). (See drawings which follow).*

*It should also be remembered that the wetland is preceded by settlement tanks prior to discharge to the wetland, significantly aiding the systems efficiency. The wetland will consist of three individual beds. Each bed base is to be sized at 521m2 (13m x 40.1m), so as to obtain, as near to a 3:1 length to width ratio, as possible.*

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***RETENTION TIMES:***

*Using the average daily rainfall figure of 2.74mm/day on the catchment area of 43,933.5m2, an average flow of 120m3/day can be assumed. A short retention time of 16–24 hrs is sufficient to achieve high performance secondary and tertiary treatment standards i.e. <5/5 BOD5/SS.*

*Considering the capacity of the wetland area is 1563m2 with a depth between 0.15m and 0.2m (234m3/day and 312m3/day respectively) a retention time of 46 hrs – 62 hrs can be expected. Therefore it can be assumed that the wetland can easily cope with twice to two and a half the flows envisaged in a 24 hr period.*

***EXPECTED PERFORMANCE:***

*96% of total extractable hydrocarbons are removed after only 5hrs retention.*
*50–75% total phosphorus.*
*60–80% nitrogen (oxidises ammonia)*
*83% COD*
*89% BOD5*
*99.9% faecal coliforms*
*70–90% suspended solids*

*NB: it should be noted that the effluent produced should exceed these estimated figures as retention times are more than twice those recommended by suggested design criteria i.e. min 16–24hr retention. See also* ***General design rationale for reed bed surface flow constructed wetlands*** *at rear of report as support to design proposal*



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*The permissible limits for the emissions to water from the site have been set by the EPA under Licence reg no: W0140-03. The following has been taken from Schedule B: Emission Limits, B.2 - Emissions to water.*

---

## B.2 Emissions to water

| | |
|---|---|
| *Emission point reference no:* | *SW1* |
| *Name of Receiving waters:* | *Southern drain* |
| *Location:* | *Southern boundary of site (note 1)* |

| *Parameter* | *Emission Limit Value (mg/l)* |
|---|---|
| *BOD* | *5* |
| *Suspended Solids* | *25* |
| *Ammonia (as NH4)* | *1* |

*Note 1: location of SW1 may be changed with the agreement of the Agency*

---

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*The following sample results were taken from the final tank/chamber at the point where the wastewater will be allowed to flow to the proposed wetland system. These were taken on the 26/9/13 and on the 5/12/13.* ***Please find attached sampling results from wastewater taken from the holding tanks.***
*From this it can be seen that the results as for the parameters as set in the emission limits are as follows:*

| *Test parameter* | *result 26/9/13* | *result 5/12/13* |
|---|---|---|
| *BOD* | *<2mg/l* | *<2mg/l* |
| *Suspended solids* | *3mg/litre* | *6mg/litre* |
| *Ammonia (as N)* | *0.047mg/l* | *1.38mg/l* |

*It should be noted that the effluent produced from the holding tanks are well below that set as suitable for discharge with the exception of one ammonia result on the 5/12/13 which is marginally above the acceptable emission limit. Therefore nutrient and suspended solids loadings will be relatively low and the effluent for all parameters, even throughout storm events produced by the wetland will be polished to an exceptional quality.*

*The flow within the ditch/drain which will be used as the discharge route was measured on the 14/11/13 during a dry weather period. It was found to have an estimated flow of 0.039m3/sec. This equates to 3,370m3/day. The average daily catchment flow to and from the wetland is estimated at~120m3. Therefore a ditch flow/catchment flow dilution ratio of 23:1 exists.*



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# REF: Panda waste

*1) Design rationale and Construction methods*

1) *The total wetland area should be divided into a minimum 2-3 separate wetlands.*

2) *As mentioned previously, the wetlands shall be a minimum of 0.15m deep and ideally no more than 0.25m deep. (i.e. average 0.2m depth). (The reeds are in fact able to perform efficiently in 0.3m deep waters).*

3) *The wetland should have a length to width ratio of approximately 3:1.*

4) *Pipe work at inlet end shall distribute the effluent evenly across the beds width.*

5) *The pipe work at the outlet shall be able to be adjusted so as the control of water depth within the bed is achievable.*

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*2) Further design considerations:*

*With respect to the groundwater protection requirements, the site is located in a poor aquifer (Pl) category area, while the area has a low vulnerability categorisation (www.gsi.ie). The guidelines for the groundwater protection have been developed with reference to the guidance document produced by the Dept. Of the Environment, Heritage and local Governments Guidance document for farmyard soiled water and domestic wastewater applications: Integrated constructed wetlands. It is therefore proposed to have a minimum of 1m depth of soil above water table/bedrock whereby the top 0.5m of that, shall create an impervious layer/liner with high clay content i.e. SILT/CLAY or CLAY - BS 5930 categorisation and compacted if deemed necessary by using the digger to track and compact the soil. A particle soil distribution test (psd) has been conducted so as to determine the clay content within a layer(s) within the sites subsoil so as to ensure a 0.5m impervious layer can be obtained. It is recognised that a soil/subsoil with a clay content >13% is suitable for use as an in situ liner. Soil/subsoil with 10%-13% clay content can be reworked and compacted in lifts using the digger to track and compact the soil. Below 10% an artificial liner will be required. The trial hole assessments and psd tests which follow will determine the status of such.*

***For reed based wetlands an additional 0.5m of topsoil shall be lain/provided/maintained on top of the impervious layer for use as rooting material.***

*This shall be done so as to alleviate any concerns with respect to the vigorous growth nature of the root network of the phragmites, opening pathways to the groundwater. This additional design feature shall be adopted, as it is assumed that a phragmites root system can grow down to a depth of 0.5m.*



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3) **Trial hole assessment, PSD test analysis and Construction method:**

*A site visit was conducted on the 11/11/13 and on the 14/11/13. Three trial holes were dug on the 11/11/13 at the proposed location of the wetland position. Each trial hole was intended to be representative of ~500m2, which also correlates with each of the three proposed cells of the wetland. Each hole had been dug to a depth of 2.8m, 2.8m and 3m respectively. On the 14/11/13, having been left open for >48hrs, each trial hole was examined. Soil samples were taken from each layer within each trial hole for classification through BS 5930. See trial holes pictures and assessments which follow. Furthermore samples were also taken to confirm clay content % within the subsoil layer in the trial hole so as to establish the suitability of the subsoil for use as the wetland impervious liner. PSD tests T1 AND T4 were taken from trial hole 1, T2 and T5 from trial hole 2 and T3 and T6 from trial hole 3.See PSD test results which follow.*

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*As can be seen from the trial hole assessment no evidence of a water table (winter or otherwise) was encountered. Furthermore three distinct soil layers emerge. From the layering within the trial hole, it can be seen, that it is likely that the top layer has been placed onto the original ground level as fill. Indeed from talking to the staff, it was confirmed that soil/subsoil from other areas of the site had been moved onto the proposed wetland area. This produces three distinct layers, imported soils (fill), original topsoil and subsoil. The imported soil/ fill has been classified as a SILT/CLAY soil type and due to its nature will be suitable for the construction of embankments due to its low to medium permeability classification. The original topsoil layers also have SILT/CLAY characteristics and lend itself suitable for use as the >0.5m rooting material layer. Meanwhile the subsoils are SILT/CLAY soils, which lend itself ideal for use as the 0.5m impervious layer and base 0.5m layer, for protection cover above bedrock/water-table. (See wetland system drawings which follow).*

*When considering the results from the psd tests it can be seen that cell 1 can be constructed relatively easily with limited disruption of the in situ conditions, however cell 2 and cell 3 will require reworking. The base of the outlet from the settlement tanks will be 0.6m below the tanks lid (at g.l.) This tank outlet has been set at base level/ground zero (0.0m) for the purpose of alignment of the wetland and cell system. There is then a 0.6m drop to the base of cell 1, a 0.3m drop from cell 1 to cell 2, a 0.2m drop between cell 2 to cell 3 and finally >0.2m drop to the ditch outfall. See construction method, which follows for further details. See also wetland system drawings.*

*The drainage ditch running on site runs from north to south in flow direction. The base of the ditch appears to be lined with concrete, which keeps the waters clean. The water level in ditch does not impact on the water table as no water table was encountered within any of the three trial holes. It is proposed however to pipe the ditch so as to alleviate any concern by not having 10m separation distance to the wetland. The outfall of the ditch (to the extreme south of the site) is >1.9m below the lids of the settlement tanks (1.3m below proposed tank outfall).*



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4) **Construction method:**

**Cell 1 (T1) construction**: the base of the first cell has been set at 0.6m below ground zero. Therefore, the top 0.2m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Now below the base ~600mm of original topsoil (13% clay content(psd-T1)) can be maintained in situ as suitable rooting material. This is then underlain by 0.5m impervious layer and 0.5m cover layer as required. (As seen in trial hole, in reality 2m of in situ impervious layer (13% clay content (psd-T4)) underlies the rooting in situ layer.

**Cell 2 (T2) construction**: the base of the second cell has been set at 0.9m below ground zero. Therefore, similar to cell 1, the top 0.2m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall again be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Now, below the base ~500mm of original topsoil (10% clay content(psd-T2)) shall be temporarily removed and reinstated later for use as suitable rooting material. As the subsoil has a 12% clay content (psd-T5)) underlies the topsoil layer, ~0.6m shall be removed and re-lain in 200mm lifts, compacted and tracked in using the digger. This is to be repeated three or four times, resulting in 600mm+ of soil, compacted to >500mm depth creating the required 0.5m impervious layer on top of the 0.5m cover layer as required. (As seen in trial hole, in reality 2m of in situ med to high impervious layer (12% clay content (psd-T5)) underlies the rooting layer). Now, the ~500mm of original topsoil (10% clay content (T3)) shall be reinstated for use as suitable rooting material.

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**Cell 3 (T3) construction**: the base of the third cell has been set at 1.1m below ground zero. In this case the top 0.8m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall again be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Due to the original topsoil (0.6m) having 9% clay content, and the subsoil (0.5m of 1.6m) having a 11% clay content these layers will be required to be effectively swapped so as to create the necessary conditions. Therefore, the next 600mm of original topsoil (11% clay content (psd-T3)) shall be temporarily removed and reinstated later for use as the compacted impervious layer. Then the underlying ~0.5m shall be removed and used later as the rooting material. This layer after removal shall then be replaced with the original topsoil (11% psd-T3) and re-lain in 200mm lifts, compacted and tracked in using the digger. This is to be repeated three or four times, resulting in 600mm+ of soil, compacted to >500mm depth creating the required 0.5m impervious layer. Under this, the remaining in situ 0.5m cover layer is in place as required. (As seen in trial hole, in reality 1.1m of subsoil will exists (9% clay content (psd-T6)) under the impervious layer, as 0.5m was removed (totalling 1.6m as seen from trial hole analysis). Now, the ~500mm of original subsoil (9% clay content (T6)) shall be reinstated for use as suitable rooting material.



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***Construction General:***

*The installation of the layers may require the movement of soils from one part of the site to another however it is hope the minimum of disturbance will be involved as, by enlarge, the in situ conditions already exist. Inlet and outlet pipe work shall consist of 9" feeds to and from each cell. Internally in each of the cells the pipe work shall be split down to 6" arrangements. Once fitted, planting is conducted at a planting rate of 2 plants/m2 with reeds (Phragmites Australis). The outlet sampling chamber shall be installed and piped to the ditch. As stated previously the ditch is to be piped back upstream parallel to the wetland using 24" concrete piping prior to the wetland works begin.*

***Supervision of installation:***

*The full construction process is to be supervised to ensure the correct processes are followed. It is envisaged the wetland will reach full maturity within 1-2 years, whereby full efficiency will be achieved. The wetland only will be subject to a-three year maintenance and guarantee contract from the date of completion of installation. After 3 years elapses this can be extended if requested.*

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***Maintenance for the efficient function of the wetland.***

*It is envisaged that the effluent produced from the wetland will be well beyond 5/5, Bod5/SS standards. As previously mentioned the treated effluent is to be discharged to the ditch.*

*Desludging of the settled sediment from the tanks should be monitored once a month and desludged every 6mths -1 years or as appropriate.*

*So as to ensure the wetland has a minimum of 0.15m deep and ideally no more than 0.25m deep. (i.e. average 0.2m depth), the pipe work at the outlet should be adjusted so as the control of water depth within the bed.*

*The pipe work at inlet end shall be rodded periodically to ensure the even distribution of the effluent evenly across each beds width.*

*Similarly the outlet shall also be checked and rodded, if necessary, to ensure the free flow of effluent.*



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*Constructed Wetland design for Panda waste services*

*Site at Rathdrinagh, Navan, Co. Meath*

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*Please find attached overleaf the site location map, site layout, EPA emissions to water licence, tank effluent sampling results, 3 trial hole assessments, trial hole pictures, particle soil distribution (psd) test lab results and wetland system drawings.*

*Also please find attached General design rationale for reed bed surface flow constructed wetlands as support to design proposal and business information sheet*



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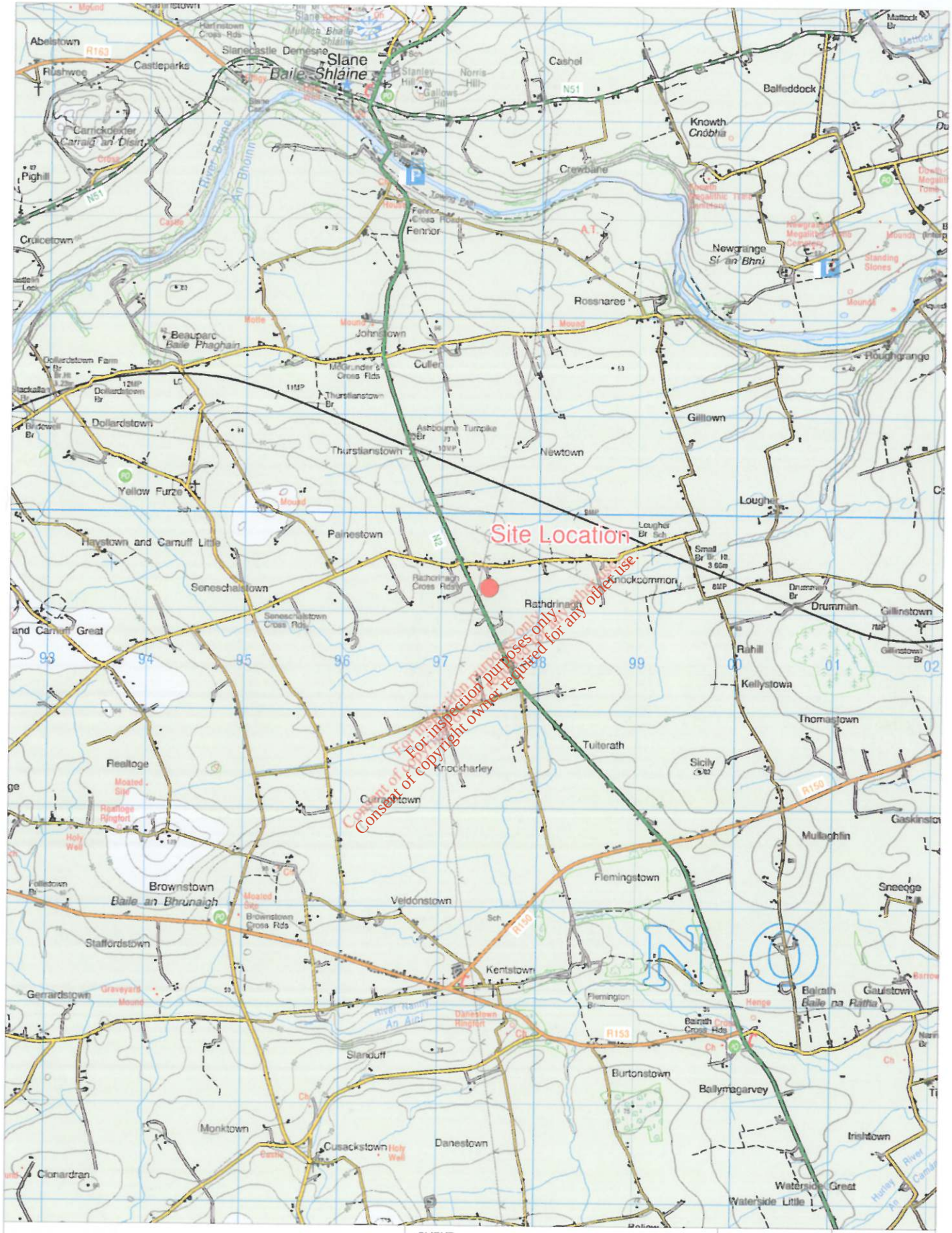


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| | | | |
|---|---|---|---|
| | CLIENT<br>Panda Waste Services | DETAILS<br>O.S. Licence Agreement Number AR 0037807 | DRG. No.<br>1 |
| | TITLE<br>Site Location Map | Ordnance Survey Ireland<br>Government of Ireland | SCALE REV.<br>1:50,000 |

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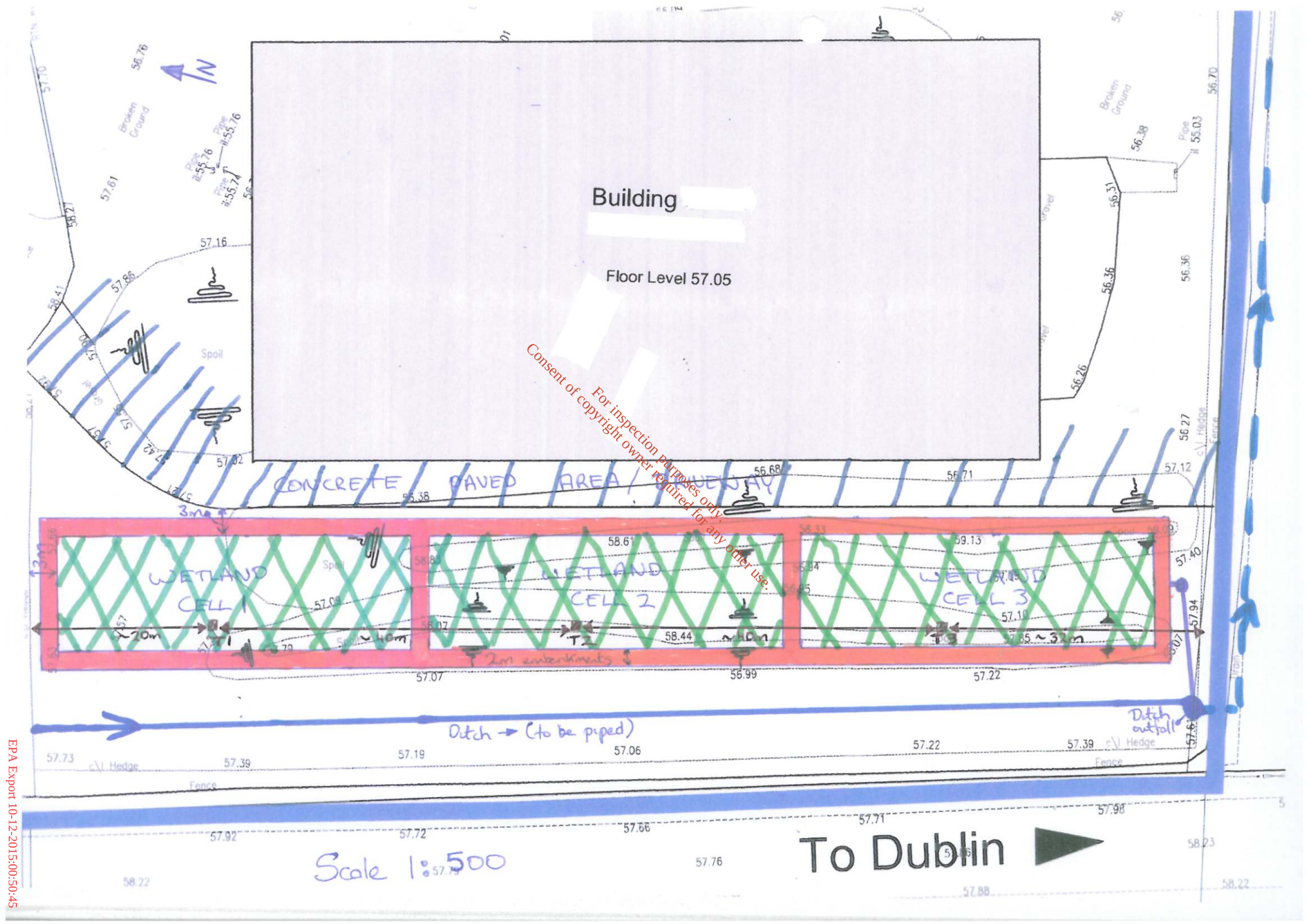


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# SCHEDULE B: Emission Limits

## *B.1 Emissions to Air*

**Emission Point Reference No.:** Biofilter emission from Biodegradable waste composting unit (A-1).

**Location:** Biofilter Unit

| Parameter | Emission Limit Value |
|---|---|
| Ammonia | 50mg/m$^3$ |
| Hydrogen Sulphide | 5mg/m$^3$ |
| Mercaptans | 5mg/m$^3$ |

## *B.2 Emissions to Water*

**Emission Point Reference No.:** SW1

**Name of Receiving Waters:** Southern drain

**Location:** Southern boundary of site [Note 1]

| Parameter | Emission Limit Value(mg/l) |
|---|---|
| BOD | 5 |
| Suspended Solids | 25 |
| Ammonia (as NH4) | 1.0 |

**Note 1:** Location of SW1 may be changed with the agreement of the Agency.

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tank effluent

Fitz scientific

Monitoring and Testing Services

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Web: www.fitzsci.ie
email info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie

| | | | |
|---|---|---|---|
| *Customer* | **David Naughton** | *Lab Report Ref. No.* | **2190/178/04** |
| | **Panda Waste** | *Date of Receipt* | **26/09/2013** |
| | **Beauparc Business Centre** | *Sampled On* | **26/09/2013** |
| | **Navan** | *Date Testing Commenced* | **26/09/2013** |
| | **Co Meath** | *Received or Collected* | **Delivered by Customer** |
| | **Ireland** | *Condition on Receipt* | **Acceptable** |
| *Customer PO* | **T1309313** | *Date of Report* | **02/10/2013** |
| *Customer Ref* | **Beau Surface Tank** | *Sample Type* | **Trade Effluent** |
| *Ref 2* | | | |

# CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|---|---|---|---|---|---|
| Ammonia (Industrial Eff.) | 114 | Colorimetry | 0.047 | mg/L as N | UKAS |
| Arsenic (Industrial Eff.) | 177 | ICPMS | 0.228 | ug/L | UKAS |
| BOD (Industrial Eff.) | 113 | Electrometry | <2 | mg/L | UKAS |
| Boron (Industrial Eff.) | 177 | ICPMS | 26.44 | ug/L | UKAS |
| Cadmium (Industrial Eff.) | 177 | ICPMS | <0.05 | ug/L | UKAS |
| Chromium (Industrial Eff.) | 177 | ICPMS | 1.637 | ug/L | UKAS |
| COD (Industrial Eff.) | 107 | Colorimetry | 11 | mg/L | UKAS |
| Copper (Industrial Eff.) | 177 | ICPMS | 2.175 | ug/L | UKAS |
| Lead (Industrial Eff.) | 177 | ICPMS | 1.732 | ug/L | UKAS |
| Mercury (Ind Effluent) | 178 | ICPMS | <0.04 | ug/L | UKAS |
| Nickel (Industrial Eff.) | 177 | ICPMS | 3.053 | ug/L | UKAS |
| Oils, Fats & Grease | 101 | Solvent Extraction/ Gravimetry | <1 | mg/L | |
| Selenium (Industrial Eff.) | 177 | ICPMS | <2.12 | ug/L | UKAS |
| Sulphate (Industrial Eff.) | 119 | Colorimetry | 93.56 | mg/L as SO4 | UKAS |
| Suspended Solids (Industrial Eff.) | 106 | Gravimetry | 3 | mg/L | UKAS |
| Zinc (Industrial Eff.) | 177 | ICPMS | 5.747 | ug/L | UKAS |

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***Signed :*** A Harmon

***Aoife Harmon - Technical Supervisor***

***Date : 02/10/2013***

*Acc. : Accredited Parameters by ISO 17025:2005*

PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)

All organic results are analysed as received and all results are corrected for dry weight at 104 C

Results shall not be reproduced, except in full, without the approval of Fitz Scientific

Results contained in this report relate only to the samples tested

**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.



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Fitz scientific

Monitoring and Testing Services

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Web: www.fitzsci.ie
email info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie

| | | | |
|---|---|---|---|
| *Customer* | **David Naughton** | *Lab Report Ref. No.* | **2190/182/01** |
| | **Panda Waste** | *Date of Receipt* | **05/12/2013** |
| | **Beauparc Business Centre** | *Sampled On* | **05/12/2013** |
| | **Navan** | *Date Testing Commenced* | **05/12/2013** |
| | **Co Meath** | *Received or Collected* | **Delivered by Customer** |
| | **Ireland** | *Condition on Receipt* | **Acceptable** |
| *Customer PO* | **T1312010** | *Date of Report* | **13/12/2013** |
| *Customer Ref* | **Beau Surface Tank - December 2013** | *Sample Type* | **Surface Water** |
| *Ref 2* | | | |

# CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|---|---|---|---|---|---|
| Ammonia (Surface Water) | 114 | Colorimetry | 1.38 | mg/L as N | UKAS |
| BOD (Surface Water) | 113 | Electrometry | <2 | mg/L | UKAS |
| Solids (Total Suspended) | 106 | Filtration/ Drying @ 104C | 6 | mg/L | |

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*Signed :* A Harmon

*Aoife Harmon - Technical Supervisor*

*Date : 13/12/2013*

Acc. : Accredited Parameters by ISO 17025:2005
PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.



