BASELINE ASSESSMENT REPORT FOR CONNOLLY'S RED MILLS ANIMAL FEED MILL LICENCE APPLICATION.

Prepared for:

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JRE
Environmental Consulting

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1. INTRODUCTION

JRE Ltd. (JRE) was retained by Connolly's Red Mills (Red Mills) to complete an environmental baseline assessment for their animal feeds mill facility at Goresbridge, Co. Kilkenny.

The assessment was completed in accordance with Stages 1 to 3 of the European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions. Article 22(2).

The guideline document outlines the requirements under the Industrial Emissions Directive (IED) and includes that under Article 22(1) of 2010/75/EU "*without prejudice to Directive 2000/60/EC, Directive 2004/35/EC, Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration and to the relevant Inion law on soil protection, the competent authority shall set permit conditions to ensure compliance with paragraphs 3 and 4 of this Article upon definitive cessation of activities".*

Article 22, paragraphs 2 to 4 provide for the activities that would be required to be completed during cessation of activities where specified hazardous materials were stored and/or utilised to identify and mitigate potential soil or groundwater impacts. A baseline report will be completed to provide a comparison following cessation of activities to provide information on the controls that were utilized at the facility during operations. Article 22(2) specifies that the following information should be included in a baseline report:

- *Information on the present use and, where available, past uses of the site;*
- *Where available, existing information on soil and groundwater measurements that reflect the state at the time the report is drawn up or, alternatively, new soil and groundwater measurements having regard to the possibility of soil and groundwater contamination by those hazardous substances to be used, produced or released by the installation concerned.*

The main stages in producing a baseline report are provided in the European Commission Guidance concerning baseline reports and outlines whether a baselines report needs to be completed, and if it does, the information to be included in the baseline report. There are eight (8) stages identified in the baseline report process, and include:

- **Stages 1 – 3**: to decide whether a baseline report is required
- **Stages 4 – 7**: to determine how a baseline report is to be prepared
- **Stage 8**: to determine the content of the report

During the operation of the facility on site conditions where an activity produces, releases or stores relevant hazardous substances and will have regard to assessment was identified as: Provisions for this Report.

Connolly's Red Mills is applying to the Environmental Protection Agency (EPA) for an Industrial Emissions (IED) Licence for its milling operations in Goresbridge, Co. Kilkenny. The animal feed mill site has been in operation at their Goresbridge site since 1908, and consists of the Grain Mill and adjacent silos, warehouses/storage buildings, an administrative block, weighbridge and car park, grain storage sheds, grain dryer units and, a collection of small buildings housing boiler, compressors, workshop and miscellaneous plant.

The feed mill falls under 7.8 (a) The treatment and processing, other than exclusively packaging, of the following raw materials, whether previously processed or unprocessed, intended for the production of food or feed from:

> (iii) animal and vegetable raw materials, both in combined and separate products, with a finished product production capacity in tonnes per day greater than: (I) 75 if A is equal to 10 or more; or (II) [300-(22.5 x A)] in any other case, where 'A' is the portion of animal material (in percent of weight) of the finished product production capacity of the First Schedule of the Environmental Protection Agency Act 1992, as amended.

The facility is located to the north of the village of Goresbridge and the site has an area of approximately 68,877 m². The area surrounding the facility, within the site boundaries consists of hard standing concrete surfaces, see Attachment 1.

In the case of an application for an IED licence for an activity that involves the use, production or release of relevant hazardous substances (as defined in Section 3 of the EPA Act 1992 as amended), it is required that a baseline report be completed in accordance with section 86B of the EPA Act 1992 as amended and Part 5 of the European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions 2014/C 136/03.

The purpose of the report is to determine the potential of soil and groundwater contamination at the site. As the existing facility operations does not involve the storage of hazardous substances but does use diesel fuel for operations associated with the site activity, a baseline report is considered to be required.

2. DETERMINATION AS TO THE REQUIREMENTS FOR A BASELINE REPORT

2.1. Stage 1: Hazardous Substances

Under Stage 1 there is a requirement to identify potential hazardous substances used, produced or released at the facility. There is also a requirement to determine whether or not hazardous substances are used, produced or released with a view to determining the need to prepare a baseline report.

The Red Mills site in Goresbridge produces cereal based animal feed stuffs at the feed mill facility on the site. Because all of the products produced at the facility are for animal consumption there are no hazardous material used in the production process at the mill facility. A review of on-site documents did not indicate any incident on site with the potential for soil / groundwater contamination. The main materials stored on site and their potential as a hazardous substance are outlined in Table 2A below.

Table 2A: Products that May Potentially Contain Hazardous Substances at the Red Mills Facility, Goresbridge

Substance Name	Approximate Quantity On-site at Any 1 time	Control Measures for Storage	Potential Hazardous Substance		Comment
			Yes	No	
Fluorescent Tubes	varies	Stored in Dedicated Containers	✓		Recycled by Irish Lamp – Stored inside so no potential migration of mercury to ground or groundwater
Diesel	10,000 litres	Vehicle fuel - Stored in PVC tank with secondary containment. Nozzle area also included inside secondary containment. Dryers 4, 5 and 6 are operated on diesel also	✓		No observed staining or leaks around base of tank. Tanks are located in concrete bund on hard standing yard to mitigate any migration to ground or groundwater. Yard surface water is directed to on-site oil/water separator prior to discharge.
Myco Curb	2,000 litres	Contained in IBCs on hard standing		✓	Not considered a hazardous substance based on MSDS data
Soya Oil	30,000 litres	Bulk Tank in Concrete Bund			Not considered a hazardous substance based on MSDS data
Molasses	37,000 litres	Bulk Tank in Concrete Bund		✓	Not considered a hazardous substance based on MSDS data
Palm Oil	33,000 litres	Bulk Tank in Concrete Bund		✓	Not considered a hazardous substance based on MSDS data
Whey	85,000 litres	Bulk Tank in Concrete Bund		✓	Not considered a hazardous substance based on MSDS data
Office Cleaning Products / Disinfectants	50 litres	Small volumes of office cleaning materials stored inside the site office building	✓		Small volumes of cleaning products that may contain trace amounts of hazardous materials (e.g., bleach).
Ad-Blue	1,000 litres	Contained in IBC on hard standing yard		✓	Not considered a hazardous substance based on MSDS data

Of the materials used on site only three were identified that may be considered to contain hazardous materials. These materials and their uses are outlined in Table 2B below.

Table 2B: Use of Products that May Potentially Contain Hazardous Substances at the Red Mills Facility, Goresbridge

Use of Hazardous Substances	There are no hazardous substances used at the Redmills site, except potentially; • Fluorescent tubes (containing mercury) • Detergents / Disinfectants (which may contain hazardous substances such as bleach) • Ancillary fuel storage for on-site vehicles (e.g., forklifts) and dryers.
Production of Hazardous Substances	There are no hazardous substances produced on site
Release of Hazardous Substances	There are no hazardous substances released from the site

3. STAGE 2 RELEVANT HAZARDOUS SUBSTANCES

Under Stage 2 there is a requirement to identify which of the hazardous substances from Stage 1 are 'relevant hazardous substances' as outlined under section 4.2 of the EU guidance documentation. The site may discard those hazardous substances that are incapable of contaminating soil or groundwater as long as they justify and record the decisions taken to exclude those certain hazardous substances
And
To restrict further consideration to only the relevant hazardous substances in view of deciding on the need to prepare and submit a baseline report. The potential hazardous substances brought forward from Stage 1 are outlined in Table 3A below.

Table 3A: Relevant Hazardous Substances at the Red Mills Facility, Goresbridge

Hazardous Material	Regulation
Fluorescent tubes	Containing mercury EC No. 231-106-7 as per Article 3 of Regulation (EC) No 1272/2008
Office cleaning products and disinfectants which may contain hazardous substances (e.g., bleach).	For example, containing bleach EC No. 226-218-8 as per Article 3 of Regulation (EC) No 1272/2008
Ancillary fuel storage on-site for vehicles and dryers.	EC No. 302-659-9 as per Article 3 of Regulation (EC) No 1272/2008

3.1. Substances Hazardous to Groundwater

This section identifies those substances that are hazardous to groundwater as determined by the EPA in accordance with the European Community Environmental Objectives Groundwater Regulations 2010 (S.I. No. 9 of 2010). The EPA classification of hazardous and non-hazardous substances to groundwater is not exhaustive, therefore, a number of the substances on the list are either 'not determined' or are 'N/A' as they do not appear in the EPA document. Therefore only substances which are defined as non-hazardous to groundwater, can be eliminated from the list.

3.2. Substances Hazardous to Soil

In accordance with the European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 (S.I. No. 62 of 2004 as amended by S.I. No. 13 of 2008), risk phrases are assigned to dangerous substances. Risk phrase, R56 denotes 'Toxic to soil organisms.' The list of substances used at Redmills was assessed and there were no substances on the list that are considered toxic to soil organisms.

3.3. Identification of Physical State, Storage and Conveyance on Site

All of the potential hazardous substances identified are in either liquid or solid form. The storage locations and methods of handling and transport on site were identified in order to determine significant risks to soil or groundwater. For the purposes of this Baseline report it is only substances that have been identified as being a theoretical pollution risk to groundwater and soils that have been taken forward for consideration in Stage 3. Table 3B is a list of relevant hazardous substances. Substances which are hazardous to soil or groundwater are highlighted in red, those that are non-hazardous are highlighted in grey.

