Dawn Meats Ireland Unlimited Company

Carroll's Cross, Kilmacthomas, Co. Waterford

Volume I

Environmental Impact Assessment Report

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Dawn Meats Ireland Unlimited Company, Carroll's Cross, Ballyshunnock, Co. Waterford

Volume I

Environmental Impact Assessment Report

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1 Chapter One - Introduction

1.1 Introduction

Redkite Environmental Ltd. has been commissioned by Dawn Meats Ireland Unlimited Company (DMIUC) to prepare an Environmental Impact Assessment Report (EIAR) for its existing convenience food production facility located on lands at Ballyshunnock, Kilmacthomas, County Waterford.

The location of the facility is indicated on **Figure 1.1 Site Location**.

This EIAR was requested by the EPA and does not address any proposed development or construction phases but deals only with the existing permitted facility and the existing maximum production capacity of the facility. This document will be submitted to the Environmental Protection Agency (EPA) as part of the company's application for an Industrial Emissions authorization under the following Class of the first Schedule of the amended EPA Act, 1992:

> *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:*
>
> *(i) only animal raw materials (other than exclusively milk) with a finished product production capacity greater than 75 tonnes per day.*
>
> *(b) For the purposes of clause (a), packaging shall not be included in the final weight of the product.*

Following recent initial consultation with the EPA, the existing facility and therefore the need for an EIAR is considered to fall under Schedule 5, Part 2 of the Planning and Development Regulations 2001 - 2015 is Food Industry Class 7(b) as follows:

> *Installations for packing and canning[1] of animal and vegetable products, where the capacity for processing raw materials would exceed 100 tonnes per day.*

1.2 Background & History

Dawn Meats was first established in Co. Waterford, Ireland in 1980. The company has since expanded with a number of plants both in Ireland and the UK.

The Carroll's Cross operation is part of DMIUC and comprises of Dawn Foods and Convenience Foods located within the same building premises at the site in Carroll's Cross. QK Stores, a separate operation is also located in an adjoining building at Carroll's Cross. It is not part of the application for an IE authorisation from the EPA.

[1] Canning is not conducted at the facility. "and" is interpreted as a means to expand a class rather than limit it.

The Carroll's Cross facility was purpose built in 1982 and a modern purpose-built processing plant was then built on to the existing structure in 2002 for Convenience Foods.

The Carroll's Cross facility currently supplies fresh portioned beef, pork and lamb to the retail, catering and food-service industry in Ireland, UK and Continental Europe.

Convenience Foods currently supply frozen beef burgers to customers in Ireland, UK and Continental Europe.

In 2012 a further purpose-built, state of the art facility for pattie production was erected. Details of planning permissions for the facility are set out under Section 1.4 below.

1.3 Facility Location & Broad Description

The facility is located directly off the N25 at Carroll's Cross, approximately 16km west of Waterford city. The N25 runs on an east/west axis close to the northern boundary of the facility. The Dawn River runs on a similar axis close to part of the southern boundary. QK stores directly adjoins the facility to the northeast while a large disused quarry lies to the south, southwest and southeast. The quarry to the south is separated from the facility by a large associated berm or, remains of Greenan Hill. The Waterford Greenway follows an old railway line track running between the Dawn River and the quarry berm. A small unit, Cross Electrical lies further to the east. The surrounding landscape is undulating, rising up and away from the N25 to both the north and south. The facility is at approx. 72mOD while surrounding lands to the north and south rise up and away to >90mOD. The facility is nestled low into the landscape. The surrounding land is mainly in agricultural use. The area is dotted with detached dwellings and farm buildings. Refer to **Figure 1.1.**

The nearest residential dwellings are located to the north, west, southwest and east of the site within 100m to the north across the N25, 210m to the east and 320m west. All of the dwellings are at a higher elevation to the facility. The Waterford Greenway to the south is at approx. 79mOD and over-looks the facility.

The facility comprises:

- One main process building housing both process and auxiliary plant, and offices;
- Wastewater Treatment System (WWTS) comprising fat screening, 2 No. settlement ponds, a Moving Bed Biofilm Reactor (MBBR) tank, chemical phosphorus removal and a 10 pond Integrated Constructed Wetland (ICW) for polishing;
- Water treatment plant and tank;
- Loading bays;
- Yard areas for parked trucks, chemstores and waste storage, and,
- Staff parking areas.

1.4 Planning and Consents History

A summary of the planning permissions and licences sought and granted for the facility since the 1980s are provided in Table 1.1 below.

Table 1.1 Applicable Consents

Planning/Licence Reference	Application Date	Grant Date	Development Description
WPW/04 2004	-	13/12/2004	License for the discharge of treated trade and domestic effluent to the Dawn River.
15681	27/11/2015	4/3/2016	Car-park extension, truck turning area, construction of an air lock and effluent tank and effluent equipment housing.
13266	1/7/2013	19/9/2013	Retention planning permission to retain as built the realigned water course to the south side of existing buildings and also to retain as built the access bridge across the Dawn River.
12363	28/9/2012	16/10/2013	Retention planning permission for additional ground floor production space, also first floor storage area and office, new security building of entrance, pump house, fine screen housing, extension to existing dispatch area on east side of the building and a mechanical services platform to the rear of the building.
12351	20/9/2012	7/10/2013	Retention planning permission for as built integrated constructed wetlands (ICW).
11381	9/9/2011	6/12/2011	Extension to the rear of the existing processing and storage facility together with the associated site works
02-244	8/3/2002	20/8/2002	Retention of an as constructed extension to the side of existing building to include a new refrigerated goods intake area, extension to existing office and provision of staff facilities at 1st and ground floors.
01-766	3/7/2001	3/10/2001	Construction of a refrigerated dispatch loading bay and provision of a dry goods store at the side of the building.
82-645	1/1/1982*	11/1/1983	Loading bay.
81-578	12/11/1981	18/12/1981	Cold store and blast freezing.
80-552	1/1/1980*	22/10/1980	Cold store and blast freezing.
80-551	22/8/1980	9/7/1981	Erection of meat processing plant.

Note: * on Waterford City and County Council website as application date.

Planning applications file ref. nos. 13266, 12363 and 12351 were accompanied by Screening Statements for Appropriate Assessment required under the Habitats Regulations, 2011. Application 15681 was screened by Waterford City and County Council (WCCC) without submission of a separate stand-alone Screening Statement as part of the application. No EIAR documents were completed or requested for submission with planning applications by the local authority in the past. Applications 12/351 and 12/363 were deemed to be sub-threshold for EIA by WCCC.

1.5 Regulatory Requirements

This EIAR has been prepared in accordance with the current statutory requirements of the Irish Planning & Development Acts 2001 (as amended), associated Regulations 2001-2015 (as amended) and the European Communities (Environmental Impact Assessment) Regulations.

This EIAR has been produced following the deadline of 16th May 2017 by which Directive EIA 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment was to be transposed into Irish law. On 15th May 2017, the Department of Housing, Planning, Community and Local Government issued Circular Letter PL 1/2017 providing advice on the aDMIUCnistrative provisions in advance of the transposition of the Directive into Irish Law. As the Directive was not transposed into Irish Law by this date, the circular stated the following:

"In respect of applications for planning permission or other development consent received on or after 16 May 2017 falling within the scope of Directive 2011/92/EU, or within the scope of Directive 2014/52/EU, competent authorities are advised to consider applying the requirements of Directive 2014/52/EU by way of aDMIUCnistrative provisions in advance of the transposition of Directive 2014/52/EU into Irish law."

At the time of writing this EIAR, the Directive had not been fully transposed into Irish Law and the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended) had not been amended to reflect the EU Directive. To ensure this EIAR complies with the upcoming transposition of Directive 2014/52/EU, the amendments required by the 2014 Directive have been incorporated into this document.

1.6 Consultation

Consultation is a practice that is carried out to ensure that all relevant issues are addressed in an EIAR i.e. that the scope of the EIAR is adequate. This EIAR has not been prepared for a new proposed development or expansion plan, therefore consultation has mainly been undertaken by review of previous comments/submissions made in the recent past on past planning applications, informal consultation with the EPA via telephone conversations and a pre-submission meeting in the Dublin office on 14th February 2018. In addition, individual team members have informally consulted relevant public bodies and information sources

where considered necessary. Additional studies were undertaken as a result of consultation including odour dispersion modelling.

In addition to informal consultation, the scope of the EIAR was considered against the relevant project type (No. 24) listed in the draft "Advice Notes for Preparing Environmental Impact Statements produced by the EPA in September 2015 and also against the provisions of the Directive EIA 2014/52/EU as advised by the Department of Housing, Planning, Community and Local Government in the circular discussed above.

Installations for packing and canning of animal and vegetable products fall under Project type No. 24 set out in the 2015 draft Advice Notes which generally note that these projects can give rise to concerns about impacts on air quality relating to dust and odour, and on water quality relating to effluent discharges and spills. Both of these areas have been assessed in detail in this EIAR. All of the typical significant impacts likely listed under Project Type 24 have been addressed in this document where considered relevant. Additional topics such as climate have also been included as DMIUC is very active in reducing Greenhouse Gas (GHG) Emissions from all facilities in the group.

2 Chapter Two – The Environmental Impact Assessment Report

This EIAR is a legal document and has been developed in line with requirements of national and international legislation, including the amendments to Environmental Impact Assessment stated within EIA Directive 2014/52/EU. This section outlines the primary sections of this document.

2.1 General Guidance

The EIAR has been prepared in accordance with the following EPA documents and relevant general best practice guidelines:

- Advice notes on Current Practice in the Preparation of Environmental Impact Statements (2003).
- Guidelines on the Information to be Contained in Environmental Impact Statements (EPA 2002).
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (draft, September 2015);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (draft, August 2017).
- Guidelines for Planning Authorities and An Bord Pleanala Carrying out Environmental Impact Assessment, Department of the Environment, Community and Local Government (2013).

Where a specialist chapter incorporates additional best practice or guidance documents these are outlined within the relevant section methodology.

2.2 Structure of the EIAR

The structure of this EIAR adopts a sequence as follows:

- Chapter 1 - Introduction broadly describing the facility history location and operation, planning history, legal requirement for an EIAR, and overview of scoping/consultation completed.

- Chapter 2 – Overview of main Guidance used and structure of the document.

- Chapter 3 - Description of the Facility;

- Chapter 4 - Alternatives Considered based on Environmental Impacts;

- Chapters 5 – 15 Impact Assessment – incorporating baseline data and specialist findings;

- Chapter 16 - Interactions.

In the description of the impacts of the activity the following attributes of the receiving environment and their interactions are described which reflect the amendments being introduced through the transposition of EIA Directive 2014/52/EU:

- Biodiversity;
- Land and Soils and Hydrogeology;
- Surface Water;
- Air Quality and Odour;
- Noise and Vibration;
- Cultural Heritage;
- Population and Human Health;
- Landscape;
- Traffic;
- Climate, and,
- Material Assets.

The EIAR is provided in the following format:

- Volume I: EIAR Main Text & Figures
- Volume II: Attachments
- Volume III: Non-Technical Summary

2.3 Methodology

2.3.1 Assessment of the Effects – Evaluation Criteria

The assessment of effects has been undertaken in accordance with best practice, legislation and guidance notes. The significance criteria as set out in the EPA Guidelines (2015 and 2017 (Draft)) and listed in **Table 2.1** below and overleaf have been followed throughout this EIAR unless otherwise stated in the methodology for each chapter and/or specialist reports.

Table 2.1 EIAR Assessment Criteria

Significance Level	Criteria
Profound	An effect which obliterates sensitive characteristics.
Very Significant	An effect, which by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.

Table 2.1 EIAR Assessment Criteria cont'd.

Slight	An effect, which causes noticeable changes in the character of the environment without affecting its sensitivities.
Not Significant	An effect, which causes noticeable changes in the character of the environment but without significant consequences.
Imperceptible	An effect capable of measurement but without significant consequences.

As per the EPA Guidelines, effects are considered as being negative, neutral or positive in nature. The extent and context of effects will be described where necessary to aid in the perception of significance.

Effects are also considered as being direct, indirect and/or cumulative, as appropriate. Duration of effects are considered as being:

- Momentary (seconds to minutes);
- Brief (less than a day);
- Temporary (less than one year);
- Short-term (from 1 to 7 years);
- Medium-term (7 to 15 years);
- Long-term (from 15 to 60 years); or
- Permanent (in excess of 60 years).

The frequency of effects will be described where applicable and relevant to establishing the significance.

2.4 Project Team

This EIAR has been prepared by Redkite Environmental Ltd. Refer to website www.redkite.ie for more detail on the company profile.

Siobhan Maher, is the Managing Director of Redkite Environmental Ltd. and she has acted as the lead assessor in the preparation of this EIAR. Her qualifications include a M.Tech. in Environmental Management from the University of Limerick, a B.Sc. in Analytical Science from Dublin City University and a post graduate diploma in Acoustics and Noise Control Engineering from the University of Ulster. She is a full Member of the Institute of Acoustics (MIOA). Siobhan has over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. Siobhan has acted as lead assessor

for over 50 major EIA projects across a number of sectors including major industrial and infrastructural projects.

Siobhan Maher was previously a Technical Director of Malone O' Regan Environmental Services Ltd. from 2001 – 2013 and a Consultant within the firm from 1998 – 2001.

A team of qualified and experienced independent consultants have provided input into this EIAR where required for more detailed or specialised assessments such as biodiversity etc. Specialists who provided input into this EIAR are listed in **Table 2.2** below. Detailed descriptions of their competent expertise is further outlined and provided at the beginning of each relevant technical chapter.

Table 2.2 EIAR Consultants/Specialists

Technical Area	**Consultant**
Biodiversity/Appropriate Assessment	Carl Dixon of Dixon Brosnan
Hydrogeology	Aisling Whelan, IE Consulting
Noise and Vibration	Siobhan Maher, MIOA, Redkite Environmental
Air (odour)	Dr. Brian Sheridan, Odour Monitoring Ireland
Cultural Heritage	Mr. Maurice Hurley, Archaeologist
Landscape & Visual	Aisling Walsh, Ash Ecology & Environmental

3 Chapter Three: Description of the Facility

3.1 Introduction

This chapter provides a detailed overview of the existing facility in terms of unit operations, staff numbers, layout and built structure and current environmental performance including general details on the main emissions to the environment. As noted in the introduction there is no proposed development or associated construction phases that require assessment in this EIAR. This EIAR addresses the existing maximum production capacity of the facility.

3.2 Overview of Layout and Built Structures

The DMIUC facility at Carroll's Cross comprises:

- One main building separated internally into process areas, offices, a factory shop, storage areas for raw materials and products, loading bays and plant rooms;
- Security hut at entrance;
- Two separate staff parking areas with a total of 158 car -parking spaces to the east and west of the security hut;
- Yard areas for access and truck turning, minimal waste handling activities, storage of fuel and cleaning and maintenance chemicals and gas canisters;
- WWTS comprising fat screening, 2 No. settlement ponds, a MBBR tank, chemical phosphorus removal and a 10 pond ICW for polishing;
- Water storage tank and treatment hut, and,
- External mechanical plant platform.

Refer to **Figure 3.1 Site Layout.**

3.2.1 Main Building

The main building is approx. 9,000 m^2 and stands on an overall site of approx. 5.4ha. Both the yard areas and the main building cover approx. 45% of the total site area. The building is solidly constructed from cement blockwork and a high performance insulated panelling system which is designed for low noise breakout and energy efficiency. The main building is approx. 9.15m high.

3.2.2 Facility Access Arrangements

Carroll's Crossroad comprises a staggered junction on the N25. The facility is accessed via a right turning lane onto a local road (L8020) from the N25 when approaching from the west. The approach from the east or Waterford side is directly onto the L8020 off the N25. The junction off the local road into the facility is a roundabout type providing access to both QK stores and staff parking to the east and to the facility to the west. The security hut is set back to allow space off the local road for trucks accessing the facility.

3.2.3 Yard Areas

Yard areas are generally maintained clear for truck access to all parts of the hardstand areas including the north-eastern boundary. There are 3 loading bays associated with the activity. These are located directly behind the security hut, at the south-western corner of the main building and also at the north-eastern corner.

Other than vehicle access, the yard area to the west is used to store small amounts of segregated and/or compacted and enclosed waste for off-site recovery or recycling. Waste is regularly removed throughout the week.

Chemstores, 2 No. gasoil storage tanks, 1 No. Adblue fuel additive, the emergency generator, the external plant platform and some waste metal storage from maintenance and gas canisters are located within the southern yard.

3.2.4 Wastewater Treatment Area

Approx. 55% of the total site area comprises the WWTS which mainly includes the MBBR and the ponds of the ICW within the southern/western portion of the overall site. Refer to **Figure 3.1.**

3.2.5 Drainage

The facility is served by separate surface, foul and trade effluent pipeline systems. Refer to **Figure 3.2,** illustrating the drainage layout. There is one discharge point to the river of treated effluent (SW-4) from the WWTS and three surface water run-off points (SW-1, SW-2 and SW-3).

Surface water from the carpark west of the security hut is collected and piped via an oil/petrol interceptor into a ditch (SW-1) running in a northwest to southeast direction to the Dawn River where it discharges to the river at SW-2 close to an internal footbridge crossing the river.

The remaining surface water from the roofs and yard/hardstand areas discharge via an oil/petrol interceptor to the Dawn River at SW-3 located on the north-eastern boundary.

All domestic effluent is routed to a CASFLO treatment plant (Envirocare Systems Ltd.) and then into the WWTS.

Trade or process effluent is routed via a separate system to the WWTS.

3.3 Unit Operations

The Carroll's Cross facility carries out the following processes – pattie production, burger production, packing of pre-cut meat portions. Boning is not conducted at the facility. All products are either vacuum packed or packed into wax lined boxes to be chilled or frozen. Products are supplied fresh or frozen to wholesalers, further processors, caterers, retailers, Manufacturers and inter-company sales. Unit operations for the production of patties is shown in Diagram 1 overleaf.

The production of patties and burgers occurs on 2 separate lines and accounts for 90% of production at the facility. A smaller area of the facility, known as CX retail is used to slice, joint and mince beef and lamb before weighing and packing into individual portion packs for sale in supermarkets.

As noted in Diagram 1 overleaf, the product process is simple whereby raw materials are taken in, placed in cold storage, brought up to a suitable temperature for processing (tempering), unpacked and then processed using a number of physical methods such as mincing and mixing (where applicable with additives and spices) before the final product is shaped, chilled or frozen, packaged and finally stored before dispatch. There are no chemical treatment methods used in the facility such as curing or smoking.

The production raw materials present on site include fresh and frozen meat and products comprising fresh or frozen meat and other food ingredients such as spices where applicable.

3.3.1 Staff Levels & Operating Hours

The facility currently employs 227 personnel. There are two shifts a day in production (Shift 1 – 07.00 – 15.00 hrs, Shift 2 – 15.00 – 22.00). Approx. 80 – 85 employees work each shift. Office staff comprise the remaining staff numbers.

Cleaning activities occur after 22.00 hrs.

Office staff work from 08.00/09.30 – 17.00/18.30hrs approx.

Shift operations occur over 7 days per week.

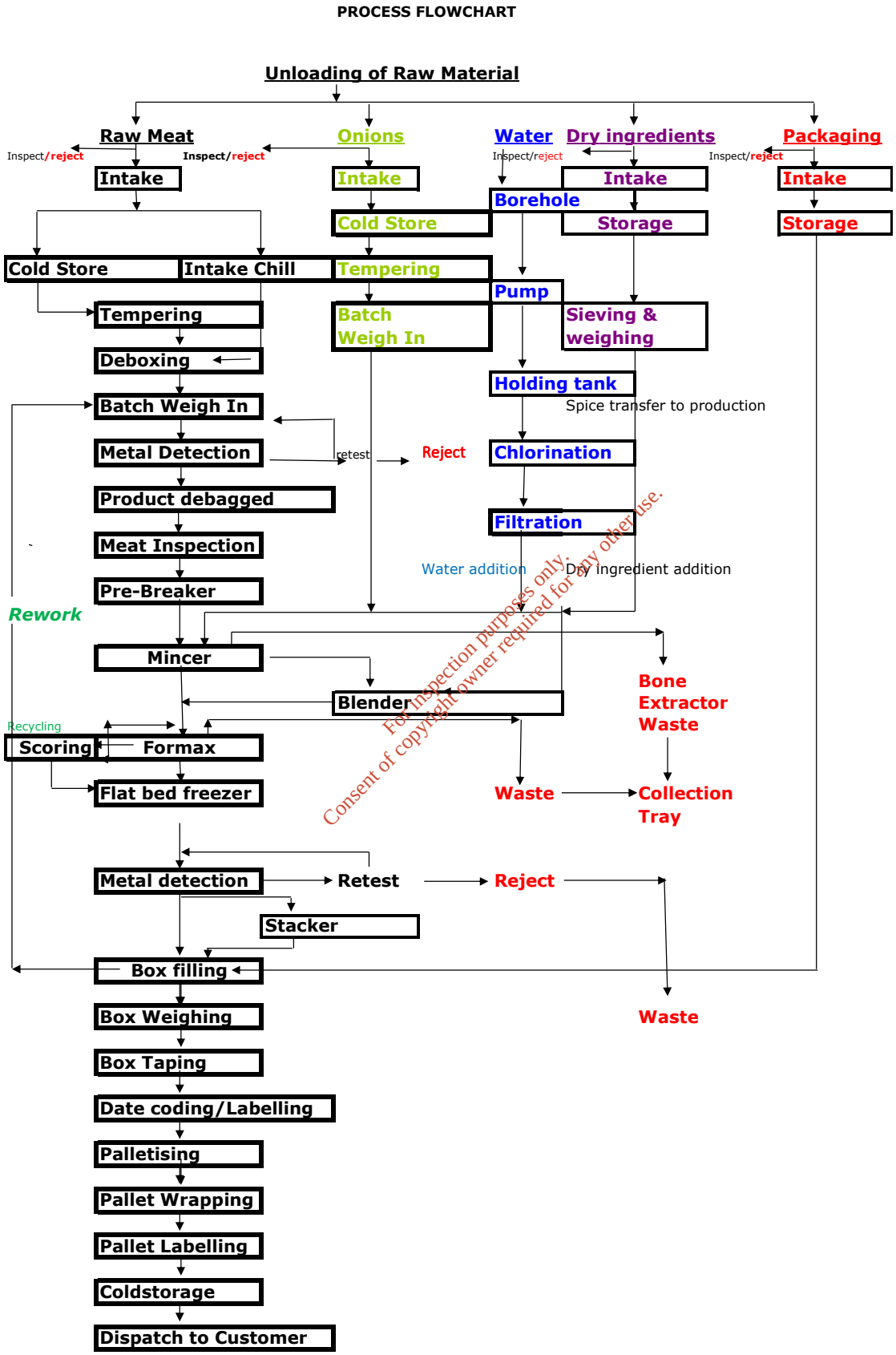
3.3.2 Auxiliary Processes

The production process is supported by auxiliary processes including temperature control/refrigeration/freezing, heat generation and recovery, washing/cleaning, waste management, water treatment and wastewater treatment.

There is no laboratory on site.

The site uses Ammonia as a refrigerant within the Low Temperature and High Temperature Refrigeration Systems. The site has three cold stores which are held at a temperature of -24°C, 4 intake product chills maintaining a temperature of -1°C and 2 Impingement tunnel freezers maintaining a temperature of -50°C. Production areas are held at 7°C.

Diagram 1



Three condensers (1 No. Evapco Eco-air series V-configuration industrial air-cooled condenser and 2 No. Evapco LSC – E Forced Draft Evaporative Condensers are used on site as part of the heat recovery system described as follows:

- Cold water from a dedicated off-site well is pumped into the site.
- The water is then softened and chlorinated and is stored in a cold-water storage tank.
- The water intended for hot water use is then pumped through the heat recovery system.
- Step one involves cooling the refrigeration compressor oil via an oil/water plate heat exchanger, which takes the water from approximately 12ºC to 45ºC.
- The water then passes through Heat Pump 1. The heat source at this point is the MCC Plant Room. The temperature of the water increases from 45ºC to 55ºC after the heat pump compression process.
- The water then moves through Heat Pump 2, which has a heat source from cooling water from Condenser 1 and 2. The temperature of the water then rises from 55ºC to 60ºC. All of this process is controlled by the on-site SCADA system.

A Benton B65-2 boiler with a thermal input of 500 kW run on gas oil is used as a back-up to the heat recovery system. Boiler usage is very low. Less than 1m^3 of gasoil was used in 2017 to fire the boiler.

3.3.3 Chemical Usage

Chemicals used include lubricating oils, antifreeze and coolants for machine maintenance, disinfectants, sanitizers, surfactants, detergents and biocides for cleaning processes and water treatment chemicals including salt for re-softening. Inert gases including nitrogen, oxygen and argon gases (used in the packaging lines) and ammonia used within the closed loop refrigerant system. R134-a, an F-gas is currently used in the heat pumps. Only small amounts of chemicals in small unit containers are stored on site. Diesel is stored in the largest quantity on site in two No. 2,500 lt doubled skinned tanks. Adblue, a fuel additive is also stored in a double-skinned tank of 2,750lt capacity.

3.3.4 Water Usage

Water is supplied from a supply well located approx. 200m north of the site. The groundwater is treated in the on-site water treatment plant located in a stand-alone hut to the southeast of the main building. The annual water usage in 2017 was 42,506m^3.

Washdown of lines with water is completed during the day between different product runs. Excessive cleaning is avoided by scheduling production whereby production changeovers are minimised. For example, simple beef products are produced sequentially followed by lamb followed by products containing additional ingredients and finally products containing potential allergens. More intensive cleaning is conducted on the production lines during the night time period. This comprises high pressure cleaning and foaming. Specific disinfectants/biocides are

used in dilute form, depending on potential microbes present/product runs. Dry cleaning (sweeping) is done in other areas such as product storage including freezing. Washdown of walls and floors is done weekly in areas such as tempering.

The annual water usage is split between washing, evaporation from the condensers and usage in toilets and the canteen in a 5:2:1 ratio. The condensers use approx. 220m^3 of water per week.

It is estimated that a further 8,300m^3 of water would be used annually if the full production capacity was operational.

3.3.5 Solid Waste Generation

Waste generated on site mainly comprises waste packaging and pallets from incoming raw materials and ancillary chemicals and waste oil and scrap metal from maintenance. The total quantity generated in 2017 was 474.5 tonnes. Approx. 205 tonnes of CAT 1 and CAT 3 animal by-products were also generated in 2017. CAT 1 material arises from the fat removal at the WWTS. The company operates a zero to landfill policy. All waste generated is recovered or recycled.

It is estimated that a further 214 tonnes of waste or an additional 45% would be generated annually if the full production capacity of the plant was operational.

3.4 Production Capacity

The production capacity of the equipment and infrastructure on site is estimated at 283 tonnes per day. The facility currently produces approx. 95 tonnes per day over a 7-day week. This is demand driven and therefore can vary at present from day to day. In reality, production is unlikely to reach the maximum capacity of the equipment due to cleaning down time and staff requirements. As in all plants, there is an amount of redundancy built in to the maximum capacity. However, it is noted that the existing auxiliary systems and in particular the WWTS have sufficient capacity for the full maximum production capacity of the facility.

3.5 Environmental Management

In keeping with group policy, an Environmental Management System (EMS) has been implemented at the Carroll's Cross facility that is certified to ISO14001:2015.

As on all sites within the Dawn Meats Group, the company has implemented an Energy Management System at Carroll's Cross which has recently received accreditation to ISO 50001:2011.

The company has made sustainability an integral part of the company culture. The company has developed a sustainability plan 'Sustainability Today for all our Tomorrows' which has been in place for several years. In this plan, the group has committed to a reduction in 40% water use, 40% energy use and a 50% reduction in carbon footprint by 2020.

Sustainability projects implemented by the group have been recognised through awards on a national level e.g. SEAI and Green awards.

3.6 Wastewater Generation

The key feature of the facility with the potential to impact on the environment is wastewater generation and treatment.

3.6.1 Current Wastewater Characteristics

The total amount of process wastewater produced in 2017 was 22,061.2 m^3 with a daily average of 61m^3 up to a daily maximum of 120.5 m^3 during that year. Accordingly, the amount of process effluent produced by the facility is relatively low compared to other food processing facilities. The BOD and COD average, minimum and maximum concentrations in the raw, untreated wastewater calculated from monthly analysis results from Feb 2014 – Oct 2017 are as follows:

	Average	**Range**
BOD (mg/l)	273	44 - 273
COD(mg/l)	609	134 - 2180

The current hydraulic load is approx. 70m^3 influent per day.

Domestic wastewater from the toilets and canteen are also produced. Based on employee numbers and a wastewater generation rate of 60 lt per day and 30g BOD per day per person this equates to 13.63 m^3 or 113.5 PE per day.

3.6.2 Maximum Wastewater Generation

The figures in Section 3.6.1 above represent current production levels. In the event of increased production output up to the maximum plant capacity, it is envisaged that concentration ranges will remain the same although the hydraulic loading to the WWTS would increase.

3.7 Wastewater Treatment System (WWTS)

Wastewater from production cleaning processes and discharge from the domestic wastewater tank is directed to the WWTS on site.

The WWTS consists of inlet screening and a fat trap, settlement ponds, a moving bed biofim reactor (MBBR) unit and a 10 pond Integrated Constructed Wetland (ICW) with a total pond area (including settlement ponds) of 10,812.4m^2. The flow through the system is indicated on **Figure 3.3.**

Wastewater first passes through a drum screen and 2 chamber fat tank to reduce fat content and then enters the 2 settlement ponds in series to further remove fats before it flows into Pond 1 of the ICW where it is further sieved before collecting in a concrete chamber in Pond 1 for onward pumping to the MBBR tank. The wastewater is fed by gravity into another drum screen to ensure it is solid free before entering the MBBR tank. The MBBR tank is filled with thousands of high density polyethylene biofilm

carriers. These carriers provide additional surface where biofilm can grow and allow for increased treatment of the wastewater. The carriers in the tank increase the surface area for biofilm to grow by 300%. It is this high-density population of bacteria that achieves high-rate biodegradation within the system, while also offering process reliability and ease of operation.

The conditions within the MBBR tank are controlled remotely from a HMI Control Panel located beside the tank. This allows for the control of the two stages which occur within the tank, the anoxic and aerobic stages. The anoxic stage lasts between 20 – 25 minutes, this is set depending on results and trends which are analysed by the site Environmental Coordinator. During the anoxic stage the two mixers which are in the tank are operational, the aim of these is agitate the waste water in the tank to remove air and as such create anoxic conditions. During the anoxic period denitrification will occur through microbiological reactions.

The aerobic stage lasts between 10-15 minutes and is created by a blower pumping air through slotted pipes into the bottom of the tank. During the aerobic stage biological processes which use microorganisms (especially bacteria) to remove biodegradable organic matter. In most cases, organic matter is oxidized by the microorganisms which use it as a source of energy for growth. Simply in this stage the ammoniacal-nitrogen, which is very concentrated in the waste water, is oxidised causing a reaction which removes the ammonia and leaves nitrogen (which is treated in the anoxic stage).

Treated wastewater is then fed through a sieve (to prevent escape of plastic carriers) to a ferric dosing tank to coagulate phosphorus and allow it to precipitate out. The wastewater is then pumped to Pond 2 and on through the remaining ICW ponds (3-10) in series before final discharge by gravity to the Dawn River at SW-4.

The MBBR has excess capacity to treat up to a total of 208m^3 per day which represents maximum production capacity.

The max concentrations of influent that the MBBR can treat are as follows:

COD 1060 mg/l;
BOD 530 mg/l;
BOD/COD ratio > 50%;
SS 300 mg/l;
TN 100 mg/l, and,
TP 10 mg/l.

Therefore, the max daily mass loadings that can be treated are as follows:

Total COD 220 kg;
BOD/COD ratio 50%,
Total nitrogen 20.8 kg, and,
Total phosphorus 2.08 kg.

Any increased flow out can be accommodated in the ICW ponds to ensure that the final discharge to the river will not exceed the assimilative capacity of the Dawn

River and can be maintained within current concentration limits set out in the Licence to Discharge for the facility.

The ICW is effectively a final polishing step as the MBBR has a high removal efficiency. The MBBR was installed in April 2018.

The ICW concept is based on the ability of wetlands to cleanse influent contaminated water; they are free water surface flow systems consisting of a series of shallow ponds, across which influents flow. The bottoms and sides of the ponds have been constructed with onsite soils deemed suitable for use in ICWs in accordance with recognised standards. The ICW onsite has performed to a high level of efficiency as detailed in **Table 3.1** below for existing production figures. It has been the main treatment process on site until recently and was designed for a total influent loading of 80m^3 per day. It is expected that the MBBR will improve the removal of nutrients further as the ICW is now only a polishing step and it will increase treatment capacity to allow for existing production capacity if this should occur in the future.

Table 3.1 Removal Efficiency of WWTS 2014 - 2017 (ICW only)

Parameter	C.O.D.	B.O.D.	Total P as P	Ortho-P as P	Total Nitrogen as N	NH_3 as N	S. Solids	Daily Flow Average 2014 - 2017
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	m^3/day
Influent (Feb 14 - Oct 17)	609.19	273.33	4.46	2.90	65.40	45.14	167.30	70.3
Effluent (Dec 14 - Nov 17)	26.11	2.79	0.40	0.20	3.91	0.29	3.71	52.61
% Removal Efficiency	95.71	98.98	91.07	92.95	94.03	99.36	97.78	-

**Note: 0.5 times the LOD used where result is below the LOD. LODs improved on ammonia and suspended solids in Jan 2017. Therefore, efficiency may even be greater than noted above for these parameters.*

The 10 ponds in the ICW system have an operational water depth of <300mm, are densely vegetated and sequentially arranged to maximise the distance over which the influent must travel for maximum retention time and treatment. Total surface water area within the ICW (including settlement ponds) is approximately 10,812.4m^2. The total area of the ICW including embankments and access roads is approx. 20,000 m^2. Individual pond sizes are detailed overleaf.

Pond No.	**Size (m^2)**
1	1235
2	418
Settlement	109.3

Settlement	109.5
3	226.7
4	370.9
5	397.8
6	766.6
7	1674.6
8	2872.3
9	1307.9
10	1323.8

The ICW was built in two phases of development. The settlement ponds and Ponds 1 - 7 were constructed in 2009 while Ponds 8 -10 were constructed in 2012. The Dawn River flowing in a southwest to northeast direction separates the two phases. Treated effluent from Ponds 1 – 7 flows to an underground tank where it is then pumped across the river to Phase 2 for further retention/treatment. Gravity flow is utilised throughout other than the pumped flow noted above.

The final treated effluent enters a monitoring station hut where automatic sampling using a 24 - hour composite sampler can be conducted.

Continuous flow monitoring is completed on both the influent to the WWTS and on the final discharge.

An assessment of the impact of the final treated effluent on the Dawn River is provided in **Chapter 7 – Water (Hydrology).**

3.8 Emissions to Atmosphere

There are no significant emissions to atmosphere arising from the facility. A small back-up boiler <1 MW thermal input to the heat recovery system is present on site and a 2MW thermal input generator used only in an emergency and when periodically tested as required for emergency planning. The gas oil usage in 2017 of 10,800 lt is indicative of the potential for low emissions to air from combustion sources. The back-up boiler does not come under the requirements of the Medium Combustion Plant Regulations, 2017.

3.8.1 Odour Generation

Openings in the building are kept to a minimum due to the nature of the activity and stringent hygiene requirements of customers.

CAT1 and CAT 2 waste has the potential to generate odours on site however this is avoided through correct storage in enclosed units and regular removal off-site.

The WWTS presents the main potential for odour generation on site. An assessment of the potential for odour impact including dispersion modelling conducted is provided in **Chapter 9 – Air Quality & Odour.**

3.9 Noise

Due to the nature of the activity at the site, the building fabric attenuates much of the noise within the building from the external environment.

The main noise sources on site that can potentially influence the external ambient noise environment are listed below:

1. 3 No. Condensers and a transformer located on a platform on the south/south-eastern façade of the process building;
2. Ammonia plant room entrance on the southern façade of the main building;
3. Truck mounted refrigerator units;
4. Wastewater pump on ground at the southern façade;
5. Loading bay activities at the northern, south-western and north-eastern façade of the main process building;
6. Waste management at the western façade of the process building;
7. Internal traffic on site.

2 No. Evapco LSC – E Forced Draft Evaporative Condensers are the standard in low sound centrifugal fans, forced draft evaporative condensers. The fans and fan motors face south and are not directed towards the nearest Noise Sensitive Locations (NSLs).

As per BAT requirements, electrical ports are provided for truck refrigeration units at loading bays. These can be used instead of diesel.

There are no night time internal truck movements. Road surfaces are maintained and speed limits apply.

An assessment of the impact of noise emissions in relation to the facility is provided in **Chapter 8 - Noise and Vibration.**

3.10 Traffic Generation

There is a total of 158 staff car-parking spaces provided to the east and west of the security hut. Approx. 50 staff cars enter the facility per production shift (07.00 and 15.00 hrs) and a further 40 office staff cars enter during the morning period. Peak hour traffic occurs at approx. 07.00 – 08.00 hrs. On average, approx. 14 HGVs and 11 vans enter and exit the facility over a 24-hour period. These movements occur during the day and evening with no vans or trucks entering or exiting over the night time period. There are approx. 15 – 20 customers per day for the Premium Butcher's shop on site. Opening times are 8.00 – 17.30 Mon-Thurs; 08.00 – 18.00 hrs on Friday and 09.00 – 16.00hrs on Saturday. This shop is closed on Sundays.

4 Chapter Four – Alternatives Considered

4.1 Introduction

The Planning and Development Regulations 2001-2015 as amended, specifies the information to be contained within an EIAR. Schedule 6 1(d) specifies that an EIAR shall include "*An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice taking into account the effects on the environment.*" The 2014 EIA Directive 2014/51/EU (Article 5 paragraph 1d) also outlines the requirement for "*A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.*"

This EIAR does not specifically address a new proposal or expansion plan for which alternatives could be considered. This EIAR deals with existing maximum production capacity. In this regard, a synopsis has been provided in this chapter relating mainly to alternative technologies considered at the facility recently with regard to wastewater treatment and minimising environmental impact.

4.2 Guidance on Assessing Alternatives

Guidance documents produced by the Agency[2] and at EC[3] level provide direction in interpreting the requirements for the evaluation of alternatives. The EU EIA Guidelines on scoping refer to three components in the consideration of alternatives and these include:

- **Alternative locations**
  Some locations have more inherent environmental problems than others. Such sites can usually be avoided in favour of sites which have fewer constraints and more capacity to sustainably assimilate the project. It can be useful to ensure that a range of options that may reasonably be expected to be considered are included in the evaluation.

- **Alternative Layouts**
  Alternative layouts can often be devised to consider how different elements of a proposal can be arranged on a site, typically with different environmental, as well as design, implications.

- **Alternative Designs**
  Most problems will be capable of being resolved by a number of design solutions by varying key aspects such as the shape of buildings or the location of facilities. Where designers are briefed at an early stage on environmental factors, these can usually be considered during the design development process, along with other design parameters.

[2] Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Protection Agency, 2002
[3] Guidance on EIA Scoping, European Commission, 2001

- **Alternative Processes**
  Within each design solution there can be a number of different options as to how the processes or activities of the project can be carried out. These can include such aspects as management of process that affect the volumes and characteristics of emissions, residues, traffic and the use of natural resources.

The Guidelines also state that alternatives are essentially different ways in which the developer, or in this case the operator of an existing activity, can feasibly meet the project objectives. Generally, the EU Guidelines seem to envisage that alternatives are identified and reviewed at the outset of the project while mitigation measures can also play a role in the process in terms of alternatives considered.

The EPA 2002 Guidelines on EIA state that "*the consideration of alternative routes, sites, alignments, layouts, processes, designs or strategies, is the single most effective means of avoiding environmental impacts.*" However, they also note that it is important from the outset to acknowledge the existence of difficulties and limitations when considering alternatives. The EPA continues to discuss these difficulties and limitations at some length and these are summarised below:

- The EPA is only concerned with projects. Many projects arise on account of plans, strategies and policies which have previously been decided upon in some instances. Neither the applicant nor the competent authority can be realistically expected to examine options which have already been previously determined by a higher authority.

- It is important to acknowledge that other non-environmental factors may have equal or overriding importance to the developer, e.g. project economics, land availability, engineering feasibility, planning considerations.

- The consideration of alternatives also needs to be set within the parameters of the availability of land or the need for the project to accommodate demands or opportunities which are site specific. Such considerations should be on the basis of alternatives within a site, e.g. design, layout.

The EPA Guidelines note that alternatives often arise as a result of consultation processes.

4.3 Reasonable Relevant Alternatives Assessed

As per Article 5(1) of the 2014 Directive this section includes 'a description of the reasonable alternatives studied by DMIUC, which are relevant to the project and its specific characteristics and an indication of the main reasons for options chosen, taking into account the effects of the project on the environment'. DMIUC have achieved accreditation to ISO14001:2015 and have recently also achieved accreditation to ISO50001:2011. Accordingly, facility management are very aware of including environmental considerations in feasibility studies for capital investment and new projects. For example, in the past, the ICW was chosen for wastewater treatment due to the perceived environmental benefits of these systems as set out in

Section 4.5.5.1 2006 BREF and 2017 Draft BREF for the FDM sector. The current heat recovery system significantly reduces the use of fossil fuels on site and reduces the facility CO_2 emissions. The facility is considered to be compliant with the requirements of BAT set out in the Energy Efficiency BREF Note and the 2006 BREF for the FDM sector.

The main reasonable relevant alternative and a preferential option that is therefore reviewed in this Chapter to comply with the EPA Guidance produced in 2002 and 2015 and the requirements of the 2014 Directive:

- Alternative Wastewater Treatment Options.

4.3.1 Alternative Wastewater Treatment Options

DMIUC has recently installed an MBBR on site to increase the capacity of the WWTS and to the ensure that significant diffusion of ammonia to groundwater through the ICW is prevented.

MBBRs use specially-designed plastic carrier media elements for biofilm attachment that are held in suspension throughout the reactor by turbulent energy imparted by aeration, liquid recirculation or mechanical mixing energy. In most applications, the reactor is filled between one-third and two-thirds full with carriers.

MBBR technology is not specifically mentioned in the 2006 and 2017 (draft) BREF Notes for the FDM sector. However, it is a fixed film process and other types of this type of process are listed such as trickling filters and biotowers (a form of trickling filter). Integrated fixed film activated sludge (IFAS) is listed as an emerging technique in Section 2.4.4 of the 2017 Draft BREF. The only difference between MBBR and IFAS is that there is no return of activated sludge. MBBR is an enhanced IFAS and can also be referred to as a submerged fixed film system (SFF). Additionally, MBBR is listed in the BREF Notes for the Paper and Pulp Industries and the tanning industry. The International Water Association, Global Trends Report, 2016 notes that MBBRs and IFAS processes are mature technologies that continue to evolve.

Comparison of IFAS and SFF

Integrated Fixed-Film Activated Sludge (IFAS) and Submerged Fixed Film (SFF) both utilize media carriers to create a protected surface for a biofilm to attach. The large surface area of media carriers can provide capacity for a large biomass inventory, increasing treatment capacity and/or reducing tank volume for treatment. There are two types of media carriers, fixed media and moving media, both of which can be used in IFAS and SFF processes.