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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T1 | Depth of Trial Hole (m): | 2.8 | Date and Time of Excavation: | 11/11/13 11:16 | Date and Time of Examination | 14/11/13 11:33 |
|---|---|---|---|---|---|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A | | | | | | |
| Depth from Ground Surface to Water Table (m) (if present): | n/A | | | | | | |
| Depth and Description of Topsoil | 0.2m fill, 0.6m topsoil | | | | | | |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | SILT/CLAY 4 threads 60 ribbons not dilatant | soft | greyish brown | n/A. | fill |
| 0.4m | | | | | |
| 0.6m | SILT/CLAY | soft | light brown | n/A. | topsoil |
| 0.8m | 4/5 threads, 70/80 ribbons, not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | | | | | |
| 1.4m | | | | | |
| 1.6m | SILT/CLAY | soft | dark grey | n/A. | subsoil. |
| 1.8m | 4/5 threads | | | | |
| 2.0m | 70/80 ribbons | | | | |
| 2.2m | not dilatant | | | | |
| 2.4m | | | | | |
| 2.6m | | | | | |
| 2.8m | | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | n/A | Rock Type (if present): | n/A. | | |

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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T2 | Depth of Trial Hole (m): | 2.8 | Date and Time of Excavation: | 11/11/13 11:29 | Date and Time of Examination | 14/11/13 11:51 |
|---|---|---|---|---|---|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A | | | | | | |
| Depth from Ground Surface to Water Table (m) (if present): | n/A | | | | | | |
| Depth and Description of Topsoil | 0.2m fill, 0.6m topsoil | | | | | | |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | SILT/CLAY 3/4 threads 60/70 ribbons not dilatant | very soft | greyish brown | n/A | fill |
| 0.4m | | | | | |
| 0.6m | SILT/CLAY | soft | light brown | n/A | topsoil |
| 0.8m | 4/5 threads, 70/80 ribbons, not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | | | | | |
| 1.4m | | | | | |
| 1.6m | SILT/CLAY | firm | dark grey | n/A | subsoil |
| 1.8m | 4/5 threads | | | | |
| 2.0m | 70/80 ribbons | | | | |
| 2.2m | not dilatant | | | | |
| 2.4m | | | | | |
| 2.6m | | | | | |
| 2.8m | | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | n/A | Rock Type (if present): | n/A | | |

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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T3 | Depth of Trial Hole (m): | 3.0 | Date and Time of Excavation: | 11/11/13 11:41 | Date and Time of Examination | 14/11/13 12:07 |
|---|---|---|---|---|---|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A | | | | | | |
| Depth from Ground Surface to Water Table (m) (if present): | n/A | | | | | | |
| Depth and Description of Topsoil | 0.8m fill, 0.6m topsoil | | | | | | |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | | | | | |
| 0.4m | SILT/CLAY | very soft | greyish brown | n/a | fill |
| 0.6m | 3/4 threads 70/80 ribbons | | | | |
| 0.8m | not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | SILT/CLAY | soft | light brown | n/A | topsoil |
| 1.4m | 3/4 threads, 70/80 ribbons, not dilatant | | | | |
| 1.6m | | | | | |
| 1.8m | | | | | |
| 2.0m | | | | | |
| 2.2m | SILT/CLAY | soft | dark grey | n/A | subsoil |
| 2.4m | 3/4 threads | | | | |
| 2.6m | 70/80 ribbons | | | | |
| 2.8m | not dilatant | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | n/A | | Rock Type (if present): | n/A. | |

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T3 T2 T1

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Trial holes @ Rathdrinagh, Navan Co Meath for Panda Waste Services.

Pictures taken >48hrs after excavation. (pictures taken out of sequence, hence T3, T2, T1).

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# TEST REPORT

Analysing
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BHP
New road
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Tel +353 61 455399
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E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/391
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/391 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T1 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 100 | | | |
| 10 | 100 | | | |
| 6.3 | 100 | | | |
| 5.0 | 99 | | | |
| 3.35 | 99 | | | |
| 2.00 | 98 | | | |
| 1.18 | 95 | | | |
| 600µm | 87 | | | |
| 425µm | 82 | | | |
| 300µm | 77 | | | |
| 212µm | 71 | | | |
| 150µm | 64 | | | |
| 63µm | 50 | | | |
| 20µm | 30 | | | |
| 6µm | 20 | | | |
| 2µm | 13 | | | |

Remarks:
Nil

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Laboratory Technical Manager
For and On Behalf of BHP Laboratories

Issue Date: 9th December 2013

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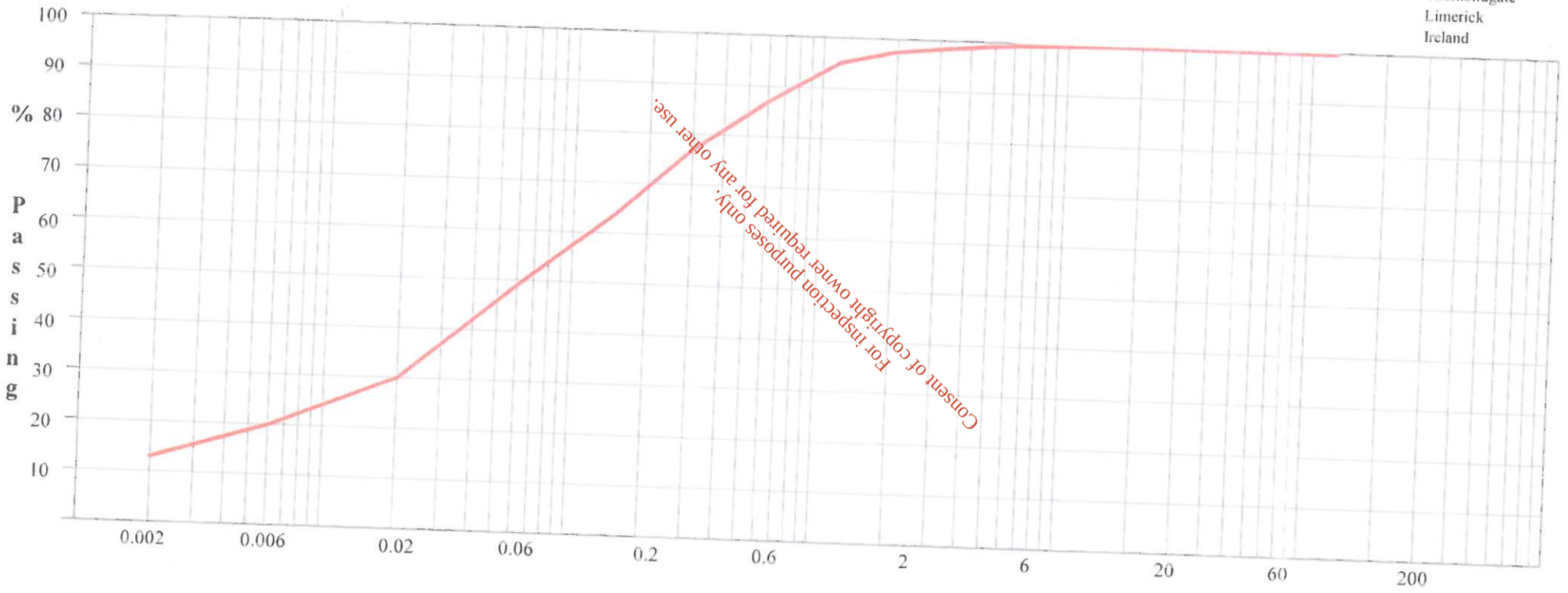
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T1 top layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/392
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/392 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | Customer Ref |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T2 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 100 | | | |
| 10 | 100 | | | |
| 6.3 | 100 | | | |
| 5.0 | 99 | | | |
| 3.35 | 98 | | | |
| 2.00 | 97 | | | |
| 1.18 | 95 | | | |
| 600µm | 87 | | | |
| 425µm | 81 | | | |
| 300µm | 76 | | | |
| 212µm | 70 | | | |
| 150µm | 64 | | | |
| 63µm | 51 | | | |
| 20µm | 28 | | | |
| 6µm | 18 | | | |
| 2µm | 10 | | | |

Remarks:
Nil

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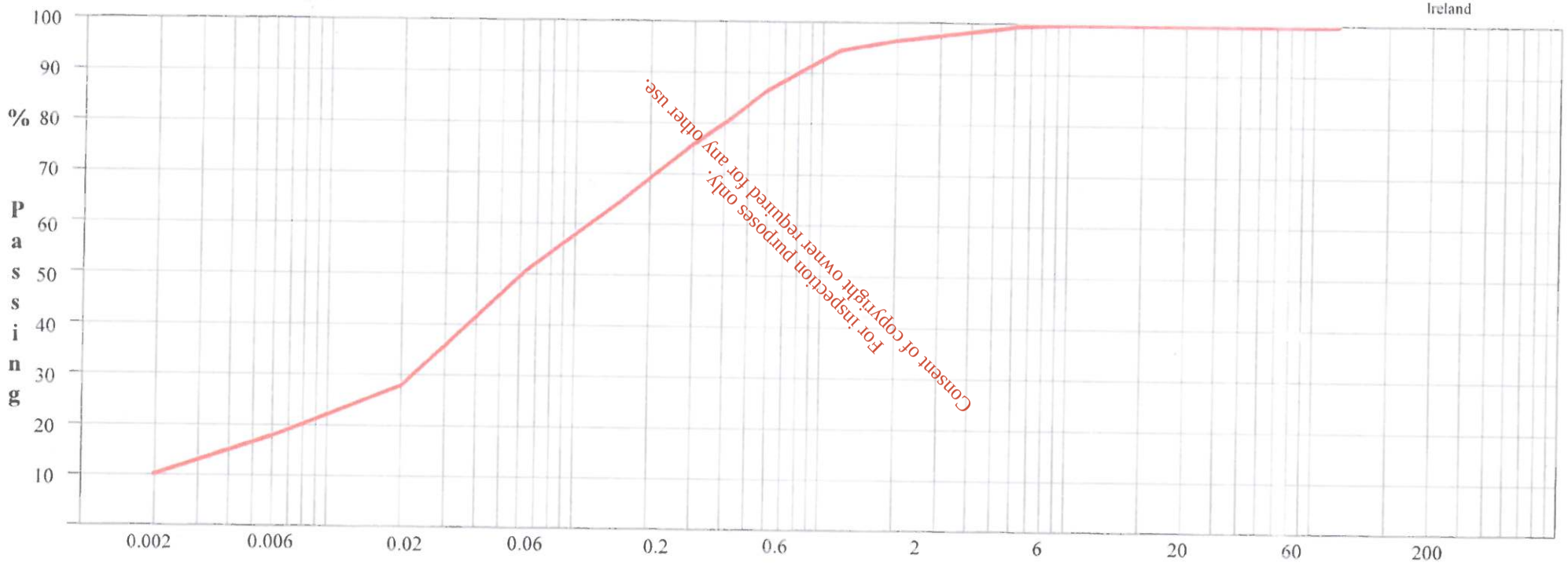
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample T2 top layer | | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/393-2
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/393-2 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T3 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 98 | | | |
| 10 | 96 | | | |
| 6.3 | 94 | | | |
| 5.0 | 93 | | | |
| 3.35 | 91 | | | |
| 2.00 | 88 | | | |
| 1.18 | 85 | | | |
| 600µm | 77 | | | |
| 425µm | 73 | | | |
| 300µm | 69 | | | |
| 212µm | 64 | | | |
| 150µm | 59 | | | |
| 63µm | 45 | | | |
| 20µm | 30 | | | |
| 6µm | 19 | | | |
| 2µm | 11 | | | |

Remarks:
Nil

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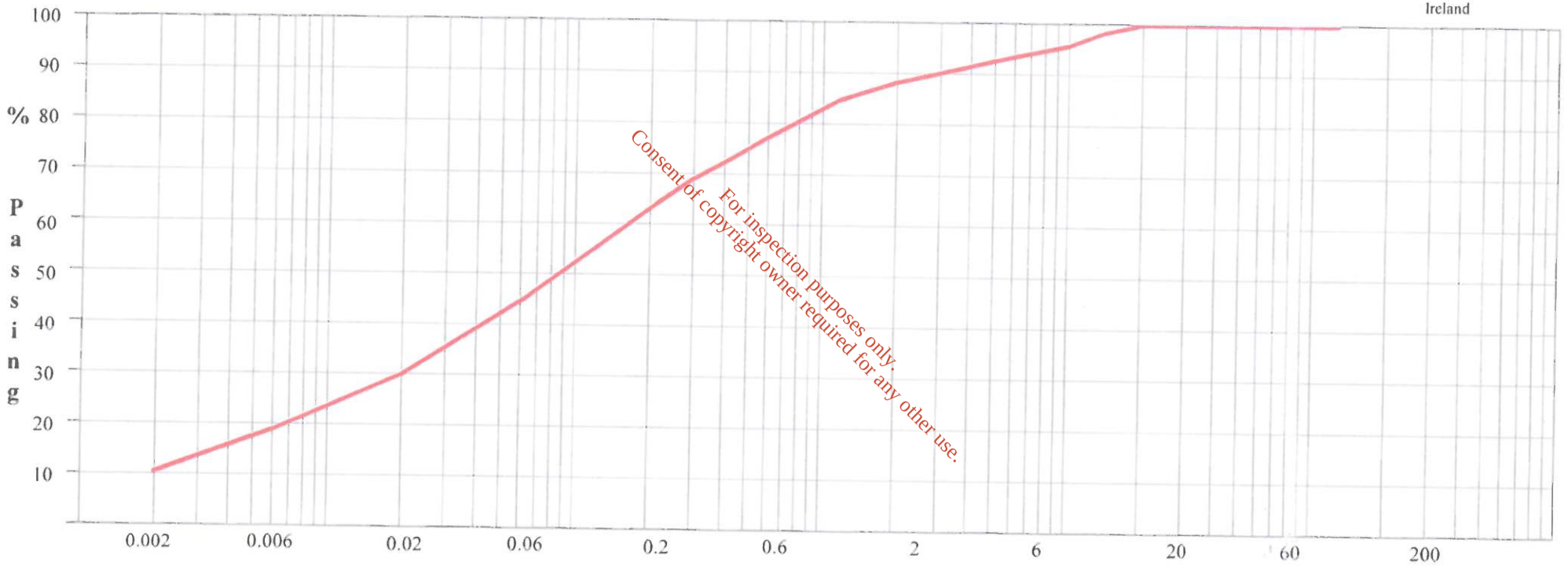
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/393-2 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T3 top layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/394
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/394 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T4 - bottom layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 93 | | | |
| 10 | 89 | | | |
| 6.3 | 87 | | | |
| 5.0 | 86 | | | |
| 3.35 | 84 | | | |
| 2.00 | 81 | | | |
| 1.18 | 79 | | | |
| 600µm | 74 | | | |
| 425µm | 71 | | | |
| 300µm | 68 | | | |
| 212µm | 63 | | | |
| 150µm | 57 | | | |
| 63µm | 44 | | | |
| 20µm | 32 | | | |
| 6µm | 20 | | | |
| 2µm | 13 | | | |

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Remarks:
Nil

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Laboratory Technical Manager
For and On Behalf of BHP Laboratories

Issue Date: 9th December 2013

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Limerick
Ireland

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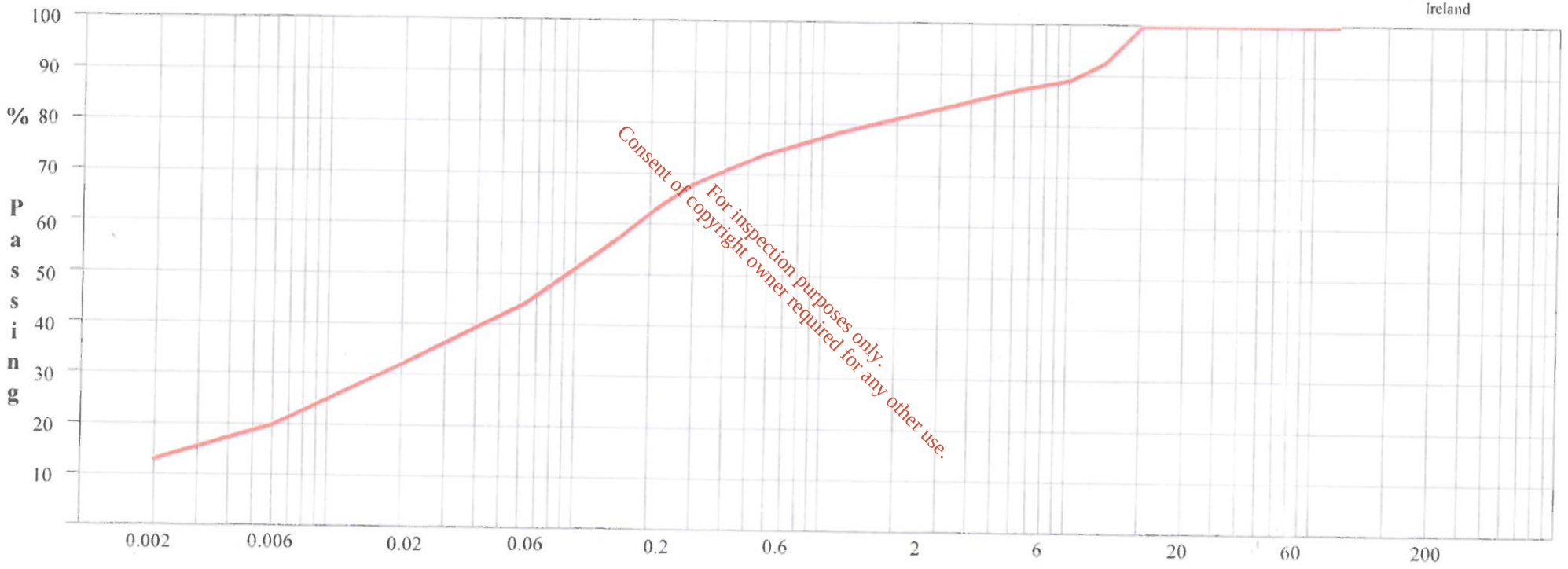
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/394 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T4 bottom layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

Seamus O'Connell
Laboratory Technical Manager
For and On Behalf of BHP Laboratories Ltd

Issue Date. 9th December 2013

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# TEST REPORT

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Tel +353 61 455399
Fax +353 61 455447
E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/395
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer s ec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/395 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | Customer Ref<br>Clay sample<br>Sample Ref:<br>T5 - bottom layer |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | |
| 100 | 100 | | | |
| 75 | 100 | | | |
| 63 | 100 | | | |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 81 | | | |
| 14 | 76 | | | |
| 10 | 73 | | | |
| 6.3 | 69 | | | |
| 5.0 | 68 | | | |
| 3.35 | 65 | | | |
| 2.00 | 61 | | | |
| 1.18 | 58 | | | |
| 600µm | 54 | | | |
| 425µm | 52 | | | |
| 300µm | 50 | | | |
| 212µm | 47 | | | |
| 150µm | 45 | | | |
| 63µm | 38 | | | |
| 20µm | 27 | | | |
| 6µm | 18 | | | |
| 2µm | 12 | | | |

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Remarks:
Nil

Seamus O'Connell
Laboratory Technical Manager
For and On Behalf of BHP Laboratories

Issue Date: 9th December 2013

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Sampling details where supplied are held on file.