Table 3B Identification of Relevant Hazardous Substances at the Red Mills Facility, Goresbridge

Ref. ID	Material	Comment	Hazardous/ Non Hazardous	EC Groundwater Regulations, 2010		R56 – Toxic to Soil Organisms
				Hazardous	Non-hazardous	
Stages in Baseline Assessment			Stage 1	Stage 2		Stage 2
1	**Fluorescent Tubes**	Light Bulbs	Yes	No	Yes	No
2	**Diesel**	Site Machinery Grain Dryers	Yes	Yes		No
3	**Detergents**	Office Cleaning Products / Disinfectants	Yes	Yes		No

4. STAGE 3

For each relevant hazardous substance brought forward from stage 2, there is a requirement to identify the actual possibility for soil and/or groundwater contamination at the site of the installation. Stage 3 includes the probability of release for the substance and their consequences taking account of;

- the quantities of each hazardous substance or group of similar hazardous substances concerned

- how and where hazardous substances are stored, used and to be transported around the installation.

- where they pose a risk to be released

- In case of existing installations, measures that have been adopted to ensure that it is impossible in practice that contamination of soil or groundwater takes place.

and

To identify which of the relevant hazardous substances represent a potential pollution risk at the site based on the likelihood of release of such substances occurring. For these substances, information must be included in the baseline report.

i) Fluorescent Tubes

Quantity and Use	Potential for Contamination of Soil/Groundwater	Decision
Minimal quantities of tubes are stored on site. They are stored in containers in a storage area with an impervious floor. Used tubes are transported off site for recycling on a regular basis.	No potential.	Exclude from further consideration.

ii) Disinfectants

Quantity and Use	Potential for Contamination of Soil/Groundwater	Decision
Stored in containers inside site office building. Limited amounts stored at any one time.	No potential.	Exclude from further consideration.

iii) Fuel Storage

Quantity and Use	Potential for Contamination of Soil/Groundwater	Decision
Diesel use on-site is mainly associated with the operation of forklifts for the transfer of feed ingredients and products and also for the grain dryers. No diesel is used in the production process. The diesel for site equipment is stored in a 5,000 litre double skinned tank. Diesel for the dryers is also contained in bulk tanks beside the dryers	Risk from failure of fuel storage tank, storage bund, and/or filling operations. Risk exists due to potential rupture of tank or failure of pipe work or valves.	Large quantity of diesel stored on site for site vehicles and dryers results in further assessment being required.

5. STAGES 4 & 5: SITE HISTORY AND ENVIONMENTAL SETTING

5.1. Stage 4: Site History

Connolly's RED MILLS (Red Mills) has been the home of the Connolly family business since 1908 in Goresbridge, County Kilkenny. With a wealth of experience in steam cooking, pressure cooking and extrusion, in 1963 the company began processing cereals for animal. By 1997, Connolly's RED MILLS was introduced into UK and the USA. The Red Mills brand is sold in 40 countries around the world, and we continue to build on their reputation for converting fresh, natural ingredients into the most trusted feed for peak performance right around the world. The facility is located approximately 1km to the north of the village of Goresbridge. The site has an area of approximately 67,600 m².

The greater landscape of the area is characterised by fertile gently undulating pasture and arable lands with a dense hedgerow grid defining field boundaries, copses of mature trees and small rural roads. Forestry plantations are located along Gallows Hill adding to the man-made nature of the landscape.

The surrounding area has Goresebridge Village to the south, farms and individual dwellings to the north and west and the River Barrow is the predominant surface water feature to the east flowing in a north south direction. This river is a European designated site. A number of tributaries flow to the river from the areas of high ground to the east and west of the site including an unnamed stream that flows beneath the south of the site

The closest designated site is the River Barrow and River Nore Special Area of Conservation (SAC). This SAC is located approximately 150 m from the site and approximately 30m from the outlet point of the Integrated Constructed Wetland (ICW) located to the east of the site that collects and processes surface water runoff from the site yard. A Natura Impact Statement was completed to examine potential impacts arising from the construction and operation of the ICW on the Natura 2000 sites.

5.1.1. Incidents on site – Hazardous Substances

The site yard surface consists of concrete and is impervious to surface impacts to soil or groundwater from surface spills. There are no recorded incidents related to hazardous substances on site.

5.1.2. Existing Data on Groundwater and Soil

5.1.2.1. Groundwater

There is a limited groundwater dataset for the site compiled though quality compliance monitoring completed for the site and there has been no historical soil sampling completed at the site.
The groundwater sampling that has been completed at Redmills was for general potability purposes and samples were collected from the on-site groundwater well located in the northwest corner of the site. The results of the groundwater sampling completed at the Redmills site are provided in Tables 4A.

Table 4A: Groundwater Quality at Redmills -2015 – 2017

Parameter	Units	2015 Result	2016 Result	2017 Result	Drinking Water Regulations (S.I. 278 of 2007) Parametric Values	Compliant ?
Sulphate	mg/l	15.12	13.56	16.56	250	✓
Ammonium	mg/l NH4	0.22	0.03	0.04	0.3	✓
Nitrite	mg/l NO2	0.03	<10	<0.03	0.5	✓
pH	pH unit	7.1	7.1	7.1	6.5<pH<9.5	✓
Nitrate	mg/l NO3	51.0	38.9	42.59	50	✓
Conductivity	µS/cm 20°C	694	606	706	2500	✓
Total Coliforms*	MPN/100ml	<1.0	<1.0	0	0	✓
Sodium	mg/l Na	9.6	10.2	10.3	200	✓
E. Coli*	MPN/100ml	<1.0	<1.0	0	0	✓
Iron	µg/l Fe	<20	<20	<20	200	✓
Manganese	µg/l Mn	<5	<5	<5	50	✓
Copper	µg/l Cu	<10	<10	<10	2000	✓
Lead	µg/l Pb	<2	<2	<1	25	✓

The groundwater samples collected between 2015 and 2017 all indicate good groundwater quality at the site that is compliant with the 2007 Drinking Water Regulation limits.

5.2. Stage 5: Environmental Setting

5.2.1. Soils

The soils in and around the Redmills site are classified by Teagasc as being shallow to deep well-drained mieral soils that are mainly basic in nature.

5.2.2. Bedrock Geology

A review of the Geological Survey of Ireland (GSI) information and maps for the site indicated that the Redmills site in Goresbridge is situated on an area predominately made up of dark muddy limestone with some areas of shale and is part of the Ballysteen Formation.

5.2.3. Aquifer Classification

In Ireland, aquifer potential is divided into three broad categories, including: Regionally Important, Locally Important, and Poor. Based on the GSI Guidelines on Aquifer Classification and Vulnerability, the bedrock aquifer beneath the Redmills site in Goresebridge, co. Kilkenny is considered to only be a Locally Important Aquifer in bedrock that is moderately productive only in local zones

5.2.4. Groundwater Vulnerability

The GSI have examined the geological and hydrogeological characteristics of all areas throughout the country to provide an assessment of the potential vulnerability of the underlying aquifer in any specified area. Aquifer vulnerability is classified under one of the four following categories

- Extreme (E);
- High (H);
- Moderate (M); and
- Low (L).

The assessment of groundwater vulnerability is an essential component in the planning, control and remediation of potentially contaminating activities (e.g., landfills). The vulnerability maps produced by the GSI indicate the vulnerability of groundwater based on discharges below a depth of 1m below ground surface (bgs) and provide an indication of the potential for contamination migration from a site activity impacting groundwater quality. The GSI classify the aquifer below the Redmills site as having high vulnerability manly due to the well draining soils and underlying limestone bedrock.

5.2.5. Hydrology

The site drains indirectly to the River Barrow via an integrated constructed wetland for the northern section of the site (i.e., grain stores and dryers) and to an unnamed stream and then to the Barrow for the southern section of the site. The River Barrow is in Hydrometric Area HA14, which is situated in the South Eastern River Basin District (SERBD).

5.2.6. Site Drainage

The ICW located to the east of the site receives surface water from the grain stores and dryer yards area and building roofs after it passes through an oil/water interceptor (interceptor 3). Surface water runoff from the yard surface and building roofs in the central and southern section of the site drains to

the interceptor in the south west corner of the yard at Warehouse No. 5 and surface water from the central area of the site is directed to interceptors 1 and 1B prior to discharging to an unnamed stream and then to the River Barrow, see drainage Drawing provided in Attachment 2.

There is a surface water management plan for the Redmills site which is designed to minimise the possibility of accidental spillage to surface water. A copy of the most up to date surface water management plan is included in Attachment 3.

5.2.7. Source, Pathway, Receptor Risk Screening

There are a number of potential connections on site between the above ground tanks and the subsurface environment. The risk of the site surface acting as potential pathway from surface to soils and groundwater is mitigated by site yard design (i.e., concrete surface), site management and operational procedures. The key mitigation measure is the concrete yard which acts as a significant barrier between the site surface and the underlying soils and groundwater

6. STAGE 6: SITE CHARACTERIZATION

The results of Stages 3-5 indicates that due to the existing concrete yard surface, diesel stored in aboveground tanks on site has very limited or negligible potential to migrate into the soils and groundwater beneath the site.