In a SFF process, media carriers (either fixed or moving media) are installed in the wastewater tanks. The tanks are aerated to maintain a dissolved oxygen concentration for organic contaminants and nutrients removal. Clarifiers are then often used to separate the solids and biomass from the treated wastewater. (Filters are used in the Carroll's Cross site to prevent washout). No sludge recycle with the separated solids and biomass is performed. SFF can also be an anoxic process through the use of submerged mixers that are used to direct the path of the water

through the tank. When utilizing moving media, this process is often referred to as Moving Bed Biofilm Reactor (MBBR).

An IFAS process is similar to the SFF process, and either fixed or moving media can be used. The main difference between the two processes is IFAS recycles part of separated biomass from the clarifier to the treatment tanks, which is regularly referred as returned activated sludge (RAS). Therefore, IFAS combines a fixed-film process with an activated sludge process by recycling the sludge back to the aeration tank to increase biomass inventory and treatment capacity. The lack of RAS in a SFF process reduces the load for clarifier solids inventory management.

Both IFAS and SFF can be used for nitrification, denitrification, and BOD removal. Common reasons for choosing one over the other include cost, site space availability, and ease of operation. For example, SFF does not need equipment for recycling activated sludge, so it is easier to operate and maintain and there is reduced potential for operator error. Since IFAS recycles its sludge, it can provide a more efficient usage of tank volume and lower cost on operation and maintenance over time.

MBBR Advantages and Disadvantages

MBBR is considered a simple, robust, flexible and compact type of treatment. MBBRs have proven to be successful in removing BOD and in ammonia oxidation and nitrogen removal applications.

These systems provide less complex operations while generating less sludge than conventional activated sludge or IFAS processes. As such, a single MBBR system as a single-pass, plug-flow design, is much simpler to operate because it requires less operator input, control and need for experience or understanding of the functionality of the biological process. The key differentiator for moving-bed technology when compared with other biofilm systems is that it combines many of the advantages of activated sludge with the advantages offered by biofilm systems, while simultaneously trying to minimize the drawbacks of each.

Like other submerged-bed biofilm processes, MBBRs help to promote a highly-specialized active biofilm that is well-suited for the particular conditions in a reactor. This highly-active specialized biomass results in high volumetric efficiencies and increased process stability, resulting in a more compact reactor.

Unlike most other submerged-bed biofilm processes, MBBR is a continuous flow-through process, eliminating the need for backwashing of the media to maintain throughput and performance; thus, headloss and operational complexity of the treatment step is minimized.

Moving-bed reactors can offer much of the same flexibility and flow-sheet simplicity as activated sludge processes, allowing multiple reactors to be configured in a flow-through series arrangement to achieve multiple treatment objectives (i.e. BOD removal, nitrification, and pre- and post-denitrification). This occurs without the need for intermediate pumping. Unlike suspended-growth processes, biological performance in the MBBR does not depend on the solids separation step because

most of the active biomass is retained continually in the reactor. The solids concentration leaving the reactor with the treated flow is at least an order of magnitude lower in concentration. As a result, MBBRs are compatible with a variety of different separation techniques, not just conventional clarifiers.

MBBR versatility allows the technology to be considered in a variety of different potential reactor geometries. For upgrades at existing plants, this makes MBBRs well suited for retrofit installation to existing tanks or WWTSs.

When the biomass concentration on MBBR carriers is presented in terms of an equivalent suspended solids concentration, values typically are 1,000 to 5,000 mg/L of suspended solids. Yet, when performance is assessed on a volumetric basis, results show that removal rates can be much higher than those compared with suspended-growth systems. This added volumetric MBBR efficiency can be attributed to the following:

1. High overall biomass activity resulting from effective control of biofilm thickness on the carrier due to the shear imparted by the mixing energy (e.g., aeration);
2. Ability to retain highly-specialized biomass specific to the conditions within each reactor, independent of the overall system solids residence time (SRT); and,
3. Acceptable diffusion rates resulting from the turbulent conditions in the reactor.

Assessment of MBBR against criteria in Annex III of the Industrial Emissions Directive 2010/75/EU

The list of criteria for determining best available techniques is taken from Annex III of the IE Directive and can be used as a guide for the MBBR assessment:

Table 4.1 BAT Assessment Summary

No.	Criteria	Remarks
1	The use of low waste technology	MBBR generate much lower sludge levels for disposal compared to other more conventional techniques and IFAS.
2	Use of less hazardous substances	The system does not utilise hazardous substances.
3	Furthering the recovery and recycling of substances generated and used in the process and of waste where appropriate	Not applicable.
4	Comparable processes, facilities or methods of operation which have been tried with success on an industrial scale	IFAS, trickling filters and biotowers are comparable technologies. MBBR technology was originally developed in Scandinavia in the 1980's and has since matured to be used successfully on a global scale. MBBR is listed as a technology in other industry BREF Notes.

Table 4.1 BAT Assessment Summary (cont'd)

5	Technological advances and changes in scientific knowledge and understanding	IFAS is listed as an emerging technology in the 2017 draft FDM BREF. MBBR is a similar type technology.
6	The nature effects and volume of the emissions concerned	MBBR is a treatment technology nevertheless, MBBR is suitable for the BOD/COD range of the wastewater and in particular is suitable for treatment of wastewater with high levels of ammonia.
7	The commissioning dates for new or existing installations	Not applicable. No BAT Conclusions as yet for the FDM Sector.
8	The length of time needed to introduce the available technique	MBBR was relatively simple to install at the Carroll's Cross site due to the small space requirements, simplicity of the technology and ease of operation.
9	The consumption and nature of raw materials (including water) used in the process and energy efficiency	In the long term, the main potential drawback of MBBR compared to IFAS is higher energy usage. However, relatively speaking, energy usage is much lower than a conventional activated sludge treatment system.
10	The need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it	MBBR is highly effective at reducing ammonia concentrations in the wastewater and therefore will prevent further diffusion of ammonia to groundwater on site.
11	The need to prevent accidents and to minimise the consequences for the environment;	Not applicable.
12	Information published by public international organisations	MBBR is a mature technology at this stage. It has been applied in both the US and Europe for many applications and has proven to be successful. Refer to Section 4.4

Summary

In summary, the MBBR represented the best additional treatment option for the Carroll's Cross facility for a combination of reasons that are site specific as follows:

1. Compact nature. The site is fully developed therefore the small space requirements for the MBBR tank are ideal.
2. Ease of use.
3. Low sludge generation.
4. Suitability to relatively low volume flow and concentration range present in the wastewater generated.
5. High efficiency of removal for pollutants to low levels. Localised elevated ammonia is present in the groundwater downgradient of the ICW. MBBR is a suitable technology for removing ammonia.
6. Level of available assimilative capacity in the Dawn River.

4.4 References

1. BAT in fish processing, Nordic Perspective, TemaNord2015:566
2. Global Trends and Challenges in Water Science, Research and Management, A Compendium of Hot Topics and Features from IWA Specialist Groups, International Water Association, Sept 2016.
3. Best Available Techniques (BAT) Reference Document for the Tanning of Hides and Skins, European Integrated Pollution Prevention and Control Bureau, 2013
4. Best Available Techniques (BAT) Reference Document for the Production of Pulp, Paper and Board, European Integrated Pollution Prevention and Control Bureau, 2015
5. Best Available Techniques (BAT) Reference Document in the Food, Drink and Milk Industries, European Integrated Pollution Prevention and Control Bureau, First Draft, Jan 2017
6. Integrated Pollution Prevention and Control Reference Document on Best Available Techniques in the Food, Drink and Milk Industries, Aug 2006

5 Chapter Five – Biodiversity

5.1 Introduction

This Chapter presents the factual biodiversity information gathered during the desk study and field study as a description of the existing environment at the Carroll's Cross site. 'Biological diversity' or biodiversity is, according to the UN Convention on Biological Diversity (BCD) defined as being the '*variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*'

Article 3 of the EIA Directive 2014/52/EU states that the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

(b) biodiversity, with particular attention to species and habitats protected under Directive 32/43/EEC and Directive 2009/147/EC.

The actual and potential impacts (direct, indirect and cumulative) of the facility on biodiversity present within the site and surroundings are qualitatively assessed in this section. Existing and proposed mitigation measures are identified.

The potential impacts of the activity on the Natura 2000 network of sites (European sites known as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) have been assessed in a standalone Natura Impact Statement (NIS).

5.1.1 Competent Expertise

This Chapter of the EIAR was prepared by Carl Dixon and Ian McDermott of Dixon Brosnan Environmental Consultants.

Carl Dixon MSc (Ecology) is a senior ecologist who has over 20 years' experience in ecological and water quality assessments with particular expertise in freshwater ecology. He also has experience in mammal surveys, invasive species surveys and ecological supervision of large scale projects. Projects in recent years include the Waste to Energy Facility Ringaskiddy, Shannon LNG Project,supervision of the Fermoy Flood Relief Scheme, Skibbereen Flood Relief Scheme, Upgrade of Mallow WWTP Scheme, Douglas Flood Relief Scheme, Great Island Gas Pipeline etc. Carl was involved in previous assessments for the ICW in 2012/2013.

Ian McDermott MSc (Ecology) completed the site survey and is an experienced ecologist with particular expertise in surveying for invasive species, mammal surveys and bird surveys. He carries out ongoing water quality surveys for a range of projects including quarries, WWTPs etc. Likewise, he has carried out ecological surveys for a range of projects including industrial developments, pipelines, quarries, agricultural units etc.

5.2 Consultation

Detailed consultation was completed with IFI and the NPWS in 2012/2013 as part of the planning applications for the ICW and re-routing of the Dawn River.

5.3 Study Assessment & Methodology

This appraisal is based on surveys of the proposed site and surrounding area and a review of desktop data. An ecological survey was carried out on the 30th of April 2018. The assessment follows the structure and protocols detailed in the general guidance listed in Section 2.1 of this document and also the following:

- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (*EU Commission, 2013*)

The appraisal of impacts follows the protocols outlined in guidelines for *Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009*) and *CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition.*

Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a NIS.

5.3.1 Desktop Study

A desktop study was used to identify features of ecological value occurring within the site and those occurring in close proximity to it. A desktop review also allows the key ecological issues to be identified early in the appraisal process and facilitates the planning of appropriate surveys. Sources of information utilised for this report include the following:

- National Parks & Wildlife Service (NPWS) - www.npws.ie
- Environmental Protection Agency (EPA) – www.epa.ie
- National Biodiversity Data Centre – www.biodiversityireland.ie
- Waterford County Biodiversity Action Plan 2008-2013
- Bat Conservation Ireland - http://www.batconservationireland.org
- Birdwatch Ireland - http://www.birdwatchireland.ie/
- British Trust for Ornithology (BTO)-www.BTO.ie
- The Irish Wetland Bird Survey (I-WeBS)
- Atlas of Mammals in Ireland 2010-2015
- Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011)
- Guidance on integrating climate changes and biodiversity into environmental impact assessment (EU Commission, 2013)
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009).
- An Ecological Screening (Habitats Directive) report for the development of an Integrated Constructed Wetland and associated works and extension of the existing development at the Dawn Meats site at Carroll's Cross, Co. Waterford

in response to RFI requests from the planning authority (Ref. 12/351 and 12/363) (DixonBrosnan, 2013).
- Fish Stock survey of the Dawn River in response to RFI requests from the planning authority (Ref. 12/351 and 12/363) (DixonBrosnan, 2013).
- Dawn Meats Site Condition Report Carroll's Cross, Kilmacthomas, Co. Waterford (IE consulting, 2018)
- Q-value assessment of Dawn River, Carroll's Cross, Co. Waterford, VESI Environmental Ltd, May 2017
- Chapter 6 of this EIAR on the assessment of impact on hydrology prepared by Redkite Environmental 2018

Reference were also made to the following key legislation and documents:

European

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (The Birds Directive);
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

Republic of Ireland

- The Wildlife Act 1976 as amended by the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1980, the Wildlife (Amendment) Act 2000, the Wildlife (Amendment) Act 2010, European Communities (Wildlife Act, 1976) (Amendment) Regulations 2017. (The Wildlife Act);
- European Communities (Conservation of Wild Birds) Regulations 1985 (S.I. 291/1985) as amended by S.I. 31/1995;
- European Communities (Natural Habitats) Regulations, S.I. 94/1997 as amended by S.I. 233/1998 & S.I. 378/2005 (The Habitats Regulations);
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011);
- The Flora (Protection) Order, 1999 (S.I. No. 94/1999);
- National Biodiversity Action Plan 2017-2021;
- Threat Response Plan: Otter 2009-2011 (DEHLG, 2009).

5.3.2 Survey Methodology

A survey was carried out at the site on 30th of April 2018. The likelihood of additional ecological impacts occurring, which have not been identified in this EIAR, is considered remote. The following surveys were carried out.

- Habitats were classified according to the classification scheme outlined in the Heritage Council Publication A Guide to Habitats in Ireland (Fossitt, 2000). Habitats were cross referenced with Habitats Directive Annex 1 habitats.
- The facility was surveyed for invasive species and rare floral species.
- All bird species recorded during the walkover survey and habitat survey were recorded.
- A general mammal survey was carried out in conjunction with the habitat survey.
- All aquatic habitats were visually assessed.

5.4 Baseline Description of Existing Conditions

The DMIUC facility is located in a rural setting approximately 16km west of Waterford City and 24km northeast of Dungarvan. The site is bounded to the west by the local road L8020. The national road N25 runs on an east/west axis to the north of the facility. The L4015 or Ballymountain Road runs further east of the facility. QK stores directly adjoins the facility to the northeast. The large abandoned Roadstone (Carroll's Cross) quarry exists to the south and southeast of the facility, separated from the facility by the Waterford to Dungarvan Greenway. The facility consists of the following:

- One main process building housing both process and auxiliary plant, as well as offices;
- Wastewater treatment system (WWTS);
- Water treatment plant and tank;
- Loading bays;
- External plant platform;
- Yard areas for parked trucks and waste storage, and,
- Staff parking area.

The site is located along the banks of the Dawn River which rises approximately 2.7km south west of the DMIUC facility. The facility is therefore located in the upper reaches of the catchment. Land in the upper reaches generally consists of low to moderate quality pasture with planted blocks of coniferous forestry. Elsewhere in the upper reaches, the northern part of the catchment drains into Ballyshonock Reservoir and the stream from this reservoir meets the Dawn River approximately 830m downstream of the DMIUC facility.

The WWTS is located in the southwest of the site and was constructed to treat process wastewater, mainly comprising washings from daily hygiene cleaning. The WWTS includes a Drum Screen Room, 2 settlement ponds, a Moving Bed Biofilm Reactor (MBBR) and a 10 pond Integrated Constructed Wetlands (ICW) and with a small associated sampling hut. The total pond area is approx.10,812.4m^2. The wastewater passes in series through the above stages before discharge to the Dawn River at SW-4. Further detail is provided in Section 3.7 of this document.

Domestic effluent from the toilets and canteen is pumped to a septic tank. The discharge from the septic tank then also enters the WWTS.

The MBBR step is designed to ensure that the full production capacity of the plant can be operated without impact on the Dawn River assimilative capacity. The ICW is effectively a final polishing step.

5.4.1 Designated Conservation Areas

Special Areas of Conservation (SACs) and candidate SACs are protected under the Habitats Directive 92/43/EEC and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Special Protection Areas (SPAs) are protected under the Birds Directive 2009/147/EC and European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Collectively, these sites are referred to as Natura 2000 or European sites. Natural Heritage Areas (NHAs/pNHAs) are national designations under the Wildlife Act 1976, as amended. A Natural Heritage Area (NHA) is designated for its wildlife value and receives statutory protection. A list of proposed NHAs (pNHAs) was published on a non-statutory basis in 1995, but these have not since been statutorily proposed or designated. Consultation with the NPWS is still required if any development is likely to impact on a pNHA.

There are no environmental designations pertaining to the DMIUC site. Thus, the site does not form part of any Natural Heritage Area (NHA), Special Protection Area (SPA), Special Area of Conservation (SAC), candidate Special Area of Conservation (cSAC), Nature Reserve, or National Park.

The DMIUC site is located within 15km of a number of designated sites which are listed in **Table 5.1**. Natura 2000 sites are shown in **Figure 5.1.** The most relevant and closest Natura 2000 site is the Lower River Suir SAC (site code 002137)), into which the Dawn River ultimately discharges. Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a NIS which has been submitted separately as part of this application. The NIS notes that following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the operation of the facility is not having an adverse effect on the integrity of Natura 2000 sites. Given the lack of hydrological connections and/or distances involved no potential impact on pNHAs has been identified.

Table 5.1 Designated Sites and their Location Relative to the DMIUC Boundary

Site	Code	Approx. distance at closest point
Special Area of Conservation (SAC)		
Lower River Suir	002137	6.59km ENE – Hydrological connection
Comeragh Mountains	001952	10.89km W
Tramore Dunes and Backstrand	000671	14.90km SE
Special Protection Area (SPA)		
Mid-Waterford Coast	004193	8.87km S
Proposed Natural Heritage Area (pNHA)		
Comeragh Mountains	001952	10.89km W
Tramore Dunes and Backstrand	000671	14.92km SE
Ballin Lough (Waterford)	001691	4.06km S
Portlaw Woods	000669	8.56km N
Lower River Suir (Coolfin, Portlaw)	000399	8.25km NE
Kilbarry Bog	001700	14.61km E
Islandtarnsey Fen	000666	12.25km SE
Carrickavrantry Reservoir	000660	11.31km SE
Fennor Bog	001697	9.90km SE
Castlecraddock Bog	001695	6.84km ESE
Lissaviron Bog	001705	7.72km SSE
Ballyoyle Head to Tramore	001693	9.05km S
Stradbally Woods	001707	13.42km SW
Fiddown Island	000402	10.41km NNE
Tibberaghny Marshes	000411	12.03km N
River Suir below Carrick-On-Suir	000655	13.16km NNW
Grannyferry	000833	14.89km NE

5.4.2 EPA Biological Monitoring

The EPA carries out a biological assessment of most river channels in the country on a regular basis. The assessments are used to derive Q values, indicators of the biological quality of the water. The biological health of a watercourse provides an indication of long term water quality.

The intermediate ratings Q1-2, Q2-3, Q3-4 and Q4-5 are used to denote transitional conditions, while ratings within parenthesis indicate borderline values. Great importance is attached to the EPA biotic indices, and consequently it is these data that are generally used to form the basis of water quality management plans for

river catchments. The EPA has not monitored the waters of the Dawn River since 1988, therefore there is no EPA biological monitoring data available within the last 10 years for the Dawn River.

The EPA have defined the area in which the Dawn River eventually flows into as the 'Middle Suir Estuary, Transitional Waters'. Transitional waters can be assigned a classification of; High, Good, Moderate, Poor or Bad. The former three are considered to be acceptable, while the latter two water quality ratings are considered as unsatisfactory. Results indicate that water quality of Middle Suir Estuary, which the Dawn River eventually flows into, is classified as Poor, see **Figure 5.2.**

5.4.3 Water Framework Directive – Dawn River

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

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

A) The Water Frameworks Directive assesses the water quality of rivers and coastal waters and ranks their status as follows: High, Good, Moderate, Poor, Bad, Yet to be determined. The status of the Dawn, Tributary of the River Suir was assessed as Good, based on the following parameters.

Table 5.2 WFD Status Parameters

Status Element Description	Dawn, Trib of Suir
General physico-chemical status	Good
Overall ecological status	Good
Monitored water body	Yes

B) The Water Framework Directive also determines the "Risk" level of river and coastal waters as follows:1a – At risk of not achieving Good Status, 1b – Probably at risk of not archiving Good Status, 2a – Expected to achieve Good Status, 2b – strongly expected to achieve Good Status. The Dawn, Trib of Suir was assessed as 1a - At risk of not achieving Good Status based on the following parameters.

Table 5.3 WFD Risk Parameters

Risk Test Description	Dawn, Trib of Suir
EPA diffuse model (2008)	At Risk
Road Wash - Soluble Copper	Not at Risk
Road Wash - Total Zinc	Not at Risk
Road Wash - Total Hydrocarbons	Not at Risk
Railways	Not at Risk
Forestry - Acidification (2008)	Not at Risk
Forestry - Suspended Solids (2008)	Not at Risk
Forestry - Eutrophication (2008)	Probably not at Risk
Overall Unsewered (2008)	Not at Risk
Unsewered Areas - Pathogens (2008)	Probably not at Risk
Unsewered Phosphorus (2008)	Not at Risk
Arable	Probably not at Risk
Sheep Dip	Not at Risk
Forestry - Dangerous Substances	Probably not at Risk
Diffuse Overall -Worst Case (2008)	At Risk
Water balance - Abstraction	Not at Risk
Channelisation (2008)	Not at Risk
Embankments (2008)	Not at Risk
Impoundments	Not at Risk
Water Regulation	Not at Risk
Morphology Overall - Worst Case (2008	Not at Risk
Rivers Overall - Worst Case (2008)	At Risk
WWTPs (2008)	Not at Risk
CSOs	Not at Risk
IPPCs (2008)	Not at Risk
Section 4s (2008)	Not at Risk
Overall Risk from Point Sources - Worst Case (2008)	Not at Risk
Q class/EPA Diffuse Model or worst case of Point and Diffuse (2008)	At Risk

C) The Water Frameworks Directive also sets out the future plans for the protection and restoration of rivers as follows: Protect, Restore – 2015, Restore – 2021 and Restore- 2027. The objective for the Dawn, Trib of Suir is to Protect.

5.4.4 Site Surveys

Habitats

Most of the DMIUC facility and site is composed of buildings and artificial surfaces with low species diversity and minimal ecological value. Scattered around the main facility are a number of flower beds areas of amenity grassland with planted immature trees and non-native hedgerows including a Berberis (*Berberis Atropurpurea*) hedgerow running along the western boundary of the north-western carpark. These habitats are of low ecological value. Just southwest of the main facility is an area that contains a mosaic of habitats. The area around the MBBR comprises disturbed ground due to recent construction which are of low ecological value.

The western boundary is composed of two distinct bands of woodland. The woodland to the southwest of the Dawn River is categorised as Mixed broadleaved/conifer woodland due to the presence of mixed stands of pine and cypress along with a defined row of willow. To the northwest of the Dawn River, the small block of woodland dominated by willow, with hawthorn also recorded. The north-western boundary of the site, located outside the main facility footprint, is composed of a treeline of semi-mature willow with some alder. A drainage ditch which collects surface water/storm water run-off from the car-park in close proximity to the western yard was recorded running in a northwest to southeast direction before being culverted underground. Surface water collected by this drainage ditch is ultimately discharged into the Dawn River at SW-2.

Within the DMIUC site there are three discharges in total to the Dawn River. SW-2 as described above and SW-4 and SW-3. SW-4 is the final discharge from the WWTS while SW-3 is located to the northeast of the site and drains storm water run-off from the building roofs and hardstand.

A section of the Dawn River was diverted into a new channel in August 2011 using a tracked machine. The diversion of the river was undertaken by excavating the new section first in dry ground to minimise silt levels. The works carried out at the new section of watercourse aimed to provide similar hydraulic and morphological characteristics to the original channel.

The section of the Dawn River within the site boundary, shows evidence of past disturbance to the channel form, this is particularly evident along the lower stretches of the river where rock armour is visible. The width and depth of the stream varies throughout but ranges from 0.8m to 4m wide and between 10cm to >1m in depth within the DMIUC site. The river is categorised as a pool-riffle-glide system with a low to moderate gradient. The bed of the river is dominated by gravel and cobbles with patches of sand. Boulders occur sporadically and some areas of bedrock remain visible. Some pockets of fine sediment and some brown algae were also noted.

As most of the river within the DMIUC site was previously modified, riparian vegetation is not well developed with a mixture of grass, herbaceous species and scrub. Species noted include Willow (*Salix spp.*), Gorse (*Ulex europaeus*), Alder (*Alnus glutinosa*), Bramble (*Rubus fruticosus agg.*) and dense Bracken (*Pteridium*

aquilinum). In the southern section of the site, where the stream was not diverted, the riparian vegetation is more complex with bands of riparian woodland/immature woodland and treelines present.

The northern section of the river has little instream vegetation. Instream/emergent vegetation is more abundant in the southern section of the river and the species noted include Floating Bur-reed (*Sparganium angustifolium*), Broad-leaved Pondweed (*Potamogeton natans*) and Water-cress (*Rorippa nastutium-aquatica*), Hemlock Water-dropwort (*Oenanthe crocata*), Yellow Iris (*Iris pseudacorus*), Soft Rush (*Juncus effuses*) and Pendulous Sedge (*Carex pendula*).

Situated to the west/southwest of the main facility is a large area dominated by the ICW ponds. The Dawn River runs in an east-west direction separating two phases of the ICW. The majority of the 10 ponds are densely vegetated with little open water visible. Water flows in series by gravity from Pond 1 -10.

Growing within most ponds are a range of emergent species with Common Reed (*Phragmites australis*) the most abundant species recorded. Other species recorded in high abundance include Bulrush *(Typha latifolia)* and Yellow Iris (*Iris pseudacorus*). The banks of each pond are gently sloping and have become colonised by a number of sapling/immature trees e.g. Willow, Alder and Birch (*Betula spp*). Gorse and soft rush were also recorded. Dividing each of the pools and running around each of their perimeters is an area of maintained amenity grassland.

The ecological value of habitats has defined by utilising the classification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009). It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. The habitats present and their ecological value are described overleaf in **Table 5.4**.

Flora

The DMIUC facility lies within Ordnance Survey National Grid 10km square S40. The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within 10km grid squares. Some 597 flowering plants are listed by the NBDC as present in the grid square S40. **Table 5.5** lists threatened species, designations and 10km grid square. No rare species were recorded during the site survey, nor are they expected to occur given that the habitats within the study area are relatively common.

Table 5.4 Habitats Present within the DMIUC Site Area and their Relative Value

Habitat	Comments	Ecological value (NRA guidelines)
Buildings and artificial surfaces (BL3)/ Amenity grassland (improved) (GA2)/ Flower beds and borders (BC4)/ Spoil and bare ground (ED2)/Recolonising bare ground (ED3)	Highly modified and/or disturbed ground habitats, with low species diversity and of minimal ecological value,	Local importance (Lower value)
Hedgerow (WL1)	The hedgerows recorded within the site are composed of non-native species.	Local importance (Lower value)
Treelines (WL2)	Treelines can provide important habitats for local wildlife such as birds, insects and possibly bats. The treelines recorded within the site connect to larger areas of woodland. In general, these habitats are somewhat fragmented from the wider landscape but add to the diversity in a local context.	Local importance (Lower value)
Riparian woodland(WN5)/immature woodland (WS2) & Mixed broadleaved/conifer woodland (WD2)	Woodland can provide important habitats for local wildlife such as birds, insects, mammals which includes bats. Trees, especially native ones, also play host to numerous insect species which are prey items for both bird and bat species. Large mature trees within a woodland habitat are of particular importance as they can provide essential refuge and breeding sites for many species of mammals and birds, as well as for many invertebrates.	Local importance (Lower value)
Scrub (WS1)/Dense bracken (HD1)	Scrub can be ecologically important, providing foraging and cover for small mammals including bats and mice. Scrub also provides feeding sites for small birds and invertebrates, in addition to nesting habitat for some bird species.	Local importance (Lower value)
Depositing/lowland rivers (FW2)	The riverine habitats adjacent to the site works, provide important habitats for local wildlife including fish, birds, insects, mammals. It can also act as an important commuting route and linking corridor between other local habitat patches. Ultimately discharges to the River Suir.	Local importance (Higher value)
Drainage ditch (FW4)	Low value habitat.	Local importance (Lower value)
Other artificial lakes & ponds (FL8)/Reed & large swamps (FS1).	This is a man-made and highly modified habitat however it can provide feeding sites for small birds and invertebrates, in addition to nesting habitat for birds.	Local importance (Lower value)

Table 5.5 NBDC Flowering and Endangered Flowering Plants for Grid Square S40

Flowering plant Species	Latin Name	Designations
Orange Foxtail	*Alopecurus aequalis*	Protected Species: Flora Protection Order
Cornflower	*Centaurea cyanus*	Threatened Species: Regionally Extinct
Corncockle	*Agrostemma githago*	Threatened Species: Regionally Extinct

Fish

During the site survey in 2018, Brown Trout (*Salmo trutta*) were visible within the Dawn River, with the highest concentration noted within the river pools. The section of river which was diverted is considered of similar habitat value for brown trout as the natural channel. An electrofishing fish stock assessment was carried out within the Dawn River by DixonBrosnan in 2013 (Fish Stock survey of the Dawn River in response to RFI requests from the planning authority (Ref. 12/351 and 12/363, DixonBrosnan, 2013). The aims of the survey were as follows:

- Presence/absence for all fish species including lamprey and European eel.
- Presence/absence of Atlantic salmon
- General assessment of value of the Dawn River for other salmonid species.
- Ascertain the possible impacts of works on the site on downstream habitats and to ascertain the value of the reconstructed/modified river channel for fish populations.

Three sections of the Dawn River within the land boundary of the DMIUC site were surveyed. The report concluded that the most upstream section within the DMIUC site is of high local value for brown trout. The large pool, although lacking cover, does support adult fish and the turbulent weir downstream of this pool provides high quality juvenile salmonid habitat. No significant areas suitable for spawning (salmonids/lamprey) were recorded within the site boundary or the section of river downstream of the site boundary.

Three sites were also surveyed along the Dawn River downstream of the DMIUC site and eel, brown trout, stickback and brook lamprey were recorded. The report noted that a large waterfall and hydro-electric scheme in the lower reaches appears to create an insurmountable obstacle to fish such as Atlantic salmon which was not recorded within the catchment. Brook lamprey which does not migrate to sea was recorded at one site on the Dawn River downstream of the DMIUC site.

The report concluded that any impact on the Lower River Suir SAC into which the Dawn River ultimately discharges is likely to have been negligible in the past and given the level of treatment provided by the ICW (main treatment at the time) no significant impacts were predicted to occur in the future.

Otter

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Direct which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Berne Convention on the Conservation of European Wildlife and Natural Habitats and are included in the Convention on International Trade of Endangered species (CITES).

Although rare in parts of Europe they are widely distributed in the Irish countryside in both marine and freshwater habitats. Otters are solitary and nocturnal and as such are rarely seen. Thus, surveys for otters rely on detecting signs of their presence. These include spraints (faeces), anal gland secretions, paths, slides, footprints and remains of prey items. Spraints are of particular value as they are used as territorial markers and are often found on prominent locations such as grass tussocks, stream junctions and under bridges. In addition, they are relatively straightforward to identify.

Otters occasionally dig out their own burrows but generally they make use of existing cavities as resting placing or for breeding sites. Suitable locations include eroded riverbanks, under trees along rivers, under fallen trees, within rock piles or in dry drainage pipes or culverts etc. If ground conditions are suitable the holt may consist of a complex tunnel and chamber system. Otters often lie out above ground especially within reed beds where depressions in the vegetation called "couches" are formed. Generally, holts or resting areas can be located by detecting signs such as spraints or tracks.

In contrast natal holts which are used by breeding females can be extremely difficult to locate. They are often located a considerable distance from any aquatic habitats and otters may also use habitats adjoining small streams with minimal or no fish populations. In addition, natal holts are usually carefully hidden and without obvious sprainting sites. Otters do not have a well-defined breeding season.

It is noted that otters are largely nocturnal, particularly in areas subject to high levels of disturbance as evidenced by the presence of otters in the centre of Cork and Limerick City. Thus, otters are able to adapt to increased noise and activity levels; however, breeding holts are generally located in areas where disturbance is lower.

A review of existing records within a 10km radius of the study site (Grid Square S40) showed that otter or signs of otter have been recorded on 40 occasions, the most recent being in September 2013. A survey for otter was carried out to within 150m of the facility along the Dawn River. Otter spraint, tracks and runs were noted along the northern half of the river in along a section of the previously diverted channel, see **Figure 5.3** including photographs**.** No holts or resting areas (couches) were recorded.

Bats

In Ireland, nine species of bat are currently known to be resident in Ireland. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus pipistrellus*, soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotids*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

A review of existing bat records within a 10km radius of the study site (sourced from BCIreland's National Bat Records Database) showed that the bat species listed in **Table 5.6** have been recorded locally. It is noted that other species which have not been included within this database may also occur.

Table 5.6 Presence of Irish Bat Species within a 10km Radius

Common name	Scientific name	Presence
Lesser Noctule	*Nyctalus leisleri*	Present
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Present
Daubenton's Bat	*Myotis daubentonii*	Present
Brown Long-eared Bat	*Plecotus auritus*	Present

All bat species are protected under the Wildlife Acts (1976 & 2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

- Intentionally kill, injure or take a bat;
- Possess or control any live or dead specimen or anything derived from a bat;
- Wilfully interfere with any structure or place used for breeding or resting by a bat, and,
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

In addition to domestic legislation bats are also protected under the EU Habitats Directive (92/43/EEC) with all bat species are listed in Annex IV of the Directive. The Irish government is also a signatory to the 1979 Bonn convention (Convention on the conservation of migratory species of wild animals) and the 1982 Bern convention (The convention on the conservation of European wildlife and natural habitats) and has a commitment to the 1991 Eurobats agreement (Agreement on the conservation of bats in Europe).

Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains and dead/alive bats. Indicators that potential roost locations and access points are likely to be inactive include the presence of cobwebs and general detritus within the apertures. Bats generally make use of large mature trees that contain natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth (bats may roost within it) and bird and bat boxes. The importance of trees to bats varies with species, season and foraging behaviour. Evidence indicating bat presence, includes dark stains running below holes or cracks, bat droppings, odours, or scratch marks.

Bats also often use features such as rivers, hedgerows, treelines and woodland edges as commuting pathways between roosts and foraging areas. Sheltering vegetation, such as treelines and woodland, not only acts as cover from potential predators and the weather, but also provides structure for acoustic orientation and navigation. Sheltered areas also allow insects to gather and therefore support bat forging. Activities which affect these bat flyways are likely to have consequences for bats.

The ICW and the Dawn River provide potential foraging habitat for bats. As a linear feature within the wider landscape, bats may also use the Dawn River as a commuting route. The existing buildings within the site are of modern construction (i.e concrete, corrugated iron etc) and are very unlikely to be utilised as bat roosts. Likewise, there are no mature trees within the site boundary which have the potential to provide significant bat roosts. No signs of bats were recorded such as staining, droppings and prey discards during the site survey.

Other Terrestrial Mammals

Fourteen other species of terrestrial mammal have been recorded within a 10km radius of the site, seven of which are protected under the Irish Wildlife Act; Fallow Deer, Badger, Hedgehog, Irish Hare, Irish Stoat, Pine Martin, Red Squirrel and Pygmy Shrew.

Badger (*Meles meles*) and their setts are protected under the provisions of the Wildlife Act 1976, as amended, and it is an offence to intentionally, knowingly or unknowingly kill or injure a protected species, or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. Badger setts are formed by a complex group of interlinked tunnels, and therefore works in proximity to setts can potentially cause damage a protected species. Badgers are also protected under Appendix III of the Berne. No signs of badger, setts or otherwise, were recorded during the site visit.

Fallow Deer (*Dama dama*) Fallow deer are Ireland's second largest deer species and are the most widespread of the deer, found in nearly every county of the island. In Ireland the fallow deer mainly resides in mature deciduous or mixed woodlands which are close to open grassland. This species is not likely to occur within the DMIUC site.

Hedgehog (*Erinaceus europaeus*), also listed on Appendix III of the Berne Convention can be found throughout Ireland, with male hedgehogs having an annual range of around 56 hectares. A number of factors are thought to influence the distribution of hedgehogs in a habitat, with nest sites, food availability and the presence of predators believed to be major contributory factors. Due to the habitats recorded within the site, it is possible that hedgehog could occur.

The Irish hare (*Lepus timidus hibernicus*) is one of three lagomorphs found on the Island of Ireland and the only native lagomorph. It is listed on Appendix III of the Berne Convention, Annex V(a) of the EC Habitats Directive (92/43/EEC) and as an internationally important species in the Irish Red Data Book. While Irish hare have been recorded within the wider landscape (NBDC), it is considered unlikely that Irish hare occurs within the DMIUC site.

Irish Stoat (*Mustela erminea hibernica*) is one of the species protected under regulations (Protection of Wild Animals) in 1980 which enabled Ireland to comply with the provisions of the Bern Convention of European Wildlife and Natural Habitats, which was ratified by Ireland in April 1982. Irish stoats occur in most habitats with sufficient cover, including urban areas. Stoat could potentially occur within the site.

Red Squirrel (*Sciurus vulgaris*) also listed on Appendix III of the Berne Convention can be found throughout Ireland. They are found in all types of habitat but typically are in higher densities in mature mixed broadleaved forests. They can also survive in monoculture coniferous woodland. Red Squirrel has been recorded within a block of woodland approximately 2.3km east of the DMIUC facility (NBDC) however it is unlikely to occur within the DMIUC site.

Pygmy Shrew (*Sorex minutus*) is common throughout mainland Ireland and has a preference for habitats such as hedgerows, woodlands and grasslands. This species could potentially occur within the DMIUC site.

Pine Marten (*Martes martes*) is listed Annex V of the EU Habitats Directive 1992 and Appendix III of the Bern Convention 1979, are habitat specialists, requiring forest or scrub habitat to exist in an area. Pine martin has been recorded approximately 2.5km south of the DMIUC site (NBDC), however it is unlikely to occur within the site itself.

Amphibians and Reptiles

According to records held by the NBDC, Common Frog (*Rana temporaria)* and Smooth Newt (*Lissotriton vulgaris*) are the only amphibians recorded in grid square S40. Both species could potentially occur within the DMIUC site. The Common Lizard (*Zootoca vivipara*) is Ireland's only native terrestrial reptile and is so protected under the Wildlife Act. it is unlikely to occur within the DMIUC site.

Birds

The National Biodiversity Centre online database lists 120 species of bird from within grid square S40. Of these 120 species, 12 are listed under Annex I of the Birds Directive, namely, Red-throated Diver, Chough, Dunlin, Corncrake, Kingfisher, Whooper Swan, European Golden Plover, Little Egret, Hen Harrier, Merlin, Mediterranean Gull and Peregrine Falcon. During surveys of the site and surrounding landscape by DixonBrosnan in 2018 the species listed in **Table 5.7** were recorded.

Overall, the site is of local value for a range of terrestrial bird species that are relatively common in the Irish countryside. The presence of a watercourse i.e. Dawn River and wetland does provide potential habitat for more specialised species such as Kingfisher. Kingfisher (*Alcedo atthis*) is listed on Annex I of the EU Birds Directive and Appendix II of the Bern Convention. The species is Amber-listed in Ireland and BirdLife International has evaluated the European population as depleted, due to a moderate historical decline.

Kingfishers prefer still or gently flowing water with plenty of small fish, and with reeds, rushes or shrubs on the banks for perches. Streams, small rivers, canals and ditches are favoured to open waterbodies, but it also uses lakes, ponds and flooded gravel pits. Egg-laying occurs from March to July. Suitable Kingfisher nesting banks are generally tall vertical banks with soft material into which they can dig their burrows. The size of a Kingfisher territory depends on the amount of food available, and on the bird population in the area. Territories tend to cover at least 1km of river, but may extend over 3/5 km. Any nearby waterbody that provides good fishing will be included in the territory.

Breeding Kingfisher has been recorded in the wider landscape (NBDC) and the Dawn River does support stickleback and trout. Thus, the river does support potential prey and there are some potential perches along the river within the site boundary. However, no kingfisher nesting sites or potential nesting sites were recorded by DixonBrosnan during the surveys.

Reedbeds are generally considered as swamp communities which provide a habitat for a range of specialist species, especially breeding birds. Reedbeds are an ideal breeding habitat for many birds providing material for nest building and shelter from predators. Species like Sedge Warbler and Reed bunting breed in reedbeds. Larger species like Water Rail, Moorhen and Coot can all breed within reedbed habitat. Reedbed habitats can develop a surprisingly high biodiversity value and can support high numbers of invertebrate species. These invertebrates are an important food source for many migratory birds to build up their body fat storage to continue migrating. Reedbed also provides roosting habitat. Species such as swallow and starlings can roost overnight in reedbeds.

Table 5.7 Bird Species Recorded by DixonBrosnan 2018

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Anas platyrhynchos	Mallard		X	X		
Sturnusvulgaris	Starling					X
Erithacus rubecula	Robin					X
Larus marinus	Great black-backed Gull					X
Delichon urbicum	House Martin					X
Turdus merula	Blackbird					
Prunella modularis	Dunnock					
Carduelis carduelis	Goldfinch					
Troglodytes troglodytes	Wren					
Corvus corax	Raven					
Pyrrhula pyrrhula	Bullfinch					
Phylloscopus trochilus	Willow Warbler					
Corvus frugilegus	Rook					
Corvus monedula	Jackdaw					
Pica pica	Magpie					
Fringilla coelebs	Chaffinch					
Corvus cornix	Hooded Crow					
Parus caeruleus	Blue Tit					
Hirundo rustica	Barn Swallow					X
Sylvia atricapilla	Blackcap					
Motacilla cinerea	Grey Wagtail				X	
Motacilla alba yarrellii	Pied Wagtail					
Parus major	Great Tit					
Turdus philomelos	Song Thrush					
Gallinula chloropus	Moorhen					
Emberiza schoeniclus	Reed Bunting					
Acrocephalus schoenobaenus	Sedge Warbler					
Symbol	**Description**					
I	**Annex 1**: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.					
II	**Annex 2**: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.					
III	**Annex 3**: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.					

Invasive Species

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality.

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed and Himalayan balsam, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

The NBDC lists a number of both aquatic and terrestrial high impact invasive species which have been recorded within grid square S40 (**Table 5.8**). However, no high risk invasive species were recorded within the DMIUC site.

Table 5.8 NBDC List of High Impact Invasive Species

Common Name	Latin Name
Japanese Knotweed	*Fallopia japonica*
Himalayan Balsam	*Impatiens glandulifera*
Cherry Laurel	*Prunus laurocerasus*
Ruddy Duck	*Oxyura jamaicensis*
Fallow Deer	*Dama dama*
Grey Squirrel	*Sciurus carolinensis*
American Mink	*Mustela vison*
Rhododendron	*Rhododendron ponticum*
Canadian Waterweed	*Elodea canadensis*
Curly Waterweed	*Lagarosiphon major*

Other species listed by NBDC as Present Within the 10km grid square S40

The National Biodiversity Centre online database lists a range of other species from within grid square S40. **Table 5.9** lists other species recorded within the 10km grid square S40, along with any species considered under threat and provided with legal protection.