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# PARTICLE SIZE DISTRIBUTION

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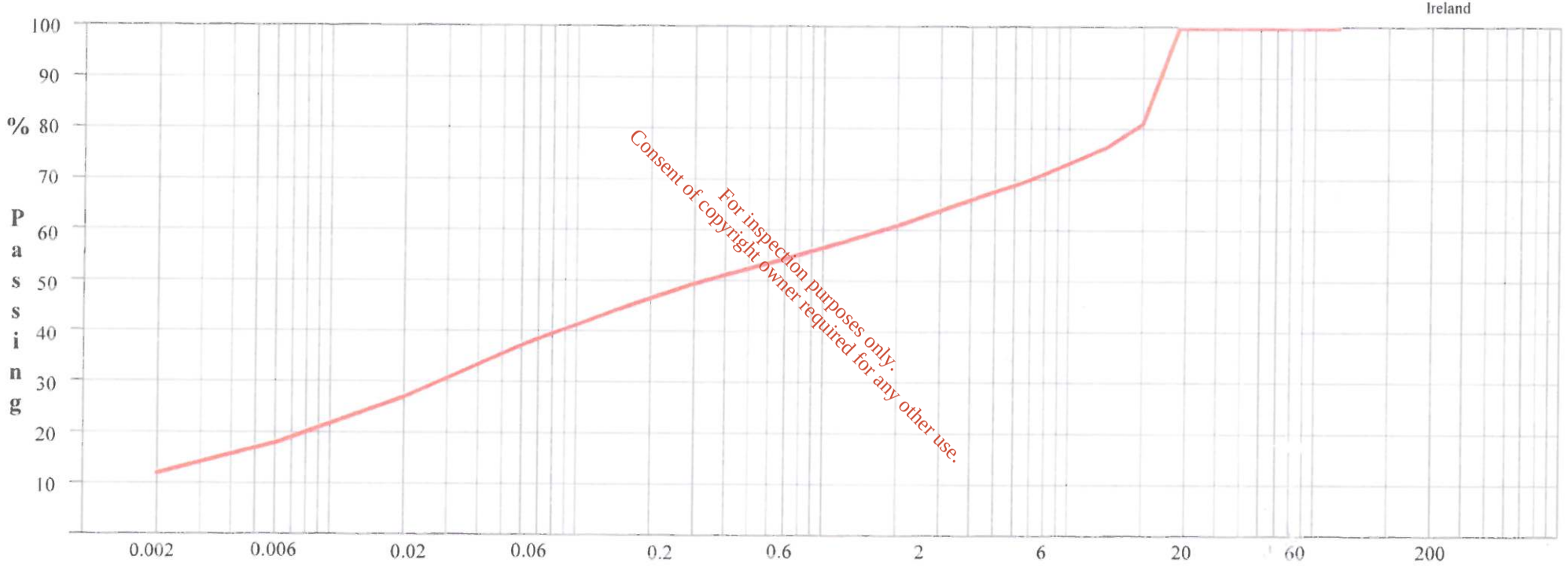
New Road
Thomondgate
Limerick
Ireland

| | | | |
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/395 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T5 bottom layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

Seamus O'Connell
Laboratory Technical Manager
For and On Behalf of BHP Laboratories Ltd

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# TEST REPORT

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Consulting
Calibration

BHP
New road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax +353 61 455447
E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/396-2
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/396-2 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T6 - bottom layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 81 | | | |
| 14 | 76 | | | |
| 10 | 73 | | | |
| 6.3 | 69 | | | |
| 5.0 | 68 | | | |
| 3.35 | 65 | | | |
| 2.00 | 61 | | | |
| 1.18 | 58 | | | |
| 600µm | 54 | | | |
| 425µm | 52 | | | |
| 300µm | 50 | | | |
| 212µm | 47 | | | |
| 150µm | 45 | | | |
| 63µm | 38 | | | |
| 20µm | 26 | | | |
| 6µm | 15 | | | |
| 2µm | 9 | | | |

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Remarks:
Nil

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Laboratory Technical Manager
For and On Behalf of BHP Laboratories

Issue Date: 9th December 2013

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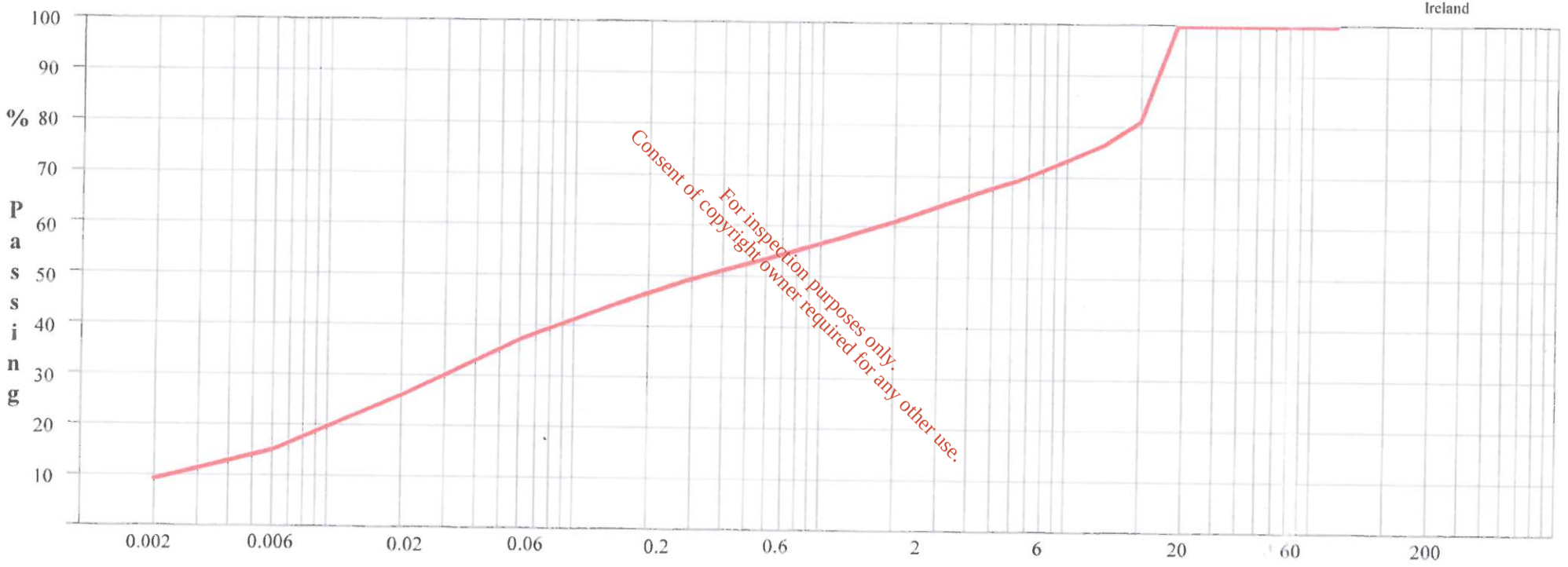
| | | | |
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/396-2 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T6 bottom layer | **Material Spec:** | Customer spec. |

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For inspection purposes only.

| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

Seamus O'Connell
Laboratory Technical Manager
For and On Behalf of BHP Laboratories Ltd

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# Licensing Notice Details



**Subject**
LS Approval - Notice - C1.2-SEW Approval

**Created Date**
12/03/2014

Dear Mr Naughton,

I refer to your submission LR007348, "Wetlands Proposal" and your response to the Agency's request for clarification regarding the construction of a wetland at your facility.

The approval is sought under Condition 3.3 of the Waste Licence W0140-03 for Specified Engineering Works (SEWs)

I am to advise you that on the basis of the information provided, the Agency approves your SEW.

The licensee is referred to the requirement to comply with Condition 3.3.2 relating to supervision of the works by a competent person(s) and Condition 3.3.3 of the waste licence which specifies quality assurance validation reporting. With respect to Condition 3.3.3 the Licensee shall submit the necessary report(s) to the Agency within 2 months following the completion of the specified engineering works.

The licensee is also referred to the requirements of Condition 6.20 whcih requires the submission of a test programme to the Agency prior to the commencement of discharge from the constructed wetlands

You are reminded of the requirement to comply with the Conditions of Waste Licence W0140-03 at all times.

The Agency may at any time, if it considers necessary, revisit and/or revoke this approval.

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Yours sincerely,

Niall Horgan

Office of Environmental Enforcement

Tel: ***(insert Regional tel. no.)***

Licence Details





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# ATTACHMENT 3

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# Dixon.Brosnan

environmental consultants

| Project | **Natura Impact Statement for a constructed wetland system and discharge by PANDA Waste Service Beauparc, Navan, County Meath** | | |
|---|---|---|---|
| Client | O Callaghan Moran/ PANDA Waste Service | | |
| Project ref | Report no | Client ref | |
| 1570 | 1570 | - | |

DixonBrosnan The Cedars, Bridewood, Ovens, Co Cork
Tel 086 851 1437| carl@dixonbrosnan.com | www.dixonbrosnan.com

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| Date | Rev | Status | Prepared by | |
|---|---|---|---|---|
| 06/12/15 | 0 | Issue to client | Carl Dixon MSc. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

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v180907



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## 1. Introduction

PANDA Waste Service submitted an application to the Environmental Protection Agency (the Agency) to revise the Waste Licence at its existing Materials Recovery Facility at Beauparc, Navan, County Meath. The application relates to the development of a new building to accommodate a processing system comprising dry fermentation and composting and the manufacture of refuse derived fuel in an existing building.

The Agency requested that a Screening for Appropriate Assessment be completed in accordance with the European Communities (Birds and Natural Habitats Directive) Regulations 2011. The objective was to determine if the proposed changes are or are not likely to have any significant direct, indirect or cumulative significant effects on Natura 2000 sites. The screening report concluded the following:

*The screening exercise has established that the proposed changes to the current activities do not have the potential for significant effects and an Appropriate Assessment is not required.*

A screening report was subsequently prepared by O' Callaghan Moran in 2012 (Stage 1 Screening Exercise Proposed Development Beauparc, County Meath. O' Callaghan Moran, 2012**).** The screening report was based on the information on the proposed changes to waste activities presented in the Licence Review application. Subsequent to the submission of this report a Stage 2 assessment (NIS) was requested by the Environmental Protection Agency (EPA). This stage 2 NIS is presented below.

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## 2. Regulatory Context and the Appropriate Assessment Procedure

### 2.1 Regulatory context

Article 6(3) of *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora* (as amended) (hereafter 'the Habitats Directive') requires that, any plan or project not directly connected with or necessary to the management of a designated site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. For the purposes of the application for permission in respect of the proposed Cork Waste to Energy Facility development, the requirements of Article 6(3) have been transposed into Irish law by Part XAB of the Planning and Development Act 2000, as amended.

The possibility of there being a significant effect on a designated or "European" site will generate the need for an appropriate assessment to be carried out by the competent authority for the purposes of Article 6(3). In this instance, the competent authority is An Bord Pleanála. As set out in Section 177U of the Planning and Development Act 200 as amended, a screening for appropriate assessment of an application for consent for proposed development must be carried out by the competent authority (in this case, An Bord Pleanála) to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on any European site. A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The first (Screening) Stage for appropriate assessment operates merely to determine whether a (Stage Two) Appropriate Assessment must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.



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## 2.2 Appropriate Assessment Procedure

The assessment requirements of Article 6(3) establish a stage-by-stage approach.This assessment follows the stages outlined in the 2001 European Commission publication "*Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC"* (2001) and The stages are as follows:

*Stage One: Screening* — the process which identifies any appreciable impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;

*Stage Two: Appropriate assessment* — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;

*Stage Three: Assessment of alternative solutions*

The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site. It is confirmed that no reliance is placed by the developer on Stage Three in the context of this application for development consent;

*Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain* — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest). Again, for the avoidance of doubt, it is confirmed that no reliance is placed by the developer on Stage Four in the context of this application for development consent

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Documentation/guidelines of relevance to this NIS include the following:

- European Commission, 2001. *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.* Office for Official Publications of the European Communities, Brussels (EC, 2001);
- European Commission, 2000a. *Communication from the Commission on the Precautionary Principle.*, Office for Official Publications of the European Communities, Luxembourg (EC, 2000a);
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft)* Office for Official Publications of the European Communities, Luxembourg (EC, 2015);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- *Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government, Dublin (DEHLG, 2010a);
- Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities (DEHLG, 2010b);



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- European Commission Staff Working Document '*Integrating biodiversity and nature protection into port development'* (EC, 2011b);
- *Interpretation Manual of European Union Habitats. Version EUR 28*. European Commission (EC, 2013).

## 3. Methodology

### 3.1 Study Area and Scope of Appraisal

In line with the precautionary principle, the study area for the preparation Natura Impact Statement extended to a radius of 15km from the applicant's site boundary. Thus any appreciable direct, indirect or cumulative impacts which could arise from the proposed development in relation to the designated sites within this zone were considered. No potential ecological risks to designated sites outside this 15km radius were identified.

This NIS was prepared by Carl Dixon MSc. (Ecological Monitoring) He has considerable experience in ecological assessment and the preparation of Natura Impact Statements for a range of large and small scale developments.

### 3.2 Desktop Study

A desktop review facilitates the identification of the baseline ecological conditions and key ecological issues relating to Natura 2000 sites and facilitates an evaluation assessment of potential in-combination impacts. Sources of information used for this NIS include previous reports prepared for the site, information from statutory and non-statutory bodies. The sources of information and relevant documentation utilised are as follows:

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#### 3.2.1 Information on the site

- Stage 1 Screening Exercise Proposed Development Beauparc, County Meath. (O' Callaghan Moran, 2012)
- Constructed Wetland design for Panda Waste Services. Site at Rathdrinagh, Navan, Co. Meath. (Alvin Morrow Reedbed Wastewater Treatment Systems, 2015)
- General Design Rationale for reed bed surface flow constructed wetlands (Alvin Morrow Reedbed Wastewater Treatment Systems, 2015)
- Environmental Impact Statement Panda Waste Services, Rathdrinagh, Beauparc, Navan, Co. Meath. (O' Callaghan Moran, 2014)

#### 3.2.2 Information from statutory and non-statutory bodies

- National Parks & Wildlife Service (NPWS) - www.npws.ie including qualifying interests and conservation objectives for Natura 2000 sites.
- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre – www.biodiversityireland.ie
- Meath County Development Plan 2013-2019
- Natura Impact Report Appropriate Assessment of Variation No. 2 to Meath County Development Plan 2013 – 2019
- Draft Navan Development Plan 2009-2015 Appropriate Screening Assessment Report



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## 4. Natura 2000 sites

### 4.1 Designated sites within a 15km radius

Natura 2000 sites within a 15km radius of the proposed development site are listed below in **Table 1.** It is noted that use of a 15km radius is a precautionary measure, as impacts at this distance from the proposed development are highly unlikely. The Natura 2000 sites listed below are considered the only sites relevant to this report.

**Table 1. Designated sites within 15km**

| Designated site | Distance from site of proposed development |
|---|---|
| **Candidate SAC sites** | |
| River Boyne and Blackwater cSAC (002165) | Approximately 3 km north east |
| **SPA sites** | |
| River Boyne and River Blackwater SPA (004232) | Approximately 3 km north east |

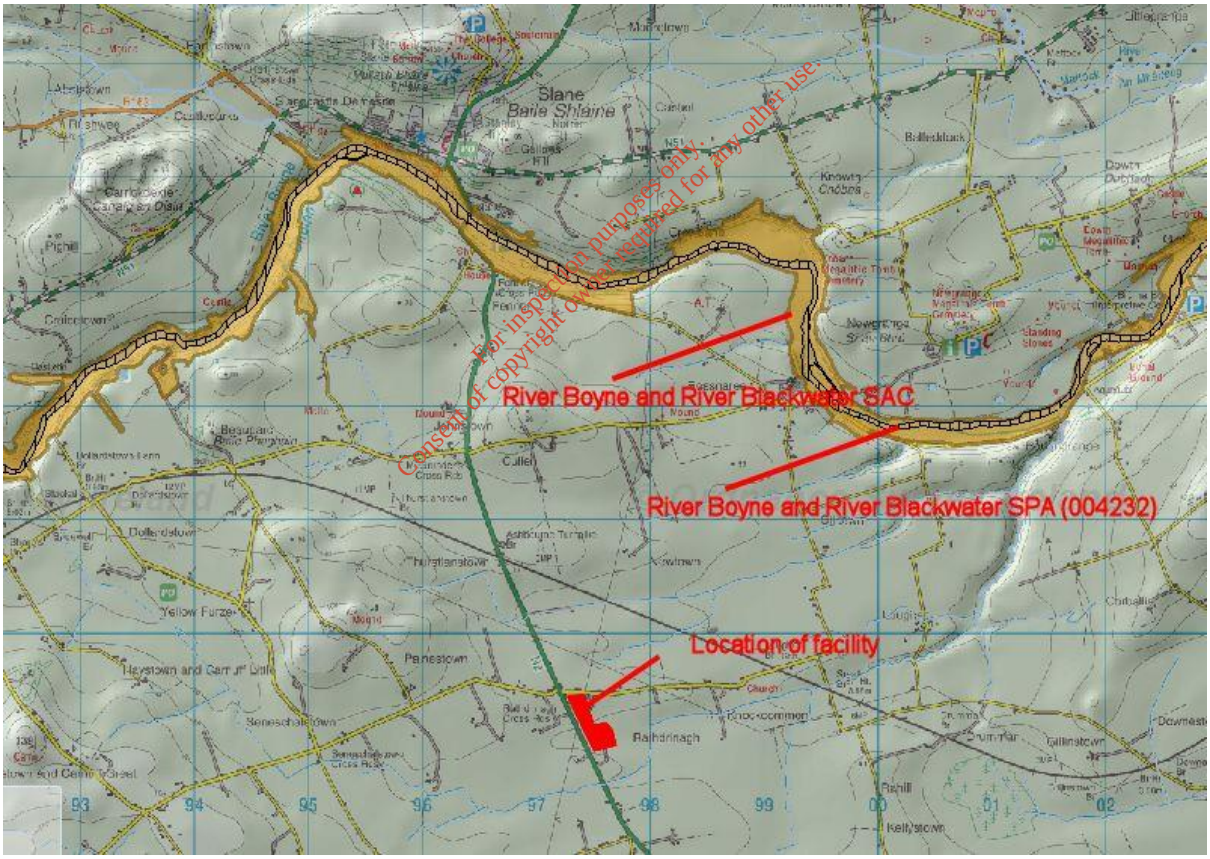


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**Figure 1. Location of facility in relation to designated sites.**



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### 4.2 Qualifying interests and conservation objectives

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

The favourable conservation status of a species is achieved when:
• population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
• the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
• there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The qualifying interests and specific conservation objectives for the River Boyne and River Blackwater cSAC are detailed in *NPWS (2015) Conservation objectives for River Boyne and River Blackwater SAC [002299]. Generic Version 4.0. Department of Arts, Heritage and the Gaeltacht.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. The generic conservation objectives for this site are listed in **Table 2.**

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**Table 2. River Boyne and River Blackwater cSAC- qualifying interests and specific conservation objectives.**

| Habitat Code | Habitat | Conservation objective |
|---|---|---|
| [7230] | Alkaline fens | To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected: |
| [91E0] | Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* | |
| [1099] | *Lampetra fluviatilis* (River Lamprey) | |
| [1106] | *Salmo salar* (Salmon) | |
| [1355] | *Lutra lutra* (Otter) | |

* denotes priority habitat

The qualifying interests and specific conservation objectives for the River Boyne and River Blackwater SPA are detailed in *NPWS (2015) Conservation objectives for River Boyne and River Blackwater SPA [004232]. Generic Version 4.0. Department of Arts, Heritage and the Gaeltacht.* The generic conservation objectives for this site are listed in **Table 3.**



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**Table 3. List of special conservation interests under the EU Birds Directive for the River Boyne and River Blackwater SPA [004232]**

| Annex of EU Birds Directive | Common Name | Scientific name | Conservation objectives |
|---|---|---|---|
| Annex 1 | KIngfisher (A229) | *Alcedo atthis* | To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. |

### 4.3 Site synopses

- **River Boyne and River Blackwater cSAC**

This site comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. These riverine stretches drain a considerable area of Meath and Westmeath, and smaller areas of Cavan and Louth. The underlying geology is Carboniferous Limestone for the most part, with areas of Upper, Lower and Middle well represented. In the vicinity of Kells Silurian Quartzite is present while close to Trim are Carboniferous Shales and Sandstones. There are many large towns adjacent to but not within the site, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7230] Alkaline Fens

[91E0] Alluvial Forests*

[1099] River Lamprey (*Lampetra fluviatilis*)

[1106] Atlantic Salmon (*Salmo salar*)

[1355] Otter (*Lutra lutra*)

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The main areas of alkaline fen in this site are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough. The hummocky nature of the local terrain produces frequent springs and seepages which are rich in lime. A series of base-rich marshes have developed in the poorly-drained hollows, generally linked with these three lakes. Open water is usually fringed by Bulrush (*Typha latifolia*), Common Club-rush (*Scirpus lacustris*) or Common Reed (*Phragmites australis*), and this last species also extends shorewards where a dense stand of Great Fen-sedge (*Cladium mariscus*) frequently occurs. This in turn grades into a sedge and grass community (*Carex* spp. and Purple Moor-grass, *Molinia caerulea*), or one dominated by Black Bog-rush (*Schoenus nigricans*). An alternative aquatic/terrestrial transition is a floating layer of vegetation. This is normally based on Bogbean (*Menyanthes trifoliata*) and Marsh Cinquefoil (*Potentilla palustris*). Other species gradually become established on this cover, especially plants tolerant of low nutrient status e.g. bog mosses (*Sphagnum* spp.). Diversity of plant and animal life is high in the fen and the flora includes many rarities. Plants of interest include Narrow-leaved Marsh-orchid (*Dactylorhiza traunsteineri*), Fen Bedstraw (*Galium uliginosum*), Cowbane (*Cicuta virosa*), Frogbit (*Hydrocharis morsus-ranae*) and Least Bur-reed (*Sparganium minimum*). These species tend to be restricted in their distribution in Ireland. Also notable is the abundance of aquatic stoneworts (*Chara* spp.) which are characteristic of calcareous wetlands.



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The rare plant Round-leaved Wintergreen (*Pyrola rotundifolia*) occurs around Newtown Lough. This species is listed in the Red Data Book and this site represents its only occurrence in Co. Meath.

Wet woodland fringes many stretches of the Boyne. The Boyne River Islands are a small chain of three islands situated 2.5 km west of Drogheda. The islands were formed by the build-up of alluvial sediment in this part of the river where water movement is sluggish. All of the islands are covered by dense thickets of wet, willow (*Salix* spp.) woodland, with the following species occurring: Osier (*S. viminalis*), Crack Willow (*S. fragilis*), White Willow (*S. alba*), Purple Willow (*Salix purpurea*) and Rusty Willow (*S. cinerea* subsp. *oleifolia*). A small area of Alder (*Alnus glutinosa*) woodland is found on soft ground at the edge of the canal in the north-western section of the islands. Along other stretches of the rivers of the site Rusty Willow scrub and pockets of wet woodland dominated by Alder have become established, particularly at the river edge of mature deciduous woodland. Ash (*Fraxinus excelsior*) and Downy Birch (*Betula pubescens*) are common in the latter, and the ground flora is typical of wet woodland with Meadowsweet (*Filipendula ulmaria*), Wild Angelica (*Angelica sylvestris*), Yellow Iris (*Iris pseudacorus*), horsetails (*Equisetum* spp.) and occasional tussocks of Greater Tussock-sedge (*Carex paniculata*).