7. STAGE 7: SITE SAMPLING

A soil and groundwater sampling programme was completed on site in December 2018 to characterise the baseline condition of soil in proximity to the fuels storage tanks for Dryers 4, 5 and 6. There is a limited groundwater dataset for the site that is representative of groundwater potability, but the historic groundwater sampling results do not include for hydrocarbon contaminants of concern and there are no soil sampling records for the site. JRE Ltd. completed a limited groundwater and soil sampling programme in December 2018 to assess the baseline soil and groundwater quality with relation to the main hazardous substance stored on site (i.e., diesel). The laboratory report of the soil and groundwater sample analysis is included as Appendix 1. The diesel storage tanks in the grain storage and drying area to the north of the site are all above ground tanks situated on concrete surface and as such shallow subsoil samples at the edge of the concrete yard were considered appropriate to assess the baseline quality of soils in the vicinity of the storage tanks.

7.1. Groundwater

In December 2018 a groundwater sample was collected from the on-site groundwater well to assess the concentrations of potential contaminants of concern associated with the storage of diesel on site. The laboratory analysis report is provided in Attachment 4. The results of the sample analysis for hydrocarbons are outlined in Table 7A.

Table 7A: Groundwater Quality – Hydrocarbon Concentrations

Parameter	Units	2018 Result	European Communities Environmental Objectives (Groundwater)(Amendment) Regulations 2016	Compliant?
EPH (C_8 – C_{40})	µg/l	<10	7.5*	✓
Mineral Oil	µg/l	<10	7.5*	✓

*- limit for Total Petroleum Hydrocarbons

The groundwater sample was also analysed for a suite of volatile organic compounds (VOCs). The laboratory analysis report is provided in Attachment 4 and indicated that the concentrations of all VOCs were less than the laboratory detection limits. The analysis results for parameters regulated under the 2010 and 2016 Groundwater Regulations are presented in Table 7B.

Table 7B: Groundwater Quality – VOC Concentrations

Parameter	Units	2018 Result	European Communities Environmental Objectives (Groundwater), Regulations 2010	Compliant?
Vinyl Chloride	µg/l	<0.1	0.375	✓
Benzene	µg/l	<0.5	0.75	✓
Trichloroethene	µg/l	<3	7.5	✓
1,2 Dichloroethane	µg/l	<2	2.25	✓
1,2 Dichloroethene	µg/l	<3	0.375^{-1}	✓
Tetrachloroethene	µg/l	<3	7.5^{-1}	✓
Dichloromethane	µg/l	<5	15^{-1}	✓
MTBE	µg/l	<0.1	10^{-1}	✓
Toluene	µg/l	<5	525^{-1}	✓

[-1-] European Union Environmental Objectives (Groundwater)(Amendment) Regulations, 2016

7.2. Soils

The Redmills site yard consists of a concrete surface and as such soil sampling within the yard area was possible. However, soil samples were collected at locations in the northern area of the site where diesel is stored for use in Dryers 4, 5 and 6. Surface soil samples were collected at the edge of the concrete yard at locations where surface water from the area around the diesel storage tanks may have flowed. The soil sampling was completed on the Redmills site in December 2018 to assess the quality of soils with relation to assessing potential impacts from the main potential hazardous substance stored on site (i.e., diesel).

The soil sampling was completed at locations on the northern and western boundaries of the grain storage areas of the site, where diesel is stored for dryers in that area. The results of the groundwater sampling completed at the Redmills site are provided in Table 7C.

Table 7C: Soil Quality – Hydrocarbon Concentrations

Sample ID	Location	Hydrocarbons mg/kg	
		EPH (C_8-C_{40})	Mineral Oil
SS18-SS1-12	North of Dryer 6 Fuel Tank	486	145
SS18-S2-12	West of Dryers 5 & 6 Fuel Tank	437	65
Dutch Optimum Limit	-	-	*50*[4]
Dutch Action Limit	-	-	*5,000*[4]
Environment Agency Soil Guideline Value	-	*1,000 / 10,000*[3]	-

1- UK Environment Agency: Soil Guideline Values
2- Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL)
3- ICRCL Threshold Limit of 1,000mg/kg and Action Limit of 10,000 mg/kg
4- Dutch Limit for Mineral Oil Concentrations (C_{15}-C_{40})

The results of the soil sampling indicated that the concentrations of hydrocarbons were significantly less than the guideline action levels and were marginally greater than the Dutch Standard optimum concentrations. The results indicated that there is no impact from hydrocarbon fuel storage on soil quality in the vicinity of the dryers fuel storage tanks.

8. STAGE 8: SUMMARY OF FINDINGS

The facility is applying for an Industrial Emission Licence. As part of the application process it was deemed by the Environmental Protection Agency that due to the large volumes of diesel fuel stored on site for site vehicles and the dryers located in the grain stores area (i.e., north of the site) that a baseline assessment should be completed.

During this process, Stages 1-3 demonstrated that a baseline report was required and Stages 4-7 were completed, resulting in this baseline report.

8.1. Stage 1: Hazardous Substances

A list of all raw materials, intermediates and products used on site was compiled. Nine substances generated/used and/or stored on site were initially identified as potentially hazardous. Six of those substances were subsequently classified as non-hazardous and eliminated from the baseline investigation process resulting in three identified potentially hazardous materials.

8.2. Stage 2: Relevant Hazardous Substances

Relevant hazardous substances are those which are capable of contaminating soil or groundwater. Using Annex 1 of Classification of Hazardous and Non-Hazardous Substances in Groundwater, EPA 2010, the list of hazardous substances was checked to determine their classification.
Substances with the risk phrase R56 are toxic to soil organisms. None of the substances on the list have the risk phrase R56. Risk phrases are as per the European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 (S.I. No. 62 of 2004 as amended by S.I. No. 271 of 20087).

8.3. Stage 3: Identification of Potential Pollution Risk

Each substance brought forward from Stage 2 was considered in the context of the site to determine whether circumstances exist which may result in the release of the substance in sufficient quantities to represent a pollution risk either as a result of a single emission or as a result of accumulation from multiple emissions.

Based on the outcome of Stages 1-3 of the screening process diesel was identified to exist in sufficient volume and have the potential to be hazardous to groundwater and so be brought forward as part of the baseline assessment process.

8.4. Soil & Groundwater Sampling

Based on the potential for impacts to soil and groundwater from the storage and use of diesel on site a baseline assessment of those media were completed. The baseline assessment consisted of collecting

composite shallow soil samples in the vicinity of the fuel storage tanks for dryers 4 & 5 and the fuel storage tanks for dryer 6. The results indicated no impacts on soil quality from diesel on site. Similarly, a ground water sample was collected from the on-site groundwater well and the results indicated no impacts on groundwater quality from diesel range organics.

The results of the baseline assessment indicated no impact on soil or groundwater quality at the Redmills site.

ATTACHMENT 1

Site Location Plan

Rural PLACE Map

Surveyed 1999-2000
Revised 2015-2016
Levelled

667842
654757
668472
654142

Groundwater Well

Soil Sample SS18-S1-12

Soil Sample SS18-S2-12

River Barrow

RIVER BARROW

Factory

Factory

Tk

Tk

ITM CENTRE PT. COORDS
668057,654450

DESCRIPTION

MAP SHEETS
1:2500
4771-C

Digital Map
4771 4770

OSi Authorised Internet Map

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N

Scale:- 1:2,500
Scála:- 1:2,500

0 50 100 150 200 Metres
0 150 300 450 600 Feet

Plot Ref. No. 19768910_1_1
Plot Date 11-JAN-2018

ATTACHMENT 2

Site Drainage Drawing

NOTES:–

1. DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY
2. DRAWING DERIVED FROM INTERPRETATION OF DETAILS & DRAWING PROVIDED BY LACEY'S DRAIN SERVICES LTD & REDMILLS LTD
3. THE LOCATION OF ALL STORM, FOUL & PROCESS PIPEWORK IS APPROXIMATED FROM ON–SITE TAPED MEASUREMENTS AND INFORMATION DERIVED FROM CCTV SURVEY. NO TOPOGRAPHICAL SURVEY TO MAP & FIX THE LOCATIONS OF DRAINAGE INFRASTRUCTURE HAS BEEN UNDERTAKEN
4. COVER LEVELS & INVERT LEVELS ARE NOT PROVIDED AS PART OF THIS SURVEY

LEGEND

- 150MM DIA PVC — STORMWATER DRAIN, PIPE DIAMETER AND MATERIAL
- S23 — STORMWATER MANHOLE
- GU — STORMWATER GULLY
- RWP — RAINWATER DOWNPIPE
- SWRP — RAINWATER DOWNPIPE
- STORMWATER "ACO" CHANNEL
- ?? — DETAILS UNKNOWN–FURTHER INVESTIGATION REQUIRED
- 150MM DIA PVC — FOULWATER DRAIN, PIPE DIAMETER AND MATERIAL
- F10 — FOULWATER MANHOLE
- GU — FOULWATER GULLY
- FGWC1 — FOULWATER WC GULLY
- ?? — DETAILS UNKNOWN–FURTHER INVESTIGATION REQUIRED

DRAINAGE LAYOUT – GENERAL ARRANGEMENT– STORM & FOUL WATER

SCALE 1:500

INFORMATION DRAWING ONLY
NOT TO BE USED FOR CONSTRUCTION

rev.	date	amendment	drn	ckd
A	15.10.07	ISSUED TO CLIENT	BB	PMS

Connelly's RED MILLS

EXISTING FOUL & SURFACE WATER DRAINAGE LAYOUT

AS–BUILT DETAILS
GENERAL ARRANGEMENT DRAWING

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL
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CARLOW
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DRAWING STATUS:	REPORT	SCALE: AS_SHOWN A1
		DATUM: ORDNANCE
		DRAWN: BB
DRAWING NUMBER:	IE385_010	REV A
		CHECKED: PMS
		APPROVED: –
		DATE: 15.10.07

