Wyeth Nutritionals Ireland Limited

Project New Card

Report for AA Screening

REP/01

Issue 2 | 8 January 2018

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 233421-03

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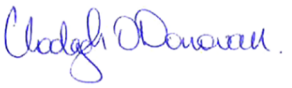
		Signature			
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1 Introduction

This report for screening for Appropriate Assessment contains the information required for the consenting authority, Limerick County Council to undertake screening for Appropriate Assessment of a new R & D facility which Wyeth Nutritionals Ireland Limited proposes to construct at its existing production facility at Askeaton, County Limerick.

The report provides information on, and assesses the potential for the proposed development to significantly impact on Natura 2000 sites. This report has been prepared by Arup.

The aims of this report are to:

- Determine whether the project is directly connected with, or necessary to the conservation management of any Natura 2000 sites.
- Determine whether the project, alone or in combination with other projects, is likely to have significant effects on Natura 2000 sites in view of their conservation objectives.

Screening was undertaken without the inclusion of mitigation.

2 Legislative background

According to the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC), member states are required to establish a Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites includes Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs).

SACs are selected for the conservation of Annex l habitats (including priority types which are in danger of disappearance) and Annex ll species (other than birds). SPAs are selected for the conservation of Annex ll birds and other regularly occurring migratory birds and their habitats. The Annex habitats and species, for which each site is selected, are the *qualifying interests* of the site. *Conservation objectives* for the site are defined for these qualifying interests.

A key requirement of the Directives is that the effects of any plan or project, alone, or in combination with, other plans or projects, on the Natura 2000 site network, should be assessed before any decision is made to allow that plan or project to proceed. This process is known as Appropriate Assessment (AA).

The obligation to undertake an appropriate assessment derives from Article 6(3) and 6(4) of the Habitats Directive (92/43/EEC), and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is

concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances.

Article 6(3) of the Habitats Directive states:

"Any plan or project not directly connected with, or necessary to, the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public".

Article 6(4) states:

"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

The competent authority (in this case Limerick County Council) is required to carry out its obligations under Article 6(3) and 6(4) of the Habitats Directive before it can agree to the plan or project. This assessment is generally carried out using a stage by stage approach as summarised below. Each stage determines whether a further stage in the process is required. If, for example, the conclusions at the end of Stage One are that there will be no significant impacts on the Natura 2000 site, there is no requirement to proceed further.

- **Stage 1 - Screening for appropriate assessment** – the process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;
- **Stage 2 - Appropriate Assessment** – This is required if it cannot be excluded, on the basis of objective information, that the development, individually or in combination with other plans or projects, will have a significant effect on a Natura 2000 site. During this stage, the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives is considered. Additionally, where there are adverse impacts, an assessment is made of the potential mitigation of those impacts;
- The appropriate assessment must include a final determination by the competent authority as to whether or not a proposed development would

adversely affect the integrity of a Natura 2000 site. In order to reach a final determination, the consenting authority must undertake examination, analysis and evaluation, followed by findings, conclusions and a final determination. The appropriate assessment must contain complete, precise and definitive findings and conclusions, and may not have lacunae or gaps.

- **Stage 3 – Assessment of alternative solutions**- the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site.
- **Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain -** an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

3 Methodology

3.1 Introduction

If, based upon the currently available information, there are aspects of the proposed development that could have a significant effect on any Natura 2000 sites, then further analysis in the form of an Appropriate Assessment is required.

If the outcome of the screening exercise is that there are no significant impacts predicted, then an Appropriate Assessment is not required.

This report for Appropriate Assessment screening contains the information required for the consenting authority, Limerick County Council, to undertake screening for Appropriate Assessment (AA) of the construction and operation of the proposed Wyeth Nutritionals Ireland Limited R & D facility. This report is based on a desk study, and a number of site visits by an Arup ecologist and specialist ecologists between September 2015 and March 2016.

In order to address the four steps above for the screening assessment, information is presented in this report is as follows:

- Overview of the proposed development and its receiving environment (Section 4)
- Description of the existing ecological environment at the site (Section 5.1).
- Identification of relevant Natura 2000 sites which may be within the zone of influence of the proposed development (Section 5.2).
- Identification of the potential effects of the proposed development on the Natura 2000 sites (Section 6)
- Assessment of likely significant effects on the Natura 2000 site (Section 7).
- Description of other projects and plans which may have the potential for having significant effects on the Natura 2000 site (Section 6.2).

- Screening statement and conclusions (Section 8 and Appendix A).

It is noted that the proposed R & D facility is not directly connected with or necessary to the management of any Natura 2000 site.

3.2 Guidance and data sources

This screening report for Appropriate Assessment was prepared with regard to the following guidance documents, where relevant:

- *Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC* (EC Environment Directorate-General, 2000); [hereafter referred to as MN2000]
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodical Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General, 2001)
- *Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC.* (European Commission, 2007)
- *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, 2010 revision)
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPW 1/10 and PSSP 2/10*
- *Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive* (International Workshop on Assessment of Plans under the Habitats Directive, 2011)

Sources of information that were used to collect data on the Natura 2000 network of sites and on the existing ecological environment are listed below:

- Ordnance Survey of Ireland mapping and aerial photography (www.osi.ie) (accessed 16.02.2016)
- Google Maps aerial photography (accessed 16.02.2016)
- National Parks and Wildlife Service online mapping and data on European Sites (www.npws.ie) (accessed 16.02.2016)
- Information on environmental quality data available from www.epa.ie (Envision Online Environmental Map Viewer)
- Status of EU Protected Habitats in Ireland (NPWS 2013)
- Limerick City and County Council online planning records accessed on 17.02.2016
- National Biodiversity Centre Data Centre database www.biodiversityireland.ie (accessed 17.02.2016).
- Natura Impact Report of Variation No 3 to the Limerick County Development Plan 2010 – 2016 (February 2015).

3.2 Location of the proposed development

The proposed development will be located within the existing Wyeth Nutritionals Ireland Limited facility at Coolrahnee, Askeaton, County Limerick. The proposed development will be located in the southern part of the site (refer to **Figure 1**). Wyeth Nutritionals Ireland Limited facility currently produces infant formula at the existing facility in Askeaton and operates under Industrial Emissions Licence P0395-03.

A description of the receiving environment is provided in the following **Section 4.2**. A description of the ecological environment is provided in **Section 5**.

4 Overview of the proposed development and its receiving environment

4.1 Description of receiving environment

The existing Wyeth facility is an industrial complex and mainly comprises buildings/plant equipment, hardstanding and landscaped areas. The site of the proposed development, located in the southern portion of the Wyeth facility, comprises areas of hardstanding and landscaped grass areas. There are no watercourses within the site.

Agricultural lands lie to the north, west and south of the Wyeth Nutritionals Ireland Limited facility. One-off residential and farm properties scattered throughout the general area.

The nearest watercourse to the Wyeth facility is the River Deel which is located approximately 20m to the east of the existing Wyeth facility's site boundary (refer to **Figure 1**). The river flows in a northerly direction before entering the Shannon Estuary downstream.

The River Deel is part of the River Shannon and River Fergus Estuaries Special Protection Area (SPA) (Site Code 004077) (refer to **Section 5.2** for details). The boundary of the SPA is immediately adjacent to the existing Wyeth facility's eastern site boundary. The site of the proposed development is located a further 22.5m west of the eastern Wyeth site boundary.

The boundary of the Lower River Shannon Special Area of Conservation (SAC) (Site Code 002165), and the Inner Shannon Estuary – South Shore proposed Natural Heritage Area (pNHA) into which the River Deel flows, are located approximately 1.37km downstream of the site (refer to **Section 5.2** for details).

A local road lies adjacent to the western boundary of the Wyeth facility. The N69 is approximately 350m south of the site. Askeaton Town is located to the south of the N69.

Figure 1 Approximate Location of Proposed Development (indicated by star) | not to scale

4.2 Description of the proposed development during the operational phase

The proposed new R&D facility will adjoin an existing building known as the RTF building. The layout of the proposed development is shown on the following **Figure 2**. The proposed development comprises the following elements:

- Relocation of an existing loading dock area on the southern elevation of the RTF building to accommodate the new works. This will require the modification of the southern elevation consisting of two new roller door openings and the construction of a protective canopy over the loading areas.
- Realignment of the main car park access road that currently runs along the western elevation of the RTF building to accommodate the proposed R&D building works.

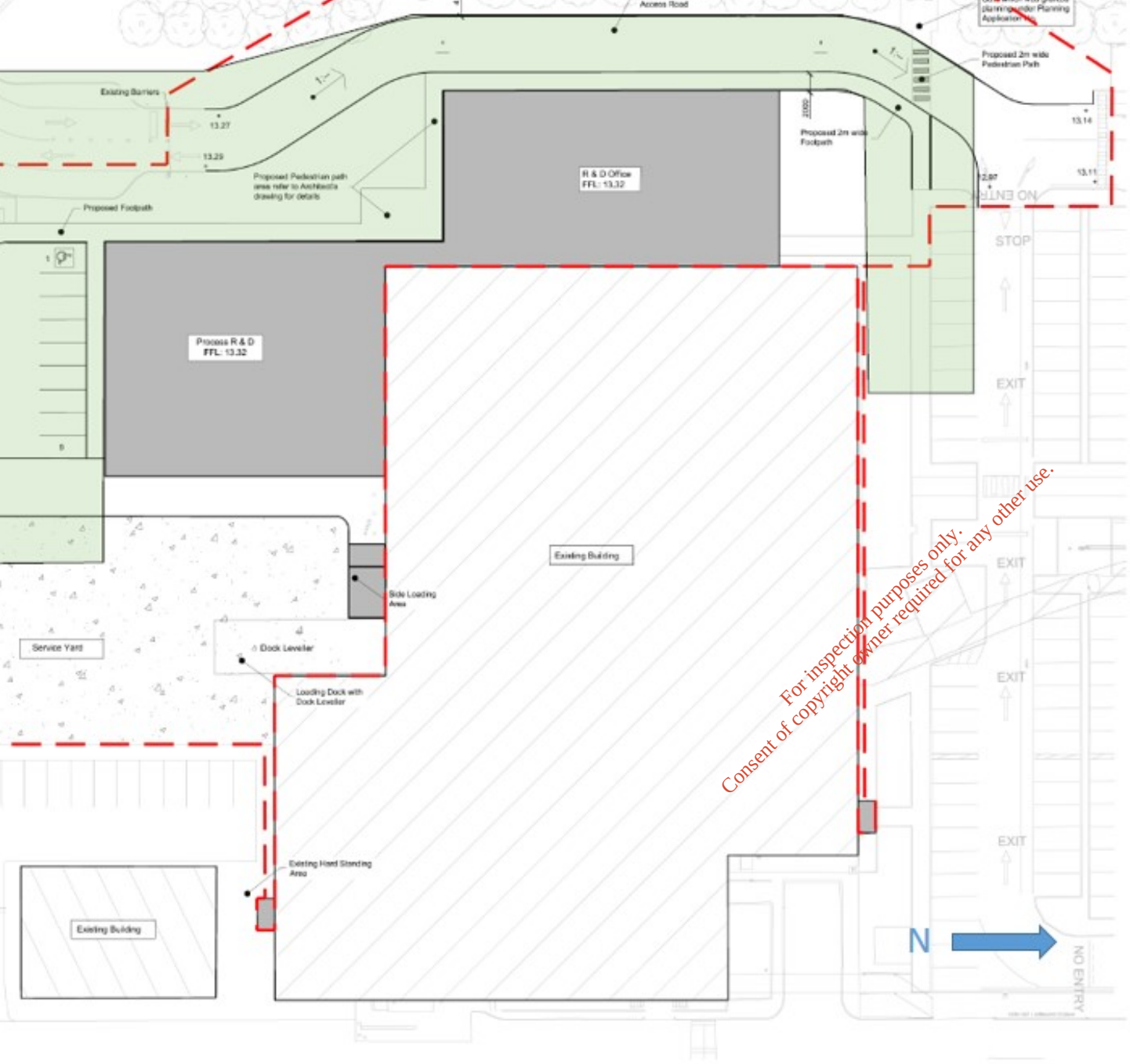
- Construction of two proposed new buildings that will adjoin the existing RTF building. One building will house the office and meeting areas for the R&D employees while providing a sensory area on the ground floor for the sensory testing of new product formulas. The second building will be a pilot plant facility equipped with unit operations to facilitate the rapid development of small scale prototype formulations, along with being fitted out with relevant large scale pilot facilities to mimic typical industrial scale processes. The pilot plant will operate to food-grade standards and will be capable of providing small scale volumes of clinical supplies.
- Construction of a new entrance lobby onto the existing northern façade of the RTF building to improve access control into the building.
- Ancillary site development work including but not limited to car park & service yard lighting, internal road pedestrian crossing, and CCTV to secure the car park and service yard areas.
- External lighting for the proposed development will comprise low impact LED pole lighting and bollard light fittings as appropriate and similar to those that exist on site at present.

The site is subject to an IED licence (P0395-03), and during operation, all discharges and emissions from the proposed development will be within the current operating limits set by the IED licence for the existing facility.

Surface water from the proposed development will be connected via a hydrocarbon interceptor to the existing facility's surface water network. The surface water drainage network at Wyeth Nutritionals Ireland Limited discharges to the adjacent River Deel under the existing facility's IED licenced discharge point. All process and foul water will be directed to the site's wastewater treatment plant.

The noise generated by the construction and operation of the proposed development is predicted to be within the IED licensed limits. Refer to Appendix C and Appendix D for further information.

Emissions to air during the operation of the proposed development are predicted to have reduced concentrations of PM_{10} and $PM_{2.5}$, so the development will have a net beneficial impact on air quality. Refer to Appendix E for further information.



ry for planning purposes is shown by the red dashed line. The area which it is envisaged the contractor will use as the area for the construction compound is

4.3 Description of the proposed development during the construction phase

The construction works will take approximately 12 months to complete. Following completion of construction, there will be a period of installation and commissioning of the process equipment.

The footprint of the construction works will be located on areas of hardstanding and landscaped grass areas at the southern end of the site. The proposed development site will form part of the existing industrial complex and will be mostly screened to north and east by the existing building complex.

It is intended that the construction compound will be located within the site of the existing facility. The area which it is envisaged the contractor will use as the area for the construction compound is indicated by green area shown on **Figure 2** above.

All construction activity will take place within the boundary of the Wyeth site. No construction works will take place within the River Deel and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) No material or spoil from the works will be deposited in the SPA.

The employment of standard construction management controls will minimise the risk of pollution of soil, storm water run-off or groundwater. A Construction Management Plan will be implemented by the Contractor to ensure that there will be no pollution of the receiving environment and in particular the River Deel, the SPA, and the Lower River Shannon cSAC downstream, during the construction period. These measures will include surface water control using silt traps and a hydrocarbon interceptor, daily inspection of the drainage gullies and the daily removal of silt.

Construction will be undertaken in accordance with Construction Industry Research and Information Association (CIRIA) UK guidance note on the control and management of water pollution from construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors* (Masters-Williams et al 2001).

Additional specific guidance is provided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects* (Murnane E, Heap A and Swain A 2006).

Surface water run-off during site works will be controlled using standard construction management measures. The existing surface water drainage network, within the site, controls surface water discharges. During construction, surface water will be discharged via a hydrocarbon interceptor to the existing site drainage network to the River Deel through the existing facility's IED licensed emission point. Surface water discharge from the proposed development during the construction period will be within the current operating limits set by the IED licence for the existing facility. There will be no other discharge points to the River Deel during construction.

Control measures, as recommended in the guidance above, will be implemented to minimise the risk of spills, sedimentation and contamination of soils and waters and thereby minimise the risk of pollution of the River Deel, the SPA, and the cSAC downstream.

No particularly noisy construction activities are envisaged during the construction phase. Given the existing background noise and disturbance on this industrial site, significant noise impacts on the receiving environment are not predicted to occur. The building contractor will employ standard procedures to minimise the potential for noise disturbance to the surrounding area to ensure the construction noise criteria are not exceeded. The Contractor will also comply with the recommendations of BS 5228-1:2009+A1:2014: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.

A dust minimisation plan and a construction waste management plan will be prepared and implemented by the building contractor during the construction phase of the project. Measures will be undertaken by the contractor to ensure that the site and surroundings are maintained to a high standard of cleanliness.

The Construction Waste Management Plan will be prepared by the contractor in accordance with the Department of the Environment, Community and Local Government (DoECLG) "*Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*".

As a modern industrial facility, the implementation of environmental protection measures occurs at the existing site as standard, and no difficulties in implementing standard construction environmental protection measures (i.e. prevention of siltation or hydrocarbon contamination in surface water run-off) under the supervision of site engineers is envisaged. Thus significant impacts on the receiving environment and in particular the River Deel, the SPA and the SAC are not predicted to occur.

5 Ecological overview

5.1 Ecological environment at the site of the proposed development

5.1.1 Overview

The ecological environment at the site and its surrounding area was determined by a desk study and by a number of site visits by an Arup ecologist and specialist ecologists between September 2015 and March 2016.

The site of the proposed development comprises areas of hardstanding and a small landscaped grass area at the southern end of the Wyeth facility. There are no habitats of ecological value within the footprint of the proposed development and associated construction works. There are no mature trees of ecological value at the site.

There are no watercourses within the site. The nearest watercourse is the River Deel immediately to the east of the Wyeth Nutritionals Ireland Limited site. Its location in relation to the Wyeth facility is shown on **Figure 1**). The river flows in a northerly direction before entering the Shannon Estuary approximately 1.37km downstream to the north. There is an area of scrub along the eastern boundary of the Wyeth facility which acts as a buffer between the existing facility and the River Deel.

The stretch of River Deel adjacent to the existing facility is tidal and is part of the Lower River Shannon and River Fergus Estuaries Special Protection Area (SPA) site code 004077 (refer also to **Section 5.4**). The SPA is located adjacent to the eastern boundary of the existing facility, and approximately 22.5m from the site of the proposed development at its nearest point. The location of the SPA in relation to the site of the proposed development is shown on **Figure 4**. The River Deel flows to the Lower River Shannon cSAC approximately 1.37km downstream of the site of the proposed development (refer to **Figure 4**).

The site of the proposed development is located within the zoned Strategic Development Location (SDL) 'Askeaton' in the *Natura Impact Report of Variation No.3 to the Limerick County Development Plan 2010 – 2016* (February 2015). The Report (page 15) states that in relation to the SDL 'Askeaton',

"… the SDL is dominated by low value habitats and no habitats representative of Annex I qualifying habitats of the Lower River Shannon cSAC occur within it.

Habitats surrounding the SDL that are representative of Annex I qualifying habitats of the Lower River Shannon cSAC include:

…Mudflats representative of the Annex I habitat mudflats and sandflats not covered by sea-water at low tide. "

At low tide conditions, stretches of linear mudflat occur along the River Deel in the vicinity of the Wyeth site. Although not examined in detail during the site survey, these mudflats may be representative of *Annex I habitat 'Mudflats and*

sandflats not covered by sea-water at low tide.' These however are outside the boundary of the cSAC.

No works will be carried out within the SPA and no materials or spoil will be deposited on the mudflats.

It is unlikely that the site of the proposed development is used by species of the SPA due to the habitat types present. Winter bird surveys were carried out in the vicinity of the Wyeth facility from November 2015 and March 2016 inclusive (refer to the following **Section 5.2** for details). An otter survey was undertaken in March 2016 (refer to following **Section 5.3** for details).

Bird species heard but not seen during the site visit in September 2015 were Robin and Blackbird. No mammal species were recorded during the site visit. Due to the nature of the buildings on the site they would be unsuitable for bat roosts. No trees suitable for bat roosts were recorded during the site visit.

5.1.2 Winter Bird Survey

A winter bird survey of the bird species in the SPA was undertaken by Dixon Brosnan consulting ecologists at two locations in the vicinity of the Wyeth facility during the months of November and December 2015 and January, February and March of 2016. The first of these locations was at the northeast corner of the Wyeth Nutrition facility and was located on high ground overlooking the River Deel. The second survey location was at the Askeaton Swimming Club (located to the south of the Wyeth Nutrition facility) and had a clear open view of the River Deel stretching north. Six of the Qualifying Interests of the SPA were observed along the River Deel during the winter bird survey: Cormorant, Teal, Curley, Redshank, Greenshank and Blackheaded Gull. The results of the bird surveys are appended to this report (**Appendix B**).

5.1.3 Otter Survey

An otter survey was undertaken by DixonBrosnan consulting ecologists on the 7th March 2016. Both banks of the River Deel were surveyed for signs of otter 150m upstream and 150m downstream of the site of the proposed development. Spraints were observed approximately 30m north of the boundary of the site. No otter holts were recorded in the survey area. No works will be undertaken within the SPA boundary. There will be no impact on water quality of the SPA. The area of scrub between the Wyeth facility and the River Deel will act as a buffer between the site and the River Deel. There will be no significant impact on otter as a result of the proposed development.

5.2 Identification of Natura 2000 sites which may be within the zone of influence of the proposed development

The proposed development is not directly connected with, or necessary for, the management of any Natura 2000 site. No habitat loss will occur within any Natura 2000 site as a result of this proposed development.

Natura 2000 sites (European sites) are only at risk from significant effects where a source-pathway-receptor link exists between a proposed development and a Natura 2000 site(s). This can take the form of a direct impact (e.g. where the proposed development and/or associated construction works are located within the boundary of the Natura 2000 site(s) or an indirect impact where impacts outside of the Natura 2000 site(s) affect ecological receptors within (e.g. impacts to water quality which can affect riparian habitats at a distance from the impact source).

Considering the Natura 2000 sites present in the region, their Qualifying Interests (QIs) and conservation objectives, and any potential impact pathways that could link those sites to the proposed development area, a distance of 15km was considered appropriate to encompass all Natura 2000 sites potentially within the Zone of Influence (ZoI)[1] of the proposed development.

Consultation of NPWS online data identified six Natura 2000 sites located within 15km of the site of the proposed development. The six sites identified are listed below and indicated on the following **Figure 3**.

Table 1 below provides details of the relevant Natura 2000 sites within 15km of the proposed development, and the relevance of these Natura 2000 sites to the proposed development, i.e. Natura 2000 sites are considered relevant where a source-pathway-receptor link exists between the proposed development and the Natura 2000 site. In ecological and environmental impact assessment, for an impact to occur, there must be a risk enabled by having a source (e.g. construction works at a proposed development site), a 'receptor' (e.g. a cSAC or other ecologically sensitive feature), and a pathway between the source and the receptor (e.g. a watercourse which connects the proposed development site to the cSAC).

The risk of the impact does not automatically mean it will occur, nor that it will be significant. However, identification of the risk means that there is a possibility of ecological or environmental damage occurring, with the level and significance of the impact depending upon the nature and exposure to the risk and the characteristics of the receptor.

Given the limited nature of the development, the only Natura 2000 sites which could be theoretically affected by the proposed development is the River Shannon and River Fergus Estuaries SPA and the Lower River Shannon cSAC. The River Shannon and River Fergus Estuaries SPA lies approximately 22.5m east of the site of the proposed development. The Lower River Shannon cSAC is located approximately 1.37km north of and downstream of the site and overlaps with the

[1] The zone of influence is a distance within which the proposed development could potentially affect the conservation condition of QI habitats or species. There is no set recommended distance for which European sites are considered as being relevant for AA. Available guidance (NPWS, 2010) recommends that 'the distance should be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects'. As a general rule of thumb, it is often considered appropriate to examine all European sites within 15km as a starting point. In some instances where there are hydrological connections, a whole river catchment or a groundwater aquifer may need to be included. Taking this into account, as a starting point all European sites within 15km of the proposed development were examined. This distance was considered to be sufficient for the purposes of this assessment as any European sites outside of the 15km distance either do not have any hydrological or any other linkages to the proposed development site, or are located at such distance from the proposed development site that no significant effects would occur.