The dominant habitat along the edges of the river is freshwater marsh, and the following plant species occur commonly in these areas: Yellow Iris, Creeping Bent (*Agrostis stolonifera*), Canary Reed-grass (*Phalaris arundinacea*), Marsh Bedstraw (Galium palustre), Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*). In the wetter areas Common Meadow-rue (*Thalictrum flavum*) is found. In the vicinity of Dowth, Fen Bedstraw (*Galium uliginosum*), a scarce species mainly confined to marshy areas in the midlands, is common in this vegetation. Swamp Meadow-grass (*Poa palustris*) is an introduced plant which has spread into the wild (naturalised) along the Boyne approximately 5 km south-west of Slane. It is a rare species which is listed in the Red Data Book and has been recorded among freshwater marsh vegetation on the banks of the Boyne in this site. The only other record for this species in the Republic of Ireland is from a site in Co. Monaghan.

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The secondary habitat associated with the marsh is wet grassland and species such as Tall Fescue (*Festuca arundinacea*), Silverweed (*Potentilla anserina*), Creeping Buttercup (*Ranunculus repens*), Meadowsweet and Meadow Vetchling (*Lathyrus pratensis*) are well represented. Strawberry Clover (*Trifolium fragiferum*), a plant generally restricted to coastal locations in Ireland, has been recorded from wet grassland vegetation at Trim. At Rossnaree river bank on the River Boyne, Round-Fruited Rush (*Juncus compressus*) is found in alluvial pasture, which is generally periodically flooded during the winter months. This rare plant is only found in three counties in Ireland.

Along much of the Boyne and along tributary stretches are found areas of mature deciduous woodland on the steeper slopes above the floodplain marsh or wet woodland vegetation. Many of these are planted in origin. However the steeper areas of King Williams Glen and Townley Hall wood have been left unmanaged and now have a more natural character. East of Curley Hole the woodland has a natural appearance with few conifers. Broadleaved species include oaks (*Quercus* spp.), Ash, willows, Hazel (*Corylus avellana*), Sycamore (*Acer pseudoplatanus*), Holly (*Ilex aquifolium*), Horse-chestnut (*Aesculus hipposcastanum*) and the shrubs Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Elder (*Sambucus nigra*). South-west of Slane and in Dowth, some more exotic tree species such as Beech (*Fagus sylvatica*), and occasionally Lime (*Tilia cordata*), are seen. The coniferous trees Larch (*Larix* sp.) and Scots Pine (*Pinus sylvestris*) also occur. The woodland ground flora includes Barren Strawberry (*Potentilla sterilis*), Enchanter's-nightshade (*Circaea lutetiana*) and Ground-ivy (*Glechoma hederacea*), along with a range of ferns. Variation occurs in the composition of the canopy - for example, in wet patches alongside the river, White Willow and Alder form the canopy.



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Other habitats present along the Boyne and Blackwater include lowland dry grassland, improved grassland, reedswamp, weedy waste ground, scrub, hedge, drainage ditch and canal. In the vicinity of Lough Shesk, the dry slopes of the morainic hummocks support grassland vegetation which, in some places, is partially colonised by Gorse (*Ulex europaeus*) scrub. Those grasslands which remain unimproved for pasture are species-rich, with Common Knapweed (*Centaurea nigra*), Creeping Thistle (*Cirsium arvense*) and Ribwort Plantain (*Plantago lanceolata*) commonly present. Fringing the canal alongside the Boyne south-west of Slane are areas with Reed Sweet-grass (*Glyceria maxima*), Great Willowherb (*Epilobium hirsutum*) and Meadowsweet.

The Boyne and its tributaries form one of Ireland's premier game fisheries and the area offers a wide range of angling, from fishing for spring salmon and grilse to seatrout fishing and extensive brown trout fishing. Atlantic Salmon (*Salmo salar*) use the tributaries and headwaters as spawning grounds. Although this species is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the Habitats Directive. Atlantic Salmon run the Boyne almost every month of the year. The Boyne is most important as it represents an eastern river which holds large three-sea-winter fish from 20-30 lb. These fish generally arrive in February, with smaller spring fish (10 lb) arriving in April/May. The grilse come in July, water permitting. The river gets a further run of fish in late August and this run would appear to last well after the fishing season. The salmon fishing season lasts from 1st March to 30th September.

The Blackwater is a medium sized limestone river which is still recovering from the effects of the arterial drainage scheme of the 1970s. Salmon stocks have not recovered to the numbers that existed pre-drainage. The Deel, Riverstown, Stoneyford and Tremblestown Rivers are all spring-fed, with a continuous high volume of water. They are difficult to fish because some areas are overgrown, while others have been affected by drainage with resultant high banks.

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This site is also important for the populations of two other species listed on Annex II of the E.U. Habitats Directive which it supports, namely River Lamprey (*Lampetra fluviatilis*), which is present in the lower reaches of the Boyne River, and Otter (*Lutra lutra*), which can be found throughout the site. In addition, the site also supports many more of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. Common Frog, another Red Data Book species, also occurs within the site. All of these animals, with the addition of the Stoat and Red Squirrel, which also occur within the site, are protected under the Wildlife Act, 1976.

Whooper Swans winter regularly at several locations along the Boyne and Blackwater Rivers. Known sites are at Newgrange (approx. 20 in recent winters), near Slane (20+ in recent winters), Wilkinstown (several records of 100+) and River Blackwater from Kells to Navan (104 at Kells in winter 1996/97, 182 at Headfort in winter 1997/98, 200-300 in winter 1999/00). The available information indicates that there is a regular wintering population of Whooper Swans based along the Boyne and Blackwater River valleys. The birds use a range of feeding sites but roosting sites are not well known. The population is substantial, certainly of national, and at times international, importance. Numbers are probably in the low hundreds.

Intensive agriculture is the main land use along the site. Much of the grassland is in very large fields and is improved. Silage harvesting is carried out. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the lakes. In the more extensive agricultural areas sheep grazing is carried out.

Fishing is a main tourist attraction on the Boyne and Blackwater and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The Eastern Regional Fishery Board have erected fencing along selected stretches of the river as part of their salmonid enhancement programme. Parts of the river system have been arterially dredged. In 1969 an arterial dredging scheme commenced and disrupted angling for 18 years. The dredging altered the character of the river completely and resulted in many areas in very high banks. The main channel from Drogheda upstream to



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Navan was left untouched, as were a few stretches on the Blackwater. Ongoing maintenance dredging is carried out along stretches of the river system where the gradient is low. This is extremely destructive to salmonid habitat in the area. Drainage of the adjacent river systems also impacts on the many small wetland areas throughout the site. The River Boyne is a designated Salmonid Water under the E.U. Freshwater Fish Directive.

The site supports populations of several species listed on Annex II of the E.U. Habitats Directive, and habitats listed on Annex I of this Directive, as well as examples of other important habitat types. Although the wet woodland areas appear small there are few similar examples of this type of alluvial wet woodland remaining in the country, particularly in the north-east. The semi-natural habitats, particularly the strips of woodland which extend along the river banks, and the marsh and wet grasslands, increase the overall habitat diversity and add to the ecological value of the site, as does the presence of a range of Red Data Book plant and animal species and the presence of nationally rare plant species.

- **Site sysnopsis -River Boyne and River Blackwater SPA [004232]**

The River Boyne and River Blackwater SPA is a long, linear site that comprises stretches of the River Boyne and several of its tributaries; most of the site is in Co. Meath, but it extends also into Cos Cavan, Louth and Westmeath. It includes the following river sections: the River Boyne from the M1 motorway bridge, west of Drogheda, to the junction with the Royal Canal, west of Longwood, Co Meath; the River Blackwater from its junction with the River Boyne in Navan to the junction with Lough Ramor in Co. Cavan; the Tremblestown River/Athboy River from the junction with the River Boyne at Kilnagross Bridge west of Trim to the bridge in Athboy, Co. Meath; the Stoneyford River from its junction with the River Boyne to Stonestown Bridge in Co. Westmeath; the River Deel from its junction with the River Boyne to Cummer Bridge, Co. Westmeath. The site includes the river channel and marginal vegetation.

Most of the site is underlain by Carboniferous limestone but Silurian quartzite also occurs in the vicinity of Kells and Carboniferous shales and sandstones close to Trim.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species: Kingfisher.

A survey in 2010 recorded 19 pairs of Kingfisher (based on 15 probable and 4 possible territories) in the River Boyne and River Blackwater SPA. A survey conducted in 2008 recorded 20-22 Kingfisher territories within the SPA. Other species which occur within the site include Mute Swan (90), Teal (166), Mallard (219), Cormorant (36), Grey Heron (44), Moorhen (84), Snipe (32) and Sand Martin (553) – all figures are peak counts recorded during the 2010 survey.

The River Boyne and River Blackwater Special Protection Area is of high ornithological importance as it supports a nationally important population of Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive.

25.11.2010

**5. Existing development**

PANDA has operated its waste recovery plant at Beauparc for over 20 years and currently employs 100 workers at the facility. The facility is located on the N2, approximately 4km south of the town of Slane. It is bordered to the west by the N2 and to the north by the Knockcommon Road. To the south and east are agricultural lands.

The site has planning permission from Meath County Council and a Waste Licence granted by the Environmental Protection Agency (EPA). The current planning permission and Waste Licence allow PANDA to take in and process up to 250,000 tonnes of non-hazardous waste annually.

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The wastes are collected from households, businesses and construction sites and are processed in three main buildings. The processing includes sorting the wastes to pick out the clean paper, cardboard, plastics, wood, metals, organics, rubble, soil and stones that can either be recycled or used to manufacture refuse derived fuel. The remaining mixed materials, for example dirty paper and organic residues that are not suitable for recycling, can be treated in the compost tunnels before going to landfill.

The proposed biological treatment is a combination of 'dry fermentation' anaerobic digestion and composting. The dry fermentation consists of a series of fully enclosed tanks, called digesters, in which the wastes are be placed. The oxygen in the air in the digesters is used up by the microbes in the waste to produce anaerobic (no oxygen) conditions. The microbes break down the waste and, in the process, produce a number of different gases (biogas). The most common gas is methane, which is the 'natural gas' supplied by Bord Gais. The biogas is cleaned (scrubbed) to remove contamination and used as a fuel in new electricity generators, which connects to the national grid.

The digesters reduce the amount of organic matter in the wastes, and convert it to biogas. The waste is then be moved to the composting area, where it is composted in fully enclosed containers called tunnels. When the composting process is complete, the material is pasteurised by raising and maintaining the temperature to a level that kill the microbes. The compost will be sold to farmers, market gardeners, landscape contractors and the general public. Pasteurisation is required in the composting process to meet the requirements of the Department of Agriculture Fisheries and Marine for the treatment of wastes containing residues of meat and fish (Animal By-Products)

The remaining mixed wastes that are not suitable for recycling are turned into a fuel, called refuse derived fuel RDF or Solid Recovered Fuel (SRF) which is used in industrial plants in Ireland and abroad, for example cement making plants.

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*Surface Water*

Rainwater falling on the existing concrete yards is currently collected in an underground tank and stored before being sent off site for treatment at an Irish Water owned sewage treatment plant. Treatment is required because rainfall on concrete yards where vehicles travel and park can become contaminated with silt and small quantities of oil that may leak from vehicle oil sumps.

Rainwater from the roof of the new building will be collected in a tank and used for spraying the yards to keep dust down. The rainwater from the new yard will pass through silt traps and interceptors, which reduces the contamination to acceptable levels, before going to a new soakaway.

All waste processing will be carried out inside fully enclosed buildings and digesters. Percolate generated in AD process will be collected and stored in above ground storage tanks located in appropriately sized and constructed bunds that prevent any accidental spills and leaks from entering the surface water drainage system. The levels in the tanks will be monitored to ensure the liquid does not overflow the tanks, and escape from the building. Leachate from the composting bays will also collected and recirculated.

The applicant has site specific procedures to deal with spills and any emergencies that may arise to ensure that the appropriate response actions are taken by trained staff to minimise any associated environmental impacts. Appropriate spill containment and clean-up equipment is provided at the facility, as required by Waste Licence conditions.



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*Wastewater*
Water from the canteen and the toilets is collected and initially treated in an on-site wastewater treatment plant before being sent to an Irish Water owned sewerage treatment plant. The water used clean the floors of the buildings and the water from truck wash is collected in an underground tank and also sent to a local authority owned sewage treatment.

The biological treatment process will produce wastewater and all of this will be collected in drains inside the new building and pumped to new storage tanks. The tanks will be fully enclosed by walls designed to trap any spills or leaks that may happen. The design and construction of the tanks and containing walls will be approved by the EPA. Much of the wastewater will be reused in the process, but any that cannot, will be sent to the local authority treatment plant.

*Groundwater*

The only emission to ground will be rainwater run-off from the new concrete yards. The rainwater will pass through silt traps and an oil interceptor before it enters the soakaway.

*Oil / Chemical Storage*

Diesel and gas oil are stored in above ground tanks (59,000 litres and 14,000 litres respectively) in dedicated structure at the eastern boundary, close to Building 1. The tanks are provided with individual bunds, each of which has a minimum capacity of 110% of the volume of the tank. The bunds are subject to routine integrity testing, as required by the Licence conditions and are structurally sound. Adblu, a diesel additive, is stored in a 1,000 litre IBC which is bunded and located adjacent to the oil bunds.

*Fire*

In the event of an incident or accident at the facility, including a fire that could give rise to the risk of surface water pollution, the shut off valve on the outlet from the proposed integrated wetland system (as detailed below) will be closed to contain the contaminated surface water within the facility's drainage system. Following any such incident, the water that accumulates in the drainage system will be tested to identify the appropriate management option.

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**6. New system for disposal of wastewater via settlement tanks and a constructed wetland.**

Following commissioning, the surface water that is currently being collected in the storage tank will be directed to a three celled constructed reed bed (See **Photo 1**). The reed bed will remove contaminants that may have been picked up by the rainwater and the treated water will discharge into a drain along the southern site boundary. A land drain that runs along the southern boundary connects to the Roughgrange River. The Roughgrange is a tributary of the River Boyne, which it joins approximately 3km downstream from the site.



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**Photo 1 showing newly constructed wetland.**

The design parameters for the constructed wetland are provided in the document *Constructed Wetland design for Panda Waste Services. Site at Rathdrinagh, Navan, Co. Meath.* (Alvin Morrow Reedbed Wastewater Treatment Systems, 2015) and *General Design Rationale for reed bed surface flow constructed wetlands* (Alvin Morrow Reedbed Wastewater Treatment Systems, 2015). These reports are included as **Appendix 1 and 2** respectively. Relevant information is summarised below:

- The site is underlain by Namurian Undifferntiated Bedrock (NU) and is located in a poor aquifer (PI) category area, whilst the area has a low vulnerability categorisation. The site is situated on subsoil categorised as (TNSSs) - shales and sandstone till-clayey texture. This suggested that the onsite soils/subsoils may lend itself to the suitably high clay contents required for the impervious protective layer required for the construction of the wetland system. This was confirmed by trial hole assessments and sampling to confirm % clay content and the method of contruction for each cell was designed to take into account the properties of the underlying soils and subsoils. The trial hole assessement did not record any evidence of a water table (winter or otherwise).



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- Waste materials are processed indoors. Therefore the wastewaters collected are not consdiered to cotnain any leahates from the waste materials being processed. Therfore the wetland design rationale for the treatment of urban/highway runoff was adopted. At present roof and yard run-offs are sent to three settlement tanks (esimated capacity of 350m3) prior to subsequent removal off site. Waters are sent to the settlement tanks as usual, prior to being sent to a watland system fro treatment prior to discharging to the existing surface water drain/ditch passing adjacent to the propsoed position of the wetland system. The wetland has been designed as a horizontal, surface flow design, divided into theree stage/cell system. The intention is then to have an overflow to the ditch/stream. It is estimated that the effluent will be of an exceptinal standard (beyond a <5/5 BOD/SS standard.

- The following design parameters were utilised: Site area 43,933.5m2. Total area to be excluded 3250m2 -unused land, 9438m2 roofed area. For design purposes roofed areas have been excluded. Using a site area of 31, 245.5m2 and assuming a wetland area of 5% a total wetland area of 1563m2 was deemed sufficeint to provide a high level of treatment. It is noted that the wetland is preceded by settlement tanks prior to discharge which significantly aids the systems overall efficiency. The estimated retention time is 46-62 hours.

- The following performance levels are predicted:96% of total extractable hydrocarbons, 50-755 total phosphorus, 60-80% nitrogen, 83% COD, 89% $BOD_5$, 99.9% faecal coliforms and 70-90% suspended solids.

- The following limits for the emissions to water from the site were set by the EPA under licence reg. no. W0140-03 at point SW1 located on the southern drain; BOD 5mg/l, Suspended solids 25 mg/l, ammonia (as $NH_4$) 1mg/l. Tests taken on samples obtained from the final settlement tank on the 26/9/13 and 5/12/13 indicated that the relevant parameters in the effluent from the final tank were generally below the relevant limits with the exception of on slightly elevated ammonia level. It was concluded that nutrient levels and suspended solid loadings will be relatively low and the effluent for all parameters, even throughout storm events, produced by the wetland will be polished to a high standard.

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## 7. Appraisal of the Receiving Environment

A site inspection was carried out on 29 November, 2015. The site is dominated by buildings and yards with natural or semi-natural habitats absent from the site. The wetland system has been constructed as a series of cells which run roughly north south along the boundary of the site and parallel to the N2 road. The constructed wetland discharges to a land drain at the southwest corner of the site; although it is noted that it does not currently take any run-off from the facility. The land drain is of insufficient size to be of value for fish and no evidence of otter activity or potential nesting sites for kingfisher were recorded in proximity to the site. No invasive species were recorded within the site. **Figure 2** shows the location of the constructed wetland in relation to the facility.



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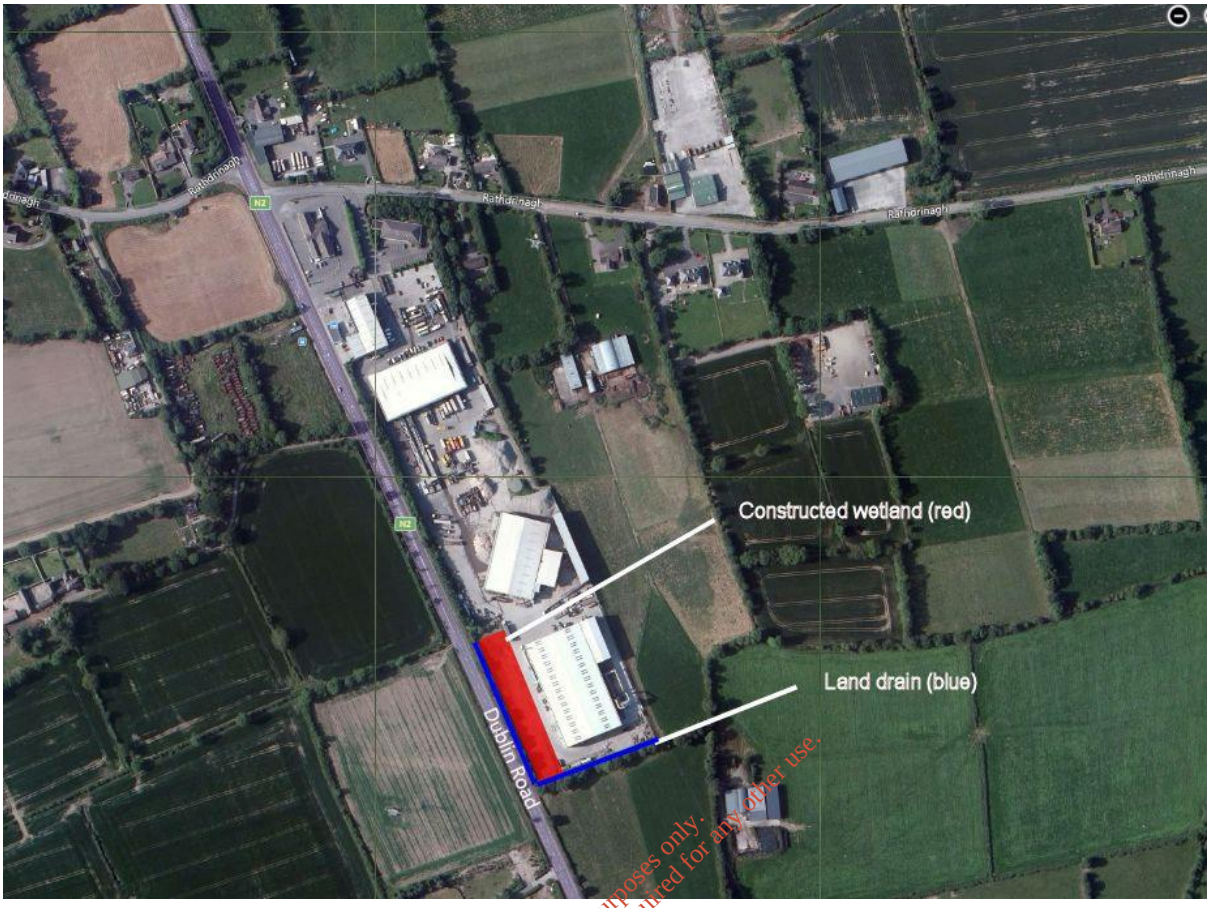


**Figure 2 location of the constructed wetland and existing facility.**

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## 8. Water quality data

A land drain that runs along the southern boundary connects to the Roughgrange River. The Roughgrange is a tributary of the River Boyne, which it joins approximately 3km downstream from the site (See **Figure 3**). The River Boyne is a designated Salmonid Water under the E.U. Freshwater Fish Directive.

### 8.1 Q values

The Q Value system which is used by the Environmental Protection Agency describes the relationship between water quality and the macro-invertebrate community in numerical terms. The presence of pollution causes changes in flora and fauna of rivers. Well documented changes occur in the macro-invertebrate community in the presence of organic pollution: sensitive species are progressively replaced by more tolerant forms as pollution increases. Q5 waters have high diversity of macro-invertebrates and good water quality, whilst Q1 have little or no macro-invertebrate diversity and bad water quality. Intermediate values, Q1-2, 2-3, 3-4 etc denote transitional conditions.

The Roughgrange River is not monitored as part of the EPA standard biological programme. The closest water quality monitoring station up-gradient of the discharge from the facility on the Boyne is Ford S of Broc H. This site is located approximately 1.7km upstream of the confluence of the Roughgrange and Boyne Rivers. The most recent Q-value was Q4 in 2012 which is indicative of satisfactory water quality.

The nearest downstream water quality monitoring station on the Boyne is located at Old Bridge (Obilesk Bridge). This site is located approximately 6.57km downstream of the confluence of the Roughgrange and Boyne Rivers. The Q-values for this location from 2012 was Q3-4. It is



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noted that this site is a considerable distance from the Panda facility and there is no evidence to indicate the slight drop in Q value is related to activities at this facility.

**8.2 Water frameworks Directive**

The Water Framework Directive (WFD) is a key initiative aimed at improving water quality throughout the EU. It applies to rivers, lakes, groundwater, and coastal waters. The Directive requires an integrated approach to managing water quality on a river basin basis; with the aim of maintaining and improving water quality. The Directive requires that management plans be prepared on a river basin basis and specifies a structured approach to developing those plans. It requires that a programme of measures for improving water quality be brought into effect.