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ATTACHMENT 3

Surface Water Management Plan

WILLIAM CONNOLLY & SONS

CONNOLLY'S RED MILLS, GORESBRIDGE, CO. KILKENNY

SURFACE WATER MANAGEMENT PLAN (AMENDED)

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

Integrated Engineering Consulting

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

WILLIAM CONNOLLY & SONS

CONNOLLY'S RED MILLS, GORESBRIDGE, CO. KILKENNY

SURFACE WATER MANAGEMENT PLAN (AMENDED)

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Appendix A *Drawing Number IE1540_001_A*

Appendix B *IE Consulting Report 784, March 2013*

Appendix C *Log Keeping Documents*

1 Introduction

IE Consulting Engineers were requested by Connolly's Red Mills, Goresbridge, Co. Kilkenny to update the existing Surface Water Management Plan for the Red Mills factory complex at Goresbridge. This plan is supplementary to IE Consulting Engineers Report 264, which responded to Kilkenny County Council's Section 23 Notice of the 27th of September 2006. The following report has been amended and should be read in conjunction with *Drawing No. IE1540_001_A.*

The purpose of this plan is to ensure adequate day-to-day management of the drainage system and associated infrastructure, and ultimately, to ensure that surface water from the factory complex does not present a polluting risk to nearby watercourses.

2 Capital Works

A series of capital works have been undertaken since the original Surface Water Management Plan was developed in 2006 in order to improve the surface water drainage system within the facility since 2007. An Integrated Constructed Wetland (ICW) has been installed to treat surface water from the grain yard and details of the ICW and its management plan, *IE Consulting Report 784, March 2013* is included in *Appendix B*.

3 On-going Procedures

3.1 Inspection of Gullies

All gullies shall be inspected on a before and after the harvest period to ensure that there are no blockages and that water can enter the surface water drainage system without impediment. Gullies shall be cleaned when necessary.

3.2 Inspection of Separation Tanks

During the harvest period, all separation tanks and bypass separators are to be checked, on a fortnightly basis, to ensure that they are not full and are operating satisfactorily. Tanks shall be cleaned and de-sludged three times a year or when necessary. The sludge will be removed from site by a licenced contractor.

3.3 Cereal Control

If possible, the loading/unloading of loose materials (e.g. cereal) should take place under the cover of the stores. This is in order to minimise the cereal particles are left on a hard standing area. Any cereal material which is deposited on hardstanding areas should be removed by mechanical sweeper or otherwise.

3.4 Training

Appropriate work practices on site are vital to ensuring the quality of the surface water discharging to neighbouring watercourses. Training in order to ensure good site practice shall be provided. The aim of this training will be to increase awareness among staff of the risks to surface water, and to highlight the potential water pollution implications of certain activities on site.

4 Monitoring and Verification

4.1 Sampling

A sampling programme shall be put in place in order to monitor the quality of surface water discharge from the factory complex. 5No. locations of the sampling points are shown in *Drawing No. IE1540_001_A.*

It is proposed to take the samples on a quarterly basis. The samples shall be analysed for the following parameters:

- *Biochemical Oxygen Demand (B.O.D.$_{5)}$*
- *ph*
- *Suspended Solids*
- *Total Ammonia (as N)*
- *Nitrates*
- *Total Phosphorous*
- *Orthophosphate*
- *Fats/oils/grease*
- *Total Hydrocarbons*

The frequency of sampling can be modified, depending on the quality of the results.

It is also proposed that 2 No. samples are taken from the ICW system on a quarterly basis. The sample locations from the ICW system are, 1No. sample from the inlet to Pond 1 and 1No. from the outlet of Pond 4. The ICW samples are analysed for the same parameters as per the surface water samples above.

4.2 Log Keeping

Details of all inspections, as described in Section 3 above, are to be recorded. This shall involve a standard sheet being prepared, with the time and date of inspection noted, along with comments on any issues encountered during the inspection.

Records of the water quality results will be tabulated and hardcopies will be archived, if required for submission to the appropriate authority. An example of the tabulated results is shown in *Appendix C.*

5 Emergency Response Plan

In the event of a major spillage of a PRO/DRO pollutant, the procedure below shall be adopted. Staff will be made aware of this procedure as part of the training process (outlined in Section 4.4 above).

- Upon the identification of a spillage, the outlet from the nearest downstream manhole shall be blocked with a suitable bung.
- If the spillage is located in the cereal storage area and enters the ICW the outfall from the first ICW pond shall be blocked with a suitable bung.
- If deemed necessary, the downstream outlet for the surface water shall also be closed off. On the southern side of the site, this implies that the penstock at the 'Triangular Bridge' shall be closed, while on the northern side of the site, there shall be a valve installed before the outlet pipe discharges from the site, and this shall be closed.
- A specialist contractor shall be commissioned to remove the contaminating spillage from site, and also to clean the manholes/pipework affected by the spillage.

It is important that there are a ready supply of bungs available on site and that all relevant persons know where they can be found in the event of a spillage.

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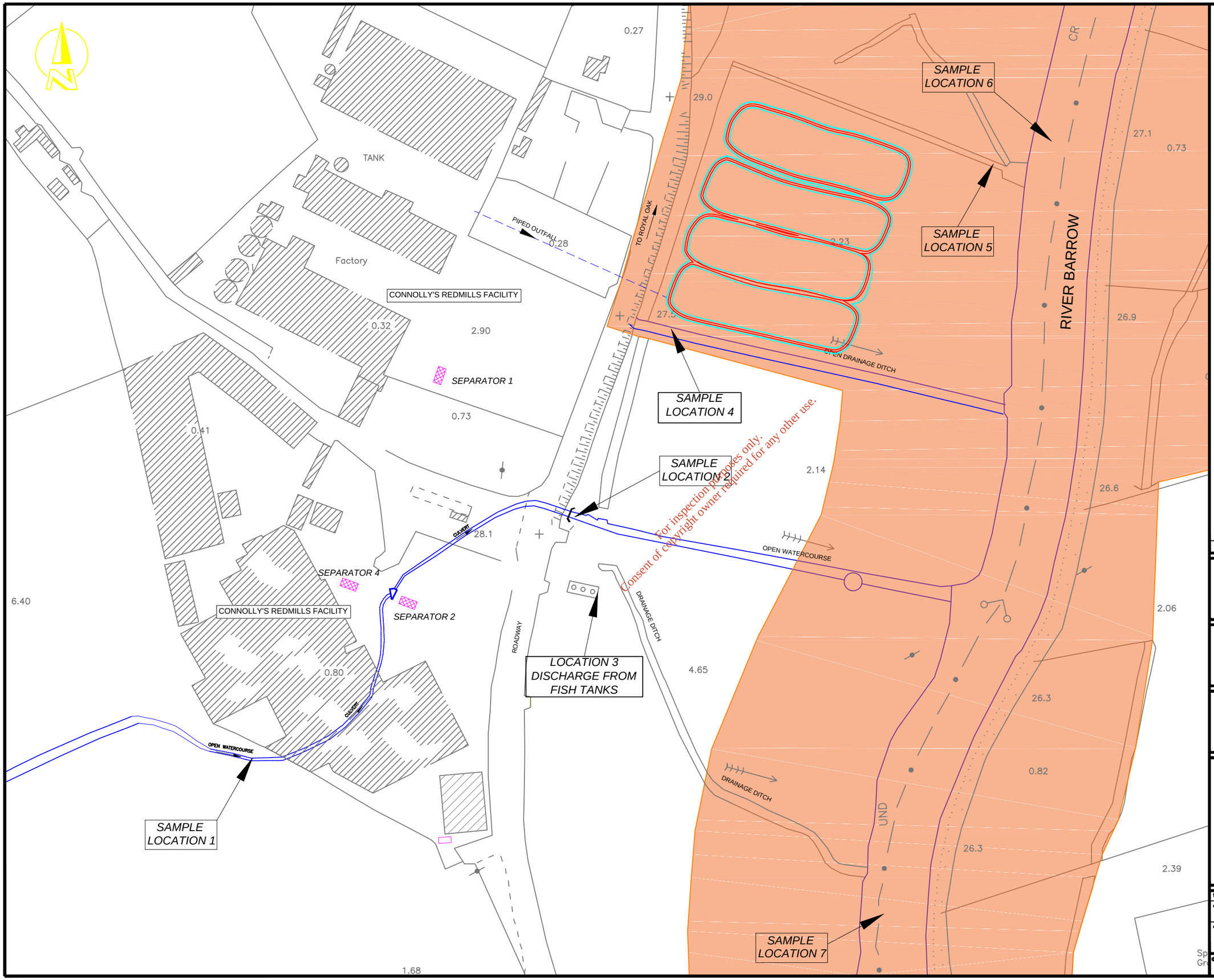
APPENDIX A