SPA (refer also to **Figure 3**). Identification of impacts on these two Natura 2000 sites is addressed in **Section 6** of this report.

The remaining designated sites in the **Table 1** below are not considered to be of relevance as they are not located within the zone of influence of the proposed development either due to their distance from the proposed development and/or the lack of connectivity/pathway between the proposed development and these designated sites. There will be no direct or indirect impacts from the proposed development on any Qualifying Interest (QI) habitats and species of these designated sites. Furthermore, the site of the proposed development is not of ecological interest for any of the transient QI species of these designated sites.

Table 1: Natura 2000 Sites identified within 15km of the site

Candidate Special Areas of Conservation (cSAC)	**Site Code**	**Distance from Site (km)**
Askeaton Fen Complex cSAC	002279	4.1
Barrigone cSAC	00432	3.19
Curraghchase Woods cSAC	00174	6.53
Lower River Shannon cSAC	002165	1.37
Special Protection Areas (SPA	**Site Code**	**Distance from Site (km)**
River Shannon and River Fergus Estuaries SPA	004077	22.5m approximately
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	004161	11.11

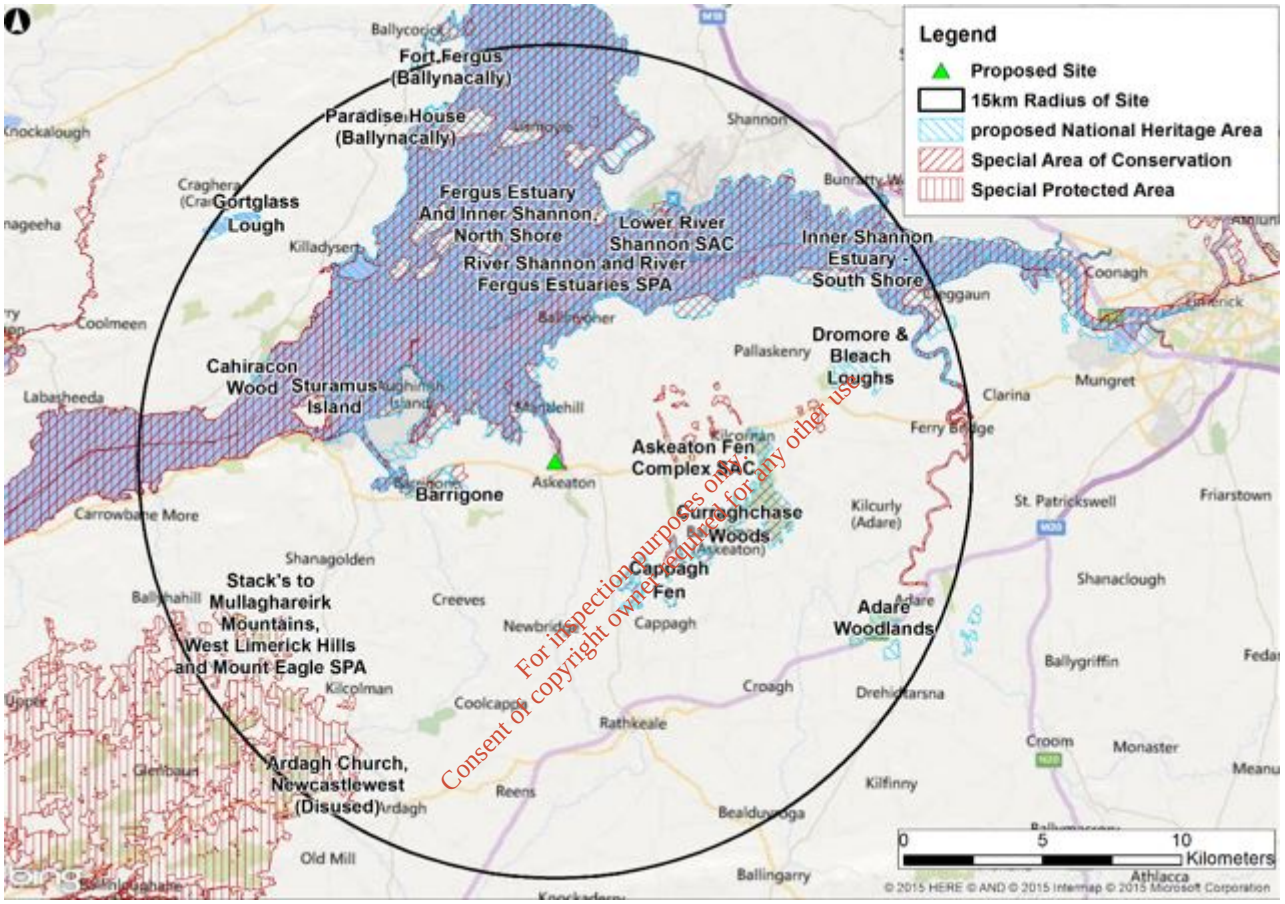


Figure 3 Natura 2000 Sites within 15km of the Proposed Development

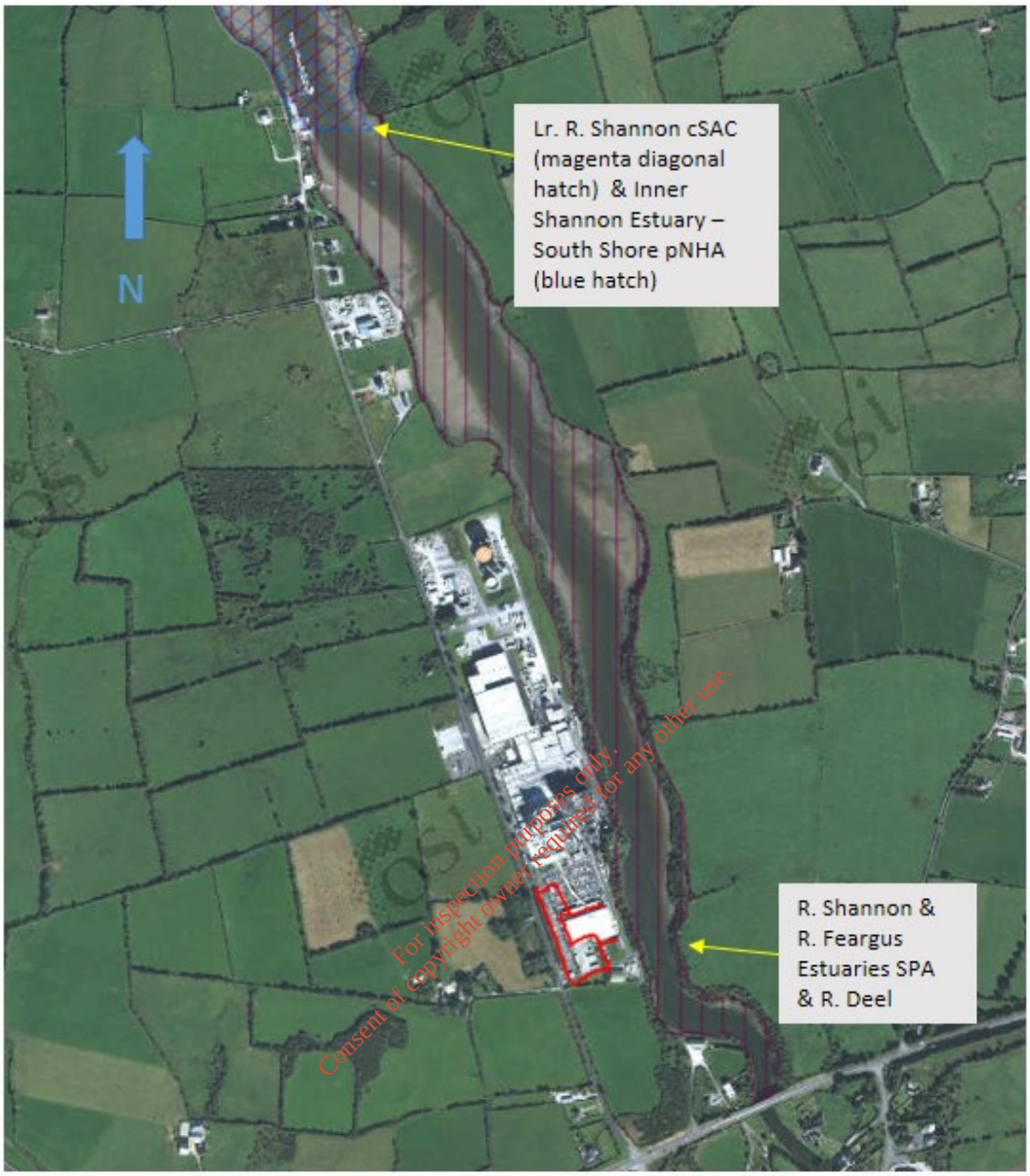


Figure 4 Sketch of approximate boundary of site of proposed development (outlined in red) in relation to the SPA, the cSAC and the pNHA (approximately 1.37km).

Table 2: Details of Natura 2000 Sites within 15km of the Proposed Development

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
River Shannon and River Fergus Estuaries SPA (Site Code 004077)	22.5m	Potential indirect pathway via proposed surface water drainage system which will link via a hydrocarbon interceptor to the existing Wyeth Nutritionals Ireland Limited surface water drainage network which discharges to the River Deel under IED licence. Surface water discharges to the River Deel will comply with this licence. Noise and air emissions from the proposed development will comply with the licence.	Cormorant (*Phalacrocorax carbo*) [A017]	To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA,
			Whooper Swan (*Cygnus cygnus*) [A038]	As previous
			Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	As previous
			Shelduck (*Tadorna tadorna*) [A048]	As previous
			Wigeon (*Anas penelope*) [A050]	As previous
			Teal (*Anas crecca*) [A052	As previous
			Pintail (*Anas acuta*) [A054	As previous

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
			Shoveler (*Anas clypeata*) [A056]	As previous
			Scaup (*Aythya marila*) [A062]	As previous
			Ringed Plover (*Charadrius hiaticula*) [A137]	As previous
			Golden Plover (*Pluvialis apricaria*) [A140]	As previous
			Grey Plover *(Pluvialis squatarola*) [A141]	As previous
			Lapwing (*Vanellus vanellus*) [A142]	As previous
			Knot (*Calidris canutus*) [A143]	As previous
			Dunlin (*Calidris alpina*) [A149]	As previous
			Black-tailed Godwit (Limosa limosa) [A156]	As previous

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
			Bar-tailed Godwit (*Limosa lapponica*) [A157]	As previous
			Curlew (*Numenius arquata*) [A160]	As previous
			Redshank (*Tringa totanus*) [A162]	As previous
			Greenshank (*Tringa nebularia*) [A164]	As previous
			Black-headed Gull (*Chroicocephalus ridibundus*) [A179]	As previous
			Wetland and Waterbirds [A999]	As previous
Lower River Shannon SAC (Site Code 002165)	1.37	Potential indirect pathway via proposed surface water drainage system which will link via a hydrocarbon interceptor to the existing Wyeth Nutritionals Ireland Limited surface water drainage network which discharges to the River Deel under IED licence. Surface water discharges to the River Deel will	Sandbanks which are slightly covered by sea water all the time [1110]	To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC,
			Estuaries [1130]	To maintain the favourable conservation condition of

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
		comply with this licence. Noise and air emissions from the proposed development will be in compliance with the IED licence limits.		Estuaries in the Lower River Shannon SAC,
			Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC,
			*Coastal lagoons [1150]	To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC,
			Large shallow inlets and bays [1160]	To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC,
			Reefs [1170]	To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC,
			Perennial vegetation of stony banks [1220]	To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Lower River Shannon SAC,
			Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition of

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
				Vegetated sea cliffs in the Lower River Shannon SAC,
			Salicornia and other annuals colonising mud and sand [1310]	To maintain the favourable conservation condition of Salicornia and other annuals colonizing mud and sand in the Lower River Shannon SAC,
			Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC,
			Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC,
			Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation [3260]	To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC
			*Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior	To restore the favourable conservation condition of

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
			(*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC,
			Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC
			Petromyzon marinus (Sea Lamprey) [1095]	To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC,
			Lampetra planeri (Brook Lamprey) [1096]	To restore the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC,
			Lampetra *fluviatilis* (River Lamprey) [1099]	To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC,
			Salmo salar (Salmon) [1106]	To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC,

Site Name and Code	Approximate Distance from Development Site	Connectivity/Pathway	Qualifying Habitats and Species	Conservation Management Objectives
			Tursiops truncatus (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC,
			Lutra lutra (Otter) [1355]	To restore the favourable conservation condition of Otter in the Lower River Shannon SAC,

The site of the proposed development is not directly connected with or necessary to the management of the above Natura 2000 sites.

With regard to the Qualifying Interests of the SPA, the results of the winter bird surveys (refer to **Section 5.2** above) show that six of the qualifying bird species of the SPA,listed in **Table 2** above, were recorded during the surveys. The SPA species recorded during the surveys are as follows:

- Cormorant
- Teal
- Curlew
- Redshank
- Greenshank
- Blackheaded Gull

With regard to the Qualifying Interests of the Lower River Shannon SAC, the conservation objectives for Freshwater Pearl Mussel relate to the population in the Cloon River, County Clare only. Signs of Otter were recorded approximately 30m downstream of the site (refer to **Section 5.3** above). No Otter holts were recorded during the survey.

During construction and operation, surface water from the proposed development will discharge to the River Deel via a hydrocarbon interceptor to the existing IED licensed discharge point and will comply with the limits of the licence. No silt or polluting substance will enter the River Deel, the SPA or the cSAC and therefore there will be no effects on the water quality and habitats and species (including Lamprey species and Salmon) of the Natura 2000 sites, (refer to **Section 6** for details).

Noise impacts on the habitats and species of the Natura 2000 sites are predicted to be negligible, based on the conclusions of the 2016 Noise Impact Assessment (refer to Section 4.2.2, **Appendix C**), which records that the increase in noise levels as a result of the proposed development, at four locations on the western bank of the River Deel will be imperceptible.

There is no potential for adverse effects on the habitats and species of the Natural 2000 sites arising from emissions to air, as the proposed development will have a beneficial impact on air quality. Refer to **Appendix E**.

5.2.1 Other designated conservation areas (other than Natura 2000 sites)

17 proposed Natural Heritage Areas (pNHAs) occur within 15km of the site of the proposed development. These are shown in the following **Table 3**.

Table 3: pNHAs within 15km of the Site of the Proposed Development

pNHA	Site Code	Distance from Site of Proposed Development (km)
Adare Woodlands	00429	12.3
Ardagh Church, Newcastlewest (Disused)	00430	12.6
Ballinvirick Marsh	001427	5.95
Ballymorrisheen Marsh	001425	4.5
Barrigone	00432	3.3
Cahiracon Wood	001000	11.1
Cappagh Fen	001429	5.55
Cloonsnaghta Lough	001004	14.48
Curraghchase Woods	00174	6.5
Dromore & Bleach Loughs	001030	10.31
Fergus Estuary And Inner Shannon, North Shore	002048	5.36
Fort Fergus (Ballynacally)	0035	14.07
Gorteennamrock	001433	5.03
Gortglass Lough	001015	13.79
Inner Shannon Estuary - South Shore	00435	1.46
Paradise House (Ballynacally)	0062	12.76
Sturamus Island	001436	7.92

There is a potential indirect pathway from the site of the proposed development to the Inner Shannon Estuary - South Shore pNHA via the proposed surface water drainage system at the proposed development which will drain to the existing Wyeth Nutritionals Ireland Limited surface water drainage system via a hydrocarbon interceptor. This, in turn, discharges to the River Deel under IED licence. The River Deel flows to the Inner Shannon Estuary – South Shore pNHA.

As part of the design of the proposed development, a hydrocarbon interceptor will be installed as part of the surface water drainage system. In addition, surface water discharges from the drainage network from the existing production facility to the River Deel are governed by Wyeth Nutritionals Ireland Limited's IED licence and therefore it is unlikely that there will be a significant risk of pollution to the River Deel as a result of surface water drainage and therefore no impact on the Inner Shannon Estuary – South Shore pNHA as a result of the proposed development. There will be no impact on any other pNHAs as a result of the proposed development due to their lack of connectivity with, and distance from, the site.

5.2.2 Rare and protected species

The site of the proposed development is located within 10 kilometre grid square R35. The National Parks and Wildlife Service database (www.npws.ie) was consulted with regard to rare species and species protected under the Flora Protection Order (1999) within this square. The NPWS database records of rare or protected plant species within 10 kilometre square grid R35 are as follows.

Table 4: NPWS recorded species within10K Grid R35

Species	Location	Date of Last Record
Papaver hybridum (Round Prickly-headed Poppy)	Askeaton R3050	1900
Viola hirta (Hairy Violet)	R3652	1890
Hordeum secalinum (Meadow Barley)	Mantlehill R330530	1988

None of the above species were recorded at the site of the proposed development during the site visit.

The National Biodiversity Centre Database was also consulted with regard to protected species recorded within the 10 kilometre grid square R35. Known records listed on the database include the following Birds of Conservation Concern Red Listed species, EU Birds Directive Annex 1 species, Flora Protection Order species and EU Habitats Directive Annex ll species.

Table 5: Protected Species recorded in 10 kilometre square R35, included on the National Biodiversity Centre Database

Species	Date of last record	BoCC Red List	EU Birds Directive Annex 1	Flora Protection Order	EU Habitats Directive Annex ll species
Northern Pintail (*Anas Acuta*)	1984	Yes			
Greater White-fronted Goose (*Anser albifrons*)	1984		Yes		
Short-eared Owl (*Asio flammeus*)	2005		Yes		
Dunlin (*Calidris alpine*)	2011		Yes		
Red Knot (*Calidris canutus*)	2011	Yes			
Twite (*Carduelis flavirostris*)	2011	Yes			
Hen Harrier (*Circus cyaneus*)			Yes		

Species	Date of last record	BoCC Red List	EU Birds Directive Annex 1	Flora Protection Order	EU Habitats Directive Annex ll species
Common Kingfisher (*Alcedo atthis*)	2011		Yes		
Northern Pintail	1984	Yes			
Northern Shoveler (*Anas clypeata*)	2011	Yes			
Corncrake (*Crex crex*)	1972	Yes	Yes		
Whooper Swan (*Cygnus Cygnus*)	2011		Yes		
Little Egret (*Egretta garzetta*)	2011		Yes		
Yellowhammer (*Emberiza citronella*)	2011	Yes			
Merlin (*Falco columbarius*)	2011		Yes		
Peregrine Falcon (Falco peregrinus)	2011		Yes		
Great Northern Diver (*Gavia immer*)	2011		Yes		
Herring Gull (*Larus argentatus*)	2011	Yes			
Little Gull (*Larus minutus*)	2005		Yes		
Black-headed Gull (*Larus ridibundus*)	2011	Yes			
Bar-tailed Godwit (*Limosa lapponica*)	2011		Yes		
Eurasian Curlew (*Numenius arquata*)	2011	Yes			
Red-necked Phalarope (*Phalaropus lobatus*)	2005	Yes	Yes		
Ruff (*Philomachus pugnax*)	2006		Yes		
European Golden Plover (*Pluvialis apricaria*)	2011	Yes	Yes		
Common Redshank (*Tringa tetanus*)	2011	Yes			
Barn Owl (*Tyto alba*)	2011	Yes			
Northern Lapwing (*Vanellus vanellus*)	2011	Yes			

Species	Date of last record	BoCC Red List	EU Birds Directive Annex 1	Flora Protection Order	EU Habitats Directive Annex ll species
Meadow Barley (*Hordeum secalinum*)	1988			Yes	
Otter (*Lutra lutra*)	2005)				Yes

Birds of Conservation Concern (Bof CC) Red List species included in the above table, and which were recorded during the winter survey, are Blackheaded gull, Curlew and Redshank.

It is unlikely that the above species occur on the site of the proposed development as the site comprises areas of hardstanding and a small landscaped grass area.

It is considered there will be no impact on rare and protected species as a result of the proposed development (refer also to **Section 6**).

6 Identification of the potential effects of the proposed development on Natura 2000 sites

The site of the proposed development is not directly connected with or necessary to the management of the above Natura 2000 sites.

There is the potential for an indirect pathway to the River Shannon and River Fergus SPA, and hence to the Lower River Shannon cSAC, via the proposed stormwater drainage system. The proposed stormwater drainage system will drain via a hydrocarbon interceptor to the existing Wyeth Nutritionals Ireland Limited facility site drainage network which, in turn, drains to the River Deel under IED licence. All emissions from the facility must comply with this licence. Therefore there will be no pollution of, or impacts on, the water quality of the River Deel, the SPA and the cSAC and their species as a result of surface water drainage for the proposed development.

The site is of little value for foraging or roosting for the bird species of the SPA.

No works will be undertaken within the SPA. There will be no significant impacts on the qualifying habitats or species (refer to **Table 2**) of these Natura 2000 sites as a result of the construction and operation of the proposed development (refer to the following Sections 6 and 7 for further details).

Two noise assessments of the proposed development have been prepared (refer to **Appendix C** and **Appendix D**). The 2016 report concludes that noise management measures will be employed by the contractor during construction to ensure that the construction noise criteria will not exceeded. The Contractor will comply with the recommendations of BS 5228-1:2009+A1:2014: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.

The 2016 noise assessment (**Appendix C**) concludes that noise impacts at the SPA will be imperceptible, and therefore there are no potential adverse effects on the SPA. The 2017 noise assessment (**Appendix D**) addressed potential effects on residential noise sensitive receptors, and does not contradict the conclusions of the 2016 report.

The air dispersion modelling study of emissions from the proposed development (Appendix E) concludes that air quality will improve, with regard to PM_{10} and $PM_{2.5}$. There is therefore no potential adverse impact on the SPA, or the cSAC.

6.1 Consultation

The Limerick City and County Heritage Officer Mr. Tom O'Neill, and the Development Applications Unit of the Department of Arts, Heritage and the Gaeltacht were consulted by email during the preparation of this report.

6.2 Other development nearby which may lead to cumulative impacts upon Natura 2000 sites

Limerick City and County Council online planning records for the area were consulted on the 14 December 2017. This search indicated that there were no existing or permitted developments in the vicinity of the site which, in combination with the proposed development, could result in cumulative impacts upon Natura 2000 Sites.

7 Assessment of likely significant effects on Natura 2000 sites

The proposed development will not result in any significant impacts on Natura 2000 sites. This judgement has been arrived at on the following basis:

- All development activity will take place within the Wyeth site. No works will take place within the River Shannon and River Fergus Estuaries Special Protection Area (SPA) the boundary of which is located approximately 22.5m east of the site of the proposed development. No material or spoil from the works will be deposited in the SPA. There will be no encroachment on the mudflats of the SPA.
- There will be no loss of Natura 2000 site habitat area, no fragmentation of the habitats of Natura 2000 sites, no disturbance to the qualifying species of the Natura 2000 sites, no impacts on population density of these species, no impacts on water resources and no impacts on water quality of the Natura 2000 sites.
- The area of scrub along the boundary between the SPA and the site will provide a buffer to minimise disturbance to species of the SPA.