Specifically the WFD aims to protect/enhance all waters (surface, ground and coastal waters), achieve "good status" for all waters, manage water bodies based on river basins (or catchments), involve the public and streamline legislation

A) The Water Frameworks Directive assesses the water quality of rivers and ranks their status as follows: High, Good, Moderate, Poor, Bad and Yet to be determined. The Lower Boyne River status was determined to be Moderate. The Roughgrange status was classified as Unassigned.

B) The Water Frameworks Directive also determines the “Risk” level of the river as follows: 1a – At risk of not achieving Good Status, 1b – Probably at risk of not archiving Good Status, 2a – Expected to achieve Good Status and 2b – strongly expected to achieve Good Status. The Boyne River is considered 1a - At risk of not achieving Good Status. The Roughgrange River is considered 1b- Possibly at risk of not achieving good status.

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**Figure 3. Surface water features**



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## 9. Identification of potential impacts on the River Boyne and River Blackwater cSAC and River Boyne and River Blackwater SPA.

Discharge of wastewater has the potential to cause deteriorations in water quality in the receiving watercourse. If of sufficient severity there could be impacts on freshwater species listed as qualifying interests for the River Boyne and River Blackwater cSAC which is located downstream of the discharge. Possible impacts are as follows:

- High silt levels could impact in particular on river lamprey and salmon spawning habitat. Excessive siltation can cause salmon and trout eggs and fry to be smothered. Spawning salmonids and lamprey are likely to avoid traditional spawning areas due to excessive silt deposits.

- Adult fish may also be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. Increased turbidity in waters may negatively affect angling activity.

- Aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species.

- Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced.

- High nutrient levels can impact on aquatic ecology including impacts on flora, macro-invertebrate assemblages and fish.

- Significant impacts on fish stocks could impact on otter and kingfisher due to a reduction in prey availability

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Based on the above, discharge via the constructed wetland system could theoretically impact on River Lamprey, Salmon and Otter (cSAC special conservation interest) and Kingfisher (SPA special conservation interest). No potential impact on the cSAC habitats Alkaline fens and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) have been identified due to lack of a significant pathway and the limited nature of the proposed development. No evidence of otter or kingfisher breeding habitat was recorded in proximity to the facility and thus no potential from disturbance has been identified.

## 10. Potential Cumulative impacts

The potential for in-combination impacts to occur needs to be taken into account. Impacts could arise in relation to impacts on water quality. Plans and projects which are considered relevant, for the purposes of assessing cumulative impacts, include the following:

### 10.1 Meath County Development Plan 2013-2019

**Volume 5 -** Written Statements and Detailed Objectives notes the following in relation to the village of Slane which is the closest upstream settlement which discharges within the River Boyne and River Blackwater cSAC and River Boyne and River Blackwater SPA:

*Wastewater: There are currently two waste water treatment plants in Slane, the Council's own treatment plant and a privately owned treatment plant. There is limited spare capacity available in Slane to service new development. For all new developments, Meath County Council are requesting developers/ applicants to try and free up capacity in this waste water treatment plant to cater for their requirements. There are no planned upgrades to the public waste water treatment plant in Slane at present. All development proposals shall be considered in the*



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*context of the available waste water and water supply capacity. It is accepted that the future development of Slane and the realisation of the household allocation from the Core Strategy may not occur until the wastewater services constraints outlined above have been remedied.*

**Water Services Policy 10** notes the following:

*To facilitate the provision of an adequate wastewater collection and treatment systems to all towns and villages in the County to serve existing and planned future populations in accordance with the Settlement and Core Strategies identified in this Plan, the Water Framework Directive 2000, the Water Services Investment Programme and as finances permit, thus improving the quality of Meath's surface, ground, transitional and coastal waters.*

**Water Services Policy 20** notes the following:
*To ensure through the implementation of the River Basin Management Plans and their associated programmes of measures, and any other associated legislation, the protection and improvement of all drinking water, surface water and ground waters throughout the county*

**Water Services Policy 27** notes the following:
*To ensure that proposed septic tanks and proprietary treatment systems, or other waste water treatment and storage systems, and associated percolation areas where required as part of a development, comply with the recommendations of the Environmental Protection Agency and that they are employed only where site conditions are appropriate.*

**Natural Heritage Objective 2** notes the following:

*To ensure an Appropriate Assessment in accordance with Article 6(3) and Article 6(4) of the Habitats Directive, and in accordance with the Department of Environment, Heritage and Local Government Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 2009 and relevant EPA and European Commission guidance documents, is carried out in respect of any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect on a Natura 2000 site(s), either individually or in combination with other plans or projects, in view of the site's conservation objectives.*

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**10.2 Natura Impact Report Appropriate Assessment of Variation No. 2 to Meath County Development Plan 2013 – 2019**

**Section 2.5. Reasons for designation, site sensitivities and** threats notes that the following settlements have the potential be a threat to the integrity of the River Boyne and River Blackwater cSAC and River Boyne and River Blackwater SPA:

Athboy - High risk. Disturbance of kingfisher breeding sites. Otters, impacts on water quality.

Baile Ghib/Gibbstown - Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via Yellow River.

Carlanstown- Moderate risk. Indirect impact on cSAC and SPA populations, impacts on water quality via Moyalty River.

Carnaross- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via watercourses but no linkages found.

Clonard - Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via watercourses but no linkages found.

Crossakiel- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via watercourses but no linkages found.



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Donore - Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via watercourses but no linkages found.

Kildalkey- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via local streams.

Kilmessan- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via Skane River.

Moynalty- Moderate risk. Indirect impact on cSAC and SPA populations, impacts on water quality via Moynalty River.

Rathcairn- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via local streams.
Slane- High risk. Disturbance of Kingfisher breeding sites, Otters, impacts on water quality.

Dunshaughlin- Low risk. Indirect impact on cSAC and SPA populations, impacts on water quality via local streams.

In conclusion the following was noted:

***Section 3.10. Conclusion of Stage 2 : Appropriate Assessment This Natura Impact Report*** *records the decisions that were taken during the preparation of Variation No. 2 to the Meath County Development Plan 2013-2019. It determines that, assuming the successful implementation of the Policies and Objectives, there will be no likely significant effects on the European sites in isolation or in combination with other Plans and Projects acting in the same area.*

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**10.3.Navan Development Plan 2009-2015 Appropriate Screening Assessment Report and Appropriate Assessment Screening Report of the Proposed Amendments to the Draft Navan Development Plan 2009-2015.**

The plan recognizes the unique qualities of the River Boyne and Blackwater cSAC and contains robust and thorough policy provisions to ensure that the integrity of the site is not compromised but where possible enhanced. The Plan contains the following policies in this regard.

**HER POL 15:** To maintain, protect and where possible enhance, the conservation value of the cSAC in Navan and any additional sites that may be proposed for designation during the lifetime of this Plan.

**HER POL 16:** To have regard to the views and guidance of the National Parks and Wildlife Service of the DoEHLG in respect of proposed development where there is a possibility that such development may have an impact on the River Boyne and River Blackwater candidate Special Area of Conservation.

**HER POL17:** To require any planning application that proposes development within or adjacent to the area designated as a cSAC to be accompanied by an ecological impact assessment carried out by appropriate professionals. The Ecological Impact Assessment will be forwarded to the National Parks & Wildlife Service of the Department of the Environment, Heritage & Local Government for their comments prior to the making of a decision by the appropriate planning authority.

**HER POL 18:** To permit development in a designated SAC or those proposed to be designated over the period of this plan, only where an assessment carried out to the satisfaction of the Planning Authority and National Parks & Wildlife Service of DoEHLG,



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indicates that it will have no significant adverse effect (such as disturbance, pollution or deterioration of habitat quality) on the protected area.

**HER POL 19:** To prohibit any development that would be harmful or that would result in a significant deterioration of habitats and/or disturbance of species.

**HER POL 20:** To ensure that development does not have a significant adverse impact, incapable of satisfactory mitigation, on plant, animal or bird species protected by law."

The report concluded the following:
*The policy provisions included in the Plan ensure that no projects giving rise to significant adverse direct, indirect or secondary impacts on the integrity of the River Boyne and River Blackwater candidate Special Area of Conservation or any other Natura 2000 sites, having regard to their conservation objectives, shall be permitted on the basis of this Plan (either individually or in combination with other plans or projects).*

### 10.3 South Eastern River Basin Management Plan (2009-2015)

This report notes that the suspected causes of less than satisfactory water in the state are discharges, principally of nutrients, from agricultural activities and from municipal wastewater treatment works. Industrial discharges, wastewater from unsewered properties and discharges from several other activities have also been identified as contributing. Action should concentrate in the first instance on these issues which pose the greatest threat to the water environment, but it is also important to address other possible sources of water pollution and impact, including issues such as water abstraction and physical modification and issues specific to the South Eastern RBD. This plan identifies a programme of measures to protect and restore water status by addressing the main pressures including

- Control of urban waste water discharges;
- Control of agricultural sources of pollution;
- Control of unsewered waste water discharges;
- Water pricing policy;
- Control of environmental impacts from forestry.

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Effective implementation of these measures is expected to have a net, positive long-term impact on river water quality**.**

## 11. Mitigation Measures

The likely success of the proposed mitigation measures is high, either in their current form or as they will be adapted on-site to achieve the desired result. The mitigation measures have been drawn up in line with current best practice. It is clear that the mitigation measures are designed to lower the risk of impact to acceptable levels. Whilst the proposed methods of mitigation may be amended and supplemented the risk that the mitigation measures will not function effectively in preventing significant impacts on designated sites is low.

- Pipework at the inlet has been designed to be adjustable to distribute the effluent evenly across the beds width.
- The pipe work at the outlet is adjustable to allow for control of water depth within the bed.



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- De-sludging of the settled sediment from the tanks will be monitoried once a month and de-sludged every 6 months-1 year as appropriate.
- To ensure the wetland has a minimum of 0.15m deep and ideally no more than 0.25m deep, the pipework at the outlet will be adjusted so as to control the water depth within the bed.
- The pipework at the inlet and outlet will be rodded periodically to ensure the even distribution of the effluent evenly across each bed width.
- A final commissioning report on the constructed wetland was requested by the EPA to ensure that it is structurally intact. This report will be include an analysis of water quality. This report will be submitted and assessed by the EPA before any discharge from the constructed wetland occurs.

## 12. Conclusions of the Natura Impact Statement

Impacts which were considered to have the potential to impact on the River Boyne and River Blackwater SPA and River Boyne and River Blackwater cSAC relate to the potential for impacts on water quality which turn can impact on other aquatic species and predators higher up the food chain such as otter and kingfisher. No direct loss of Natura 2000 habitats will occur and there is no potential for disturbance of qualifying interests for the River Boyne and River Blackwater SPA and River Boyne and River Blackwater cSAC. No significant in-combination impacts have been identified.

Precautionary measures have been incorporated into the project design, and other mitigation measures have been developed and proposed, with the purpose of avoiding or minimising impacts on water quality. The likely success of these measures was also considered and no particular difficulties in their effective implementation were identified.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'.

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for the River Boyne and River Blackwater SPA and River Boyne and River Blackwater cSAC, it has been concluded that the proposed development will not have an adverse effect on the integrity of these Natura 2000 sites.

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# APPENDIX 1

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# Constructed Wetland design for Panda waste services

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## Site at Rathdrinagh, Navan, Co. Meath

*Please find attached the site location map, site layout, EPA emission licence, tank effluent sampling results, 3 trial hole assessments, trial hole pictures, particle soil distribution (psd) test lab results and wetland system drawings at rear of report.*

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# REF: Panda waste

***OVERVIEW:***

*The following is a worked design for the proposed constructed wetland system for Panda waste at Rathdrinagh, Navan, Co. Meath. The national grid reference for the site is NGR 297957 268590. The site is situated on subsoil categorised as (TNSSs) - shales and sandstone till - clayey texture. This suggests, from the outset, that the on-site soils/subsoils may lend itself to the suitably high clay contents required for the impervious protective layer required for the construction of the wetland system. The site is underlain by Namurian Undifferentiated bedrock (NU). The site appears to fall within the river Boyne catchment area as a stream to the south of the site feeds the Boyne. However the river Nanny catchment area lies nearby to the south. (See site location map).*

*Waste materials at the facility are processed indoors. Therefore the wastewaters collected are not considered to contain any lechates from the waste materials being processed. Therefore wetland design rationale for the treatment of urban/highway runoff shall be adopted. At present the roof and yard runoffs are sent to three settlement tanks (estimated capacity of ~350m3) prior to subsequent removal off site. The intention is to send the waters to the settlement tanks as usual, prior to being sent to a wetland system for treatment prior to discharging to the existing surface water drain/ditch passing adjacent to the proposed position of the wetland system. The wetland is to be a horizontal, surface flow design, divided into a three stage/cell system. The intention is then to have an overflow to the ditch/stream where it is estimated that the effluent will be of an exceptional standard (beyond a <5/5 bod5/SS standard).*

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***WETLAND DESIGN RATIONALE:***

***Site area:*** *43,933.5m2. (See site layout).*
***Total area to be excluded:***
*3250m2 - unused land (i.e. land on which proposed wetland area will sit)*
*9438m2 - roofed area.*
*This equates to a total of 12,688m2*
*Therefore site area for treatment - 31,245.5m2.*

*(For design purposed roofed areas have been excluded. While the roof waters at present flow into the holding tanks, they are considered effluent neutral as the waters from the roofs are clean and provide dilution, and do not provide parameter loading on the systems design).*

***Met Eireann rainfall figures:***
*800-1000mm/year. Therefore a maximum average rainfall figure of 2.74mm/day can be assumed*



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***SIZING THE SYSTEM:***

***Using the WRc guideline manual: Reed beds and Constructed Wetlands for Wastewater treatment, when designing wetlands for urban/highway runoff, a wetland area is required to be 0.5% – 5% of the total catchment area to effectively deal with subsequent flows and pollutants gained.***

*Therefore using best practice, assuming 5% of 31,245.5m2, a wetland area of 1562.3 (1563m2) is deemed to be sufficient to ensure excellent treatment of run off. The ditch which intersects this area inhibits the area available for the construction of the wetland. It is proposed to pipe the ditch in a 24" concrete pipe so as to protect the ditch, as a 10m separation distance cannot be obtained from the edge of the proposed wetland, while trying to position the wetland system. As a result, the proposed maximum available area for the wetland on site (~2504m2) now lends itself to incorporating the wetland area, plus the additional allowance for embankments etc. The total constructed area for the wetland design is ~2178m2 (17m x 128m). (See drawings which follow).*

*It should also be remembered that the wetland is preceded by settlement tanks prior to discharge to the wetland, significantly aiding the systems efficiency. The wetland will consist of three individual beds. Each bed base is to be sized at 521m2 (13m x 40.1m), so as to obtain, as near to a 3:1 length to width ratio, as possible.*

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***RETENTION TIMES:***

*Using the average daily rainfall figure of 2.74mm/day on the catchment area of 43,933.5m2, an average flow of 120m3/day can be assumed. A short retention time of 16–24 hrs is sufficient to achieve high performance secondary and tertiary treatment standards i.e. <5/5 BOD5/SS.*

*Considering the capacity of the wetland area is 1563m2 with a depth between 0.15m and 0.2m (234m3/day and 312m3/day respectively) a retention time of 46 hrs – 62 hrs can be expected. Therefore it can be assumed that the wetland can easily cope with twice to two and a half the flows envisaged in a 24 hr period.*

***EXPECTED PERFORMANCE:***

*96% of total extractable hydrocarbons are removed after only 5hrs retention.*
*50–75% total phosphorus.*
*60–80% nitrogen (oxidises ammonia)*
*83% COD*
*89% BOD5*
*99.9% faecal coliforms*
*70–90% suspended solids*

*NB: it should be noted that the effluent produced should exceed these estimated figures as retention times are more than twice those recommended by suggested design criteria i.e. min 16–24hr retention. See also* ***General design rationale for reed bed surface flow constructed wetlands*** *at rear of report as support to design proposal*



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*The permissible limits for the emissions to water from the site have been set by the EPA under Licence reg no: W0140-03. The following has been taken from Schedule B: Emission Limits, B.2 - Emissions to water.*

---

## B.2 Emissions to water

| | |
|---|---|
| *Emission point reference no:* | *SW1* |
| *Name of Receiving waters:* | *Southern drain* |
| *Location:* | *Southern boundary of site (note 1)* |

| *Parameter* | *Emission Limit Value (mg/l)* |
|---|---|
| *BOD* | *5* |
| *Suspended Solids* | *25* |
| *Ammonia (as NH4)* | *1* |

*Note 1: location of SW1 may be changed with the agreement of the Agency*

---

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*The following sample results were taken from the final tank/chamber at the point where the wastewater will be allowed to flow to the proposed wetland system. These were taken on the 26/9/13 and on the 5/12/13.* ***Please find attached sampling results from wastewater taken from the holding tanks.***
*From this it can be seen that the results as for the parameters as set in the emission limits are as follows:*

| *Test parameter* | *result 26/9/13* | *result 5/12/13* |
|---|---|---|
| *BOD* | *<2mg/l* | *<2mg/l* |
| *Suspended solids* | *3mg/litre* | *6mg/litre* |
| *Ammonia (as N)* | *0.047mg/l* | *1.38mg/l* |

*It should be noted that the effluent produced from the holding tanks are well below that set as suitable for discharge with the exception of one ammonia result on the 5/12/13 which is marginally above the acceptable emission limit. Therefore nutrient and suspended solids loadings will be relatively low and the effluent for all parameters, even throughout storm events produced by the wetland will be polished to an exceptional quality.*

*The flow within the ditch/drain which will be used as the discharge route was measured on the 14/11/13 during a dry weather period. It was found to have an estimated flow of 0.039m3/sec. This equates to 3,370m3/day. The average daily catchment flow to and from the wetland is estimated at~120m3. Therefore a ditch flow/catchment flow dilution ratio of 23:1 exists.*

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# REF: Panda waste

*1) Design rationale and Construction methods*

1) *The total wetland area should be divided into a minimum 2-3 separate wetlands.*

2) *As mentioned previously, the wetlands shall be a minimum of 0.15m deep and ideally no more than 0.25m deep. (i.e. average 0.2m depth). (The reeds are in fact able to perform efficiently in 0.3m deep waters).*

3) *The wetland should have a length to width ratio of approximately 3:1.*

4) *Pipe work at inlet end shall distribute the effluent evenly across the beds width.*

5) *The pipe work at the outlet shall be able to be adjusted so as the control of water depth within the bed is achievable.*

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*2) Further design considerations:*

*With respect to the groundwater protection requirements, the site is located in a poor aquifer (Pl) category area, while the area has a low vulnerability categorisation (www.gsi.ie). The guidelines for the groundwater protection have been developed with reference to the guidance document produced by the Dept. Of the Environment, Heritage and local Governments Guidance document for farmyard soiled water and domestic wastewater applications: Integrated constructed wetlands. It is therefore proposed to have a minimum of 1m depth of soil above water table/bedrock whereby the top 0.5m of that, shall create an impervious layer/liner with high clay content i.e. SILT/CLAY or CLAY - BS 5930 categorisation and compacted if deemed necessary by using the digger to track and compact the soil. A particle soil distribution test (psd) has been conducted so as to determine the clay content within a layer(s) within the sites subsoil so as to ensure a 0.5m impervious layer can be obtained. It is recognised that a soil/subsoil with a clay content >13% is suitable for use as an in situ liner. Soil/subsoil with 10%-13% clay content can be reworked and compacted in lifts using the digger to track and compact the soil. Below 10% an artificial liner will be required. The trial hole assessments and psd tests which follow will determine the status of such.*

***For reed based wetlands an additional 0.5m of topsoil shall be lain/provided/maintained on top of the impervious layer for use as rooting material.***

*This shall be done so as to alleviate any concerns with respect to the vigorous growth nature of the root network of the phragmites, opening pathways to the groundwater. This additional design feature shall be adopted, as it is assumed that a phragmites root system can grow down to a depth of 0.5m.*



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3) **Trial hole assessment, PSD test analysis and Construction method:**

*A site visit was conducted on the 11/11/13 and on the 14/11/13. Three trial holes were dug on the 11/11/13 at the proposed location of the wetland position. Each trial hole was intended to be representative of ~500m2, which also correlates with each of the three proposed cells of the wetland. Each hole had been dug to a depth of 2.8m, 2.8m and 3m respectively. On the 14/11/13, having been left open for >48hrs, each trial hole was examined. Soil samples were taken from each layer within each trial hole for classification through BS 5930. See trial holes pictures and assessments which follow. Furthermore samples were also taken to confirm clay content % within the subsoil layer in the trial hole so as to establish the suitability of the subsoil for use as the wetland impervious liner. PSD tests T1 AND T4 were taken from trial hole 1, T2 and T5 from trial hole 2 and T3 and T6 from trial hole 3.See PSD test results which follow.*

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*As can be seen from the trial hole assessment no evidence of a water table (winter or otherwise) was encountered. Furthermore three distinct soil layers emerge. From the layering within the trial hole, it can be seen, that it is likely that the top layer has been placed onto the original ground level as fill. Indeed from talking to the staff, it was confirmed that soil/subsoil from other areas of the site had been moved onto the proposed wetland area. This produces three distinct layers, imported soils (fill), original topsoil and subsoil. The imported soil/ fill has been classified as a SILT/CLAY soil type and due to its nature will be suitable for the construction of embankments due to its low to medium permeability classification. The original topsoil layers also have SILT/CLAY characteristics and lend itself suitable for use as the >0.5m rooting material layer. Meanwhile the subsoils are SILT/CLAY soils, which lend itself ideal for use as the 0.5m impervious layer and base 0.5m layer, for protection cover above bedrock/water-table. (See wetland system drawings which follow).*

*When considering the results from the psd tests it can be seen that cell 1 can be constructed relatively easily with limited disruption of the in situ conditions, however cell 2 and cell 3 will require reworking. The base of the outlet from the settlement tanks will be 0.6m below the tanks lid (at g.l.) This tank outlet has been set at base level/ground zero (0.0m) for the purpose of alignment of the wetland and cell system. There is then a 0.6m drop to the base of cell 1, a 0.3m drop from cell 1 to cell 2, a 0.2m drop between cell 2 to cell 3 and finally >0.2m drop to the ditch outfall. See construction method, which follows for further details. See also wetland system drawings.*

*The drainage ditch running on site runs from north to south in flow direction. The base of the ditch appears to be lined with concrete, which keeps the waters clean. The water level in ditch does not impact on the water table as no water table was encountered within any of the three trial holes. It is proposed however to pipe the ditch so as to alleviate any concern by not having 10m separation distance to the wetland. The outfall of the ditch (to the extreme south of the site) is >1.9m below the lids of the settlement tanks (1.3m below proposed tank outfall).*



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4) **Construction method:**

**Cell 1 (T1) construction**: the base of the first cell has been set at 0.6m below ground zero. Therefore, the top 0.2m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Now below the base ~600mm of original topsoil (13% clay content(psd-T1)) can be maintained in situ as suitable rooting material. This is then underlain by 0.5m impervious layer and 0.5m cover layer as required. (As seen in trial hole, in reality 2m of in situ impervious layer (13% clay content (psd-T4)) underlies the rooting in situ layer.