Drawing Number IE1540-001-B



LEGEND

- WATERCOURSE
- RIVER BARROW AND RIVER NORE SAC
- CONSTRUCTED WETLAND

NOTES:-

1. DO NOT SCALE FROM THIS DRAWING. FOR INFORMATION ONLY
2. ANY DISCREPANCIES OR ERRORS ON THIS DRAWINGS ARE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER

rev.	date	amendment	drn	ckd
B	04.01.18	REPORT	DB	PMS
A	13.12.17	REPORT	DB	PMS

CONNOLLY'S RED MILL,
GORESBRIDGE, CO. KILKENNY

SURFACE WATER MANAGEMENT PLAN

SURFACE WATER SAMPLING LOCATIONS

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

INNOVATION CENTRE
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		date:	04/01/2018

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APPENDIX B

IE Consulting Report 784, March 2013

Connolly's
RED MILLS

WILLIAM CONNOLLY & SONS

REDMILLS,

GORESBRIDGE, CO KILKENNY

PROPOSED INTEGRATED CONSTRUCTED WETLAND (ICW) SYSTEM

SUMMARY PLANNING REPORT

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VEARNCOMBE ASSOCIATES
CONSULTING ENGINEERS

Integrated Engineering Consulting
An Associate Company of VA Consulting Engineers & Geotechnical & Environmental Services Ltd

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WATER-ENVIRONMENTAL-CIVIL

WILLIAM CONNOLLY & SONS

REDMILLS,

GORESBRIDGE, CO KILKENNY

PROPOSED INTEGRATED CONSTRUCTED WETLAND (ICW) SYSTEM

SUMMARY PLANNING REPORT

IE Consulting
Innovation Centre
Green Road
Carlow

Client :-
William Connolly & Sons
Redmills,
Gorebridge,
Co. Kilkenny.

Document No:	IE771/874
Issue No:	01-issue
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Date:	4th March 2013
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Appendix B *ICW System – Earthworks Specification*
Appendix C *ICW System – Planting Specification*
Appendix D *ICW System – Operation & Maintenance*
Appendix E *ICW System – Assimilative Capacity*

1 Introduction

IE Consulting were requested by Connolly's Redmills, Goresbridge, Co Kilkenny, to undertake the planning stage design for a proposed Integrated Constructed Wetlands (ICW) system to be constructed on lands directly opposite the Connolly's Redmills facility.

The purpose of the proposed ICW system is to treat potentially organic enriched surface water run-off from an area of the Connolly's Redmills facility. Surface water run-off from this area has the potential to become organically enriched during the grain harvest campaign period, which generally occurs during the months of August and September each year.

This planning report summaries the requirement and design of the proposed ICW system and should be read in conjunction with the accompanying drawings, maps and relevant details.

2 Requirement for ICW System

In September 2011 Kilkenny County Council issued a Section 12 Notice to Connolly's Redmills in relation to discharge from a surface water drainage pipe to a ditch watercourse on lands opposite the Connolly's Redmills facility. IE Consulting subsequently prepared a reply to the Section 12 Notice which assessed water quality sampling undertaken by Kilkenny County Council and Connolly's Redmills Ltd, identified the probable cause of the pollution incident as highlighted in the Section 12 Notice, discussed future mitigation works and provided details of remediation works which were undertaken on the drainage ditch watercourse.

As identified in the Section 12 Notice reply the probable cause of the pollution incident is due to the generation of organic enriched surface water run-off from stockpiles of grain during precipitation events and from spilled grain modules which become crushed by vehicular traffic and mix with hardstanding yard run-off. This mix of run-off from grain stockpiles and crushed grain modules accounts for the elevated levels of COD, Ammonia (N) and Ortho-Phosphate (P) as previously sampled and analysed by Kilkenny County Council. The area within the Connolly's Redmills facility which generates the potentially organic enriched surface water run-off is illustrated within the yellow line in *Figure 1* below.

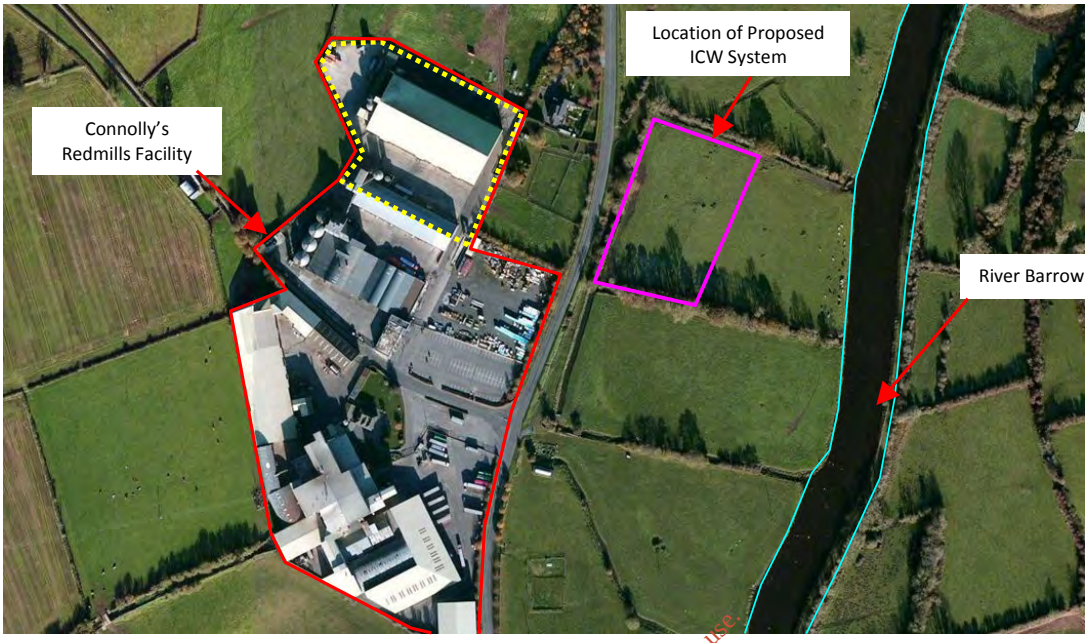

Figure 1

This area is approximately 12,300m^2 and comprises roof areas and hardstanding yard areas. Stockpiling of grain is generally not undertaken in any other hardstanding area of the Connolly's Redmills facility.

Any organically enriched surface water run-off is only likely to occur during the grain harvest campaign period, which generally runs from August to September each year.

In order to mitigate against any adverse impact to the receiving watercourse, due to surface water run-off from the catchment area shown above (*Figure 1 -yellow line*), a number of possible mitigation measures were assessed and a feasibility scoping exercise undertaken. The outcome of this scoping exercise concluded that a suitably designed and constructed ICW system would provided the most economically viable and environmentally sustainable method of intercepting and treating potentially organic enriched surface water run-off from this area of the Connolly's Redmills facility. The location of the proposed ICW system is shown in *Figure 1* above.

Section 3 below provides additional detail of the proposed ICW system to be implemented.

3 Proposed Integrated Constructed Wetlands (ICW) System

Calculations detailing the size and performance of the proposed ICW system are presented in *Appendix A*. It is proposed to provide an ICW system within a minimum pond surface area of 8500m^2 (0.85 hectares). The methodology used to size and assess the performance of the proposed ICW system is summarised below.

3.1 Surface Water Run-Off Area

The proposed ICW system will deal with surface water run-off from a total catchment area of approximately 12,300m^2, comprising approximately 4810m^2 of roof area and approximately 7190m^2 of hardstanding yard area. The catchment area is illustrated in *Figure 1* above (*yellow line*).

For surface water run-off assessment purposes roof areas and yard areas are assumed to have a run-off co-efficient of 0.90 and 0.80 respectively, therefore the effective contributing catchment area =

(4810 x 0.90) + (7190 x 0.80) = 10,081m^2

3.2 Quality of Surface Water Run-Off As Discharged to the ICW

The performance of the proposed ICW system has been assessed in consideration of the main surface water quality parameters of Ammonia (N) and Otho-Phosphate (P) *(assumed to equate to Molybdate Reactive Phosphorus)* and also Chemical Oxygen Demand (COD). For the purposes of calculation and assessment of the performance of the ICW system the quality of the surface water run-off is assumed as having maximum COD, Ammonia (N) and Ortho-Phosphate (P) levels, similar to those recorded by Kilkenny County Council in September 2011 at the surface water outfall pipe which will discharge to the proposed ICW system i.e.:-

COD = 5410 mg/l
Ammonia (N) = 13.5 mg/l
Ortho-Phosphate (P) = 10.2 mg/l

It is important to note that the above COD, Ammonia and Ortho-Phosphate levels recorded by Kilkenny County Council in September 2011 are considered as a single one-off incident and a worst case scenario. Analysis of surface water samples taken from the same outfall pipe at approximate 4 month intervals between 2010 and 2012 indicates the following average values of COD, Ammonia and Ortho-Phosphate:-

COD = 22 mg/l

Ammonia (N) = 0.41 mg/l

Ortho-Phosphate (P) = 0.17 mg/l

Nevertheless, the proposed ICW system has been designed in consideration of the maximum parameters recorded by Kilkenny County Council in September 2011. This should provide the proposed ICW system with a relative factor of safety and significant buffering capacity. It is also noted that the proposed ICW system will only have to deal with potential organic enriched surface water run-off for approximately 2 months per year – i.e. August and September during the grain harvest campaign.

3.3 Volume of Surface Water Run-Off as Discharged to the ICW

The volume of surface water run-off which would discharge to the proposed ICW system will be wholly dependant on precipitation levels. It would not be possible to design an ICW system which would deal with all precipitation events that may be expected, therefore the design of the ICW system is based on an assumption of daily average rainfall amounts plus precipitation levels to an approximate factor of 5 in excess of this.