- External lighting for the proposed development will comprise low impact LED pole lighting and bollard light fittings as appropriate and similar to those that exist on site at present.
- There is a potential indirect pathway between the proposed development and the two relevant Natura 2000 sites, via the existing Wyeth Nutritionals Ireland Limited surface water drainage system. The surface water drainage network at the existing Wyeth facility discharges to the River Deel via an IED licensed (P0395) discharge point. All emissions from the Wyeth site are governed by the limits of its IED licence. Surface water drainage from the proposed development will link to this existing drainage network at the facility. A hydrocarbon interceptor forms part of the surface water drainage system. All surface water discharges to the River Deel via the IED licensed discharge point will comply with the IED licence during operation. All process and foul water will be directed to the site's wastewater treatment plant. Therefore there will be no effects on the habitats or species of the SPA and the cSAC as a result of the proposed development.
- The impacts of noise from the proposed development will be imperceptible at the SPA.
- The impacts of improvements in air quality arising from the proposed development cannot have an adverse effect on the SPA or the cSAC.
- No particularly noisy construction activities are envisaged during the construction phase. Given the existing background noise and disturbance on this industrial site, significant noise impacts on the receiving environment are not predicted to occur. The building contractor will employ measures to minimise the potential for noise disturbance to the surrounding area to ensure the construction noise criteria are not exceeded. The Contractor will comply with the recommendations of BS 5228-1:2009+A1:2014: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.
- The site is part of an existing industrial complex and is screened from much of the SPA to the east and cSAC to the north by the existing building complex. This will mean that works during the construction phase of the development will not be visible for the most part and this would minimise the disturbance effects of construction activities on the species of the nearby River Shannon and River Fergus Estuaries Special Protection Area (SPA).
- A Construction Management Plan, a Dust Management Plan and a Waste Management Plan will be implemented by the contractor during the works.
- During construction, surface water run-off during site works will be controlled using standard construction management measures. The existing surface water drainage network, within the site, controls surface water discharges. During construction, surface water will be discharged via a hydrocarbon interceptor to the existing site drainage network to the River Deel through the existing facility's IED licensed emission point. All discharges and emissions from the proposed development during the construction period will be within the current operating limits set by the IED licence for the existing facility. There will be no other discharge points to the River Deel during construction.

Boundaries for construction vehicles will be clearly indicated to lessen the chances of sediment or pollutants ending up in the river.

Control measures, as recommended in the guidance above, will be implemented to minimise the risk of spills, sedimentation and contamination of soils and waters and thereby minimise the risk of pollution of the River Deel, the SPA, and the cSAC downstream. There will be no pollution or siltation of the water of the River Deel as a result of the proposed development, therefore there will be no impacts on the Qualifying Interests Lamprey species or Salmon of the cSAC downstream.

- As a modern industrial facility, the implementation of environmental protection measures occurs at the existing site as standard, and no difficulties in implementing standard construction environmental protection measures (i.e. prevention of siltation or hydrocarbon contamination in surface water run-off) under the supervision of site engineers is envisaged. Thus significant impacts on the receiving environment and in particular the River Deel, the SPA and the cSAC are not predicted to occur.
- It is intended that the construction compound will be located within the site of the existing facility. The area which it is envisaged the contractor will use as the area for the construction compound is indicated by green area shown in **Figure 2.**

8 Screening Statement and Conclusions

The assessment for screening identified six Natura 2000 sites within the zone of influence of the site of the proposed development, however only two of these are of relevance to the proposed development i.e. the River Shannon and River Fergus Estuaries SPA, and the Lower River Shannon cSAC. The remaining sites are not considered due to the distance to, and lack of connectivity with, the remaining sites and due to the low value of the site of the proposed development for foraging species of these Natura 2000 sites.

Based on the information provided above, and by applying the precautionary principle, it is the opinion of Arup that it was possible to rule out likely significant impacts on any Natura 2000 site. Therefore it is the opinion of Arup that is it is not necessary to undertake any further stage of the Appropriate Assessment process. Refer to **Appendix A** *Finding of No Significant Effects Report*.

Appendix A

Findings of No Significance Report

A1 Findings of No Significance Report

Name of Project:

Construction of the R&D Centre for Wyeth Nutritionals (Project New Card)

Names of Natura 2000 Sites within 15km of site:

- Askeaton Fen Complex cSAC (Site Code 002279)
- Barrigone cSAC (Site Code 00432)
- Curraghchase Woods cSAC (Site Code 00174)
- Lower River Shannon cSAC (Site Code 002165)
- River Shannon and River Fergus Estuaries SPA (Site Code 004077)
- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site Code 004161)

Only the Lower River Shannon cSAC (Site Code 002165) and the River Shannon and River Fergus Estuaries SPA (Site Code 004077) are of relevance to the proposed development. The remaining Natura Sites listed are not considered in this report due to the lack of pathway/connectivity with the site and the low value of the site for foraging species of the Natura 2000 sites.

Is the project or plan directly connected with or necessary to the management of the sites?

No

Are there other projects or plans that together with the project or plan being assessed could affect the site?

No

THE ASSESSMENT OF SIGNIFICANCE OF EFFECTS

Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 sites.

The proposed development will not result in any significant impacts on Natura 2000 sites.

Explain why these effects are not considered significant.

The assessment concludes that the project is not likely to significantly affect any Natura 2000 sites (directly or indirectly). The proposed development will not result in any significant impacts on Natura 2000 sites. This judgement has been arrived at on the following basis:

- All development activity will take place within the Wyeth site. No works will take place within the River Shannon and River Fergus Estuaries Special Protection Area (SPA) the boundary of which is located approximately 22.5m

east of the site of the proposed development. No material or spoil from the works will be deposited in the SPA. There will be no encroachment on the mudflats of the SPA.

- There will be no loss of Natura 2000 site habitat area, no fragmentation of the habitats of Natura 2000 sites, no disturbance to the qualifying species of the Natura 2000 sites, no impacts on population density of these species, no impacts on water resources and no impacts on water quality of the Natura 2000 sites.
- The area of scrub along the boundary between the SPA and the site will provide a buffer to minimise disturbance to species of the SPA.
- External lighting for the proposed development will comprise low impact LED pole lighting and bollard light fittings as appropriate and similar to those that exist on site at present.
- There is a potential indirect pathway between the proposed development and the two relevant Natura 2000 sites, via the existing Wyeth Nutritionals Ireland Limited surface water drainage system. The surface water drainage network at the existing Wyeth facility discharges to the River Deel via an IED licensed (P0395) discharge point. All emissions from the Wyeth site are governed by the limits of its IED licence. Surface water drainage from the proposed development will link to this existing drainage network at the facility. A hydrocarbon interceptor forms part of the surface water drainage system. All surface water discharges to the River Deel via the IED licensed discharge point, and will comply with the IED licence during operation. All process and foul water will be directed to the site's wastewater treatment plant. Therefore there will be no effects on the habitats or species of the SPA and the cSAC as a result of the proposed development.
- The impacts of noise from the proposed development will be imperceptible at the SPA and cSAC.
- The impacts of improvements in air quality arising from the proposed development cannot have an adverse effect on the SPA or cSAC.
- No particularly noisy construction activities are envisaged during the construction phase. Given the existing background noise and disturbance on this industrial site, significant noise impacts on the receiving environment are not predicted to occur. The building contractor will employ measures to minimise the potential for noise disturbance to the surrounding area to ensure the construction noise criteria are not exceeded. The Contractor will comply with the recommendations of BS 5228-1:2009+A1:2014: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.
- The site is part of an existing industrial complex and is screened from much of the SPA to the east and cSAC to the north by the existing building complex. This will mean that works during the construction phase of the development will not be visible for the most part and this would minimise the disturbance effects of construction activities on the species of the nearby River Shannon and River Fergus Estuaries Special Protection Area (SPA).

- A Construction Management Plan, a Dust Management Plan and a Waste Management Plan will be implemented by the contractor during the works.
- During construction, surface water run-off during site works will be controlled using standard construction management measures. The existing surface water drainage network, within the site, controls surface water discharges. During construction, surface water will be discharged via a hydrocarbon interceptor to the existing site drainage network to the River Deel through the existing facility's IED licensed emission point. All discharges and emissions from the proposed development during the construction period will be within the current operating limits set by the IED licence for the existing facility. There will be no other discharge points to the River Deel during construction. Boundaries for construction vehicles will be clearly indicated to lessen the chances of sediment or pollutants ending up in the river.

  Control measures, as recommended in the guidance above, will be implemented to minimise the risk of spills, sedimentation and contamination of soils and waters and thereby minimise the risk of pollution of the River Deel, the SPA, and the cSAC downstream. There will be no pollution or siltation of the water of the River Deel as a result of the proposed development, therefore there will be no impacts on the Qualifying Interests Lamprey species or Salmon of the cSAC downstream.
- As a modern industrial facility, the implementation of environmental protection measures occurs at the existing site as standard, and no difficulties in implementing standard construction environmental protection measures (i.e. prevention of siltation or hydrocarbon contamination in surface water run-off) under the supervision of site engineers is envisaged. Thus significant impacts on the receiving environment and in particular the River Deel, the SPA and the cSAC are not predicted to occur.
- It is intended that the construction compound will be located within the site of the existing facility. The area which it is envisaged the contractor will use as the area for the construction compound is indicated by green area shown in **Figure 2**.

List of Agencies consulted

The following were consulted by email:

Mr. Tom O'Neill, Heritage Officer, Limerick City and County Council.

Manager Development Applications Unit (DAU) of the Department of Heritage, Arts and the Gaeltacht

DATA COLLECTED TO CARRY OUT THE ASSESSMENT

Who carried out the assessment?

The assessment was carried out by Arup.

Sources of Data -

Sources of data included:

- *Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC* (EC Environment Directorate-General, 2000); [hereafter referred to as MN2000]
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodical Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General, 2001)
- *Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC.* (European Commission, 2007)
- *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, 2010 revision)
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPW 1/10 and PSSP 2/10*
- *Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive* (International Workshop on Assessment of Plans under the Habitats Directive, 2011)

Sources of information that were used to collect data on the Natura 2000 network of sites and on the existing ecological environment are listed below:

- Ordnance Survey of Ireland mapping and aerial photography (www.osi.ie) (accessed 16.02.2016)
- Google Maps aerial photography (accessed 16.02.2016)
- National Parks and Wildlife Service online mapping and data on European Sites (www.npws.ie) (accessed 16.02.2016)
- Information on environmental quality data available from www.epa.ie (Envision Online Environmental Map Viewer)
- Status of EU Protected Habitats in Ireland (NPWS 2013)
- Limerick City and County Council online planning records accessed on 17.02.2016
- National Biodiversity Centre Data Centre database www.biodiversityireland.ie (accessed 17.02.2016).
- Natura Impact Report of Variation No 3 to the Limerick County Development Plan 2010 – 2016 (February 2015).

OVERALL CONCLUSIONS

Based on the information provide above, and by applying the precautionary principle, it was determined by Arup that it was possible to rule out likely significant impacts on any European Sites. It is the opinion of Arup that it is not necessary to undertake any further stage of the Appropriate Assessment process.

Appendix B

Results of Winter Bird Surveys 2015 - 2016

B1 Results of Winter Bird Surveys 2015 – 2016

Date	Tides	Location	Weather	Notes
05/11/2015	Low: 08:18 High:14:12	Wyeth Nutrition Facility – north east corner	Sea state 2-3. Wet, with high cloud cover. Wind SW 15kph. Cloud 7/8. 14^0C	Site located on high ground overlooking River Deel.
05/11/2015	Low: 08:18 High:14:12	Askeaton swimming club	Wet, with moderate cloud cover. Wind SW 12kph. Cloud 6/8. 14^0C. Water calm.	Site located south of the Wyeth Nutrition Facility with clear open view of the River Deel stretching North.

Winter Survey Results - 05/11/2015

Date	Location	
05/11/2015	**Wyeth Nutrition Facility**	**Askeaton swimming club**
Time of survey:	12.30 – 14.00	15.00 – 16.30
Tide/River state:	Mid	High
Species present & abundance		
Black-headed Gull	211	
Common Gull	10	
Lesser Black-backed Gull		1
Grey Heron	1	2
Cormorant	4	1
Curlew	1	1
Oystercatcher	1	
Curlew Sandpiper		1
Mallard	8	
Robin	3	2
Woodpigeon	6	3
Blackbird	6	1
Chaffinch	3	2
Wren	1	1
Blue tit	1	
Long-tailed tit		8
Pied Wagtail	1	
Rook		1
Hooded Crow	11	1
Magpie	1	

Fly-by: 38 Curlew

Date	Tides	Location	Weather	Notes
16/12/2015	Low: 15:02 High:09:04	Wyeth Nutrition Facility – north east corner	Sea state 2-3. Wet, with high cloud cover. Wind SW 25-35kph. Cloud 6/8. 10^0C	Site located on high ground overlooking River Deel.
16/12/2015	Low: 15:02 High:09:04	Askeaton swimming club	Wet, with moderate cloud cover. Wind SW 05kph. Cloud 4/8. 12^0C. Water – strong flow.	Note: Fox noted on bank nearest the Wyeth Nutrition Facility. Site located south of the Wyeth Nutrition Facility with clear open view of the River Deel stretching North.

Winter Survey Results - 16/12/2015

Date	Location	
16/12/2015	**Wyeth Nutrition Facility**	**Askeaton swimming club**
Time of survey:	12.15 – 13.45	13.55 – 15.25
Tide/River state:	Low	Low
Species present & abundance		
Black-headed Gull	60	18
Common Gull	1	
Little Egret		3
Cormorant		1
Curlew	12	2
Greenshank	1	1
Redshank	8	2
Common Sandpiper		1
Teal	22	3
Mallard	5	15
Robin	3	2
Woodpigeon	2	1
Blackbird	1	1
Chaffinch		3
Pied Wagtail		2
Hooded Crow	4	1
Magpie	3	1
Jackdaw		2
Goldfinch	1	1
Raven	1	
Dipper		1
Redpoll	1	

Date	Tides	Location	Weather	Notes
12/01/2016	Low: 13:31 High:07:25	Wyeth Nutrition Facility – north east corner	Sea state 3-4. Wet, with high cloud cover. Wind SW 25-35kph. Cloud 4/8. 3-4^{0}C. Some drizzle and hail stone	Site located on high ground overlooking River Deel.
12/01/2016	Low: 13:31 High:07:25	Askeaton swimming club	Wet, with moderate cloud cover. Wind SW 15kph. Cloud 2/8. 4^{0}C. Water – strong flow.	Site located south of the Wyeth Nutrition Facility with clear open view of the River Deel stretching North.

Winter Survey Results - 12/01/2016

Date	Location	
12/01/2016	**Wyeth Nutrition Facility**	**Askeaton swimming club**
Time of survey:	11.45 – 13.15	13.30 – 15.00
Tide/River state:	Low	Low
Species present & abundance		
Black-headed Gull	28	5
Common Gull		1
Grey Heron		1
Little Egret		1
Cormorant	1	
Curlew	6	1
Greenshank	1	1
Redshank	9	5
Common Sandpiper		1
Teal	51	9
Mallard	5	5
Robin		1
Woodpigeon		14
Blackbird	2	1
Chaffinch	1	
Pied Wagtail		2
Hooded Crow	3	3
Song thrush		1
Goldfinch	2	
Greenfinch	1	
Linnet		8
Bullfinch	1	

Fly-by: Wyeth Facility (3 Greater Black-backed Gulls, 12 Rooks, 2 Magpies, 8 Curlew, 3 Hooded Crows, 16 Black Headed Gulls, 2 Jackdaws, 2 Cormorant) & Askeaton Swimming Club (35 Rooks, 3 Woodpigeons, 10 Jackdaws, 2 Common Gulls).

Date	Tides	Location	Weather	Notes
17/02/2016	Low: 07:08 High:13:53	Wyeth Nutrition Facility – north east corner	Sea state 2-3.Rain 0mm. Wind SW 10-30kph. Cloud4/8. Temp.3^{0}C	Note: Large number of Curlew noted in field opposite the facility. Site located on high ground overlooking River Deel.
17/02/2016	Low: 07:08 High:13:53	Askeaton swimming club	Wind SW 05-10kph. Cloud 4/8. 5^{0}C. Water very high with strong flow.	Site located south of the Wyeth Nutrition Facility with clear open view of the River Deel stretching North.

Date	Location	
17/02/2016	**Wyeth Nutrition Facility**	**Askeaton swimming club**
Time of survey:	11:45 – 13:15	13:25 – 14:55
Tide/River state:	Mid - High	High
Species present & abundance		
Black-headed Gull	28	6
Common Gull	3	
Cormorant	2	
Curlew	147	
Oystercatcher	1	
Greenshank	1	
Redshank	2	
Snipe	4	
Common Sandpiper		1
Teal	17	11
Mallard	2	7
Robin	2	2
Woodpigeon	1	2
Blackbird	1	2
Chaffinch	3	
Wren		2
Grey Wagtail		1
Pied Wagtail		2
Rook		1
Hooded Crow	3	
Starling	13	

Date	Tides	Location	Weather	Notes
01/03/2016	Low: 16:36 High:10:40	Wyeth Nutrition Facility – north east corner	Sea state 3.Wet conditions - drizzle. Wind SW 30-50kph. Cloud 7/8. Temp.9^{0}C	Note: Rookery situated near construction security entrance and possible others in near by locations Site located on high ground overlooking River Deel.
01/03/2016	Low: 16:36 High:10:40	Askeaton swimming club	Wind SW 10-30kph. Cloud 7/8. 9^{0}C. Wet conditions – drizzle. Water- moderate flow.	Site located south of the Wyeth Nutrition Facility with clear open view of the River Deel stretching North.

Date	Location	
1/3/2016	**Wyeth Nutrition Facility**	**Askeaton swimming club**
Time of survey:	10:45 - 12:15	12:30 - 14:00
Tide/River state:	high	high - moderate flow
Species present & abundance		
Black-headed Gull		43
Little Egret		1
Cormorant	2	
Curlew	1	
Greenshank	1	
Redshank	5	3
Common Sandpiper		1
Teal	8	4
Mallard	1	7
Woodpigeon	3	30
Blackbird	2	
Chaffinch	5	8
Grey Wagtail		3
Pied Wagtail		2
Hooded Crow	7	2
Magpie	2	
Kestrel		1
Reed Bunting	3	

Appendix C

Noise Assessment Report 2016

C1 Noise Assessment Report

See Noise Assessment Report 2016 overleaf.

Nestle

Project Newcard

Noise impact assessment

REP1

Issue | 15 March 2016

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 233421-00

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Contents

1 Introduction

It is proposed to construct an extension to the existing R&D pilot plant at the Nestlé facility in Askeaton, Co. Limerick. A number of new noise sources will be provided as part of the development. This report was prepared to assess the potential noise impact due to the constructional and operational phases of the development. The facility is licensed by the Environmental Protection Agency (EPA) under Industrial Emissions (IE) Licence Register No. P0395-03.

2 Methodology

2.1 Environmental noise survey methodology

The survey methodology followed the Environmental Protection Agency (EPA) '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in relation to Scheduled Activities'* NG4 and ISO 1996 '*Description and Measurement of Environmental Noise'*.

2.1.1 Monitoring locations

Figure 1 shows the six monitoring locations where baseline monitoring was undertaken. These locations are referred to as:

- NSL1 – New house approximately 200m north of the site, at roadside;
- NSL2 – 260m south, at lay-by beside B&B;
- NSL3 – Askeakon, 460m south, on the footpath at a retirement home;
- NSL 4 – Ballysteen Road, 470m southeast, in gateway;
- NSL 5 – Ballysteen Road, 870m east, in gateway;
- NSL6 – 460m east, laneway at rear of house.

2.1.2 Instrumentation

The monitoring was carried out using a Bruel & Kjaer 2250 Type 1 sound level meter. The calibration was checked before and after the monitoring using a Bruel & Kjaer 4231 Calibrator.

2.1.3 Monitoring procedure

Measurement locations at residential properties were at the property boundaries. The measurement locations are shown in **Figure 1**.

2.1.4 Measurement parameters

At each location, the noise level was measured for a 30-minute period. The limits in IE licence P0395-03 refer to the noise emitted from the licensed activity only, i.e. the specific noise. During the survey, the specific noise levels due to noise emissions from the Nestle facility were established based primarily on the noise level statistics.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

2.2 Assessment criteria

Nestle is licenced by the EPA to operate under their IE licence. The licence assigns a daytime noise limit ($L_{Aeq, 30min}$) of 55dB (07:00 to 19:00hrs.) and a 45dB night-time (23:00 to 07:00hrs.) limit at noise sensitive locations. Although not a specific limit of the site, the EPA '*Guidance Note for Noise: Licence Application, Surveys and Assessments in Relation to Scheduled Activities*' NG4, 2012 applies a noise limit of 50dB for the evening time (19:00 to 23:00hrs.).

The impact of the development is assessed through the application of significance criteria based on predicted changes in noise level due to the operational phase of the development. This was achieved by calculating the change in L_{Aeq} and categorising the significance (refer to **Table 2**).

Table 2: Changes in Noise Level – Significance Criteria

Change in Sound Level (dB)	Subjective Reaction	Significance Level
<3	Inaudible	Imperceptible
4-5	Perceptible	Slight
6-10	Up to doubling of loudness	Moderate
11-15	Over a doubling of loudness	Significant
>16		Profound

Source: Based on a number of noise documents including *EPA Guidelines*, *BS4142* and *PPG24*

2.3 Assessment methodology

Calculations used to predict impacts associated with the operational impacts of the development have been completed using SoundPLAN modelling software, Version 7.3. The following input data was used to develop the noise model:

- Details of ground conditions;
- Location of noise sensitive locations (NSLs);
- Proposed buildings; and
- Sound power levels of each individual plant source.

Noise predictions for the operational phase were made using this software according to guidelines specified in 'ISO 9613-2: *Attenuation of Sound Propagation Outdoors: General Method of Calculation*' (ISO, 1996). **Table 3** outlines the sound power level associated with new plant items.

Table 3: Sound power levels of new plant proposed for pilot plant

Floor of pilot plat	Plant	Sound power level (L_w, dB)	Operation times
Ground	Vacuum mixer	80	Continuous
	Pumps x 2	103	Continuous
First	Through louvers	94	Continuous
	DSI	105	Continuous
	Air take	72	Continuous
	AHU	63	Continuous
	AHU	66	Continuous
Second	Thermocompressor	108	Continuous
	Explosion vents x 2	77	Continuous
Roof	SD building walls	66	Continuous
	AHU	62	Continuous
Dry roof tower	Exhaust outlet	93	Continuous

The external wall cladding proposed for the development is Kingspan RW/80 panels. The noise reduction due to the cladding has been factored for internal noise sources, at a Weighted Sound Reduction Index (Rw) of 45dB. External noise sources have been assumed to have no attenuation for modelling purposes. No account has been taken noise attenuation that will arise from the implementation of ducting or enclosing of internal or external noise sources.

3 Existing environment

3.1 Introduction

In order to establish the existing environment, a series of noise surveys were carried out during daytime evening time and night-time at six noise sensitive locations (see **Figure 1**). Measurements were undertaken on the 25th and 26th May, 2015. Surveys were carried out on a week-day and during time periods which were selected in order to provide a typical snapshot of the existing baseline noise climate.

3.2 Weather report

Weather details for the daytime, evening time and night-time surveys are presented in **Table 4**.

Table 4 Weather conditions during monitoring

Period	Locations	Temp (°C)	Wind speed (m/s)	Precipitation
Daytime	All locations	14-16	1 - 4	None
Evening	All locations	11-15	0-2	None
Night-time	All locations	9-11	0-2	None

3.3 Noise sources during monitoring

A description of the noise sources audible during the surveys is provided below. Refer to **Figure 1** for the locations of noise monitoring points.

3.3.1 NSL1

This monitoring point is located approximately 200m to the north of the site at the roadside.

3.3.1.1 Daytime survey

Local traffic, birds chirping, planes and silage cutting were all audible during the survey, the plant was not audible.

3.3.1.2 Evening time survey

Local and distant traffic, birds chirping, planes and silage making were all audible during the survey, the plant was barely audible.

3.3.1.3 Night-time survey

Distant traffic, trees rustling, planes and dawn chorus were all audible during the survey, the plant was barely audible.

3.3.2 NSL2

This monitoring point is a noise sensitive location (a B&B), situated 260m south of the site.

3.3.2.1 Daytime survey

Traffic noise from the N69 and local traffic were audible during the survey, the plant was barely audible.