**Cell 2 (T2) construction**: the base of the second cell has been set at 0.9m below ground zero. Therefore, similar to cell 1, the top 0.2m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall again be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Now, below the base ~500mm of original topsoil (10% clay content(psd-T2)) shall be temporarily removed and reinstated later for use as suitable rooting material. As the subsoil has a 12% clay content (psd-T5)) underlies the topsoil layer, ~0.6m shall be removed and re-lain in 200mm lifts, compacted and tracked in using the digger. This is to be repeated three or four times, resulting in 600mm+ of soil, compacted to >500mm depth creating the required 0.5m impervious layer on top of the 0.5m cover layer as required. (As seen in trial hole, in reality 2m of in situ med to high impervious layer (12% clay content (psd-T5)) underlies the rooting layer). Now, the ~500mm of original topsoil (10% clay content (T3)) shall be reinstated for use as suitable rooting material.

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**Cell 3 (T3) construction**: the base of the third cell has been set at 1.1m below ground zero. In this case the top 0.8m of the fill shall be cleared from the proposed area (13m x 40.1) to create a level plateau and used to construct the embankments at 1m height, as required. The embankments shall again be constructed by placing 200mm lifts and compacted and repeated until the 1m height is achieved, so as to create a sealed bund. Due to the original topsoil (0.6m) having 9% clay content, and the subsoil (0.5m of 1.6m) having a 11% clay content these layers will be required to be effectively swapped so as to create the necessary conditions. Therefore, the next 600mm of original topsoil (11% clay content (psd-T3)) shall be temporarily removed and reinstated later for use as the compacted impervious layer. Then the underlying ~0.5m shall be removed and used later as the rooting material. This layer after removal shall then be replaced with the original topsoil (11% psd-T3) and re-lain in 200mm lifts, compacted and tracked in using the digger. This is to be repeated three or four times, resulting in 600mm+ of soil, compacted to >500mm depth creating the required 0.5m impervious layer. Under this, the remaining in situ 0.5m cover layer is in place as required. (As seen in trial hole, in reality 1.1m of subsoil will exists (9% clay content (psd-T6)) under the impervious layer, as 0.5m was removed (totalling 1.6m as seen from trial hole analysis). Now, the ~500mm of original subsoil (9% clay content (T6)) shall be reinstated for use as suitable rooting material.



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***Construction General:***

*The installation of the layers may require the movement of soils from one part of the site to another however it is hope the minimum of disturbance will be involved as, by enlarge, the in situ conditions already exist. Inlet and outlet pipe work shall consist of 9" feeds to and from each cell. Internally in each of the cells the pipe work shall be split down to 6" arrangements. Once fitted, planting is conducted at a planting rate of 2 plants/m2 with reeds (Phragmites Australis). The outlet sampling chamber shall be installed and piped to the ditch. As stated previously the ditch is to be piped back upstream parallel to the wetland using 24" concrete piping prior to the wetland works begin.*

***Supervision of installation:***

*The full construction process is to be supervised to ensure the correct processes are followed. It is envisaged the wetland will reach full maturity within 1-2 years, whereby full efficiency will be achieved. The wetland only will be subject to a-three year maintenance and guarantee contract from the date of completion of installation. After 3 years elapses this can be extended if requested.*

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***Maintenance for the efficient function of the wetland.***

*It is envisaged that the effluent produced from the wetland will be well beyond 5/5, Bod5/SS standards. As previously mentioned the treated effluent is to be discharged to the ditch.*

*Desludging of the settled sediment from the tanks should be monitored once a month and desludged every 6mths -1 years or as appropriate.*

*So as to ensure the wetland has a minimum of 0.15m deep and ideally no more than 0.25m deep. (i.e. average 0.2m depth), the pipe work at the outlet should be adjusted so as the control of water depth within the bed.*

*The pipe work at inlet end shall be rodded periodically to ensure the even distribution of the effluent evenly across each beds width.*

*Similarly the outlet shall also be checked and rodded, if necessary, to ensure the free flow of effluent.*



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*Constructed Wetland design for Panda waste services*

*Site at Rathdrinagh, Navan, Co. Meath*

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*Please find attached overleaf the site location map, site layout, EPA emissions to water licence, tank effluent sampling results, 3 trial hole assessments, trial hole pictures, particle soil distribution (psd) test lab results and wetland system drawings.*

*Also please find attached General design rationale for reed bed surface flow constructed wetlands as support to design proposal and business information sheet*



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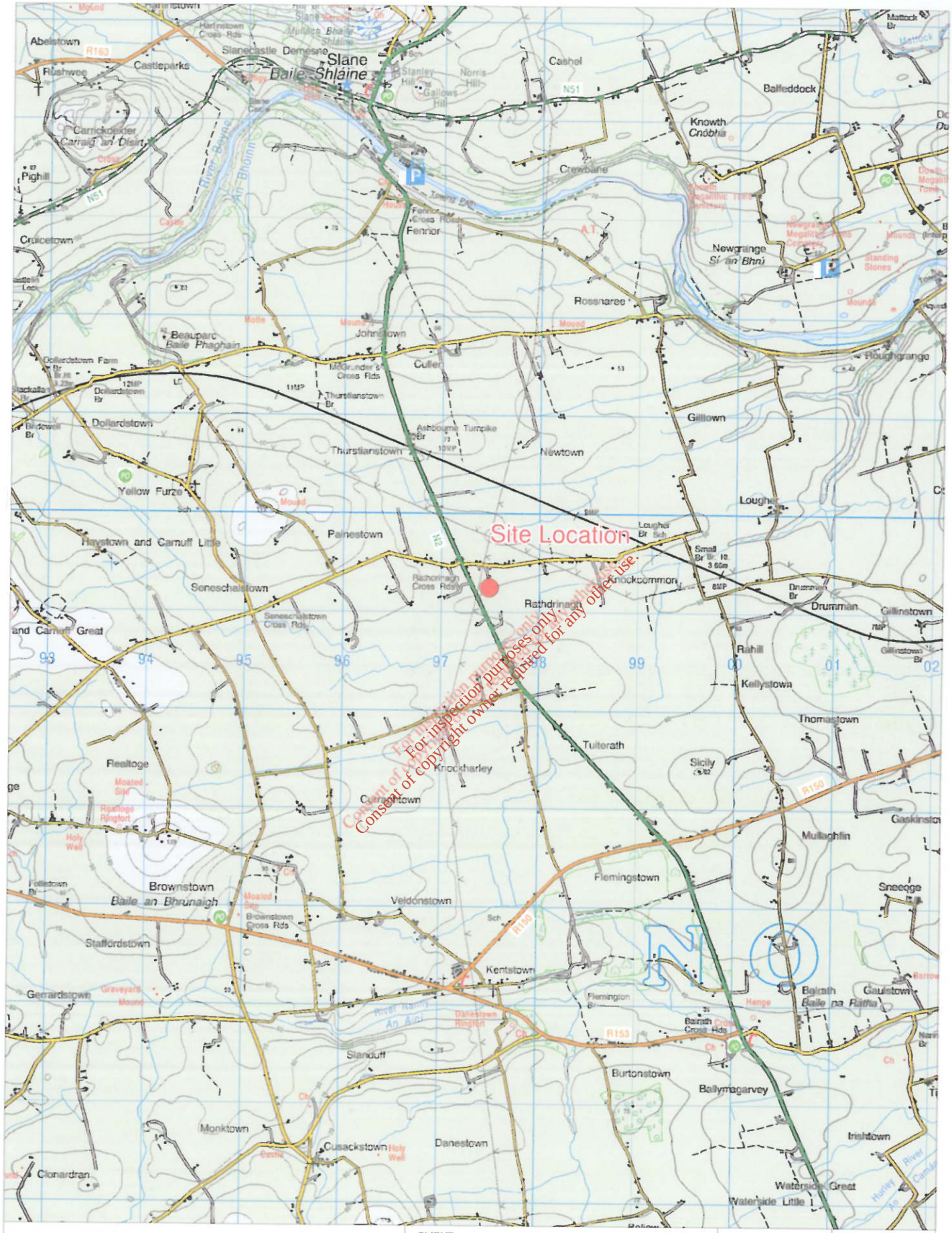


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| | | | |
|---|---|---|---|
| | CLIENT<br>Panda Waste Services | DETAILS<br>O.S. Licence Agreement Number AR 0037807 | DRG. No.<br>1 |
| | TITLE<br>Site Location Map | Ordnance Survey Ireland<br>Government of Ireland | SCALE REV.<br>1:50,000 |

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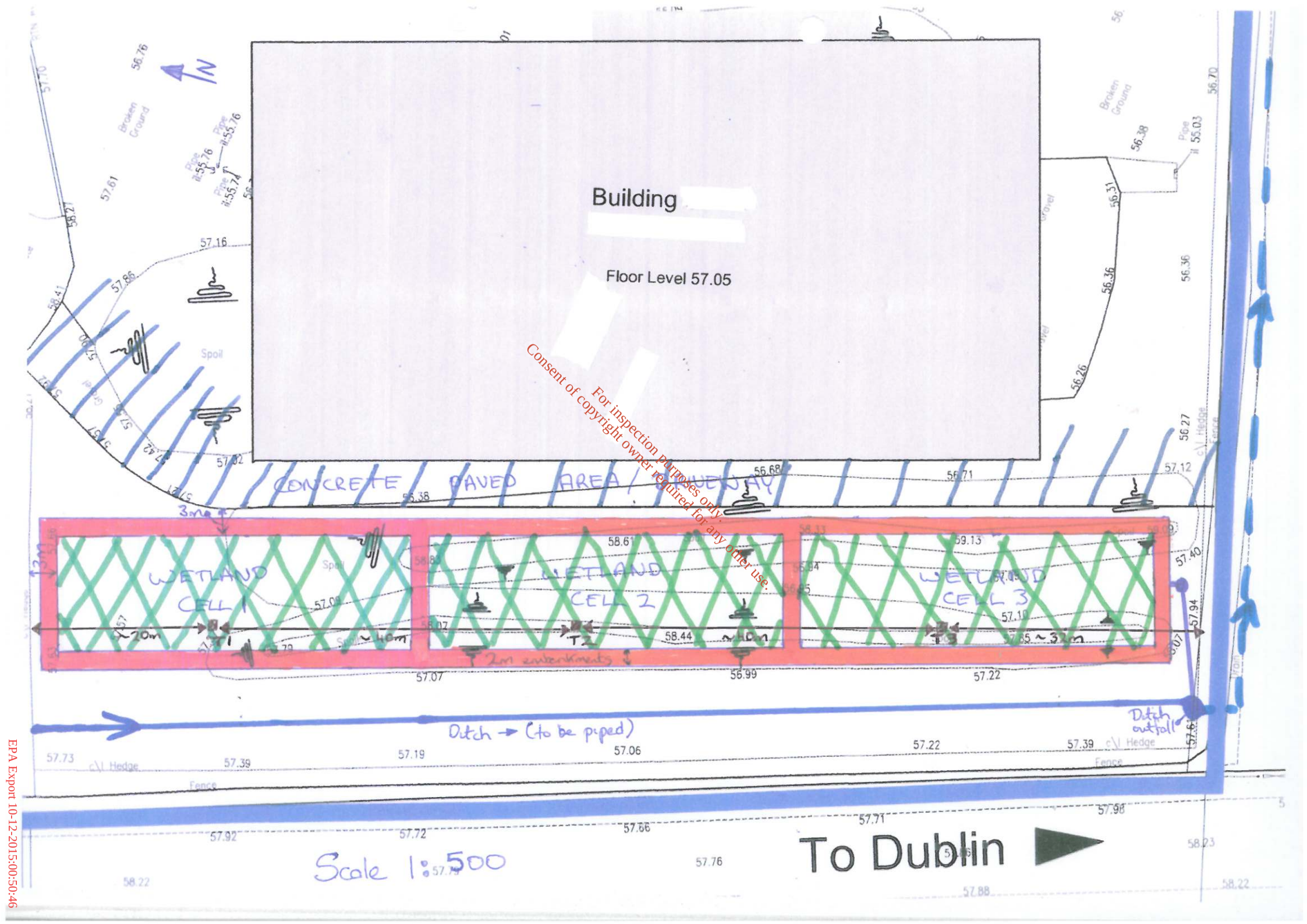


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# SCHEDULE B: Emission Limits

## *B.1 Emissions to Air*

**Emission Point Reference No.:** Biofilter emission from Biodegradable waste composting unit (A-1).

**Location:** Biofilter Unit

| Parameter | Emission Limit Value |
|---|---|
| Ammonia | 50mg/m$^3$ |
| Hydrogen Sulphide | 5mg/m$^3$ |
| Mercaptans | 5mg/m$^3$ |

## *B.2 Emissions to Water*

**Emission Point Reference No.:** SW1

**Name of Receiving Waters:** Southern drain

**Location:** Southern boundary of site [Note 1]

| Parameter | Emission Limit Value(mg/l) |
|---|---|
| BOD | 5 |
| Suspended Solids | 25 |
| Ammonia (as NH4) | 1.0 |

**Note 1:** Location of SW1 may be changed with the agreement of the Agency.

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tank effluent

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email info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie

| | | | |
|---|---|---|---|
| *Customer* | **David Naughton** | *Lab Report Ref. No.* | **2190/178/04** |
| | **Panda Waste** | *Date of Receipt* | **26/09/2013** |
| | **Beauparc Business Centre** | *Sampled On* | **26/09/2013** |
| | **Navan** | *Date Testing Commenced* | **26/09/2013** |
| | **Co Meath** | *Received or Collected* | **Delivered by Customer** |
| | **Ireland** | *Condition on Receipt* | **Acceptable** |
| *Customer PO* | **T1309313** | *Date of Report* | **02/10/2013** |
| *Customer Ref* | **Beau Surface Tank** | *Sample Type* | **Trade Effluent** |
| *Ref 2* | | | |

# CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|---|---|---|---|---|---|
| Ammonia (Industrial Eff.) | 114 | Colorimetry | 0.047 | mg/L as N | UKAS |
| Arsenic (Industrial Eff.) | 177 | ICPMS | 0.228 | ug/L | UKAS |
| BOD (Industrial Eff.) | 113 | Electrometry | <2 | mg/L | UKAS |
| Boron (Industrial Eff.) | 177 | ICPMS | 26.44 | ug/L | UKAS |
| Cadmium (Industrial Eff.) | 177 | ICPMS | <0.05 | ug/L | UKAS |
| Chromium (Industrial Eff.) | 177 | ICPMS | 1.637 | ug/L | UKAS |
| COD (Industrial Eff.) | 107 | Colorimetry | 11 | mg/L | UKAS |
| Copper (Industrial Eff.) | 177 | ICPMS | 2.175 | ug/L | UKAS |
| Lead (Industrial Eff.) | 177 | ICPMS | 1.732 | ug/L | UKAS |
| Mercury (Ind Effluent) | 178 | ICPMS | <0.04 | ug/L | UKAS |
| Nickel (Industrial Eff.) | 177 | ICPMS | 3.053 | ug/L | UKAS |
| Oils, Fats & Grease | 101 | Solvent Extraction/ Gravimetry | <1 | mg/L | |
| Selenium (Industrial Eff.) | 177 | ICPMS | <2.12 | ug/L | UKAS |
| Sulphate (Industrial Eff.) | 119 | Colorimetry | 93.56 | mg/L as SO4 | UKAS |
| Suspended Solids (Industrial Eff.) | 106 | Gravimetry | 3 | mg/L | UKAS |
| Zinc (Industrial Eff.) | 177 | ICPMS | 5.747 | ug/L | UKAS |

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***Signed :*** A Harmon

***Aoife Harmon - Technical Supervisor***

***Date : 02/10/2013***

*Acc. : Accredited Parameters by ISO 17025:2005*

PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)

All organic results are analysed as received and all results are corrected for dry weight at 104 C

Results shall not be reproduced, except in full, without the approval of Fitz Scientific

Results contained in this report relate only to the samples tested

**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.



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| | | | |
|---|---|---|---|
| *Customer* | **David Naughton** | *Lab Report Ref. No.* | **2190/182/01** |
| | **Panda Waste** | *Date of Receipt* | **05/12/2013** |
| | **Beauparc Business Centre** | *Sampled On* | **05/12/2013** |
| | **Navan** | *Date Testing Commenced* | **05/12/2013** |
| | **Co Meath** | *Received or Collected* | **Delivered by Customer** |
| | **Ireland** | *Condition on Receipt* | **Acceptable** |
| *Customer PO* | **T1312010** | *Date of Report* | **13/12/2013** |
| *Customer Ref* | **Beau Surface Tank - December 2013** | *Sample Type* | **Surface Water** |
| *Ref 2* | | | |

# CERTIFICATE OF ANALYSIS

| Test Parameter | SOP | Analytical Technique | Result | Units | Acc. |
|---|---|---|---|---|---|
| Ammonia (Surface Water) | 114 | Colorimetry | 1.38 | mg/L as N | UKAS |
| BOD (Surface Water) | 113 | Electrometry | <2 | mg/L | UKAS |
| Solids (Total Suspended) | 106 | Filtration/ Drying @ 104C | 6 | mg/L | |

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*Signed :* A Harmon

*Aoife Harmon - Technical Supervisor*

*Date : 13/12/2013*

Acc. : Accredited Parameters by ISO 17025:2005
PVL - Parametric Value Limit as per EU Drinking water Regulations (SI 278 2007)
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.



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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T1 | Depth of Trial Hole (m): | 2.8 | Date and Time of Excavation: | 11/11/13 11:16 | Date and Time of Examination | 14/11/13 11:33 |
|---|---|---|---|---|---|---|---|

| | |
|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A |
| Depth from Ground Surface to Water Table (m) (if present): | n/A |
| Depth and Description of Topsoil | 0.2m fill, 0.6m topsoil |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | SILT/CLAY 4 threads 60 ribbons not dilatant | soft | greyish brown | n/A. | fill |
| 0.4m | | | | | |
| 0.6m | SILT/CLAY | soft | light brown | n/A. | topsoil |
| 0.8m | 4/5 threads, 70/80 ribbons, not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | | | | | |
| 1.4m | | | | | |
| 1.6m | SILT/CLAY | soft | dark grey | n/A. | subsoil. |
| 1.8m | 4/5 threads | | | | |
| 2.0m | 70/80 ribbons | | | | |
| 2.2m | not dilatant | | | | |
| 2.4m | | | | | |
| 2.6m | | | | | |
| 2.8m | | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | | n/A | Rock Type (if present): | n/A. | |

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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T2 | Depth of Trial Hole (m): | 2.8 | Date and Time of Excavation: | 11/11/13 11:29 | Date and Time of Examination | 14/11/13 11:51 |
|---|---|---|---|---|---|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A | | | | | | |
| Depth from Ground Surface to Water Table (m) (if present): | n/A | | | | | | |
| Depth and Description of Topsoil | 0.2m fill, 0.6m topsoil | | | | | | |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | SILT/CLAY 3/4 threads 60/70 ribbons not dilatant | very soft | greyish brown | n/A | fill |
| 0.4m | | | | | |
| 0.6m | SILT/CLAY | soft | light brown | n/A | topsoil |
| 0.8m | 4/5 threads, 70/80 ribbons, not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | | | | | |
| 1.4m | | | | | |
| 1.6m | SILT/CLAY | firm | dark grey | n/A | subsoil |
| 1.8m | 4/5 threads | | | | |
| 2.0m | 70/80 ribbons | | | | |
| 2.2m | not dilatant | | | | |
| 2.4m | | | | | |
| 2.6m | | | | | |
| 2.8m | | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | n/A | Rock Type (if present): | n/A | | |

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## 3.3 TRIAL HOLE

The Trial Hole should be excavated to a minimum depth of 2m below the base of the proposed wetland.

| Trial Hole No | T3 | Depth of Trial Hole (m): | 3.0 | Date and Time of Excavation: | 11/11/13 11:41 | Date and Time of Examination | 14/11/13 12:07 |
|---|---|---|---|---|---|---|---|

| | |
|---|---|
| Depth from Ground Surface to Bedrock (m) (if present): | n/A |
| Depth from Ground Surface to Water Table (m) (if present): | n/A |
| Depth and Description of Topsoil | 0.8m fill, 0.6m topsoil |

| | Soil/Subsoil Texture & Classification (Include Plasticity/ Dilatancy Results) | Density/ Compactness | Colour | Preferential Flowpaths | |
|---|---|---|---|---|---|
| 0.2m | | | | | |
| 0.4m | SILT/CLAY | very soft | greyish brown | n/a | fill |
| 0.6m | 3/4 threads 70/80 ribbons | | | | |
| 0.8m | not dilatant | | | | |
| 1.0m | | | | | |
| 1.2m | SILT/CLAY | soft | light brown | n/A | topsoil |
| 1.4m | 3/4 threads, 70/80 ribbons, not dilatant | | | | |
| 1.6m | | | | | |
| 1.8m | | | | | |
| 2.0m | | | | | |
| 2.2m | SILT/CLAY | soft | dark grey | n/A | subsoil |
| 2.4m | 3/4 threads | | | | |
| 2.6m | 70/80 ribbons | | | | |
| 2.8m | not dilatant | | | | |
| 3.0m | | | | | |
| 3.2m | | | | | |
| 3.4m | | | | | |
| 3.6m | | | | | |
| 3.8m | | | | | |
| 4.0m | | | | | |
| Depth of Water Ingress: | | n/A | Rock Type (if present): | n/A. | |

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T3 T2 T1

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Trial holes @ Rathdrinagh, Navan Co Meath for Panda Waste Services.

Pictures taken >48hrs after excavation. (pictures taken out of sequence, hence T3, T2, T1).