Based on Met Eireann data the annual average rainfall amount for this area of Kilkenny is approximately 823mm, which equates to an average daily rainfall amount of 2.25mm.

In August and September 2011 the average daily rainfall amounts for this geographical region was 0.82mm and 4.6mm respectively. In August and September 2012 the average daily rainfall amounts for this geographical region was 4.11mm and 1.3mm respectively. The design of the proposed ICW system is therefore based in consideration of daily rainfall amounts of 2.25mm (daily average), 5mm (approx 2x daily average) and 11.5mm (approx 5x daily average). This would result in daily discharge volumes to the proposed ICW system of approximately 22.7m^3, 50.4m^3 and 100.8m^3 respectively.

3.4 Assessment of ICW System Performance

The proposed ICW system will generally comprise of a 4 pond cell horizontal surface flow system planted with suitable emergent plant species. Each pond cell with have a minimum surface water area of 2125m^2, equating to a total ICW surface area of 8500m^2.

The predicted performance of the proposed ICW system was analysed using a plug flow reactor model decay equation as presented by Kadlec & Knight (1996) and O'Sullivan (1998). This provides a more detailed analysis of ICW performance in comparison to other methods as it considers ICW system water depth, decay rate constants, water quality background concentrations and the effects of temperature variation. The plug flow reactor equations used to assess the predicted performance of the proposed ICW system are presented in *Appendix A*.

The predicted performance of the proposed ICW system in terms of input and output water quality is summarised in *Table 1* and *Table 2* below. *Table 1* assumes a daily discharge volume of 100.8m^3 (10mm rainfall amount) whilst *Table 2* assumes a daily discharge volume of 50.4m^2 (5mm rainfall amount).

Pond No.	Pond Area (m^2)	COD_{in} (mg/l)	COD_{out} (mg/l)	$Ammonia_{in}$ (mg/l)	$Ammonia_{out}$ (mg/l)	Ortho-P_{in} (mg/l)	Ortho-P_{out} (mg/l)
1	**2125**	5400	**1472**	13.50	**7.20**	10.20	**5.30**
2	**2125**	1472	**403**	7.20	**4.10**	5.30	**2.10**
3	**2125**	403	**112**	4.10	**1.90**	2.10	**0.98**
4	**2125**	112	**30**	1.90	**0.96**	0.98	**0.34**
Total Area	**8500**		**30**		**0.96**		**0.34**
Final Predicted Discharge Concentration (mg/l)			**30**		**0.96**		**0.34**

Table 1 – Predicted Performance of Proposed ICW System – 100.8m3 Daily Discharge

Pond No.	Pond Area (m^2)	COD_{in} (mg/l)	COD_{out} (mg/l)	$Ammonia_{in}$ (mg/l)	$Ammonia_{out}$ (mg/l)	Ortho-P_{in} (mg/l)	Ortho-P_{out} (mg/l)
1	**2125**	5400	**632**	13.50	**4.10**	10.20	**2.01**
2	**2125**	632	**79**	4.10	**1.70**	2.01	**0.97**
3	**2125**	79	**26**	1.70	**0.51**	0.97	**0.25**
4	**2125**	26	**9**	0.51	**0.24**	0.25	**0.08**
Total Area	**8500**		**9**		**0.24**		**0.08**
Final Predicted Discharge Concentration (mg/l)			**9**		**0.24**		**0.08**

Table 2– Predicted Performance of Proposed ICW System – 50.4m^3 Daily Discharge

3.5 Significant Rainfall Events

During the months of August and September significant rainfall events in excess of 10mm per daily may be experienced. For example a 24 hour duration 2 year return period rainfall event would result in a daily rainfall amount of approximately 34mm, which would result in approximately 342m^3 of surface water run-off discharge to the proposed ICW system. A 24 hour duration 100 year return period rainfall event would result in approximately 665m^3 of surface water run-off discharge to the proposed ICW system.

Although the proposed ICW system will generally operate at an average water depth of 0.30m – 0.35m within each pond cell, the system can however easily deal with water depths of up to 0.50m-0.55m on a temporary basis. This will provide an additional storage capacity within the proposed ICW system of approximately 1700m^3 – 2125m^3. Therefore, during periods of significant rainfall events the full storage and attenuation capacity within the ICW system can be utilised. The operation and management procedures which will be provided for the proposed ICW system will include procedures for operating and controlling the ICW system during significant rainfall events.

It should be noted that the proposed ICW system has been designed and assessed on the basis that the system would receive a daily discharge of up to 100.8m^3 on a continual basis. In reality the surface water discharge to the proposed ICW system may be zero for durations of several days or more during the grain harvest campaign period.

4 Location & Construction of Proposed ICW System

It is proposed to construct the proposed ICW system on lands opposite the Connolly's Redmills facility. These lands are currently in the ownership of Connolly's Redmills. The proposed location is a suitable site for an ICW system as it allows direct discharge from the existing surface water outfall pipe and will allow a final gravity discharge from the proposed ICW system to an adjacent drainage ditch watercourse.

The location and general layout of the proposed ICW system is shown on *Drawing Number IE771-002-A* and *Drawing Number IE771-003-A.*

4.1 Site Investigation Works

In August 2012 a temporary storage lagoon was constructed within the site area of the proposed ICW system. This storage lagoon was intended to provide a temporary mitigation measure for the duration of the 2012 gain harvest campaign (*August – September 2012*). Details of the temporary storage lagoon were submitted to Kilkenny County Council under a Section 12 Notification.

During the course of construction of the temporary storage lagoon a number of insitu falling head tests were undertaken on the underlying sub-soil layers. These falling head tests indicated that the permeability of the underlying sub-soil material at the site of the proposed ICW system is at least 1×10^{-8} m/s. It was also observed that the underlying groundwater level was between 0.4m-0.5m below existing ground levels. Due to the significant rainfall amounts experience during the months of June-August 2012, the groundwater levels observed are considered to be at or close to the seasonally high groundwater levels for the area.

4.2 Construction of ICW Pond Bases & Embankments

The proposed ICW system shall be constructed entirely above existing ground levels using suitable imported sub-soil material. This is to ensure an adequate gravity flow through the various elements of the ICW system and to ensure that the outfall from the ICW system can discharge during periods of elevated water levels in the receiving watercourse.

The pond bases and embankments of the proposed ICW system shall be constructed to a particular earthworks specification to ensure a minimum basal permeability of 1×10^{-8} m/s. This earthworks specification has been developed over several years by IE Consulting with particular regard to the construction of ICW systems. A copy of the proposed earthworks specification for construction of the ICW system is contained in *Appendix B*. *Drawing Number IE771-004-A* illustrates the earthworks construction sequence of the proposed ICW system. All imported sub-soil material brought to site for the construction of the ICW system shall be inspected and certified by an engineer from IE Consulting prior to construction works. During construction of the ICW system several insitu falling head permeability tests shall be undertaken by IE Consulting to ensure minimum basal permeability is achieved.

4.3 Planting of Proposed ICW System

To ensure optimum treatment performance the proposed ICW system shall be planted with suitable emergent plants in accordance with a particular planting specification. This planting specification has been developed over several years by IE Consulting with particular regard to the emergent planting of ICW systems. A copy of the proposed planting specification for the ICW system is contained in *Appendix C*.

4.4 Discharge from ICW System to Receiving Watercourse

As illustrated on *Drawing Number IE771-003-A*, discharge from the final pond of the ICW system shall be to an adjacent existing drainage channel. This channel in turn discharges to the River Barrow approximately 140m downstream.

In order to assess any potential impact to the River Barrow an assimilative capacity assessment has been undertaken. Details of the assimilative capacity assessment are contained in *Appendix E*.

The assimilative capacity assessment indicates that the proposed ICW system would not have an adverse impact on the water quality of the River Barrow.

A Natura Impact Statement for the proposed ICW system has also been undertaken by Openfield Ecological Consultants, which has determined that, subject to certain mitigation measures, the project is not expected to result in any negative impacts to the surrounding environs.

5 Operation, Management & Maintenance of Proposed ICW System

The proposed ICW system shall be operated, managed and maintained in accordance with the specification and recommendations contained in *Appendix D*.

In order to assess the on-going performance of the ICW system it is proposed to undertake routine sampling and laboratory analysis of waters at selected locations within the ICW system. It is proposed that sampling and analysis shall only be undertaken during the period of the grain harvest campaign.

The proposed sampling and analysis regime is summarised in *Table 3* below:-

Sample Point	Sample Method	Analysis Parameter	Sampling Frequency
Inlet to ICW Pond 1	Grab	BOD (mg/l)	Monthly
	Grab	COD (mg/l)	Bi-weekly
	Grab	Ammonia-N (mg/l)	Bi-weekly
	Grab	Ortho-Phosphate-P (mg/l)	Bi-weekly
Outlet From ICW Pond 4	Grab	BOD (mg/l)	Monthly
	Grab	COD (mg/l)	Bi-weekly
	Grab	Ammonia-N (mg/l)	Bi-weekly
	Grab	Ortho-Phosphate-P (mg/l)	Bi-weekly

Table 3

The above sampling and analysis regime will enable the performance of the ICW system to be monitoring during the grain campaign period and to allow any issues with water quality to be identified and rectified, if required.