Table 5.9 Other Species Recorded within the 10km Grid Square S40

Species Group	Named species
Other Mammals	Wood Mouse, Grey Squirrel, American Mink, Rabbit, Red Fox, Bank Vole.
Annelid	2 species recorded. None protected
Bony fish (Actinopterygii)	2 species recorded. European Eel - Threatened Species: OSPAR Convention & Threatened Species: Critically Endangered
Centipede	4 species recorded. None protected.
Conifer	7 species recorded. None protected.
Fern	18 species recorded. None protected.
Harvestman (Opiliones)	1 species recorded. Not protected.
Hornwort	1 species recorded. Not protected.
Horsetail	7 species recorded. None protected.
Beetle (Coleoptera)	46 species recorded. None protected.
Butterflies	20 species recorded. Wall listed as Endangered. Grayling, Gatekeeper listed as Near Threatened. Dark Green Fritillary listed as Vulnerable. Marsh Fritillary Protected Species: EU Habitats Directive Annex II & Threatened Species: Vulnerable
Caddis fly (Trichoptera)	14 species recorded. None protected.
Dragonfly (Odonata)	16 species recorded. None protected
Earwig (Dermaptera)	1 species recorded. Not protected.
Hymenopteran	7 species recorded. None protected.
Lacewing (Neuroptera)	1 species recorded. Not protected.
Louse (Phthiraptera)	1 species recorded. Not protected.
Mayfly (Ephemeroptera)	1 species recorded. Not protected.
Moths	46 species recorded. None protected.
Orthopteran	2 species recorded. None protected.
Stonefly (Plecoptera)	1 species recorded. Not protected.
Hemiptera	10 species recorded. None protected.
True fly (Diptera)	41 species recorded. None protected.

Table 5.9 Other Species Recorded within the 10km Grid Square S40 (cont'd)

Liverwort	7 species recorded. None protected
Millipede	3 species recorded. None protected.
Mollusc	34 species recorded. Freshwater Pearl Mussel: Protected Species: EU Habitats Directive Annex II & V. Protected Species: Wildlife Acts. Tree Snail listed Vulnerable.
Moss	35 species recorded. River Bristle-moss listed as Near Threatened

5.5 Results of Assessment

Most of the habitats within the site have been significantly modified from the natural state by human activity. However, based on the site visit and findings of water quality assessments, the DMIUC facility is currently not having a significantly negative impact on existing habitats and species.

5.6 Assessment of Impacts

During the continued operation of the DMIUC facility, potential impacts could arise from increased noise and disturbance from site activities which could result in the disturbance/displacement of birds and mammals such as otter. Impacts on water quality could also potentially arise due to the operation of the facility.

Potential impacts on designated Natura 2000 sites (SAC/cSAC/SPA) are specifically addressed in a NIS. The NIS Report states that following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the operation of the facility is not having an adverse effect on the integrity of Natura 2000 sites.

5.6.1 Do Nothing' Impact

Most of the habitats within the site have been significantly modified from the natural state by human activity. If the site were to be left unmanaged, a general pattern of succession would be expected to occur e.g. grassland to scrub to eventually woodland. If sufficient time elapsed without site management, the unused areas of the site would be expected to develop a covering of woodland with a mix of native and introduced species.

5.6.2 Magnitude, Probability and Significance of Impacts

When describing changes/activities and impacts on ecosystem structure and function, important elements to consider include magnitude, duration and probability of occurrence (IEEM, 2006).

Magnitude refers to the 'size' or 'amount' of an impact, determined on a quantitative basis if possible. Duration refers to the time for which the impact is

expected to last prior to recovery or replacement of the resource or feature. This should be defined in relation to ecological characteristics (for example species' lifecycles) rather than human timeframes. Appropriate criteria for the assessment of magnitude and duration for this project are provided in **Tables 5.10 & 5.11** below and overleaf.

Table 5.10 Criteria for Determining the Magnitude of Ecological Impacts

Magnitude	Examples
Very High	e.g. The project (either on its own or with other projects) will result in – The total loss of or very major alteration to key elements/features of the baseline conditions such that post-development/character/composition/attributes will be fundamentally changed and may be lost from the site altogether.
High	e.g. The project (either on its own or with other projects) will result in – Major alterations to key elements/features of the baseline (predevelopment) conditions such that post-development/character/composition/attributes will be fundamentally changed.
Medium	e.g. The project (either on its own or with other projects) will result in – The loss of or alteration to one or more key elements/features of the baseline conditions such that post-development/character/composition/attributes of baseline would be partially changed.
Low	e.g. The project (either on its own or with other projects) will result in – A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline conditions would be similar to predevelopment circumstances/patterns.
Negligible	e.g. The project (either on its own or with other projects) will result in – A very slight change from baseline condition. Change barely distinguished approximating to the "no change" situation.

Table 5.11 Criteria for Assessment of Duration

Duration	Criteria
Permanent	Effects continuing beyond one human generation (c.25 years) are expected. There is likely to be a substantial improvement after this period, whereby these would be described as "very long-term effects."
Temporary	Long term-(15-25 years) Medium (5-15 years) Short term (0-5 years)

5.6.3 Probability of Occurrence

It is important to consider the likelihood that a change/activity will occur as predicted and also the degree of confidence in the assessment of the impact on ecological structure and function. It is noted that no significant changes in the operation of the facility is proposed. The following scale (IEEM, 2006) is often utilised in ecological assessment:

- Certain/near-Certain: probability estimated at 95% chance or higher.
- Probable: probability estimated above 50% but below 95%.
- Unlikely: probability estimated above 5% but less than 50%.
- Extremely Unlikely: probability estimated at less than 5%.

5.6.4 Significance of Impacts

Based on the above and the value of habitats and species a matrix of significance can be used to determine specific impacts. This matrix is shown below in **Table 5.12.**

Table 5.12 Impact Significance Matrix

Impact Significance		Ecological Value				
		Very High	**High**	**Medium**	**Low**	**Negligible**
Magnitude	Very High	Major	Major	Major	Moderate	Minor
	High	Major	Major	Moderate	Minor	Negligible
	Medium	Major	Moderate	Minor	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible

5.6.5 Impacts on Habitats

Impacts on terrestrial habitats are generally restricted to direct removal of habitats and possible impacts from the spread of invasive species; however, the DMIUC facility is currently operational and in the absence of major development in the future no significant impact on habitats is predicted to occur. The facility is currently not operating at its full production capacity, however if this were to occur then the existing WWTS, and in particular the MBBR has the capability to treat any wastewater arisings to within the current assimilative capacity of the river. Minor works in the future will only have minor localised impacts as the habitats recorded within the site boundary are not of high ecological value. The habitat of highest value is the Dawn River and any direct impacts on this river, which have the potential to affect its ecological value, will require a detailed ecological assessment prior to commencement. Overall, the habitats within the site are relatively common and no Annex 1 habitats or rare or uncommon habitats or floral species will be directly affected by the continued operation of the facility.

5.6.6 Impacts on Protected Mammals

Signs of otter were recorded along the Dawn River within the site boundary. Otter, which are largely nocturnal have therefore habitualised to background noise and disturbance generated by the facility. Water quality in the Dawn River is of sufficient quality to support salmonids on which otter feed. In the absence of any significant impacts on water quality or significant increases in noise and disturbance no additional impact on otter will occur. Overall it is concluded that the current impact on otter is negligible. Impacts on otter are specifically addressed by the NIS.

Treeline and woodland habitat provides potential feeding/commuting habitat for bats. The continued operation of the facility will impact on the Dawn River which may provide commuting routes within the wider landscape. Overall the impact from operations at the facility is negligible.

Other mammal species which are protected under the Irish Wildlife Act 1976, as amended, such as Pygmy Shrew, Hedgehog, Stoat etc could potentially occur within the DMIUC site, although no signs of these species were recorded. The impact on this species from the operation of the facility is negligible.

5.6.7 Impacts on Birds

The terrestrial bird species recorded during bird surveys are typical of the types of habitat noted on site and are generally common. No rare or uncommon species or species of high conservation value were recorded. No Kingfisher or Kingfisher breeding sites were recorded during the recent site survey.

Sections of treeline, hedgerow, woodland, reedbed and scrub within the site have some potential to provide suitable nesting and feeding resources for these species. It is also noted that a number of bird boxes have been erected around the site in order to encourage breeding bird populations within the site boundary.

Disturbance can cause sensitive species to deviate from their normal, preferred behaviour, resulting in stress, increased energy expenditure and, in some cases, species mortality. However, as the facility has been operational for some time, the levels of activity will have stabilised and birds in the surrounding landscape will have habitualised to the noise and disturbance factors created by the day to day operations of the facility. The impact on terrestrial birds in habitats within and adjoining the DMIUC site is therefore predicted to remain negligible during operation.

5.6.8 Impacts on other Fauna

No signs of amphibians or reptiles were recorded. The DMIUC site is only likely to support common invertebrate species. Given that the habitats which are within the facilities boundaries are relatively common in the surrounding landscape, any impact on these species as a result of the operation of the facility are negligible.

5.6.9 Impacts on Water Quality

Potential impacts on aquatic habitats which could arise from the abnormal operation of the facility could include increased silt levels in surface water run-off, inadvertent spillages of hydrocarbons from fuel and hydraulic fluid and increased nutrients from treated waste water.

High levels of silt in surface water run-off from the storage areas and yards etc. or from sediment removal from the ICW, could impact in particular on fish species such as salmonids. If of sufficient severity, adult fish could theoretically be affected by increased silt levels as gills may become damaged by exposure to elevated suspended solids levels. Excessive siltation can cause eggs and fry to be smothered. If of sufficient severity, aquatic invertebrates may be smothered by excessive deposits of silt from suspended solids. In areas of stony substrate, silt deposits may result in a change in the macro-invertebrate species composition, favouring less diverse assemblages and impacting on sensitive species. Aquatic plant communities may also be affected by increased siltation. Submerged plants may be stunted and photosynthesis may be reduced.

However, in this instance, yards are maintained in a clean condition with minimal potential of slit generation. Sediment removal from the ICW ponds may be required approximately every 10 years. However, the flow from one pond to another can be manually controlled and thus it is straight forward to minimise any potential for elevated silt levels in discharges to the Dawn River.

Inadvertent spillages of hydrocarbons from onsite machinery could introduce toxic chemicals into the aquatic environment via surface water run-off or groundwater contamination and have a direct toxicological impact on habitats and fauna.

It is noted that forklifts used on site are electric and thus spills could only potentially occur from delivery trucks and cars and minor spills from machinery during minor works. All hydrocarbons within the site are protected from collision and stored within double skinned tanks. Thus, the risk of significant hydrocarbon contamination is minimal.

Eutrophication of the Dawn River may result from inadequate treatment of effluent on site. An excessive supply of nutrients to the Dawn River as a result of inadequate treatment may lead to subsequent losses to the aquatic environment which can lead to adverse effects on the ecology of receiving waters. Eutrophication may lead to excessive plant growth and decay, favouring simple algae and plankton over other more complicated plants, and causes a severe reduction in water quality. Enhanced growth of aquatic vegetation and algal blooms disrupts normal functioning of the ecosystem, causing a variety of problems such as anoxia or loss of oxygen in the water with severe reductions in fish and other animal populations.

As the facility has been operational for a number of years, significant increases in the quantities of storm water requiring control are not anticipated. There are two storm water discharges to the Dawn River from the facility. Surface water from the carpark is collected and piped via an oil/petrol interceptor into a ditch at SW-1 running in a

northwest to southeast direction to the Dawn River where it discharges close to the bridge crossing the river (SW-2). The remaining surface water from the roofs and yard/hardstand areas discharge via an oil/petrol interceptor to the Dawn River on the north-eastern boundary (SW-3). DMIUC regularly inspect, maintain and clean out the interceptors to ensure the absence of mineral oil/petroleum and metals in the run-off.

Wastewater from the manufacturing process is directed to the WWTS on site as described earlier. There is one main emission (SW-4) of final treated effluent from the WWTS to the Dawn River. The flow and quality of the final treated effluent is regularly monitored. The site will adhere to conditions of the site IE licence when granted and to the current discharge licence in the intervening period. The WWTS has capacity to treat effluent arisings from the full production capacity of the plant.

It is noted from Chapter 6 of this EIAR dealing with impacts on hydrogeology, that the ICW has had a localised impact on groundwater in terms of elevated nutrients present. However, it has been concluded by IE Consulting that the risk to groundwater and also to surface water is LOW. Further details are presented in Chapters 6 and 7.

Additionally, Chapter 7 of this EIAR notes that 87 river water samples were taken downstream of the treated effluent discharge between March 2013 and May 2016 by DMIUC. Having assessed the data it was concluded that there is no appreciable difference in water quality downstream of the facility when compared to upstream quality. The river water quality was found to comply with the good status EQSs for key parameters as set out in the Surface Water Regulations 2009 – 2015. Storm water run-off monitoring also indicated that run-off is of good quality. It was concluded therefore that the results of run-off and in river monitoring, indicate that run-off from the parking, yards and building roofs and from the WWTS does not impact on the water quality in the Dawn River.

The report Q-value assessment of Dawn River, Carroll's Cross, Co. Waterford, (VESI Environmental Ltd, May 2017) assessed the results of biological monitoring of the Dawn River at two points, 142 and 187m upstream and downstream respectively from the discharge point of the Integrated Constructed Wetland (ICW).The report concluded that the Q-value rating of 3-4 assigned to both sites were in-line with previous assessments, as far back as 2002, showing that there has been no significant deterioration within the river.

Based on the above there is no indication at present that discharges of surface water or treated waste water from the facility or groundwater inputs are having a significant negative impact on water quality. In the absence of impacts on water quality, the impacts on aquatic ecology will be localised and minor to negligible.

5.7 Mitigation and Enhancement Measures

The MBBR is expected to remove the potential for diffusion of pollutants from the ICW to groundwater as a high level of removal will occur prior to entry to the ICW. Correspondingly, this will further minimise impact on surface water. The MBBR has

only recently been installed however the quality of the final treated effluent is expected to be at least the same or of better quality.

The operational manual which has been prepared for the ICW by VESI Environmental Ltd will be followed with regard to maintenance and inspections of the wetland.

The MBBR will be operated in accordance with the designer's operational manual.

Continued monitoring of the final discharge and the Dawn River will take place in accordance with the requirements of the IE licence in the future and the existing discharge licence in the intervening period.

A detailed emergency response and spillage procedure is in place and all staff are trained with respect to the relevant procedures to be undertaken in the event of any potential release of deleterious material on site and/or into a watercourse. Spill kits are maintained on site and relevant staff are trained in their effective usage. The EPA will be notified under the conditions of the licence regarding notification of incidents. In addition, in the event of spillage of any polluting substance and/or pollution of a watercourse, Waterford County Council, Inland Fisheries Ireland and the NPWS shall also be notified.

Any further built development or further expansion of production capacity with the potential to impact on the Dawn River or to impact significantly on water quality will required a detailed ecological assessment.

5.8 Residual Impacts

The residual impacts are as described under Section 5.6.

5.9 Cumulative Impacts

Cumulative impacts on fauna chiefly relate to increased noise and activity levels and potential impacts on water quality. During the continued operation of the facility, no impact from noise or disturbance is predicted. As the DMIUC facility is not predicted to significantly increase long term noise and disturbance levels within the area, no significant cumulative impacts in respect of noise and disturbance have been identified. Water quality data indicates that the Dawn River is not being affected by the current discharge. The full production capacity of the plant is not currently used however the WWTS has the capacity to deal with any additional effluent arisings within the assimilative capacity of the river to ensure that the current status remains unaffected. In this context no cumulative impacts on water quality have been identified.

5.10 Summary & Conclusions

The biodiversity assessment for the facility has been completed through desk-based study and site survey and assessment of impacts and effects in accordance with recognised standards and guidance.

The DMIUC site supports a range of relatively low value habitats which are common in the wider landscape. The habitat of greatest ecological value is the Dawn River which runs through the site and which supports salmonid species. A range of common countryside birds occur within the terrestrial habitats within the site and additional habitats are provided by the Dawn River and ICW. Signs of otter were recorded along the Dawn River within the site. There are no indications that the discharges from the facility are currently impacting significantly on water quality within the Dawn River. The WWTS has capacity to treat effluent arisings from the full production capacity of the plant. Fauna, including various bird species and otter have habitualised to ongoing noise and activity at the site. Overall therefore the impact on ecology from the continued operation of the facility is considered minor to negligible.

5.11 References

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6 Chapter 6 – Land, Soils and Hydrogeology

6.1 Introduction

The impact of the existing activity and production capacity with respect to land and soils and hydrogeology will be assessed in this section. Mitigation measures are identified and outlined where necessary.

6.1.1 Competent Expertise

IE Consulting were commissioned to undertake an assessment of the potential impacts associated with the activity on the soils, geological and hydrogeological characteristics of the site and surrounding environs. The assessment was led by Aisling Whelan, Associate Director and Senior Hydrogeologist at IE Consulting. Aisling is a Member of the International Association of Hydrogeologists (IAH). A Site Condition Report was prepared by IE Consulting and relevant extracts from the report are presented in this chapter.

There is no land-take arising as the DMIUC site is already fully developed. Over 50% of the site is developed as an ICW and this has some value as a habitat as discussed in the preceding chapter on biodiversity. There is no evidence of soil contamination on site. Accordingly, this chapter mainly deals with hydrogeology and the effects on it. In doing so, the soils and geology of the site and surrounding areas are identified.

6.2 Consultation

No specific consultation was conducted as part of this assessment other than review of information on soils, geology and groundwater held on public data systems and past reports prepared for planning.

6.3 Study Assessment & Methodology

A Site Condition Report was prepared by IE Consulting as part of the IE licence application for the facility. In preparing the Site Condition Report, IE Consulting undertook both a desk-based study and site investigation work including the installation of groundwater monitoring wells and sampling and analysis of groundwater.

Wells were installed by JS Drilling in accordance standard recognised methods for well installation.

Standard protocols were followed when taking samples from the groundwater wells in accordance with *BS ISO 5667-11:2009, BS 6068-6.11:2009 Water quality. Sampling - guidance on sampling of groundwaters.*

6.4 Baseline Description of Existing Conditions

The baseline description of existing conditions is sub-divided into relevant sections concerning geology, soils, hydrogeology and land as the characteristics, though linked, have different risks from the development.

6.4.1 Bedrock Geology

Reference to the 1:100,000 scale map of the Geology of East Cork - Waterford (Sheet 22) (Geological Survey of Ireland (GSI) (1999) indicates that the site is underlain by bedrock from the Middle to Late Ordovician Ross Member (CArs) of the Campile Formation (CAfv). The Ross Member is described as consisting predominantly of massive grey shale, shale with silty laminations, and thin greywackes, with minor debris-flow deposits and acid tuffs. The felsic volcanics of the Campile Formation lie to the south of the site. Reference to Sheet 22 also indicates that two minor northeast/ southwest trending faults are mapped in the vicinity of the site (**Figure 6.1**). One of these faults is mapped directly beneath the ICW and extends under the DMIUC factory building.

6.4.2 Site Geology

Bedrock was encountered in all three shallow monitoring wells drilled in the ICW area of the site. A grey/black SHALE was encountered in all three wells at depths ranging between 2.5 and 16 mbgl. A green/grey slatey MUDSTONE was encountered at 10.2 mbgl in GW3 in the southwest corner of the site. Depths to bedrock in the three wells range between 2.5 and 6.7 mbgl. A well drilled just north of the factory in 2012 recorded weathered rock at 6 mbgl and compotent rock at 15 mbgl.

6.4.3 Soils and Subsoils

Regional Data

The Teagasc/GSI Subsoil Map refers to the subsoils material at the site as Made Ground (made), with undifferentiated Alluvium (A) underlying the newer area of the ICW. The subsoils to the northwest of the site consists of TLPSs soil (Till derived chiefly form Lower Palaeozoic Rocks) as shown on **Figure 6.2,** which is described as Shale Till (Lower Palaeozoic/Devonian). To the south and east of the site subsoils are classified as TaV (Till derived chiefly from Acid Volcanic Rocks).

Site Specific Overview

Three trial pits were excavated in the area of the ICW by VESI Environmental Ltd (30/04/2013). The trial pits were excavated to depths of 2.1m and bedrock was not encountered. Topsoil was encountered at depths of between 0.2-0.5m. The underlying subsoils were described as "gravelly, sandy SILT/CLAY" and "gravely, silty CLAY" with cobbles and occasional boulders.

Three samples for PSD analysis were taken from each of the three trial pits by VESI Environmental Ltd on 16/05/2013.

A high permeability subsoil is characterised by a grain size distribution of <8% fines, whereas a subsoil of moderate permeability is characterised by <35% fines and <12% clay content. A low permeability subsoil has >50% fines or >13% clay.

In all samples, the primary subsoil constituent of SILT/CLAY comprised a higher proportion of SILT than CLAY. The percentage fines ranged between 52.5% and 68.7% for the samples taken. The percentages of CLAY ranged between 6.4% and 14.8%. The result of a permeability test undertaken on TP03 was 9.19 x 10^{-11} m/s. The site assessment report concluded that the in-situ material was suitable for construction of an ICW system (Wastewater treatment system for Dawn Meats Ireland, Carroll's Cross, Co. Waterford - Proposed Integrated Constructed Wetland, VESI Environmental Sept 2012).

The three monitoring wells drilled at the ICW in 2016 showed Fill at the surface at thicknesses of between 1.2m and 2.5 m. This is underlain in all the holes by slightly gravelly CLAY to varying depths. The subsoil is thicker in GW1 and GW2, with depths of the CLAY ranging between 6.0m and 6.7 mbgl. In GW3, at the southern corner of the site, the CLAY only extends to 2.5 mbgl. The CLAY is underlain in all three wells by bedrock. In the well drilled just north of the factory, very soft CLAY was recorded to 6 mbgl. This was underlain by weathered bedrock.

6.4.4 Hydrogeology

Groundwater Body Characteristics & Aquifer Classification

The bedrock underlying the site has been characterised as being part of the Waterford Groundwater Body (GWB), which mainly comprises bedrock classified as a **Regionally Important Aquifer with fissured bedrock (Rf)** (**Figure 6.4**).

The key characteristics of the groundwater body have been identified by the GSI as follows:

- This groundwater body is defined to the north by the River Suir, to the east and west by the extent of the Campile Formation and to the south by the boundary of Hydrometric area 16.
- Groundwater is most likely recharged in the west and south where there is higher rainfall and lower subsoil cover. Groundwater then flows towards the north, discharging to surface water bodies.
- Transmissivity values range from 2m^2/d to 290m^2/d. Effective thickness of this aquifer is probably as deep as 100m.
- In the main area of the groundwater body, subsoil thickness is between 1m and 3m but in local areas there is often between 3m and 5m and rarely more than 5m.
- The regional discharge appears to be towards the Suir River but in many areas there is a poor aquifer between this groundwater body and the River

Suir. Therefore, it is likely that in these areas the groundwater will be forced into the associated surface water bodies e.g. the Dawn River and the Whelan-Bridge River.

- Groundwater flow in the Campile Formation is considered to be entirely through fractures within these rocks. The limited hydrochemical data suggest that the groundwater is of an intermediate type, where no one cation or anion is dominant and the groundwater has roughly equal proportions of calcium, magnesium and sodium (cations) and bicarbonate and chloride (anions).

Groundwater Vulnerability and Depth to Bedrock

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Where the subsoil thickness is <3m, the vulnerability is rated as Extreme (the highest risk situation). Where the subsoil thickness is >3m, the vulnerability is rated as High, Moderate or Low (depending on the nature and thickness of the subsoil). The groundwater vulnerability map for the area indicates that the groundwater vulnerability beneath the majority of the site is High (H) which assumes a depth to bedrock of >3m below ground level (**Figure 6.3,**). The area along the eastern boundary of the site is classified as Extreme (E) vulnerability which assumes a depth to bedrock of <3m below ground level. This is supported by the monitoring well logs which shows depth to bedrock in GW3, along the eastern boundary, as 2.5 mbgl, whereas depth to bedrock in GW1 and GW2 and the borehole north of the factory is between 6.0 and 6.7 mbgl. Immediately to the south and east of the site vulnerability is classified as 'Rock at or near surface' (X) and corresponds to the quarried area.

Groundwater Levels, Flow Direction and Gradients

In the area of the newer ICW, the land slopes at a gradient of 0.15 towards the river. In the case of the older ICW, the land slopes at a gradient of 0.03 towards the river. These gradients were calculated from OS surface topographical mapping (1:50,000 scale).

On site topographical surveying was undertaken on 20 February 2018 to include GW1, GW2, GW3 and a number of points along the Dawn River (**See Table 6.1 & Table 6.2**). The Dawn River flows southwest to northeast through the site dissecting the two phases of the ICW. All the groundwater levels recorded were at a higher elevation than all the surface water levels recorded. The groundwater flow direction beneath the ICW was found to be towards the Dawn River (**Figure 6.5**).

GW1 and GW2 are artesian. The water level in both wells is usually close to the surface, though they are both screened at depths > 8mbgl. GW1 was found to be overflowing on a number of occasions. GW3, which is screened closer to the surface, is unconfined.

Two capped boreholes are present on site. It appears that these wells were artesian based on comments from DMIUC Environmental staff.

Based on drainage patterns, the regional groundwater flow direction is inferred to be north-eastwards towards the River Suir, approximately 7km north-east of the site.

Table 6.1 Casing & Groundwater Levels

GW1		GW2		GW3	
Top of Casing	Groundwater Level	Top of Casing	Groundwater Level	Top of Casing	Groundwater Level
74.0	73.2	75.5	73.9	78.6	74.9

Note: all levels mOD

Table 6.2 River Bed and Water Surface Levels

SW1		SW2		SW3	
River Bed	Surface Water Level	River Bed	Surface Water Level	River Bed	Surface Water Level
72.9	73.2	71.3	71.5	69.9	70.2

Note: all levels mOD

Groundwater Quality

Three groundwater monitoring wells were installed at the ICW complex in 2016. GW1 was installed north of the Dawn River but south of the old ICW ponds (**Figure 6.5**). This acts as a downgradient well for these ponds. GW2 is located south of the Dawn River and north of the new ICW ponds. This acts as a downgradient well for these ponds. GW3 is located south of the new ponds and acts as an upgradient monitoring wells for these ponds. An offsite borehole, which is used as the water supply borehole for the factory was sampled and used as an upgradient well for the old ponds. This borehole is in a farmyard approximately 220m northwest of the site.

Groundwater samples were taken from GW1, GW2 and GW3 in February, June, August and December 2017. Samples were obtained from the offsite supply borehole in August and December 2017. Groundwater samples were analysed for the following parameters:

- Ammoniacal Nitrogen (NH_3-N);
- Alkalinity as $CaCO_3$;
- Ammonium as NH4;
- Calcium;
- Chloride;
- Colour;
- Conductivity;
- Dissolved Iron;
- Magnesium;
- Dissolved Manganese;
- Molybdate Reactive Phosphorus as P;
- Nitrate as NO_3;
- Nitrite as NO_2;
- pH;

- Potassium;
- Sodium;
- Sulphate;
- Total Organic Carbon (TOC);
- Total Hardness as $CACO_3$;
- Total Phosphorous;
- Turbidity (FTU);
- Total Coliforms; and,
- Faecal Coliforms.

The results were tabulated and compared against the Drinking Water MAC (SI No. 122 of 2014) and the Groundwater Threshold Values (SI No. 366 of 2016). The table of results are contained within **Attachment 6.1.**

The results in **Attachment 6.1** show that the ICW ponds are impacting on groundwater at the site.

Ammonium as NH_4 is higher in the two downgradient wells (GW1 & GW2) than in the two upgradient wells (Site Borehole & GW3).

Chloride, Electrical Conductivity, Iron, Magnesium, Manganese, Sodium and Sulphate are also higher in the downgradient wells than the upgradient wells.

This suggests that the ICW ponds having a localised negative impact on groundwater quality in the west of the site.

Nitrate, Total Coliforms and Faecal Coliforms are higher in the upgradient boreholes than the downgradient ones, suggesting off-site sources for these parameters.

Site specific compliance values were calculated for Ammonium (14.8 mg/l), Nitrate (296.3 – 666.6 mg/l) and Phosphate (13.0 mg/l) using standard methodology. These were not exceeded in any of the groundwater wells. The data suggests that the ICW ponds are causing an elevation of ammonium levels, however this is localised and not causing an impact off-site at receptors. Based on monitoring data and on biological sampling, there is no impact on the Dawn River.

This means that although it appears that the ICW ponds are leaking to groundwater, the concentrations are low enough and the dilution in the Dawn River high enough that the leaking liquid will not have a detrimental effect on the river water quality. Furthermore, in this regard, the MBBR is expected to address this potential impact on groundwater in the short to medium term as concentrations entering the ICW greatly reduce.

Groundwater Response Matrix (ICWs)

Using a Regionally Important (Rf) aquifer and High (H) groundwater vulnerability scenario the response matrix for the majority of the site is R1. This can be summarised as follows: An ICW is acceptable, subject to normal good practice. For the area of the site that is Extreme (E) vulnerability, the response matrix is $R3^2$. This can be summarised as: An ICW is generally acceptable, unless a consistent minimum

thickness of 2 m of soil and subsoil can be demonstrated. As the borehole logs show, there is a minimum subsoil thickness of 2m at the ICW.

Groundwater Abstractions

The water supply for the DMIUC facility is obtained from an upgradient well located approximately 220m to the north-west of the site. The drawdown of this well does not appear to be affecting the groundwater at the site. At each groundwater sampling event there was always water in the three monitoring wells at the site. Furthermore, two capped wells on site are artesian. It is assumed that local residents are likely to use private groundwater wells for water supply. A map search on www.water.ie has not revealed any public water supply zones in the Carroll's Cross area. The nearest public water scheme using groundwater is in Kilmacthomas. There have been no complaints of water shortages to DMIUC from assumed private users in the area.

6.5 Results of Assessment

6.5.1 Risk Assessment

The concepts of Risk Assessment and Risk Management have become important tools in the area of environmental protection. The philosophical basis and language of risk is useful in that it provides a logical framework for considering the impact of potentially polluting activities on the environment.

This framework enables a more rigorous systematic approach to decision making. In reality it is putting a recognised framework to what is done intuitively, but by being systematic. In addition, it is an aid in conceptualising the potential impact of the discharge of effluent on the wider environment.

A hazard (source) presents a risk when it is likely to affect something of value (the target/receptor), which in this case is groundwater and/or surface water, which in turn may impact on humans. It is the probability of the hazard occurring and its consequences that is the basis of Risk Assessment.

The conventional Source-Pathway-Receptor model for environmental management can be applied to identify potential sources, receptors and pathways, and hence potential pollutant linkages relating to the site.

For a particular contaminant to present a risk to receptors, three components must be present:

- **Source**: An entity or action that releases contaminants into the environment.
- **Pathway:** A mechanism by which receptors can become exposed to contaminants.
- **Receptors**: The human or ecological component at risk of experiencing an adverse response following exposure to a contaminant.

The qualitative risk assessment presented below is based on the hydrological and hydrogeological information collected to date in relation to the site, and described

in the previous sections of this chapter. The source and potential receptors considered in this assessment are as follows:

Sources: Pollutants associated with the process wastewater discharged to the existing ICW. Oil in the oil tanks on site.
Potential Receptors: Groundwater in the underlying Rf aquifer, shallow groundwater in the subsoil and surface water in the Dawn River.

The various potential **Pathways** considered in this assessment and the presence of pollutant linkages are discussed in **Table 6.3** below.

Table 6.3 Potential Pathways

Potential Pathway	Considerations	Pollutant Linkage Present?
Leakage from the base of the ICW to underlying groundwater	The upper portion of subsoil has a permeability of less than 1x 10^{-10}m/s. The site is classified according to the Groundwater Response Matrix for ICWS as R2[1], "acceptable, subject to normal good practice". This can be summarised as follows: acceptable, subject to normal good practice with the additional requirement that the minimum thickness of subsoil with a permeability of < 1x10^{-8}m/s shall be 750mm. All known groundwater abstractions are upgradient of the ICW. However, the results of groundwater monitoring in GW1, GW2, GW3 and the Offsite borehole indicate that the ICW is affecting groundwater quality.	**Yes, but short term**
Migration of wastewater pollutants to surface water	Any leakage from the ICW will likely be transported via shallow groundwater flow towards the Dawn River. Treated effluent discharge is also discharged to the Dawn River that flows in an easterly direction between the two phases of the ICW. Downstream monitoring data indicates that the treated effluent discharge from the ICW is not likely to be adversely affecting surface water quality in the Dawn River downstream. The downstream monitoring data also indicates that the pollutants observed in the groundwater monitoring wells are not affecting the water Quality in the Dawn River. Site specific compliance values also indicate that parameter concentrations in the groundwater are low enough so as not to exceed surface water guideline values in the Dawn River. The MBBR will in future further reduce risk.	**No**
Migration of oil and/or chemicals stored outside the factory to shallow groundwater and into the Dawn River.	There is the potential for chemicals and oil stored on site to leak, and if they leaked, to make their way to the subsurface, shallow groundwater and the Dawn River. All oil tanks on site are double skinned and bunded, with regular integrity tests undertaken on the bunds. The chemical stores are also bunded, with regular integrity tests undertaken on these. During the last round of integrity tests, all bunds passed. The ground around the factory consists of hardstanding at the surface, so any leaks would pool on the surface, allowing easy bunding and collection.	**No**

The ICW was the main wastewater treatment process on site until very recently. It has now been augmented with the MBBR and therefore the concentrations of pollutants entering the ICW are now expected to be at lower levels. Overall the risk posed by the ICW to groundwater in the past and the immediate short to medium term (before the full effects of the MBBR can be realised) is currently assessed to be LOW for the following reasons:

- The majority of the site is classified according to the Groundwater Response Matrix for ICWS as R2[1]. This can be summarised as follows: acceptable, subject to normal good practice with the additional requirement that the minimum thickness of subsoil with a permeability of < $1x10^{-8}$m/s shall be 750mm.

- Subsoils in the area of the ICW comprise gravelly, sandy SILT/CLAY and gravelly silty CLAY with cobbles and occasional boulders with test results indicating a permeability of 10^{-11}m/s. Online mapping shows that the east of the site is underlain by the same subsoil as at the ICW.

The groundwater well survey has demonstrated that the ICW system is downgradient of all known groundwater abstractions in the surrounding area. On this basis, it is not considered likely that the ICW system impacts or impacted on the site or surrounding users groundwater supply. There is evidence of past and immediate short – medium term localised impact on groundwater quality, but calculations suggest that this impact will not be transferred to the wider groundwater body or to surface waters.

6.6 Assessment of Impacts

The implementation of the MBBR as part of the WWTS ensures that there is adequate capacity to treat wastewater arisings up to maximum production capacity. The ICW is no longer the main treatment facility on site. Accordingly, a downward trend in the concentrations of ortho-phosphate and ammonia in groundwater downgradient of the ICW is expected in the short to medium term.

It is envisaged that water requirements could increase by up to 20% annually in the event of maximum capacity usage. This is not a significant quantity in the context of the underlying aquifer resource.

6.7 Mitigation and Enhancement Measures

It is anticipated that the MBBR step will eliminate/significantly reduce diffusion of pollutants from the ICW to groundwater. The ICW will effectively become a polishing step. Groundwater monitoring and on-going monitoring of the MBBR will occur as part of the IE licence requirements.

DMIUC has implemented ISO14001:2015 on site. Prevention of pollution of groundwater through integrity testing of bunds and pipelines form part of the procedures already implemented on site.

Water conservation is a key consideration at the facility. BAT has been implemented with regard to scheduling of production to reduce cleaning requirements. Water

meters are in place and data is used to evaluate performance and set KPIs for the facility.

Regular groundwater monitoring and assessment will be conducted as part of the IE licence requirements.

6.8 Residual Impacts

The risk to groundwater from the facility is currently assessed to be LOW. Water usage is not likely to be impacting on the groundwater resource. The mitigation measures listed above will ensure that there are no significant impacts on groundwater, or soils and land due to the continued operation of the facility.

6.9 Cumulative Impacts

As the current and future operation of the facility is not deemed to be significantly impacting on land, soil and hydrogeology, no cumulative impacts are expected.

6.10 Summary & Conclusions

An assessment of the impact on soils, geology and hydrogeology has been prepared through desk-based study and site survey including installation of groundwater monitoring wells in 2016 and sampling throughout 2017. Past surveys undertaken as part of the planning application for the ICW such as trial pitting and PSD analysis of soil were reviewed as part of the desk-based study. The GSI and Irish Water websites were consulted for information on boreholes in the area and location of nearby groundwater dependent public water supplies.

There is no landtake as the facility is existing therefore the assessment did not focus on potential impacts on land such as sterilisation for future use, loss of agricultural land or mineral resources as a result of development. Over 50% of the site is developed as wetlands, providing more varied habitat in the area to birds and mammals.

No evidence of potential for contamination of soil has been identified.

The ICW has been found to have a localised effect on groundwater quality with elevated concentrations of ammonium and ortho-phosphate downgradient. However, the risk has been classified as LOW. Site specific compliance values have been calculated for ammonium, o-phosphate and nitrate. Concentrations in groundwater are below these values. The MBBR has recently been installed as part of the WWTS. It is anticipated that this will reduce the potential for diffusion of pollutants from the ICW to groundwater as the majority of pollutants will be removed before entry into the ICW.

The facility uses groundwater as a water supply. There is no evidence that water usage is impacting on the underlying resource. DMIUC has implemented water conservation measures on site. Water usage is relatively low in comparison to other operators in the FDM sector.

Measures such as integrity testing and good housekeeping are in place as part of the EMS implemented on site.

Overall, there are no significant impacts on groundwater, or soils and land due to the continued operation of the facility.

6.11 References

Dawn Meats Ireland Unlimited Company, Site Condition Report, IE Consulting, July 2018.

www.water.ie

https://dcenr.maps.arcgis.com/apps/MapSeries/

7 Chapter 7 – Surface Water

7.1 Introduction

This chapter presents the potential and actual impact of the facility on surface water. Impacts on groundwater are dealt with in the preceding Chapter 6. The existing impact on surface water as a result of current production output is described and assessed in this chapter as well as the potential for impact from additional wastewater arisings in the context of full production capacity where appropriate such as increased wastewater arisings.

The key issue to be addressed in this report include identification and assessment of existing and potential impact on the Dawn River.

This chapter also considers the vulnerability of the site to flooding and the potential to cause flood impacts downstream.

7.1.1 Competent Expertise

This chapter has been prepared by Siobhan Maher whose qualifications include an M.Tech. Environmental Management from the University of Limerick and a B.Sc. Analytical Science specialising in chemistry from Dublin City University. Siobhan is the Managing Director of Redkite Environmental and has over 20 years of experience providing environmental consultancy services to business, industry and public sectors. Siobhan has experience in managing and preparing over 50 EIARs including chapters relating to water quality. She was a Director of Malone O' Regan Environmental Services from 2001 – 2013.

7.2 Consultation

As part of the compilation of data for river water quality, both the EPA and Waterford County Council were consulted.

No further consultation other than review of past Planning Inspector's reports was conducted as there is no proposed development under assessment in this EIAR.

7.3 Study Assessment & Methodology

The assessment included a number of site visits in 2017 and 2018 and a desk-based study which involved reviewing publicly available online resources relating to hydrology and also flooding.

The following sources were reviewed:

- Water Framework Directive – Water Maps Map Viewer (www.wfdireland.ie)
- Environmental Protection Agency (EPA) Envision public viewer (www.epa.ie)

- Office of Public Works www.floodinfo.ie website launched in May 2018 and the Catchment Flood Risk Assessment Management (CFRAM) Flood Mapping, www.cfram.ie

DMIUC has collated monitoring data for the Dawn River both up and downstream of the facility between March 2013 and May 2016. Influent and treated effluent is regularly monitored as per the conditions set out in the current discharge licence for treated wastewater. Accredited external laboratories were/are used to test samples. This data was used in the calculation of the assimilative capacity of the Dawn River. The data was validated against data held by WCC and the EPA.

Licensing of Discharges to Surface Waters, Guidance to the Applicant, Local Authorities Services National Training Group, August 2011, Rev B was used as guidance in completing the assimilative capacity assessment.

7.4 Baseline Description of Existing Conditions

7.4.1 Hydromorphology

The main surface water feature of the site and surrounding areas is the Dawn River which flows from the southwest entering the site at the western boundary between Phase 1 (ponds 1-7) and Phase 2 (ponds 8 -10) of the ICW before flowing along the southern boundary of the site towards the northeast and QK Stores. This is a small river rising approx. 2.7km to the southwest. The facility is therefore in the upper reaches of the river. It eventually discharges to the River Suir some 8km downstream between Kilmeaden and Portlaw.

A section of the Dawn River at the site was diverted into a new channel in August 2011. The works carried out at the new section of watercourse aimed to provide similar hydraulic and morphological characteristics to the original channel.

A ditch within the site runs towards the Dawn River in a north to south direction close to the western extent of the yard and buildings. This is culverted within the site before discharge to the Dawn River. Storm water run-off from the staff car-park discharges to this ditch at SW-1 via an oil petrol interceptor. The ditch is never dry due to the high-water table. A number of artesian wells were present on site in the past. **Figure 7.1** indicates the location of surface water features on site.

7.4.2 Flow

The estimated flow duration curve for the Dawn River in proximity to the site was obtained from the EPA. Refer to **Attachment 7.1**. The 95%ile flow for the section of the Dawn River at Carroll's Cross is 0.026 m^3/sec.

7.4.3 Water Quality

Chapter 5 – Biodiversity presents data based on biological quality and risk status of the Dawn River under the Water Framework Directive. Summary chemical water quality data is presented in **Table 7.1** overleaf for the Dawn River in the immediate upstream and downstream sections of river. **Figure 7.1** illustrates the monitoring

locations and **Attachment 7.2** contains more detailed results. **Table 7.2** provides a comparison to the EQSs set out in the Surface Water Regulations, 2009 – 2015.

Table 7.1 Summarised River Water Quality Results

Location	pH	C.O.D.	B.O.D.	Total Phosphorus as P	Ortho-P as P	Total Nitrogen as N	Nitrate as N	NH_3 as N	S.Solids	O/F/G
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Upstream average	7.08	8.53	1.14	0.056	0.02	7.6	4.3	0.035	5.55	1.04
Upstream max	7.9	53	4	0.27	0.13	39	5.8	0.37	49	4
Downstream average	7.01	7.84	1.08	0.065	0.02	6.45	4.16	0.039	5.8	0.99
Downstream max	7.84	24	2.92	1.04	0.12	31	14	0.16	33	3

Notes: 0.5 times the LOD was assumed where values were listed as below the LOD. Ortho-P values as PO_4 converted to P.
Excluded results for Mar – June 2013 where LOD was too high.

Table 7.2 Comparison to Surface Water Regulations, 2009 – 2015

Parameter	Upstream	Downstream	EQS	
			mean	95%ile
Unit	mg/l	mg/l	mg/l	mg/l
pH	7.08*	7.01*	6 < pH < 9	
BOD	1.14	1.08	≤1.5	≤2.6
Ammonia as N	0.035	0.039	≤0.065	≤0.140
Ortho-P as P	0.02	0.02	≤0.035	≤0.075

*Note: * pH units*

As noted in the table above, the water quality is good and does not deteriorate downstream of the facility.

Water quality testing is also completed by the local authority/EPA on the Dawn River. The data is presented in **Attachment 7.3**. The results are similar to those collated by DMIUC thus validating the background data used in this assessment.

Using the 95%ile flow, mean upstream/background concentrations presented above and 95%ile EQSs as target values, the available assimilative capacity in the river has been calculated in accordance with the equations set out in Appendix C of "*Application for a Licence to Discharge to Surface Waters, Guidance to Applicants,* prepared by the Water Services Training Group. Refer to **Table 7.3** overleaf.