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# TEST REPORT

Analysing
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Tel +353 61 455399
Fax +353 61 455447
E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/391
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/391 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T1 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 100 | | | |
| 10 | 100 | | | |
| 6.3 | 100 | | | |
| 5.0 | 99 | | | |
| 3.35 | 99 | | | |
| 2.00 | 98 | | | |
| 1.18 | 95 | | | |
| 600µm | 87 | | | |
| 425µm | 82 | | | |
| 300µm | 77 | | | |
| 212µm | 71 | | | |
| 150µm | 64 | | | |
| 63µm | 50 | | | |
| 20µm | 30 | | | |
| 6µm | 20 | | | |
| 2µm | 13 | | | |

Remarks:
Nil

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Laboratory Technical Manager
For and On Behalf of BHP Laboratories

Issue Date: 9th December 2013

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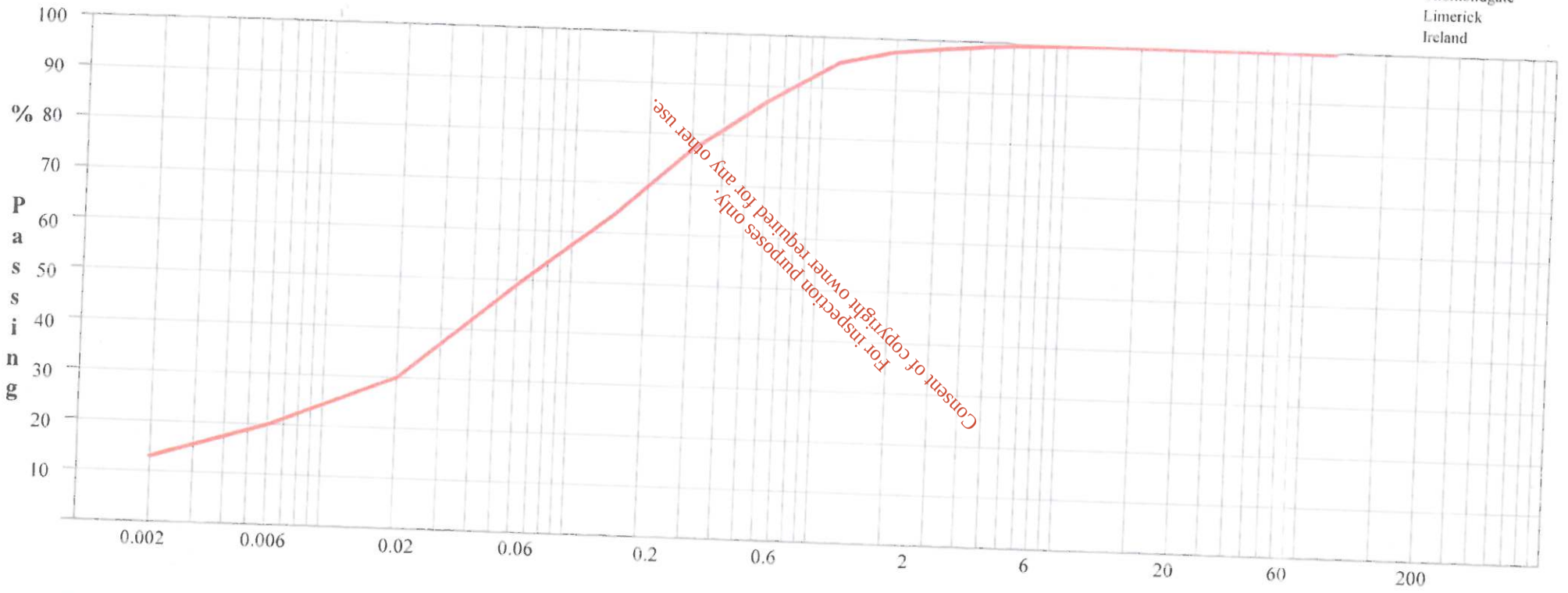
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/391 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T1 top layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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Laboratory Technical Manager
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E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/392
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/392 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | Customer Ref |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T2 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 100 | | | |
| 10 | 100 | | | |
| 6.3 | 100 | | | |
| 5.0 | 99 | | | |
| 3.35 | 98 | | | |
| 2.00 | 97 | | | |
| 1.18 | 95 | | | |
| 600µm | 87 | | | |
| 425µm | 81 | | | |
| 300µm | 76 | | | |
| 212µm | 70 | | | |
| 150µm | 64 | | | |
| 63µm | 51 | | | |
| 20µm | 28 | | | |
| 6µm | 18 | | | |
| 2µm | 10 | | | |

Remarks:
Nil

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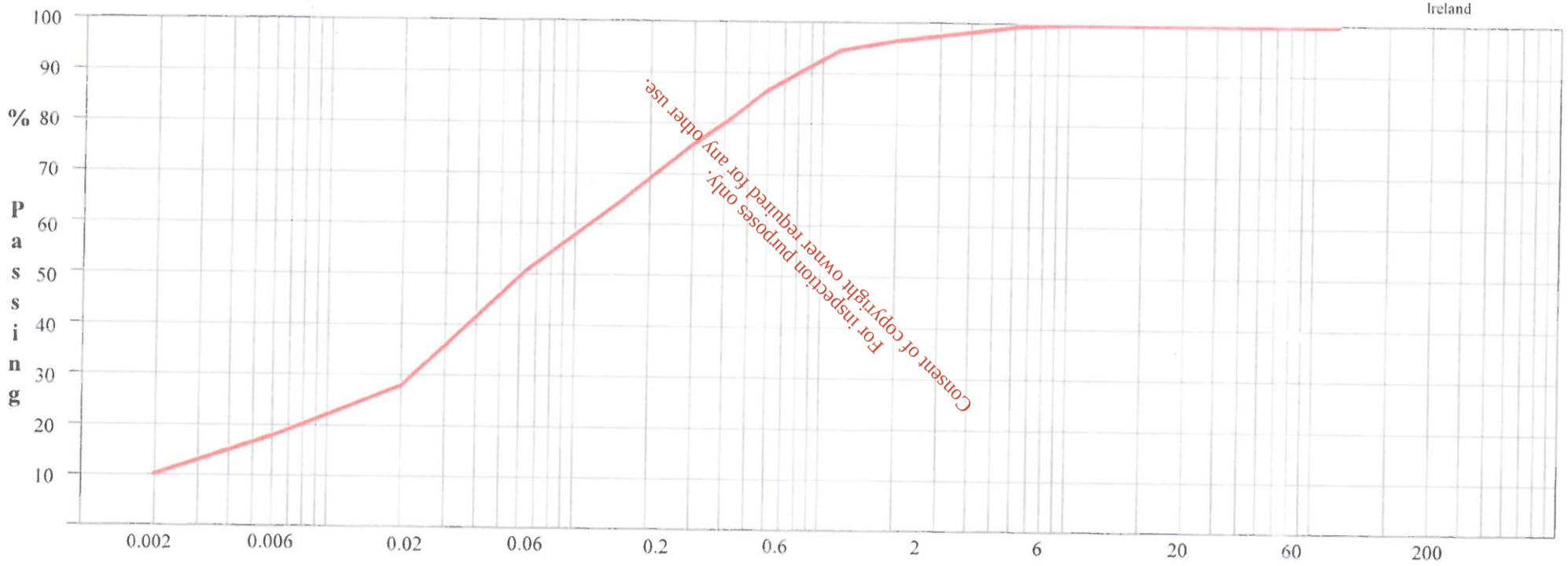
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample T2 top layer | | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/393-2
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/393-2 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T3 - top layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 98 | | | |
| 10 | 96 | | | |
| 6.3 | 94 | | | |
| 5.0 | 93 | | | |
| 3.35 | 91 | | | |
| 2.00 | 88 | | | |
| 1.18 | 85 | | | |
| 600µm | 77 | | | |
| 425µm | 73 | | | |
| 300µm | 69 | | | |
| 212µm | 64 | | | |
| 150µm | 59 | | | |
| 63µm | 45 | | | |
| 20µm | 30 | | | |
| 6µm | 19 | | | |
| 2µm | 11 | | | |

Remarks:
Nil

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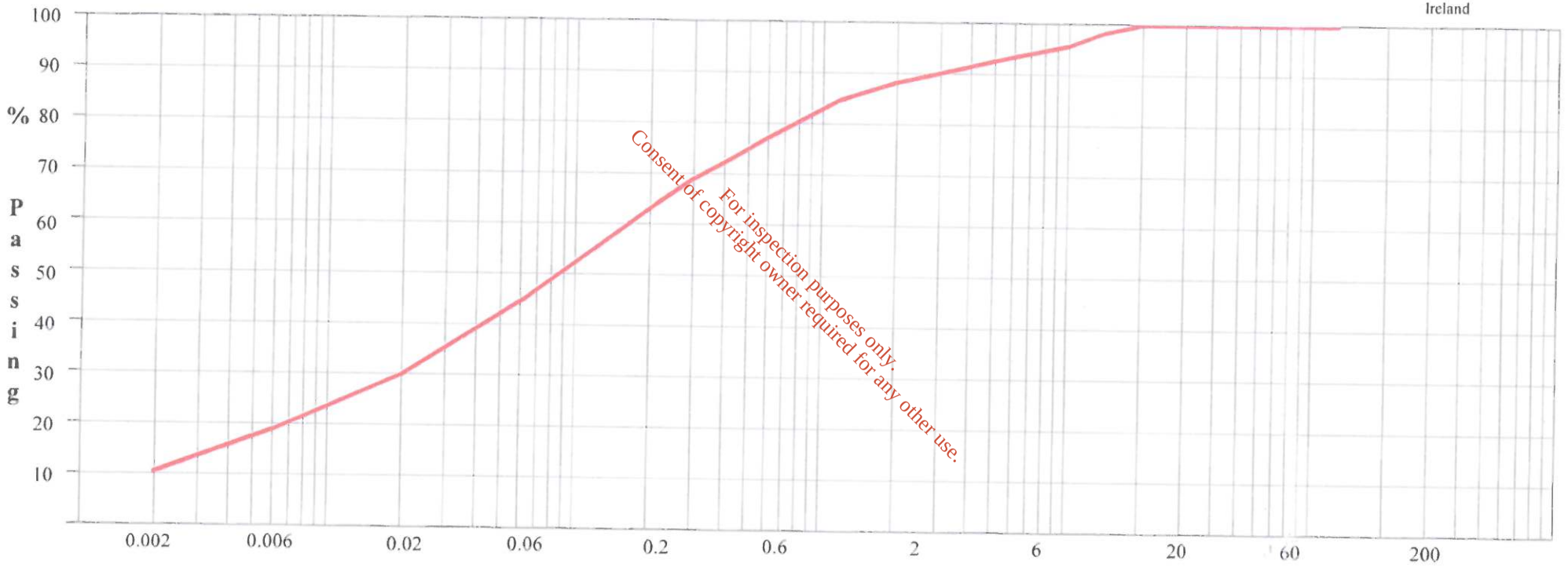
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T3 top layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/394
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/394 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T4 - bottom layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 100 | | | |
| 14 | 93 | | | |
| 10 | 89 | | | |
| 6.3 | 87 | | | |
| 5.0 | 86 | | | |
| 3.35 | 84 | | | |
| 2.00 | 81 | | | |
| 1.18 | 79 | | | |
| 600µm | 74 | | | |
| 425µm | 71 | | | |
| 300µm | 68 | | | |
| 212µm | 63 | | | |
| 150µm | 57 | | | |
| 63µm | 44 | | | |
| 20µm | 32 | | | |
| 6µm | 20 | | | |
| 2µm | 13 | | | |

Remarks:
Nil

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Issue Date: 9th December 2013

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|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/394 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T4 bottom layer | **Material Spec:** | Customer spec. |

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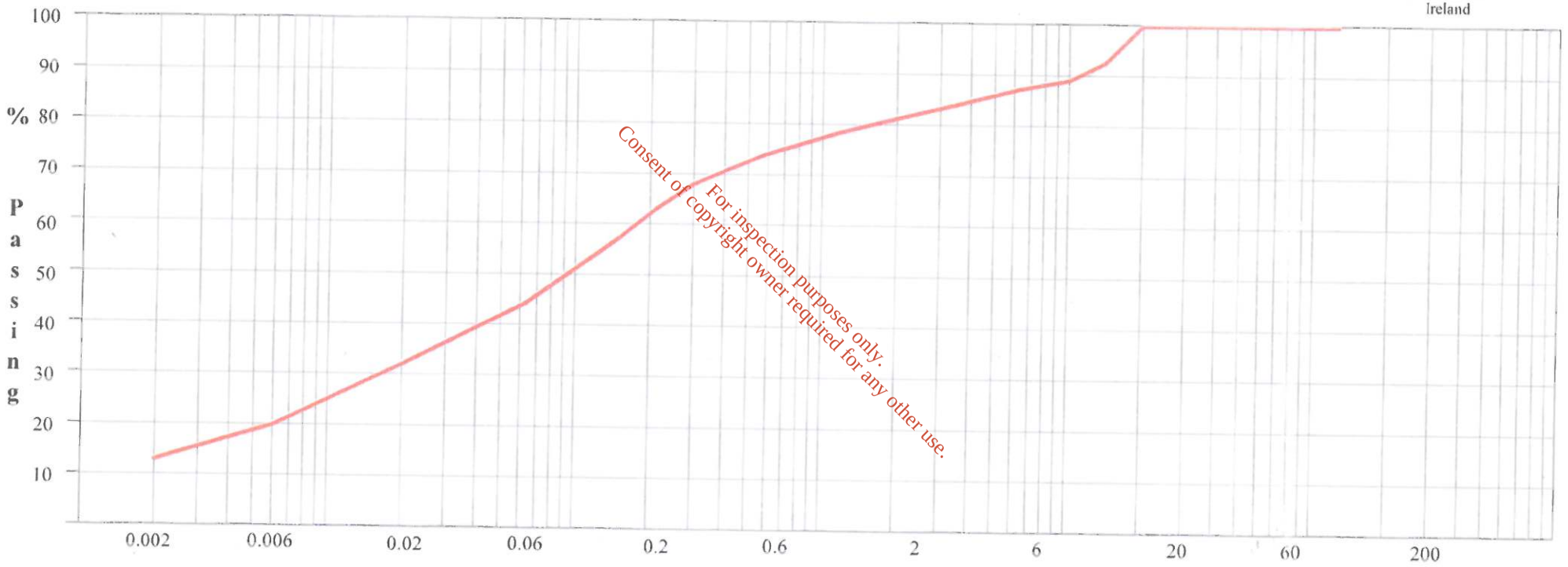
Thomondgate
Limerick
Ireland

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

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Laboratory Technical Manager
For and On Behalf of BHP Laboratories Ltd

Issue Date. 9th December 2013

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E Mail
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**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/395
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer s ec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/395 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | Customer Ref<br>Clay sample<br>Sample Ref:<br>T5 - bottom layer |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | |
| 100 | 100 | | | |
| 75 | 100 | | | |
| 63 | 100 | | | |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 81 | | | |
| 14 | 76 | | | |
| 10 | 73 | | | |
| 6.3 | 69 | | | |
| 5.0 | 68 | | | |
| 3.35 | 65 | | | |
| 2.00 | 61 | | | |
| 1.18 | 58 | | | |
| 600µm | 54 | | | |
| 425µm | 52 | | | |
| 300µm | 50 | | | |
| 212µm | 47 | | | |
| 150µm | 45 | | | |
| 63µm | 38 | | | |
| 20µm | 27 | | | |
| 6µm | 18 | | | |
| 2µm | 12 | | | |

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Remarks:
Nil

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Laboratory Technical Manager
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Issue Date: 9th December 2013

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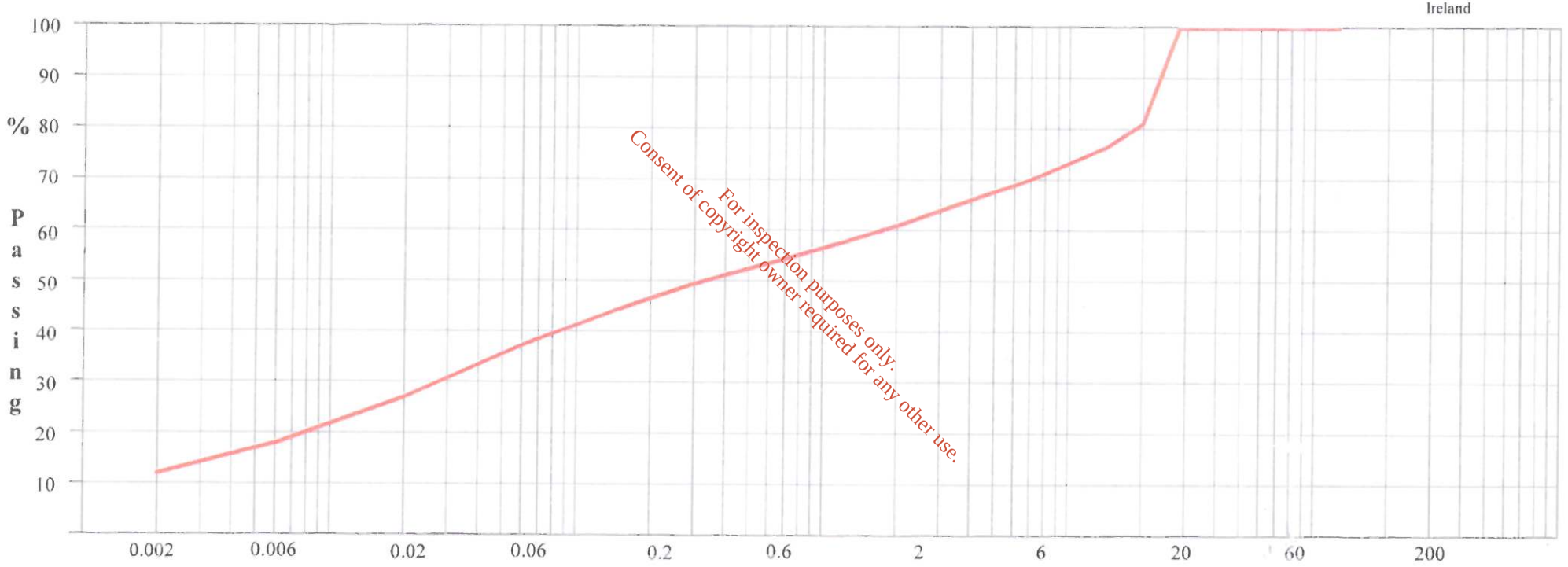
# PARTICLE SIZE DISTRIBUTION

Analysing
Testing
Consulting
Calibrating

BHP
New Road
Thomondgate
Limerick
Ireland

| | | | |
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/395 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T5 bottom layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

Seamus O'Connell
Laboratory Technical Manager
For and On Behalf of BHP Laboratories Ltd

Issue Date: 9th December 2013

Test results relate to the samples, as supplied . This test report shall not be duplicated,except in full and only with the permission of the test laboratory.
Sampling details where supplied are held on file.



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# TEST REPORT

Analysing
Testing
Consulting
Calibration

BHP
New road
Thomondgate
Limerick
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Tel +353 61 455399
Fax +353 61 455447
E Mail
bhpcon2@bhp.ie

**Client:** Reed Bed & Wetland WWTS
Abbey
Ballyshannon
Co. Donegal

**F.T.A.O.:** Mr. Alvin Morrow

**BHP Ref. No.:** 13/11/396-2
**Order No.:** Not supplied
**Date Received:** 21/11/2013
**Date Tested:** 27/11/2013
**Test Specification:** Customer spec.
**Item:** Clay sample

**Client Reference:** Site Investigation and material classification.

**Sampling Certificate Provided:** No No

**BS 1377:Part 2:1990**

| BHP Reference | 13/11/396-2 | | | CLIENT REFERENCE |
|---|---|---|---|---|
| Client Reference | | | | |
| Sieve Size (mm) | % Passing | % Passing (minimum) | % Passing (maximum) | |
| 125 | 100 | | | **Customer Ref** |
| 100 | 100 | | | Clay sample |
| 75 | 100 | | | **Sample Ref:** |
| 63 | 100 | | | T6 - bottom layer |
| 50 | 100 | | | |
| 37.5 | 100 | | | |
| 28 | 100 | | | |
| 20 | 81 | | | |
| 14 | 76 | | | |
| 10 | 73 | | | |
| 6.3 | 69 | | | |
| 5.0 | 68 | | | |
| 3.35 | 65 | | | |
| 2.00 | 61 | | | |
| 1.18 | 58 | | | |
| 600µm | 54 | | | |
| 425µm | 52 | | | |
| 300µm | 50 | | | |
| 212µm | 47 | | | |
| 150µm | 45 | | | |
| 63µm | 38 | | | |
| 20µm | 26 | | | |
| 6µm | 15 | | | |
| 2µm | 9 | | | |

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Remarks:
Nil

Seamus O'Connell
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Form No.:BHP/AB/320/A/08/01/02

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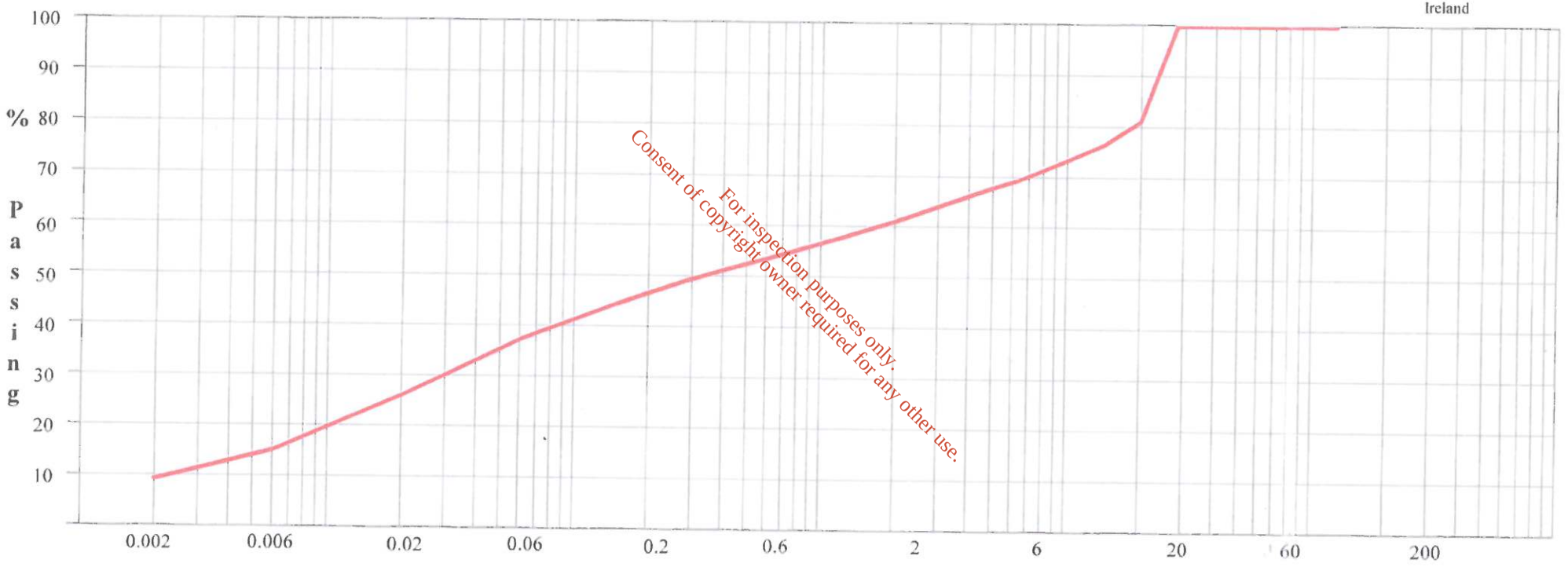
| | | | |
|---|---|---|---|
| **Client:** | Reed Bed & Wetland WWTS | **BHP Ref.:** | 13/11/396-2 |
| **Client Reference:** | Site Investigation and material classification. | **F.T.A.O.:** | Mr. Alvin Morrow |
| **Date Received:** | 21/11/13 | **Date Tested:** | 27/11/2013 |
| **Location:** | Sample- T6 bottom layer | **Material Spec:** | Customer spec. |

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| CLAY | Fine | Medium | Coarse | Fine | Medium | Coarse | Fine | Medium | Coarse | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Silt | | | Sand | | | Gravel | | | | |

Seamus O'Connell
Laboratory Technical Manager
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Issue Date: 9th December 2013

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# APPENDIX 2

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Alvin Morrow
Reed bed wastewater treatment systems
design, installation and maintenance

Alvin Morrow
Abbey
Ballyshannon
Co. Donegal

***General design rationale for reed bed surface flow constructed wetlands:***

*The following is a design rationale for a reed based (phragmites australis) wetland system for the treatment of domestic , agricultural, commercial and industrial wastewater applications as clarified with the Dept of Agriculture.*

*The principles for this type of wetland design correlates with the equation and effluent strengths and are based on figures from the WRc manual: Reed beds and Constructed Wetlands for Wastewater treatment. It has also been developed with reference to the guidance document produced by the Dept. Of the Environment, Heritage and local Governments Guidance document for farmyard soiled water and domestic wastewater applications: Integrated constructed wetlands.*

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*Met Eireann figures (in mm/year) are used to calculate the flow figures in m3/day.*
*Washing parlours: ~2000mg/litre bod5*
*Dirty yards: ~2500mg/litre bod5*
*Clean yards/highway runoff: 0.5% – 5% of catchment area to wetland.*

*Using the Kickuth equation x 4.*

$$\frac{Qd\ (\ln Co - \ln Ct)}{Kbod} \times 4$$

*Where,*
*Qd = flow per day in m3*
*Co = influent bod concentration in mg/litre e.g. 2000mg/litre for washing parlours.*
*Ct = required effluent bod concentration in mg/litre e.g. 5mg/litre for discharge to surface waters. (For efficiency purposes in all scenarios, it is good practice to aim to achieve <5mg bod5 when designing the wetland).*
*Kbod = constant i.e. 0.1*



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Alvin Morrow

# Reed bed wastewater treatment systems

## design, installation and maintenance

Alvin Morrow
Abbey
Ballyshannon
Co. Donegal

***General design rationale for reed bed surface flow constructed wetlands:***

*This equation derives from the equation for sub surface horizontal flow, gravel based, reed bed systems. So as to relate it to surface flow constructed wetlands the design is multiplied by four, as wetlands are a maximum four times shallower than reed bed horizontal flow gravel based systems. This assumption is also supported by the notion that domestically designed systems have a 5m2/pe for subsurface horizontal flow (gravel based) systems, while wetlands have a 20m2/pe design comparison.*

*Comparing the Dept design with reed based wetland design; the dept wetland design requires a ratio of 2:1 wetland to dirty yard. Although dependant on rainfall the reed based wetland require ~1:1 wetland to dirty yard. The anomaly between the two designs is due to the better efficiency of phragmites. ICW's utilise various aquatic plant species which grow in 'clumps', whereas reeds (phragmites australis) are extremely invasive and create a thick stand of plants invading every available space.*

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*Furthermore each cell depth has been stated as being 0.15m deep. However in practical terms, each cell has an average depth of 0.2m (0.15m to 0.25m) which provides a 25% buffer incorporated into its design. (Phragmites are known to grow beyond depths of 0.5m in free surface flow systems as in nature).*

*For reed based wetlands an additional 0.5m of topsoil shall be lain/provided/maintained on top of the impervious layer for use as rooting material. This shall be done so as to alleviate any concerns with respect to the vigorous growth nature of the root network of the phragmites, opening pathways to the groundwater. This additional design feature shall be adopted, as it is assumed that a phragmites root system can grow down to a depth of 0.5m.*

***While this design rationale is not relevant to the design of this system, it is hoped that the principle of the design shows the increased potential of such a system as compared to ICW methodologies.***



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Alvin Morrow

# Reed bed wastewater treatment systems

## design, installation and maintenance

Alvin Morrow
Abbey
Ballyshannon
Co. Donegal

***Designing, supplying, installing and maintaining reed bed and wetland systems since 2003, ensuring quality professional service and proven system design.***

***Flexible single and multiple domestic designs for secondary and tertiary treatment prior to discharge available.***

*Domestic reed bed prices start at €1570 + vat for kit supply only, for a 30m2 system i.e. 6pe (3 bedroom) secondary treatment (20/20) after a septic tank.*
*Comprehensive installation and maintenance guides*
*Supervised installations provide 3 year guarantee and maintenance. Prices start at €2226 + vat for a 30m2 system.*
*Ideal and easy upgrade add-on treatment to old septic tank systems.*
*Wetlands/ponds and/or willow beds can be used after tertiary (5/5) treated effluents to reduce contaminants further, if and where necessary.*

***Commercial, Industrial and agricultural designs also available.***

*Applications include for example: highways, airports, storm/drain, road, urban and yard runoffs, agricultural sector lechates/wastewaters/runoffs, quarry, landfill lechates hydrocarbon, composting and sawdust resins, food processing coastal bathing water protection, recreation and amenity, golf clubs and numerous other agri, commercial and industrial wastewaters. Lined and in situ applications available*
*Wetland system prices start at €5/m2 + labour/supervision of works.*

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***Advantages:***

*-low installation costs/minimal maintenance.*
*-once established the system requires little to no maintenance*
*-provides an aesthetically pleasing landscape feature*
*-extremely robust, copes easily with varying flows*
*-no mechanical parts, no energy requirements, no on-going maintenance or running costs.*
*-natural, reliable simple and sustainable*

***for more info contact:***

*mob: 00353 87 9440370*
*tel: 00353 7198 58170*
*web: www.alvinmorrow.com*
*email: alvinmorrow@eircom.net*



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# ATTACHMENT 4

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# 1. NON TECHNICAL SUMMARY

## Introduction

Nurendale, trading as Panda Waste Services (PANDA) is applying to the Environmental Protection Agency (Agency) for a review of the current Waste Licence (Reg. No. W0140-03) for its waste processing facility at Beauparc, Navan, County Meath. The objectives of the review are: -

- To extend the licence area to include a new building (Building 4), which will house a biological treatment system. The system, which is a combination of anaerobic digestion and composting, will treat organic waste to produce compost. Gases produced during the digestion stage will be used as a fuel to generate electricity and heat, which will be used at the facility and sold to electricity supply companies;

- To expand the processing of household and commercial waste to recover materials, for example paper and plastic, that can be used as a fuel, for example in cement manufacturing. These materials are called Refuse Derived Fuel (RDF);

- To amend Condition 1.5.3 of the current licence to allow the continuous operation of the biological treatment and RDF manufacturing systems;

- To amend Condition 8.6 to allow the continued operation of the construction and demolition waste processing plant in a dedicated open area.

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As the installation will have the capacity to biologically treat more than 75 tonnes of waste/day and pre-treat more than 75 tonnes/day of waste for in incineration, it will require an Industrial Emissions Licence to operate. The classes and nature of the industrial emissions directive activities in accordance with the First Schedule to the Act of 1992 are:

11.1 The recovery or disposal of waste in a facility, within the meaning of the Act of 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required.

11.4.(b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply):

(i) biological treatment

(ii) pre-treatment of waste for incineration or co-incineration;



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PANDA has obtained planning permission from Meath County Council for the development. An Environmental Impact Statement (EIS) was submitted to the Council and a copy of the EIS is included in this application

The design and method of operation at both the existing facility and proposed development are based on the requirements of the Best Available Techniques for the Waste Treatment Industries 2006 (BREF), which specifies the Best Available Techniques (BAT) for Waste Management Facilities; and BREF for Storage and the BREF for Energy Efficiency.

The emission limit values were determined by those set in the existing Licence, which comply with BAT, and an assessment of the impacts of the new emission sources, which include air emissions and noise.

The EC (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2006 do not apply.

## The Installation

The current planning permission and Waste Licence allow PANDA to take in and process up to 250,000 tonnes of non-hazardous waste annually. The wastes are collected from households, businesses and construction sites and are processed in three main buildings (Buildings 1, 2 and 3).

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The processing includes sorting the wastes to pick out the clean paper, cardboard, plastics, wood, metals, organics, rubble, soil and stones that can either be recycled or used to manufacture refuse derived fuel. The remaining mixed materials, for example dirty paper and organic residues that are not suitable for recycling, can be treated in the compost tunnels before going to landfill.

Currently approximately 100 people are based at the facility. These comprise a Facility Manager, weighbridge clerk, machine operators, general operatives, collection vehicle drivers and customer service personnel. The current operational hours are 8am to 8pm Monday to Friday and 8am to 4pm on Saturday.

## Proposed Development

PANDA has looked at ways to reduce the amount of waste going to landfill so as to keep the costs to its customers as low as possible. The two best options are to expand the composting operation (biological treatment) for the food stuff and to improve the quality of the refuse derived fuel. This will not involve changing either the type or the amount of waste taken in, but will require the construction of a new building (Building 4). Recycled aggregate will be used in the construction works. Planning permission has been granted for the development.



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*Biological Treatment*

The expansion of the composting system will involve the use of what is called a 'dry fermentation anaerobic digestion' plant at the initial stage of the process. This type of system is ideal for the types of waste PANDA accepts and is fully proven and safe.

It will consist of a series of fully enclosed tanks, called digesters, in which the wastes will be placed. The oxygen in the air in the digesters will be used up by the microbes in the waste to produce anaerobic (no oxygen) conditions. The microbes will break down the waste and, in the process, produce a number of different gases (biogas). The most common gas will be methane, which is the 'natural gas' supplied by Bord Gais. The biogas will be cleaned (scrubbed) to remove contamination and used as a fuel in new electricity generators, which will connect to the national grid.

While methane gas is explosive and can pose a risk of explosion when present in the air at certain levels, as is the case with natural gas used in homes, the dry fermentation process is designed to minimise the risk of this occurring. The design of the plant will be based on a rigorous hazard assessment including design and operational controls on the gas collection and ventilation systems, explosion protection, fire safety and lightning protection.

The digesters will reduce the amount of organic matter in the wastes, and convert it to biogas. The waste will then be moved to the composting area, where they will be composted in fully enclosed containers called tunnels. Unlike anaerobic digestion, the compost process requires oxygen and air will be pumped into the tunnels to ensure that oxygen levels are kept at the level needed to complete the composting.

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The composting tunnels, which are no longer operational and will not be used in the future, are provided with an odour control system that draws air from the tunnels into a bio-filter, where the substances that form the odours are removed. This type of system has proven very effective in controlling odours and bio-filters units are in operation at more than 15 other composting plants around the county. A similar system will be provided to treat the air inside the anaerobic digestion and composting building.

When the composting process is complete, the material will be pasteurised by raising and maintaining the temperature to a level that kill the microbes. The compost will be sold to farmers, market gardeners, landscape contractors and the general public.

Pasteurisation is required in the composting process to meet the requirements of the Department of Agriculture Fisheries and Marine for the treatment of wastes containing residues of meat and fish (Animal By-Products) so as to avoid the spread of animal diseases, for example mad cow disease and foot and mouth.

The Department has issued guidelines on how anaerobic digestion and composting plants must be designed and operated. The proposed design fully complies with the Departments guidance. Furthermore, approval must be obtained from the Department before the process can start. Once it is operational vets from the Department will also carry out inspections of the plant to ensure that it is operating properly. These inspections will be entirely separate from those carried out by the EPA.



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*Manufacture of Fuel*

The remaining mixed wastes that are not suitable for recycling will be turned into a fuel, called refuse derived fuel RDF or Solid Recovered Fuel (SRF) which can be used in industrial plants in Ireland and abroad, for example cement making plants.

The mixed waste contains a lot of water and needs to be dried to improve its value as a fuel. This will be done using heat from a new furnace. It had been intended to use LPG (liquefied petroleum gas) as a fuel, but this was not the best environmental option because it is a fossil fuel and produces greenhouse gases that contribute to global warming.

A better environmental alternative is to use wood (biomass), as a fuel. Wood is a renewable source of energy and will help PANDA reduce its greenhouse gas emissions from fossil fuels. Waste plastic, paper, cardboard etc. will not be burned in the furnace and the EPA will not approve such use.

The mixed waste will be placed inside a drying drum and the temperature raised using heat from furnace. The air inside the building and the steam from the dryer will contain odours. The air and steam will be sucked into pipes by fans and drawn into the furnace. The temperature of the furnace is designed to ensure that all the odour causing substances are destroyed.

It had been proposed to use a Regenerative Thermal Oxidiser (RTO), operating independently of the furnace to treat the steam from the dryer. However the RTO is fuelled by LPG and if it broke down the production of the RDF would have to stop. The biomass furnace is designed to achieve the same temperatures ($800^0$C to $850^0$C) and same level of treatment performance as the RTO.

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As a back-up measure for when the furnace is shut down for maintenance, the odorous air in the building will be treated in carbon filter unit. These units are commonly used in industries that use or manufacture odorous chemicals.

## Environmental Conditions

The facility is bordered to the west by the N2 and to the north by the Knockcommon Road. Surrounding land use is predominantly agriculture, however there are some commercial units to the west. There are nine residential dwellings with 0.5km of the site along Knockcommon Road, with a further thirteen residences within 0.5km, along the N2 and Senchelstown Road.

*Hydrology*

The ground slopes from north to south and there is a land drain along the southern site boundary that flows from west to east and joins an unnamed third order stream, which is a tributary of the River Boyne. This stream enters the Boyne at Roughgrange, approximately four kilometres northeast of the facility.

The facility is in the catchment of the River Boyne and is in the Boyne Lower Water Management Unit (WMU) as designated in the ERBD Management Plan prepared under the



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EU Water Framework Directive (WFD). The WMU comprises a number of different Water Bodies and the site is in the Rathdrinagh Upper Water Body.

The ERBD Plan contains reports on the 'Status' of each water body. Status means the condition of the water in a watercourse and is defined by its ecological status and chemical status, whichever is worse. Waters are ranked in one of five status classes, High, Good, Moderate, Poor and Bad.

The WFD requires measures to ensure waters achieve at least 'Good Status' by 2015, and that their current 'Status' does not deteriorate. Where necessary, for example in heavily impacted or modified watercourses, extended deadlines (2021 and 2027) can be set for achieving the following objectives:-

- Prevent Deterioration
- Restore Good Status
- Reduce Chemical Pollution
- Achieve Protected Areas Objectives

The objectives for particular watercourses are based on Pressure and Impact Assessments of human activity, including point and diffuse emissions, landuse (e.g. peat harvesting, quarrying, industrial and residential use) and morphological conditions (e.g. river depth and width, structure and substrate of river bed) on surface waters to identify those water bodies that are 'At Risk' of failing to meet the WFD objectives.

'At Risk' does not necessarily mean that the water bodies have already been adversely impacted, but that there is a likelihood that a water body will fail to meet its objectives unless appropriate management action is taken.

The Rathdrinagh Upper Water Body is ranked as being of Moderate Status based on the overall ecological status and is 'Probably At Risk' of not achieving its Objective of 'Restoring Good Status' by 2027.

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*Geology & Hydrogeology.*

The description of the site geology and hydrogeology is based on a review of databases maintained by the Geological Survey of Ireland (GSI) and Teagasc, data derived from investigations carried out in 2009 and 2015 and the construction logs of two on-site groundwater wells.

The soil maps prepared by Teagasc indicates that the subsoil type is a till derived from Namurian Shales and Sandstones (TNSSs). The site investigation confirmed the subsoils comprise a brown clay to approximately 1m, which is underlain by a grey/black clay that ranges in depth from 6.5 to more than 10m.

The site is underlain by the Balrickard Formation, which is described by the GSI as coarse sandstone, shale. It is classified by the GSI as a bedrock aquifer that is generally unproductive except for local zones (Pl). The subsoils are the single most important natural feature influencing groundwater vulnerability. The Vulnerability Map for Meath indicates that the



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vulnerability at the site is Low, which is supported by the available data on the thickness of the subsoils (10m).

*Soil & Groundwater Quality*

The aquifer beneath the site is part of the Donore Groundwater Body (GWB) as designated in the ERBD Plan. The condition of a GWB is defined by its chemical and quantitative status, whichever is worse, and groundwater quality is ranked in one of two status classes: Good or Poor. The Donore GWB is categorised as being of 'Good' status and is 'Probably Not At Risk' of retaining this status. A Baseline Report that describes the existing soil and groundwater conditions has been prepared.

*Designated Sites*

There is no Natura 2000 Site immediately adjacent to the site. The closest Natura 2000 Site is The River Boyne and River Blackwater Special Area of Conservation (SAC) and Special Protection Area (SPA) which is 3km to the north. In addition, there are two Natural Heritage Areas (NHA) within 2.5km of the site.

## Nature of the Emissions and Assessment of Impact

The actual and potential emissions from the site are:

Rainwater run-off from the yards and building roofs.

Sanitary wastewater and wastewater from the biological treatment process.

Noise from plant and equipment used to process the wastes; delivery/collection vehicles and odour control fans.

Dust from waste processing and vehicle movements on yards during dry weather.

Odours from the processing of the household and residual food waste.

Vehicle exhaust gases from the delivery and collection vehicles.

*Surface Water*

Rainwater falling on the existing concrete yards is collected in an underground tank and stored before being sent off-site for treatment at a local authority owned sewage treatment plant. Treatment is required because rainfall on concrete yards where vehicles travel and park can become contaminated with silt and small quantities of oil that may leak from vehicle oil sumps.

PANDA has approval to change the drainage system to channel the water from the existing yards to a new reed bed that will be located beside Building 3. The reed bed will remove contaminants that may have been picked up by the rainwater and the treated water will

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discharge into a drain along the southern site boundary. This drain is a tributary of the River Boyne, which is 3km from the site.

Rainwater from the roof of the new building will be collected in a tank and used for spraying the yards to keep dust down. The rainwater from the new yards will pass through silt traps and oil interceptors, which will reduce the contamination to acceptable levels, before going to a new soakaway.

*Wastewater*

Water from the canteen and the toilets is collected and initially treated in an on-site wastewater treatment plant before being sent to a local authority owned sewerage treatment plant. The water used clean the floors of the buildings and the water from truck wash is collected in an underground tank and also sent to a local authority owned sewage treatment.

The biological treatment process will produce wastewater and all of this will be collected in drains inside the new building and pumped to new storage tanks. The tanks will be fully enclosed by walls designed to trap any spills or leaks that may happen. The design and construction of the tanks and containing walls will be approved by the EPA.

Much of the wastewater will be reused in the process, but any that cannot, will be sent to the Irish Water treatment plant.

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*Groundwater*

The only emission to ground will be the rainwater run-off from the new concrete yards. The rainwater will pass through silt traps and an oil interceptor before it enters the soakaway.

*Designated Sites*

An Appropriate Assessment of the proposed development confirmed that it will not have any significant impacts on any designated sites.

*Dust*

The main source dust emissions with the potential to cause a nuisance are vehicle movements over the concrete yards in dry weather and the Construction and Demolition Waste processing area. The proposed new waste activities will be carried out inside the new building, which will effectively prevent dust causing a nuisance.

*Odours*

The odour management measures, which include a negative air pressure system inside Buildings 3 and 4 and the collection and treatment of odorous air in a combination of biofilters, carbon filters and the biomass furnace will ensure that smells from the new activities will not cause a nuisance. Odour surveys carried out by the EPA have confirmed that the site is not a source of obnoxious odours.



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*Noise*

The noise sources include the waste processing equipment operating inside the main buildings the C&D processing plant and truck and car movements. The noise monitoring carried out by both PANDA and the EPA has consistently shown noise from the site is not causing a nuisance.

*Vermin and Pests*

Birds, rats and flies can be attracted to sites where there is available food. The waste accepted at the site include waste accepted at the site includes foodstuffs. All such wastes are and will continue to be processed and stored inside the buildings. This has already been effective in preventing bird attraction. A pest and vermin contractor is used to control flies and rodents.

**Proposed technology and other techniques to prevent or eliminate, or where this is not practicable, limit, reduce or abate emissions from the installation**

The design and method of operation of both the existing facility and proposed development are based on the requirements of the Waste Treatment Industries 2006 (BREF), which specifies the BAT for Waste Management Facilities, the BAT for Storage, and the Agency's Final Draft BAT Guidance on Best Available Techniques for the Waste Sector: Materials Recovery and Transfer.

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Condition 2 of the current Waste Licence requires PANDA to develop and implement an Environmental Management System for the facility, which is consistent with the requirements of both Agency's BAT Guidance Note and the BREFs. It requires PANDA to prepare operational control procedures for all waste activities and ensure that facility staff are provided with the appropriate skills and training to perform their assigned functions.

The Licence conditions require the implementation of the control measures specified in the BREF in so far as they apply to non-hazardous solid waste processing and the prevention of soil contamination. The conditions also specify the relevant control techniques referenced in the Agency's BAT Guidance

The proposed changes take into consideration the requirements of the BREFs and the Agency's BAT Guidance. In particular;

- The collection and treatment of odorous air from the buildings which will handle the household residual and food waste. This will be achieved by a combination of building design and construction; provision of a negative air system, and the treatment of the odorous air in appropriately designed and operated combined combustion treatment plant and carbon filter..

- For the preparation of waste for use of a solid waste fuel BAT requires the development of a close relationship with the solid fuel user to ensure user in order that a proper transfer of the knowledge of the waste fuel composition is carried out; have a quality assurance system to guarantee the characteristics of the waste fuel produced, and to manufacture different type of waste fuels according to the type of user (e.g. cement kilns, power plants).



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- For the preparation of a solid fuel from non-hazardous waste it is BAT to visually inspect the incoming waste to sort out the bulky metallic or non-metallic parts; use magnetic ferrous and non-ferrous metal separators and use a combination of shredder systems and pelletisers suitable for the preparation of the specified size waste fuel.

**Measures to Comply with Waste Management Hierarchy**

The existing facility is designed and operated to maximise the recovery of recyclables from the incoming wastes. The proposed changes are consistent with the Waste Hierarchy as the production of SRF/RDF using non-recyclable materials will gain the maximum value from the waste.

**Abnormal Operating Conditions**

PANDA has prepared and adopted an Accident Prevention Policy (APP) and Emergency Response Procedures (ERP). The APP addresses all potential hazards, with particular reference to the prevention of accidents that may cause damage to the environment. The ERP identifies all potential hazards at the site that may cause damage to the environment and also specifies roles, responsibilities and actions required to deal quickly and efficiently with all foreseeable major incidents and to minimise environmental impacts.

**Avoidance of the Risk of Environmental Pollution due to Closure of the Facility**

PANDA has prepared an Environmental Liability Risk Assessment (ELRA) and Decommissioning Management Plan (DMP) for the facility, which includes the proposed development.

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**Environmental Monitoring**:

Environmental monitoring will be carried out in accordance with the licence conditions. The monitoring will includes noise, dust, surface water and odours.

**Measures to Comply with an Environmental Quality Standard**

The emission limit values proposed in the application and those that will be set by the EPA in the new licence are and will be based on achieving compliance with the relevant EQS

**Measures to comply with Council Directive 80/68/EEC and 2006/118/EC in relation to the protection of groundwater.**

The only discharge to ground will be rainfall run-off. The site is designed to prevent accidental emissions to ground.

**The Main Alternatives to the Proposed Technology, Techniques and Measures**

*Alternative Sites*

The site is suitable for the proposed biological treatment and the expansion of the existing RDF/SRF manufacturing process and an agreement to acquire the lands on which Building 4



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