6 Summary

It is proposed to construct an Integrated Constructed Wetlands (ICW) system on lands opposite to the Connolly's Redmills facility in order to treat potentially organic enriched surface water run-off from an area of the Connolly's Redmills facility.

The occurrence of any potentially organic enriched surface water run-off is only likely to occur during the gain harvest campaign period, i.e. August-September each year.

The proposed ICW system has been designed to include a relevant factor of safety and significant buffering capacity. The system will be constructed to a particular earthworks specification to ensure a minimum basal permeably of $1x10^{-8}$ m/s and planted to specific specification. It is expected that the proposed ICW system shall be constructed and adequately established prior to the commencement of the 2013 grain harvest campaign.

The proposed ICW system shall be operated, managed and monitored during the grain harvest campaign in accordance with the recommendations contained in *Appendix D* - this shall ensure optimum performance of the ICW system.

The Natura Impact Statement and Assimilative Capacity Assessment indicate that the proposed ICW system will not have an adverse impact on the surrounding environment.

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APPENDIX B

ICW – Earthworks Specification

1.0 GENERAL

1.1 Scope

This specification covers the requirements for earthworks in relation to the construction of the proposed integrated constructed wetland system and pond system to provide tertiary treatment for the proposed primary and secondary wastewater treatment system at Faha East, Faha, Killarney, Co Kerry. The works shall be in general accordance with B.S. 6031 "Code of Practice for Earthworks" and in accordance with *'Integrated Constructed Wetlands – Guidance Document for Domestic Wastewater Applications – DoEHLG, November 2010'.*

The recommended sequence of construction to comply with this earthworks specification is shown on *Drawing Number IE651-003-A*.

1.2 *Definitions*

1.2.1 Engineer

The Engineer referred to in this specification means the Civil/Structural Engineer appointed by the Employer or the Architect for the purposes of the construction contract.

1.2.2 Contractor

The Contractor (including sub-contractors) referred to in this specification means the person or persons responsible for the physical undertaking of construction of the proposed wetlands system and pond areas.

3.0 Subsoil Liner Construction

3.1 General

It is imperative that the subsoil liner in the floor and inner bank surfaces of each wetland cell and the pond areas and the core of the embankments are thoroughly compacted. If the subsoil liner is stony or has a relatively high gravel content the proportion of these materials present shall be such that they are embedded in the dense matrix of the subsoil liner itself and do not create any air-filled porosity by bridging or result in the liner subsoil losing any of its overall plasticity. If these conditions are met the overall hydraulic conductivity will be reduced rather than increased. A 20+ tonne (at minimum) tracked excavator shall be used to construct the store and effect optimum compaction. Floors and banks shall be built in layers/lifts of 150 mm and compacted until the desired density and sealing has been achieved.

A minimum of four runs (two each in cross directions) per lift should give adequate compaction in normal conditions. On sites susceptible to groundwater pollution a minimum of six runs or its equivalent with compacting machinery shall be used. Alternative compaction plant may be used if it can be clearly demonstrated that **at least** equivalent compaction will be achieved.

3.2 Compaction of Subsoils

The design and construction of compacted subsoil liners is governed by the strength and degree of compaction required to ensure low permeability. The geotechnical component of a subsoil liner is determined by the nature of the subsoil being utilised. The base and part slopes of the wetland system shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to a permeability of 1×10^{-8} m/s over a thickness of 0.3 m. Achieving the required permeability may require compaction of a minimum thickness of subsoil resulting in a compacted subsoil liner.

3.3 Compactive Energy

Compactive energy is a function of the weight of the machine used to effect compaction, the thickness of the lift and the number of passes of the machine over each lift. Additional passes cannot be used to compensate for machines that are too light for the construction of the liner. Machine size is usually specified in terms of contact pressure exerted by the machine. For a hydraulic excavator, the contact pressure is determined based on the operating weight of the machine and the contact area of the machine on the ground. (e.g. Hydraulic excavator 20000 kg operating weight, track width 600 mm, tumbler length 2.5 m. Therefore the contact pressure = (20000/(2.5 x 2 x 0.6)) = 65.4 kPa).

Weight is important to ensure that penetration of the specified loose lift is attained. A lift thickness of 150 mm is suitable for most compaction procedures and coupled with a 20000 kg hydraulic excavator capable of exerting a ground pressure greater than 40 kPa and a minimum of four passes per lift, effective compaction should be achieved.

Table 1 below lists typical ground pressure values for various types of tracked excavators. If tracked excavators are to be used for compaction at this facility then the 'Track Length on Ground' should comply with *Table 1* below:-

Track length on ground	Track width	Machine weight	Ground pressure		
(m)	(m)	(kg)	($kg.m^{-2}$)	(kPa)	(psi)
3.00	0.6	13950	3875.0	38.0	5.5
3.27	0.6	19700	5028.1	49.3	7.2
3.28	0.6	20575	5235.4	51.3	7.4
3.37	0.6	18070	4468.3	43.8	6.4
3.37	0.6	19300	4772.5	46.8	6.8
3.37	0.6	20095	4969.1	48.7	7.1
3.37	0.6	19021	4703.5	46.1	6.7
3.45	0.6	19650	4746.4	46.5	6.8
3.66	0.6	23069	5252.5	51.5	7.5
3.66	0.6	21340	4858.8	47.6	6.9
3.83	0.6	24200	5265.4	51.6	7.5

Table 1 - Ground pressure values for a sample of hydraulic excavators

If the contractor proposes to employ a non-vibrating or vibrating roller for this facility contract he shall comply with the compaction requirements listed in *Table 2* below.

The table below is adapted from the NRA specification for roadworks and gives guidance on the required construction requirements for different types of compaction plant to ensure an impermeable compacted subsoil liner.

Type of compaction plant	Category	Max. depth of compacted layer	Minimum number of passes
		(mm)	(No.)
Smooth wheeled roller (mass per metre width of roll):	over 2100 kg to 2700 kg over 2700 kg to 5400 kg over 5400 kg	125 125 150	8 6 4
Grid roller (mass per metre width of roll):	over 2700 kg to 5400 kg over 5400 kg to 8000 kg over 8000 kg	150 150 150	10 8 4
Tamping roller (mass per metre width of roll):	over 4000 kg	225	4
Vibratory roller (mass per metre width of a vibratory roll):	less than 700 kg over 700 kg to 1300 kg over 1300 kg to 1800 kg over 1800 kg to 2300 kg over 2300 kg to 2900 kg over 2900 kg to 3600 kg over 3600 kg to 4300 kg over 4300 kg to 5000 kg over 5000 kg	100 125 150 175 200 225 250 275	Unsuitable 12 8 4 4 4 4 4 4

Table 2 – Compaction Guidance for Roller Plant

3.4 Construction of Liner to Achieve Required Impermeability

Constructed liners for the proposed wetland system and pond areas at this facility shall have, on completion, a permeability of less than 1 x 10^{-8} m/s and shall be at least 0.3 m thick, over at least 0.75m of undisturbed subsoil.

The liner on the banks and floor shall be constructed of suitable excavated dense plastic subsoil material only. It is imperative that the subsoil liner in the base of the ponds, the inner bank surfaces and the core of the banks are thoroughly compacted, as listed in this specification.

The liner on the pond base and banks shall be built in layers/lifts of 150 mm and each layer/lift compacted until the desired permeability has been achieved. The excavator shall make a minimum of 4 passes per lift (two each in cross directions) over the liner soil so as to compact the material for 0.3 m thick liners. Each layer comprising the compacted subsoil liner shall be fully compacted prior to placement of the next layer.

Once the full depth of liner has been constructed, the inside floor and bank slopes shall be smoothed off and compacted (plastered) with the track machine using a remoulded subsoil. This is particularly necessary when the liner is constructed in dry conditions.

Compaction shall be effected by means of a hydraulic excavator with a minimum weight of 20 tonne capable of exerting a ground pressure of at least 40 kPa (40 kN.m^{-2}) (e.g. a 20 tonne excavator with tumbler length 3.7 m and track width 0.6 m shall exert a ground pressure of 44.17 kPa). Alternative suitable compaction plant may be used if it can be demonstrated that ***at least*** equivalent compaction can be effected.

4.0 Construction of Embankments

Embankments should be constructed from firm sub-soil material with at least a 10-13% clay content. An impermeable liner should be provided to embankments for a minimum face height of 0.45m on the pond side only. The liner should be constructed as per *Section 3.0* above. Top-soil material can be used to landscape the embankments prior to any seeding.

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APPENDIX C

ICW – Planting Specification

1 Table of Contents

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4.2 Suitable Plants for the Constructed Wetland & Reed Bed Areas 3
4.3 Planting Density 4
4.4 Size & Maturity of Plants 4
5 Planting Procedure 5
6 Maintenance 5

2 Introduction

This planting specification has been prepared for a proposed Integrated Constructed Wetlands system (ICW) at Connolly's Redmills, Goresbridge, Co Kilkenny.

To ensure the successful treatment of the effluent waters each constructed wetland area will be densely vegetated with suitable emergent plant species.

The proposed planting specification is in accordance with *'Integrated Constructed Wetlands – Guidance Document for Domestic Wastewater Applications – DoEHLG, November 2010'.*

3 Consideration

Plant establishment of the wetland areas require the following considerations.

- Plant species selection and density
- Sourcing – native and non-native species
- Water levels – variable- different plants for varying depths
- Setting – wind direction/exposure, sun or shade
- Liner protection

4 Proposed Planting Specification

4.1 The Role of Plants Within the System

Vegetation, emergent, marginal and aquatic, play an essential role in the functioning of an integrated constructed wetland system.