Table 7.3 Available Assimilative Capacity in the Dawn River at Carroll's Cross

Parameter	Available AC of river kg/day
BOD	3.28
Ammonia as N	0.24
Ortho-P	0.12

7.4.4 Flood Risk

Preliminary flood risk assessments were completed by the OPW in 2011 for the whole country. In 2014, risk areas for further assessment were identified. The facility is located within the Suir CFRAM Area. It is not listed as one of the risk areas listed for further assessment.

The OPW has recently launched a new website www.floodinfo.ie containing the Flood Risk Management Plans (FRMP) and floodmaps. The floodmaps cover present day extents of flooding and future scenarios for pluvial, river and/or coastal flooding taking account of climate change such as increases in rainfall and sea level rise. The mapping on the website indicates that the N25 at Carroll's Cross has been subject to recurrent historical flooding due to heavy rainfall. The data relating to the N25 dates back to 2004/2006 and it is noted that other locations along the N25 were also listed as sites of recurrent flooding. This is likely due to drainage arrangements on the N25. Flooding has never occurred on the site and the flood maps do not indicate any downstream flooding. There are 3 discharges to the Dawn River including 2 storm water run-off points from the facility as described in Section 3.2.5 of this EIAR. Potential for onsite or downstream flooding was not addressed in recent Planner's Reports post 2013.

7.5 Results of Assessment

7.5.1 Compliance with Existing ELVs

DMIUC currently discharges treated wastewater to the Dawn River in accordance with the requirements of a licence to discharge trade effluent to surface waters (Ref. No. WPW 04/2004) issued by Waterford County Council.[4] Refer to **Attachment 7.4**. The licence is due for renewal however the application is currently suspended in light of the application to the EPA for authorisation instead. The discharge location (SW-4) is shown on Figure 7.1. **Table 1** of the licence to discharge sets out limits for discharge to the Dawn River and limits for BOD and Suspended Solids on the influent. **Table 2** of the licence sets out the frequency of monitoring requirements on the influent and the effluent. Refer to **Attachment 7.4.**

Summary details of compliance monitoring on the influent and final treated effluent are presented in in the following **Tables 7.4** and **7.5** respectively. Suspended solids are higher than the permitted limit on the influent however this has not presented an issue on the operation of the WWTS due to the presence of 2 settlement ponds and settlement via the remaining 10 ponds. The current authorisation dates from 2004 pre

[4] Now known as Waterford City and County Council

the construction of Phase 2 of the ICW. The maximum influent flow in 2017 was 120.5m^3. There is no limit on the influent flow.

Table 7.4 Influent Monitoring (Monitoring Chamber 1)

Sample Date	B.O.D.	Suspended solids	Sample Date	B.O.D.	Suspended solids
Limit	700	50	Limit	700	50
Unit	mg/l	mg/l	Unit	mg/l	mg/l
04-Feb-14	125	56	*04-Feb-16*	316	220
05-Mar-14	402	580	*09-Mar-16*	130	78
06-Mar-14	402	580	*07-Apr-16*	138	50
01-Apr-14	348	384	*09-May-16*	203	84
06-May-14	360	46	*13-Jun-16*	486	111
03-Jun-14	44	<10	*13-Jul-16*	526	372
02-Jul-14	115.42	104	*12-Aug-16*	475	122
20-Aug-14	279	150	*09-Sep-16*	352	119
17-Oct-14	157	48	*11-Oct-16*	373	90
25-Nov-14	723	418	*02-Nov-16*	308	100
05-Dec-14	168	44	*09-Dec-16*	528	432
12-Jan-15	111	48	*19-Jan-17*	190	162
21-Feb-15	185	67	*08-Feb-17*	124	36
30-Mar-15	154	34	*15-Mar-17*	66	30
07-Apr-15	123	45	*19-Apr-17*	155	60
20-May-15	323	239	*18-May-17*	513	450
05-Jun-15	433	352	*07-Jun-17*	356	113
25-Jul-15	99	86	*27-Jun-17*	332	136
12-Aug-15	61	12	*26-Jul-17*	410	145
01-Sep-15	206	169	*29-Aug-17*	411	361
06-Oct-15	137	86	*19-Sep-17*	438	83
04-Nov-15	152	61	*18-Oct-17*	159	150
14-Dec-15	160	86	*29-Oct-17*	459	420
08-Jan-16	131	77			

Table 7.5 overleaf presents the results of final effluent monitoring. The facility is 100% compliant with existing ELVs for all parameters on the final discharge to the Dawn River with the exception of the 24-hour flow limit.

In this regard, the flow from the ICW is by gravity and therefore influenced by natural factors such as rainfall contribution, processes such as evapotranspiration as well as influent quantities from the facility. Accordingly, there is no direct correlation between the amount of wastewater put through the ICW for treatment and the final daily run-off volume from the ICW. Some days may have no discharge at all to the Dawn River.

Additionally, it is noted that in 2017 the total annual raw wastewater sent to the ICW was 22,061m^3 compared to an annual average final total discharge from the ICW for 2014 – 2017 of 25,157 m^3. The average daily and max. discharge flows for the period 2014 – 2017 were 70.3 and 278m^3 respectively. The 24-hour licence limit is 75m^3 per day. This correlates to 27,375m^3 annually. Accordingly, the annual average discharge flow is below the extrapolated annual limit. **Attachment 7.5** sets out the daily averages and maximum flows of treated effluent from the ICW to the Dawn River for each year to 2017.

Although the discharge flow exceeded the license limit, the concentrations recorded for each parameter were well within and much lower than the licence limits. Therefore, the mass loadings were within the assimilative capacity of the river. It is also noted that there is no direct mathematical relationship between concentrations of key parameters in influent and final discharge from ICWs. Research suggests that high flow will not lead to low concentrations and vice versa.

There is sufficient assimilative capacity in the Dawn River to accept flows above the current license limit.

The limit in the 2004 discharge licence appears to have been set based on the capacity of the ICW.

Table 7.5 Final Effluent Monitoring (Monitoring Chamber 2)

Sample Date	pH	C.O.D.	B.O.D.	Total P as P	Ortho-P as P	Total N as N	NO_3 as N	NH_3 as N	S. Solids	Faecal Coliform	O/F/G
Limit	**6.0 - 8.5**	**120**	**10**	**1**	**0.5**	**5**	**5**	**1**	**10**	**500**	**1**
		mg/l	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**cfu/100ml**	**mg/l**
05-Dec-14	6.9	21	<2	0.25	0.15	4.6	4.3	0.89	<10	ND	<1
12-Jan-15	7.2	21	<2	0.17	0.1	4.6	2.6	0.34	<10	ND	<1
21-Feb-15	7.3	12	<2	<0.1	<0.1	4	2.1	0.29	<10	21	<1
30-Mar-15	7.5	<10	<4	<0.1	<0.1	4.5	4.3	<0.2	<10	ND	<1
07-Apr-15	7.1	40	<2	<0.1	<0.1	3	<1	0.82	<10	ND	<1
20-May-15	6.9	56	<2	0.24	<0.1	2.7	<1	0.76	<10	ND	<1
05-Jun-15	7	62	<2	0.2	<0.1	2.2	<1	0.69	<10	ND	<1
25-Jul-15	7.9	28	5.2	0.94	0.39	<2	0.013	<0.2	<10	ND	<1
12-Aug-15	6.9	39	2.3	0.54	0.17	4.7	0.014	0.94	<10	1	<1
01-Sep-15	7.9	20	2.9	0.24	0.28	2.2	1.3	<0.2	<10	ND	<1
06-Oct-15	7.3	34	5.28	0.44	0.42	4.8	4.3	0.88	<10	14	<1
04-Nov-15	7.6	21	2.9	0.22	<0.1	4.8	3.3	<0.2	<10	<1	<1
14-Dec-15	7.8	22	<2	0.7	0.43	4.9	<1	<0.2	<10	<201	<1
08-Jan-16	7.4	11	<2	0.53	0.42	4.5	1.7	<0.2	<10	ND	<1
04-Feb-16	7.1	16	4.2	0.47	0.42	4.8	4.4	<0.2	<10	ND	<1
09-Mar-16	7.4	13	<2	0.34	0.29	4.7	4.1	<0.2	<10	ND	<1
07-Apr-16	7.4	10	<4	0.28	0.25	4.5	4.4	<0.2	<10	ND	<1

Table 7.5 Final Effluent Monitoring (Monitoring Chamber 2) cont'd

Sample Date	pH	C.O.D.	B.O.D.	Total P as P	Ortho-P as P	Total N as N	NO_3 as N	NH_3 as N	S. Solids	Faecal Coliform	O/F/G
Limit	**6.0 - 8.5**	**120**	**10**	**1**	**0.5**	**5**	**5**	**1**	**10**	**500**	**1**
		mg/l	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**cfu/100ml**	**mg/l**
09-May-16	7.9	16	<4	0.31	0.31	4.9	3.8	<0.2	<10	ND	<1
13-Jun-16	7.6	26	<4	0.73	0.14	4.8	<1	0.82	<10	ND	<1
13-Jul-16	7.2	71	8	0.86	0.44	4.3	2.6	0.7	<10	ND	<1
12-Aug-16	6.9	53	8	0.51	0.41	4.5	<1	0.91	<10	ND	<1
09-Sep-16	6.9	59	6.2	0.54	0.45	4.3	<1	0.87	<10	ND	<1
11-Oct-16	7.4	47	9	0.54	0.49	3.8	3.4	0.43	<10	ND	<1
02-Nov-16	7.2	25	9	0.3	0.24	<2	<1	<0.2	<10	3	<1
14-Dec-16	7.7	41	<2	0.85	0.25	4.6	3.5	0.01	6	ND	<1
04-Jan-17	6.7	22	<3	0.67	0.12	4.2	4.8	0.01	<1	ND	<1
24-Feb-17	6.9	28	8	0.8	0.14	3.6	2	0.01	2	ND	<1
15-Mar-17	7.3	29	<5	0.9	0.11	3	4	0.12	<1	2	<1
19-Apr-17	6.7	12	<2	0.54	0.13	4.6	3.3	0.06	<1	13	<1
18-May-17	6.3	21	<3	0.54	0.13	4.3	4.7	0.04	2	6	<1
07-Jun-17	6.2	22	<3	0.1	0.13	4	2.2	0.03	4	1	<1
27-Jun-17	6.3	13	<2	0.21	0.15	4	2.8	0.08	1	0	<1
26-Jul-17	6.6	14	<2	0.16	0.13	3	2.4	0.16	<1	0	<1
15-Aug-17	7.1	36	<5	0.66	0.12	4	4	0.01	<1	<100	<1

Table 7.5 Final Effluent Monitoring (Monitoring Chamber 2) cont'd

Sample Date	pH	C.O.D.	B.O.D.	Total P as P	Ortho-P as P	Total N as N	NO_3 as N	NH_3 as N	S. Solids	Faecal Coliform	O/F/G
Limit	**6.0 - 8.5**	**120**	**10**	**1**	**0.5**	**5**	**5**	**1**	**10**	**500**	**1**
		mg/l	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**cfu/100ml**	**mg/l**
29-Aug-17	6.3	<4	<2	0.06	0.07	3	3	0.01	<1	<100	<1
19-Sep-17	7	20	<3	0.1	0.08	4.5	3.7	0.02	2	<100	<1
18-Oct-17	6.5	<4	<2	<0.05	0.07	4.5	4.2	<0.01	<1	15	<1
29-Nov-17	6.3	<4	<2	<0.05	0.03	3	3.2	<0.01	<1	6	<1

7.5.2 Performance of WWTS

The efficiency of the ICW element of the WWTS as a treatment method for the wastewater has been independently evaluated periodically since 2012. The latest assessment based on the mean values of monthly samples of influent and final treated effluent are presented in **Table 7.6** below. The ICW has consistently performed since records began with high removal rates as set out below.

Table 7.6 Performance of ICW

Parameter	C.O.D.	B.O.D.	Total P as P	Ortho-P as P	Total Nitrogen as N	NH_3 as N	S. Solids
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Influent (Feb 14 - Oct 17)	609.19	273.33	4.46	2.90	65.40	45.14	167.30
Effluent (Dec 14 - Nov 17)	26.11	2.79	0.40	0.20	3.91	0.29	3.71
% Removal Efficiency	95.71	98.98	91.07	92.95	94.03	99.36	97.78

**Note: 0.5 times the LOD used where result is below the LOD.*

7.5.3 Assimilative Capacity Used

Using the mean final treated effluent concentrations (presented in **Table 7.6** above) max. flow (278m^3/day) and background concentrations presented in **Tables 7.1 and 7.2**, the remaining available assimilative capacity of the River has been calculated and presented below in **Table 7.7.**

Table 7.7 Scenario 1 Remaining Assimilative Capacity

Parameter	Loading kg/day	Remaining Capacity %
BOD	0.78	76
Ammonia as N	0.08	66
Ortho-P	0.06	55

The predicted concentrations in the river based on the current license limits BOD 10mg/l, NH_3-N –1 mg/l and Ortho-P 0.5 mg/l combined with the max. flow recorded (278m^3) using the same background and 95%ile river flow values are predicted to be as follows in **Table 7.8.**

Table 7.8 Predicted Values under Current License Limits & Highest Flow Recorded

Parameter	Predicted Downstream Value (mg/l)
BOD	2.12
Ammonia as N	0.14
Ortho-P as P	0.07

The above values are ≤ the 95%ile EQS values set out in the Surface Water Regulations, 2009 – 2015 for BOD and o-P. It is however noted that the assessment of remaining capacity under the licence limits and high flow indicates that there would be a deficit of 18% and 13% for ammonia and ortho-P respectively.

In this regard it is noted that sampling on the day of the highest flow (14/12/2016 with spells of heavy rainfall preceding and during the day) indicated that the BOD, ammonia and o-P values were 1mg/l, 0.01 mg/l and 0.25 mg/l respectively. In this scenario, the corresponding values in the river would have been well under the 95%ile EQSs. The mass loading to the river and remaining capacity in this scenario are presented in **Table 7.9** below.

Table 7.9 Scenario 2 Remaining Assimilative Capacity

Parameter	Loading kg/day	Remaining Capacity %
BOD	0.28	92
Ammonia as N	0.003	99
Ortho-P	0.07	44

A review of relatively high monthly sampling results against the flows on the day of sampling indicate that high concentrations occurred mainly on days of low flow or at least on days of much lower flow than on the 14/12/2016. **Table 7.10** below presents a snapshot of monthly treated effluent results against flow.

Table 7.10 Flow versus Concentration

Date	Flow m^3/day	BOD mg/l	o-Phosphate as P mg/l	NH_3 as N mg/l
29/11/2017	8.48	1	0.03	0.005
18/10/2017	22.67	1	0.07	0.005
19/9/2017	3.43	1.5	0.08	0.02
29/8/2017	4.55	1	0.07	0.01
15/8/2017	24.34	2.5	0.12	0.01
15/3/2017	29.35	2.5	0.11	0.12
24/2/2017	32.11	8	0.14	0.01
4/1/2017	23.05	1.5	0.12	0.01
14/12/2016	278	1	0.25	0.01
13/7/2016	93.95	8	0.44	0.7
12/8/2015	64.83	2.3	0.17	0.94

7.5.4 Storm Water Run-off

There are three storm water run-off points from the facility to watercourses in the vicinity of the facility. Refer to **Figure 7.1** for the location of run-off points.

Rainfall run-off from the car-park located in the north-western part of the site initially flows via a Klargester NSBP004 Bypass Interceptor to the ditch at point 244878E, 108204N (SW-1) close to the western extents of the yard area. It is then culverted within the site close to the bridge crossing of the Dawn River and finally discharges at SW-2 (244976E, 108164N) into the river just below the bridge.

Clean rainwater run-off from the remainder of the site including the production building roof and yard hardstand areas flows to the Dawn River at SW-3 (245080E, 108275N) located at the north-eastern site boundary close to QK Stores.

In effect there are two run-off points to the Dawn river, although grab samples are taken regularly from all three storm water run-off points including the run-off to the ditch. **Tables 7.11, 7.12** and **7.13** below and overleaf set out the results of monitoring completed in 2017.

Table 7.11 Monitoring Results Run-off to Ditch (SW-1)

Sampling Date	Parameter				
	COD (mg/l)	NH3-N (mg/l)	OFG (mg/l)	Suspended Solids (mg/l)	pH
Surface Water Regulations, 2009	-	≤0.140	-	-	6 < pH < 9
Jan	-	-	-	-	-
Feb	-	-	-	-	-
Mar	5	0.03	0	5	6
Apr	8	0.05	0	14	6.6
May	-	-	-	-	-
June	23	0.3	<2	8	6.6
July	8	0.07	<2	7	6.9
Aug	24	0.02	4	<1	7.7
Sept	4	0.02	0	1	7
Oct	11	0.01	<2	6	7.3
Nov	4	0.01	2	1	7.2
Dec	-	-	-	-	-

Table 7.12 Monitoring Results Run-off to Dawn River downstream of bridge (SW-2)

Sampling Date	Parameter				
	COD (mg/l)	NH3-N (mg/l)	OFG (mg/l)	Suspended Solids (mg/l)	pH
Surface Water Regulations, 2009	-	≤0.140	-	-	6 < pH < 9
Jan	-	-	-	-	-
Feb	-	-	-	-	-
Mar	-	-	-	-	-
Apr	-	-	-	-	-
May	-	-	-	-	-
June	-	-	-	-	-
July	8	0.07	1	7	7
Aug	5	0.02	5	1	7.8
Sept	7	0.06	0	2	6.5
Oct	11	0.01	2	3	7.4
Nov	-	-	-	-	-
Dec	-	-	-	-	-

Table 7.13 Monitoring Results Run-off to Dawn River close to boundary with QK Stores (SW-3)

Sampling Date	Parameter				
	COD (mg/l)	NH3-N (mg/l)	OFG (mg/l)	Suspended Solids (mg/l)	pH
Surface Water Regulations, 2009	-	≤0.140	-	-	6 < pH < 9
Jan	-	-	-	-	-
Feb	-	-	-	-	-
Mar	<4	<0.01	0	3	6.6
Apr	10	<0.01	0	2	6.9
May	-	-	-	-	-
June	19	0.01	<2	5	7
July	-	-	-	-	-
Aug	-	-	-	-	-
Sept	10	0.05	0	10	6.6
Oct	14	0.01	2	3	7.3
Nov	5	0.01	<2	1	7.2
Dec	-	-	-	-	-

As noted from the preceding Tables, the quality of the storm water run-off is good and, where applicable, complies with the EQSs set out in the Surface Water Regulations 2009 – 2015 with the exception of one value for Ammonia taken at SW-1 in June 2017. This was an isolated result and may be due to a laboratory anomaly. Furthermore, in this regard, the run-off to SW-2 is from a car-park only which is not a typical source for ammonia.

COD levels are well under 100mg/l indicating that the run-off comprises clean rainwater. Other parameters are all within acceptable ranges.

7.5.5 Impact on Dawn River of Existing Discharge and Storm Water Run-off

VESI Environmental Ltd were commissioned in May 2017 to undertake a Q-value assessment of the Dawn River at two locations upstream and downstream of the final treated effluent discharge point (SW-1). No deterioration in water quality downstream of the treated discharge. The report is contained in **Attachment 7.6.**

River water monitoring data in **Attachment 7.2** and summarised in **Table 7.1** above shows that the water quality in the river is good and does not deteriorate downstream of the facility.

Overall, the facility does not and will not impact on the objectives for the Dawn River under the Water Framework Directive.

7.5.6 Abnormal Operations/Fire

In the event of a fire, internal firewater arisings will enter the process drains and discharge to the WWTS. Some firewater may also accumulate in yards and discharge to the river via the existing storm water run-off drains.

The ICW ponds are operated to ensure that there is a minimum freeboard of 100mm present in each pond. The area of the ponds is 10,812.4m^2. Therefore, the minimum spare capacity for retention is 1,081.24 m^3. There is also spare capacity in the MBBR and process effluent lines. Therefore, based on the low risk of the facility in terms of fire, current built areas (approx. 9,000m^2), and considering a 20-year 24-hour rainfall return period of 91.2 mm[5], there is likely to be adequate capacity within the WWTS for retention. Pending the results of an in-depth firewater risk assessment, further measures may be implemented to shut off current storm water discharge points to the river in the event of a fire. At present the storm water discharge points are fitted with hydrobrakes.

7.5.7 Flooding

There is no identified risk of flooding either on or off site as a result of the existing facility. As noted above, storm water drains are fitted with hydrobrakes.

[5] From Met Eireann Records derived from a Depth Duration Frequency Model for the Carroll's Cross area.

7.5.8 Elevated Nutrients in Groundwater Affecting Surface Water

As noted in Chapter 6 of this EIAR, elevated concentrations of ammonia and o-phosphate are present in groundwater downgradient of the ICW. However according to IE Consulting in the Site Condition Report, 2018 prepared for the facility, the following is noted:

"Overall the risk posed by the ICW to surface water is currently assessed to be LOW for the following reasons:

- *Although, certain parameters have been detected in the downgradient monitoring wells, indicating the ICW is impacting local groundwater quality, actual downstream sampling results demonstrate that the discharge of final treated effluent does not result in an adverse impact to background water quality in the receiving watercourse (Dawn River).*

- *Groundwater concentrations for Ammonium, Nitrate and Phosphate are less than site specific compliance values. This indicates that the groundwater concentrations of these parameters are not high enough to pose a threat to the Dawn River.*

7.6 Assessment of Impacts

The WWTS on site, with the addition of the MBBR unit, has adequate capacity to deal with additional wastewater arisings from maximum capacity production output. Additional wastewater arisings will have the same concentration levels at higher volume however the final treated effluent discharge will remain within the current assimilative capacity of the river as set out above. It is not anticipated that there will be any impact on the objectives for water quality for the Dawn River under the Water Framework Directive.

7.7 Mitigation and Enhancement Measures

The MBBR and ICW will be maintained and operated in accordance with the designer's specifications.

The MBBR will ensure that levels of nutrients entering the ICW will be low and therefore diffusion to groundwater will be minimised.

Monitoring of intermediate and final discharge (SW-4) will be completed as per the requirements of the existing discharge licence and additional EPA requirements.

DMIUC regularly inspect, maintain and clean out the interceptors to ensure the absence of mineral oil/petroleum and metals in the run-off.

Measures such as automatic shutoff valves linked to the fire alarm system will be implemented to ensure that discharges to the river do not occur during major fire events.

DMIUC operate an EMS on site certified to ISO14001:2015. Staff are trained and procedures are in place to deal with spills.

All chemicals are stored appropriately in chemstores. Gasoil is stored in double skinned tanks in small quantities and in areas protected from collision.

There are no BAT Conclusions published as yet for the FDM sector. Accordingly, the 2006 BREF Notes for the Food, Drink and Milk Industries apply. The EPA has produced a document summarising '*Conclusions on BAT from the Food, Drink and Milk Industries BAT Reference Document'. This* is a vertical BREF that addresses activities for the treatments and processes intended for the manufacture of food products from:

- animal raw materials (other than milk)
- vegetable raw materials, and
- treatment and processing of milk.

The typical FDM wastewater quality after treatment is set out as follows in the EPA document:

Table 7.14 Typical FMD Waste Water Quality after Treatment

Parameter	Concentration (mg/l)
BOD_5	<25
COD	<125
TSS	<50
pH	6-9
Oil and Grease	<10
Total Nitrogen	<10
Total Phosphorus	0.4 - 5
Better levels of BOD_5 and COD can be obtained. It is not always possible or cost effective to achieve the total nitrogen and phosphorus levels shown, in view of local conditions.	

The current WWTS on site complies with the above.

7.8 Residual Impacts

There are no expected residual negative impacts on surface water in the event of normal and abnormal operational scenarios.

7.9 Cumulative Impacts

The facility is located in the upper reaches of the Dawn River. There are no significant discharges in the immediate area further downstream. The impact of additional wastewater arising from maximum production capacity has been considered in this chapter.

7.10 Summary & Conclusions

An assessment of the impact on surface water has been prepared through desk-based study and site survey including extensive monitoring of river water quality both chemical and biological and monitoring of final treated effluent and influent quality.

The assimilative capacity of the Dawn River has been determined from survey data and calculation methods set out in Licensing of Discharges to Surface Waters, Guidance to the Applicant, Local Authorities Services National Training Group, August 2011, Rev B.

The discharge of treated effluent from the facility, up to maximum production capacity will be within the assimilative capacity of the river. Currently, the facility has no adverse impact on the river both in terms of chemical and biological quality based on a comparison of upstream and downstream monitoring data.

Existing storm water run-off quality is good and generally within the EQSs for surface water quality set out in the Surface Water Regulations 2009 – 2015.

The site is not vulnerable to flooding and is not likely to cause downstream flooding. Nevertheless, controls are in place in this regard such as hydrobrakes on storm water run-off points to the river.

Abnormal scenarios such as fire resulting in the generation of firewater can be managed on site to prevent contamination of the river.

Overall, the facility will not impact on the objectives for the Dawn River as set out under the Water Framework Directive to protect current water quality.

7.11 References

Dawn Meats Ireland Unlimited Company, Site Condition Report, IE Consulting, July 2018.

Environmental Protection Agency Ireland mapping (http://gis.epa.ie/)

Licensing of Discharges to Surface Waters, Guidance to the Applicant, Local Authorities Services National Training Group, August 2011, Rev B.

2006 BREF Notes for the Food, Drink and Milk Industries.

8 Chapter Eight – Noise and Vibration

8.1 Introduction

This chapter presents the noise and vibration impact assessment of the facility at Carroll's Cross. The facility is operational and is therefore part of the existing ambient sound environment and is described accordingly in this chapter. The potential for impact from additional noise sources has been addressed in the context of full production capacity where appropriate and mitigation measures are identified.

Key issues to be addressed in this chapter include identification and assessment of existing and potential long-term noise impacts on nearby Noise Sensitive Locations (NSLs).

8.1.1 Competent Expertise

This chapter has been prepared by Siobhan Maher whose qualifications include a M.Tech. in Environmental Management, a B.Sc. in Analytical Science, and a post graduate Dip. in Acoustics and Noise Control Engineering. Siobhan is a full Member of the Institute of Acoustics (MIOA) since 2001. Siobhan is the Managing Director of Redkite Environmental and has over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. Siobhan has experience in, but not limited to the areas of; noise and vibration impact assessment, building acoustics (design and standard assessment), environmental noise prediction, modelling and assessment, selection of appropriate abatement measures and also has extensive experience in occupational noise assessment.

8.2 Consultation

DMIUC has not received noise complaints as a result of existing operations. During the noise survey conducted as part of this assessment, consultation has been undertaken with some local residents at the nearest noise sensitive locations (NSLs). No issues with regard to noise or the facility in general were highlighted.

8.3 Study Assessment & Methodology

8.3.1 Characterisation of the Receiving Environment

The receiving ambient noise environment or existing soundscape has been characterised by field survey.

The measurement methodology followed was in accordance with the recommendations of the following:

- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016, and
- BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound.

A field survey was carried out on the 29th and 30th January 2018. Day, evening and night time monitoring was undertaken to fully characterise the soundscape. In accordance with the requirements of the EPA NG4 Guidelines, a minimum of three, one and two sampling events were conducted at each ambient monitoring location during the day, evening and night time periods respectively.

Ambient noise monitoring was undertaken at 3 NSLs located to the west, north and east of the facility. The noise survey was also conducted directly at two boundary locations. All locations are shown in **Figure 8.1 Noise Monitoring Points** and described in **Table 8.1** below. The Photolog in **Attachment 8.1** illustrates the monitoring locations.

Table 8.1 Description of Noise Monitoring Points

Location	GPS Co-Ordinate (ITM)	Attachment 8.1 Plate No.	Description	Direction
Boundary				
B1	245076E 108277N	8.1, 8.11	At north-eastern boundary with the Dawn River. Opposite new loading bay and close to boundary with QK stores.	ENE
B2	244830E 108072N	8.2, 8.15	At ICW south-western boundary with the adjoining disused quarry development.	SW
Noise Sensitive Locations				
NSL1	244982E 108428N	8.7	NSL1 100m to the north of the facility across the N25 was a former pub but the rear of the building appears to be used as a residence. The meter was located close to the western façade of the building.	N
NSL2	245268E 108335N	8.3, 8.4, 8.8, 8.9	201m to the east, of the facility, beside greenway barrier. Two-storey dwelling.	E
NSL3	244588E 108322N	8.5, 8.6	Bungalow located 302m to the west.	W

Weather conditions during the ambient survey period. **Attachment 8.2** contains Met Eireann weather reports. In summary the conditions were noted as follows:

- 29th January 11.00 – 18.00; 19.30 - 24.00 Dry, cold and calm. Breeze up to 3m/sec recorded. Wind direction from the north.
- 30th January 00.01 – 02.00 Dry, very cold and calm.

Noise measurement was carried out using an NTi XL2 hand-held Sound Level Meter (type 1). The meter was field calibrated before, during and after each survey period using a Larson Davis CAL200 calibrator. A UA 1650 windscreen was used on the microphone.

As required in NG4, details of the monitoring equipment used are provided in **Table 8.2** below.

Table 8.2 Monitoring Equipment Details

Instrument Type	Manufacturer	Model Number	Serial Number
Sound Level Meter	NTi	XL2	A2A-08898-E0
Acoustic Calibrator	Larson/Davis	CAL200	11728
Pre-amp and microphone	NTi	MA220 Pre-amp MC230	5062 8694

The Acoustic Calibrators were calibrated to published data as described and recommended by BS EN 60942:1998 and BS EN 60942:2003. **Attachment 8.3** contains calibration certs for the equipment used.

An LCD Digital Wind Speed Scale Gauge Meter Anemometer was used to measure wind speeds.

Sample periods were 15 minutes for all ambient noise monitoring locations during the survey. The results were saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to the ambient noise environment. Logging was conducted to assist in ascertaining facility-specific noise where required. Detailed field notes were recorded during the survey. The meter was calibrated frequently during the survey. Details are contained in the monitoring summary sheets in **Attachment 8.4**. The frequency of calibration was adjusted depending on observed instrument drift which was <0.1 dB.

8.3.2 Prediction of Noise Impacts

Criteria for Assessment of Noise Impact and Determination of Significance

The following criteria have been used where appropriate to assess potential noise impacts and effects described in this chapter with regard to maximum production capacity:

Table 8.3 Criteria for Noise Impact Assessment

Criteria for Extent of Noise Impact (dB)	Noise Impact Magnitude	Magnitude Rating
>10	Severe	Very high
5 to 10	Substantial	High
3 to 5	Moderate	Medium
1 to 3	Slight	Low
<1	No impact	Very Low

Table 8.3 above describes the noise impact i.e. the change in noise levels with and without sources in place. The table does not however describe whether the change in noise levels is significant. Relying solely on change in noise level is not appropriate because it risks ignoring the context of the noise change. The actual effect on NSLs and hence significance takes account of other relevant factors such as time of day of occurrence, averaging periods, nature of source, frequency spectra, frequency of occurrence and absolute level. The linking of magnitude of impact to likely effects and significance is described in **Table 8.4** below. The above assessment procedure is in line with recently published methodologies set out in BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound and Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, 2014.

Table 8.4 Significance of Effects

Impact Magnitude	Receptor Perception	Significance
Negligible	No discernible effect	Not significant
Slight	Non-intrusive	Less likely to be significant ↓ More likely to be significant
Moderate	Intrusive	
Substantial	Disruptive	
Severe	Physically harmful (e.g. sleep disturbance, cardio-vascular effects)	Always significant

8.3.3 Definitions

The following definitions apply in this report:

L_{Aeq} is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period.

L_{A10} is the A-weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from road traffic.

L_{A90} is the A-weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period.

L_{AFmax} is the maximum A-weighted noise level measured during a cycle with a fast time weighting.

L_{AFmin} is the minimum A-weighted noise level measured during a cycle with a fast time weighting.

$L_{Ar,T}$ - The Rated Noise Level is equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and/or impulsiveness of the sound.

The "A" suffix denotes sound levels that have been "A-weighted" in order to account for the non-linear nature of human hearing to sounds of different frequencies.

Lw - Sound power is the sound energy radiated in all directions by a source. Total sound power in watts is equal to the intensity in watts/m^2 multiplied by the area in m^2.

Tonal sounds are defined as sounds which cover a range of only a few Hz which contains a clearly audible tone, i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.

A simplified objective method for determining if tones are present is set out in Section 5.1 of NG4 and BS4142:2014: Annex C (normative): Objective Method for assessing the audibility of tones in sound: One-third octave method.

According to the simplified method, an audible tone is normally defined as being greater than or equal to the following values in both adjacent one third octave bands:

- 15dB in low frequency one third octave bands (25Hz to 125Hz);
- 8dB in middle frequency bands (160Hz to 400Hz), and;
- 5dB in high frequency bands (500Hz to 10,000Hz).

1/3 Octave Analysis is defined as frequency analysis of sound such that the frequency spectrum is subdivided into narrower bands of one–third of an octave each in order to objectively determine if a sound is tonal or not. The simplified method has been applied in this report.

All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

8.4 Baseline Description of Existing Conditions

8.4.1 Locational Context

The facility is located directly off the N25 at Carroll's Cross, approximately 16km west of Waterford city. The N25 runs on an east/west axis close to the northern boundary of the facility. QK stores directly adjoins the facility to the northeast while a disused quarry lies to the south, southwest and southeast. A small industrial unit, Cross Electrical lies further to the east. The surrounding landscape is undulating, rising up and away from the facility to the southeast and south and is mainly in agricultural use. The area is dotted with detached dwellings and farm buildings. Refer to **Figure 8.1** illustrates the location of the nearest NSLs.

The facility comprises of:

- One main process building housing both process and auxiliary plant, as well as offices;
- WWTS comprising a Drum Screen Room, settlement ponds, MBBR and ICW ponds;
- Water treatment plant and tank;
- Loading bays;
- External plant platform containing condensers and transformers;
- Yard areas for parked trucks, chemical and waste storage, and,
- Staff parking area.

Approx. 55% of the site is covered by the ponds and vegetation of the ICW.

The nearest NSLs are located to the north, east and west of the site within 100m to the north across the N25, 210m to the east and 320m to the west. Refer to **Attachment 8.1, Plates 8.1-8.8,**). The southern boundary of the facility faces onto a large berm (refer to **Attachment 8.1, Plates 8.4-8.5,**) which in effect is the remains of Greenan Hill post quarrying in the adjoining disused quarry. The Waterford Greenway runs between the berm and the facility boundary, see **Attachment 8.1, Plate 8.9**.

8.4.2 Existing Ambient Sound Environment

A summary of the survey results and sources affecting each monitoring location is outlined in the following **Tables 8.5, 8.6 and 8.7** overleaf. Detailed noise monitoring logging and overall 1/3 octave band analysis are contained in **Attachment 8.4.**

8.5 Results of Assessment

The facility is located beside a national road and therefore the ambient noise environment at NSLs in the vicinity of the facility is predominantly influenced by this major transport noise source. The N25 as a traffic noise source comprises of 2 elements; - (a) noise from immediate passing vehicles which is highly variable in level and character and (b) distant steady traffic flow noise

which can contribute to background levels recorded particularly during the day and evening although, the N25 traffic begins to become more intermittent after late evening time and is very sporadic after midnight.

This is illustrated by the $L_{Aeq,15min}$ values recorded during all periods that progressively decrease at all locations with the exception of boundary location B1 as it is screened from the road by the buildings and is therefore predominantly influenced by sources at the facility and also at the adjoining QK stores, refer to **Attachment 8.1, Plate 8.10**. $L_{Aeq,15min}$ values decreased from day to evening at B1 but increased from evening to night time due to the operation of a refrigeration unit at QK stores.

The existing facility is not located in a quiet area or an area of low background sound as defined in NG4.

Therefore, in order to assess current conditions, the following typical limits as set out in NG4 apply at NSLs:

Daytime (07.00 – 19.00 hrs) – 55 dB $L_{Ar,T}$
Evening time (19.00 – 23.00 hrs) – 50 $L_{Ar,T}$
Night time (23.00 – 07.00 hrs) – 45 $L_{Ar,T}$

NG4 Guidance also specifies the following conditions:

> *During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5 dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,t}$ values to determine the appropriate rating level ($L_{Ar,t}$).*
>
> *During the night time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.*

The facility is currently compliant with the above day, evening and night time limits which are considered appropriate for the facility location.

No complaints regarding noise arising from the facility have ever been received by DMIUC.

The main steady sources on site e.g. condensers and ammonia plant room are masked during the day and evening due to traffic noise although these sources become audible both late in the evening period and at night time. These are not tonal in nature at NSLs and, overall it is considered that these sources represent site specific noise at NSLs due to a number of factors including facility layout, low levels of yard activity, topography and intervening distance to NSLs. The night time $L_{A90,15min}$ values are <45 dB and therefore noise from the facility is considered to be compliant with the typical day, evening and night time limit values at all of the 3 representative NSLs. Furthermore, in this regard, the daytime and evening average $L_{A90,15\ min}$ values at all NSLs were below 55 and 50 dB respectively with the exception of NSL1

during the daytime. The exceedance was due to traffic noise which completely masks site sources at this location.

The facility currently implements BAT by installing electrical ports for the operation of truck refrigeration units. These are much quieter than diesel run options. The yard area is quiet at night time and deliveries cease in the evening time until the following morning. The condensers are located to the rear of the facility and thus are screened by the process building from NSLs located to the north, northeast and northwest, see **Attachment 8.1**, **Plate 8.11**. The remains of Greenan Hill forming a boundary with the adjoining disused quarry rises up to the south and screens the facility in this direction as does the topography to the west.

Table 8.5 Daytime Noise Monitoring Results Summary 13.11 – 18.02 hrs (January 2018)

Noise Location	L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}	Comments
B1#1	61	58	61	74	On northwest boundary with river facing QK Stores. This location is influenced by yard activities including a truck parked at the loading bay with the refrigerator unit on at two settings during #1. The refrigerator unit was predominant during #1 however other yard sources commenced during #2 and were louder. These other sources continued during #3 but moved further away from the monitoring location. QK Stores – no sources audible as yard activities in Dawn Meats predominated. The flowing of water in the river was constantly audible but did not contribute significantly to the values recorded due to the predominance of the truck and yard sources. The L_{Aeq} is representative of facility noise at this boundary location. A potential tone at 40Hz was noted in association with the truck refrigerator unit when on during #1.
B1#2	68	57	70	73	
B1#3	61	55	63	83	
Average	**63**	**57**	**65**	-	
B2#1	55	49	58	63	At southwestern boundary of ICW. N25 traffic predominates. Occasional yard sources are discernible and audible including muffled forklifts beeping and waste collection activities however they do not contribute significantly to the L_{Aeq} values recorded due to the N25 traffic source. The condensers are discernible in rare traffic lulls but not tonal. The L_{A90} is more representative of plant noise at this location than the L_{Aeq} although both parameters are heavily influenced by traffic on the N25 during the daytime due to the constant nature of the traffic.
B2#2	54	47	57	64	
B2#3	55	48	58	66	
Average	**55**	**48**	**58**	-	
NSL1#1	69	63	72	78	Opposite northern entrance to the facility on N25. Meter set back 30m from N25 to the western side of the NSL. Dominated by traffic noise. Facility sources are not audible. Traffic noise heavily affected both the L_{Aeq}, and L_{A90} values recorded.
NSL1 #2	69	63	72	78	
NSL1 #3	69	65	72	76	
Average	**69**	**64**	**72**	-	
NSL2#1	61	55	64	75	Located beside Greenway to east, close to Cross Electrical and where Greenway intersects local road to east heading south to Ballymountain. Steady plant sound low but audible at times. Traffic on N25 clearly predominates. Peaks due to passing cars on local road. Traffic noise affected both the L_{Aeq} and L_{A90} values recorded. L_{A90} most representative of facility sources.
NSL2 #2	62	56	64	74	
NSL2 #3	61	53	64	74	
Average	**61**	**55**	**64**	-	
NSL3#1	64	45	59	85	Passing vehicles on local road predominant noise sources affecting L_{Aeq} and responsible for L_{Amax} values recorded. N25 traffic also audible and affecting both L_{Aeq} and L_{A90}. Plant steady sources low but audible in rare lulls in traffic noise. L_{A90} most representative of facility sources.
NSL3 #2	66	48	61	86	
NSL3 #3	66	50	64	86	
Average	**65**	**48**	**61**	-	

1/3 octave frequency spectra assessed using BS4142:2014: Annex C (normative): Objective Method for assessing the audibility of tones in sound: One-third octave method.

Table 8.6 Evening Time Noise Monitoring Results Summary 20.56 – 23.00 hrs (January 2018)

Noise Location	L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}	Comments
B1#1	54	51	57	63	Condensers and ammonia plant predominate, see **Attachment 8.1, Plates 8.11 & 8.12**. Chugging type sound from waste water pump audible when on, see **Attachment 8.1, Plate 8.13.** There are no trucks parked at the loading bay during the evening compared to daytime. No tones were subjectively or objectively identified during the evening survey. River flow is constantly audible at this location but is not significant compared to condensers. L_{Aeq} representative of facility sources at B1.
B2#1	53	46	57	64	Immediate passing traffic on the N25 is slightly more intermittent but still contributing to L_{Aeq} and also to L_{A90} as constant background in distance. Condensers sources are audible at B2 in terms of both continuous steady sound as well as ramp up periods lasting 1 -1.5 secs. The L_{A90} is more representative of plant noise at this location than the L_{Aeq} although both parameters are still influenced by traffic on the N25. No tones identified.
NSL1#1	62	49	66	74	Plant sources still not audible although traffic on N25 is now slightly more intermittent and unsteady compared to earlier in the day. No mobile sources were noted in operation at the facility during the evening survey. L_{A90} parameter most representative of steady noise from facility although traffic noise is also still contributory to this parameter.
NSL2#1	56	48	59	71	Intermittent traffic on N25 and local road contributing to L_{Aeq} value recorded over background. Facility condensers/ammonia plant are audible and chugging sound from the waste water pump, see **Attachment 8.1, Plate 8.13**, although muffled is discernible when on. L_{A90} most representative of steady noise from facility but this is also influenced by distant traffic noise. No tones noted.
NSL3#1	62	46	59	86	Passing vehicles on local road predominant noise sources affecting L_{Aeq} and responsible for L_{Amax} values recorded. N25 traffic also audible and affecting both L_{Aeq} and L_{A90} but has reduced since daytime. Plant steady sources audible. L_{A90} most representative of facility sources. No tones noted.

1/3 octave frequency spectra assessed using BS4142:2014: Annex C (normative): Objective Method for assessing the audibility of tones in sound: One-third octave method.

Table 8.7 Night time Noise Monitoring Results Summary 23.00 – 02.10 hrs (January 2018)

Noise Location	L_{Aeq}	L_{A90}	L_{A10}	L_{Amax}	Comments
B1#1	57	55	58	67	L_{Aeq} increased at this location during the night time compared to the evening due to a refrigerator unit at QK Stores switching on at approx. 22.58 hrs. This unit had an associated tone at 315Hz. The condensers were also audible as a steady source as well as the intermittent chugging noise from the waste water pump. There were no trucks parked in the eastern loading bay. The site-specific sound was approx. 54 dB(A) before the QK stores unit switched on resulting in an increase in the L_{Aeq} to 57 dB.
B1#2	57	56	58	65	
Average	**57**	**56**	**58**	**-**	
B2#1	49	45	52	61	Traffic on the N25 becoming more intermittent but is still main source contributing to L_{Aeq} values recorded. The condensers are clearly audible. Plant noise approx. 45 dB(A) in lulls in traffic. L_{A90} representative of plant noise although some distant traffic noise is also still contributing to this parameter.
B2#2	50	44	52	62	
Average	**50**	**45**	**52**	**-**	
NSL1#1	51	42	53	72	Plant noise now predominant as steady background source with intermittent passing traffic increasing L_{Aeq} value above background (L_{A90}). Some parked vehicle activity at the NSL also contributing to L_{Aeq} values recorded. L_{A90} is representative of facility steady sources mainly the ammonia plant at this location. No other facility sources were operational.
NSL1 #2	55	42	59	73	
Average	**53**	**42**	**56**	**-**	
NSL2#1	52	41	57	65	Steady facility sources (condensers and ammonia plant) clearly audible and represented by L_{A90} values. Traffic intermittent on N25 and elevating L_{Aeq} above background.
NSL2 #2	51	41	56	69	
Average	**52**	**41**	**56**	**-**	
NSL3#1	46	33	50	53	Intermittent traffic on N25 affecting L_{Aeq} with two passing cars on local road during #2. Dog in NSL barking on occasion also affecting L_{Aeq}. Plant steady sources clearly audible. L_{A90} is representative of facility sources. No tones were noted.
NSL13#2	47	37	50	66	
Average	**47**	**35**	**50**	**-**	

1/3 octave frequency spectra assessed using BS4142:2014: Annex C (normative): Objective Method for assessing the audibility of tones in sound: One-third octave method.

8.6 Assessment of Impacts

The existing facility is compliant with typical limits set out in NG4 which are based on WHO Guidelines for the protection of human health. Due to the proximity of a main transport source, the existing operation is generally masked during the day and evening time and for part of the night time when traffic on the N25 reduces after midnight. The plant is audible at night at NSLs however, the noise is steady and broadband in nature with no tones audible. Site specific noise levels are well below the typical night time noise limit value.

The current production output is approx. 95 tonnes per day. However, the existing plant equipment has capacity up to 283 tonnes per day. As the noise survey was conducted during a period of current production output, the potential noise impact of the plant if run at full capacity has been considered as follows:

1. Full capacity production affects internal equipment operations. Due to the building sound insulation this will not affect the external noise environment. Existing internal activities are not audible at the facility boundaries or NSLs.
2. The existing auxiliary plant such as the heat recovery system will remain unchanged as there is adequate capacity within the system.
3. Yard activities such as vehicle movements are currently not audible at the nearest NSLs due to distance and the masking effect of traffic on the N25. Any additional yard activities during the day and evening time will be similarly masked by traffic noise arising from the N25 and will therefore be imperceptible.
4. Any additional traffic arising from deliveries and departures on the N25 would be negligible in the context of current flows on the N25.

8.7 Mitigation and Enhancement Measures

DMIUC have implemented a Noise Management Plan (NMP) on site containing the following elements:

- Regular maintenance of condensers and ammonia plant to prevent the introduction of tones;
- Awareness training for staff and drivers regarding the regular use of electrical ports for truck refrigeration units and closing of plant room door;
- Assessment of all new capital investment for potential noise impact as part of ISO14001 procedures;
- Completion of annual monitoring and review of the NMP as necessary.

The above measures comply with BAT set out in the 2006 BREF Notes for the FDM Industry.

No additional measures are proposed for full production capacity operations as no additional impacts are anticipated.

8.8 Residual Impacts

The implementation of an NMP on site represents good practice. The existing facility both at current and in the event of full production capacity does/is not likely to significantly impact on the existing ambient noise environment. Accordingly, the residual impact is as described in Section 8.6.

8.9 Cumulative Impacts

Cumulative impacts and effects have been considered in the assessments undertaken.

8.10 Summary & Conclusions

The noise impact assessment for the facility has been completed through site survey and assessment of noise impacts and effects in accordance with recognised standards and guidance.

The ambient noise environment in the vicinity of the facility is predominantly influenced by traffic on the N25 which masks any sources from the facility at NSLs during the day and evening time. Steady sources from the facility are audible at the nearest NSLs to varying degrees during the night time. However, the levels are below typical night time limits set in NG4 and based on protection of human health from noise nuisance. Overall, it can be concluded that based on the monitoring undertaken in January 2018, typical limits and conditions regarding tones and impulsive noise set out in NG4 in relation to site specific noise are currently complied with during the day, evening and night time periods. It is considered that the facility does not significantly impact on the ambient noise environment taking level, characteristics and context into account.

Full production capacity has been assessed and it is concluded that this is not likely to change current site-specific noise levels at NSLs.

DMIUC have implemented noise reduction measures on site in accordance with BAT and will continue to implement an NMP as good practice.

8.11 References

BS4142:2014: Methods for Rating and Assessing Industrial and Commercial Sound.

'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Environmental Protection Agency in January 2016.

9 Chapter Nine – Air Quality and Odour

9.1 Introduction

This chapter presents the potential and actual impact of the facility on ambient air quality. The existing impact on ambient air quality as a result of current production output is described and assessed in this chapter as well as the potential for additional impact arising in the context of full production capacity where appropriate such as increased emissions to air.

As set out in Section 3.3.2 of this document, there are no major point emissions to atmosphere from the facility. The boiler on site is 500kW in size and is used as a back-up only. A 2 MW generator is present on site however this is only for emergency use. Approximately 1 m^3 of gasoil was used in 2017. The heat recovery system is expected to adequately provide for hot water requirements if full production capacity was realised in the future. Accordingly, there are no significant point source emissions to air and no further assessment is provided in this chapter. Fugitive emissions may occur from elements of the WWTS. Accordingly, an odour assessment is presented in this chapter.

9.1.1 Competent Expertise

The odour assessment which forms the main aspect of this chapter was completed by Dr. Brian Sheridan of Odour Monitoring Ireland (OMI). Dr. Brian Sheridan has worked as an odour and air pollution control specialist in OMI since 2009. He is also a Research Associate of the Dept. of Chemical Engineering, University of California, Riverside since 2003. Brian completed his BSc. degree in Analytical Science in DCU in 1997 and then continued his education in UCD completing a MSc. and a 4-year Ph.D. Eng. in Odour and Environmental Engineering in 2002 before taking up a position of Research Associate in the University of California in 2004. Brian has over 16 years experience as a Consultant and has worked on numerous odour and air quality projects around the country and for various project types including the FDM and waste sectors. He has published a number of peer-reviewed papers on odour and air pollution topics in a number of International journals.

9.2 Consultation

DMIUC has not received any odour complaints as a result of existing operations from the nearest Odour Sensitive Locations (OSLs). Odour dispersion modelling and assessment was prepared following consultation with the EPA on potential impacts in February 2018.

9.3 Study Assessment & Methodology

The odour assessment was performed in accordance with currently recommended international guidance and practice for the assessment of odours (UK Environment Agency H4 and Irish EPA AG4 guidance documents). A copy of the full OMI report is contained in **Attachment 9.1.**

9.3.1 Odour Sampling & Measurement

Point Sampling

In order to obtain air samples for odour assessment, a static sampling method was used where air samples were collected in 40 to 60 litre pre-conditioned NalophanNA bags using a vacuum sampling device over a 15-minute period. The sampler operates on the 'lung principle', whereby the air is removed from a rigid container around the bag by a battery powered SKC vacuum pump at a rate of 4 *l* min-1. This caused the bag to fill through a stainless steel and PTFE tube whose inlet is placed in ambient air, with the volume of sample equal to the volume of air evacuated from the rigid container. All odour-sampling bags were pre-conditioned and flushed with odourous air to remove any interference from the sample material. Samples were collected on site on 31st May 2018 from the ponds, Drum Screen Room and the MBBR.

Area Flux Hood Sampling

In order to measure the odour emission rate from area odour surfaces a calibrated wind tunnel method was used. This calibrated sampling hood allowed for the accurate determination of odour emission rate from the surface of the tanks. In combination with the point source static sampling method a 60-litre sample was obtained.

Olfactometry

Olfactometry using the human sense of smell is the most valid means of measuring odour and at present is the most commonly used method to measure the concentration of odour in air. Olfactometry is carried out using an instrument called an olfactometer. Three different types of dynamic dilution olfactometers exist:

- Yes/No Olfactometer
- Forced Choice Olfactometer
- Triangular Forced Choice Olfactometer.

In the dynamic dilution olfactometer, the odour is first diluted and is then presented to a panel of screened panellists of no less than four (CEN, 2003) Panellists are previously screened to ensure that they have a normal sense of smell (Casey et al., 2003). According to the CEN standard this screening must be performed using a certified reference gas *n*-butanol. This screening is applied to eliminate anosmia (low sensitivity) and super-noses (high sensitivity). The odour analysis has to be undertaken in a low odour environment such as an air-conditioned odour free laboratory. Analysis should be performed preferably within 8 to 12 hours of sampling.

Odour Measurement in Accordance with the EN13725:2003

An ECOMA TO8 dynamic yes/no olfactometer was used throughout the measurement period to determine the odour threshold concentration of the sample air. The odour threshold concentration is defined as the dilution factor at which 50% of the panel can just detect the odour. Only those panel members who pass

screening tests with n-butanol (certified reference gas, CAS 72-36-3) and who adhered to the code of behaviour were selected as panellists for olfactometry measurements (CEN, 2003). Odour measurement was carried out in an odour free laboratory in accordance with EN13725:2003. The analyses were carried out in the laboratory of OMI in Trim Co. Meath.

Odour Emission Rate Calculation

Area source mass emission rates/flux were calculated as either OuE m^{-2} s^{-1} or OuE s^{-1} depending if they are being represented as discrete point sources or area sources in the atmospheric dispersion model.

9.3.2 Dispersion Modelling

AERMOD Prime (18081) dispersion model was used to assess the predicted odour concentrations on the surrounding area.

- Five years of hourly sequential meteorological data was screened within the dispersion model in order to provide statistical sound predictions for the impact assessment. Cork Airport 2011 to 2015 inclusive was used for the operation of the dispersion model while Cork Airport 2015 was determined as worst-case impact year. This is in keeping with current national and international recommendations (EPA Guidance AG4 and EA).

- In addition, AERMOD incorporates a meteorological pre-processor AERMET PRO. The AERMET PRO meteorological preprocessor requires the input of surface characteristics, including surface roughness (z0), Bowen Ratio and Albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of Albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10km from the meteorological station for Bowen Ratio and Albedo and to a distance of 1km for surface roughness in line with USEPA recommendations

- The 98th percentile of maximum hourly predicted concentrations was used to provide the output data from the dispersion model.

- Emissions to the atmosphere from the existing operations were assumed to occur 24 hours each day / 7 days per week over a standard year at 100% output for all sources.

- All building wake affects were assessed within the dispersion model.

- Terrain effects were accounted within the model using AERMAP software and digital data from OSI (10 m spaced).

9.4 Baseline Description of Existing Conditions

As noted in Section 9.2 DMIUC has not received any odour complaints from surrounding OSLs. Within the site boundary, odour has been noted at the Drum Screen Room, Settlement Ponds 1 and 2 and also in association with some Ponds e.g. 1 – 6.

The predicted overall emission odour rates from the existing WWTS elements following on site sampling has been completed by OMI. Full details are presented in OMI's full report contained in **Attachment 9.1, Table 4.1**. A summary table is provided below.

Table 9.1 Predicted Overall Emission Odour Rates

Odour Source	Odour Emission Rate (OER) (Ou_E/s)
Drum Screen Room	5,430
MBBR	888
Settlement Pond 1	1,617
Settlement Pond 2	1,621
Pond 1	10,127
Pond 2	835
Pond 3	453
Pond 4	742
Pond 5	796
Pond 6	1,533
Pond 7	3,349
Pond 8	2,012
Pond 9	916
Pond 10	927
Total OER	**31,244**

9.5 Results of Assessment

Odour Impact Criterion for Odours

The odour impact criterion chosen for the analysis of the output data from the dispersion model is based on recommended levels in EPA / EA guidance for such operations. The 1-hour average shall be less than 3.0 Ou_E/m^3 at the 98th percentile of worst case total annual hours, as measured at the nearest OSL. In order to comply with recent guidance provided by the EPA and EA, five years of meteorological data was screened and the worst-case year used to present data (yr 2015 Cork Airport was considered worst case) (AG4 Guidance document and EA - ADMU).

Model Output – Existing

Aermod Prime (18081) was used to determine the odour impact of the existing operational WWTS emission sources. The output data was analysed to calculate predicted odour emission contribution of the overall existing operational WWTS during routine operation to odour plume dispersal at the 98th percentile for an odour concentration of less than or equal to 3.0 $Ou_E.m^{-3}$.

The visual assessment of the odour plume spread is shown in **Figure 9.1**. In summary, the nearest OSLs, Carroll's Cross Inn (R1) to the north and Cross Electric (R2) to the northeast are predicted to perceive an odour concentration in the range of 2.1 – 2.6 $Ou_E.m^{-3}$ for the 98%ile of hourly averages which is below the criterion.

As shown in **Figure 9.1**, parts of the Waterford Greenway are predicted to be greater than 3.0 Ou_E/m^3 for the 98%ile of worst case total annual hours (175 hours). Duration and frequency are important considerations in this context as well as the non-static nature of receptors. Users of the Greenway will pass by the facility quickly therefore any negative impact will be momentary at most. The frequency is likely to be insignificant when considering the frequency of occurrence (175 hours) and the frequency of use by individual users. Accordingly, no significant impacts are anticipated.

9.6 Assessment of Impacts

The modelling undertaken by OMI assessed the existing operational conditions. The WWTS has adequate capacity for additional flows that could arise from full production capacity. Existing measures to ensure that odour is minimised as detailed in Section 9.7 will continue to be implemented. Accordingly, there are no additional impacts envisaged.

9.7 Mitigation and Enhancement Measures

Operational manuals have been prepared by the MBBR and ICW designers and are implemented on site. The main factors affecting odour generation are maintaining optimal water depths in the ponds and ensuring waste CAT1 is regularly removed from the Drum Screen.

9.8 Residual Impacts

Residual impacts are the same as described under Section 9.6 above.

9.9 Cumulative Impacts

Refer to Section 9.6 above.

9.10 Summary & Conclusions

Odour Monitoring Ireland Ltd carried out an odour sampling and odour dispersion modelling assessment of odour emissions from the existing operational WWTS. The

purpose of the assessment was to determine the potential for the generation of odour impact on the surrounding population from operations at the existing WWTS.

A site assessment utilising odour sampling and analysis techniques was conducted and an odour emission dataset was developed.

Aermod Prime (18081) was then used to determine the overall odour impact of the operational existing WWTS. The output data was analysed to calculate the predicted odour emission contribution of the overall existing operational WWTS during routine operation, to odour plume dispersal at the 98th percentile for an odour concentration of less than or equal to 3.0 Ou_Em^3. These computations gave the odour concentration at each Cartesian grid receptor location that is predicted to be exceeded for 2% (175 hours) over 5 years of screened hourly sequential meteorological data (Cork Airport 2011 to 2015 inclusive). The Cartesian receptor grid was 20 and 50 m spaced given a total receptor number of 1894 over an area of 3.07 km^2.

The main conclusion from the assessment is that predicted level of odour from the operational WWTS is not likely to generate odour impact in the vicinity of the facility. A number of discrete OSLs (Carroll's Cross Inn and Cross Electric) were incorporated into the model. Each discrete OSL will perceive an odour concentration in in the range of 2.10 to 2.60 OuE/m^3 for the 98th percentile of hourly averages which are below the criterion.

As shown in **Figure 9.1**, parts of the Waterford Greenway are predicted to be greater than 3.0 Ou_E/m^3 for the 98%ile of worst case total annual hours (175 hours). Duration and frequency are important considerations in this context as well as the non-static nature of receptors. Users of the Greenway will pass by the facility quickly therefore any negative impact will be momentary at most. The frequency is likely to be insignificant when considering the frequency of occurrence (175 hours) and the frequency of use by individual users. Accordingly, no significant impacts are anticipated.

The existing WWTS has adequate capacity to treat wastewater arisings from full production capacity. Accordingly, it is not anticipated that an odour issue is likely to arise from a full production capacity scenario. DMIUC implement operational manuals for both the ICW and MBBR which include for measures to minimise odour generation.

9.11 References

Refer to Section 8 of the OMI report contained in **Attachment 9.1.**

10 Chapter Ten – Cultural Heritage

10.1 Introduction

This chapter assesses the archaeological, architectural and cultural heritage resource of the existing site.

10.1.1 Competent Expertise

This chapter of the EIAR was prepared by Maurice Hurley, a qualified archaeologist with 35 years of experience as a professional archaeologist. Maurice studied archaeology in University College Cork (UCC) having been awarded both a BA and MA in field of archaeology. He was also presented with an Awarded Doctorate of Literature (D.Litt) by the National University of Ireland in 2007 based on published works. He specialises in the Archaeology/Cultural Heritage components of Environmental Impact Assessments and in urban archaeology, where he has particular expertise on the complex interface between development and archaeology in the planning process.

10.2 Consultation

No specific consultations were undertaken with the relevant authorities as the proposal does not involve specific impacts on the archaeological or built heritage resource of the site or area as a result of new development.

In regard to archaeological assessments it is generally approved practice that in regard to studies of this type, The Department of Culture, Heritage, & Gaeltacht generally require the following:

- Documentary and map research regarding the location of the facility with particular reference to the archaeological landscape.
- A site inspection with the aim of assessing the current landscape and likely impact of the development on archaeological monuments, features and possible deposits.
- A detailed record of any upstanding monuments that will be affected by the development.
- Recommendations with regard to visual amenity of the development in relation to the archaeological landscape.
- Recommended mitigation measures to protect archaeological deposits/features.

All of the above were undertaken to inform this study.

10.3 Study Assessment & Methodology

This study is produced to assess the archaeological resource of the site in the context of the archaeological environment of the area.

The study is based on the results of documentary and cartographic research. Consulted sources include;

- All editions of the Ordnance Survey maps.
- Estate papers and maps at Waterford County Library, (Waterford County Council, Dungarvan) and Waterford Archives (Waterford City Council).
- Various published works including the Archaeological Inventory of Co. Waterford (Moore 1999) for Dúchas The Heritage Service; Waterford History & Society (Nolan & Power eds. 1992); The Ancient & Present State of the County & City of Waterford (Smith 1746); all editions of the Journal of the Waterford & South-East of Ireland Archaeology Society (WAJ); all editions of Decies; and all editions of Excavations Annual summary accounts of Archaeological excavations in Ireland. The History, Topography and Antiquities of the City and County of Waterford (Ryland 1824).
- The area has been subject to survey by the National Monuments Service and Sites and Monuments Record (SMR). The SMR surveys were compiled using all published and publicly available documentary and cartographic sources including historical and archaeological journals, an Foras Forbartha surveys and the records of the National Museum of Ireland. The compilation of the SMR included a study of available vertical aerial photographs.

10.4 Baseline Description of Existing Conditions

10.4.1 Description of Site

The facility occupies an area on the southern side of the N25 Dungarvan to Waterford City Road. The townland boundary between Ballyshonock on the north and Greenan on the south is formed by the Dawn River. The river, which flows from southwest to northeast through the site has been realigned subject to planning approval (Planning Ref 13266). The natural topography and old ground levels of the site has been extensively altered by the facility and its associated features such as the ICW (Planning Ref: 12351).

A total of twelve ponds occur in the western part of the site; the two largest ponds having been created between 2013 and 2015 in the south-western part of the site near the former railway line (now the Greenway route).

Prior to the construction of the facility, the northwest part of the site was laid out as three rectangular relatively flat fields (**Figures 10.2, 10.3, 10.4**). The Dawn River followed a meandering course through the site and the area to the south was rough pasture with rock outcrop. The Great Southern Railway was created in the mid nineteenth century along the north-western edge of a rock outcrop known as

Greenan Hill (**compare Figures 10.2, 10.3, 10.4**). Greenan Hill has now been largely removed by quarrying (**Figure 10.1**) and a high embankment surrounds the quarry site, now a lake. The area immediately to the south of the facility contains workings/spoil heaps etc. associated with the quarry.

All of the buildings on the DMIUC site belong to the latter half of the twentieth century with some constructed in the early twenty-first century. There are no historic buildings on the site.

10.4.2 Archaeology of the Wider Area

The visible surviving archaeological monuments in the wider vicinity date to the prehistoric period as well as Viking and medieval times. The Waterford Harbour was subject to an extensive survey in the late 1980s (Zvelebil, Moore, Green & Henson 1987). In the course of this project, field survey was used to assess the occurrence and densities of prehistoric flint in several areas around Waterford Harbour. The area to the southwest of Waterford City was not subject to field-walking.

A range of Neolithic stone monuments occurs in East Waterford (**Figure 10.5**). These include passage tombs, portal tombs and wedge tombs. All of the megalithic tombs occur in land below 400ft in height. There are no Neolithic tombs in the area under review.

A number of Bronze Age tumuli also occur in the lowlands of east Waterford (**Figure 10.6**), but none are occurring close to the site under review.

There are also notable concentrations of standing stones in Co. Waterford with a particularly large lowland group occurring to the southeast of the site. A pair standing stone (WA016-044) occurs at c.1.5km to the south the site under review. Those shown on **Figure 10.7** are standing stones whose prehistoric authenticity is not in doubt.

Other Bronze Age monuments common in Co. Waterford are Fulachta Fiadh or Bronze Age cooking places (**Figure 10.8**). The nearest Fulachta Faidh (SMR WA016-134) lies at distances of 300m or more from the site boundary and is situated in a valley 100m to the south of Dawn River (**Figure 10.8**). This site was identified in the course of archaeological monitoring and testing (Licence No. 06E0163) in advance of laying a water-pipe and was later excavated (Licence 06E0280). A spread of burnt mound material (diam. 17m; T 0.2-0.35m) overlay a wood-lined trough (dims. 2.8m x 2m; D 0.6m) which had eight stake-holes and two post-holes associated with it.

Several other burnt mounds lie in the wider vicinity, three such mounds (SMR WA016-014, SMR WA016-014001 & SMR WA016-013) are located to the east of the site under review, at distances of c. 0.5km to 1km; all are listed as possible Fulacht Fiadh (burnt mound on **Figure 10.1**) (NMI file, c. 1950), but nothing is visible on the landscape today. The monuments are registered as Delisted (**Figure 10.2**) on the Record of Monuments & Places Map (RMP) but remain included in the Site and Monuments Record (SMR) for Co. Waterford (**Figure 10.1**).

The early medieval period saw the development of ringforts in the Irish landscape and these are the most common field monument in Ireland. Frequently it is not possible to distinguish ringforts from medieval moated sites where surface features have been denuded or levelled. Several ringforts occur in the vicinity of the site under review, the nearest (SMRWA016-018) is classified as an enclosure and marked as a circular embanked enclosure on the 1840 ed. of the Ordnance Survey six-inch map (**Figure 10.3**), with a possible souterrain indicated as 'cave', the souterrain not visible at ground level today.

The site is located c.13 kilometres from the historic centre of Waterford City. The townland of Ballyshonnock is unlikely to have experienced direct influence from the urban settlement of Viking and medieval Waterford, however the lands in the area were certainly subject to Ostman (Viking) control in the 10th & 12th century (Bradley 1988) and subsequently under the influence of the Anglo-Norman city of Waterford.

10.4.3 List of Archaeology in the Wider Vicinity

There are no known archaeological monuments on the site or in the surrounding area (**Figure 10.1**).

A list of the sites in the wider vicinity compiled from the Dúchas SMR, RMP and Archaeological Inventory of Co. Waterford (Moore 1996) is shown in **Table 10.1.**

Table 10.1 List of Sites in the Wider Vicinity

RMP No.	Classification	Townland	Distance from site
WA016-134	Fulacht Fiadh	Greenan	450m
WA016-14	Burnt Mound	Ballyshonock	420m
WA016-1401	Burnt Mound	Ballyshonock	440m
WA016-13	Burnt Mound	Ballyshonock	600m
WA016-16	Ringfort	Ballyshonock	820m
WA016-17	Ringfort	Ballyshonock	830m
WA016-1801/02	Enclosure/souterrain	Greenan	500m

10.4.4 Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) is a state initiative established to identify, record, and evaluate the post-1700 built heritage of Ireland, uniformly and consistently as an aid to its protection and conservation. The National Inventory of Architectural Heritage does not list any buildings on the site as being of architectural merit.

Two architectural features on the northern side of the N25 road (opposite side of the N25 road) are indicated by blue dots on **Figure 10.1**. Both features are listed as being of '*Regional Importance*'. The features are a wall-mounted post-box (Reg. No. 22901616) dating to c. 1915 and a house (Reg. No. 22901610) described as "*a detached four-bay single-storey thatched cottage with dormer attic, c.1790. Renovated, c.1940, with single-bay single-storey gabled projecting porch added to accommodate commercial use. Extensively renovated and extended, c.1990... Although inappropriately renovated and altered in the late twentieth century, this cottage remains an important element of the vernacular heritage of County*

Waterford on account of the presence of features including the thatched roof" (National Inventory of County Waterford).

The building burnt in the recent past and is now partially roofed with galvanised sheeting.

10.5 Results of Assessment

There is no archaeological monument in the site or in the immediate vicinity. There is no building of architectural merit on the site and the existing development has no impact on any in the vicinity. There is no potential for impact on the archaeological resource of the site or area as there is no new building component.

10.6 Assessment of Impacts

There are no potential impacts on the archaeology, architecture or cultural resource of the site. Potential increases to existing maximum production capacity will not result in any further land disturbance.

10.7 Mitigation and Enhancement Measures

There are no remedial and mitigation measures considered necessary.

10.8 Residual Impacts

The residual impacts are as per Section 10.6 above.

10.9 Cumulative Impacts

There are no cumulative impacts as no new development is proposed.

10.10 Summary & Conclusions

There are no archaeological monuments or buildings of architectural merit within the boundary of the site; nor are there any in the immediate vicinity that could be impacted on. There are no potential impacts on the archaeological, architectural or cultural heritage resource of the site likely to arise as there is no ground works proposed and no new buildings proposals.

10.11 References

Bradley, J. (1988) *'The interspersion of Scandinavian Settlement in Ireland'* in J. Bradley (ed.) *Settlement & Society in Medieval Ireland*, 49-78, Kilkenny.

Craig, M. & Garner, W. (1977) *Revised report on areas of historic interest in Co. Waterford.* unpublished report, Foras Forbartha.

Excavations: Summary accounts of excavations in Ireland. Wordwell. Bray.

Empy, C.A. (1992) '*County Waterford: 1200-1300*' in W. Nolan and T.P. Power (eds), *Waterford: History and Society*.
Hurley, M.F. (1997) '*Topography and development*' in M.F. Hurley & O.M.B. Scully *Late Viking Age & Medieval Waterford: excavations 1986-1992,* 7-12 Waterford Corporation.

Moore, M. (1999) '*Archaeological Inventory of County Waterford'* Dublin.

Moore, M. and Woodman, P. (1992) '*The prehistory of County Waterford'* in W. Nolan and T.P. Power (eds), *Waterford: History and Society*, 1-26 Dublin.

Ryland, R.H. (1824) '*The history, topography, and antiquities of the city of Waterford'* London.

Simington, R. C. (ed.) (1942) '*The civil Survey AD 1654-1656, vi, the County of Waterford'*. Irish Manuscripts Commission. Dublin.

Zvelebil, M. Moore,J. , Green, S. & Henson, D. (1987) '*Regional survey and the analysis of lithic scatters: a case study from southeast Ireland*' in P. Rowley-Conway, M. Zvelebil & H.P. Blankholm (eds), *Mesolithic Northwest Europe: recent trends.* University of Sheffield.

11 Chapter Eleven – Population and Human Health

11.1 Introduction

The aim of this chapter is to assess the positive and negative impacts of the existing facility on population and human health with respect to the socio-economic effects and potential adverse effects on human beings arising from environmental impacts.

Human beings comprise one of the most important elements in the environment. In carrying out any development, one of the principal concerns is that human beings should experience no reduction in the quality of life as a consequence of the operation of the facility.

Page 16 Section 4.2 of the EPA Draft Advice Notes describe this section as '*a broad ranging section which covers the existence, activities and health of people, usually considering people as groups or 'populations'*.

Issues which may be examined under the topic of Population & Human Health include the following:

- Economic Activity likely to lead to projects - will the development stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?
- Social Consideration - will the development change the intensity of patterns and types of activity and landuse?
- Land-use - will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately to alter the character and use of the surroundings?
- Tourism – will the development affect the tourism profile of the area?
- Health – have the vectors through which human health impacts could be caused been assessed, including adequate consideration of inter relationships between those assessments?

11.2 Consultation

No detailed consultation was carried out in order to prepare this chapter which is mainly desk-based. DMIUC provided figures on employee numbers and potential employment at maximum levels of production.

11.3 Methodology

A desk-based study was conducted in order to characterise baseline conditions with regard to this topic.

The Guidelines as set out Section 2.1were used in the preparation of this chapter.

An assessment of population requires that an understanding of the community is built up through methods such as background research, site visits, and discussions

with local people and community representatives. Specifically, in the case of this study, data has been collected by means of:

- Primary data sources (e.g. preliminary demographic data from Census 2016 and demographic data from Census 2011 produced by the Central Statistics Office);
- Maps of the surrounding area, including Ordnance Survey 1:50,000 maps;
- Other relevant environmental data considered during the Environmental Impact Assessment (EIA), especially potential for odour generation, traffic volumes, noise and visual impacts;
- A review of secondary sources including the Waterford County Development Plan 2010-2017 and National Spatial Strategy 2002-2020;
- Observation of local settlement and travel patterns and identification of community facilities.

Publications and other data sources that guided the preparation of this chapter are listed hereunder:

- *The Central Statistics Office – data from the 2016 Census;*
- *Waterford County Development Plan 2011-2017.*

11.4 Baseline Description of Existing Conditions

11.4.1 Population and Settlement Structure

Carroll's Cross/Ballyshunnock lies within the Newtown Electoral Division of County Waterford. The results of Census 2016 indicate that the population of Newtown Electoral Division is 471, with a total housing stock of 182 dwellings.

Compared with 2011 statistics, the population experienced little growth of only 3 additional persons. The population is spread across an area comprising of 7 rural town lands.

Table 11.1 describes population level data for Newtown electoral division and compares it with County data over the previous three censuses.

Table 11.1 Population Levels within Newtown Electoral Division 1996-2011

Town	Population		
	2006	2011	2016
Newtown Electoral Division	455	468	471
County Waterford	107,961	113,795	116,176

Waterford County as a whole has seen a population increase of 2% between 2011 and 2016. The Newtown Electoral Division falls within the Waterford County Strategic Planning Area. The Waterford County Development plan (2011-2017) is committed to promoting Waterford as a hub for the pharmaceutical, life sciences engineering and international business sectors. It provided continual improvement in infrastructure to promote further economic growth in the years ahead therefore it is expected that Waterford will grow strongly in the post-recession years.

According to the ESRI 2018 report on prospects for Irish regions and counties, the Waterford region is projected to experience a population growth of up to 50% by the year 2040.

Due to the rural location of Newtown, it would be expected that figures will remain relatively stable in terms of both population and growth.

11.4.2 Age Profile

The age profile for Newtown Electoral Division, along with County data for the year 2016 is shown in **Table 11.2**, as abstracted from the CSO.

Table 11.2 Persons Classified by Age Group, Newtown Electoral Division 2016

Area	Total	Age Group (Years)				
		0-14	15-24	25-44	45-64	65+
Newtown Electoral Division	471	112	51	119	121	68
% Total		**24%**	**11%**	**25%**	**26%**	**14%**
County Waterford*	116,176	21,264	17,081	31,304	29,156	17,371
% Total		**18%**	**15%**	**27%**	**25%**	**15%**

**Waterford City & County are amalgamated by the CSO for statistical purposes*
Source: 2016 Census

The age profile for Newtown is strong and comparable with County data. It shows a large proportion of eligible workforce (25-64 year age groups = 51% of population), while maintaining a strong youth population for the support of this group in later years (0-24 year age groups = 35%). Also of note is the far stronger trend in the 0-14 age group (24%) in comparison to County wide data (18%).

Reviewing the figures for the working age group (24-64), the eligible workforce stands at approximately 240 persons.

11.4.3 Local Economy & Employment

Table 11.3 overleaf describes the breakdown of primary employment classes for Newtown Electoral Division.

Table 11.3 Total Persons Aged 15 Years and Over at Work Classified by Broad Industrial Group – Newtown Electoral Division

Industrial Group	Newtown Electoral Division
Agriculture, forestry and fishing	36
Manufacturing	42
Building and Construction	9
Commerce and Trade	28
Transportation and Communications	7
Professional Services	38
Public ADMIUCnistration	13
Industry not stated	22
Total	**195**

Source: Census 2016 Electoral Division Newton. Theme 14- Industries

In the census, unemployment is measured on a Principal Economic Status basis and the results for Newtown Electoral Division showed an overall unemployment rate of 6.4%. This contrasts with 2011 census data, where 40 people were classed as unemployed in April 2011. This gave an 11.2% unemployment rate.

Among males the numbers have declined from 26 to 12 over the five-year period 2011-2016, giving an unemployment rate of 6.1 %. For females, the numbers out of work also decreased from 14 to 11 giving an unemployment rate of 6.2 %.

In comparison, data for County Waterford shows an unemployment figure of 8.1%.

Nationally, the unemployment figure stood at 12.9% for 2016. Therefore, the Newtown District's unemployment rate stands at less than half of the national average.

11.5 Results of Assessment

11.5.1 Local Economy & Employment

The existing DMIUC facility is a long term and steady employer within the Newtown Electoral Division area since 1980 providing employment opportunities to the local population. The facility currently employs 227 people. Based on local population figures, the existing facility therefore represents a significant long term positive impact in terms of providing employment locally. The facility also provides the opportunity to work and live in the same area thus reducing distance to travel to work for locals. Employment in rural areas can provide an anchor to local communities.

11.5.2 Services

The DMIUC facility has a factory shop on site presenting the opportunity for local people to purchase quality food at lower prices.

11.5.3 Human Health

Noise

The noise assessment completed as part of this EIAR is discussed in detail in Chapter 8 and concluded that existing facility does not give rise to significant adverse noise related effects on nearby NSLs. No complaints have ever been received in the past.

Air and Odour

The assessment of air quality and odour impacts in Chapter 9 demonstrated that no significant impact on the health of the local community or surrounding environment occurs from the existing facility. No complaints have ever been received in the past.

Traffic

Traffic arising from the existing facility is addressed in Chapter 13. There are no significant impacts on existing traffic flows or road users in terms of safety.

Visual Amenity

Visual amenity is addressed in Chapter 12. There are no significant visual impacts impacts arising from the existing development on nearby residential dwellings or users of the Greenway. DMIUC has improved the landscape in the general area of Carroll's Cross with the construction of the wetlands over 50% of the site. An ongoing landscaping plan is also implemented which will further enhance the area for users of the Greenway.

Major Accidents and Incidents

Regarding potential impacts on the environment, vulnerability of the existing facility to 'major accidents and/or natural disasters (such as flooding, sea level rise, or earthquakes)' has also been considered as per the 2014 Directive. Potential impacts associated with such events are discussed under each relevant chapter e.g. the vulnerability of the facility to flooding is assessed in more detail under Chapter 6 of this EIAR. The facility is not considered vulnerable to flooding and does not give rise to downstream flooding impacts.

Water Supply

Groundwater is likely to be used as a water supply source to residential dwellings in the area. Slightly elevated levels of ammonia have been found in the groundwater downgradient of the ICW within the site however there are no potential off-site supply wells for human receptors that could be affected. The MBBR is expected to result in an improvement in groundwater quality in the short to medium term.

There have been no complaints relating to potential draw-down on supply from local users. The supply well is located to approx. 200m to the northwest of the facility and is located in a regionally important aquifer. Measures to minimise water use in

accordance with BAT are also implemented on site. The annual water usage is relatively small compared to other facilities within the FDM sector.

11.6 Assessment of Impacts

The facility is currently operating below maximum production capacity. As a long term committed employer to the local community, it is expected that full production capacity could potentially have a further notable positive impact on local employment, and to employment and trade within the greater Waterford region. Although as noted in Chapter 2 of this EIAR, the full production capacity is unlikely to be realised due to other operational requirements such as cleaning schedules. Production in the FDM sector is demand driven and therefore at times there may be opportunities for increased temporary employment at the plant. Overall, the potential impact of the facility in terms of employment is considered to be significant and positive in the long-term.

There are no anticipated additional significant impacts on human health in terms of traffic, water supply, air quality, odour or noise arising from the plant operating at maximum capacity.

11.7 Mitigation and Enhancement Measures

None required.

11.8 Residual Impacts

The residual impacts are the same as those discussed above under Section 11.6.

11.9 Cumulative Impacts

Refer to Section 11.6 above.

11.10 Summary Conclusions

The potential effects on human health and population were identified and evaluated via desk-based study. A number of sources including the CSO Census data from 2016 and 2011 were consulted. Detailed of existing employment levels at the facility were provided by DMIUC. The assessment of potential impacts on human health was informed by more detailed assessments completed for noise and air quality and odour including measurement and detailed dispersion modelling for the odour assessment.

The principal impacts on human health and population are considered to be generally positive and can be summarised as follows:

- Long established employer in the area, with potential for further jobs.
- Significant contribution to economic activity in local and Waterford region.
- Contributing to the rural community by supporting population numbers in the long term.

There are no potential significant impacts on human health factors including noise, odour, visual amenity, water supply or traffic.

11.11 References

CSO (2016) Census Data 2016 http://www.cso.ie/en/census/

ESRI (2018). Prospects for Irish Regions and Counties. http://npf.ie/wp-content/uploads/Prospects-for-Irish-Regions-and-Counties.-Scenarios-and-Implications.Jan-2018.pdf

The Waterford County Development plan (2011-2017), Chapter 6, Economic Development. http://www.waterfordcouncil.ie/media/plans-strategies/development-plan/county/Volume%201%20-%20Written%20Statement/Chapter%206.pdf

National Spatial Strategy 2002-2020. http://www.nss.ie/pdfs/Completea.pdf

12 Chapter Twelve – Landscape

12.1 Introduction

This chapter deals with landscape and visual impact assessment (LVIA) examining the existing effects of the facility on the landscape setting as well as on visual receptors in the landscape such as residents, visitors, people pursuing recreational activities etc. The assessment indicates the level of existing impact and outlines measures by which impacts can be further mitigated where necessary. There are no new built elements proposed therefore there are no potential impacts associated with the site under this topic except potentially positive impacts from ongoing landscaping management and planning for the facility. This chapter seeks to identify current impacts.

12.1.1 Competent Expertise

This chapter has been prepared by Aisling Walsh whose qualifications include MSc in Biodiversity and Conservation and B.Sc. (Hons) Zoology. Aisling has over 10 years of experience providing environmental consultancy and environmental assessment services and has provided input, prepared and reviewed landscape assessments in the past 10 years for several EIARs. Aisling was assisted by Siobhan Maher of Redkite Environment who conducted a site visit to identify visual receptors in the area.

12.2 Consultation

Planning Reports prepared by Waterford County Council for the planning permissions granted as set out in Table 1.4 of this document were reviewed. No further consultation was undertaken as there is no proposed built development under consideration in this EIAR.

12.3 Study Assessment & Methodology

12.3.1 Desk-based Study

A desk top review of planning policy affecting the site was undertaken and the following documents were reviewed:

- Waterford County Development Plan 2011 – 2017, Chapter 8 - Environment & Heritage;
- Waterford County Development Plan 2011 – 2017, Appendix 9 - Scenic Landscape Evaluation;
- Waterford County Development Plan 2011 – 2017, Appendix 11 – Protected Wetlands;
- Waterford County Development Plan 2011 – 2017, Appendix 13- Record of Protected Structures;
- Waterford Greenway Intercept Survey 2017 - Baseline Survey Report, AECOM Consultants, December 2017

12.3.2 Site Assessment

The DMIUC site and environs were visited as part of the landscape and visual impact assessment in May 2018. The purpose of the site visit was to gain a thorough understanding of the character of the site and locality and to determine the location of visual receptors in the area that could be potentially affected by the DMIUC facility. Chapter 5 on biodiversity also informed the assessment.

The nature of potential mitigation measures appropriate to the setting was also informed by the site visit.

12.3.3 Landscape Impact Assessment Criteria

This Landscape and Visual Impact Assessment (LVIA) has been completed using relevant general best practice guidelines listed in Chapter 2.1 of this EIAR and the UK Landscape Institute Guidelines, 2002. The Waterford County Development Plan 2011 – 2017 was also consulted with regard to designating landscape sensitivity.

The EPA guidelines suggest that impacts should be assessed by reference to an existing acknowledged standard and requires clarity and a systematic approach to the description of impacts - Character (Positive, Neutral or Negative), Magnitude, Significance, Duration.

The UK Landscape Institute Guidelines, 2002 prescribe that landscape and visual impacts be assessed by separate, although linked procedures. Landscape assessment considers the effects deriving from alterations to the elements and characteristics of the landscape, which may give rise to changes in its character, how it is experienced and hence the ascribed value of the landscape. The landscape is often described as "townscape". Visual assessment is concerned with changes that arise in the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity. Visual change is the alteration to a view, visual impact is the assessment of the significance of that change.

Landscape Impacts

The potential landscape impact assessment is based on the sensitivity of the landscape, which is a function of its land use, landscape / townscape patterns and scale, visual enclosure and distribution of visual receptors, and the value placed on the landscape.

The landscape sensitivity is classified as:

- High (exhibits a very strong positive character with valued elements and characteristics that combine to give an experience of unity, richness and harmony, therefore particularly sensitive to change in general)
- Medium (exhibits positive character but has evidence of alteration to / degradation / erosion of elements and characteristics resulting in an area of mixed character, therefore potentially sensitive to change in general, or

- Low (exhibits generally negative character with few valued elements or characteristics), and;

The scale or magnitude of landscape effects or the quantity of change to be imposed on the landscape by a development:

The magnitude of change to the landscape is classified as:

- High (total loss of or major alteration to the key elements or characteristics of the landscape/townscape, and / or introduction of elements considered totally uncharacteristic in the context of the receiving environment's landscape/townscape character),
- Medium (partial loss of or alteration to one or more key elements or features, and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic in the context of the receiving environment),
- Low (minor loss of or alteration to one or more key elements or characteristics, and / or introduction of elements that may not be uncharacteristic in the context), or
- Negligible (very minor loss, alteration or introduction of elements of the landscape).

Visual Impacts

The potential visual impact assessment describes the changes in the character of the available views and the changes in the visual amenity of the visual receptors for a number of places / viewpoints selected to represent the receiving environment and its users. The potential visual impact on each viewpoint is assessed based on:

The sensitivity of the visual receptors, which is a function of the location and context of the viewpoint, the expectations and occupation or activity of the receptor, and the importance of the view.

Viewpoint sensitivity is classified as:

- High (e.g. users of outdoor recreation facilities or centres of activity focused on the landscape, and occupiers of residential properties with views affected by the development),
- Medium (e.g. people travelling through or past the affected landscape in cars or on public transport, i.e. viewing but not focused on the landscape), or
- Low (e.g. people at their place of work or engaged in similar activities such as shopping, etc., whose attention will be focused on these activities).

The scale or magnitude of visual effects or the degree / quantity of change to the field of view (towards the site) resulting from the development. This takes into account the extent of the view that would be occupied by the intrusion, e.g. full, partial, glimpse, etc. including the distance of the viewpoint from the development and its effect on the importance of the development in the field of view, the proportion of the development or particular features that would be visible, and

whether the view of the development would be static, or a sequence or transient (as seen from a moving vehicle).

The magnitude of change to each view is classified as:

- High (total loss of or major alteration to the key elements or characteristics of the view, and / or introduction of elements considered totally uncharacteristic in the context of the view),
- Medium (partial loss of or alteration to one or more key elements or features, and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic in the context of the view),
- Low (minor loss of or alteration to one or more key elements or characteristics, and / or introduction of elements that may not be uncharacteristic in the context), or
- Negligible (very minor loss, alteration or introduction of elements of the view).

The significance of the impacts (both landscape and visual) is determined based on the measurement of the magnitude of change against the sensitivity to change and shown in **Table 12.1.**

Table 12.1 Assessment / Grading of Impact Significance

Magnitude	Sensitivity: High	Sensitivity: Medium	Sensitivity: Low
High			
Medium			
Low			
Negligible			

	High Significance
	Medium Significance
	Low Significance

The predicted impacts are also classified as beneficial, neutral or adverse. This is not an absolute exercise; in particular, visual receptors' attitudes to development, and thus their response to the impact of a development, will vary. However, the methodology applied is designed to provide robust justification for the conclusions drawn.

These qualitative impacts are defined as:

Adverse – Scheme at variance with landform, scale, pattern. Would degrade, diminish or destroy the integrity of valued features, elements or their setting or cause the quality of the landscape (townscape)/view to be diminished.

Neutral – Scheme complements the scale, landform and pattern of the landscape (townscape)/view and maintains landscape quality.

Beneficial – improves landscape (townscape)/view quality and character, fits with the scale, landform and pattern and enables the restoration of valued characteristic features or repairs / removes damage caused by existing land uses.

Impacts are also categorised according to their longevity or timescale:

- Temporary – Lasting for one year or less
- Short Term – Lasting one to seven years
- Medium Term – Lasting seven to fifteen years
- Long Term – Lasting fifteen years to sixty years
- Permanent – Lasting over sixty years

A statement is made as to the appropriateness of a development based on the combined assessment of the predicted landscape and visual impacts.

This methodology, in accordance with the various guidelines for LVIA, results in a conclusion as to the appropriateness of the development based on objective assessment of its likely landscape and visual impacts.

12.4 Baseline Description of Existing Conditions

12.4.1 Designations

There are no designations directly affecting the facility, with the closest, the *Lower River Suir SAC* (Code 002137) located over 6km away. There are no listed scenic routes in the Waterford Development Plan.

12.4.2 Site Context

The facility is located in an area that is low-lying with the surrounding land undulating and rising up and away from the N25 and the facility (approx. 72mOD) to the north and south (>90mOD). The facility is nestled low into the landscape. The surrounding land is mainly in agricultural use. The area is dotted with detached dwellings and farm buildings. The facility is located just south and off of the N25 Dungarvan to Waterford City Road. Refer to **Plates 12.1 – 12.5 in Attachment 12.1** illustrating the above.

Prior to the construction of the facility, the northwest part of the site was laid out as three rectangular relatively flat fields. The Dawn River followed a meandering course through the site and the area to the south was rough pasture with rock outcrop. The Great Southern Railway was created in the mid nineteenth century along the north-western edge of Greenan Hill, a rock outcrop which is now largely removed by previous quarrying operations and a high embankment (**Attachment 12.1, Plates 12.5,12.6, 12.16 and 12.17**) now surrounds the neighbouring quarry site, now a lake. The area immediately to the south of the facility contains workings/spoil heaps associated with the quarry (**Attachment 12.1, Plates 12.18,12.19 and 12.20**) and indicates the degraded nature of parts of the landscape to the south.

All of the buildings on the DMIUC site belong to the latter half of the twentieth century with some constructed in the early twenty-first century. There are no historic buildings on the site.

Presently around the DMIUC facility are a number of flower beds areas of amenity grassland with planted immature trees and non-native hedgerows including a Berberis (*Berberis Atropurpurea*) hedgerow running along the western boundary of the north-western carpark. Just southwest of the facility is an area that contains a mosaic of habitats. The area around the MBBR comprises disturbed ground due to recent construction.

The western boundary is composed of two distinct bands of woodland. The woodland to the southwest of the Dawn River includes mixed stands of pine and cypress along with a defined row of willow. To the northwest of the Dawn River, the small block of woodland dominated by willow with hawthorn also recorded. The north-western boundary of the site, located outside the main facility footprint is composed of a treeline of semi-mature willow with some alder.

The Dawn River is a small river which rises approximately 2.7km south west of the DMIUC facility and flows in a northeasterly direction to the south of the existing facility. As most of the Dawn River within the site was previously modified, riparian vegetation is not well developed with a mixture of grass, herbaceous species and scrub. Species noted include Willow (*Salix spp.*), Gorse (*Ulex europaeus*), Alder (*Alnus glutinosa*), Bramble (*Rubus fruticosus agg.*) and dense Bracken (*Pteridium aquilinum*). In the southern section of the site, where the stream was not diverted, the riparian vegetation is more complex with bands of riparian woodland/immature woodland and treelines present.

A section of the Dawn River was diverted into a new channel in August 2011 using a tracked machine. The diversion of the river was undertaken by excavating the new section first in dry ground to minimise silt levels. The works carried out at the new section of watercourse aimed to provide similar hydraulic and morphological characteristics to the original channel.

Situated to the southwest of the main facility is a large area, >50% of the site, dominated by the ICW for the facility. Refer to **Attachment 12.1, Plate 12.10.** The Dawn River runs in an east-west direction separating the two phases of the ICW. The majority of the 10 ponds are densely vegetated with little open water visible. Water flows in series by gravity from Ponds 1 -10.

Growing within most ponds are a range of emergent species with Common Reed (*Phragmites australis*) the most abundant species recorded. Other species recorded in high abundance include Bulrush *(Typha latifolia)* and Yellow Iris (*Iris pseudacorus*). The banks of each pond are gently sloping and have become colonised by a number of sapling/immature trees e.g. Willow, Alder and Birch (*Betula spp*). Gorse and soft rush were also recorded. Dividing each of the pools and running around each of their perimeters is an area of maintained amenity grassland.

The Waterford Greenway follows a disused railway line and is elevated behind the facility to the east and south, see **Figure 12.1. and Attachment 12.1, Plates 12.10 - 12.13.**

The remains of Greenan Hill rises up and away from the Greenway and obscures the disused quarry to the south, see **Attachment 12.1, Plates 12.15-12.17.**

A series of five residential receptors, including the Greenway, were identified during the site visit which are located in close proximity to the existing DMIUC facility. These five receptors are shown as **Figure 12.1 and on Plates 12.21-12.25 in Attachment 12.1.**

12.4.3 Waterford County Development Plan (2011-2017)

Waterford County Development Plan (2011-2017) Chapter 8 – 'Environment & Heritage' contains relevant policies in respect of landscape and visual amenity which include;

Policy ENV 1:

"To comply with the requirements of Directive 2001/42/EC on the assessment of certain plans and programmes on the environment- The SEA Directive and associated Planning and Development (Strategic Environmental Assessment) Regulations 2004 and carry out screening of all land use and non-land use plans as required under the regulations."

Policy ENV 2:

"To support provisions of the National Landscape Strategy and provide for the sustainable management of all of County Waterford's landscapes including archaeological landscapes, coastal, upland, rural and peri-urban landscapes."

Policy ENV 3:

"To develop the Comeragh Area into a National amenity and to promote the heritage and recreational features of the area for all users while conserving its natural habitats, protected species, flora, fauna, archaeology and landscape, and as a sustainable area for the local community. Objective ENV 1 To prepare a Landscape Character Assessment of County Waterford in accordance with National guidance on landscape from the Department of Environment, Heritage and Local Government."

Policy ENV 4:

"The Council will assess all proposals for development in terms of the Scenic Landscape Evaluation map, the Development Management Standards (Chapter 10) and the Rural Housing Design Guidelines (that will be prepared within one year of the adoption of the Plan)."

Policy ENV 5:

"Development in areas outside of settlements, along the coast road (from Youghal to Cheekpoint) and in upland areas, will only be considered where such proposals do not have an adverse impact on the landscape and where they satisfy the criteria set out under the settlement strategy policy contained in Chapter 4 County Settlement Strategy."

Landscape Designations

The objectives of *Appendix 9 Scenic Landscape Evaluation*, taken from the Waterford County Development Plan, include the following:

"The objective of this landscape study is to establish a method, which would provide the basis for arriving at landscape designations. It should be based on objective and easily replicable techniques. This method will be used to protect areas of high amenity by identification, categorisation and designation in the Waterford County Development Plan."

The main aims of these landscape designations will be to:

(a) Facilitate policy formulation by: - having a rational and legal basis; and - creating an awareness of limitations and strengths.
(b) Assist in development control by: - providing criteria for decision making: and - alerting applicants and designers to the need for special design requirements in certain areas to facilitate the integration of development focusing resources.
(c) Be unambiguous: - the designations should not be arbitrary; - they should be systematic and easily replicable; and - they should be open ended and capable of being updated as further information becomes available.

12.4.4 Mapping the Zones of Sensitivity

Topographical and land cover information were used to determine the categories of land use sensitivity -Vulnerable, Sensitive, Normal, Robust and Degraded.

Carroll's Cross, Kilmacthomas - the site of DMIUC, is classified as '*Degraded*'. Degraded areas are characterised by a breakdown of natural processes or pollution, in this instance the mineral extraction site at Greenan Hill (a disused quarry). The area includes the DMIUC site according the Scenic Landscape Evaluation map shown in Appendix 9 of the WCC Development Plan 2011-2017.

Areas included in these categories are characterised by the breakdown of natural processes or pollution. Once extraction or dumping has been completed, new development in these areas is desirable as a means to improve the existing character.

The policy with regard to areas designated as degraded states that "*New development should be encouraged as a means of improving the existing character of such areas.*"

12.5 Results of Assessment (status of existing conditions)

12.5.1 Landscape Impact

The nature of the existing facility is very much in keeping with existing adjacent developments such as Cross Electrical and QK Stores in close proximity to the site in terms of building form and scale. As such, it does not constitute an intrusive element in the local landscape setting. In wider views from the N25, the L4015 and L8061, distance will have a diminishing effect such that landscape character is not affected from these locations.

The sensitivity of the landscape resource is a function of its land use, landscape patterns and scale, visual enclosure and distribution of visual receptors and the value placed on the landscape (Refer to Section 12.3.3). The landscape sensitivity of the existing facility site on the receiving environment is classified as Low as it is not sensitive to change and the site of DMIUC facility is designated as 'Degraded'.

The scale or magnitude of landscape effects (or the quantity of change) that has been imposed on the landscape by the existing facility is classified as Low. There has been alteration to one or more key elements or features of the area and the introduction of elements that would be prominent for example the establishment of the ICW and the additional planting that has taken place, particularly since the submission of the landscape plan submitted in 2012 (part of Planning Ref 12/363).

On balance, there is a Low Significance impact on the Landscape Character that reflects the existing facility in the operational phase and therefore Long Term. The ICW and associated planting provides a beneficial impact. Previous use of the site as mentioned in Section 12.4.2 was agricultural, therefore the addition of ICW provides an improvement in landscape diversity.

12.5.2 Visual Impact

Based on the assessment of the landscape characteristics, values and sensitivities, 5 receptors were selected for assessment of visual amenity impact as set out in Table 12.2. overleaf.

Table 12.2 Viewpoint of Receptors for Visual Impact Assessment

No	Location	Direction Of View	Viewpoint Type	Distance to site
1	Carroll's Cross Inn (N25) **Plate 12.21**	North of site	Residential/Public Road	0.1km
2	Along the L4015 **Plate 12.22**	East of site	Residential	0.25km
3	Along the L8061 **Plate 12.23**	West of site	Residential	0.33km
4	Along the L4015 **Plate 12.24**	East of site	Residential	0.35km
5	Along the Greenway **Plates 12.9 – 12.13**	South of the site boundary	Amenity	Adjacent to the southern boundary

Distances from the site are from the receptor viewpoints to the nearest boundary of the facility. **Figure12.1** illustrates the locations of the above receptors.

The existing visual impact on each of the receptor viewpoints is assessed below, mainly based on the sensitivity of the visual receptors at that location. There is no change to the field of view as the facility has been present since the 1980s. The significance of the visual impact is scored and the quality of that impact. Finally, a conclusion is made as to the actual visual amenity impact.

Viewpoint 1 - Carroll's Cross Inn (Receptor 1)

Description of View
The selected viewpoint is located to the north of the facility along the N25 and known as 'Carroll's Cross Inn', a protected structure. This business is now closed however there is a residential dwelling to the back.

Existing View and Mitigation
There is no existing visual impact experienced for Carroll's Cross Inn (residential element) due to the screening effect of vegetation and buildings surrounding the dwelling which means that the existing facility is not visible from this location (**Attachment 12.1, Plate 12.21**).

Viewpoint 2 - Residential Dwelling (Receptor 2)

Description of View
The selected viewpoint is located approximately 0.25km to the east of the site on the L4015 and adjacent to a residential dwelling.

Existing View and Mitigation
There are no visual impacts experienced as the existing facility is not visible from this location (**Attachment 12, Plate 12.22**). Any visual impact from this location is screened from view by existing built elements as well as by existing roadside vegetation. Refer also to **Attachment 12.1 Plate 12.14.**

Viewpoint 3 - Residential Dwelling (Receptor 3)

Description of View
The selected viewpoint is located approximately 0.33km to the west of the site on the L8061 and adjacent to a residential dwelling.

Existing View and Mitigation
There are no visual impacts experienced as the existing facility is not visible from this location (**Attachment 12.1, Plate 12.23**). Any visual impact from this location is screened from view by existing built elements as well as by existing roadside vegetation.

Viewpoint 4 - Residential Dwelling (Receptor 4)

Description of View
The selected viewpoint is located approximately 0.35km to the west of the site on the L4015 and adjacent to a residential dwelling.

Existing View and Mitigation
There are no visual impacts experienced as the existing residential dwelling and garden faces east away from the facility (**Attachment 12.1, Plate 11.24**). The dwelling is roadside with no windows facing the road. Notwithstanding this, the facility is nestled into the landscape and is not intrusive from this viewpoint. Refer to **Attachment 12.1, Plate 12.15.**

Viewpoint 5 - Waterford Greenway (Receptor 5)

Description of View
The selected viewpoints are located along the old disused railway line or Waterford Greenway to the south of the facility. **Attachment 12.1, Plates 12.9 – 12.13.**

Existing View and Mitigation
Users of the Waterford Greenway may potentially experience a negative impact when passing by the facility due to its industrial nature. Approximately 0.5km of the 46km Greenway passes by the site. Much of the 46km of Greenway passes through agricultural land. Although it does also pass through industrial areas in Waterford City and immediately west and prior to the stretch at Carroll's Cross, lies within the degraded areas associated with past quarrying. Refer to **Attachment 12.1, Plates 12.17 – 12.20** taken from the Greenway.

In considering the impact further, the context must be considered. The impact is momentary in duration and the frequency is negligible to low even for regular users.

Approximately 250,000 people used the Greenway in its first year of opening and it has been an overwhelming success. A recent Baseline Survey Report was published in December 2017. Perceptions were evaluated as part of the study. A large majority of respondents noted that they liked the scenery or nature.

The ICW and associated planting takes up over 50% of the site and contributes a beneficial visual effect in the Carroll's Cross area for the Greenway users. In time, landscape planting may screen the main plant further.

VIA Result

- The viewpoint sensitivity is considered Medium reflecting the amenity nature of the location with users travelling past and the fact the facility is visible.
- The magnitude of visual effects or degree of change from this viewpoint is/will be Low/Negligible in the Long Term.
- The significance of the visual impact will be Neutral to Beneficial in the Long Term as the ICW and associated landscape planting become more established.

12.6 Assessment of Impacts

There is no proposed additional development on this site. Increases to maximum capacity will not have any landscape or visual impacts.

12.7 Mitigation and Enhancement Measures

DMIUC have an ongoing landscape maintenance and management plan that is implemented on site. Furthermore, the ICW with the associated planting provides a long term beneficial visual aspect for users of the Greenway in the Carroll's Cross area.

12.8 Residual Impacts

There are no residual impacts associated with the existing facility as it is mostly screened from view from nearly residential receptors. The existing built element currently causes only a momentary non-significant negative impact to users of the greenway and roads. This will reduce over time as planting further matures. The existing ICW covering over 50% of the site provides a varied and beneficial impact to users of the Greenway.

12.9 Cumulative Impacts

There are no impacts on nearby residential receptors therefore there are no cumulative.

The cumulative impact for users of the Greenway over the full 46km will be long term beneficial due to ongoing landscape planting.

12.10 Summary and Conclusions

The potential effects on landscape and visual amenity were identified and evaluated via site visits and desk-based study. A number of sources including the Waterford County Development Plan 2011 -2017 were consulted.

There is no proposed built development that requires assessment therefore the effect of the existing facility and landscaping has been evaluated. The assessment methodology took account of standard guidance for landscape and visual impact assessment where possible.

This assessment concludes that the existing DMIUC facility does not cause any significant negative impacts in respect of local landscape character or sensitive visual receptors in the environs of the site, i.e. local or distant residents or users of the surrounding road network infrastructure and Waterford Greenway.

The absence of landscape and visual impacts reflects the capacity of the existing facility to accommodate changes to the original site with minimal alteration to the landscape setting. This is due to a combination of variations in topography, existing tree and hedgerow cover including existing buildings and infrastructure which combines to restrict views of the existing facility and only cause momentary impact to the users of the N25 and local roads adjacent to the site and to the Waterford Greenway.

12.11 References

Waterford County Development Plan 2011 – 2017.

Waterford Greenway Intercept Survey 2017 - Baseline Survey Report, AECOM Consultants, December 2017

13 Chapter Thirteen - Traffic & Transport

13.1 Introduction

The purpose of this chapter is to present a traffic statement for the facility. A detailed traffic and transport impact assessment is not deemed necessary for the following main reasons:

- Traffic generation was addressed by the local authority in the planning application for the additional production floorspace in 2012 (Planning File Ref No. 12363). At the time, the traffic arisings from the additional floor space were provided to the local authority who granted permission including a condition for road improvements/traffic management at the junction of the N25 "*benefitting the proposed development that is provided or intended*".

- The NRA[6] Traffic and Transport Assessment Guidelines, 2014 sets out thresholds above which traffic and transport assessments in relation to planning applications is recommended. The existing activity/traffic generation falls below the applicable threshold. No additional floorspace is proposed.

13.2 Consultation

Planning Reports prepared by Waterford County Council for the planning permissions granted as set out in Table 7.4 of this document were reviewed. No further consultation was undertaken as there is no proposed development under consideration in this EIAR. Traffic arising from the additional floorspace for increased production capacity was addressed during the planning process in 2012.

13.3 Study Assessment & Methodology

A desk-based review of websites such as Transport Infrastructure Ireland (TII) and the Road Safety Authority (RSA) has been conducted. A full list of references is included in Section 13.11 of this chapter.

13.4 Baseline Description of Existing Conditions

13.4.1 Existing Road Network

The facility is located at Carroll's Cross Roads, Ballyshunnock, Co. Waterford. It is adjacent to the N25 National primary road from Cork to Waterford, as shown in Figure 13.1. and **Attachment 13.1, Plates 13.1 and 13.2.** The N25 runs on an east/west axis close to the northern boundary of the facility. The N25 is considered a moderately trafficked single carriageway. The road is subject to a 100kph urban speed limit in the vicinity of the DMIUC entrance. Refer to **Figure 13.1** for more detail.

[6] The National Roads Authority no longer exists. It merged with the Railway Procurement Agency in 2015 and is now part of Transport Infrastructure Ireland.

Carroll's Cross Roads consists of a staggered junction (**Attachment 13.1, Plates 13.4 and13.5**) between the N25 and a series of local roads. Firstly, a simple T-junction at the northern side of the N25 which branches to the L4022 and L8061. This is accessed via a slip-lane travelling westbound and a direct turn travelling eastbound. The L4022 extends north east towards Guilcagh cross roads while the L8061 extends west towards Kilmacthomas village. Refer to **Figure 13.1** for more detail.

Secondly, a simple T junction at the southern side of the N25 leads onto the L8020. This is accessed via a slip-lane travelling eastbound and a direct turn travelling westbound. The L8020 extends south west towards a series of further local roads. Refer to **Attachment 13.1, Plates 13.3 and 13.6.**

Additionally, another simple T junction exists further east of Carroll's Cross Roads, also on the southern side of the N25. It is accessed via a direct turn travelling westbound and a slip-lane is provided eastbound. This leads onto the L4015 which extends south towards a series of local roads. Refer to **Attachment 13.1, Plate 13.1.**

Access to the facility is via the N25 L8020 junction, with the facility entrance immediately past this junction on the left.

13.4.2 Traffic Volumes

Annual Average Daily Traffic (AADT) volumes and typical weekday peak hour link traffic volumes on the N25 have been established via a desk survey of Transport Infrastructure Ireland (TII) data. The 2017 volumes are shown in Table 13.1 below.

Table 13.1 2017 Traffic Volumes on N25

Road	Location	Total Vehicles	% HGV's	Typical Weekday Peak Hour Vehicles	
		AADT		11.00 AM	14.00 PM
N25	Kilmacthomas	10,513	6.7%	403	679

Data provided by TII for the years 2014 - 2018 indicates a growth in total traffic volume in excess of 5% year on year.

13.4.3 Collision Data

The latest data from the TII collision database indicates no recorded collisions for 2014, with the last collision at Carroll's Cross occurring in 2013. This was a minor single vehicle accident. For prior years back to 2007, no further collisions are recorded in the immediate vicinity.

13.4.4 Traffic Arising at the Facility

Approx. 50 staff cars enter the facility per production shift (07.00 and 15.00 hrs) and a further 40 office staff cars enter during the morning period. Peak hour traffic occurs at approx. 07.00 – 08.00 hrs. On average, approx. 14 HGVs and 11 vans enter and

exit the facility over a 24-hour period. These movements occur during the day and evening with no vans or trucks entering or exiting over the night time period.

There are approx. 15 – 20 customers per day for the Premium Butcher's shop on site. Opening times are 08.00 – 17.30 hrs Mon-Thurs; 08.00 – 18.00 hrs on Friday and 09.00 – 16.00hrs on Saturday. This shop is closed on Sundays.

During the application for additional floorspace in 2012 (Planning File Ref No. 12363) the following figures were listed in the Planner's Report dated 11/9/2013 relating facility related traffic.

- Average weekly volumes of HGVs entering the site prior to the provision of additional floor space and expansion plans were estimated at 64 units per week. Post additional floor space, the figure was expected to rise to 101 units per week.

WCC granted permission which included a condition for road improvements/traffic management at the junction of the N25 "*benefitting the proposed development that is provided or intended*".

13.5 Results of Assessment

The flows arising as a result of the existing facility are insignificant in the context of overall flows on the N25 and at 3.1%, are significantly below the 10% threshold of total flow on the N25 whereby a detailed transport assessment would be required.

In addition, the safety record for the N25 at Carroll's Cross is good.

13.6 Assessment of Impacts

The maximum production capacity of the facility production equipment and infrastructure is 283 tonnes per day compared to current output of 95 tonnes per day. There is an amount of redundancy built into this level of production and, as stated in Chapter 3 of this EIAR, maximum production is unlikely to occur due to other factors such as cleaning and staffing requirements. The FDM sector is demand driven and therefore production output can fluctuate. On average traffic flows are not likely to increase to any significant degree over time and any increases in HGV traffic from the existing facility/max. production capacity are not likely to be more than 50% of existing flows.

It is envisaged that flows from the facility will remain sub-threshold.

13.7 Mitigation and Enhancement Measures

Not applicable.

13.8 Residual Impacts

Refer to Section 13.6 above.

13.9 Cumulative Impacts

Traffic flows from existing facility and production capacity are not expected to significantly increase and therefore will be insignificant in the context of existing flows on the N25.

13.10 Summary Conclusions

Traffic generation was addressed by the local authority in the planning application for the additional production floorspace in 2012 (Planning File Ref No. 12363). At the time, the traffic arisings from the additional floor space were provided to the local authority who granted permission including a condition for road improvements/traffic management at the junction of the N25 "*benefitting the proposed development that is provided or intended*". Accordingly, a detailed traffic and transport assessment is not deemed to be required and has not been provided in this EIAR.

Notwithstanding this and in addition, the existing facility including likely traffic flows arising from maximum production capacity are sub-threshold under the TII Guidelines.

The traffic flows, including those likely to arise from maximum production capacity from the facility, are insignificant in the context of the overall flows on the N25. The accident record for the N25 are Carroll's Cross is good.

13.11 References

National Roads Authority, Traffic and Transport Assessment Guidelines, May 2014.

Transport Infrastructure Ireland (2017), Traffic Data – N25 (Kilmacthomas) 2015-2017

14 Chapter Fourteen - Climate Change

14.1 Introduction

This chapter provides an overview of the facility in terms of performance on the national and global issue of climate change and the need to reduce Greenhouse Gas (GHGs) emissions and the need to conserve natural resources. The potential impact of the facility in terms of carbon dioxide emissions is addressed and existing and proposed future mitigation measures are identified where required.

14.2 Consultation

No specific consultation was undertaken in the preparation of this chapter other than review of existing policies etc. on climate as set out in Section 14.4 below.

14.3 Methodology

14.3.1 Desk Based Assessment

Various national and international documents on climate change were reviewed in order to compile this section.

A site visit was undertaken by Redkite Environmental Ltd. on the 10th April, 2018 to review current activities and practices against the 2009 BREF for Energy Efficiency and the 2006 BREF for FDM industries.

14.4 Baseline Description of Existing Conditions

Climate change is recognised as the most serious global environmental problem. While natural variations in climate over time are normal, human interference with the global atmosphere system through the emission of very substantial amounts of GHGs is causing a discernible effect on global climate. Continuing change in the global climate system is expected in the future due to further emissions of GHGs.

14.4.1 International and EU Climate Change Policy

The first United Nations (UN) convention on climate change was held in Kyoto in 1997. Ireland, as part of the EU, signed up to this agreement which originally extended until 2012. It was agreed to extend the Kyoto Agreement on climate change to 2020 at the UN convention held in Doha in December 2012.

In 2015, the UN climate change conference held in Paris set the groundwork for 195 countries to adopt the first ever universal, legally binding global climate agreement. The Paris agreement came into force on 4th November 2016.

In the agreement, all countries agreed to work to limit global temperature rise to well below 2°C, and given the grave risks, to strive for 1.5°C.

Furthermore, The Marrakesh Partnership for Global Climate Action was launched in 2016 (United Nations, 2016) to carry out the following:

- Catalyse action on climate change by all players;
- Further increase ambition before 2020, and,
- Support the Paris Agreement.

The Partnership addressed 7 key areas to include:

- Land use
- Oceans and coastal zones
- Water
- Human settlements
- Transport
- Energy
- Industry

Meanwhile, the EU has set itself targets for reducing its GHG emissions progressively up to 2050, known as the 2050 low-carbon roadmap. As a step towards this objective, the EU published ambitious targets known as the 2020 climate and energy package (European Commission, 2009) and 2030 climate and energy framework (European Commission, 2014).

The 2020 climate and energy package, adopted in 2009, provided the "20-20-20" targets which set three key objectives for 2020:

- A 20% reduction in EU GHG emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%, and,
- A 20% improvement in the EU's energy efficiency.

The targets were set by EU leaders in March 2007, when they committed Europe to become a highly energy-efficient, low carbon economy.

The 2030 climate and energy framework was adopted in October 2014 and builds on 2020 targets to provide

- At least 40% cuts in GHG emissions (from 1990 levels);
- At least 27% share for renewable energy, and,
- At least 27% improvement in energy efficiency.

The EU is also offering to increase its emissions reduction to 30% by 2020 if other major economies in the developed and developing worlds commit to undertake their fair share of a global emissions reduction effort.

14.4.2 Situation in Ireland

Under the Kyoto Protocol, Ireland was required to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO_2eq over the five-year period 2008 – 2012 which is

equivalent to 62.8 Mtonnes of CO_2eq per annum. The Kyoto Protocol limit was calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO_2eq following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the United Nations Framework Convention on Climate Change (UNFCCC).

Reports & Projections

According to the EPA's report and news release entitled '*Ireland's Greenhouse Gas Emissions Projections 2012-2030*', which was published on 25th April 2013, Ireland is on track to meet its commitment under the Kyoto Protocol (EPA, 2013). This is in marked contrast to the projection in Ireland's 2007 National Climate Change Strategy which forecast a total distance to target of 18 Mtonnes of CO_2eq.

The report goes on to state the following:

> *"Whilst the reduction in the distance to target for the Kyoto Protocol period is a positive outcome in terms of compliance, its occurrence is, primarily, a direct result of the current economic recession and economic outlook for the future. In order to meet future targets, Ireland cannot rely on a recession and needs to develop as a low carbon economy going forward.*
>
> *There continues to be a significant risk that Ireland will not meet its 2020 EU targets even under the most ambitious emission reduction scenario. There is projected to be a cumulative distance to target of 7 – 24 Mtonnes for the period 2013-2020 with Ireland breaching its annual limits in 2015-2016. Strong projected growth in emissions from transport and agriculture are the key contributors to this trend."*

According to the report, Ireland's GHG emission profile is unique due to the dominance of the agricultural sector.

By 2020, transport and agriculture are projected to account for nearly 80 per cent of Ireland's emissions not accounted for under the Emissions Trading Scheme. Under the most ambitious reduction scenario, transport and agriculture emissions are both projected to increase by 12% by 2020. This scenario assumes that ambitious targets are met for renewable fuel penetration, electric vehicle rollout and targets under the Food Harvest 2020.

According to the EPA, failure to deliver on any of the measures, or a reduction in their effectiveness will mean higher emissions levels than projected. Earlier this year, it emerged that Ireland may have to spend up to €300m over the next eight years to fulfill its obligations under these EU targets.

In April 2018, the EPA published a report titled "Ireland's Final Greenhouse Gas Emissions 2010-2016" (EPA, 2018). A number of key findings included:

- For 2016, total national GHG emissions are estimated to be 61.55 million tonnes carbon dioxide equivalent (Mt CO_2eq). This is 3.6% higher (2.12 Mt CO_2eq) than emissions in 2015 and returns GHG emissions to 2009 levels.

- In the last 2 years, national total emissions have increased by 7.4% or 4.23 Mt CO_2eq. In the same period, emissions in the ETS sector have increased by 11.2% or 1.78 Mt CO_2eq and in the non-ETS sector by 5.9% or 2.45 Mt CO_2eq.
- Agriculture and Transport accounted for 73.2% of total non-ETS emissions in 2016.
- Emissions from the Manufacturing Combustion 2 sector increased by 0.07 Mt CO_2eq or 1.6% in 2016. There were minor decreases in combustion emissions for all sub sectors except cement which increased by 3.5% in 2016.
- The Industrial Processes sector emissions increased by 7.1% or 0.14 Mt CO_2eq, mainly from increased cement production. Cement process emissions increased by 8.6% in 2016.
- Greenhouse gas emissions from the Residential sector remained almost unchanged with a small increase of 0.1% or 0.01 Mt CO_2eq.
- Emissions from the Waste sector increased by 0.9% or 0.01 Mt CO_2eq in 2016.

Policy

In April 2014, the National Policy Position on Climate Action and Low Carbon Development was published to address the challenge in reducing GHG emissions. The National Policy Position provided a high-level policy direction for the adoption and implementation by Government of plans to enable the State to move to a low carbon economy by 2050. It stated the following:

> *"The evolution of climate policy in Ireland will be an iterative process based on the adoption by Government of a series of national plans over the period to 2050. Greenhouse gas mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through National Mitigation Plans and National Climate Change Adaptation Frameworks."*

Following the National Policy Position, The Climate action and low carbon development act (2015) was seen as a major advancement of climate change policy in Ireland. It provided the statutory basis for the *national transition objective laid out in the national policy position (*Dept of Communications, Climate Change & Environment, 2015).

Ireland's first statutory National Adaptation Framework (NAF) was published on 19 January 2018 (Dept of Communications, Climate Change & Environment, 2018). The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts. The NAF was developed under the Climate Action and Low Carbon Development Act 2015.

The NAF builds on the work already carried out under the National Climate Change Adaptation Framework -2012. The NAF outlines a whole of government and society approach to climate adaptation in Ireland. Under the NAF, sectoral adaptation plans will be required and prepared by a number of Government Departments with responsibility for key priority areas.

2018 will see work on these plans commence. Local adaptation strategies will also be prepared by Local authorities, with the NAF being reviewed at least once every

five years. The NAF also aims to improve the enabling environment for adaptation through ongoing engagement with civil society, the private sector and the research community.

14.4.3 Dawn Meats Ireland Group

The group is committed to sustainability, which is detailed in the publishing of their 2016 Corporate Social Responsibility report (Dawn Meats Ireland, 2016). This report addresses 5 core pillars to which the company commits including:

- People & community
- Sustainable sourcing
- Animal Welfare
- Innovation & nutrition
- Resource Management

Dawn Meats has set a goal to be "*Europe's most sustainable meat company*"

In addition, the company has developed a sustainability plan 'Sustainability Today for all our Tomorrows' which has been in place for several years. In this plan, the group has committed to a reduction in 40% water use, 40% energy use and a 50% reduction in carbon footprint by 2020.

Carroll's Cross Plant

Dawn Meats have a commitment to low carbon production and, have set a target of achieving fossil fuel free status at the Carroll's Cross facility (BITC, 2018). A multi-faceted approach was prepared to include:

1. Heat recovery from the refrigeration and cooling systems;
2. Solar and wind powered street lights;
3. A passive integrated constructed wetland as a significant component of the WWTS;
4. A LEAN management system was instigated involving multiple kaizen and A3 projects, and,
5. 100% renewable electricity was sourced.

The heat recovery system has been a huge success to date with the following savings delivered annually at Carroll's Cross:

- Reduction of fossil oil use by 74,000 litres;
- 806,000 KWH equivalent electricity savings, and,
- 217.8 Tonnes of CO_2 savings.

The group has implemented Energy Management Systems (EMSs) across its plants including Carroll's Cross. The group has received certification of the EMSs to ISO50001 2011 in 2018.

The facility complies with the requirements of the 2009 BREF on Energy Efficiency.

14.5 Results of Assessment

As noted above, the Carroll's Cross facility is a very low energy user in both relative and absolute terms with ongoing savings in GHG emissions. Energy usage in 2017 was as follows:

8,874 MWhr electricity;
Approx. 1 m^3 gas oil equivalent to 3.54 T CO_2eq

As noted above, electricity is sourced from renewable supplies. The small boiler on site is only used as a back-up to the heat recovery system.

R134-a (CH_2FCF_3) an F-gas is used in the heat pumps on site. This gas is listed in Regulation EU No. 517/2014 on fluorinated greenhouse gases and repealing regulation 842/2006. The Greenhouse Warming Potential (GWP) of this gas is 1,430. 3.5 kg of R134A has a 5 tonne CO_2eq. Approx. 25kg is present on site within enclosed systems. The heat pump system is maintained and serviced by an authorised contractor as required under the regulations.

14.6 Assessment of Impacts

It is envisaged that the existing heat recovery system has adequate capacity to manage the hot water requirements for maximum production capacity. Electricity requirements from renewable sources could increase by up to 55%.

14.7 Mitigation and Enhancement Measures

DMIUC has implemented an Energy Management System complying with, and certified to, the requirements of ISO50001. Accordingly, energy efficiency will remain at the forefront of management of the facility. Group policy will also drive projects to reduce GHG emissions.

DMIUC will work with their specialist contractor to source alternatives to R134-a as the phase down of F-gases continues. The operation of equipment with F-gases accounts for a significant percentage of energy costs. Therefore, the sourcing of an alternative will focus on ensuring equal or better energy efficiency.

14.8 Residual Impacts

In the future, it is anticipated that the Carroll's Cross facility will continue to effect positive changes in terms of reducing GHG emissions in line with current group policy.

14.9 Cumulative Impacts

Cumulative impacts and effects have been considered in the assessments undertaken above.

14.10 Summary and Conclusions

The measures undertaken by DMIUC in their commitment to both climate change legislation and their goal of being carbon neutral provide solid evidence that the facility is actively addressing the issue of climate change. The measures introduced including the Energy Management System means the facility will have an ongoing positive impact in terms of reducing GHG emissions. The 'fossil fuel free' commitment by the company is a strong indicator for the future.

14.11 References

Business in the Community Ireland (BITC). 2018. *Dawn Meats going Fossil Fuel Free.* https://www.bitc.ie/newsroom/members-news/dawn-meats-going-fossil-fuel-free/

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15 Chapter Fifteen – Material Assets

15.1 Introduction

Material Assets as defined in the 'Advice Guidelines on the Information to be contained in Environmental Impact Assessment Reports DRAFT' (EPA, 2017) as 'built services and infrastructure'. This includes roads and traffic, electricity, telecommunications, gas, water supply infrastructure and sewerage (built infrastructure). The Advice Notes for Preparing Environmental Impact Statements, Draft 2015 refer to material assets as "resources that are valued and intrinsic to specific places." Accordingly, material assets can be a broad and less easily definable subject for assessment.

Generally, the objective of the assessment of impact on such assets is to ensure that they are used in a sustainable manner, so ensure continued availability for future generations after the development of a project. As noted throughout this EIAR, the facility is currently operational. Full production capacity has already been permitted under planning and therefore what is intended has been provided for.

15.1.1 Competent Expertise

This chapter has been prepared by Siobhan Maher whose qualifications include M.Tech. Environmental Management, B.Sc. Analytical Science, Dip. Acoustics and Noise Control Engineering, MIOA. Siobhan is the managing director of Redkite Environmental and has over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. Siobhan has acted as lead assessor on over 50 EIARs over the past 20 years during her time as Technical Director in Malone O' Regan Environmental Services.

15.2 Methodology

This chapter of the EIAR has been prepared with reference to the specific criteria set out in the Guidelines on Information to be Contained in an Environmental Impact Statement (EPA 2002) and the Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA 2003). This chapter also has regard to EIA Directive 2014/52/EU and the associated Draft EPA guidelines (2017), which will be updated upon the enactment of the directive into national law. These draft guidelines include information on the assessment of the effects of development on material assets and advise on the nature of the material assets that should be examined as part of the preparation of an EIAR.

15.3 Baseline Description of Existing Conditions

Under the definition of material assets contained in the 2017 draft, the following material assets relevant to the DMIUC facility include:

- Transportation infrastructure (roads);
- Use of the electricity supply network;
- Use of the telecommunications network.

The facility has its own wastewater treatment infrastructure and also its own private groundwater supply well and therefore does not impact on public infrastructure in this regard. The nearest public water scheme is for Kilmacthomas and is a groundwater supply south of the N25 at Kilmacthomas. Gas is not used on site.

The following assets could be included under the broader definition of material assets set out in the 2015 Advice Notes:

- Water Supply - usage of groundwater as a natural resource;
- Dawn River – usage of assimilative capacity of the river;
- Downstream lands/properties – potential for flooding.

15.4 Results of Assessment

The impacts on all of the above listed material assets with the exception of electricity and telecommunications have been assessed in the relevant preceding chapters of this EIAR:

Chapter 6 – Groundwater/Water Supply;
Chapter 7 – Surface water/assimilative capacity of Dawn River and flooding;
Chapter 13 – Traffic and Transportation.

No significant residual impacts have been identified. Electricity and telecommunication supplies to the facility are in place and operational and therefore were subject to interaction between DMIUC and supply bodies in the past.

15.5 Assessment of Impacts

The current facility up to maximum capacity is permitted as intended and therefore operates within the capacity of existing relevant public infrastructure.

15.6 Mitigation and Enhancement Measures

DMIUC have implemented ISO14001:2015 and ISO50001:2011 at the facility and therefore conservation of water and energy resources are at the forefront of business decisions and operations.

15.7 Residual Impacts

Residual impacts are as described above. Mitigation measures listed will ensure that the facility does not significantly impact on resources and infrastructure into the future.

15.8 Cumulative Impacts

No significant impacts have been identified and no new development proposed therefore there are no additional cumulative impacts to consider.

15.9 Summary and Conclusions

Material assets is a broad subject and may cover both services infrastructure and assets such as natural resources, property and cultural heritage. The potential for impacts on transport infrastructure, groundwater as a potable water supply, the assimilative capacity of the Dawn River to receive treated wastewater and the potential for downstream flooding has been assessed in this EIAR.

The current facility up to maximum capacity is permitted as intended and therefore operates within the capacity of existing relevant public infrastructure.

DMIUC have implemented ISO14001:2015 and ISO50001:2011 at the facility and therefore conservation of water and energy resources are at the forefront of business decisions and operations.

Overall, there are no significant residual impacts on material assets as a result of the operation of the DMIUC facility at current or maximum production output.

15.10 References

https://www.water.ie/water-supply/water-quality/map/

Waterford County Development Plan, 2011 – 2017, Chapter 7 – Infrastructure

https://dcenr.maps.arcgis.com/apps/MapSeries/

16 Chapter Sixteen – Interactions

16.1 Introduction

All environmental factors are inter-related to some extent, and the relationships can range from tenuous to highly complex. The interactions between impacts on different environmental factors have been addressed throughout this EIAR. For example, potential impacts on biodiversity are inter-related to the quality of water which in turn can be directly affected by treated wastewater discharges. Redkite Environmental Ltd. has ensured that interactions between the various disciplines has been addressed.

As per general practice, **Table 16.1** overleaf provides a matrix showing where interactions between the various environmental factors have been addressed in this EIAR.

16.2 Summary of Interactions

16.2.1 Population & Human Health and Lands, Soil & Groundwater

There is no evidence of contaminated soil on site. Diffusion of non-hazardous pollutants to groundwater has occurred through the base of the ICW ponds. This has resulted in a temporary localised impact on groundwater downgradient of the ICW. No groundwater supply wells have been affected.

16.2.2 Population & Human Health and Air

The potential for odour nuisance arising from the WWTS and impacting on local residents has been assessed as part of this EIAR. To date, DMIUC has received no odour complaints. Dispersion modelling indicates that there will be no significant impact on nearby receptors.

16.2.3 Population & Human Health and Noise & Vibration

The potential for impact on human health arising from noise sources on site has been addressed in this EIAR. The facility currently complies with typical guideline limit values for day, evening and night and conditions relating to tones based on the WHO Guidelines.

16.2.4 Population & Human Health and Landscape

The impact on visual amenity has been assessed in this EIAR. The facility is located in an area considered degraded in the County Development Plan due to the adjoining remnant quarry located to the south. There are no plans for further land take associated with the existing facility. The effects on the visual amenity of users of the Greenway has been assessed. DMIUC has a landscaping plan in place. Overall, there is no significant impact on visual amenity.

16.2.5 Population & Human Health and Traffic

The main interaction between human health and traffic relates to air quality, noise and road safety. There have been no accidents on the N25 at Carroll's Cross junction associated with the facility. The traffic movements associated with the facility are insignificant in the context of the overall flows on the N25 and related potential emissions to air and noise impact.

16.2.6 Population & Human Health and Material Assets

Refer to Section 16.2.5 above with regard to road infrastructure/safety and human health.

Refer to Section 16.2.1 above with regard to groundwater supply quality and human health.

Water usage and the potential for draw-down on the aquifer has been considered in this EIAR. It is assumed that private groundwater wells are used by local residents in the surrounding area. The water usage by the facility is relatively small compared to other facilities in the FDM sector. There have been no reports of loss of water pressure or drying up of local wells. The underlying aquifer is of regional importance and it is noted that there are artesian wells on site indicating a large natural resource present.

16.2.7 Biodiversity and Land, Soils and Groundwater

The potential effect of elevated ammonia and ortho-phosphate downgradient of the ICW in groundwater on surface water and biodiversity has been assessed in this EIAR. There are no differences in biodiversity or water quality in the Dawn River upstream or downstream of the facility.

Approx. 55% of the site is covered by the ICW which provides habitat for birds and mammals.

16.2.8 Biodiversity and Surface Water

See Section 16.2.7 above.

16.2.9 Biodiversity and Air

The potential for impact on biodiversity arising from air quality issues has been considered in the EIAR. There are no interactions between both environmental factors due to the negligible emissions to air from the facility.

16.2.10 Biodiversity and Noise

The potential for impact on biodiversity arising from impact on the ambient noise environment has been considered in the EIAR. It is considered likely that birds and

mammals have habituated to noise emissions from the facility. There are no proposed increases in noise sources associated with the facility.

16.2.11 Groundwater and Surface Water

The potential for elevated localised levels of nutrients such as ammonia and ortho-phosphate in the groundwater impacting on the Dawn River has been addressed in this EIAR. There is no evidence of impact based on chemical and biological monitoring of the river.

16.2.12 Groundwater and Material Assets

Groundwater is likely used as a water supply for local residents. Refer to Sections 16.2.1 16.2.6 above.

16.2.13 Noise and Vibration and Traffic

Refer to Section 16.2.5. above.

16.2.14 Traffic and Material Assets

Traffic arising from the facility is insignificant in the context of the N25 daily flows. The facility will not affect key objectives of the County Development Plan regarding maintaining the carrying capacity of the N25.

Table 16.1 Interactions Summary Table

Interactions	Population & Human Health	Biodiversity	Land, Soils, Ground-water	Surface Water	Air	Climate	Noise & Vibration	Landscape	Traffic	Cultural Heritage	Material Assets
Population & Human Health		✘	✔	✘	✔	✘	✔	✔	✔	✘	✔
Biodiversity			✔	✔	✔	✘	✔	✘	✘	✘	✘
Land Soils, Groundwater				✔	✘	✘	✘	✘	✘	✘	✔
Surface Water					✘	✘	✘	✘	✘	✘	✘
Air						✘	✘	✘	✘	✘	✘
Climate							✘	✘	✘	✘	✘
Noise & Vibration								✘	✔	✘	✘
Landscape									✘	✘	✘
Traffic										✘	✔
Cultural Heritage											✘
Material Assets											

✔	Weak Interaction
✔	Some Interaction
✔	Strong Interaction
✘	No Interaction

Figures

Approximate Facility Boundary – Carroll's Cross

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 1.1 - Site Location

Scale:	NTS	
Ref:		
RK Ref:		
Revison:		
Document Control:	Date:	Aug 18
	Drawn By:	AW
	Checked By:	SM
	Approved By:	SM

Approximate Facility Boundary

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 3.1 - Site Layout

Scale:	NTS	
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Document Control:	Date:	Aug 18
	Drawn By:	AW
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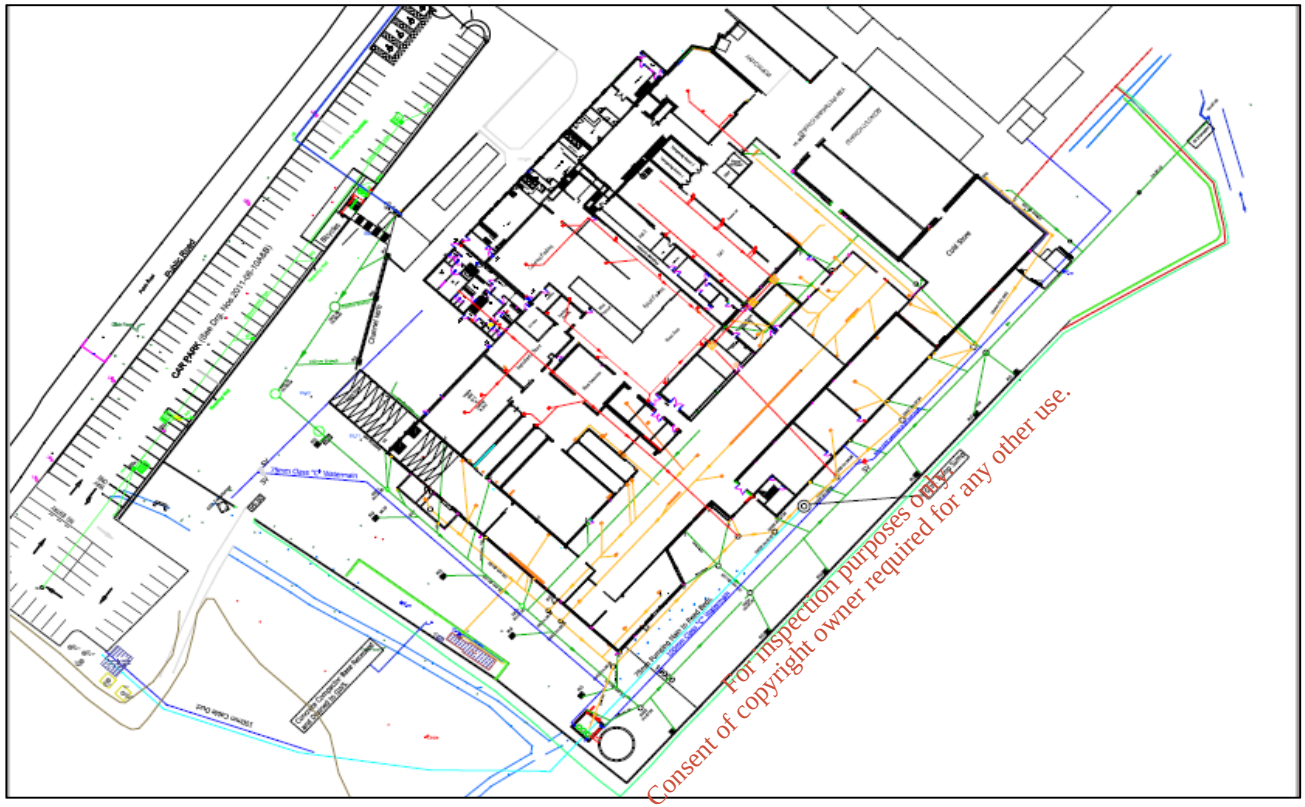
	Approved By:	SM



N

Existing Drainage

Surface Water Drainage

Gray water Drainage

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 3.2 - Drainage

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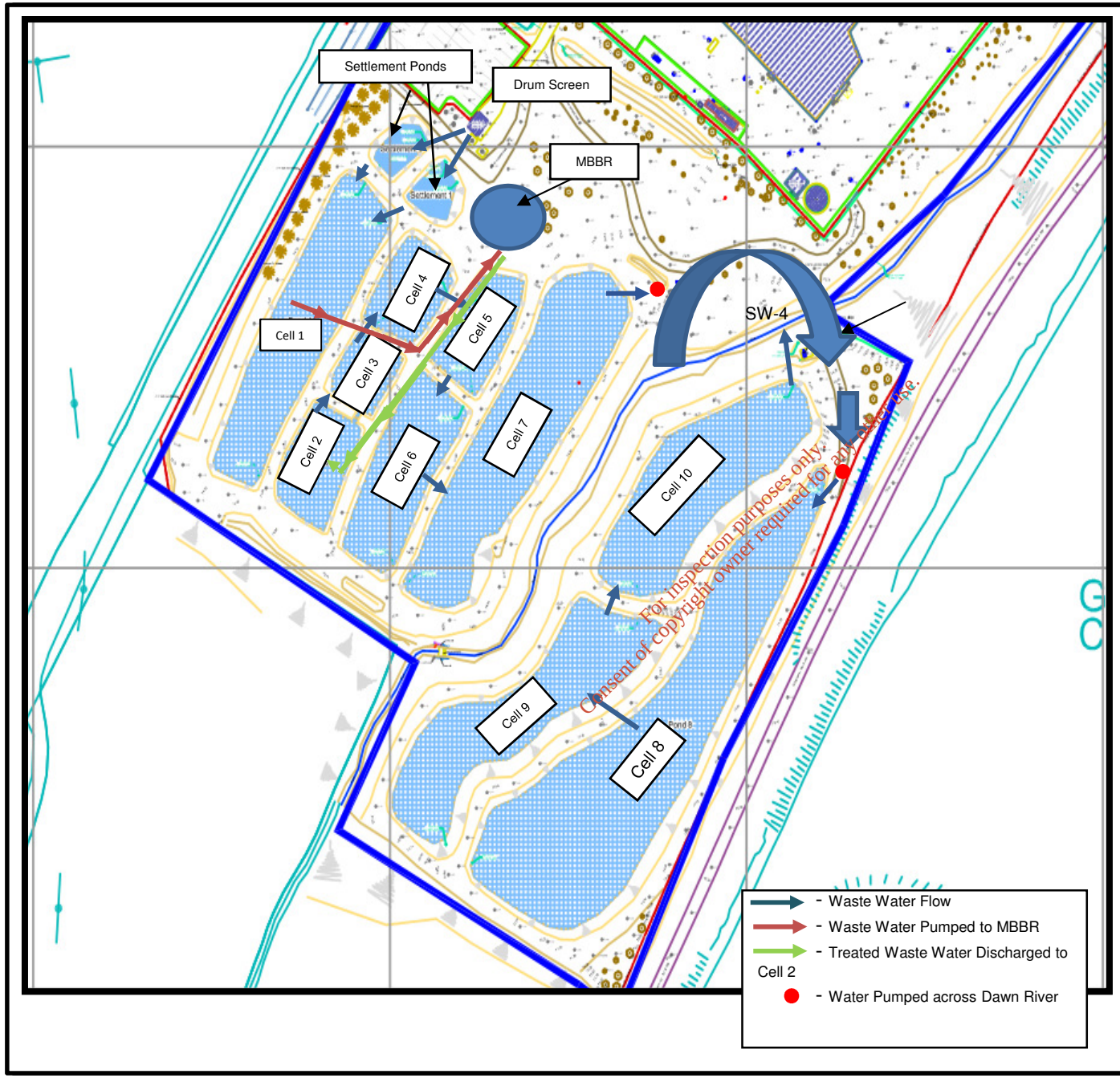

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 3.3 - Flow through WWTS

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	Drawn By:	AW
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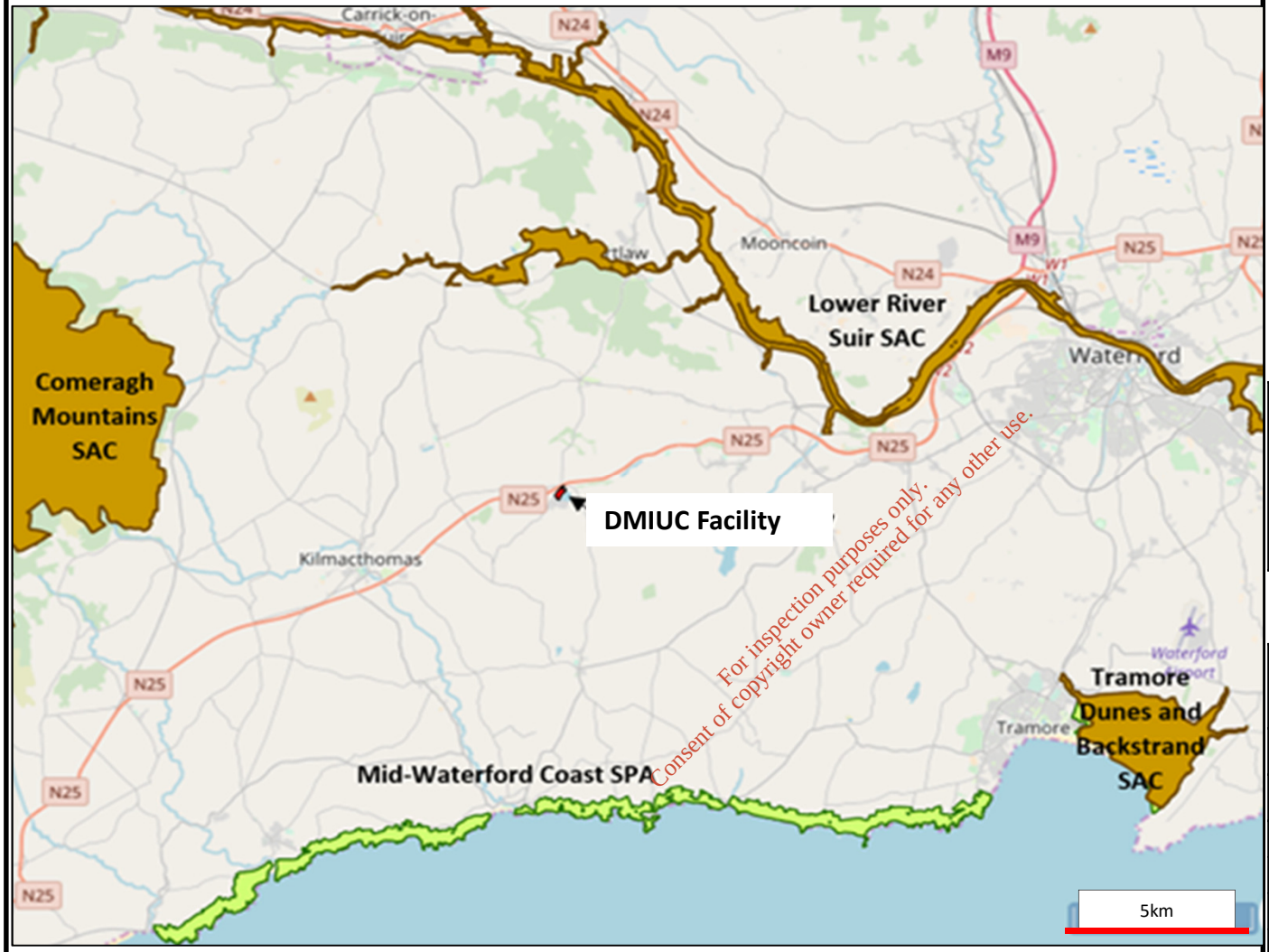

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Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 5.1 - DMIUC with Respect to Natura 2000 Sites within 15km

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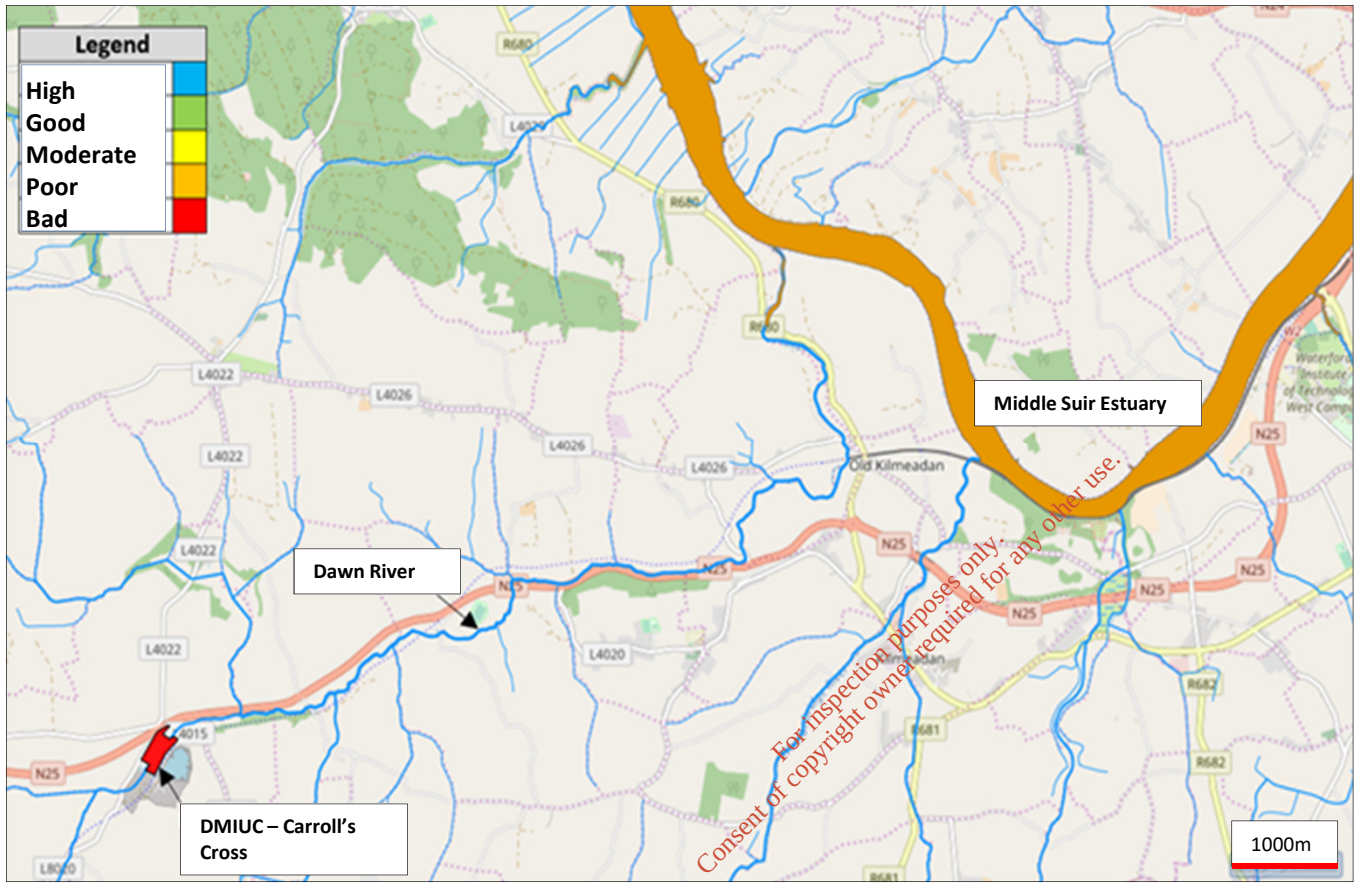

Source:https://gis.epa.ie

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Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 5.2 - EPA Water Quality Status

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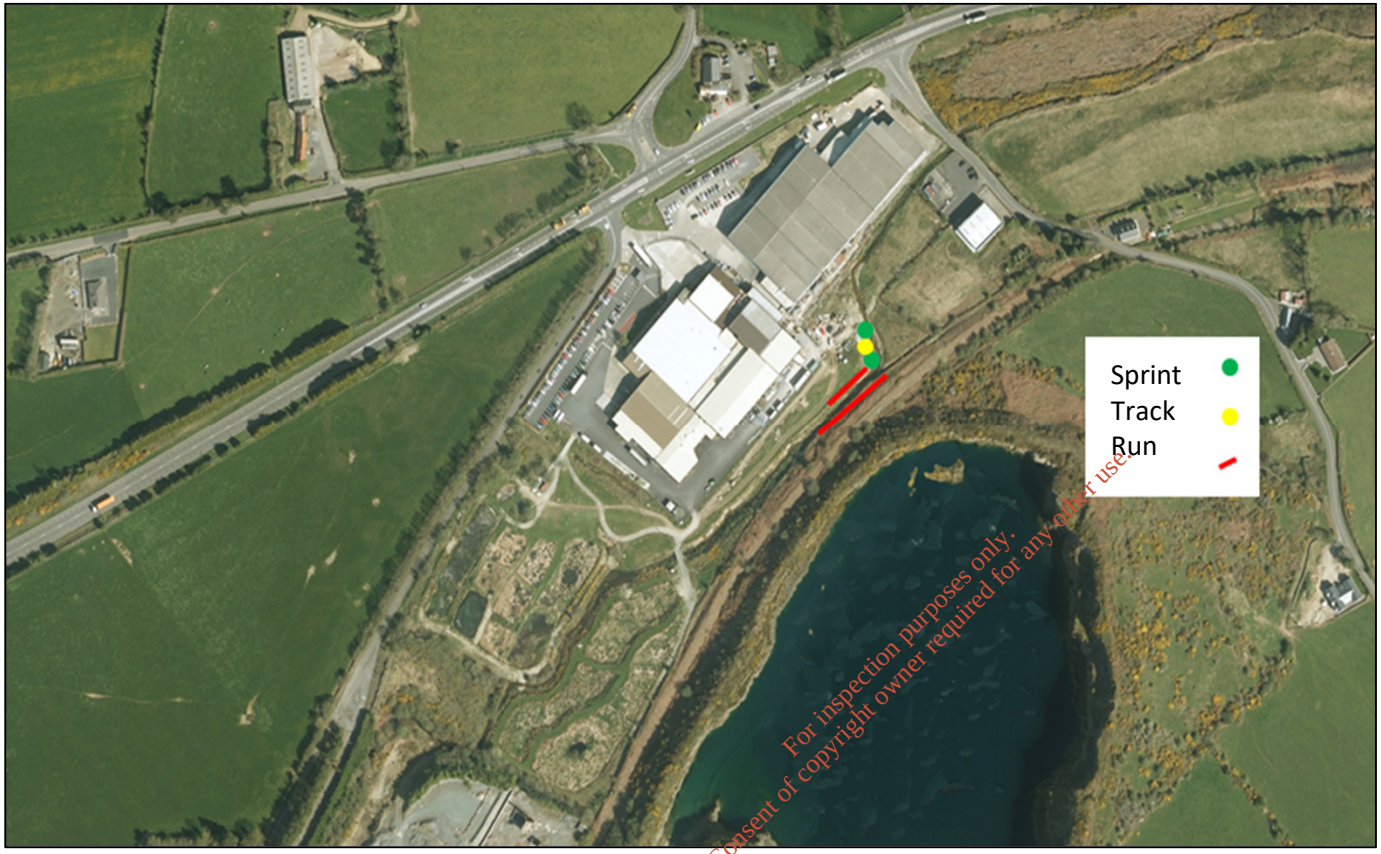

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Otter spraints recorded along the Dawn River

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 5.3 – Aerial Photograph Showing Location of Otter Signs

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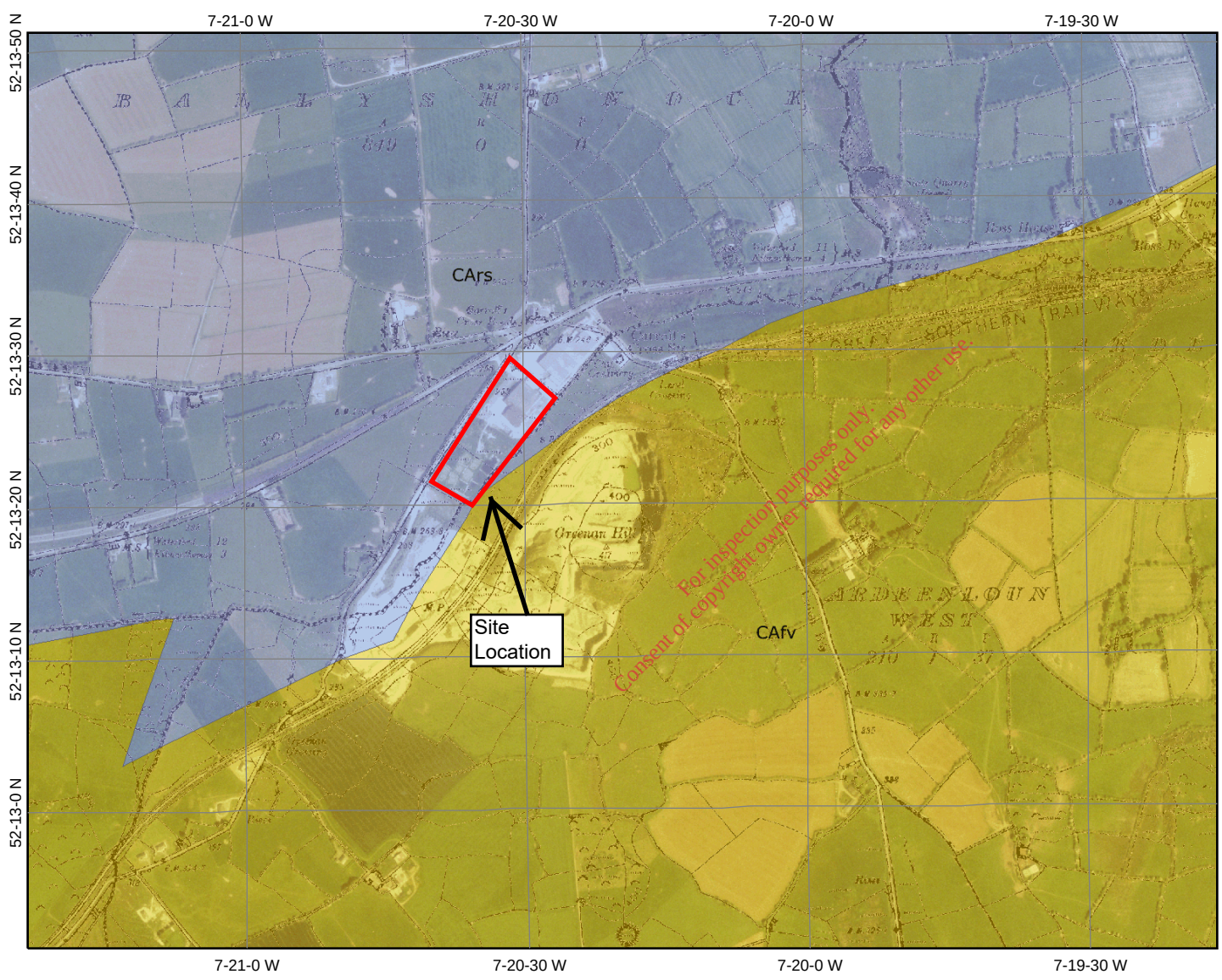
Document Control:	Date:	Aug 18
	Drawn By:	AW
	Checked By:	SM
	Approved By:	SM

Figure 6.1 - Bedrock Geology



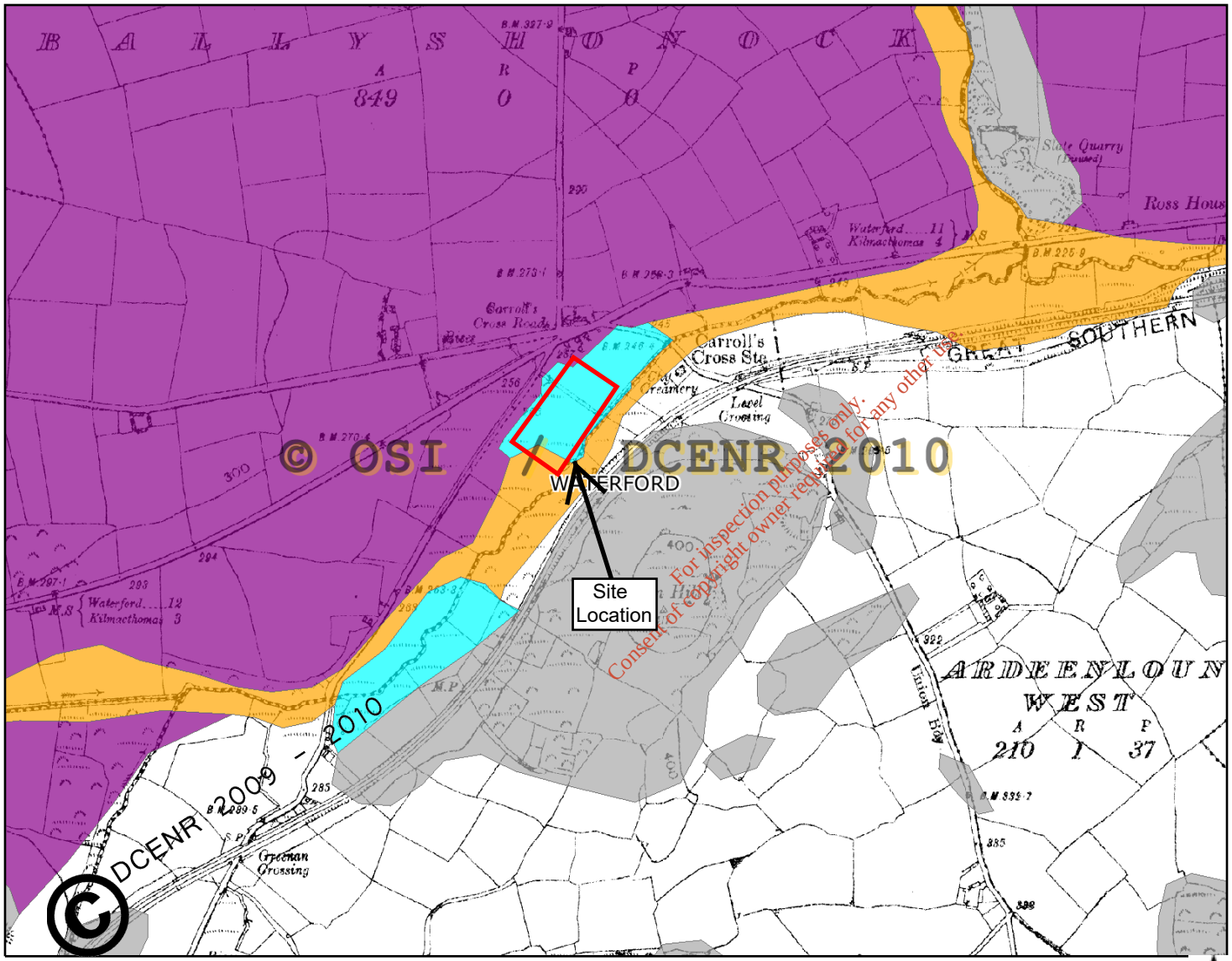
Map center: 245183, 108049

Legend

Bedrock 100k Solid Geology

- AA - Aille and Barney Fms (undifferentiated)
- AA - Allen Andesite Formation
- AAwp - Westport Oolite
- AB - South Achillbeg Formation
- ABcg - Achillbeg Conglomerate Member
- ABps - Achillbeg Lighthouse Psammite Member
- ABsl - Achillbeg School Black Slate Member
- AD - Aghaward Formation
- AD - Ardagh Shale Formation
- AD - Ardenagh Formation
- AD - Ashleam Bridge Dolomitic Formation
- AE - Aghamore Formation
- AE - Ardane Formation
- AG - Addergoole River Formation
- AG - Aghfarrell Formation
- AG - Aghmacart Formation
- AGdh - Dowery Hill Member
- AGdo - Aghmacart Formation
- AH - Achill Head Formation
- AH - Arklow Head Formation
- AHfv - in Arklow Head Formation
- Al - Aille Limestone Formation
- AK - Askingarran Formation
- AL - Altan Limestone Formation
- AL - Annas[illegible] Formation
- AL - Argillaceous Limestones (Visean)
- ALmk - in Argillaceous Limest (Visean)
- AN - Anaffrin Formation
- AN - Annabella Formation
- ANgm - Glennamong Member
- ANrd - Old Road Member
- AP - Ards Pelite Formation
- AP - Ashleam Head Formation

Figure 6.2 - Teagasc Subsoil Map



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Map center: 245074, 108140

Legend

RBD Subsoils

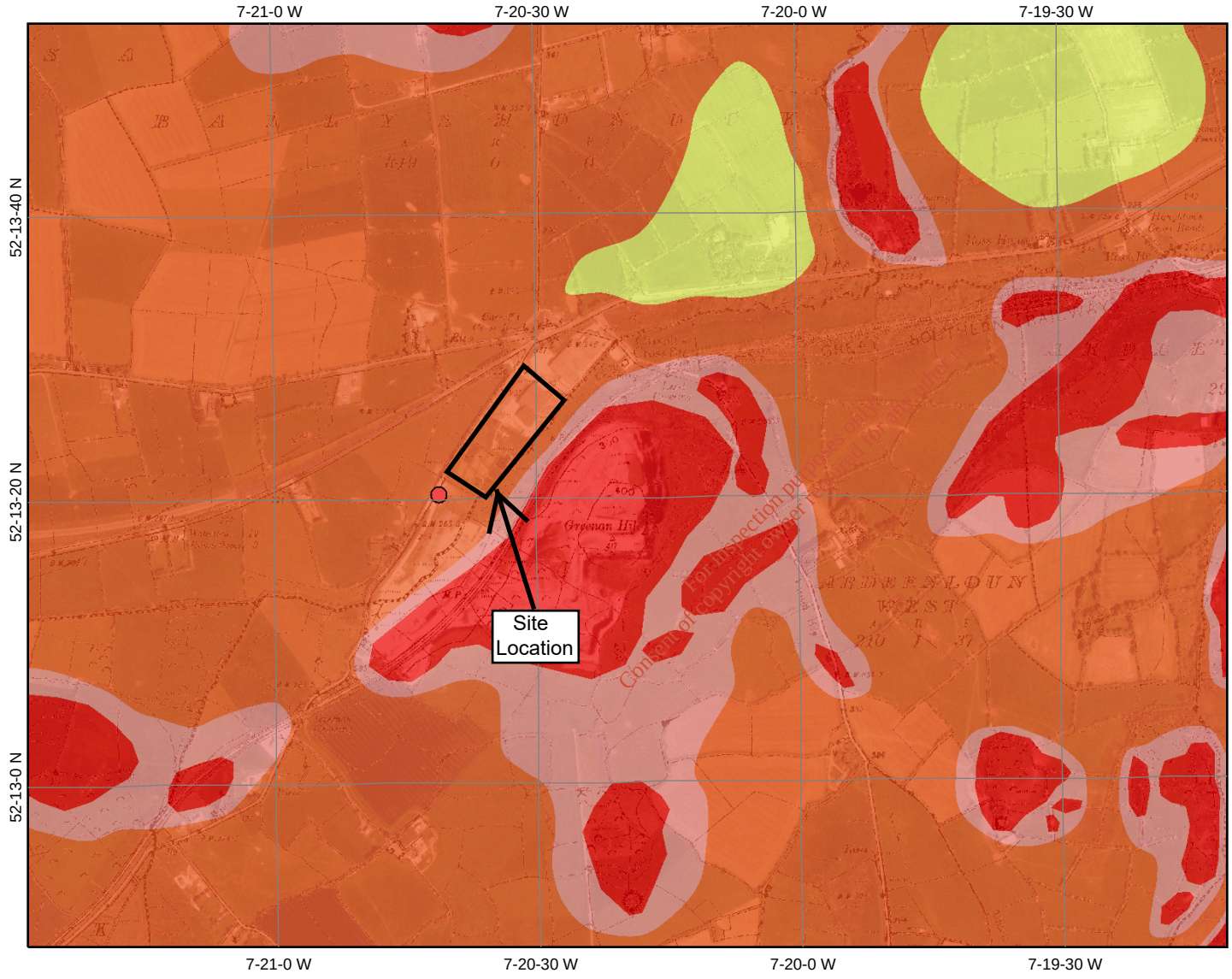
- Alluvium
- Beach sands and gravels
- Bedrock outcrop and subcrop
- Esker sands and gravels
- Glaciofluvial sands and gravels
- Lake sediments
- Made ground
- Marine/estuarine silts and clays
- Marsh
- Peat
- Scree
- Till derived chiefly from Devonian sandstones
- Till derived chiefly from Lower Palaeozoic rocks
- Till derived chiefly from Namurian rocks
- Till derived chiefly from granite
- Till derived chiefly from limestone
- Till derived chiefly from metamorphic rocks
- Till derived from metamorphic rocks
- Till derived from mixed Devonian and Carboniferous rocks
- Water
- Windblown sands
- County Boundaries

Watermark

Scale: 1:10,126

Snapshot Date: 17-Jul-2013

Figure 6.3 - Groundwater Vulnerability



Map center: 245183, 108049

Legend

Quarries (Active 2001)

- Mine
- Pit
- Quarry
- Quarry&Pit

Vulnerability

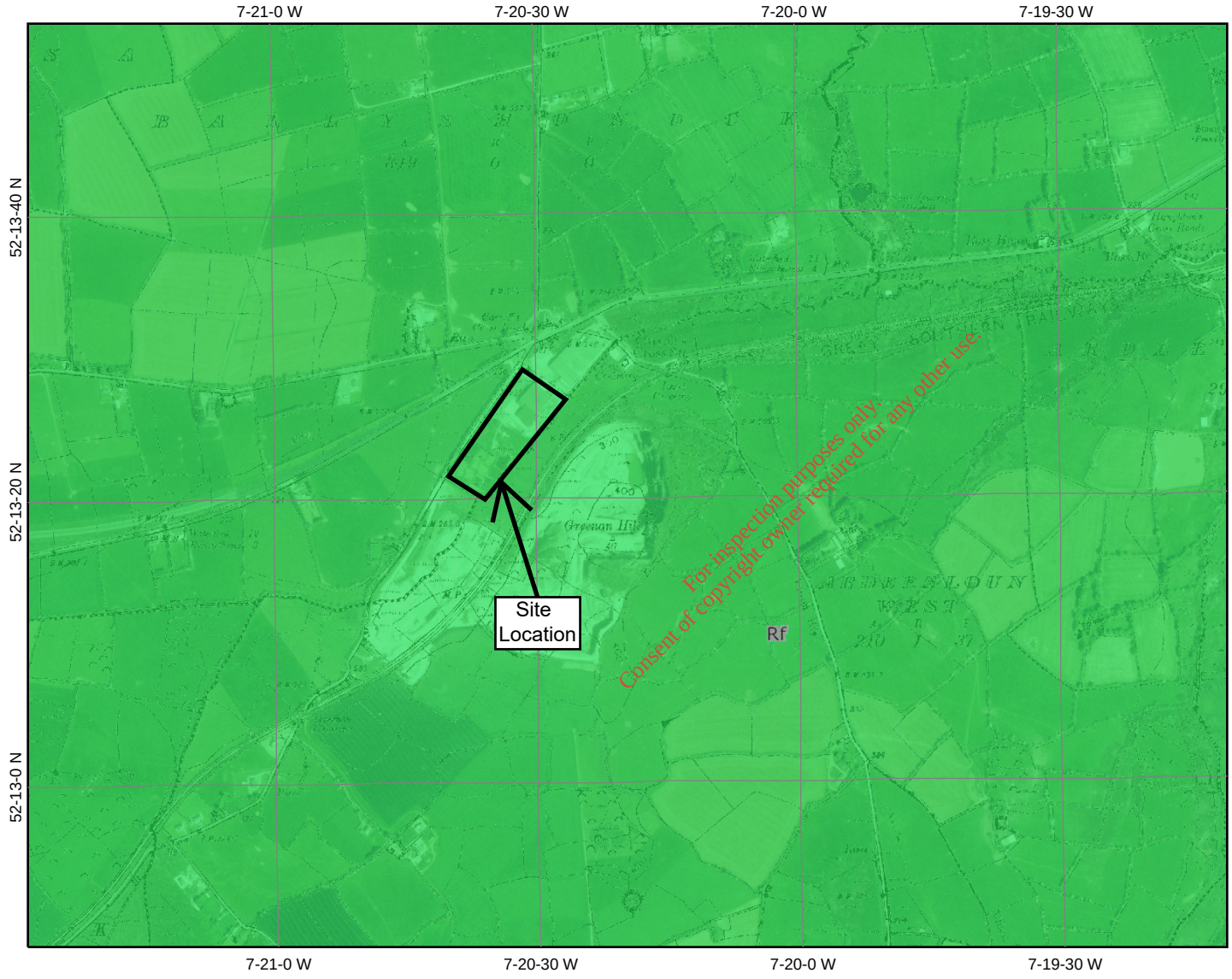
- X (Rock near Surface or Karst)
- E - Extreme
- H - High
- M - Moderate
- L - Low
- HL - High to Low. Only an interim study took place.
- Water
- No Data Available

Irish National Seabed Survey Zones (50m-5000m)

Irish Designated Seabed Zone

Bathymetry

Figure 6.4 - Aquifer Map



Map center: 245183, 108049

Legend

National Draft Bedrock Aquifer Map

- Rf - Regionally Important Aquifer - Fissured bedrock
- Rk - Regionally Important Aquifer - Karstified
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Unclassified

Irish National Seabed Survey Zones (50m-5000m)

Irish Designated Seabed Zone Bathymetry

IE Consulting,
Campus Innovation Centre,
Green Road,
Carlow.
Ph: 059-9133084
Fax: 059-9140499
E-mail: info@iece.ie

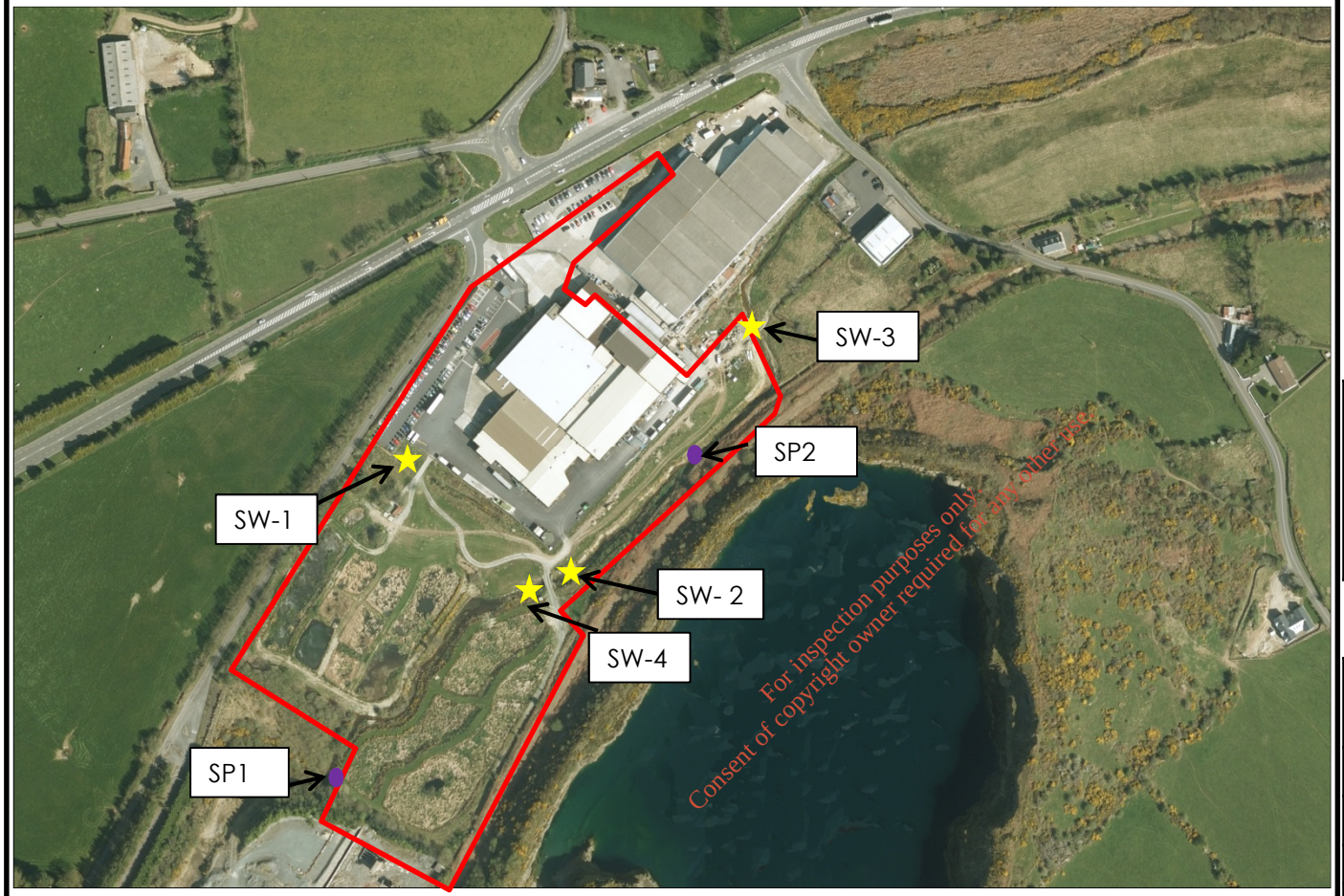
Project Title: Dawn Meats |EIAR

Project Address: Carrolls Cross, Co. Waterford.

Client: Dawn Meats

Dwg. Title: Groundwater Contour Map

Dwg Scale	Date	Dwg No	Job No	Revision	Dwg By
NTS	10/5/2018	Figure 6.5	IE1573	A	CL



Approximate Site Boundary

SW = Storm Water Discharge Locations

SP = River Sampling Points (SP1 is upstream and SP2 is downstream of SW-4)

N

Redkite Environmental

Ballykeane Road, Redcross,
Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 7.1 – Location of Surface Water Discharges & in-River Monitoring Locations

Scale:	NTS	
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NSL = Noise Sensitive Location
B = Boundary Location

N

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Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 8.1 – Location of NSLs and Noise Monitoring Locations

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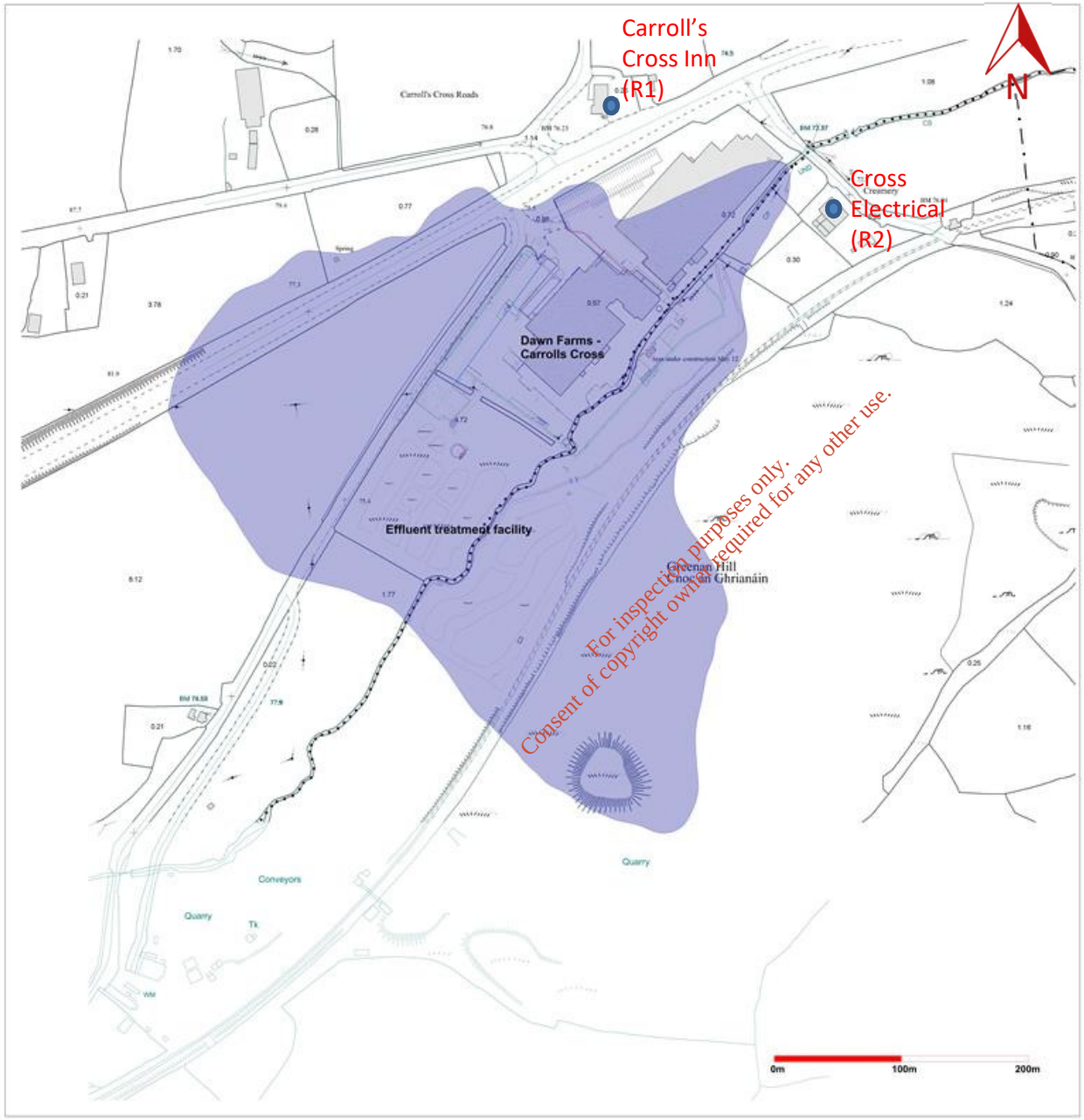

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 9.1 Predicted Odour Contour Plot

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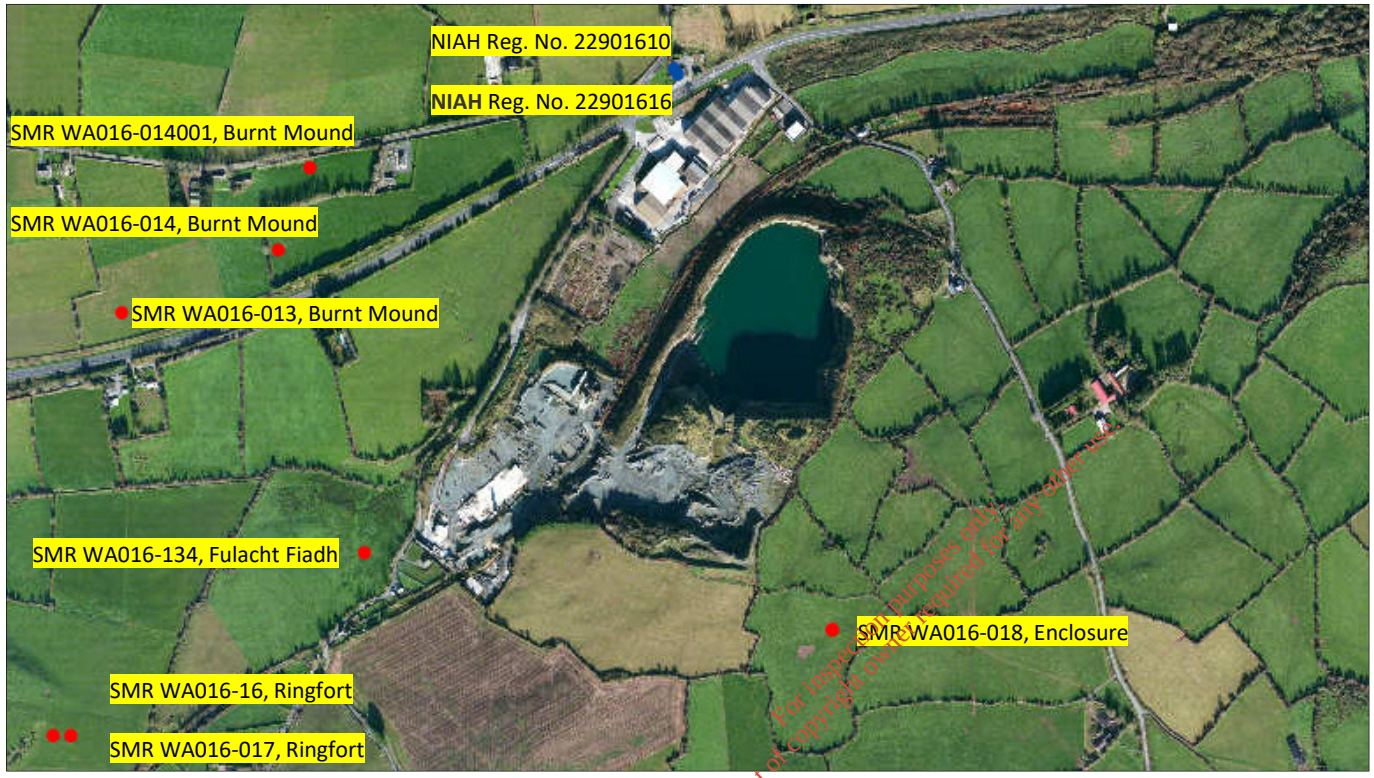

The site under review (with Recorded Monument in the vicinity (red dots), features on Architectural Heritage (blue dots) as presented on the Archaeological Survey of Ireland (ASI) (a unit of the National Monuments Service). The ASI was established to compile an inventory of the known archaeological monuments in the State. The information is stored on a database and in a series of paper files that collectively form the ASI Sites and Monuments Record (SMR).

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.1 - Recorded Monuments & Features of Architectural Heritage in the site Vicinity

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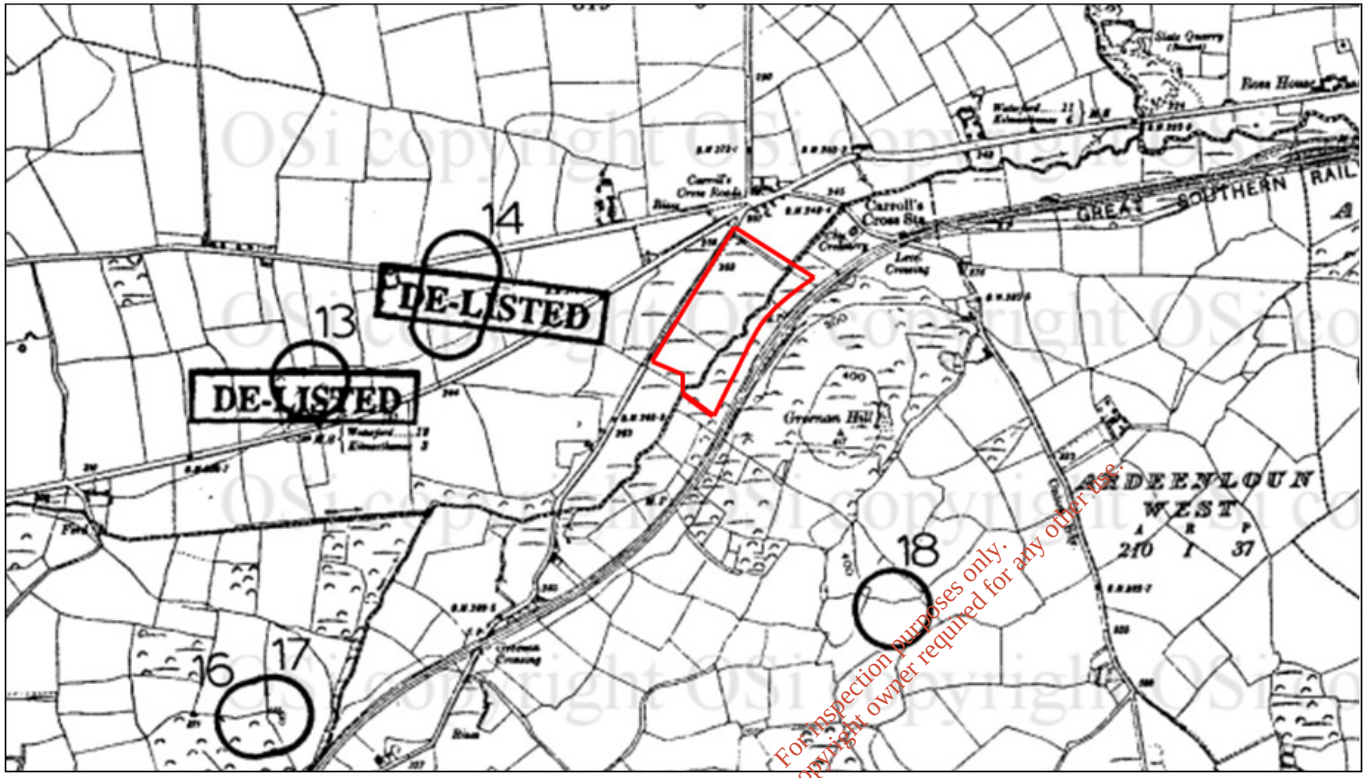

25 inch OSI Map, DMIUC boundary in red.

N

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Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.2 – 25 Inch OSI Map 1

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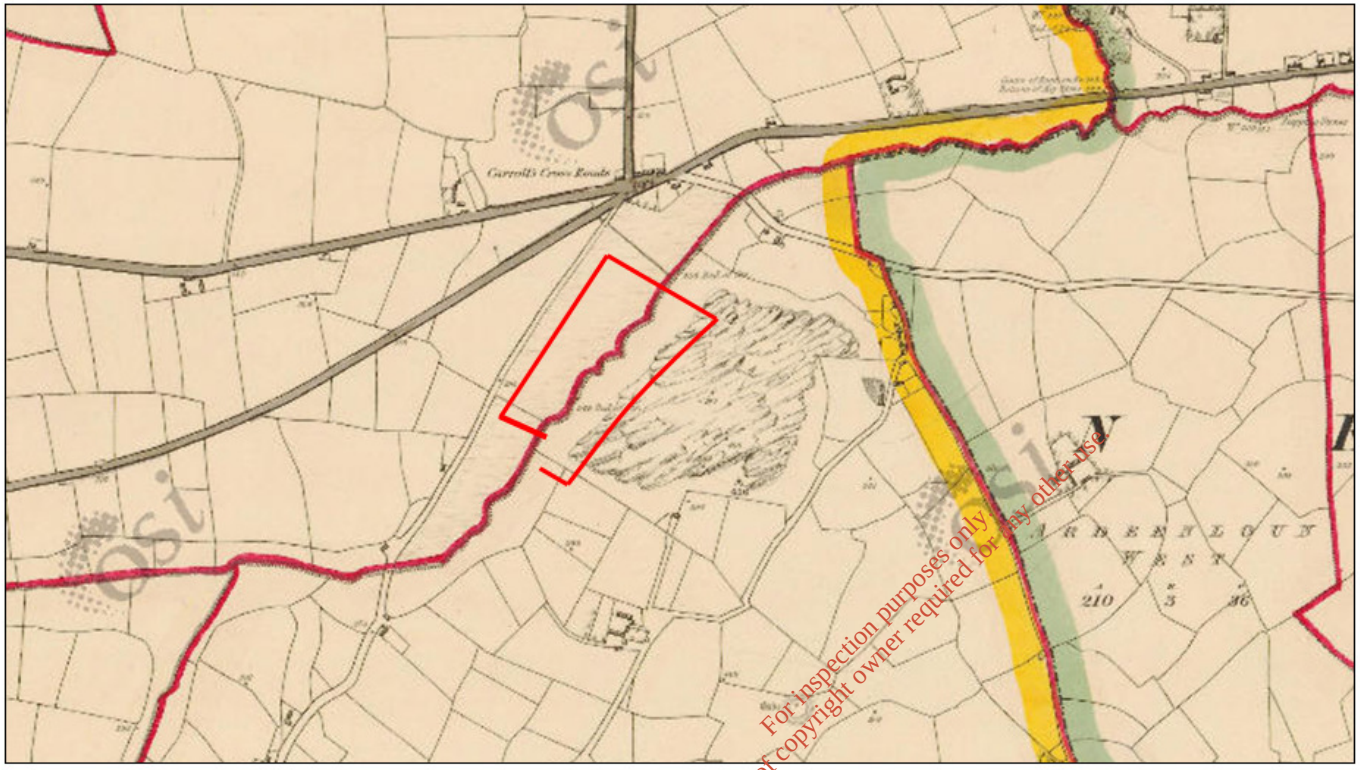

25 inch scale map (date 1829-1942), DMIUC boundary in red.

N

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Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.3 – 25 Inch OSI Map 2

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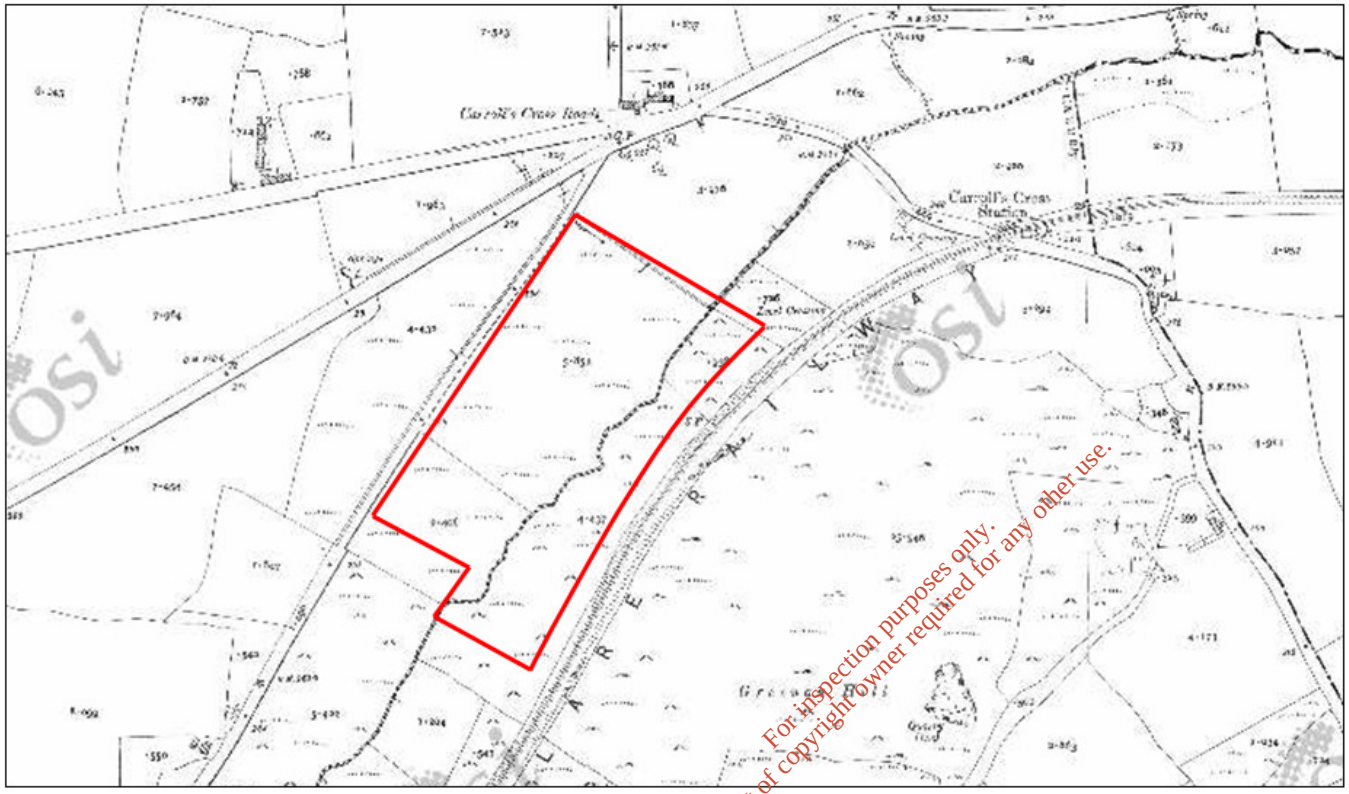

6 inch scale map (date 1897-1913), DMIUC boundary in red.

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Co. Wicklow, Ireland

Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.4 – 6 Inch OSI Map

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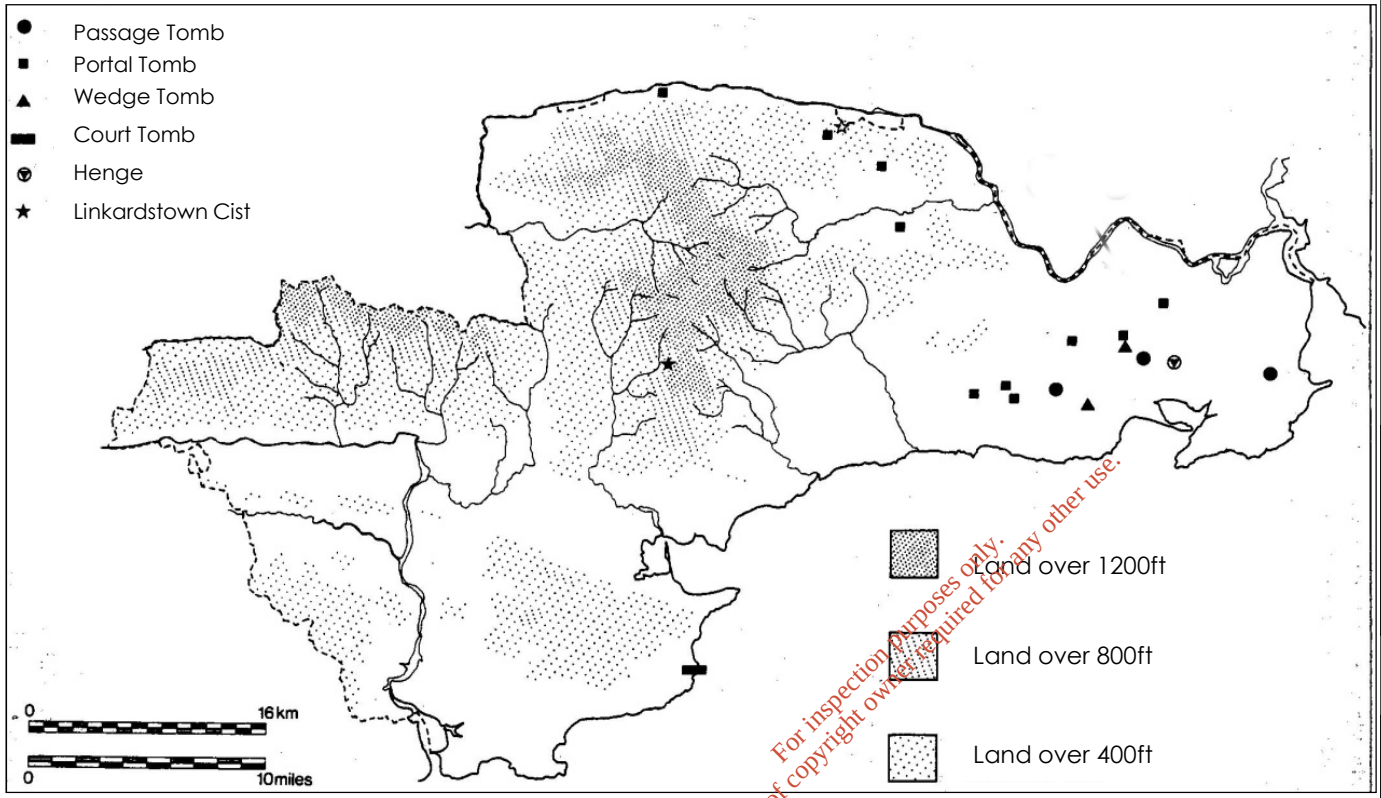

Neolithic monuments in Co. Waterford (after Moore & Woodman 1992).

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.5 – Neolithic Monuments in Co. Waterford

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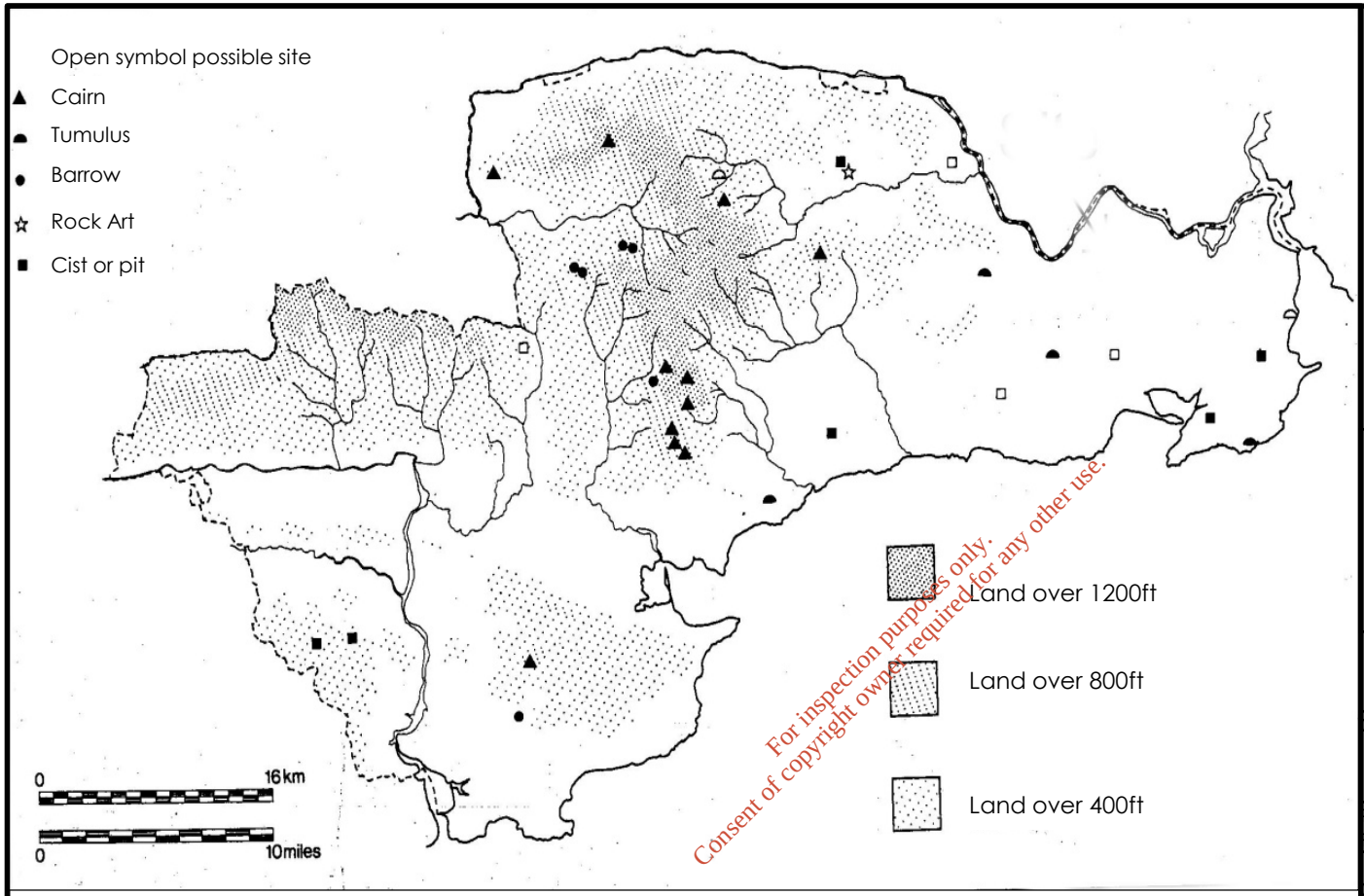

Bronze Age burials, tumuli, barrows and cairns in Co. Waterford (after Moore & Woodman 1992).

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.6 – Bronze Age Monuments in Co. Waterford

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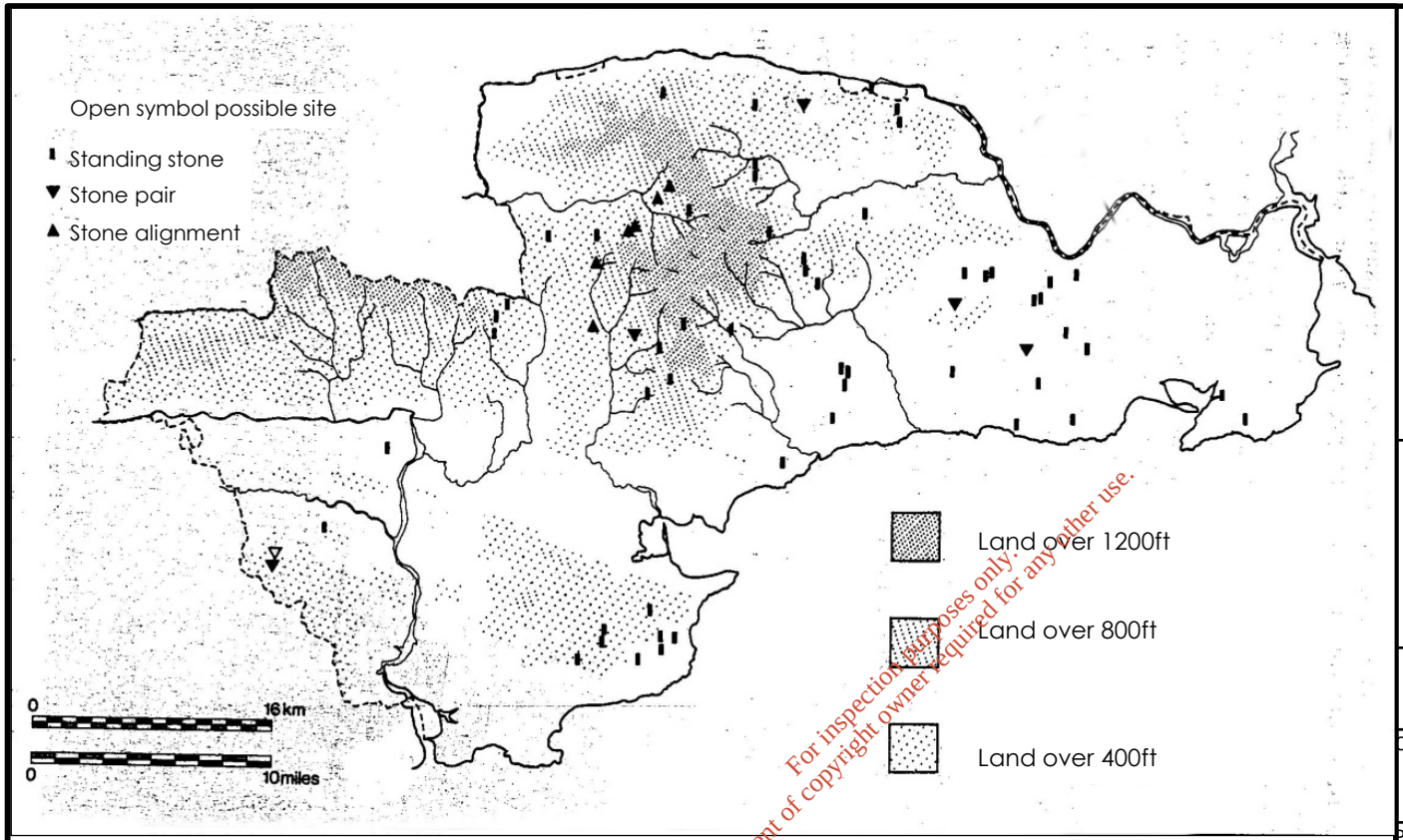

Standing stones in Co. Waterford (after Moore & Woodman 1992).

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.7 –Standing Stones in Co. Waterford

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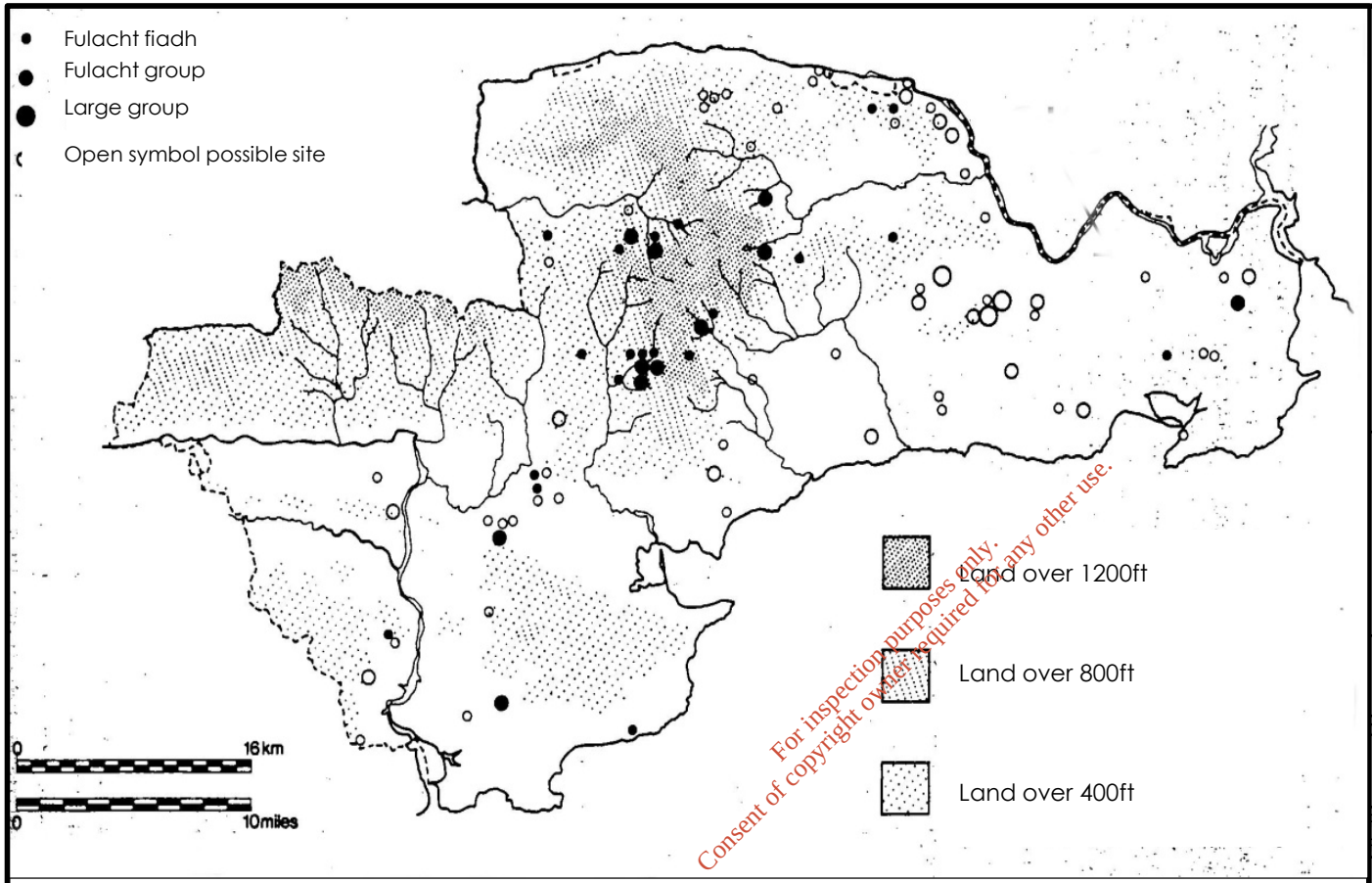

Fulachta Fiadh in Co. Waterford (after Moore & Woodman 1992).

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Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 10.8 –Fulachta Fiadh in Co. Waterford

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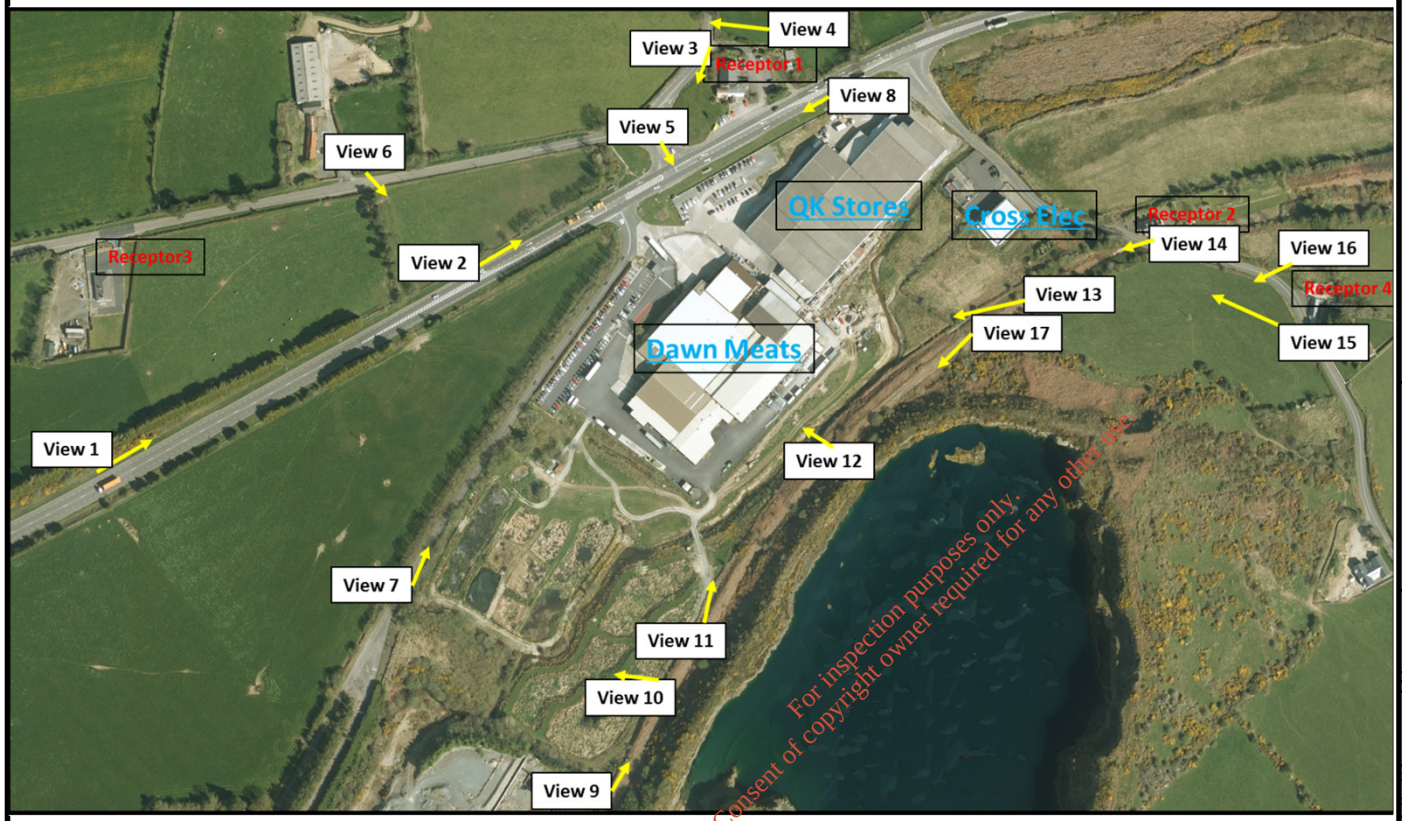

Yellow arrows depict views shown in Plates 12.1 to 12.20.

Receptors 1 – 4 are shown in red and depicted in Plates 12.21 to 12.24.

The DMIUC site and surrounding business labelled in blue text.

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Project: Environmental Impact Assessment Report

Title: Figure 12.1 – Landscape Receptors and Location of Views

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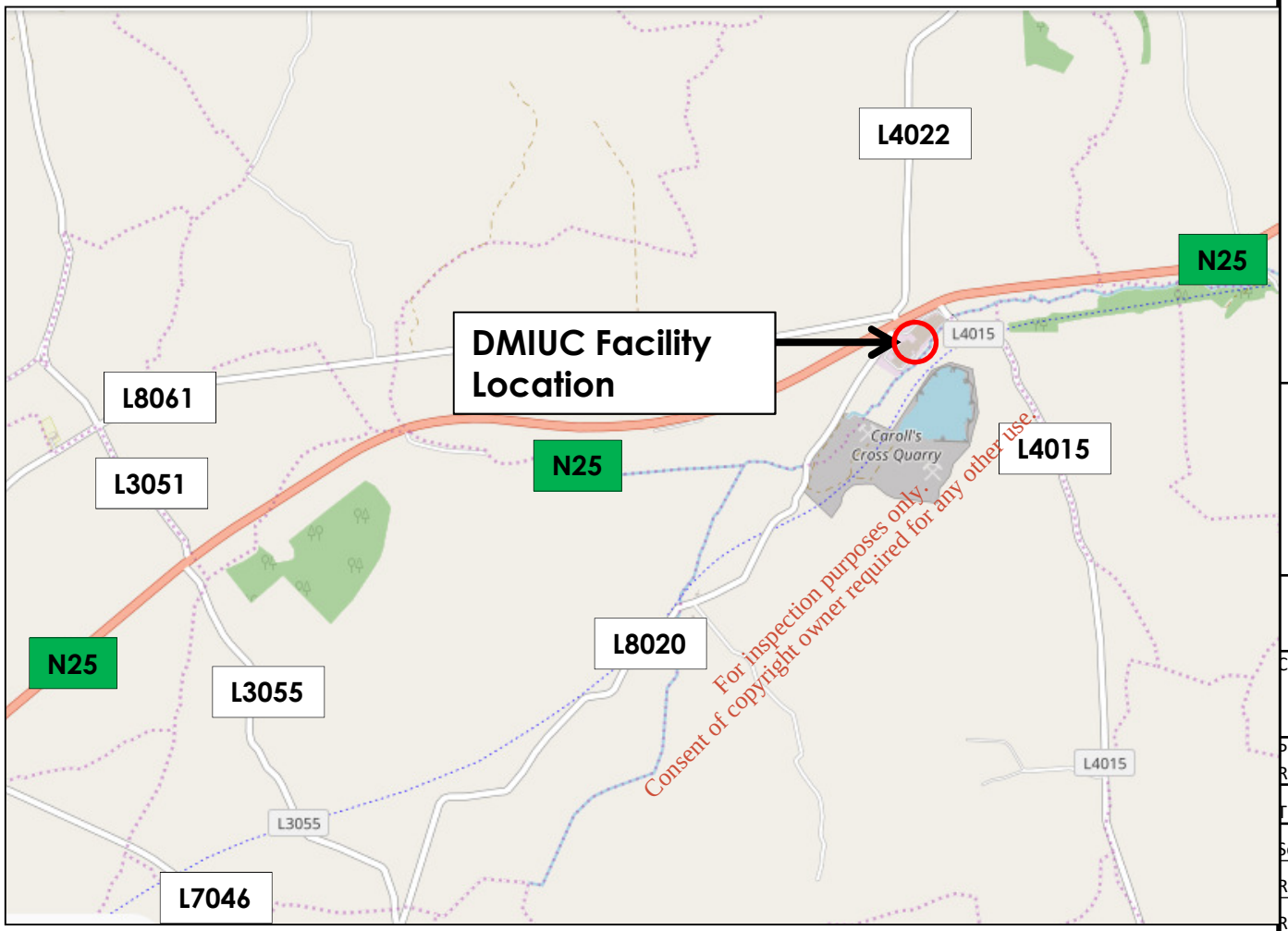

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Client: DAWN MEATS

Project: Environmental Impact Assessment Report – Carroll's Cross

Title: Figure 13.1 – Local Road Network

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