3.3.2.2 Evening time survey

Traffic noise from the N69, local traffic and a dog barking were audible during the survey, the plant was barely audible.

3.3.2.3 Night-time survey

Traffic noise from the N69, local traffic and trees rustling were audible during the survey, the plant was barely audible.

3.3.3 NSL3

NSL3 is situated at a noise sensitive location located in Askeaton, 460m south of the plant, adjacent to a retirement home.

3.3.3.1 Daytime survey

The main source of noise at this point was the traffic noise from the N69 and local traffic. The plant was not audible.

3.3.3.2 Evening time survey

The main source of noise at this point was the traffic noise from the N69 and local traffic. A dog was also barking during the survey. The plant was not audible.

3.3.3.3 Night-time survey

Local and distant traffic noise were audible during the survey. The plant was barely audible in traffic lulls.

3.3.4 NSL4

This monitoring location is positioned in the gateway of a house on Ballysteen Road, 470m southeast of the site.

3.3.4.1 Daytime survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Birds chirping were also audible. Low level steady plant noise was barely audible in traffic lulls.

3.3.4.2 Evening time survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Low level steady plant noise was barely audible in traffic lulls.

3.3.4.3 Night-time survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Dogs were also heard barking. Low level steady plant noise was barely audible in traffic lulls.

3.3.5 NSL5

This monitoring location is positioned in the gateway of a house on Ballysteen Road, 870m east of the site.

3.3.5.1 Daytime survey

The greatest source of noise at this point was distant traffic on the N69 and local traffic. The plant was barely audible in traffic lulls.

3.3.5.2 Evening time survey

Distant and local traffic noise was audible at this location. The plant was not audible.

3.3.5.3 Night-time survey

Distant traffic and low level steady plant noise were audible during this survey.

3.3.6 NSL6

NSL6 is situated at a laneway to the rear of a house, 460m east of the plant.

3.3.6.1 Daytime survey

Steady plant noise and distant and local traffic were audible during the survey period.

3.3.6.2 Evening time survey

Distant traffic noise and low level steady plant noise were audible during the survey.

3.3.6.3 Night-time survey

Distant traffic noise and low level steady plant noise were audible during the survey.

3.4 Measurement results

Table 5 presents the specific noise level for each location based on the noise survey

Table 5: Specific noise level monitoring results

Monitoring location	Mean specific noise level dB L_{Aeq}		
	Daytime	**Evening**	**Night-time**
NSL1	<<42	<36	<<33
NSL2	<48	<43	<<43
NSL3	<<48	<<44	<40
NSL4	<49	<50	<44
NSL5	<40	<<43	36
NSL6	45	40	41
IE Limit	*55*	*50*	*45*

< Plant barely audible
<< Plant not audible

The noise survey determined that the measured noise was broadband in character at all locations.

Measured specific noise levels are in compliance with licensed limits.

4 Potential impacts of the development

4.1 Construction phase

There is potential for noise to be generated during the construction phase of the development. The following construction noise management measures will be implemented by the contractor to minimise the potential for noise disturbance to the surrounding area and to ensure that construction noise criteria are not exceeded.

The Contractor will comply with the recommendations of BS 5228-1:2009+A1:2014: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.

BS 5228 includes guidance on several aspects of construction site practices, including, but not limited to:

- Selection of quiet plant,
- Control of noise sources,
- Screening, and
- Working hours

Selection of quiet plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not the item can be replaced with a quieter alternative.

General comments on noise control at source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS 5228 states that "as far as reasonably practicable sources of significant noise should be enclosed". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

Working hours

Works will not be undertaken outside of normal working hours without the written permission of the local authority.

4.2 Operation phase

4.2.1 Noise sensitive locations

Six noise sensitive locations (in both upper and lower floors) were modelled to assess the impact of the development. Modelled results predicted at nearby residential receptors are presented and discussed below. In addition, to assess the effects of noise from the proposed development on the bird species of the SPA, four locations at the western bank of the River Deel (see **Figure 1** for locations) were assessed (refer to Section 4.2.2 *Special Protection Areas* for further information).

Baseline noise levels for each receptor were obtained from the onsite monitoring. Predicted noise levels are derived from the SoundPlan modelling assessment at each receptor. The change in noise level is then compared to the assessment criteria outline in Section 2.2.2. It should be noted that for the purposes of comparison to EPA limits the specific noise levels derived from the monitoring results are added to the predicted values. In some cases, the plant was not audible during monitoring.

Tables 6 to **8** below contains comparisons of predicted total noise levels to baseline values for daytime, evening time and night-time and apply a significance criteria to the change. **Figure 1** presents the noise contour map for the predicted noise levels.

4.2.1.1 Daytime assessment

Table 6 below contains comparisons of predicted total noise levels to baseline values for daytime and apply a significance criteria to the change.

Table 6 Assessment of change in noise levels for daytime

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA daytime limit? (55dB L_{Aeq})	Significance level (see Table 2)
NSL1	<<42	Ground	19.2	42	0.0	Yes	Imperceptible
		1st	19.2	42	0.0	Yes	Imperceptible
NSL2	<48	Ground	31.6	48	0.1	Yes	Imperceptible
		1st	31.6	48	0.1	Yes	Imperceptible
NSL3	<<48	Ground	26	48	0.0	Yes	Imperceptible
		1st	26.1	48	0.0	Yes	Imperceptible
NSL4	<49	Ground	26.8	49	0.0	Yes	Imperceptible
		1st	26.8	49	0.0	Yes	Imperceptible
NSL5	<40	Ground	20.2	40	0.0	Yes	Imperceptible
		1st	20.2	40	0.0	Yes	Imperceptible
NSL6	45	Ground	23.1	45	0.0	Yes	Imperceptible
		1st	23.5	45	0.0	Yes	Imperceptible

< Plant barely audible

<< Plant not audible

As presented in **Table 6**, impacts associated with the development are considered imperceptible. Furthermore, the baseline stated at NSL1, 2, 3, 4 and 5 are overstated, as according to the noise surveys undertaken at these locations, plant from the facility was either barely audible or not audible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 0.1dBA. This change is deemed imperceptible and complies with the daytime noise limits stated in Section 2.2.2.

4.2.1.2 Evening time assessment

Table 7 below contains comparisons of predicted total noise levels to baseline values for evening time and apply a significance criteria to the change.

Table 7 Assessment of change in noise levels for evening time

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA evening time limit? (50dB L_{Aeq})	Significance level (see Table 2)
NSL1	<36	Ground	19.2	36	0.1	Yes	Imperceptible
		1st	19.2	36	0.1	Yes	Imperceptible
NSL2	<43	Ground	31.6	43	0.3	Yes	Imperceptible
		1st	31.6	43	0.3	Yes	Imperceptible
NSL3	<<44	Ground	26	44	0.1	Yes	Imperceptible
		1st	26.1	44	0.1	Yes	Imperceptible
NSL4	<50	Ground	26.8	50	0.0	Yes	Imperceptible
		1st	26.8	50	0.0	Yes	Imperceptible
NSL5	<<43	Ground	20.2	43	0.0	Yes	Imperceptible
		1st	20.2	43	0.0	Yes	Imperceptible
NSL6	40	Ground	23.1	40	0.1	Yes	Imperceptible
		1st	23.5	40	0.1	Yes	Imperceptible

< Plant barely audible

<< Plant not audible

As presented in **Table 7**, impacts associated with the development are considered imperceptible. Furthermore, the baseline stated at NSL1, 2, 3, 4 and 5 are overstated, as according to the noise surveys undertaken at these locations, plant from the facility was either barely audible or not audible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 0.3dBA. This change is deemed imperceptible and complies with the evening time noise limits stated in Section 2.2.2.

4.2.1.3 Night-time assessment

Table 8 contains comparisons of predicted total noise levels to baseline values for night-time and apply a significance criteria to the change.

Table 8 Assessment of change in noise levels for night-time

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA night-time limit? (45dB L_{Aeq})	Significance level (see Table 2)
NSL1	<<33	Ground	19.2	33	0.2	Yes	Imperceptible
		1st	19.2	33	0.2	Yes	Imperceptible
NSL2	<<43	Ground	31.6	43	0.3	Yes	Imperceptible
		1st	31.6	43	0.3	Yes	Imperceptible
NSL3	<40	Ground	26	40	0.2	Yes	Imperceptible
		1st	26.1	40	0.2	Yes	Imperceptible
NSL4	<44	Ground	26.8	44	0.1	Yes	Imperceptible
		1st	26.8	44	0.1	Yes	Imperceptible
NSL5	36	Ground	20.2	36	0.1	Yes	Imperceptible
		1st	20.2	36	0.1	Yes	Imperceptible
NSL6	41	Ground	23.1	41	0.1	Yes	Imperceptible
		1st	23.5	41	0.1	Yes	Imperceptible

< Plant barely audible

<< Plant not audible

As presented in **Table 8**, impacts associated with the development are considered imperceptible. Furthermore, the baseline stated at NSL1, 2, 3 and 4 are overstated, as according to the noise surveys undertaken at these locations, plant from the facility was either barely audible or not audible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 0.3dBA. This change is deemed imperceptible and complies with the night-time noise limits stated in Section 2.2.2.

4.2.2 Special Protection Areas (SPAs)

The River Shannon and River Fergus Estuaries Special Protection Area (SPA) is located at the eastern boundary of the Nestle site. In order to assess the effect of noise from the proposed development on the bird species of the SPA, four locations at the western bank of the River Deel were assessed (see **Figure 1** for location).

The highest noise level predicted at these locations is 44dBA, see **Figure 1**. Results from the 2015 Environmental Noise Survey indicate that at the western boundary of the site, a night-time noise level of 47dBA is experienced. It is conservative to assume that this noise level is not any greater along the eastern

boundary, as the eastern boundary is located further away from any local roads which are a main noise source.

Therefore, using 47dBA as a baseline noise level, a total noise level of 49dBA is predicted, an increase of 2dBA. This increase is categorised as an imperceptible, refer to **Table 2.**

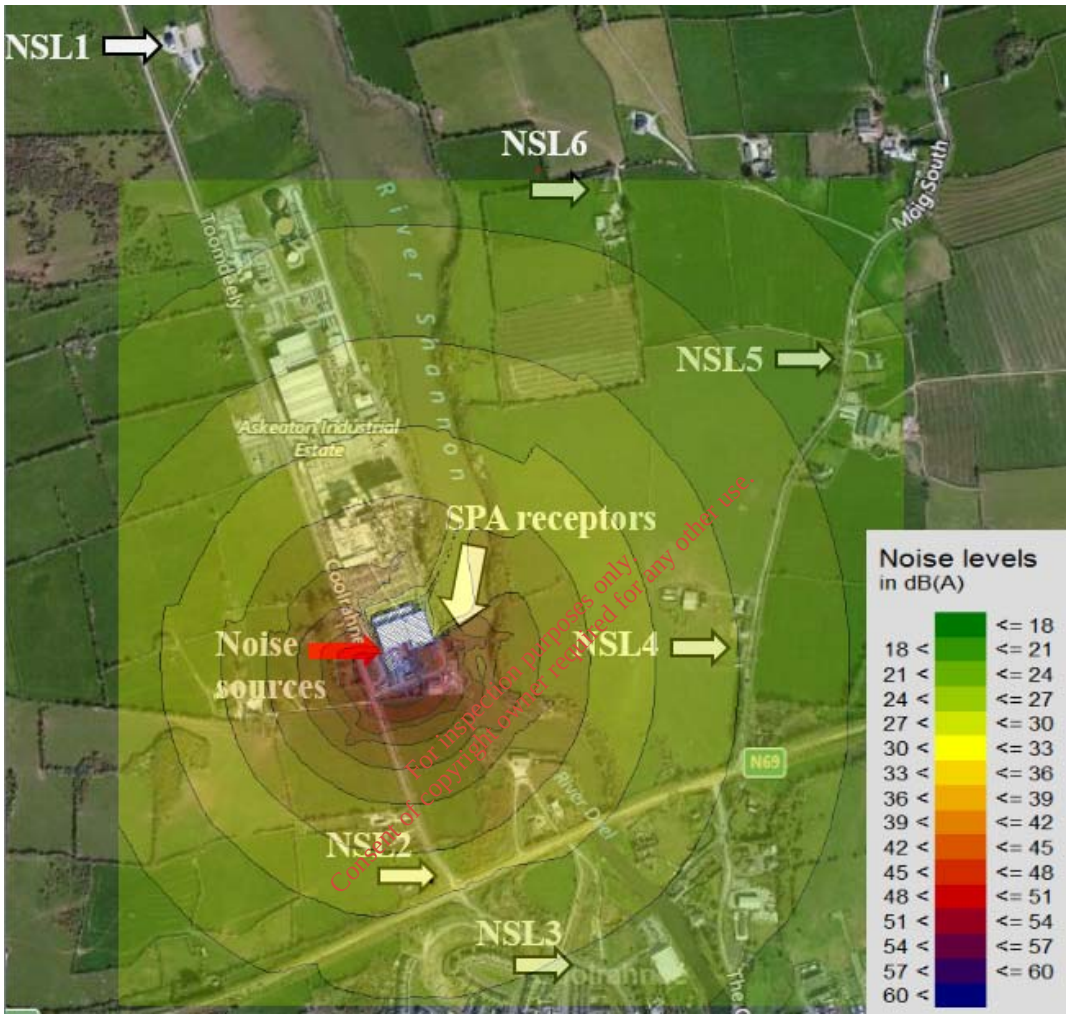

Figure 1: Operational phase noise levels at noise sensitive locations

[background mapping © Microsoft Corporation © 2016 Bing Maps] not to scale

5 Conclusions

A noise assessment was carried out to assess the potential noise impact for the proposed extension to the existing R&D pilot plant at the Nestlé facility in Askeaton, Co. Limerick.

The results of the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is considered imperceptible and complies with the daytime, evening time and night-time noise limits stated in Section 2.2.

Furthermore, the inclusion of noise reduction measures such as ducting and internal structures, which are not included in this assessment, will reduce noise emissions further.

Ultimately, the facility will be obliged to comply with the noise limits outlined in Section 2.2 of this report as stated in IE Licence P0395-03. Noise monitoring results are reported annually via the facility's Annual Environmental Report which is submitted to the EPA.

6 References

Environmental Protection Agency (EPA) '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in relation to Scheduled Activities'* NG4

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TII (formerly the NRA), 2014. *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*. NRA, Dublin, Ireland.

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise

Appendix D

Noise Assessment Report 2017

D1 Noise Assessment Report

See Noise Assessment Report 2017 overleaf.

Nestle

Project Newcard

Noise impact assessment 2017

REP1

Issue | 10 March 2017

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 233421-00

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		Signature			
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Contents

1 Introduction

A detailed noise impact assessment has been undertaken for the Nestlé facility in Askeaton, Co Limerick to assess the potential noise impact due to the operational phases of the extension to the existing R&D pilot plant. The facility is licensed by the Environmental Protection Agency (EPA) with an Industrial Emissions (IE) Licence, Register No. P0395-03.

2 Methodology

2.1 Environmental noise survey methodology

The survey methodology followed the Environmental Protection Agency (EPA) '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in relation to Scheduled Activities'* NG4 and ISO 1996 '*Description and Measurement of Environmental Noise'*.

2.1.1 Monitoring locations

Figure 1 shows the six monitoring locations where baseline monitoring was undertaken. These locations are referred to as:

- NSL1 – New house approximately 200m north of the site, at roadside;
- NSL2 – 260m south, at lay-by beside B&B;
- NSL3 – Askeakon, 460m south, on the footpath at a retirement home;
- NSL4 – Ballysteen Road, 470m southeast, in gateway;
- NSL5 – Ballysteen Road, 870m east, in gateway; and
- NSL6 – 460m east, laneway at rear of house.

2.1.2 Instrumentation

The monitoring was carried out using a Bruel & Kjaer 2250 Type 1 sound level meter. The calibration was checked before and after the monitoring using a Bruel & Kjaer 4231 Calibrator.

2.1.3 Monitoring procedure

Measurement locations at residential properties were at the property boundaries. The measurement locations are shown in **Figure 1**.

2.1.4 Measurement parameters

At each location, the noise level was measured for a 30-minute period. The limits in IE licence P0395-03 refer to the noise emitted from the licensed activity only, i.e. the specific noise. During the survey, the specific noise levels due to noise emissions from the Nestle facility were established based primarily on the noise level statistics.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

2.2 Assessment criteria

Nestle is licenced by the EPA to operate under their IE licence. The licence assigns a daytime noise limit ($L_{Aeq, 30min}$) of 55dB (07:00 to 19:00hrs.) and a 45dB night-time (23:00 to 07:00hrs.) limit at noise sensitive locations. Although not a specific limit of the site, the EPA '*Guidance Note for Noise: Licence Application, Surveys and Assessments in Relation to Scheduled Activities*' NG4, 2016 applies a noise limit of 50dB for the evening time (19:00 to 23:00hrs.).

The impact of the development is assessed through the application of significance criteria based on predicted changes in noise level due to the operational phase of the development. This was achieved by calculating the change in L_{Aeq} and categorising the significance (refer to **Table 1**).

Table 1: Changes in Noise Level – Significance Criteria

Change in Sound Level (dB)	Subjective Reaction	Significance Level
<3	Inaudible	Imperceptible
4-5	Perceptible	Slight
6-10	Up to doubling of loudness	Moderate
11-15	Over a doubling of loudness	Significant
>16		Profound

Source: Based on a number of noise documents including *EPA Guidelines, BS4142* and *PPG24*

2.3 Assessment methodology

Calculations used to predict impacts associated with the operational impacts of the development have been completed using SoundPLAN modelling software, Version 7.4. The following input data was used to develop the noise model:

- Details of ground conditions;
- Location of noise sensitive locations (NSLs);
- Buildings; and
- Sound power levels of each individual plant source.

Noise predictions for the operational phase were made using this software according to guidelines specified in 'ISO 9613-2: *Attenuation of Sound Propagation Outdoors: General Method of Calculation*' (ISO, 1996). **Table 2** outlines the sound power level associated with new plant items.

All plant, with the exception of the cooling tower, has been assumed to in operation full time. The cooling tower is assumed to be in operation from 7am to 10pm.

Table 2: Sound power levels of new plant for pilot plant

Location of plant	Plant	Sound power level (Lw, dB)	Quantity	Location of plant	Plant	Sound power level (Lw, dB)	Quantity
Internal	Water Pump	83	4		Purge air fan	90	1
	Product Pump	82	4		Homogenizer	82	1
	Product Pump	85	1		Feed pump	82	1
	Product Pump	71	2		Hammer at Drying chamber	113	1
	Mixers	78	5		Hammer at Cyclone	113	1
	Homogeniser	85	2		Hammer at bag filter	113	1
	Vacuum Mixer	93	1		Exhaust fan	79	1
	Pumps	98	1	External	VF	88	1
	TVR	103	1		Sifter	88	1
	Vacuum Pump	98	1		Chemicals Pump	78	5
	Inlet fan	94	1		Cooling Tower	94	1
	Main Fan	90	1		CIP forward pump	85	1
	Nozzle cooling fan	94	1		CIP circulation pump	82	1
	Static fluid bed fan	91	1	Roof	Silencer	88	1
	VF fan	92	1				
	Fines return blower	80	1				

The external wall cladding for the development is Kingspan RW/80 panels. The noise reduction due to the cladding has been factored for internal noise sources, at a Weighted Sound Reduction Index (Rw) of 45dB. External and roof noise sources have been assumed to have no attenuation for modelling purposes. No account has been taken noise attenuation that will arise from the implementation of ducting or enclosing of internal or external noise sources.

3 Existing environment

3.1 Introduction

In order to establish the existing environment, a series of noise surveys were carried out during daytime evening time and night-time at six noise sensitive locations (see **Figure 1**). Measurements were undertaken on the 23rd and 24th of May 2016. Surveys were carried out on a week-day and during time periods which were selected in order to provide a typical snapshot of the existing baseline noise climate.

3.2 Weather report

Weather details for the daytime, evening time and night-time surveys are presented in **Table 4**.

Table 3: Weather conditions during monitoring

Period	Locations	Temp (°C)	Wind speed (m/s)	Precipitation
Daytime	All locations	18-23	1 - 2	None
Evening	All locations	14-16	0	None
Night-time	All locations	12-14	0 - 2	None

3.3 Noise sources during monitoring

A description of the noise sources audible during the surveys is provided below. Refer to **Figure 1** for the locations of noise monitoring points.

3.3.1 NSL1

This monitoring point is located approximately 200m to the north of the site at the roadside.

3.3.1.1 Daytime survey

Helicopter and airplane, distant traffic and birds were all audible during the survey, the plant was not audible.

3.3.1.2 Evening time survey

Local and distant traffic, birds chirping were all audible during the survey, the plant was barely audible.

3.3.1.3 Night-time survey

Local and distant traffic, birds chirping were all audible during the survey, the plant was barely audible.

3.3.2 NSL2

This monitoring point is a noise sensitive location (a B&B), situated 260m south of the site.

3.3.2.1 Daytime survey

Traffic noise from the N69, local traffic and birdsong were all audible during the survey, the plant was barely audible in traffic lulls.

3.3.2.2 Evening time survey

Traffic noise from the N69, local traffic and birdsong were all audible during the survey, low level plant noise was audible during traffic lulls.

3.3.2.3 Night-time survey

Traffic noise from the N69, local traffic and birdsong were all audible during the survey, low level plant noise was audible during traffic lulls.

3.3.3 NSL3

NSL3 is situated at a noise sensitive location located in Askeaton, 460m south of the plant, adjacent to a retirement home.

3.3.3.1 Daytime survey

The main source of noise at this point was the traffic noise from the N69 and local traffic. Birdsong and ventilation noise at a nearby nursing home was also audible. The plant was not audible.

3.3.3.2 Evening time survey

The main source of noise at this point was the traffic noise from the N69 and local traffic. Birdsong and ventilation noise at a nearby nursing home was also audible. The plant was barely audible.

3.3.3.3 Night-time survey

The main source of noise at this point was the traffic noise from the N69 and local traffic. Birdsong and ventilation noise at a nearby nursing home was also audible. The plant was barely audible.

3.3.4 NSL4

This monitoring location is positioned in the gateway of a house on Ballysteen Road, 470m southeast of the site.

3.3.4.1 Daytime survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Birds chirping were also audible. Low level steady plant noise was barely audible in traffic lulls.

3.3.4.2 Evening time survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Birds chirping were also audible. Low level steady plant noise was barely audible in traffic lulls.

3.3.4.3 Night-time survey

The greatest source of noise at this point was the traffic on the N69 and local traffic. Birds chirping were also audible. Low level steady plant noise was barely audible in traffic lulls.

3.3.5 NSL5

This monitoring location is positioned in the gateway of a house on Ballysteen Road, 870m east of the site.

3.3.5.1 Daytime survey

The greatest source of noise at this point was distant traffic on the N69, local traffic and farmyard noise. The plant was not audible in traffic lulls.

3.3.5.2 Evening time survey

The greatest source of noise at this point was distant traffic on the N69, local traffic and farmyard noise, low level steady plant noise was audible.

3.3.5.3 Night-time survey

The greatest source of noise at this point was distant traffic on the N69, local traffic and farmyard noise. The plant was barely audible in traffic lulls.

3.3.6 NSL6

NSL6 is situated at a laneway to the rear of a house, 460m east of the plant.

3.3.6.1 Daytime survey

Farmyard noise, birdsong, trees rustling, distant and local traffic were audible during the survey period. Low level steady plant noise audible in traffic lulls.

3.3.6.2 Evening time survey

Farmyard noise, birdsong, trees rustling, distant and local traffic were audible during the survey period. Low level steady plant noise audible.

3.3.6.3 Night-time survey

Farmyard noise, birdsong, trees rustling, distant and local traffic were audible during the survey period. Low level steady plant noise audible.

3.4 Measurement results

Table 4 presents the specific noise level for each location based on the noise survey

Table 4: Specific noise level monitoring results for 2016

Monitoring location	Mean specific noise level dB L_{Aeq}		
	Daytime	**Evening**	**Night-time**
NSL1	<<32	<<25	38
NSL2	<<45	45	43
NSL3	<<44	<<40	31
NSL4	<45	<48	<34
NSL5	<<33	<<35	36
NSL6	33	34	36
IE Limit	*55*	*50*	*45*

< Plant barely audible
<< Plant not audible

The noise survey determined that the measured noise was broadband in character at all locations.

Measured specific noise levels are in compliance with licensed limits.

4 Potential impacts of the development

4.1 Noise sensitive locations

Six noise sensitive locations (in both upper and lower floors) were modelled to assess the impact of the development. Modelled results predicted at nearby residential receptors are presented and discussed below.

Baseline noise levels for each receptor were obtained from the onsite monitoring. Predicted noise levels are derived from the SoundPlan modelling assessment at each receptor. The change in noise level is then compared to the assessment criteria outline in Section 2.2. It should be noted that for the purposes of comparison to EPA limits the specific noise levels derived from the monitoring results are added to the predicted values. In some cases, the plant was not audible during monitoring.

Tables 5 to **7** below contains comparisons of predicted total noise levels to baseline values for daytime, evening time and night-time and apply a significance criteria to the change. **Figure 1** presents the noise contour map for the predicted noise levels.

4.1.1.1 Daytime assessment

Table 5 below contains comparisons of predicted total noise levels to baseline values for daytime and apply a significance criteria to the change.

Table 5: Assessment of change in noise levels for daytime

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA daytime limit? (55dB L_{Aeq})	Significance level (see Table 2)
NSL1	<<32	Ground	18.8	32.0	0.0	Yes	Imperceptible
		1st	18.9	32.0	0.0	Yes	Imperceptible
NSL2	<<45	Ground	36.8	45.6	0.6	Yes	Imperceptible
		1st	36.9	45.6	0.6	Yes	Imperceptible
NSL3	<<44	Ground	31.4	44.2	0.2	Yes	Imperceptible
		1st	31.6	44.2	0.2	Yes	Imperceptible
NSL4	<45	Ground	29.2	45.1	0.1	Yes	Imperceptible
		1st	29.3	45.1	0.1	Yes	Imperceptible
NSL5	<<33	Ground	23	33.4	0.4	Yes	Imperceptible
		1st	23.1	33.4	0.4	Yes	Imperceptible
NSL6	33	Ground	20.7	33.2	0.2	Yes	Imperceptible
		1st	20.9	33.2	0.2	Yes	Imperceptible

< Plant barely audible

<< Plant not audible

As presented in **Table 5**, impacts associated with the development are considered imperceptible. Furthermore, the baseline stated at NSL1, 2, 3, 4 and 5 are overstated, as according to the noise surveys undertaken at these locations, plant from the facility was either barely audible or not audible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 0.6dBA. This change is deemed imperceptible and complies with the daytime noise limits stated in Section 2.2.

4.1.1.2 Evening time assessment

Table 6 below contains comparisons of predicted total noise levels to baseline values for evening time and apply a significance criteria to the change.

Table 6: Assessment of change in noise levels for evening time

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA evening time limit? (50dB L_{Aeq})	Significance level (see Table 2)
NSL1	<<25	Ground	18	25.8	0.8	Yes	Imperceptible
		1st	18.1	25.8	0.8	Yes	Imperceptible
NSL2	45	Ground	36.3	45.5	0.5	Yes	Imperceptible
		1st	36.4	45.5	0.5	Yes	Imperceptible
NSL3	<<40	Ground	30.9	40.5	0.5	Yes	Imperceptible
		1st	31.1	40.5	0.5	Yes	Imperceptible
NSL4	<48	Ground	28.6	48.1	0.1	Yes	Imperceptible
		1st	28.7	48.1	0.1	Yes	Imperceptible
NSL5	<<35	Ground	22.2	35.2	0.2	Yes	Imperceptible
		1st	22.3	35.2	0.2	Yes	Imperceptible
NSL6	34	Ground	20	34.2	0.2	Yes	Imperceptible
		1st	20.2	34.2	0.2	Yes	Imperceptible

< Plant barely audible

<< Plant not audible

As presented in **Table 6**, impacts associated with the development are considered imperceptible. Furthermore, the baseline stated at NSL1, 3, 4 and 5 are overstated, as according to the noise surveys undertaken at these locations, plant from the facility was either barely audible or not audible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 0.8dBA. This change is deemed imperceptible and complies with the evening time noise limits stated in Section 2.2.

4.1.1.3 Night-time assessment

Table 7 contains comparisons of predicted total noise levels to baseline values for night-time and apply a significance criteria to the change.

Table 7: Assessment of change in noise levels for night-time

Receptor	Baseline noise level (dB)	Floor	Predicted noise level (dB)	Total noise level (dB)	Change in noise level (dB)	Compliant with EPA night-time limit? (45dB L_{Aeq})	Significance level (see Table 2)
NSL1	38	Ground	14	38	0.0	Yes	Imperceptible
		1st	14.1	38	0.0	Yes	Imperceptible
NSL2	43	Ground	34.5	43.6	0.6	Yes	Imperceptible
		1st	34.6	43.6	0.6	Yes	Imperceptible
NSL3	31	Ground	29.1	33.1	2.1	Yes	Imperceptible
		1st	29.3	33.1	2.1	Yes	Imperceptible
NSL4	<34	Ground	26.2	34.8	0.8	Yes	Imperceptible
		1st	26.3	34.8	0.8	Yes	Imperceptible
NSL5	36	Ground	17.8	36.0	0.0	Yes	Imperceptible
		1st	17.8	36.0	0.0	Yes	Imperceptible
NSL6	36	Ground	16.8	36.0	0.0	Yes	Imperceptible
		1st	16.8	36.0	0.0	Yes	Imperceptible

< Plant barely audible

As presented in **Table 7**, impacts associated with the development are considered imperceptible.

The results for the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is 2.1dBA. This change is deemed imperceptible and complies with the night-time noise limits stated in Section 2.2.

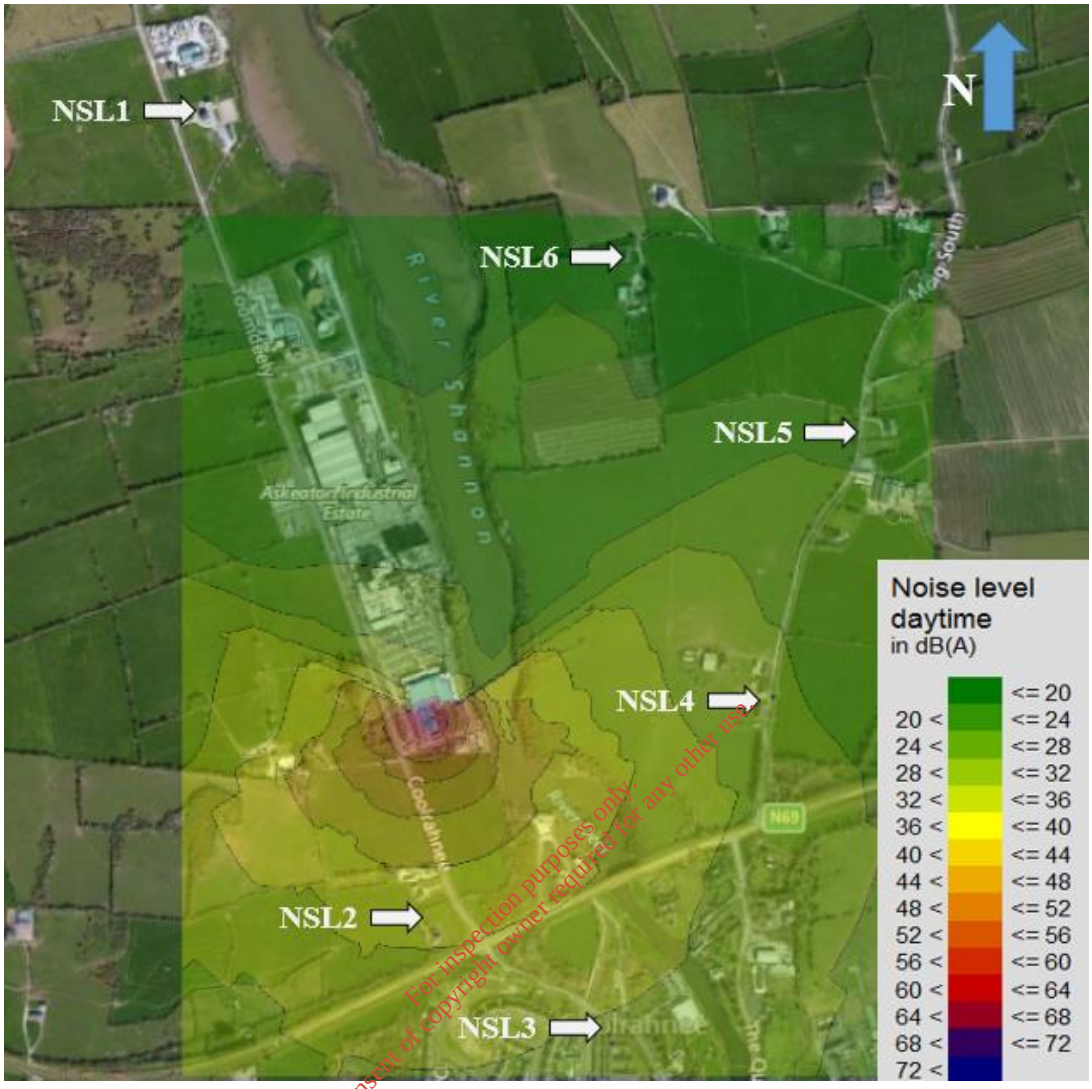

Figure 1: Operational phase noise levels at noise sensitive locations

[background mapping © Microsoft Corporation © 2017 Bing Maps] not to scale

5 Conclusions

A noise assessment was carried out to assess the potential noise impact for the extension to the existing R&D pilot plant at the Nestlé facility in Askeaton, Co Limerick.

The results of the assessment show that the maximum increase occurring at noise sensitive locations adjacent to the development is considered imperceptible and complies with the daytime, evening time and night-time noise limits stated in Section 2.2.

Furthermore, the inclusion of noise reduction measures such as ducting and internal structures, which are not included in this assessment, will reduce noise emissions further.

Ultimately, the facility will be obliged to comply with the noise limits outlined in Section 2.2 of this report as stated in IE Licence P0395-03. Noise monitoring results are reported annually via the facility's Annual Environmental Report which is submitted to the EPA.

6 References

Environmental Protection Agency (EPA) '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in relation to Scheduled Activities'* NG4

International Standards Organisation (ISO), 1996:2007: *Acoustics – Description, measurement and assessment of environmental noise - Part 1-4*. ISO, Geneva, Switzerland.

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BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise

Appendix E

Air Emissions Report 2017

E1 Air Emissions Report 2017

See overleaf for the *Determination of Air Emission to Atmosphere from the Nestle Facility, Askeaton, County Limerick* (AWN 2017)

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DETERMINATION OF AIR EMISSIONS TO ATMOSPHERE FROM THE NESTLE FACILITY, ASKEATON, COUNTY LIMERICK

Technical Report Prepared For

Nestle Askeaton
Coolrahnee
Askeaton
County Limerick

Technical Report Prepared By

Dr. Edward Porter C Chem MRSC MIAQM

Our Reference

EP/17/9407AR01

Date Of Issue

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Name	Edward Porter	Avril Challoner
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Date	09/03/2017	09/03/2017

EXECUTIVE SUMMARY

AWN Consulting Ltd were commissioned to carry out an air dispersion modelling study of emissions from the Nestle Askeaton facility in Askeaton, Co. Limerick based on the current design details. The modelling assessment will form part of the Technical Amendment application process which will be required due, in part, to the installation of one new emission points on-site (A2-8) and the decommissioning of two emission points (A2-2 and A2-5).

The air dispersion modelling compared the ambient air quality impact of the current licensed main emission points (A2-1, A2-2, A2-3, A2-4, A2-5 and A2-6) and the proposed scenario based on five emission points (A2-1, A2-3, A2-4, A2-6 and A2-8).

Air dispersion modelling was carried out using the United States Environmental Protection Agency's regulatory model AERMOD (Version 16128r). The aim of the study was to assess both the existing scenario and secondly the contribution of one new emission point and all remaining existing emission points from the facility to off-site levels of release substances and to identify the location and maximum of the worst-case ground level concentrations for each compound assessed. The dispersion model study consisted of the following components:

- Review of new and existing emission data and other relevant information needed for the modelling study;
- Summary of background for the pollutants of concern (PM_{10} / $PM_{2.5}$ levels);
- Dispersion modelling of released substances under the current and proposed emission scenarios;
- Presentation of predicted ground level concentrations of released substances;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the relevant ambient air quality limit values.

Assessment Summary

The results indicate that the ambient ground level concentrations are below the relevant air quality standards for PM_{10} / $PM_{2.5}$ for the existing scenario. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 86% of the maximum ambient 24-hour limit value at the worst-case receptor. In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 58% of the annual mean limit values at the worst-case receptor.

The results also indicate that the ambient ground level concentrations are below the relevant air quality standards for PM_{10} / $PM_{2.5}$ for the proposed scenario. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 73% of the maximum ambient 24-hour limit value at the worst-case receptor. In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 50% of the annual mean limit values at the worst-case receptor.

Comparing the results of the existing and proposed modelling scenarios shows that the impact of the proposed removal of main emission points A2-2 and A2-5 and the introduction of main emission point A2-8 is to decrease the predicted ambient air concentrations for all averaging periods and for both PM_{10} and $PM_{2.5}$. The benefit of the proposed changes to licenced emission points is to decrease ambient levels of PM_{10} by as much as 13% of the ambient limit value whilst $PM_{2.5}$ ambient levels will decrease by up 10% of the ambient limit value.

In summary, all emissions from the facility under normal operations of the facility will be in compliance with the ambient air quality standards whilst the proposed changes to the licenced emission points will further reduced environmental concentrations.

CONTENTS Page

1.0 INTRODUCTION

AWN Consulting Ltd were commissioned to carry out an air dispersion modelling study of emissions from the Nestle Askeaton facility in Askeaton, Co. Limerick based on the current and proposed design details. The modelling assessment will form part of the Technical Amendment application process which will be required due, in part, to the installation of one new emission points on-site (A2-8) and the decommissioning of two emission points (A2-2 and A2-5).

The air dispersion modelling will compare the ambient air quality impact of the current licensed main emission points (A2-1, A2-2, A2-3, A2-4, A2-5 and A-2-6) and the proposed scenario based on five emission points (A2-1, A2-3, A2-4, A-2-6 and A2-8). The current Industrial Emission Directive (IED) Licence for the facility is P0395-03.

The site, consisting of approximately 13 hectares, is located approximately 25km west of Limerick City and 1km north of Askeaton. In the immediate region of the facility, the land-use is dominated by agriculture and one-off housing as shown in Figure 1 with Askeaton village located approximately 1 km south of the facility. Several residential units are also located in the vicinity of the facility with various commercial units located within 500m of the site. The River Shannon & River Fergus SPA is also located immediately east of the facility with the Lower Shannon SAC located within 1km north of the site.

Air dispersion modelling was carried out using the United States Environmental Protection Agency's regulatory model AERMOD (Version 16128r). The aim of the study was to assess both the existing scenario and secondly the contribution of one new emission point and all remaining existing emission points from the facility to off-site levels of release substances and to identify the location and maximum of the worst-case ground level concentrations for each compound assessed. The dispersion model study consisted of the following components:

- Review of emission data and other relevant information needed for the modelling study;
- Summary of background PM_{10} / $PM_{2.5}$ levels;
- Dispersion modelling of PM_{10} / $PM_{2.5}$ under the current and proposed emission scenarios;
- Presentation of predicted ground level concentrations of released substances;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the relevant ambient air quality limit values.

Information supporting the conclusions has been detailed in the following sections. The assessment methodology and study inputs are presented in Section 2. The dispersion modelling results and assessment summaries are presented in Section 3. The model formulation is detailed in Appendix I, a review of the meteorological data used is detailed in Appendix II whilst detailed meteorological data is presented in Appendix III.

Site Location

Residential Areas

Industry / Warehousing

Commercial

Scale
1:16,000

N

Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 1
Map Of Land-Use In The Vicinity Of Nestle Askeaton, Askeaton, County Limerick

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2.0 ASSESSMENT METHODOLOGY

Emissions from the facility have been modelled using the AERMOD dispersion model (Version 16216r) which has been developed by the U.S. Environmental Protection Agency (USEPA)[1] and following guidance issued by the EPA[2]. The model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources and has replaced ISCST3[3] as the regulatory model by the USEPA for modelling emissions from industrial sources in both flat and rolling terrain[4-6]. The model has more advanced algorithms and gives better agreement with monitoring data in extensive validation studies[7-10]. An overview of the AERMOD dispersion model is outlined in Appendix I.

The air dispersion modelling input data consisted of information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and five years of appropriate hourly meteorological data. Using this input data the model predicted ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological years. The model post-processed the data to identify the location and maximum of the worst-case ground level concentration. This worst-case concentration was then added to the background concentration to give the worst-case predicted environmental concentration (PEC). The PEC was then compared with the relevant ambient air quality standard to assess the significance of the releases from the site.

Throughout this study a worst-case approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The worst-case assumptions are outlined below:

- Maximum predicted concentrations were reported in this study, even if no residential receptors were near the location of this maximum;
- Worst-case background concentrations were used to assess the baseline levels of substances released from the site;
- The effects of building downwash, due to on-site and any nearby off-site buildings, has been included in the model;
- Worst-case operations for PM_{10} / $PM_{2.5}$ emissions assumes all emission points were running continuously for a full year;
- Hours of operation were based on the highest recorded level over the last five years for each emission point. It was also assumed that all emission points overlap for a significant period each day that the emission points were in operation;
- Modelling assumed that all emission points were running at the IED emission concentration and maximum volume flow for each hour modelled.

2.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health- or environmental-based levels for which additional factors may be considered. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC (see Table 1). The ambient air quality standards applicable for PM_{10} / $PM_{2.5}$ are outlined in this Directive.

These standards have been used in the current assessment to determine the potential impact of PM_{10} / $PM_{2.5}$ emissions from the proposed facility on air quality.

Pollutant	Regulation Note 1	Limit Type	Value
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Table 1 Air Quality Standards 2011 (Based on Directive 2008/50/EC)

2.2 Background Concentrations Of Pollutants

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities[11,12]. The most recent annual report on air quality "Air Quality Monitoring Annual Report 2015"[11], details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes[11]. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, Askeaton is categorised as Zone D[11].

PM_{10}

Long-term PM_{10} monitoring was carried out at the Zone D locations of Castlebar, Claremorris, Enniscorthy and Kilkitt in 2015. The PM_{10} annual averages for these four locations in 2015 ranged from 9.2 to 18 µg/m^3[11]. The PM_{10} annual average in 2015 for the rural Zone D location of Kilkitt was 9.2 µg/m^3[11]. In addition, data from the Phoenix Park provides a good indication of urban background levels, with an annual average in 2015 of 12 µg/m^3[11]. Based on the above information, a conservative estimate of the background PM_{10} concentration for Askeaton of 10 µg/m^3 has been used. In relation to the maximum 24-hour averaging period, real monitoring data for Kilkitt for 2015 (90th%ile of 18.0 µg/m^3) was employed using the methodology outlined in Appendix E of AG4[2]. A summary of the average short-term and annual mean PM_{10} concentrations at Zone D locations is shown in Tables 2 and 3.

In relation to the annual averages, the ambient background concentration was added directly to the process concentration. However, in relation to the short-term peak concentration, concentrations due to emissions from elevated sources cannot be combined in the same way. Guidance from the UK DEFRA[13] and EPA[2] advises that for PM_{10} an estimate of the maximum combined pollutant concentration can be obtained as shown on the following page:

PM_{10} - The 90.4th%ile of total 24-hour mean PM_{10} is equal to the maximum of either A or B below:

a) 90.4th%ile of 24-hour mean background PM_{10} + annual mean process contribution PM_{10}

b) 90.4th%ile 24-hour mean process contribution PM_{10} + annual mean background PM_{10}

$PM_{2.5}$

The results of $PM_{2.5}$ monitoring at the Zone D location of Claremorris in 2015[11] indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.6. Based on this information, a conservative ratio of 0.65 was used to generate a background $PM_{2.5}$ concentration of 6.5 µg/m^3.

Year	Claremorris	Kilkitt	Shannon Town	Castlebar
2012	17.7	15.9	23.1	19.8
2013	21	18.6	-	26.9
2014	9.5	15.4	-	21.4
2015	10.2	18.0	-	22.7
Average	**14.6**	**17.0**	**23.1**	**22.7**

Table 2 90th%ile of 24-Hour PM_{10} Concentrations In Zone D Locations 2012 - 2015 (µg/m^3)

Year	Claremorris	Kilkitt	Shannon Town	Castlebar
2012	10	9	11	12
2013	13	11	-	15
2014	15.4	8.9	-	12.4
2015	16.6	9.2	-	12.9
Average	**13.8**	**9.5**	**11.0**	**13.1**

Table 3 Annual Mean PM_{10} Concentrations In Zone D Locations 2010 - 2013 (µg/m^3)

2.3 Air Dispersion Modelling Methodology

The United States Environmental Protection Agency (USEPA) approved AERMOD dispersion model has been used to predict the ground level concentrations (GLC) of compounds emitted from the principal emission sources on-site.

The modelling incorporated the following features:

- Three receptor grids were created at which concentrations would be modelled. Receptors were mapped with sufficient resolution to ensure all localised "hot-spots" were identified without adding unduly to processing time. The receptor grids were based on Cartesian grids with the site at the centre. An outer grid extended to 20,000m^2 with the site at the centre and with concentrations calculated at 500m intervals. A middle grid extended to 5,000m^2 with the site at the centre and with concentrations calculated at 100m intervals. A smaller denser grid extended to 1250m from the site with concentrations calculated at 25m intervals. Boundary receptor locations were also placed along the boundary of the site, at 20m intervals, giving a total of 14,368 calculation points for the model as shown in Figure 2 (outer, middle and boundary receptors shown for ease of viewing).

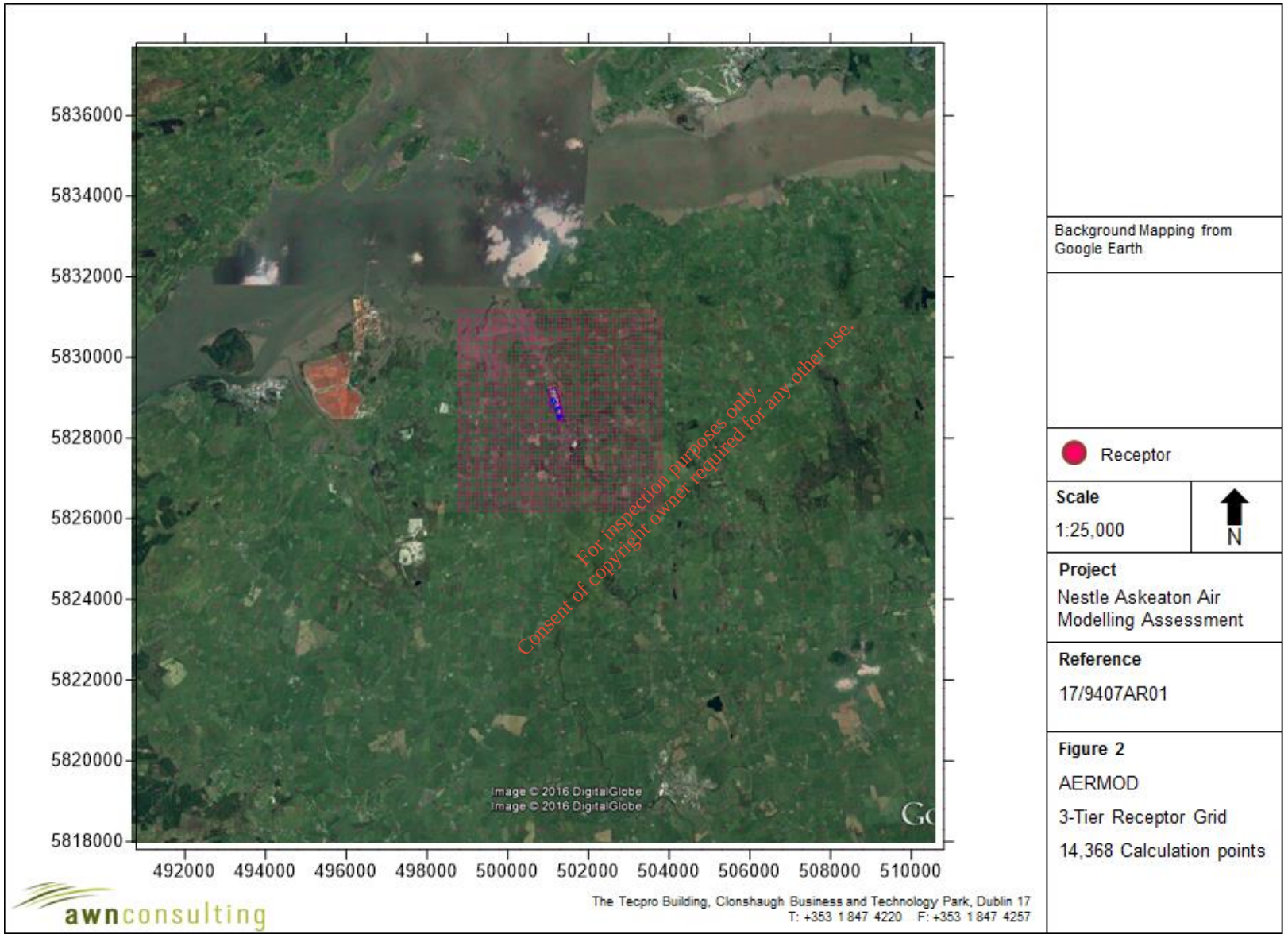
- All on-site buildings and significant process structures were mapped into the computer to create a three dimensional visualisation of the site and its emission

points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.

- Detailed terrain has been mapped into the model using SRTM data with 30m resolution. The site is located in gentle terrain. All terrain features have been mapped in detail into the model using the terrain pre-processor AERMAP[14] as shown in Figure 3.

- Hourly-sequenced meteorological information has been used in the model. Meteorological data over a five year period (Shannon Airport, 2012 – 2016) was used in the model (see Figure 4 and Appendix III).

- The source and emission data, including stack dimensions, gas volumes and emission temperatures have been incorporated into the model.



2.4 Terrain

The AERMOD air dispersion model has a terrain pre-processor AERMAP[14] which was used to map the physical environment in detail over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was obtained from SRTM. This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, H_{crit}, for each receptor. The terrain height scale is derived from the Digital Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

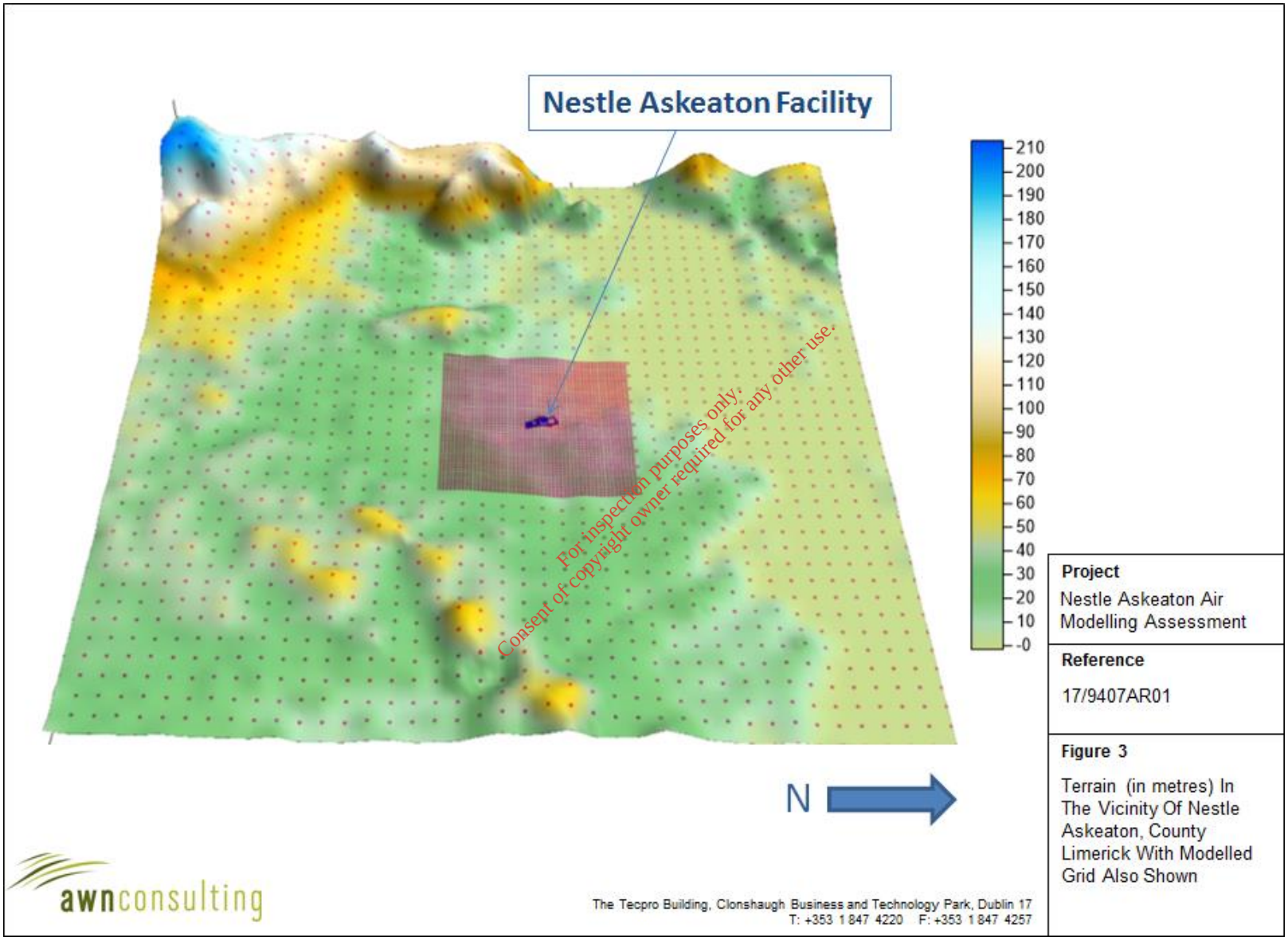
In areas of complex terrain, AERMOD models the impact of terrain using the concept of the dividing streamline (H_c). As outlined in the AERMOD model formulation[1] a plume embedded in the flow below H_c tends to remain horizontal; it might go around the hill or impact on it. A plume above H_c will ride over the hill. Associated with this is a tendency for the plume to be depressed toward the terrain surface, for the flow to speed up, and for vertical turbulent intensities to increase.

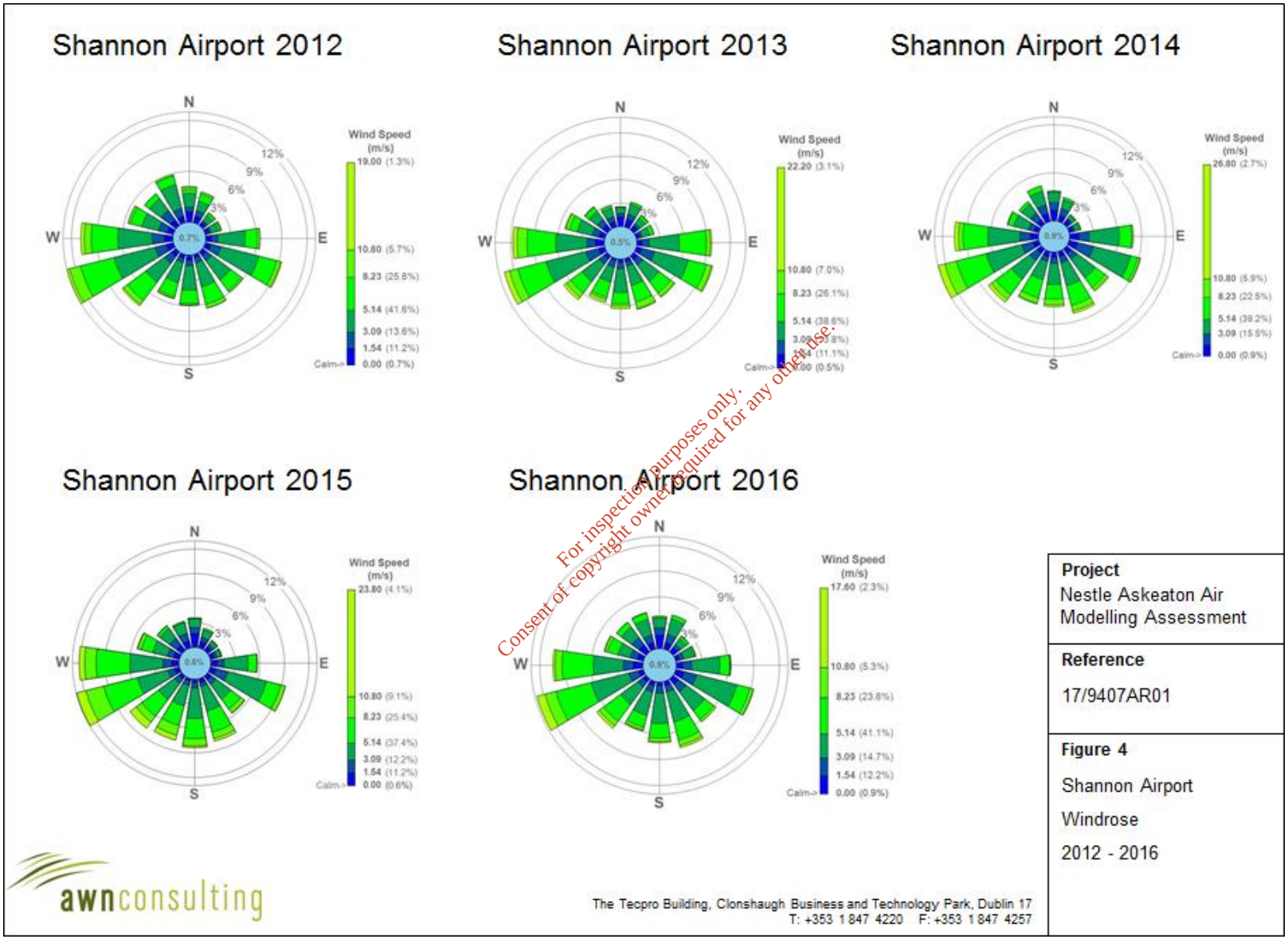
AERMOD model formulation states that the model “captures the effect of flow above and below the dividing streamline by weighting the plume concentration associated with two possible extreme states of the boundary layer (horizontal plume and terrain-following). The relative weighting of the two states depends on: 1) the degree of atmospheric stability; 2) the wind speed; and 3) the plume height relative to terrain. In stable conditions, the horizontal plume "dominates" and is given greater weight while in neutral and unstable conditions, the plume traveling over the terrain is more heavily weighted”[2].

The terrain in the region of the facility is complex in the sense that the maximum terrain in the modelling domain peaks at 230m which is above the stack top of all emission points onsite. However, in general, as shown in Figure 3, the region of the site has gently sloping terrain particularly in the immediate vicinity of the facility.

2.5 Meteorological Data

The selection of the appropriate meteorological data has followed the guidance issued by the USEPA[4]. A primary requirement is that the data used should have a data capture of greater than 90% for all parameters. Shannon Airport meteorological station, which is located approximately 11 km north-east of the site, collects data in the correct format and has a data collection of greater than 90%. Long-term hourly observations at Shannon Airport meteorological station provide an indication of the prevailing wind conditions for the region (see Figure 4 and Appendix III). Results indicate that the prevailing wind direction is from south-easterly to westerly in direction over the period 2012 - 2016. The mean wind speed is approximately 4.7 m/s over the period 1981-2010. Calm conditions account for only a small fraction of the time in any one year peaking at 80 hours in 2014 (0.9% of the time). There are also no missing hours over the period 2012 – 2016.





2.6 Geophysical Considerations

AERMOD simulates the dispersion process using planetary boundary layer (PBL) scaling theory[1]. PBL depth and the dispersion of pollutants within this layer are influenced by specific surface characteristics such as surface roughness, albedo and the availability of surface moisture. Surface roughness is a measure of the aerodynamic roughness of the surface and is related to the height of the roughness element. Albedo is a measure of the reflectivity of the surface whilst the Bowen ratio is a measure of the availability of surface moisture.

AERMOD incorporates a meteorological pre-processor AERMET[15] to enable the calculation of the appropriate parameters. The AERMET meteorological preprocessor requires the input of surface characteristics, including surface roughness (z_0), 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[15,16] as outlined in Appendix II.

In relation to AERMOD, detailed guidance for calculating the relevant surface parameters has been published[17]. The most pertinent features are:

- The surface characteristics should be those of the meteorological site (Shannon Airport) rather than the installation;
- Surface roughness should use a default 1km radius upwind of the meteorological tower and should be based on an inverse-distance weighted geometric mean. If land use varies around the site, the land use should be sub-divided by sectors with a minimum sector size of 30º;
- Bowen ratio and albedo should be based on a 10km grid. The Bowen ratio should be based on an un-weighted geometric mean. The albedo should be based on a simple un-weighted arithmetic mean.

AERMOD has an associated pre-processor, AERSURFACE[16], which has representative values for these parameters depending on land use type. The AERSURFACE pre-processor currently only accepts NLCD92 land use data which covers the USA. Thus, manual input of surface parameters is necessary when modelling in Ireland. Ordnance survey discovery maps (1:50,000) and digital maps such as those provided by the EPA, National Parks and Wildlife Service (NPWS) and Google Earth® are useful in determining the relevant land use in the region of the meteorological station. The Alaska Department of Environmental Conservation has issued a guidance note for the manual calculation of geometric mean for surface roughness and Bowen ratio for use in AERMET[17]. This approach has been applied to the current site with full details provided in Appendix II.

2.7 Building Downwash

When modelling emissions from an industrial installation, stacks which are relatively short can be subjected to additional turbulence due to the presence of nearby buildings. Buildings are considered nearby if they are within five times the lesser of the building height or maximum projected building width (but not greater than 800m).

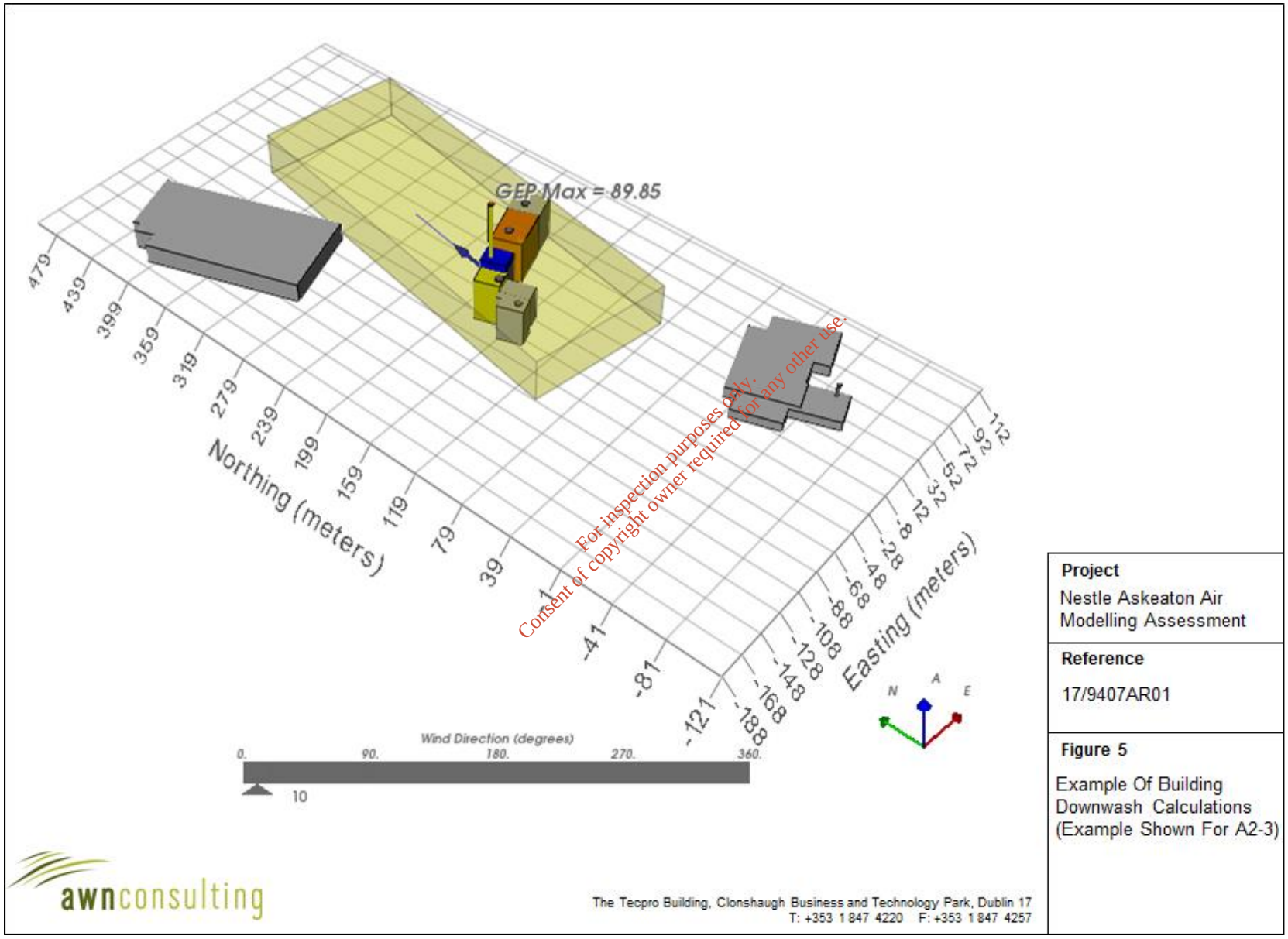
The USEPA has defined the “Good Engineering Practice” (GEP) stack height as the building height plus 1.5 times the lesser of the building height or maximum projected

building width. It is generally considered unlikely that building downwash will occur when stacks are at or greater than GEP[18].

When stacks are less than this height, building downwash will tend to occur. As the wind approaches a building it is forced upwards and around the building leading to the formation of turbulent eddies. In the lee of the building these eddies will lead to downward mixing (reduced plume centreline and reduced plume rise) and the creation of a cavity zone (near wake) where re-circulation of the air can occur. Plumes released from short stacks may be entrained in this airflow leading to higher ground level concentrations than in the absence of the building.

The Plume Rise Model Enhancements (PRIME)[8,9] plume rise and building downwash algorithms, which calculates the impact of buildings on plume rise and dispersion, have been incorporated into AERMOD. The building input processor BPIP-PRIME produces the parameters which are required in order to run PRIME. The model takes into account the position of each stack relative to each relevant building and the projected shape of each building for 36 wind directions (at 10º intervals). The model determines the change in plume centreline location with downwind distance based on the slope of the mean streamlines and coupled to a numerical plume rise model[9].

Given that most stacks onsite are less than 2.5 times the lesser of the building height or maximum projected building width, building downwash will need to be taken into account and the PRIME algorithm run prior to modelling with AERMOD. Shown in Figure 5 is an example of the dominant building (in blue) which is influencing the building downwash for stack A2-3. The dominant building may change as the wind direction changes for each of the 36 wind directions. The dominant building for each relevant stack will vary as a function of wind direction and relative building heights.



2.8 Process Emissions

Nestle Askeaton are currently licensed (IED Licence number P0395-03) to operate 11 major emission points (A1-1, A1-2, A1-3, A1-4, A2-7, A2-1, A2-2, A2-3, A2-4, A2-5 and A2-6). Of these, six emission points (A2-1, A2-2, A2-3, A2-4, A2-5 and A2-6) are licenced to emit Total Particulates.

Nestle Askeaton intend to apply for a Technical Amendment which will be required due, in part, to the installation of one new emission points on-site (A2-8) and the decommissioning of two emission points (A2-2 and A2-5). Thus, the future relevant Total Particulate emission points will be A2-1, A2-3, A2-4, A2-6 and A2-8.

The information used in the dispersion model for the existing and proposed emission points is shown in Tables 4 and 5.

Stack Reference	Irish Grid (IG) Stack Location	Height Above Ground Level (m)	Height Above Ordnance Datum (m)
A2-1	E133512, N151217	37.7	51.1
A2-2	E133518, N15196	25.5	38.8
A2-3	E133522, N151232	25.5	39.0
A2-4	E133556, N151244	37.3	50.8
A2-5	E133506, N151195	32.0	45.5
A2-6	E133588, N151255	35.8	49.3
A2-8	E133591, N150990	19.2	32.5

Table 4 Stack Release Points Used in The Air Modelling

The facility currently operates the six existing particulate emission points for differing frequencies over the course of the year. As shown in Table 6, the hours of operation for each of the six existing emission point has varied from a minimum of 677 hours per year for A2-1 in 2016 to a maximum of 5,743 hours per year for A2-4 in 2015. As shown in Table 6, conservative hours of operation have been selected for each emission point which reflects the maximum hours of operation that has been experienced over the last five years.

Stack Reference	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temperature (K)	Max Volume Flow (Nm^3/hr)	Exit Velocity (m/sec actual)	PM_{10} / $PM_{2.5}$ Concentration[Note 1] (mg/Nm^3)	PM_{10} / $PM_{2.5}$ Mass Emission[Note 1] (g/s)
A2-1	0.90	0.636	361.15	46,992	27.1	50	0.65
A2-2	1.49	1.744	364.15	38,132	8.1	50	0.53
A2-3	1.07	0.899	357.15	83,267	33.6	50	1.16
A2-4	1.43	1.606	350.15	104,084	23.1	50	1.45
A2-5	0.85	0.567	331.15	29,267	17.4	50	0.41
A2-6	1.43	1.606	350.15	104,084	23.1	50	1.44
A2-8	0.447	0.157	348.15	6,600	14.9	15	0.028

Note 1 Concentrations and mass emissions are licenced as Total Particulates. As a worst-case it is assumed that all particulate matter released from the facility is firstly less than 10 microns when comparing to the PM_{10} ambient limit values and secondly less then 2.5 microns when comparing to the $PM_{2.5}$ ambient limit value.

Table 5 Nestle Askeaton Facility, Askeaton, Co. Limerick. Stack Emission Details for PM_{10} / $PM_{2.5}$.

Stack Reference	2016 (Hours / year)	2015 (Hours / year)	2014 (Hours / year)	2013 (Hours / year)	2012 (Hours / year)	Maximum Frequency (%)	Max (Days) / Week	Modelled[Note 2]
A2-1	677	912	811	1532	2042	23%	1.63	8 hrs (5 days/week)
A2-2	3000	3000	3000	3000	3000	34%	3.00	8 hrs (7 days/week)
A2-3	3694	3373	2632	2097	2887	42%	2.95	10 hrs (7 days/week)
A2-4	5260	5743	5604	5655	5049	66%	4.59	16 hrs (7 days/week)
A2-5	3000	3000	3000	3000	3000	34%	3.00	8 hrs (7 days/week)
A2-6	4685	4043	4679	3602	4635	53%	3.74	13 hrs (7 days/week)
A2-8	n/a							Continuously

Note 1 A2-2 and A2-5 hours of operation are historical averages.

Note 2 Each emission point was modelled such that all emissions occurred as a minimum between the hours of 08:00 – 16:00 with additional hours added to the emission points which operated greater than this period.

Table 6 Nestle Askeaton Facility, Askeaton, Co. Limerick. Modelled and Actual Hours Of Operation

3.0 RESULTS & DISCUSSION

3.1 Process Contributions - Existing Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 7 – 8 for the existing scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 7 and Table 8. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 86% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 7 and Figure 6). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 58% of the annual mean limit values at the worst-case receptor (Figure 7 and Tables 7 and 8).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	28.4	37.6	50
PM_{10} / 2012	9.2	Annual mean	8.5	17.7	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	33.9	43.1	50
PM_{10} / 2013	9.2	Annual mean	8.4	17.6	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	28.5	37.7	50
PM_{10} / 2014	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	24.7	33.9	50
PM_{10} / 2014	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	26.4	35.6	50
PM_{10} / 2016	9.2	Annual mean	8.2	17.5	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance[17] based on the maximum background 24-hr mean (as a 90th%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 7 Dispersion Model Results – PM_{10} (Existing Scenario)

Pollutant / Scenario	Annual Mean Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³)[Note 1]
$PM_{2.5}$ / 2012	6.0	Annual mean	8.5	14.5	25
$PM_{2.5}$ / 2013	6.0	Annual mean	8.4	14.4	25
$PM_{2.5}$ / 2014	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2015	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2016	6.0	Annual mean	8.3	14.3	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 8 Dispersion Model Results – $PM_{2.5}$ (Existing Scenario)

3.2 Process Contributions - Proposed Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 9 – 10 for the proposed scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 9 and Table 10. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 73% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 9 and Figure 8). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 50% of the annual mean limit values at the worst-case receptor (Figure 9 and Tables 9 and 10).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	22.2	31.4	50
PM_{10} / 2012	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	27.2	36.4	50
PM_{10} / 2013	9.2	Annual mean	6.6	15.8	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	22.6	31.8	50
PM_{10} / 2014	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	19.8	29.0	50
PM_{10} / 2014	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90th%ile) Note 2	19.9	29.1	50
PM_{10} / 2016	9.2	Annual mean	6.0	15.2	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance[17] based on the maximum background 24-hr mean (as a 90th%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 9 Dispersion Model Results – PM_{10} (Proposed Scenario)

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
$PM_{2.5}$ / 2012	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2013	6.0	Annual mean	6.6	12.6	25
$PM_{2.5}$ / 2014	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2015	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2016	6.0	Annual mean	6.0	12.0	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 10 Dispersion Model Results – $PM_{2.5}$ (Proposed Scenario)

3.3 Process Contributions - Comparison Of Existing & Proposed Scenarios

Comparing the results of the existing and proposed modelling scenarios shows that the impact of the proposed removal of main emission points A2-2 and A2-5 and the introduction of main emission point A2-8 is to decrease the predicted ambient air quality for all averaging periods and for both PM_{10} and $PM_{2.5}$.

As shown in Figure 10, the benefit of the proposed changes to licenced emission points is to decrease ambient levels of PM_{10} by as mcuh as 13% of the ambient limit value whilst $PM_{2.5}$ ambient levels will decrease by up 10% of the ambient limit value.

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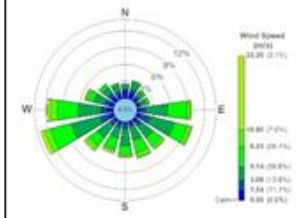

Background Mapping from Google Earth

90th%ile of 24-Hour Mean PM_{10} Concentrations (excluding background) Maximum Concentration = 33.9 µg/m³

Boundary Of Facility

Scale
1:15,000

N

Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 6
Existing 90th%ile of 24-Hour PM_{10} Concentrations (µg/m³) (Year 2013)

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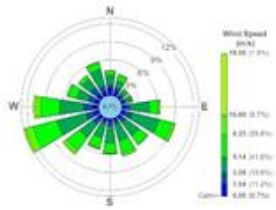


Background Mapping from Google Earth

Annual Mean PM_{10} Concentrations (excluding background)
Maximum Concentration = 8.5 µg/m³

Boundary Of Facility

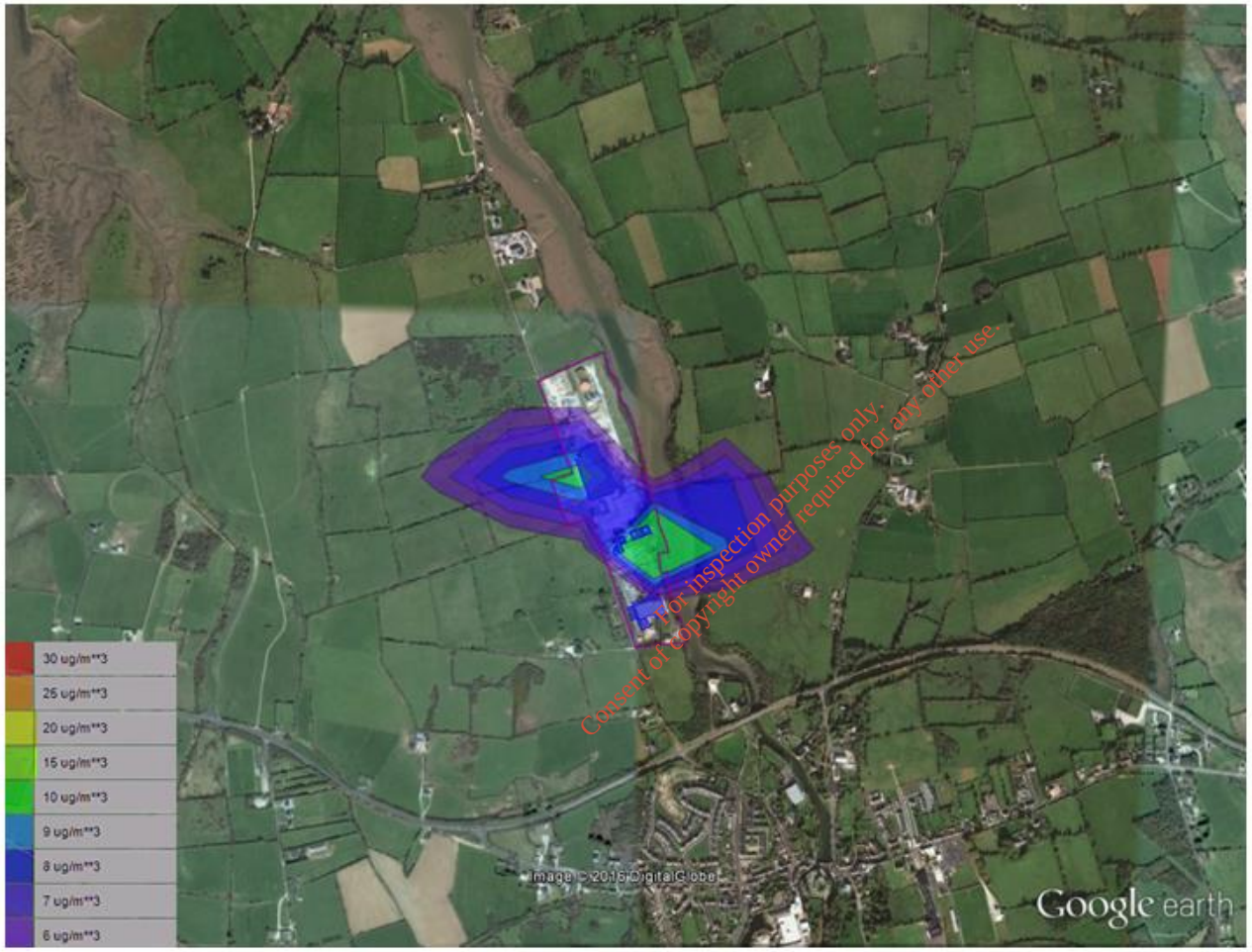
Scale
1:12,000

N

Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 7
Existing Annual Mean PM_{10} Concentrations (µg/m³) (Year 2012) (excluding background concentration).



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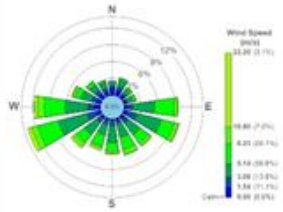


Background Mapping from Google Earth

90th%ile of 24-Hour Mean PM_{10} Concentrations (excluding background) Maximum Concentration = 27.2 µg/m³

Boundary Of Facility

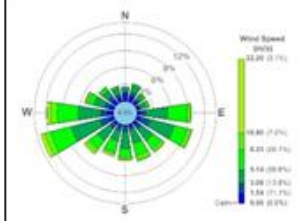
Scale
1:15,000

N

Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 8
Proposed 90th%ile of 24-Hour PM_{10} Concentrations (µg/m³) (Year 2013)



Background Mapping from Google Earth

Annual Mean PM_{10} Concentrations (excluding background)
Maximum Concentration = 6.6 µg/m³

Boundary Of Facility

Scale
1:12,000

N

Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 9
Proposed Annual Mean PM_{10} Concentrations (µg/m³) (Year 2013) (excluding background concentration).

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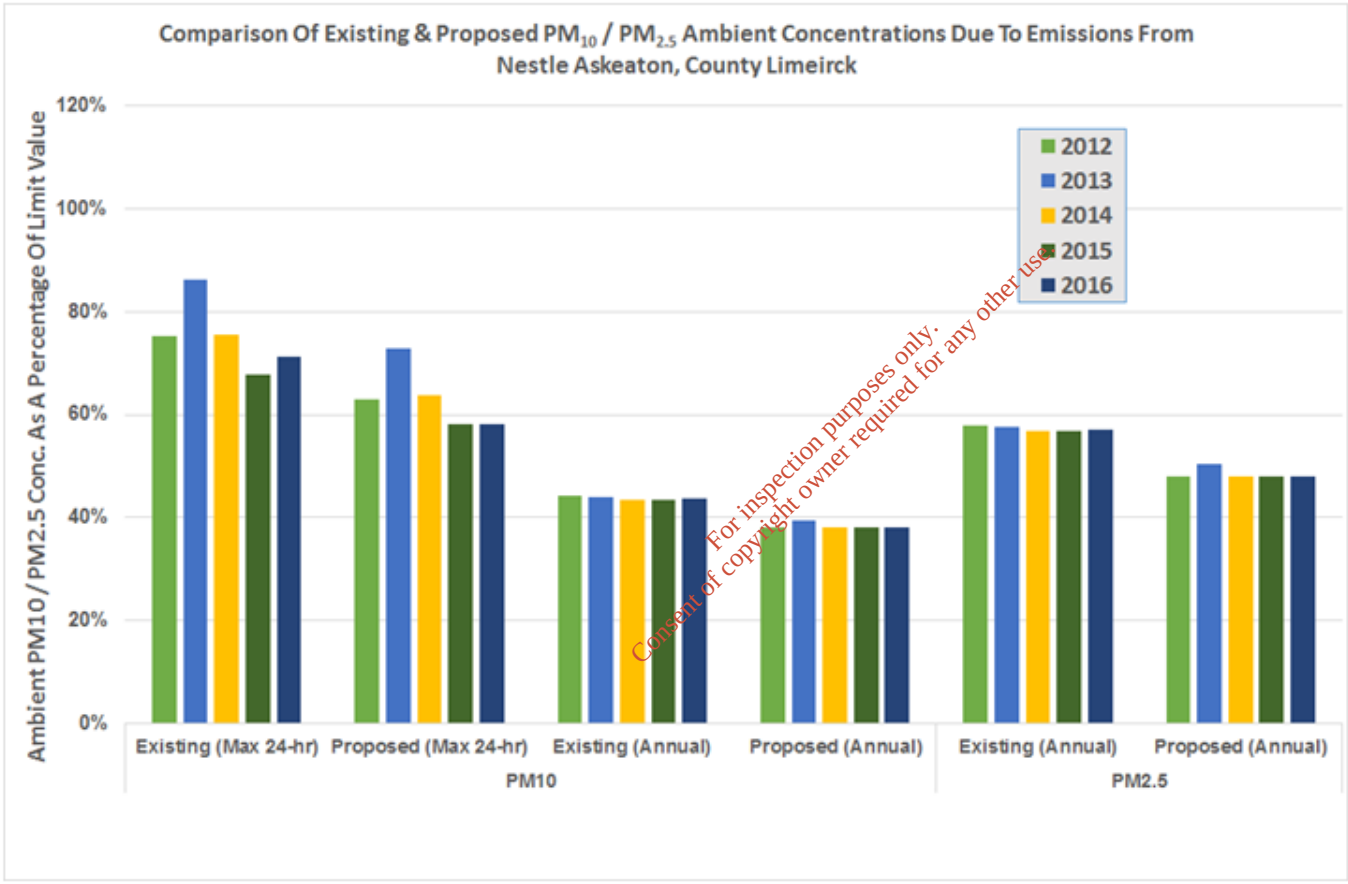

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Project
Nestle Askeaton Air Modelling Assessment

Reference
17/9407AR01

Figure 10
Comparison Of The Existing & Proposed PM_{10} / $PM_{2.5}$ Ambient Concentrations For Each Year 2012 - 2016

3.4 Assessment Summary

The results indicate that the ambient ground level concentrations are below the relevant air quality standards for PM_{10} / $PM_{2.5}$ for the existing scenario. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 86% of the maximum ambient 24-hour limit value at the worst-case receptor. In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 58% of the annual mean limit values at the worst-case receptor.

The results also indicate that the ambient ground level concentrations are below the relevant air quality standards for PM_{10} / $PM_{2.5}$ for the proposed scenario. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 73% of the maximum ambient 24-hour limit value at the worst-case receptor. In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 50% of the annual mean limit values at the worst-case receptor.

Comparing the results of the existing and proposed modelling scenarios shows that the impact of the proposed removal of main emission points A2-2 and A2-5 and the introduction of main emission point A2-8 is to decrease the predicted ambient air concentrations for all averaging periods and for both PM_{10} and $PM_{2.5}$. The benefit of the proposed changes to licenced emission points is to decrease ambient levels of PM_{10} by as much as 13% of the ambient limit value whilst $PM_{2.5}$ ambient levels will decrease by up 10% of the ambient limit value.

In summary, all emissions from the facility under normal operations of the facility will be in compliance with the ambient air quality standards whilst the proposed changes to the licenced emission points will further reduced environmental concentrations.

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(3) USEPA (1995) User's Guide for the Industrial Source Complex (ISC3) Dispersion Model Vol I & II
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(7) USEPA (1999) Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3 vs. CTDM PLUS
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(12) Environmental Protection Agency (2016) Air Quality Monitoring Report 2015 (& earlier reports)
(13) UK DEFRA (2016) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(16)
(14) USEPA (2004) AERMAP Users Guide
(15) USEPA (2004) User's Guide to the AERMOD Meteorological Preprocessor (AERMET)
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APPENDIX I

Description of the AERMOD Model

The AERMOD dispersion model has been developed in part by the U.S. Environmental Protection Agency (USEPA)[1,4]. The model is a steady-state Gaussian model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement on the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources.

Improvements over the ISCST3 model include the treatment of the vertical distribution of concentration within the plume. ISCST3 assumes a Gaussian distribution in both the horizontal and vertical direction under all weather conditions. AERMOD with PRIME, however, treats the vertical distribution as non-Gaussian under convective (unstable) conditions while maintaining a Gaussian distribution in both the horizontal and vertical direction during stable conditions. This treatment reflects the fact that the plume is skewed upwards under convective conditions due to the greater intensity of turbulence above the plume than below. The result is a more accurate portrayal of actual conditions using the AERMOD model. AERMOD also enhances the turbulence of night-time urban boundary layers thus simulating the influence of the urban heat island.

In contrast to ISCST3, AERMOD is widely applicable in all types of terrain. Differentiation of the simple versus complex terrain is unnecessary with AERMOD. In complex terrain, AERMOD employs the dividing-streamline concept in a simplified simulation of the effects of plume-terrain interactions. In the dividing-streamline concept, flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. Extensive validation studies have found that AERMOD (precursor to AERMOD with PRIME) performs better than ISCST3 for many applications and as well or better than CTDMPLUS for several complex terrain data sets[8].

Due to the proximity to surrounding buildings, the PRIME (Plume Rise Model Enhancements) building downwash algorithm has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered. The PRIME algorithm takes into account the position of the stack relative to the building in calculating building downwash. In the absence of the building, the plume from the stack will rise due to momentum and/or buoyancy forces. Wind streamlines act on the plume leads to the bending over of the plume as it disperses. However, due to the presence of the building, wind streamlines are disrupted leading to a lowering of the plume centreline.

When there are multiple buildings, the building tier leading to the largest cavity height is used to determine building downwash. The cavity height calculation is an empirical formula based on building height, the length scale (which is a factor of building height & width) and the cavity length (which is based on building width, length and height). As the direction of the wind will lead to the identification of differing dominant tiers, calculations are carried out in intervals of 10 degrees.

In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. Once the streamline encounters the zone of influence of the building, two forces act on the plume. Firstly, the disruption caused by the building leads to increased turbulence and enhances horizontal and vertical dispersion. Secondly, the streamline descends in the lee of the building due to the reduced pressure and drags the plume (or part of) nearer to the ground, leading to higher ground level concentrations. The model calculates the descent of the plume as a function of the building shape and, using a numerical plume rise model, calculates the change in the plume centreline location with distance downwind.

The immediate zone in the lee of the building is termed the cavity or near wake and is characterised by high intensity turbulence and an area of uniform low pressure. Plume mass captured by the cavity region is re-emitted to the far wake as a ground-level volume source. The volume source is located at the base of the lee wall of the building, but is only evaluated near the end of the near wake and beyond. In this region, the disruption caused by the building downwash gradually fades with distance to ambient values downwind of the building.

AERMOD has made substantial improvements in the area of plume growth rates in comparison to ISCST3[1,3]. ISCST3 approximates turbulence using six Pasquill-Gifford-Turner Stability Classes and bases the resulting dispersion curves upon surface release experiments. This treatment, however, cannot explicitly account for turbulence in the formulation. AERMOD is based on the more realistic modern planetary boundary layer (PBL) theory which allows turbulence to vary with height. This use of turbulence-based plume growth with height leads to a substantial advancement over the ISCST3 treatment.

Improvements have also been made in relation to mixing height[1,3]. The treatment of mixing height by ISCST3 is based on a single morning upper air sounding each day. AERMOD, however, calculates mixing height on an hourly basis based on the morning upper air sounding and the surface energy balance, accounting for the solar radiation, cloud cover, reflectivity of the ground and the latent heat due to evaporation from the ground cover. This more advanced formulation provides a more realistic sequence of the diurnal mixing height changes.

AERMOD also has the capability of modelling both unstable (convective) conditions and stable (inversion) conditions. The stability of the atmosphere is defined by the sign of the sensible heat flux. Where the sensible heat flux is positive, the atmosphere is unstable whereas when the sensible heat flux is negative the atmosphere is defined as stable. The sensible heat flux is dependent on the net radiation and the available surface moisture (Bowen Ratio). Under stable (inversion) conditions, AERMOD has specific algorithms to account for plume rise under stable conditions, mechanical mixing heights under stable conditions and vertical and lateral dispersion in the stable boundary layer.

AERMOD also contains improved algorithms for dealing with low wind speed (near calm) conditions. As a result, AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s, but still greater than the instrument threshold.

APPENDIX II

Meteorological Data - AERMET

AERMOD incorporates a meteorological pre-processor AERMET (version 16216)[15]. AERMET allows AERMOD to account for changes in the plume behaviour with height. AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, convective (CBL) and stable boundary layer (SBL) height and surface heat flux. AERMOD uses this information to calculate concentrations in a manner that accounts for changes in dispersion rate with height, allows for a non-Gaussian plume in convective conditions, and accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET meteorological preprocessor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. A morning sounding from a representative upper air station, latitude, longitude, time zone, and wind speed threshold are also required.

Two files are produced by AERMET for input to the AERMOD dispersion model. The surface file contains observed and calculated surface variables, one record per hour. The profile file contains the observations made at each level of a meteorological tower, if available, or the one-level observations taken from other representative data, one record level per hour.

From the surface characteristics (i.e. surface roughness, albedo and amount of moisture available (Bowen Ratio)) AERMET calculates several boundary layer parameters that are important in the evolution of the boundary layer, which, in turn, influences the dispersion of pollutants. These parameters include the surface friction velocity, which is a measure of the vertical transport of horizontal momentum; the sensible heat flux, which is the vertical transport of heat to/from the surface; the Monin-Obukhov length which is a stability parameter relating the surface friction velocity to the sensible heat flux; the daytime mixed layer height; the nocturnal surface layer height and the convective velocity scale which combines the daytime mixed layer height and the sensible heat flux. These parameters all depend on the underlying surface.

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 types was carried out in line with USEPA recommendations[4] and using the detailed methodology outlined by the Alaska Department of Environmental Conservation[17]. AERMET has also been updated to allow for an adjustment of the surface friction velocity (u*) for low wind speed stable conditions based on the work of Qian and Venkatram (BLM, 2011). Previously, the model had a tendency to over-predict concentrations produced by near-ground sources in stable conditions.

Surface roughness

Surface roughness length is the height above the ground at which the wind speed goes to zero. Surface roughness length is defined by the individual elements on the landscape such as trees and buildings. In order to determine surface roughness length, the USEPA recommends that a representative length be defined for each sector, based on an upwind area-weighted average of the land use within the sector, by using the eight land use categories outlined by the USEPA. The inverse-distance weighted surface roughness length derived from the land use classification within a radius of 1km from Shannon Airport Meteorological Station is shown in Table A1.

Sector	Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter[Note 1]
270-180	100% Grassland	0.05	0.10	0.01	0.01
180-270	100% Urban	1	1	1	1

(1) Winter defined as periods when surfaces covered permanently by snow whereas autumn is defined as periods when freezing conditions are common, deciduous trees are leafless and no snow is present (Iqbal (1983))[19]. Thus for the current location autumn more accurately defines "winter" conditions in Ireland.

Table A1 Surface Roughness based on an inverse distance weighted average of the land use within a 1km radius of Shannon Airport Meteorological Station.

Albedo

Noon-time albedo is the fraction of the incoming solar radiation that is reflected from the ground when the sun is directly overhead. Albedo is used in calculating the hourly net heat balance at the surface for calculating hourly values of Monin-Obuklov length. A 10km x 10km square area is drawn around the meteorological station to determine the albedo based on a simple average for the land use types within the area independent of both distance from the station and the near-field sector. The classification within 10km from Shannon Airport Meteorological Station is shown in Table A2.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter[Note 1]
6% Urban, 49% Grassland, 45% Water	0.151	0.143	0.172	0.172

(1) For the current location autumn more accurately defines "winter" conditions in Ireland.

Table A2 Albedo based on a simple average of the land use within a 10km × 10km grid centred on Shannon Airport Meteorological Station.

Bowen Ratio

The Bowen ratio is a measure of the amount of moisture at the surface of the earth. The presence of moisture affects the heat balance resulting from evaporative cooling which, in turn, affects the Monin-Obukhov length which is used in the formulation of the boundary layer. A 10km x 10km square area is drawn around the meteorological station to determine the Bowen Ratio based on geometric mean of the land use types within the area independent of both distance from the station and the near-field sector. The classification within 10km from Shannon Airport Meteorological Station is shown in Table A3.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter[Note 1]
19% Urban, 81% Grassland	0.301	0.557	0.655	0.655

(1) For the current location autumn more accurately defines "winter" conditions in Ireland.

Table A3 Bowen Ratio based on a geometric mean of the land use within a 10km × 10km grid centred on Shannon Airport Meteorological Station.

APPENDIX III

Detailed Meteorological Data – Shannon Airport 2012 - 2016

Shannon Airport 2012

Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	106	51	141	40	27	4	369
22.5	70	59	100	76	21	2	328
45.0	42	22	65	29	9	0	167
67.5	40	24	79	23	8	0	174
90.0	57	68	284	130	25	2	566
112.5	60	110	404	194	40	12	820
135.0	47	71	244	141	19	1	523
157.5	34	57	253	188	39	3	574
180.0	54	58	251	138	16	5	522
202.5	38	47	214	148	20	6	473
225.0	62	89	241	237	52	17	698
247.5	79	117	440	360	118	27	1,141
270.0	86	130	357	277	72	36	958
292.5	68	91	178	126	23	1	487
315.0	76	119	150	63	1	0	409
337.5	66	85	256	92	15	0	514
Total	985	1,198	3,657	2,262	505	116	8,723
Calms							61
Missing							0
Total							8,784

Shannon Airport 2013

Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	106	42	65	9	0	0	222
22.5	91	57	111	27	2	0	288
45.0	57	33	74	33	9	1	207
67.5	38	30	88	48	2	0	206
90.0	56	83	339	305	42	18	843
112.5	64	148	390	209	61	14	886
135.0	58	74	223	164	50	10	579
157.5	36	52	221	193	75	12	589
180.0	32	77	265	128	27	28	557
202.5	23	77	170	179	26	32	507
225.0	42	77	237	161	60	36	613
247.5	72	146	461	330	96	59	1,164
270.0	97	99	349	324	112	47	1,028
292.5	68	79	173	91	41	10	462
315.0	69	77	112	58	5	1	322
337.5	61	58	99	27	2	0	247
Total	970	1,209	3,377	2,286	610	268	8,720
Calms							40
Missing							0
Total							8,760

Shannon Airport 2014

Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	118	84	112	12	2	0	328
22.5	66	80	98	25	0	0	269
45.0	56	21	44	9	0	0	130
67.5	44	23	53	14	0	1	135
90.0	102	111	332	132	18	2	697
112.5	96	181	418	81	26	5	807
135.0	65	77	250	135	34	15	576
157.5	56	71	257	222	64	27	697
180.0	58	68	229	159	62	22	598
202.5	60	52	203	207	61	10	593
225.0	62	100	250	211	64	39	726
247.5	68	126	402	335	133	74	1,138
270.0	91	113	352	271	49	45	921
292.5	58	61	166	67	6	0	358
315.0	61	92	118	35	1	0	307
337.5	87	100	153	60	0	0	400
Total	1,148	1,360	3,437	1,975	520	240	8,680
Calms							80
Missing							0
Total							8,760

Shannon Airport 2015

Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	146	66	93	10	0	0	315
22.5	68	49	79	19	0	0	215
45.0	52	33	45	5	0	0	135
67.5	48	29	43	8	0	0	128
90.0	70	73	256	96	4	0	499
112.5	64	130	426	159	49	2	830
135.0	48	64	198	130	49	9	498
157.5	47	40	268	233	72	29	689
180.0	36	58	327	216	79	18	734
202.5	25	51	223	216	107	55	677
225.0	39	61	212	224	77	81	694
247.5	50	77	337	372	195	102	1,133
270.0	76	94	355	361	123	59	1,068
292.5	66	67	162	127	38	6	466
315.0	71	94	129	34	4	0	332
337.5	74	85	120	13	0	0	292
Total	980	1,071	3,273	2,223	797	361	8,705
Calms							55
Missing							0
Total							8,760

Shannon Airport 2016

Dir \ Spd	<= 1.54	<= 3.09	<= 5.14	<= 8.23	<= 10.80	> 10.80	Total
0.0	137	75	100	18	0	0	330
22.5	68	86	162	42	0	0	358
45.0	57	38	76	27	4	1	203
67.5	40	43	106	17	5	1	212
90.0	65	93	288	102	6	4	558
112.5	89	131	423	138	35	5	821
135.0	70	97	236	115	27	1	546
157.5	47	64	313	191	57	23	695
180.0	38	76	308	150	35	13	620
202.5	43	68	245	126	27	11	520
225.0	43	65	219	213	57	31	628
247.5	50	104	397	371	113	87	1,122
270.0	97	102	309	319	70	22	919
292.5	64	75	128	113	27	7	414
315.0	90	93	132	61	2	0	378
337.5	70	79	164	67	4	0	384
Total	1,068	1,289	3,606	2,070	469	206	8,708
Calms							76
Missing							0
Total							8,784

Appendix F

Air Emissions Report - Technical Note

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TECHNICAL NOTE

Project **Nestle Askeaton**

Subject **Response To RFI**

Author **Dr. Edward Porter**

Date **11/01/18**

Ref. **17_9407AT02a**

Attached is a response to the Request For Additional Information from the EPA dated 07 December 2017 in relation to Information Request 1 (Air Dispersion Modelling).

AWN Consulting were responsible for carrying out the air modelling assessment that was submitted as part of the Technical Amendment Request.

Kind regards

Dr. Edward Porter C CHEM MRSC MIAQM

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Associate Director: D Kelly

EPA Request For Additional Information Letter Dated 07/12/17

1. In relation to the Air Dispersion Modelling report dated 09 March 2017:

a. Provide further information by way of historical data to confirm the current emission details having reference to the emission rates referred to in the report (i.e. 20 kg/hr and 17.02 kg/hr).

Response:

The results of emission monitoring of stacks A2-1, A2-3, A2-4 and A2-6 are shown in Table 1 covering each quarter from 2012 – 2017.

The average total emission rate for these four emission points over the period is 7.75 kg/hr. The licence emission rate, based on maximum emission concentrations and maximum volume flows, sums to 16.92 kg/hr and thus these four emission points are typically operating at less than 50% of the licence limits. The licensed emission rate of 17.02 kg/hr referred to above includes A2-1, A2-3, A2-4, A2-6 and additionally A2-8 which has a mass emission of 0.1 kg/hr.

Drier 1b, A2-1				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	32.9	46.59	Not OP.	Not OP.
2013	Not OP.	27.63	34.11	11.53
2014	34.26	26.65	Not OP.	Not OP.
2015	16.02	24.19	Not OP.	Not OP.
2016	33.9	Not OP.	26.19	Not Op.
2017	20.1	1.5	29.61	

Drier 1b, A2-1				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	34693	29983	Not OP.	Not OP.
2013	Not OP.	35365	36494	32756
2014	33812	37205	Not OP.	Not OP.
2015	34824	30783	Not OP.	Not OP.
2016	36193	Not Op.	39637	Not Op.
2017	30810	28155	33362	

Drier 1b, A2-1						
	Flow Rate kg/hr					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.14	1.40				
2013		0.98	1.24	0.38		
2014	1.16	0.99				
2015	0.56	0.74				
2016	1.23		1.04			
2017	0.62	0.04	0.99		0.89	kg/hr

Drier 3, A2-3				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	40.9	23.13	25.62	37.33
2013	Not OP.	26.33	28.34	13.05
2014	26.04	40.5	39.02	36.9
2015	3.86	27.87	27.59	38.59
2016	46.46	29.44	Not Op.	10.86
2017	26	39.4	45.08	

Drier 3, A2-3				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	84031	77607	74765	77802
2013	Not OP.	76569	79174	73731
2014	80656	48657	44314	72085
2015	66163	78748	70822	71869
2016	59622	73649	Not Op.	77686
2017	75007	76899	81742	

Drier 3, A2-3						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	3.44	1.80	1.92	2.90		
2013		2.02	2.24	0.96		
2014	2.10	1.97	1.73	2.66		
2015	0.26	2.19	1.95	2.77		
2016	2.77	2.17		0.84		
2017	1.95	3.03	3.68	0.00	2.06	kg/hr

Drier 4, A2-4				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	13.63	27.14	20.03	22.19
2013	9.66	12.03	41.13	11.59
2014	16.68	15.74	26.93	24.23
2015	16.96	33.24	14.63	25.72
2016	25.37	47.6	16.39	29.81
2017	26.52	29.08	Not Op.	

Drier 4, A2-4				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	114573	105319	99851	95320
2013	92329	93609	99293	88814
2014	98923	98395	95852	93135
2015	88193	91530	99609	96192
2016	73399	94761	78380	101548
2017	106173	101632	Not Op.	

Drier 4, A2-4						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.56	2.86	2.00	2.12		
2013	0.89	1.13	4.08	1.03		
2014	1.65	1.55	2.58	2.26		
2015	1.50	3.04	1.46	2.47		
2016	1.86	4.51	1.28	3.03		
2017	2.82	2.96			2.21	kg/hr

Drier 5, A2-6				
	Dust mg/Nm³			
Year	Q1	Q2	Q3	Q4
2012	16.78	29.59	14.73	26.9
2013	22.83	24.84	23.57	12.8
2014	10.74	22.76	21.3	42.86
2015	19.8	30.89	23.02	20.39
2016	33.11	41.84	27.17	52.23
2017	34.26	49.94	32.21	

Drier 5, A2-6				
	Flow Rate Nm³/h			
Year	Q1	Q2	Q3	Q4
2012	95444	102758	97251	98182
2013	104003	97200	101693	93009
2014	89393	92760	100220	90629
2015	88317	88056	91302	92053
2016	94796	98953	96188	103299
2017	98845	106793	103552	

Drier 5, A2-6						
	Flow Rate Nm³/h					
Year	Q1	Q2	Q3	Q4	Average	
2012	1.60	3.04	1.43	2.64		
2013	2.37	2.41	2.40	1.19		
2014	0.96	2.11	2.13	3.88		
2015	1.75	2.72	2.10	1.88		
2016	3.14	4.14	2.61	5.40		
2017	3.39	5.33	3.34	0.00	2.58	kg/hr
					Sum	
					7.75	kg/hr

Table 1 Dust emission monitoring concentrations and volume flows – 2012 – 2017.

b. In Section 2.0 it is stated that worst-case operations for PM_{10}/$PM_{2.5}$ emissions assume all emission points to be running continuously for a full year, while Table 5 refers to the hours and days/week actually modelled. Please clarify which is correct.

Response:

The model was run based on the operational scenario outlined in Table 5 of the Air Dispersion Modelling Report. The comment that emissions were running continuously is incorrect.

c. Clarify the source of the volumetric flows set out in Table 5 and confirm that these are maximum values.

Response:

The model was based on the volume flows outlined in Table 5 of the Air Dispersion Modelling Report. The volume flows were based on the maximum volume flows reported by Nestle Askeaton and are outlined in Table 2 below.

As shown in Table 1 and 2, average volume flows over the period 2012 – 2017 are between 72% and 93% of the maximum volume flows. Thus, the volume flows used in the air dispersion modelling report were conservative and thus will also over-estimate the mass emission of dust from the facility.

Emission Point	Maximum Volume Flow (Nm^3/hr)	Average Volume Flow (Nm^3/hr)	Average Flow As % Of Maximum Flow
A2-1	46992	33862	72%
A2-3	83267	72457	87%
A2-4	104084	95765	92%
A2-6	104084	96726	93%
A2-8	6600	Not Applicable	Not Applicable

Table 2 Comparison of Actual And Maximum Volume Flows (Nm^3/hr) For A2-1, A2-3, A2-4 and A2-6

d. Provide predicted environmental concentrations for (i) beyond the installation boundary and (ii) at the nearest sensitive receptors. Also, identify the locations of these receptors.

Response:

The model was run based on a three-tiered grid and including boundary receptors (amounting to 14,368 receptors) with the worst-case result at any location reported in Tables 7 - 10 of the air dispersion modelling report. These have been reproduced below with the location of the maximum sensitive receptor for each scenario outlined in Tables 7 – 10 of this note and shown in Figure 1.

(i) Worst-Case Beyond Installation Boundary - Existing Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 3 – 4 for the existing scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 3 and Table 4. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 86% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 3). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 58% of the annual mean limit values at the worst-case receptor (Tables 3 and 4).

Pollutant / Scenario / Maximum Receptor	Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	19.4	37.6	50
PM_{10} / 2012	9.2	Annual mean	8.5	17.7	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	33.9	43.1	50
PM_{10} / 2013	9.2	Annual mean	8.4	17.6	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	28.5	37.7	50
PM_{10} / 2014	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	24.7	33.9	50
PM_{10} / 2015	9.2	Annual mean	8.2	17.4	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90thO%ile) Note 2	26.4	35.6	50
PM_{10} / 2016	9.2	Annual mean	8.2	17.5	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 µg/m³ (based on Kilkitt)

Table 3 Dispersion Model Results – PM_{10} (Existing Scenario)

[1] EPA (2010) Air Dispersion Modelling From Industrial Installations Guidance Note

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$)[Note 1]
$PM_{2.5}$ / 2012	6.0	Annual mean	8.5	14.5	25
$PM_{2.5}$ / 2013	6.0	Annual mean	8.4	14.4	25
$PM_{2.5}$ / 2014	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2015	6.0	Annual mean	8.2	14.2	25
$PM_{2.5}$ / 2016	6.0	Annual mean	8.3	14.3	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 4 Dispersion Model Results – $PM_{2.5}$ (Existing Scenario)

Worst-Case Beyond Installation Boundary - Proposed Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 5 – 6 for the proposed scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 5 and Table 6. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 73% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 3). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 50% of the annual mean limit values at the worst-case receptor (Tables 5 and 6).

Pollutant / Scenario	Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³) Note 1
PM_{10} / 2012	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	22.2	31.4	50
PM_{10} / 2012	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2013	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	27.2	36.4	50
PM_{10} / 2013	9.2	Annual mean	6.6	15.8	40
PM_{10} / 2014	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	22.6	31.8	50
PM_{10} / 2014	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2015	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	19.8	29.0	50
PM_{10} / 2015	9.2	Annual mean	6.0	15.2	40
PM_{10} / 2016	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	19.9	29.1	50
PM_{10} / 2016	9.2	Annual mean	6.0	15.2	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 µg/m³ (based on Kilkitt)

Table 5 Dispersion Model Results – PM_{10} (Proposed Scenario)

Pollutant / Scenario	Annual Mean Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³)Note 1
$PM_{2.5}$ / 2012	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2013	6.0	Annual mean	6.6	12.6	25
$PM_{2.5}$ / 2014	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2015	6.0	Annual mean	6.0	12.0	25
$PM_{2.5}$ / 2016	6.0	Annual mean	6.0	12.0	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 6 Dispersion Model Results – $PM_{2.5}$ (Proposed Scenario)

(ii) Worst-Case Sensitive Receptor - Existing Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 7 – 8 for the existing scenario. These have been reproduced below with the location of the maximum sensitive receptor (R) for each scenario outlined in each Table and shown in Figure 1.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 7 and Table 8. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 39% of the maximum ambient 24-hour limit value at the worst-case sensitive receptor (see Table 7). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 30% of the annual mean limit values at the worst-case sensitive receptor (Tables 7 and 8).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	5.6	19.5	50
PM_{10} / 2012 / R10	9.2	Annual mean	1.5	10.7	40
PM_{10} / 2013 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	5.3	19.5	50
PM_{10} / 2013 / R10	9.2	Annual mean	1.5	10.7	40
PM_{10} / 2014 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	5.4	19.4	50
PM_{10} / 2014 / R6	9.2	Annual mean	1.4	10.6	40
PM_{10} / 2015 / R10	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	5.1	19.4	50
PM_{10} / 2015 / R10	9.2	Annual mean	1.4	10.6	40
PM_{10} / 2016 / R6	18.0	Maximum 24-hr mean (as a 90thO%ile)Note 2	4.7	19.4	50
PM_{10} / 2016 / R6	9.2	Annual mean	1.4	10.6	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90thO%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 7 Dispersion Model Results – PM_{10} (Existing Scenario)

Pollutant / Scenario	Annual Mean Background (µg/m³)	Averaging Period	Process Contribution (µg/m³)	Predicted Environmental Concentration (µg/Nm³)	Standard (µg/Nm³)[Note 1]
$PM_{2.5}$ / 2012 / R10	6.0	Annual mean	1.5	7.5	25
$PM_{2.5}$ / 2013 / R10	6.0	Annual mean	1.5	7.5	25
$PM_{2.5}$ / 2014 / R16	6.0	Annual mean	1.4	7.4	25
$PM_{2.5}$ / 2015 / R10	6.0	Annual mean	1.4	7.4	25
$PM_{2.5}$ / 2016 / R6	6.0	Annual mean	1.4	7.4	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 8 Dispersion Model Results – $PM_{2.5}$ (Existing Scenario)

Worst-Case Sensitive Receptor - Proposed Scenario

Ambient Ground Level Concentrations (GLCs) of PM_{10} / $PM_{2.5}$ have been predicted below in Tables 9 – 10 for the proposed scenario.

PM_{10} / $PM_{2.5}$ Emissions

The PM_{10} / $PM_{2.5}$ modelling results are detailed in Table 9 and Table 10. The results indicate that the ambient ground level concentration is below the relevant air quality standard for PM_{10} / $PM_{2.5}$. Emissions from the facility lead to an ambient PM_{10} concentration (including background) which is 39% of the maximum ambient 24-hour limit value at the worst-case receptor (see Table 9). In relation to the annual mean concentration, ambient PM_{10} / $PM_{2.5}$ concentration (including background) are at most 29% of the annual mean limit values at the worst-case receptor (Tables 9 and 10).

Pollutant / Scenario	Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
PM_{10} / 2012 / R10	18.0	Maximum 24-hr mean (as a 90^{th}%ile) Note 2	4.7	19.3	50
PM_{10} / 2012 / R10	9.2	Annual mean	1.3	10.5	40
PM_{10} / 2013 / R10	18.0	Maximum 24-hr mean (as a 90^{th}%ile) Note 2	4.6	19.3	50
PM_{10} / 2013 / R10	9.2	Annual mean	1.3	10.5	40
PM_{10} / 2014 / R10	18.0	Maximum 24-hr mean (as a 90^{th}%ile) Note 2	4.4	19.2	50
PM_{10} / 2014 / R16	9.2	Annual mean	1.2	10.4	40
PM_{10} / 2015 / R10	18.0	Maximum 24-hr mean (as a 90^{th}%ile) Note 2	4.4	19.2	50
PM_{10} / 2015 / R10	9.2	Annual mean	1.2	10.4	40
PM_{10} / 2016 / R1	18.0	Maximum 24-hr mean (as a 90^{th}%ile) Note 2	4.1	19.2	50
PM_{10} / 2016 / R16	9.2	Annual mean	1.2	10.4	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

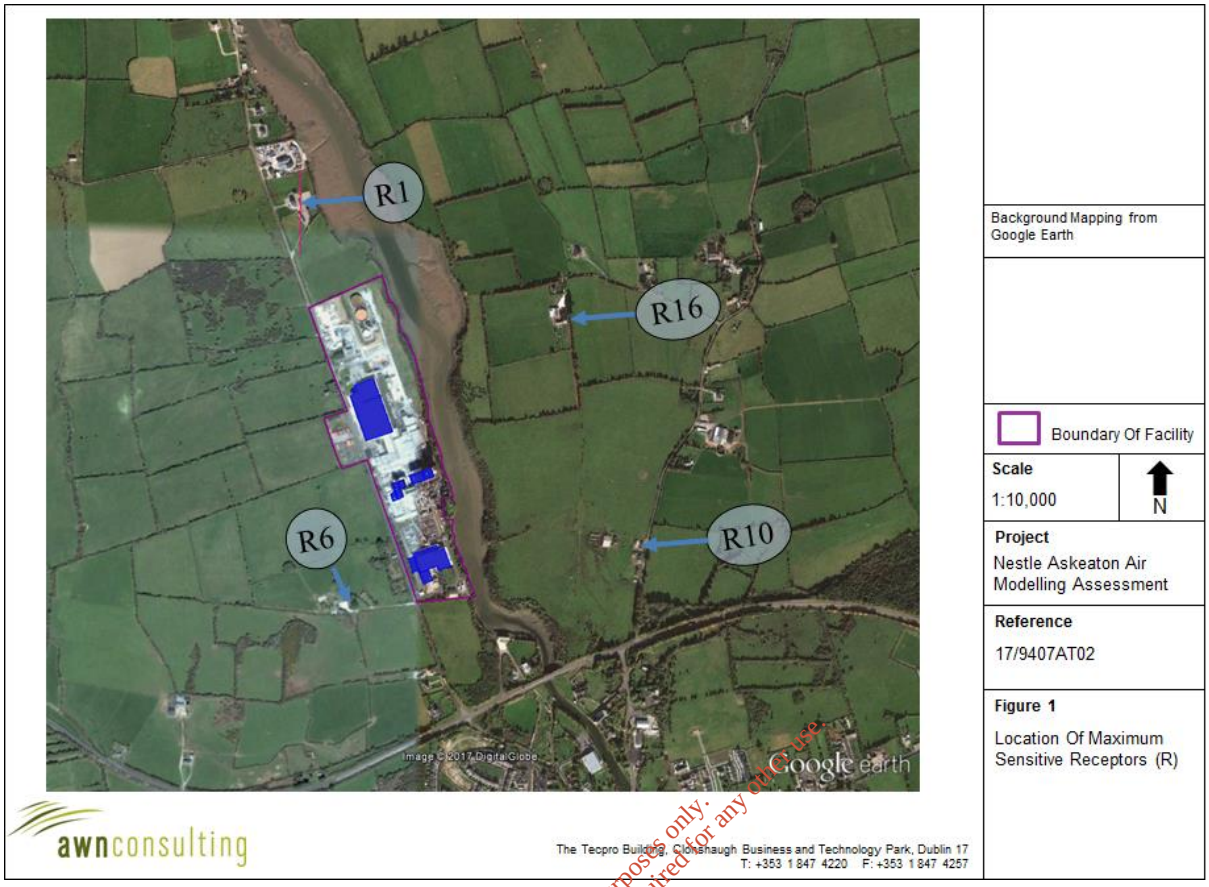
Note 2 Short-term Environmental Concentrations calculated according to UK DEFRA guidance(1) based on the maximum background 24-hr mean (as a 90^{th}%ile) of 18.0 $\mu g/m^3$ (based on Kilkitt)

Table 9 Dispersion Model Results – PM_{10} (Proposed Scenario)

Pollutant / Scenario	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution ($\mu g/m^3$)	Predicted Environmental Concentration ($\mu g/Nm^3$)	Standard ($\mu g/Nm^3$) Note 1
$PM_{2.5}$ / 2012 / R10	6.0	Annual mean	1.3	7.3	25
$PM_{2.5}$ / 2013 / R10	6.0	Annual mean	1.3	7.3	25
$PM_{2.5}$ / 2014 / R16	6.0	Annual mean	1.2	7.2	25
$PM_{2.5}$ / 2015 / R10	6.0	Annual mean	1.2	7.2	25
$PM_{2.5}$ / 2016 / R16	6.0	Annual mean	1.2	7.2	25

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC)

Table 10 Dispersion Model Results – $PM_{2.5}$ (Proposed Scenario)



e. The contour plots are unclear and the legend appears to be incorrect for some of the figures (e.g. Figure 6), please review and resubmit these plots accordingly.

Response:

The figures are based on the process contribution from the facility only (i.e. the contour plots do not show the existing background concentration). The colour-coded legend varies from purple / blue through shades of green to yellow and finally orange and red. The purple / blue represents lower concentrations whilst the red / orange are the "hot-spots" i.e. the absolute maximum concentration at the site boundary and beyond. In each case, the maximum location is at the boundary of the site with a sharp fall-off in concentration away from this point. As the gradient is very steep at this point, the area covered by red and orange is too confined to show up on the contour plot but will be a sub-section of the yellow / green contour plot in each case.