The emergent plant species within the system provide the following functions:

- Provide support structure for microbial colonies to develop
- Facilitate aerobic microbial activity (principal cleansing process)
- Absorption of nutrients
- Bind nutrients in the accumulating organic matter
- Reduce the flow of water → improves settlement
- Reduce preferential flow and increase residence time
- Reduce final volumetric discharge through plant transpiration and interception

4.2 Suitable Plants for the Integrated Constructed Wetland Areas

There are a number of different plant species that are recommended for the proposed constructed wetland areas.

The constructed wetland areas are suitable for range of different plants species. The list below gives a selection of plants that are tolerant of varying water depths. Plants which prefer shallower waters will be established along the waters edge (0-5cm), with deeper living plants planted in 5-35cm.

Alisma plantago-aquatica	Water plantain	0-30 cm
Acorus calamus	Sweet flag	0-20cm
Carex pendula	Drooping sedge	0-35cm
Carex elata	Sedge	0-10cm
Carex rostrata	Lesser sedge	0-20cm

Cladium mariscus	Saw sedge	0-30cm
Glyceria maxima	Water grass	0-20cm
Juncus effuses 'Spiralis'	Spiral rush	0-5cm
Phalaris arundinacea	Canary reed	0-15cm
Phalaris arundinacea 'varigata'	Variegated canary reed	0-15cm

The plant species below are non-native, but also suitable for planting within the wetland areas.

Cyperus spp.

Zantedeschia aethopica

Zizania latifolia

Gunnera manicata

There are many other plants also suitable.

Several bog or moisture loving plants that prefer saturated soils can be planted in areas along the edge of the proposed surface water pond areas, e.g. *Lysimachia punctata, Astilbe, hostas.*

4.3 Planting Density

To provide a dense plant cover as quickly as possible, depending on the species and maturity of the plants, it is recommended that the constructed wetlands are planted at a rate of 1-2 plants/m^2

4.4 Size & Maturity of Plants

The size and maturity of the plants to be used in the constructed wetlands will have to consider at least the following;

- Availability and sourcing
- How quickly cover is needed
- Planting conditions
- Costs

Physiologically mature plants from nursery stock (1-3 litre) will provide establishment of plants within the shortest period of time. The use of seedlings may be used if plant cover and establishment are not required within the first 1-2 years; however greater management will be required to ensure their success.

5 Planting Procedure

Plants are easiest to establish when water levels are minimal and just sufficient to keep the soil wet. Following construction of each wetland pond base, at least 100mm of topsoil shall be placed with each ICW area to provide a suitable medium for planting. Once plants are established, ranging from weeks to months with physiological mature plants with good root systems, to months to a year for bare rooted and a year for seedlings. Ideally water levels in the wetland should be gradually increased.

The following should also be considered during planting;

Planting should be carried out manually to avoid damage to plants and liner.

Planting should be carried out mainly in groups of similar species type, but some mixing is encouraged.

Planting should ideally be carried out in late winter/early spring or early summer to avail of the full growing season (March-September for most species).

6 Maintenance

A permanent water depth of 0.35m will be maintained within the ICW system, however during heavy rainfall events the surface area of the ICW may increase and the water level would rise by a further 0.2-0.25m. The plants selected will cope with periods of being submerged during storm events once the plants are established. Likewise they are adapted to periods of drying out for periods of time.

The plants within the wetlands will require little maintenance. However, a visual inspection should be carried out regularly especially for the first growing season.

Replanting may be necessary if storm event occurs within the first twelve months, as plants may not be fully established and may be uprooted, due to heavy rain or winds.

The majority of emergent plant species are deciduous and die back during the winter, leading to an accumulation of dead plant material, most of which will be embedded in the soils.

APPENDIX C

Log Keeping Documents

CONNOLLY'S RED MILLS SURFACE WATER MONITORING DATA (EXAMPLE)

Parameter	Date of Sampling	SAMPLE LOCATION: 31/1/17	30/4/017	27/7/17	31/10/17	31/1/18	30/4/18	31/7/18	31/10/18
Biochemical Oxygen Demand (mg/l)									
Chloride (mg/l)									
Chemical Oxygen Demand (mg/l)									
Electrical Conductivity (µS/cm)									
Copper (µg/l)									
E. Coli (MPN/100ml)									
Iron (µg/l)									
Manganese (µg/l)									
Ammonia (mg/l as NH3)									
Nitrate (mg/l NO_3)									
Fats, Oils and Grease									
Total Coliforms (MPN/100ml)									

ATTACHMENT 4

Laboratory Report

Exova Jones Environmental

Registered Office: Exova Environmental UK Limited, 10 Lower Grosvenor Place, London, SW1W 0EN. Reg No. 11371415

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

John Rea Environmental Ltd
Purcellsinch Business Park
Carlow Road
Kilkenny
Ireland

Attention :	John Rea
Date :	27th December, 2018
Your reference :	3289
Our reference :	Test Report 18/20278 Batch 1
Location :	Redmills
Date samples received :	13th December, 2018
Status :	Final report
Issue :	1

One sample was received for analysis on 13th December, 2018 of which one was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Lucas Halliwell
Project Co-ordinator

Client Name: John Rea Environmental Ltd
Reference: 3289
Location: Redmills
Contact: John Rea
JE Job No.: 18/20278

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-4												
Sample ID	GW18-GW1-12												
Depth													
COC No / misc													
Containers	V P G												
Sample Date	12/12/2018												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	13/12/2018												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
EPH (C8-C40) #	<10										<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	<10										<10	ug/l	TM5/PM30

Client Name: John Rea Environmental Ltd
Reference: 3289
Location: Redmills
Contact: John Rea
JE Job No.: 18/20278

VOC Report : **Liquid**

J E Sample No.	1-4												
Sample ID	GW18-GW1-12												
Depth													
COC No / misc													
Containers	V P G												
Sample Date	12/12/2018												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	13/12/2018												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1										<0.1	ug/l	TM15/PM10
Chloromethane #	<3										<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1										<0.1	ug/l	TM15/PM10
Bromomethane	<1										<1	ug/l	TM15/PM10
Chloroethane #	<3										<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3										<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<5										<5	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1										<1	ug/l	TM15/PM10
Bromochloromethane #	<2										<2	ug/l	TM15/PM10
Chloroform #	<2										<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2										<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3										<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2										<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2										<2	ug/l	TM15/PM10
Benzene #	<0.5										<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromomethane #	<3										<3	ug/l	TM15/PM10
Bromodichloromethane #	<2										<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
Toluene #	<5										<5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2										<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3										<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Dibromochloromethane #	<2										<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2										<2	ug/l	TM15/PM10
Chlorobenzene #	<2										<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2										<2	ug/l	TM15/PM10
Ethylbenzene #	<1										<1	ug/l	TM15/PM10
p/m-Xylene #	<2										<2	ug/l	TM15/PM10
o-Xylene #	<1										<1	ug/l	TM15/PM10
Styrene	<2										<2	ug/l	TM15/PM10
Bromoform #	<2										<2	ug/l	TM15/PM10
Isopropylbenzene #	<3										<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4										<4	ug/l	TM15/PM10
Bromobenzene #	<2										<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3										<3	ug/l	TM15/PM10
Propylbenzene #	<3										<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3										<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3										<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3										<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3										<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
n-Butylbenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2										<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3										<3	ug/l	TM15/PM10
Naphthalene	<2										<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	130										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	120										<0	%	TM15/PM10

Client Name: John Rea Environmental Ltd
Reference: 3289
Location: Redmills
Contact: John Rea

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 18/20278						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/20278

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 18/20278

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

Exova Jones Environmental

Registered Office: Exova Environmental UK Limited, 10 Lower Grosvenor Place, London, SW1W 0EN. Reg No. 11371415

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John Rea Environmental Ltd
Purcellsinch Business Park
Carlow Road
Kilkenny
Ireland

Attention :	John Rea
Date :	9th January, 2019
Your reference :	3289
Our reference :	Test Report 18/20275 Batch 1
Location :	Redmills
Date samples received :	13th December, 2018
Status :	Final report
Issue :	2

Two samples were received for analysis on 13th December, 2018 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: John Rea Environmental Ltd
Reference: 3289
Location: Redmills
Contact: John Rea
JE Job No.: 18/20275

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1	2											
Sample ID	SS18-S1-12	SS18-S2-12											
Depth													
COC No / misc													
Containers	B	B											
Sample Date	12/12/2018	12/12/2018											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	13/12/2018	13/12/2018											

Please see attached notes for all abbreviations and acronyms

			LOD/LOR	Units	Method No.
EPH (C8-C40) #	486	437	<30	mg/kg	TM5/PM8
C8-C40 Mineral Oil (Calculation)	145	65	<30	mg/kg	TM5/PM8
Natural Moisture Content	34.6	21.0	<0.1	%	PM4/PM0

Client Name: John Rea Environmental Ltd

Reference: 3289

Location: Redmills

Contact: John Rea

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
18/20275	1	SS18-S1-12		1	EPH	Sample received in inappropriate container
18/20275	1	SS18-S2-12		2	EPH	Sample holding time exceeded
18/20275	1	SS18-S2-12		2	EPH	Sample received in inappropriate container

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/20275

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
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ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 18/20275

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes