ENVIRONMENTAL IMPACT ASSESSMENT REPORT

'BALLYFASKIN PIG FARM'

BALLYFAUSKEEN, BALLYLANDERS, CO LIMERICK



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In relation to the application for; "increased capacity of the piggery from 600 sows to 1000 sows and their progeny in addition to new electrical substation will be constructed. The development requires EPA Industrial Emissions License (formerly Integrated Pollution Prevention and Control License)".

Prepared by

Curtin Agricultural Consultants Ltd, 12 The Paddocks, Kells Road, Kilkenny

October 2020

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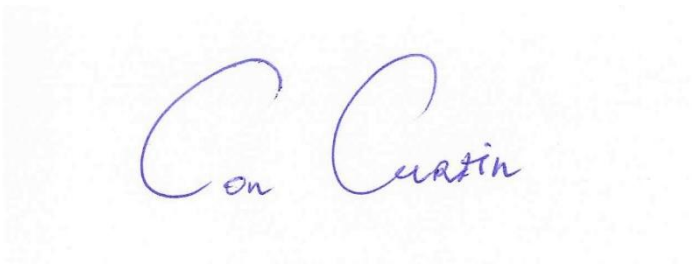
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THE EIAR IS SET OUT IN THE FOLLOWING PARTS;

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Volume 2 : Main body of the EIAR report with 13 Chapters.

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2	Alternatives
3	Human Population and Human Health
4	Biodiversity
5	Land and Soils
6	Water
7	Air
8	Climate
9	Material Assets
10	Landscape
11	Cultural Heritage
12	Interactions and Cumulative Effects

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Volume 3 : EIAR Appendices

Volume 4 : EIAR Figures

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2	*SI 605 of 2017 – European Union (Good Agricultural Practice for Protection of Waters) Regulations 2017 (Nitrates Regulations)*
3	*DAFM Draft Code of Good Agricultural Practice for reducing Ammonia Emissions from Agriculture*
4	*Odour management Plan*
5	*Water Analysis Results for well in existing pig farm*
6	*Ordnance Survey license for discovery mapping*
7	*Lighting Specification / Lighting Spill Drawing*
8	*Landscape Specification Drawing*
9	*Design Drawings*

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1.4	Existing Site Layout (Aerial Photo) (1:1,000 @ A3);
1.5	Proposed Site Layout (Aerial Photo) (1:1,000 @ A3);
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6.12.1	Baseline Surface Water Quality (1:80,000 @ A3);
6.12.2	Baseline Surface Water Quality (1:80,000 @ A3);
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VOLUME 1

EIAR NON-TECHNICAL SUMMARY

For;

For 'BALLYFASKIN PIG FARM'

BALLYFAUSKEEN, BALLYLANDERS, CO LIMERICK



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In relation to the application for; "increased capacity of the piggery from 600 sows to 1000 sows and their progeny in addition to new electrical substation will be constructed. The development requires EPA Industrial Emissions License (formerly Integrated Pollution Prevention and Control License)".

Prepared by

Curtin Agricultural Consultants Ltd, 12 The Paddocks, Kells Road, Kilkenny

October 2020

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Signed by;

Dated ; **12/10/2020**



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EXECUTIVE SUMMARY

This family pig farm has been operation for over 40 years. It operates to the highest standards, with Bord Bia and 'Red Tractor' certification and this year it won a prestigious EU Innovation competition for European pig producers.

In the proposed development there is no change the area of pig buildings except for the addition of the proposed electrical substation – a relatively small structure (22m^2). The proposed electrical sub-station is to allow the up-grading of the electricity supply for the feed mill. The application also seeks to reconfigure the pig herd, increasing the sow numbers from 600 to 1,000 and decreasing the number of finishers on-site to accommodate the extra sows. This will be accomplished by internal refurbishment of pig houses and will not require any new construction. The refurbishment works will involve changing in internal partitions, re-wiring, new water and feed fixtures etc. The slats and floors will remain in situ with some minor exceptions.

The proposed development is essential to secure the viability of the pig farm and without it the market requirement to reduce finisher sale weight would result in a substantial proportion of the existing housing being left empty.

The proposed development will reduce ammonia and odour emissions by approx. 11% and 18% respectively compared to the existing herd. This can be achieved because the number of finishers will be less, and, with the introduction of an adequate power supply the mill can become fully operational and produce specialised low protein diets for the growing pigs. Pig manure production will not change significantly (+1%). Traffic on the R662 is projected to increase by two movements per day, with a temporary increase of 6 movements during the 4 month construction period. Noise and visual impacts will not change significantly.

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The farm is located in a rural setting which has good ground and surface water quality. This is an indication that the farm has an excellent environmental track record. It operates an Environmental Management System to insure compliance with the requirements of its EPA license and both the EPA and the Department of Agriculture, Food and The Marine monitor pig manure exports from the farm. The pig manure is land-spread according to a legal framework (SI 605 of 2017 as amended) which governs how pig manure is utilised, and within this legal framework there are adequate protections to insure that pig manure is applied without adverse environmental effects.

In conclusion, the proposed construction of the small electricity sub-station and the herd reconfiguration will ensure that this family farm will remain viable for the next generation, and continue to give rural employment, directly and indirectly, to more than 40 people. It will also allow the farm to reduce its current emissions.

1. INTRODUCTION

1.1 Introduction

The EIAR consists of four Volumes;

- **Volume 1** is the Non-Technical Summary (NTS);
- **Volume 2** contains the main text and technical information and contains 13 chapters (as discussed below);
- **Volume 3** are the appendices. There are 9 appendices in Volume 3;
    - Appendix 1 : Noise Impact Assessment Report & Supplementary Report;

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- Appendix 2 : S1 605 OF 2017 (as amended);
- Appendix 3 : DAFM Draft Code of Good Practice for Reducing Emissions from Agriculture;
- Appendix 4 : Odour Management Plan;
- Appendix 5 : Water Analysis Results for well in existing pig farm;
- Appendix 6 : Ordnance Survey License for discovery mapping;
- Appendix 7: Lighting Specification / Lighting Spill Drawing;
- Appendix 8 : Landscape Specification Drawing
- Appendix 9 – Design Drawings (Site Layout and Substation design)

- **Volume 4** : Figures. There are 23 figures in Volume 4:
  - Figure 1.1 – Local Environs;
  - Figure 1.2 – Site Location (1:8,500 @ A3);
  - Figure 1.3 – Planning History of the Site (1:1,000 @ A3);
  - Figure 1.4 – Existing Site Layout (Aerial Photo) (1:1,000 @ A3);
  - Figure 1.5 – Proposed Site Layout (Aerial Photo) (1:1,000 @ A3);
  - Figure 1.9: - Study Area (1:150,000 @ A3);
  - Figure 3.1.1 – Human Environment (1:50,000 @ A3);
  - Figure 3.1.2 – Human Environment (1:50,000 @ A3);
  - Figure 3.1.3 – Human Environment (1:50,000 @ A3);
  - Figure 3.1.4 – Human Environment (1:50,000 @ A3);
  - Figure 3.1.5 – Human Environment (1:50,000 @ A3);
  - Figure 5.2.1 – Soil Types (1:80,000 @ A3);
  - Figure 5.2.2 – Soil Types (1:80,000 @ A3);
  - Figure 6.2.1 – Bedrock Formations and Aquifer Status (1:80,000 @ A3);
  - Figure 6.2.2 – Bedrock Formations and Aquifer Status (1:80,000 @ A3);
  - Figure 6.3.1 – Groundwater Vulnerability (1:80,000 @ A3);
  - Figure 6.3.2 – Groundwater Vulnerability (1:80,000 @ A3);
  - Figure 6.4.1 – Ground waterbodies, Public Water Sources and Aquifer Status (1:80,000 @ A3);
  - Figure 6.4.2 – Ground waterbodies, Public Water Sources and Aquifer Status (1:80,000 @ A3);
  - Figure 6.12.1 – Baseline Surface Water Quality (1:80,000 @ A3);
  - Figure 6.12.2 – Baseline Surface Water Quality (1:80,000 @ A3);
  - Figure 6.13.1 – Baseline Surface Water Risk Status (1:80,000 @ A3); and,
  - Figure 6.13.2 – Baseline Surface Water Risk Status (1:80,000 @ A3).

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Chapter 1 of the EIAR introduces the proposed development, outlines the EPA Guidance followed, the layout of the Environmental Impact Assessment Report (hereafter referred to as EIAR) and the team who wrote it and their competency. It describes the existing pig farm, the proposed refurbishment of existing pig houses, the construction of the proposed electrical substation and operation of the re configured pig farm development. Chapter 1 also describes National and Regional/Local policy, Need for the development, Risk of Major Accidents or Natural Disaster and describes the study area.

The EIAR is presented in 13 chapters;

1. Introduction;
2. Alternatives Considered;
3. Human Population and Human Health;
4. Biodiversity;
5. Land and Soils;

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6. Water;
7. Air;
8. Climate;
9. Material Assets;
10. Landscape;
11. Cultural Heritage;
12. Interactions, Cumulative Effects and Transboundary Effects; and
13. Summary of Impacts and Schedule of Commitments (Mitigation)

The main authors of the EIAR are;

- Curtin Agricultural Consultants Ltd. Con Curtin, the main author and coordinator, is an agricultural scientist and consultant with 32 years of experience. He was responsible for Chapters 1, 2, 3, 5, groundwater section of part 6, 7, 8, 9, 10, 12 and 13;
- Ash Ecology and Environmental Ltd headed by Aisling Walsh who wrote Chapter 4 – Biodiversity and carried out the field assessment and surface water baseline assessment in Chapter 6;
- Panther Environmental Solutions Ltd – Noise Impact Assessment in Appendix 1;
- Dave Pollock is an experienced archaeologist who wrote chapter 11 – Cultural Heritage; and
- Seamus Lynch, Consulting Engineer provided the design drawings and advised on technical issues.

The applicant is Balyfaskin Enterprises Ltd, Ballyfaskin, Ballylanders, Co Limerick. The proposed development is to increase the capacity of the piggery from 600 sows to 1000 sows and their progeny in addition to the construction of a new electrical substation – Planning Ref No 191135

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1.2 Description of the local area

The existing pig farm is situated on a 2.6ha site, adjoining the R662, in Ballyfauskeen (also spelt Ballyfaskin[1]), Ballylanders, Co. Limerick (V35KV12), and is located 2.8km south east of Ballylanders, 4.1kms south of Galbally and 2.6kms north west of Anglesborough as illustrated in Figure 1.1 of Volume 4. The area is described in the Limerick County Development Plan as the *Ballyhoura/ Slieve Reagh* Landscape area. The storm water from the site drains to the Aherlow River which is 1.4km east of the pig farm. The Galtee Mountains are located 2.5km to the east and south east and eastern fringe of the Ballyhoura Mountains is located approx. 5kms to the west. The surrounding lands are entirely grassland interspersed with once off dwellings, farmsteads, forestry and settlements; typical of rural County Limerick. The site is located on a locally important aquifer and groundwater vulnerability at the site is 'medium' (Section 6.3.1.2 of Volume 2). The pig farm is serviced by a well located in Ballyfauskeen approx. 0.67km north west of the site as shown in Figure 1.2 of Volume 4 and this well has a capacity of 14m^3 per hour (336m^3 / day).

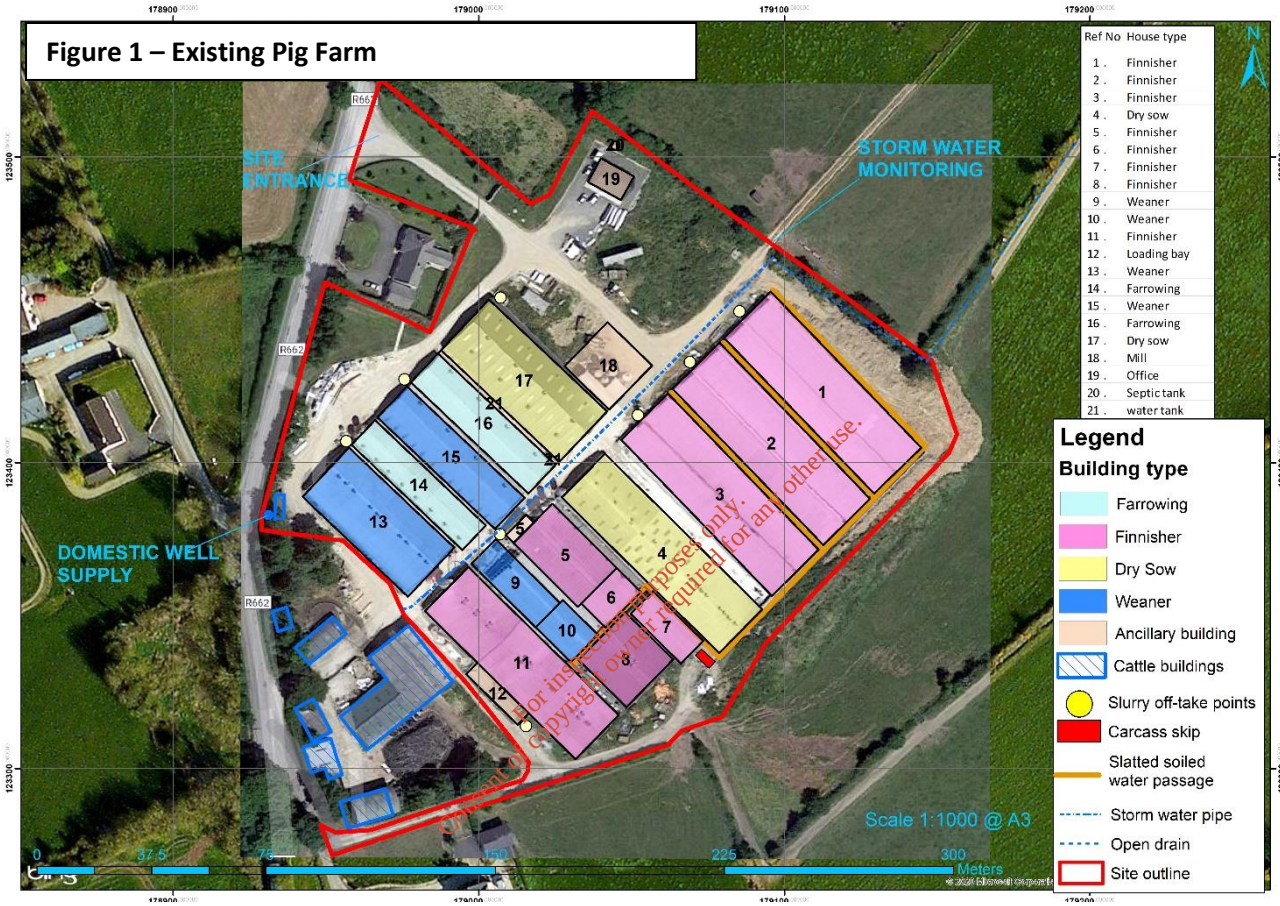
The nearest Natura site is located 3.8 kms east of the site boundary i.e. Galtee Mountains Special Area of Conservation and proposed Natural Heritage Area. The nearest national monument, an enclosure site, is located 100m north east of the site boundary (LI049-198). The nearest dwellings (not including the developer's two family houses) are 60m and 100m to the west, 195m and 270m to the north and 390m and 400m to the south (as illustrated in Figure 1.2 of Volume 4).

[1] Ballyfauskeen is used in this EIAR when referring to the geographical location – 'Ballyfaskin' is used when referring to the pig farm itself which is owned by 'Ballyfaskin' Enterprises Ltd

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1.2.1 Operational details of the existing pig farm

This pig farm has been operational since the 1970s and was recently selected by EU PiG Innovation Group, as a 2020 Grand Prix Winner in an EU wide competition involving over 300 pig farms. It implements an Environmental Management System to comply with requirements of the EPA License which applies to this pig farm, requirements of the Department of Agriculture, Food and the Marine (DAFM) in relation to animal and slurry movements and requirements of the Bord Bia and 'Red Tractor' Quality Assurance schemes. Since 2006 there are seven planning



applications, including the current application (19/1135), which are related to this site. The existing 600 sow herd pig buildings, mill building, rainwater harvesting tank and office building were constructed following permission granted in 2012 (2012/306) and 2014 (2014/276). The layout of the existing pig farm is illustrated in Figure 1 above (copy of Figure 1.4 of Volume 4).

There are 17 pig buildings on site which are up to 70m long and 22.5m wide and generally 5m high or less and these house the 600 sows and their progeny. The mill building (18) is the tallest on the site at approx. 18m high. There is an office building (19) and a rainwater harvesting tank (21) between houses 16 and 17 – which captures the rain water for power washing the pig houses. All pig passages are slatted and soiled water is collected to slatted slurry tanks. There is at least 50 weeks storage for the approx. 15,681m^3 of pig manure which is currently produced each year.

A traffic count was taken in September 2020 and the average annual daily traffic (AADT) was 923 movements. The existing pig farm contributes 14 movements per day, as follows;

- Employees - 7.4 / day (52 / week);
- Feed lorry – 1.6 / day;
- Pig transport - 0.5 / day;

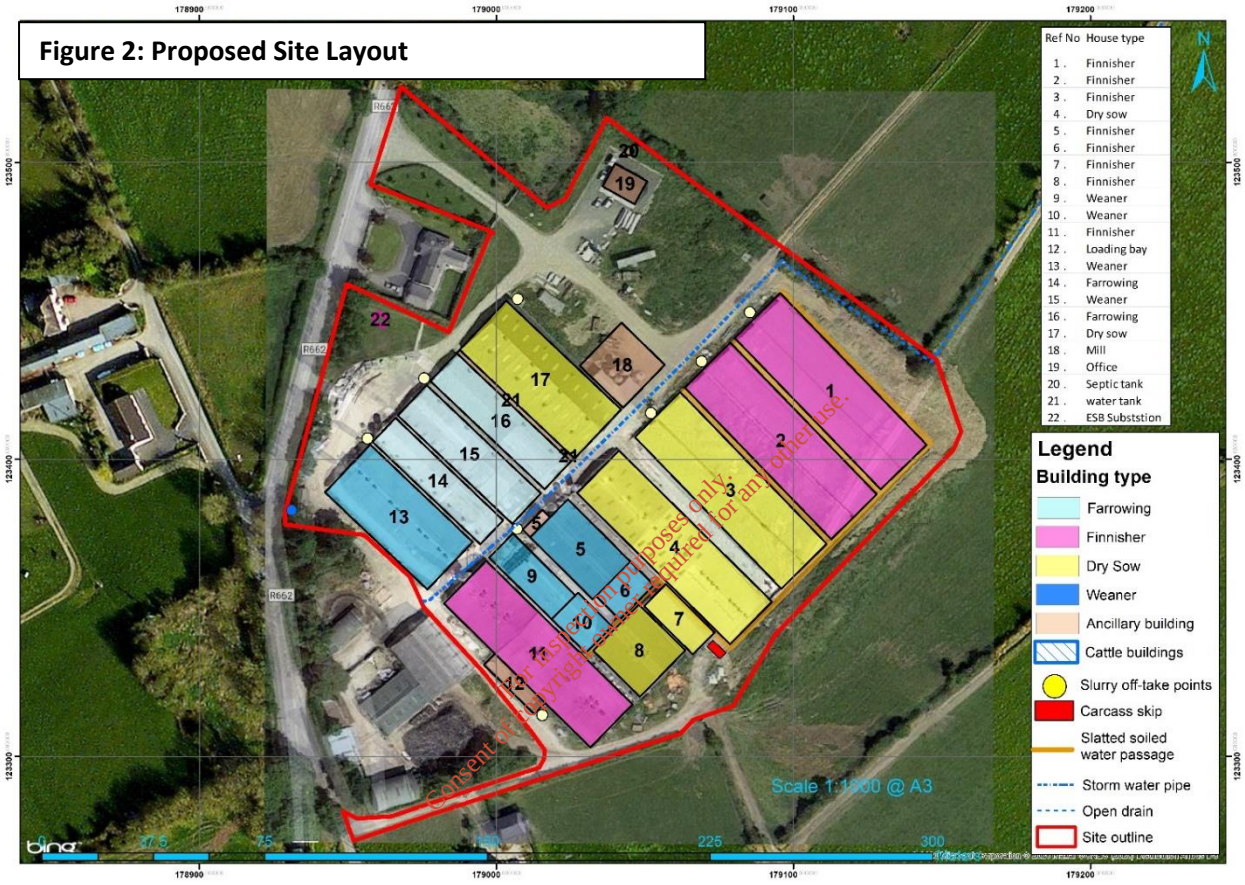
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- Service vans – 0.3 / day
- Slurry tankers - 3.7 / day
- Others - 0.65 / day

Existing noise levels are typical for a pig farm enterprise and are within the limits as set out by the EPA license which applies to the pig farm.

1.3 Description of proposed development

Figure 2: Proposed Site Layout



In this planning application the only new building to be constructed will be a small electrical sub-station (22). This will be 22m^2. The proposed electrical sub-station is to allow the up-grading of the electricity supply to the site to enable the full operation of the feed mill. The application also proposes reconfiguring the pig herd; increasing the sow numbers from 600 to 1,000 and decreasing the number of finishers on-site by approx. 1,400 to accommodate the extra sows. This will be accomplished by internal refurbishment and will not require any new construction. The refurbishment works will involve changing in internal partitions, re-wiring, new water and feed fixtures etc. The slats and floors will remain in situ with some minor exceptions. The following changes will occur;

- Houses 3, 7 and 8 will change from finisher to dry sow houses.
- Houses 5 and 6 will change from finisher houses to weaner houses; and
- House 15 will change from weaner house to farrowing house;

When these works are complete the footprint of the proposed development will increase by 22m^2, the number of sows will increase to 1,000 and the number of finisher places will decrease to 3,957.

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The slurry production will increase by 1% to 15,805m^3. Tables 1.3 and 1.5 of Volume 2 are combined in Table 1 below.


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Plate No 1: Example of single mv electrical substation

Table 1: Number of pigs in existing and proposed sow herds and slurry produced

Type of pig	Existing 600 sow unit	Proposed 1,000 sow unit
sows	600	1,000
Gilts	100	166
Boars	3	5
Finisher places	5236	3,957
Breeding unit manure production (m^3 / sow / week)	0.174	0.174
Finishing pig production (m^3 / finisher / week)	0.034	0.034
Total manure produced from breeding unit (m^3)	5,429	5,762
Total manure produced from finisher unit (m^3)	9,257	9,048
Total (m^3) =>	**14,686**	**14,810**
Soiled water (m^3)	995	995
Total including soiled water (m^3) =>	**15,681**	**15,805**

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Other changes which will occur (as discussed in Section 1.3.3 of Volume 2) are;

- Ammonia emissions will reduce by 11% after mitigation measures are employed;
- Odour emissions will reduce by 18% after mitigation measures are employed;
- Water consumption will increase from 43m^3/day to 48m^3/day;
- Traffic will increase from 14 to 16 movements per day;
- Noise emissions will not significantly impact sensitive receptors and remain within EPA limits for this facility;
- Sharps waste will increase by 5-6kgs per annum. Municipal waste will not change significantly;
- Carcass waste will increase by 21% (but collection traffic will remain once per fortnight);
- Labour will increase by one person;
- Power usage will increase by approx. 26%; and
- Methane and Nitrous will increase by approx. 17%.

It is predicted that construction traffic will increase by approx. 6 movements per day due to construction over a 4 month period with peaks of approx. 13 movements per day.

These impacts are addressed in terms of how they will impact on the receiving environment in the various chapters of the EIAR. It is estimated that approx. 100 tons of construction waste was produced during the construction of the existing 600 sow farm and approx. 10 tons or less will be produced during the proposed construction of the electrical substation and the refurbishment of the pig houses. This is a tiny proportion of the regional capacity which exceeds 1.4 million tons.

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1.4 National and Local Policy and Planning

The proposed development complies with **local policy** and planning in the following ways;

- Section 5.6.1 of the Limerick County Development Plan (2010 – 2016 including variations 1-3, 5 & 6) states that *The Planning Authority will support and facilitate agricultural developments and improvements where the developments are considered in relation to their likely impact on the character and amenity of the surrounding area*.
- Policy CP 08 of the Development Plan (DP) recognises *the overall importance of agriculture, and of the County's natural resource base, is given specific recognition*. The DP seeks to create and maintain employment. The proposed development will create 1 job on site and sustain create 36 - 42 jobs in the agri services and food sector (see Section 3.5.3.3 of Chapter 3).
- Objective ED O22 of the PD in relation to Agricultural developments states *the Council will normally permit development proposals for agricultural development where*:
    - *(a) they are appropriate in nature and scale to the area in which they are located;*
    - *(b) the proposal is necessary for the efficient use of the agricultural holding or enterprise;*
    - *(c) where the proposal involves the erection of buildings, there are no suitable redundant buildings on the farm holding which would accommodate the development;*
    - *(d) the development is not visually intrusive in the local landscape and, where the proposal is for a new building(s) and there are no suitable redundant buildings, the proposal is sited adjacent to existing buildings and suitably visually integrated in the holding;*

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(e) *the proposal demonstrates that it has taken into account traffic, environmental and amenity considerations and is in accordance with the policies, requirements and guidance contained in this Plan.*

The proposed development demonstrates in the attached EIAR that the environmental impacts (including traffic) are not significant.

- Objective EH O8 (Ballyhoura / Slieve Reagh Landscape Character Area) encourages the use of species native to this particular area (mountain ash and birch) in landscaping developments.
- Section 7.4.4 of the DP states that one of the challenges facing the County is that of climate change. Pigmeat is 4 times more carbon efficient than beef or lamb. Section 8.5.4 of the DP suggests Anaerobic Digestion as possibly playing a huge role in producing renewable energy and helping to manage sources of wastes and producing renewable energy and suited to intensive dairying, pig and poultry farming.
- In section 10.8 of the DP it stipulates;
    - *All effluent storage tanks should be constructed to Department of Agriculture and Food specifications.*
    - *The capacities of all slurry, effluent and soiled water tanks and all other tanks for pollutants shall comply with the current Department of Agriculture Guidelines and any subsequent documents/guidelines.*
    - *The applicant may be required to demonstrate that sufficient lands of suitable nutrient status are available within a reasonable distance for the disposal/recycling of organic waste from a proposed agricultural development.*

    The EIAR demonstrates that there is adequate capacity in the receiving environment to cater for the pig manure produced and that the proposed development complies with the relevant regulations.

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National Policy Objectives which are complied with include;

- National Spatial Strategy (investments throughout the economy and promote rural development);
- Food Wise 2025 which seeks to meet the food demands of a rising national and world population while at the same time achieving carbon emission reductions;
- Climate Action Plan 2019 required a reduction in emissions from agriculture. EPA July 2020 Report *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* predicts that Ireland can and will meet its 2030 commitments by early adoption of a '*with additional measures scenario*' and a reduction of 12% in agricultural GHGs. According to this most recent report the pig sector can contribute to this reduction by reducing protein in the diets and improved animal health. The proposed development will implement these measures and commits to hire contractors with low emission spreading equipment where possible. Pork is 4 times more efficient than beef or lamb in terms of CO_2 emissions;
- *European Communities (National Emissions Ceilings) Regulations 2004 incorporated into SI No 10 of 2004 and Code of Good Practice for Reducing Ammonia Emissions* and *Code of Good Practice for Reducing Ammonia Emissions from Agriculture* published by Department of Agriculture, Food and the Marine in November 2019 are adhered to by reducing ammonia emissions by 11%; and
- The *Nitrates Directive & Regulations Si 605 of 2017 (as amended in Si 65 of 2018 and Si 40 of 2020)* and the *Water Framework Directive WFD (2000/60/EC)* are adhered to by providing 50 week's slurry storage and storage of slurry in leak-proof tanks.

1.5 Need

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The proposed electrical substation is required to upgrade the electricity supply to the mill. By having an adequate power supply the mill the farm can produce bespoke diets to reduce protein levels and lower emissions of ammonia and odour. The increased sow numbers is in response to a marketplace change. The market for heavier pigs (135 kgs) produced by the 600 sow herd was specialized and is no longer available thereby requiring the production of lighter pigs (100 – 105 kgs). If the sow herd size remained unchanged at 600 sows then a substantial percentage of the existing housing would remain empty and consequently the business would be unviable.

For each job supported on a pig farm there are 6 – 7 jobs supported in the wider economy most of these in County Limerick. This pig farm is an important source of supply for the Irish pork industry and these companies rely on the supply of Irish produced pork and bacon. Food production and supply is critically important for the national interest and required to meet a rising world population which is predicted to increase by 25% before 2050. €890 million of pig meat products were exported in 2019. Agriculture is a key industry in Ireland, particularly for the rural economy, employing approximately 110,000 people in primary production and approximately 175,000 are employed in the agri-food industry. In addition to this tens of thousands of jobs are supported in the services industries. The importance of agriculture to the rural economy is immense and the industry has to sustain itself with continued investment. In order to meet increasing demand for pork world-wide there must be an inevitable increase in the supply chain. Pig meat is 4 times more carbon efficient than beef of sheep and therefore from a climate change perspective it is essential to increase the proportion of pig and / or poultry meat in the supply chain.

.

1.6 Risks from Major Accidents and Natural Disasters

There is no risk from flooding, subsidence, earthquakes or other natural disasters. The construction materials of the building will conform to national standards to withstand the strongest winds and the tanks will be leak-proof. Continuous checking of equipment and electrical installations will take place to insure the risk from fire is minimized. Fire extinguishers are installed in the pig houses and regularly maintained. There will be procedures in place to contact the emergency services if there is a fire and to remove staff and other personnel from the site. Environmental incidents, accidents and natural disasters (fire) are rare on pig farms.

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1.7 Difficulties Encountered in Compiling the Required Information

No significant difficulties were encountered when compiling this report.

1.8 The Study Area

The study area for this EIAR is defined as the 48 townlands which receive pig manure produced by the proposed development. The list of townlands is provided in Table 1.9 of Chapter 1 of Volume 2 and the map of the study area is illustrated in Figure 1.9 of Volume 4.

1.9 Photos of Existing Pig Farm

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Plate 2: Entrance to 'Ballyfaskin Pig Farm' (mill House in background)


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Plate 3: Site of proposed electrical substation

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Plate 4: Looking south east with house 13 of left-hand-side



Plate 5: Covered slatted pig-walk passage.

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Plate 6: Un-covered slatted pig-walk passage



Plate 7: View from R662



Plate 8: Building No 11 on Left-hand-side and looking SE onto loading bay



Plate 9: Buildings 3-11 on left-hand-side and mill and buildings 13-15 on right-hand-side

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2. ALTERNATIVES

Chapter 2 of the EIAR sets out the alternatives that were considered.

Do Nothing

The 'do-nothing alternative' has been considered. However, the vast majority of the housing infrastructure is in place. The 'do-nothing' alternative does not respond to the change in the market place which has switched from the specialized market for heavier pigs (135 kgs) towards mid-sized finisher weights (100 – 105 kgs). Therefore, in this scenario, the sow herd size remains unchanged at 600 sows and a substantial percentage of the existing housing remains empty and consequently the business becomes unviable.

The 'do-nothing' alternative has to be considered in the context that pork is 4 times more carbon efficient than beef or lamb. The density of pigs in Ireland is low compared to other European countries and pig numbers have been relatively static over the past 10+ years. Failing to maintain the viability of the existing pig farm would result in negative economic spin-offs in the wider regional economy e.g. the current pig farm maintains 30 – 35 jobs in the agri sector and produces equivalent to €140,000 of fertiliser which replaces expensive imported non-renewable chemical fertiliser.

Do Something

The 'do-something' alternative will result in the optimum enterprise mix, increasing the viability of the enterprise, it will allow the specialization required in the milling operation for the formulation of low protein diets and resulting reduction in emissions of ammonia and odour, and, it will minimise impact on traffic due to feed deliveries in larger loads. It will secure employment on and off the farm and minimise the import of chemical fertiliser.

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Alternative sites and Layouts have been considered and are not be as suitable as the existing site because of the history of pig production at this site since the 1970's. This site has enough space to facilitate the proposed development, there is enough slurry storage on site and the existing layout minimises the movement of pigs, minimises visual impact and maximises the efficiency of operation.

Alternative house designs have been considered such as housing systems with under-slat scraping systems, under-slat flushing systems combined with manure gutters and vacuumed piped systems. Slurry cooling systems were considered. Exhaust air treatment systems were examined. Retrofitting some of the design features described in Section 2.6 of Volume 2 would be prohibitively expensive, cause major disturbance to the existing enterprise and these alternatives are considered uneconomic.

The existing design has incorporated underground slurry tanks with additional slurry storage to minimise risk of spillage and facilitate improved management of pig manure. All pig walk-ways are slated to minimise soiled water. Storm water is harvested and re used to power wash the pig houses. There is a wet feeding system which minimises dust emissions and noise. The houses use timer switches to minimise energy usage.

Alternative processes such as outdoor pig production were considered but this does not suit the soils or climate in Ireland.

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Alternative mitigation measures were considered. Upward splash-plate and rain gun spreading is ruled out due to prevailing regulations in Ireland. Many farmers use downward splash-plate spreaders but there is a move to band-spreading and trailing shoe spreading which can reduce emissions by 35%. Also a move towards spreading in the early season reduces emissions. Alternatives such as anaerobic digestion (AD), aeration, slurry additives, scrubbing and slurry odour masking agents were considered. AD is a proven technology but requires additional state incentives to make it viable. Slurry additives are a developing technology which may offer options in the future. The pig farm will, where possible, hire only contractors that use low emission spreading equipment. The pig farm will adopt low protein diets to reduce ammonia emissions and odour.

Having examined the available alternatives and having considered the existing infrastructure is largely in place it is concluded that the best alternatives is to introduce low protein diets to reduce ammonia and odour emissions and where possible, use only contractors who use low emission spreading equipment.

3. HUMAN POPULATION AND HUMAN HEALTH

Chapter 3 of the EIAR assesses the impacts from the proposed development on the receiving Human Population and Human Health.

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Existing Human Environment

The Human population environment is described in Section 3.3 of Volume 2 and Figures 3.1.1 – 3.1.5 of Volume 4. There is a weak upward trend in the rural population (1.6% growth from 2011 – 2016)) in Co Limerick. There are 40 dwellings within 1 km of the pig farm site boundary with an estimated population of 112 persons. There are approx. 30 inhabitants per sq. km of countryside in the study area and 13 settlements in the study area (or within 500m of the study area), with a total population of approx. 3,448 inhabitants. There are commercial and non-commercial premises such as churches, schools, banks, credit unions, manufacturing businesses, bars, community halls, guest houses, shops, post office, schools, playing/GAA pitches, pharmacies, restaurants, garage/car sales, Garda barracks and veterinary businesses. In the environs of the pig farm there are furniture manufacturing businesses in Ballylanders, a metal fabricator between Ballylanders and Spittle and two rurally based bakeries located 1.5km south and 2km south east from the site. The local environs are predominantly agricultural with one-off houses and farms that benefit from the availability of pig manure. Local tourist services include the Galtee and Ballyhoura Mountains, the Ballyhoura Way 2.2km north of the site, guest houses near Anglesborough approx. 2.5km south of the site and there is a scenic route on the R513 as far as its junction with the R662 (0.75km south of site). There are 15 public water sources in the study area (or within 500m of the study area) – the closest of these being the Ballylanders ground water supplies which are 1.1km and 1.6km west of the site. The Aherlow River (1.4km east of the pig farm) is an important local fishery and other rivers such as the Arra River, Camogue River, River Funchion, Mulkear River and Morningstar Rivers are important local amenities. The study area is rich in Cultural heritage sites – the closest is the site of an enclosure which is 100m from the site boundary. Within the study area there are approx. 250km of local roads, 123kms of regional roads and 11kms of national roads which will be utilised by traffic to and from the pig farm.

Potential impacts

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The farming community benefit to the degree of approx. €140,000 each year from the approx. 15,800m^3 of pig manure produced by the 'Ballyfaskin' Pig Farm. This is an organic renewable fertiliser source which replaces imported non-renewable chemical fertiliser. Employment on the site is projected to increase from 5 persons to 6. Local commercial businesses will generally benefit from increased economic activity and increased employment. The traffic to and from the 'Ballyfaskin' site is projected to increase from 14 to 16, increasing the average daily trips on the R662 from 923 to 925. During the 4 month construction period there will be a temporary increase of approx. 6 movements per day due to construction traffic. Without mitigation there are no significant impacts on farms, commerce, tourism or traffic.

Odour impacts from land-spreading will be typical of normal agricultural practices in the rural study area and will not have a significant impact on local communities, businesses or tourism. There is the potential for periodic odours in the vicinity of the pig farm. There are no pre-mitigation human health impacts on local residents from ammonia, methane, nitrous oxide, dust and other gases associated with the storage and land-spreading of pig manure. There are potential pre mitigation health effects on workers with in the pig confinement buildings. The mill is 150m from nearest dwellings and at this separation distance noise impacts will not be significant pre-mitigation. The noise from the pig houses will not change significantly and is predicted to be within the EPA license limits for this facility. Only workers and visitors operating inside the boundary of the pig farm may be exposed to construction noises which could exceed Health and Safety Authority guidelines which, without mitigation, could result in a slight adverse impact on human health.

The Aherlow River in the vicinity of the pig farm is good quality and not at risk of deterioration. Throughout the study area the water quality is relatively stable and is classified as mostly 'moderate – good'. Other sensitive ecosystem services such as forests, woodlands are not directly affected due to separation distance from the pig farm and will not be significantly affected by land-spreading before mitigation. Fifteen public ground water supply sources (Section 3.3.1.5 of Volume 2) have been identified within or adjacent to the study area and these are very high sensitive receptors. In addition there are many private wells attached to dwellings which have not been identified. While the land spreading of organic manures is common place in rural Ireland and in the study area, without good practice there is a potential slight adverse impact on human population due to potential impacts on water supplies.

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Without mitigation there is the potential to damage an unknown archaeology at the site of the proposed development, leading to a slight – moderate adverse effect on the Cultural Heritage environment.

Mitigation

The pig farm, or its contractors, will be required to provide health and safety training and have a safety statement/plan. To mitigate potential impacts it is proposed to control dust and noise during construction and provide workers with personal protection safety devices. A water tanker will be available to douse exposed soil during dry weather to prevent dust nuisance. The construction hours will be restricted to 8am to 6pm Monday to Saturday. Contractors will employ measures to protect watercourses from sediment run-off and will insure soil is not transported out on to the public road by having wheel wash facilities. The pig farm management will notify adjoining land owners in advance of commencement of sudden loud construction works in case there are any sensitive livestock nearby (e.g. horses or cows at the point of calving)

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During the operational phase there will be health and safety training to minimise and manage risks to farm worker's health from noise and dust within the pig houses. The pig house ventilation system will remove harmful concentrations of dust, particulate matter and toxic gases. A Noise Management Programme (Appendix 1 of Volume 3) will be in place to monitor and manage noise emissions. While noise impacts are within the acceptable limits the applicant is cognisant of the local submissions in respect of noise, particularly in relation to the loading of pigs. Therefore the applicant, subject to the agreement of Limerick County Council and as a condition of any permission if granted, will commit to insulate the loading bay enclosure with insulated walls and roof to mitigate noises at the point of loading. During the operational phase the regulations pertaining to land-spreading as set out in Si 605 of 2017 (Nitrates Regulations) will be adhered to, which requires setback distances of 200m, 25m and 5m from public and private water sources and watercourses respectively. A setback distance of 50m will be recommended by the pig farm around rural dwellings and any source protection zones for public water sources will be avoided. There is 50 weeks of slurry storage on site which insures that the pig manure can be spread in suitable conditions. Odour will be mitigated by use of low protein diets, implementing an Odour Management Plan (Appendix 4 of Volume 3) and maintaining a high degree of cleanliness on-site. The pig farm will monitor complaints and advise caution when spreading manure at these locations (e.g. adjoining settlements). The pig farm will, where possible, hire contractors that use low emission slurry spreading equipment. A rodent and pest control programme will be implemented to minimise nuisance from pests.

Residual and Cumulative Impacts

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The proposed development will not significantly impact on population growth within the study area. The residual impact on local business is not significant – although there may be beneficial spin offs due to increased construction activity. The residual impact on farms due to land-spreading is positive but not significant. There will be no residual impact on tourism from the proposed development due to adequate separation distance, and land-spreading pig manure will not add significantly to the existing baseline land-spreading of agricultural manures. The proposed operational pig farm will be approximately 1.5% of the traffic on the local road, with a 0.5% increase in construction traffic, and therefore residual impacts on local traffic are not significant.

After mitigation (low protein diets) the odour emissions will be reduced by 18% compared to the existing pig farm reducing potential nuisance on local residents.

The statutory regulations governing the application of organic manures contain mandatory mitigation measures which protect water sources. The pig manure will be applied in accordance to these regulations and therefore residual impacts on water sources is not significant.

Cumulative impacts from the pig farm located in Inchacoomb (2 km south east of the 'Ballyfaskin' site) and from two licensed facilities in the Glen of Aherlow 13km north west of the 'Ballyfaskin' pig farm have been considered and are not significant. The land-spreading of cattle manure in the study area is considered part of the baseline environment and with standard mitigation the potential cumulative nuisance and water quality effects are not significant.

The interaction between Human Population and Human Health with the Risk of Major Accidents or Incidents will not give rise to significant change in the assessed impacts.

4. BIODIVERSITY

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Chapter 4 of the EIAR assesses the impacts from the proposed development on Biodiversity.

Existing Biodiversity

Ash Ecology carried out a survey at the site on 28th of July 2020 and a visual assessment of the study area was conducted when study area was classified according to Fossitt (2000).

The locations of designated sites within 15km of the pig farm are illustrated in Table 4.4 and in Figures 4.1 and 4.2 of Chapter 4 of Volume 2. There are five designated Special Areas of Conservation within 15km of the pig farm (plus 3 proposed Natural Heritage Areas (pNHA));

1. 000646 Galtee Mountains SAC (and pNHA) (3.9km E, SE from site);
2. 002137 Lower River Suir SAC(8.9km NE from site);
3. 002257 Moanmour Mountain SAC (7.6km NE from site boundary);
4. 002037 Carrigeenamronety Hill SAC (and pNHA) (10.8km SW from site boundary); and,
5. 002036 Ballyhoura Mountains SAC (and pNHA) (12.7km SW from site boundary)

There are 6 additional pNHA sites – (002035) Glenacurrane River Valley pNHA, (002087) Ballynacourty Wood pNHA, (002089) Ballyroe Hill & Mortlestown Hill, (002090) Castleoliver Woods pNHA, (000899) Ballindangan Marsh pNHA and (000651) Mitchelstown Caves pNHA – within 5.7km SE, 9.3km SW, 10.3km SW, W, 11.7km SW, 14.2km S and 14.9km SE respectively from the pig farm. There are no designated sites in the study area.

The habitats on the pig farm site are described in Figure 4.3 and Table 4.6 of Volume 2 as buildings and artificial surfaces (BL3), amenity grassland (GA2), improved agricultural grassland (GA1), non-native treelines (WL2), scrub (WS1), grassy verges (WL1), trees (WL2), hedgerows (WL1) and Drainage Ditches (FW4). No rare species of flora was recorded or observed at the site. Neither were protected fauna species such as otter, badger, pygmy shrew, red squirrel, fallow deer, Irish hare, pine marten, Irish stoat or hedgehog recorded or observed. A bat survey was deemed unnecessary as there was no demolition works. No invasive species were recorded. The drainage ditches at the northern boundary of site may contain common frog. Overall, the site of the proposed development is of local value for a range of terrestrial bird species and bats that are relatively common in the Irish countryside.

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Potential Impacts

Construction disturbance can cause sensitive species to deviate from their normal, preferred behaviour, resulting in stress, increased energy expenditure and, in some cases, increased mortality. Deterioration in water quality due to storm water discharges and land-spreading could impact on the River SACs. Construction activities could adversely affect the Aherlow River but this has been ruled out. Construction activities could lead to the introduction of non-invasive species.

Mitigation

The proposed construction phase mitigation includes measures to control water run-off and accidental spills of fuels, oils and greases and operational phase mitigation includes measures to protect groundwater and surface water features. These measures are specifically mentioned Sections 6.6 of Volume 2. Environmental noise arising from activities on the construction site shall be controlled and minimised in accordance with the specifications of the noise management plan. Wheel wash facilities will be used to insure that vehicles entering and existing the site are clean to prevent ingress of invasive species. In the event of unintended introduction of an invasive species

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a person with sufficient training, experience and knowledge in the control of non-native invasive species will be employed to assist in the planning and execution of control measures. Pig manure will be handled, stored and spread according to the relevant regulations.

Residual and Cumulative Impacts

The Natura Impact Statement Report states that following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the proposed works will not have an adverse effect on the integrity of Natura 2000 sites. The habitats within the site boundary are relatively common and no Annex I or rare or uncommon habitats or floral species will be directly affected by the proposed works. Invasive species were not noted on the site. Prevention of pollution of drainage ditches will insure no effect on the common frog.

A habitat assessment of the complete study area was mainly that of Improved Agricultural Grassland, Arable Cropping and conifer woodland. Small pockets of higher diversity habitat such as treelines, grassy verges beside rivers and watercourses occur away from the more intensive farms and would therefore not be affected by outputs from to the proposed pig farm development

With mitigation any residual impacts on the habitats and species that occur on the site due to the proposed works is considered to be neutral in the long-term and the predicted residual impact on flora and fauna will be insignificant.

Cumulative impacts from the nearest pig farm development located in Inchacoomb (2 km south east of 'Ballyfaskin' Pig Farm) are not significant due to the separation distance. The interaction between Biodiversity with other environmental topics will not give rise to significant change in the assessed impacts.

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5. LAND AND SOILS

Chapter 5 of the EIAR assesses the impacts from the proposed development on the receiving Land and Soil environment.

Existing sub-soils and soils

Within the study area there are 36 bedrock formations as illustrated in Figure 5.1.1 and 5.1.2 of Volume 4. Bedrocks contain aquifers and aquifers are categorised in order of their importance. Firstly, the most important category are *Regionally Important Aquifers*. These bedrocks make up 16.5% of the study area. Secondly, there are *Locally Important Aquifers*. These bedrocks make up 79% of the study area and this is also the aquifer type under the site of the pig farm. Thirdly, and least important, are *Poor Aquifers* which make up 4.5% of the study area.

The bedrock has been weathered over the ages to produce top soils. There are 8 soil groups in the study area as illustrated in Table 5.3 of Volume 2 and Figures 5.2.1 and 5.2.2 of Volume 4. These include; the principle soil is the *Elton series* (39% of the study area), surface water and groundwater gleys (23% of the study area), acid brown earths (21% of the study), alluvial soils (11.5% of the study area), podzols and brown podzols (5% of the study area) and peaty type soils (1.5% of the study area). With the exception of peats and some poorly drained gleys all these soils with improved grassland are suitable for land-spreading, subject to weather and soil conditions. The main restriction in terms of land-spreading of pig manure on moderately well drained soils is

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going to be at the shoulders of the season – requiring additional slurry storage to avoid waterlogged soils. An application of pig manure will be equivalent to 1 - 2mm per hectare. The infiltration rates associated with brown earths and *Elton* soils can be assumed to be in excess of 100mm / hr (see Table 5.2 of Volume 2). Moderately well drained gleys and podzolics will have mid – lower infiltration rates (30+mm / hr) and poorly drained gleys and peats will have low infiltration rates of 5mm / hr or less.

Nutrient Management

The study area is comprised of approx. 8,250ha. When adjusted for forestry, roads, houses, scrub, farm yards, buffer strips, source protection zones and zones of contribution, the available land with minimal risk to water is 5,543ha (as illustrated in Figures 5.4.1 – 5.4.33 of Volume 2). The average phosphorous (P) requirement within the study area, based on Teagasc data for soil samples in Counties Limerick and Tipperary, is approx. 14kg / ha or 77,602kgs (5543 x 14) of P. Taking a more conservative estimate based on assuming P index 3, the P requirement is approx. 55,430kgs. The pig farm will produce approx. 23% (12,644 kgs) of this requirement demonstrating the relatively low contribution that the pig manure is making to the total fertiliser requirement. The chemical nitrogen allowance for the typical receiving farmer is 206 kgs / ha - 1,142 tons of N required within the study area. The pig farm will supply 3% of this requirement.

Mitigation

There is a legal framework (SI 605 of 2017 as amended - Appendix 2 of Volume 3) which governs how pig manure is land-spread, and within this legal framework there are adequate protections to insure that pig manure is applied without adverse environmental effects. To minimise the risks from spreading on heavy moderately drained soils in the shoulders of the spreading season the pig farm has sufficiently extra storage so that pig manure exports are not necessary during these high risk periods, The pig farm maintains a pig manure export register for inspection by the EPA as required by the existing EPA license and gives a record of slurry movements to the Department of Agriculture, Food and the Marine (DAFM) each year so that slurry movements can be monitored. DAFM inspect approx. 5% of farmers each year for cross compliance with the relevant regulations.

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Residual and cumulative impacts

The loss of approximately 0.1 hectares of agricultural grassland at the 'Ballyfaskin' site for the electrical substation development is not a significant residual impact. By adhering to the regulations chemical fertiliser requirement is replaced with pig manure and therefore nutrient over loading is avoided. Pig manure will supply a relatively small proportion of the P requirement of the study area. The pig manure will add organic matter to the receiving soils – which is beneficial.

Cumulative impacts with the nearest pig farm development, which is 2km south east of the 'Ballyfaskin' site in Inchacoomb, are assessed in Chapter 5 of Volume 2. The Inchacoomb pig farm delivers pig manure to some of the townlands within the study area and therefore there is a potential cumulative impact on soil nutrients. However the pig manure is applied according to the relevant regulations and therefore the nutrient requirement of the receiving environment is taken into account, thus insuring that adverse effects are avoided. The total contribution of pig manure to County Limerick organic manure levels is approx. 2% (see Table 5.5 of volume 2). Therefore the cumulative impact of pig farms in County Limerick is not significant.

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Land and Soils has the potential for significant interactions with Human Population, Human Health, Water, Air, Climate and Material Assets, however, having considered these interactions, there is no significant change in the assessed impacts.

6. WATER

Chapter 6 of the EIAR assesses the impacts from the proposed development on the receiving groundwater and surface water environments. The water quality has been assessed by referring to Geological Survey of Ireland (GSI) data, EPA data, County Council data, Water Framework Data and water analysis results from groundwater at the pig farm (Appendix 5 of Volume 3). A field assessment of the study area carried out by Ash Ecology and Environmental (AAE). AAE took 30 Q-samples throughout the study area to supplement the EPA surface water data.

Groundwater

Receiving groundwater environment

The receiving groundwater environment is described in Section 6.3. The site overlies a Locally Important Aquifer and the groundwater vulnerability (i.e. the ease with which groundwater can be contaminated) is categorised as medium. This represents a relatively low risk to groundwater at the site. 2% the study area is categorised as extreme vulnerable land over regionally important aquifers. Extreme vulnerability represents a high risk to groundwater, however, the low percentage of the study area represents a low risk overall.

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The water quality was assessed by examining EPA data (https://gis.epa.ie/EPAMaps/) on ground waterbodies, the water analysis results from 22 out of 36 groundwater sources in the vicinity of the study area (https://waterquality.limerick.ie) and the water analysis results of the pig farm well.

The EPA data shows that there are 21 ground waterbodies throughout the study area (as listed in Table 6.5 of Volume 2 and shown in Figures 6.4.1 and 6.4.2 of Volume 4). Approximately 1% of the study area overlies groundwater bodies of poor status. The Mitchelstown (SE_G_082) and Industrial Facility (SE_G_219) waterbodies are poor quality – townlands 14, 15, 16 and 46 are the relevant townlands. Approximately 55% of the study area overlies ground waterbodies that are *not at risk* from deteriorating water quality, 25% of the study area overlies groundwater bodies that are *at risk* due to deteriorating water quality and 20% of the study area overlies groundwater bodies that are under *review* due to increased pressures. This compares favourably with approx. 40%, 37% and 23% of groundwater bodies in County Limerick that are not at risk, under review and at risk. On the EPA mapping system (https://gis.epa.ie/EPAMaps/Water) there are five ground waterbodies where agriculture is the significant pressure on groundwater quality – these make up 15% of the study area.

Table 2[2] shows the average water analysis results for 22 out of 36 public water sources in the vicinity of the study area. Ammonium–N (NH_4-N), Coliforms, E.coli Nitrate-N (NO_3-N) and phosphates can indicate contamination of groundwater from agricultural (and other) sources.

[2] Summarised from Table 6.6 of Volume 2

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Table 2: Summary of Water analysis for Public Groundwater Supplies in the vicinity of the Study Area

	NH_4-N (mg/l)	Coliforms	E.coli	NO_3 (mg/l)	Ortho P (mg/l)
Threshold values	0.3	0	0	37.5	0.03
Average	**0.02**	**8.14**	**3.11**	**15.3**	**0.03**
Maximum	0.03	75	62	24	0.21
Minimum	0.02	0.03	0	2.6	0

Average Ammonium–N levels in the study area are satisfactory and below threshold levels. The presence of Coliform and or E.coli bacteria indicates contamination from agricultural or human excrement. Therefore the threshold for these bacteria is zero. Many of the wells have had one-off spikes in bacterial counts, but generally levels are acceptably low. There is No bacterial contamination at the pig farm well. Nitrate–N levels are generally satisfactory, ranging from 7 to 24 mg / l NO_3 –N and averaging 16.4 mg / l NO_3 –N. There is a weak upward trend in Nitrates in the groundwater bodies in the vicinity of the study area. Ortho – Phosphate levels are generally low with the average increased to threshold levels due to one high Phosphate source in Knocklong (labelled 21, 22 & 23 in Figures 6.4.1 and 6.4.2 of Volume 4)).

Overall, the ground water analysis reflects the EPA 'good' status for ground water in the study area.

Surface water

Receiving surface water environment

River water quality is assessed by taking samples at monitoring points along a river to investigate the presence or absence of macroinvertebrates (tiny animals without backbones e.g. insects, snails and worms). The presence or absence of these macroinvertebrates can be assessed to give a q-rating or value (1/poor – 5/high) at that sampling point – and therefore a q-value for that segment of river body.

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The water quality in the vicinity of the pig farm is represented by the Aherlow River quality results downstream from the piggery at *Br SW of Keeloges*. The monitoring results indicate 'good' quality and 'not at risk' status due historic samples being 'good' also.

Table 3: Summary of surface water body quality status & risk categories

Catchment	Number of rivers	2010 – 2015 Status						Risk Category		
		High	Good	Mod	Poor	Bad	Unassigned	Not at risk	Review	At Risk
		Number								
Total for four catchments	**469**	30 (6%)	190 (41%)	84 (18%)	57 (12%)	0	108 (23%)	202 (43%)	93 (20%)	174 (37%)
Within the Study Area (2013-2018 Data)	**30 River Sub-basins**	0	14 (47%)	8 (27%)	5 (17%)	0	3 (10%)	16 (53%)	3 (10%)	11 (37%)

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The EPA data for the regional is determined by examining the water quality status for the four main relevant catchments (Shannon Estuary South Catchment (HA24), Munster Blackwater (HA18), Suir Catchment (HA16) and Lower Shannon & Mulkear Catchment (HA25D)) that intersect with the study area. These larger catchments are sub divided into sub-basins - each sub-basin represents one river body catchment. The study area is represented by 30 sub-basins (30 river / stream catchments). Table 3 above compares the study area with the wider regional data.

In general the study area reflects both the quality status and the risk status of the wider region. Therefore the baseline surface water quality is mostly 'Moderate – Good' and is reflective of the wider surface water quality in County Limerick. Of the 30 sub-basins there are 7 river sub-basins where Agriculture is listed as the main pressure (or partial pressure).

When the water quality of the sub-basins is expressed in relation to the individual townlands within the study area the water quality is as follows;

- 29% of townlands contain river sub-basins classed as 'Good'
- 17% of townlands contain river sub-basins classed as 'Moderate'
- 10% of townlands contain river sub-basins classed as 'Poor'
- 29% of townlands contain river sub-basins classed as 'Unassigned'

The 29% unassigned represent a gap in the EPA data. Therefore Ash Ecology and Environmental (AAE) took 30 additional Q samples in 2020 to reduce unassigned data. When this exercise was complete there were 45 Q-monitoring points relevant to the study area, 15 EPA points and 30 AAE points. The results for the 45 monitoring points combined were;

5% - High Quality
40% - Good Quality
42% - Moderate Quality
13% - Poor Quality

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Again, the results indicate mostly 'Moderate – Good' quality status in the study area.

Potential impacts on groundwater and surface water

The potential effects on groundwater include contamination with pig manure nutrients at the site of the pig farm and throughout the study area. Negative effects on groundwater are only likely where there is poor practise in the storage or application of pig manure. Run-off of nutrients from the site (via storm water) or from land-spreading could result in a slight adverse effect on surface water quality before mitigation. Deposition of NH_3 could affect surface waters.

Mitigation

A suite of standard construction mitigation measures is presented in Section 6.6 of Volume 2. These include controlling silt and sediment runoff, re fuelling in a bunded area on-site, avoiding having machinery that leaks oil or fuel on-site, and removing any contaminated soil to a licensed waste facility using a licensed waste contractor. During the operation phase mitigation measures to protect water quality at the site of the pig farm include on-going monitoring of ground and surface waters, bunding all over ground liquid and slurry storage tanks, monitoring installed leak detection facilities underneath slurry tanks, collecting the run-off from concreted pig manure off-take points,

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slatted pig walk-ways and carrying out a tank and pipeline assessment every 5 years, as per the EPA license requirements, to insure pig manure storage tanks are leak-proof.

During the operation phase measures to protect water quality during land-spreading include adherence to the regulations (contained in Appendix 2 of Volume 3). In addition the pig farm will insure that leaking slurry spreading equipment is not allowed on site. There is 50 weeks of slurry storage on site which insures that slurry can be stored long enough to avoid having to spread in unsuitable conditions and at sensitive times (e.g. at the shoulders of the season). The spreading of pig manure is monitored by DAFM to insure compliance with the regulations. The surface (storm) water quality and groundwater quality will be monitored as required by existing EPA license.

Residual and cumulative impacts

Pig manure has been spread in the study area for 40 years. Overall the baseline **groundwater** water quality in the study area is good. The water quality in public water supplies in Ballylanders, which is the closest the pig farm, has low NH_4-N (0.02mg/l), low NO_3-N (6mg/l) and E.coli = zero. This confirms EPA 'good' status of groundwater in this area. The pig manure replaces chemical fertiliser and therefore with adherence to the regulations there is no significant pre-mitigation residual impact on baseline ground water quality. The proposed water extraction rate of 48m^3 / day will not significantly affect aquifer where local well yields average 62m^3 / day and the pig farm well can supply 330m^3 / day.

Overall the baseline **surface water quality** is reflective of regional water quality and the operation of the proposed pig farm is not expected to adversely affect the existing water environment. Water quality in the upper Aherlow River is good and the status is not at risk. With the mitigation of adherence to SI 605 of 2017 (as amended), which means that pig manure is used to replace chemical fertiliser, land spreading will not significantly affect the baseline water quality.

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The nearest pig farm is located in Inchacoomb 2km south east of the 'Ballyfaskin' site. There are potential cumulative effects on surface waters such as the Aherlow River. However the water quality downstream from both of these piggeries is 'good' and the status is 'not at risk'. Therefore there are no significant **cumulative effects**. There are two EPA licensed pig farms in the Glen of Aherlow, further along the Aherlow River. The baseline water quality in the upper Aherlow is good, indicating that the 'Ballyfaskin' farm will not have an in-combination effect with these two piggeries.

Interactions with Water and Biodiversity, Material Assets and Major Accidents and Natural Disasters have been considered and are not significant.

7. AIR

Chapter 7 of the EIAR assesses the impacts from air emissions from the proposed pig farm development.

Receiving Air environment

The rural air quality in for the study area is rated as 'good' by the EPA Air Quality Index for Health (http://www.epa.ie/air/quality/). The sensitive receptors within the study area are agricultural land holdings, rural dwellings, commercial businesses, tourist services, settlements, public water sources, ecosystems (watercourses, rivers, woodlands/forests, clean air, habitats) and cultural heritage assets. These receptors are illustrated in Figures 3.1.1 – 3.1.5 of Volume 4.

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Predicted emissions to Air

The main gaseous emissions with potential impacts on receptors are; ammonia (NH_3), methane (CH_4), nitrous oxide (N_2O), dust, particulate matter (PM) and malodour. Other gaseous emissions which are released in very small concentrations include Sulphur Dioxide, Hydrogen Sulphide, Carbon Monoxide and Non-Methane Volatile Fatty Acids. Ammonia, methane, nitrous oxide and malodour are emitted from land-spreading and ammonia, methane, nitrous oxide, dust, PM and malodour are emitted from the pig houses.

Ammonia (NH_3)

The baseline ammonia deposition levels for the study area is approximately 21 kgs / ha / year of NH_3. Most of this is from agricultural sources. Ammonia is emitted from pig houses and land-spreading. With the proposed increase in sow numbers the total NH_3 levels will increase by approx. 6% before mitigation. However by introducing a 2% protein reduction in the growing pig diets the overall NH_3 emissions will reduce by approx. 11% compared to the existing 600 sow pig farm.

Ammonia can have a deleterious effect on human health and the Occupational Safety and Health Administration (OSHA) in the USA (ATSDR, 2004) have an 8 hours exposure concentration limit of 17,000 µg / m^3. The ambient air concentration measurements from the UK at sites near pig and poultry farms were 8.68 µg NH_3 / m^3. Without mitigation, there are no known significant effects on rural residents, businesses, cultural heritage assets or tourist services at these acceptably low levels. There are no significant effects before mitigation on water sources or ecosystems from land-spreading and no sensitive ecosystems are close enough to the pig buildings to be affected.

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Methane and Nitrous Oxide

These greenhouse gases are set to increase by 17% after mitigation (see Section 8 below). These emissions are not at levels directly harmful to human health.

Dust and other gaseous emissions

Most of the construction dust will be generated inside the pig houses, and externally, low levels dust emissions may occur where exposed soil is exposed to drying conditions. Generally without mitigation the impact from construction dust will not be significant. During the operational phase the dust generated within pig buildings may contain many types of particles which can be harmful to human health and contribute to malodour emissions. Along with dust particulate matter PM_{10} and $PM_{2.5}$ are sometimes found in emissions from pig buildings. However these are expected to dissipate to harmless levels within a few meters of the ventilation outlets.

Other gaseous emissions such as Sulphur Dioxide, Hydrogen Sulphide, Carbon Monoxide and Non-Methane Volatile Fatty Acids are released in very small concentrations from the surface of slurry. Outside of the pig confinement buildings the concentrations of these gases is miniscule.

Odour

Malodour substances are released from pig houses and at land-spreading. Odour nuisance from land-spreading is generally related to weather conditions, rates of application and proximity to

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sensitive receptors. Effects from land-spreading are generally dissipated within a few hours, are temporary and do not result in significant impacts.

The main source of odour at the pig farm is from the finisher pigs (22 odour units per pig) compared to the sows (19 odour units per pig). Therefore as illustrated in Table 7.4 of Volume 2 the proposed development will have a slightly lower output of odour units due to having less finisher places on the site – before mitigation. However with the mitigation of low protein diets the odour emissions will reduce by approx. 18%.

Mitigation

During construction a water tanker will be available to douse exposed soil during dry weather to minimise dust emissions. Construction workers will be equipped with the relevant personal protection equipment at all times (eye and ear protection and dust masks).

To mitigate emissions at land-spreading the pig farm will encourage spreading of pig manure early in the season and where possible will employ contractors who use band spreaders and / or trailing shoes. Through its discussions with customer farmers the pig farm will collaborate with them to insure that the requirements as specified in SI 605 of 2017 (as amended) are adhered to and setback distances around rural dwellings are also adhered to. Applying pig manure in adherence to the regulations means that chemical nitrogen will be replaced thus off-setting NH_3 and N_2O emissions from chemical fertiliser. The Department of Agriculture, Food and the Marine will monitor records of pig manure exports from pig farms and inspect farmers who use it to ensure that the land spreading of pig manure is in compliance with the Regulations. These records will also be available for inspection by the EPA who monitor operation of this facility.

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The low protein diet will reduce ammonia and odour emissions by 20% from the weaner and finisher pigs. These pigs account for approx. 80% of NH3 emissions on the farm and therefore the overall reduction is 16% of the before mitigated total. The result is an 11% reduction compared to existing pig farm. During the operational phase dust in the pig confinement buildings will be mitigated by using an automatic sealed wet feed system, which takes feed from sealed containers (silos) and distributes it via sealed pipes/augers to ad-lib feeders in the rooms, as per pig's natural requirements, reducing the dust levels and thereby also mitigating odour. The feed silos and augers are completely housed in the new mill building, thus confining dust. Pig houses will be adequately ventilated. The health and safety of workers is addressed in the safety statement of the pig farm which includes administrative controls to minimise the amount of time workers are exposed to dust, NH_3 and particulate matter and insures adequate cleaning of pig houses, safety and awareness training and the provision of personal protection equipment i.e. dust masks and eye and ear protection. Training will provide awareness of the dangers associated with agitation of slurry and particularly in relation to hydrogen sulphide and carbon monoxide gases. The ventilation system will efficiently ventilate the pig houses removing harmful concentrations of dust, particulate matter and toxic gases.

The pig farm commits to adhere to the current draft of the '*Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture*' *(November 2019)* as published by DAFM (and contained in Appendix 3 of Volume 3).

The mitigation measures for NH_3 emissions, i.e. low protein diet will reduce emissions of ammonia by 11%, and odour by approximately 18%, compared to the existing pig farm.

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Residual and cumulative impacts

The residual impacts from ammonia, methane and nitrous oxide emissions will not be significant. Odour will reduce significantly due to the proposed mitigation. The adverse effects from other gaseous emissions such as dust, particulate matter and other toxic slurry gases will be imperceptible outside of the pig houses. With adequate training and personal protection equipment the residual effects within the pig houses is not significant. There are no significant cumulative effects from other pig farms due to separation distance of 2km.

8. CLIMATE

Chapter 8 of the EIAR assesses the impacts from the proposed emissions on Climate and Air Quality. Ireland's climate obligations and Nation Policy on Climate Action in relation to carbon dioxide emissions, and Clean Air commitments (relating mainly to ammonia limits) are considered.

National Commitments

Ireland's Greenhouse Gas (GHG) emission reduction targets are a 20% reduction on 2005 levels for in 2020 and 30% below the 2005 levels by 2030. In order to achieve these binding targets the Government published the 'Climate Action Plan' in June 2019. The 2019 report recognises that there are no zero emissions options for agriculture and sets a target of 10 - 15% reduction in CO_2 emissions for agriculture in page 101 of the plan.

The National Emissions Ceilings (NEC) Directive entered into force on 31/12/2016. In Ireland the national ceiling for ammonia is 116 kilo tons. Under the NEC Directive Ireland has to adopt and implement a '*Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture*' – the current EU approved code of practice is available on the DAFM website (a copy of which is contained in Appendix 3 of Volume 3.

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Proposed emissions

The emissions of greenhouse gases (GHG) (methane and nitrous oxide) will increase by approx. 17%. Ammonia emissions will reduce by approx. 11%.

Mitigation measures

The most recent EPA Report (July 2020): *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* predicts that Ireland can and will meet its 2030 commitments by early adoption of a '*with additional measures scenario*' and a reduction of 12% in agricultural GHGs. The pig sector is responsible for approx. 2% of agricultural GHG emissions. Achieving the 12% reduction in agricultural emissions requires a focus on the main sectors responsible for GHG emissions, i.e. beef, dairy and sheep. The additional measures mentioned in Section 3.3 of the July 2020 report in relation to agriculture are;

- *nitrogen use efficiency;* This measure applies mainly to grass based agricultural enterprises and is not relevant to pig farming;
- *use of protected urea products;* This measure applies mainly to grass based agricultural enterprises and is not relevant to pig farming – however pig manure replaces and therefore reduces nitrogen usage;

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- *improved animal health;* This is very relevant to the pig farm. As verified by the recent EU 2020 Grand Prix award in relation to Health Management and the use of Slaughter Data Dashboard System to improve Pig Herd Health; this farm complies with the 'improved animal health' measure. Also, genetic improvements in the Irish sow herd since 2011[3] has seen the quantity of pig meat produced per sow has increase by 21% - this genetic improvement also leads to a reduction in greenhouse gases
- *extended grazing;* This measure applies mainly to grass based agricultural enterprises and is not relevant to pig farming;
- *reducing crude protein in pigs:* The pig farm commits to reduce the protein in the growing pig diet by 2%, thus complying with the additional measures targets;
- *low emission slurry spreading;* The pig farm commits to using only contractors who have low emission slurry spreading, where possible and
- *inclusion of clover in pasture swards;* This measure applies mainly to grass based agricultural enterprises and is not relevant to pig farming;

Mitigation measures to reduce GHG emissions during the operational phase involve implementing an Energy Management System and carrying out regular energy audits, turning off machinery and motors when not in use, using thermostatic controls on all heating and lighting systems, using automatic controls on the ventilation system to insure optimum efficiency, using night rate electricity where possible, using high U-value insulation materials, using low energy equipment and lighting (LED lights) with timers and continued investment in advanced genetics and improved management systems to achieve improvements in feed efficiency with resulting reductions of inputs and emissions.

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Good operational practise such as cleanliness and dryness will mitigate impacts from ammonia, dust and particulate matter emissions. Using an automatic wet feed system, which takes feed from sealed containers and distributes through sealed pipes/augers to the feeders in the rooms, reduces the dust and particulate matter levels. The pig farm will commit to adhering to *Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture* as published by the Department of Agriculture, Food and the Marine in November 2019.

Residual and cumulative impacts

Supplying the increasing demand for meat protein with pork produces 4 times less CO_2 emissions compared to beef or lamb (Section 8.8.1 of Volume 2) – therefore the proposed development is in line with the overall objectives of the national climate plan. The proposed CO_2 emissions represents <0.02% of the total national agricultural GHG emissions and therefore the residual impact is not significant. Furthermore, the most recent EPA greenhouse gas publication (July 2020): *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* predicts that Ireland can and will meet its 2030 commitments by early adoption of a '*with additional measures scenario'.* These additional measures focuses on the main GHG emitting sectors (dairy, beef, sheep) which is logical since the pig sector produces on 2% of the national agricultural GHGs. These additional measures specifically mention low protein diets for the pig sector, adoption of low emission slurry spreading, improved nitrogen use efficiency and improved heard health. The proposed development is compliant with all these measures and therefore in line with policy that will allow Ireland to meet its 2030 GHG commitments.

[3] Teagasc National Pig Herd Performance Report 2017

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Section 8.8.1 of Volume 2 shows that beyond 2030 commitments that it is possible to mitigate a further 19% of the annual CO_2 produced using alternative technologies such as solar panel energy, however, these mitigation options will require State incentives before they are viable.

Post mitigation total emissions of NH_3 will reduce by approx. 11% annually which is line with national commitments.

The cumulative Climate impacts of the nearest pig farm at Inchacoomb, which is 2 km south east of the 'Ballyfaskin' site, along with two EPA licensed pig farms in the Glen of Aherlow located 13km from the 'Ballyfaskin Pig Farm' site, are part of the national pig sector which contributes 2% of the national agricultural CO_2 emissions. Therefore cumulative impacts are considered not significant. Cattle GHGs emissions are considered and assessed as part of the baseline and therefore not considered a cumulative effect.

Agriculture contributes less than 1% to national SO_2 emissions, less than 2% carbon monoxide (CO), approx. 41% of the national non-methane volatile organic compounds (NMVOCs) emissions, 32% of the national PM_{10} production and 9% of the national $PM_{2.5}$ production in 2017. The pig sector is responsible for a tiny proportion of the total agricultural sector. Ireland is generally well below EU thresholds for these emissions. The existing air quality is rated as good by the EPA. Therefore residual impacts from these gaseous emissions is not significant.

GHG emissions to air has the potential for significant interactions with Human Population and Human Health and Biodiversity, however, having considered these interactions, there is no significant change in the assessed impacts.

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9. MATERIAL ASSETS

Chapter 9 of the EIAR assesses the impacts from the proposed development on material assets.

Existing material assets

The material assets identified in the vicinity of the study area are roads, public utilities and services (fifteen groundwater sources), 13 settlements, rural dwellings, commercial premises, farms, commercial forestry & woodland, tourism services, national monuments, structures listed on the National Inventory of Architectural Heritage and waste facilities.

The townlands within the study area are linked with a network of 125km of regional roads and approx. 250km of local roads. The study area is linked to Limerick City and Tipperary Town via the N24 and the M8 and N73 into Mitchelstown provide connections from the south. The traffic on the R662 at the pig farm entrance is approx. 923 movements per day. The existing pig farm contributes 14 movements and will increase to 16 during operational phase of the proposed development and an additional 6 movements during the 4 month construction phase.

Public utilities include two overhead transmission lines (110 kV and 220 kV) which cross the study area from the Mitchelstown area to Limerick City. These are illustrated in Figures 3.1.1 – 3.1.5 of Volume 4. There is a gas pipeline within 150m of the pig farm. There is a small windfarm 3.5km west of the pig farm. There are at least 15 public ground water sources located within the study area (as shown in Figures 6.41 – 6.4.2 of Volume 4). There are waste water treatment facilities in Bruff, Caherconlish, Emly and Knocklong, Hospital, Oola and Limerick junction.

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There is a range of small business within the 13 settlements and the rural areas in the vicinity of the study area. These include furniture manufacturing businesses in Ballylanders, a metal fabricator between Ballylanders and Spittle and two rurally based bakeries located 1.5km south and 2km south east from the pig farm. The Ballyhoura way passes within 2.2 kms of the pig farm (to the north) and there are guest houses within 2kms to the south.

The study area is rich in architectural and archaeological heritage with one national monument within 100m of the pig farm and 12 bridges within the study area listed on the National Inventory of Architectural Heritage.

Outside the study area there are potential impacts on waste facilities due to construction waste material produced during the construction phase and waste materials produced during the operational phase.

Potential impacts

The average daily traffic on the R662 road at the pig farm entrance will increase from 923 to 925 due to the proposed development. There will be a temporary increase of 6 movements per day experienced during the construction period which will last 4 months. Regional roads (125 km in total) and local roads (250 km in total) within the study area are in good condition and suitable for both agricultural traffic (tractors and slurry tankers) and heavy goods vehicles and the impact is not significant before mitigation.

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The pre-mitigation impact on water material assets is not significant – slight adverse where pig manure is not land-spread according to the relevant regulations.

Impacts on water services, transport/road services, gas lines, power services or nuisance from odour could potentially affect settlements, rural dwellings and businesses. The nearest settlement to the pig farm is Ballylanders, which although outside the study area, is approx. 2.8km north west of the pig farm. At this separation distance there is no impact from the pig houses and the potential pre mitigation impact from land spreading is not significant. There may be positive spin-offs from the capital investment involved in the development. Rural dwellers who share the road network with tractors and slurry tankers may be affected by this traffic. Without mitigation, there will be no significant impact on the road network either during construction or during the operational phase of the proposed development because the site is serviced by a regional road (R662) which has the capacity to accommodate the existing and proposed traffic. Rural dwellers may be affected by odour emissions from the pig farm. Without mitigation there will be no significant effect on the potential to develop private property in the study area as a result of the proposed development. The land around the pig farm is entirely in agricultural use without significant development potential. The proposed development will not involve the demolition of property. There will be no effect on tourist services such guest houses, Ballyhoura Way or the scenic routes on the R513 or R663. The proposed development will have a positive effect on the agricultural material assets through the provision of an organic renewable fertiliser to replace chemical fertiliser. There will be no effect on the forestry, woodlands or cultural heritage sites. The increased quantities of construction waste and operational waste (carcass wastes and sharps & veterinary waste) are considered to be not significant in the context of the capacity of receiving waste facilities to take this waste from the pig farm.

Mitigation

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To mitigate impacts on material assets construction waste materials will be segregated and recycled where possible. Building materials will be secured and covered on site to prevent weather damage. Haul distances will be minimised by selecting locally sourced materials where possible and materials will be ordered in bulk to minimise deliveries and resulting wear and tear on local road network. On site materials will be recycled where possible. Only licensed waste contractors will be used to remove waste and the pig farm will adopt a policy of waste reduction. Sediment control measures will be implemented as discussed in Section 6.6 of Volume 2 to protect surface waters. During the operational phase the impacts on material assets will be minimised by using low energy equipment and lighting with automatic controls and timing switches to reduce consumption of energy. Machinery will be turned off when not in use. In relation to the land-spreading and storage of pig manure there will be adherence to regulations Si 605 of 2017 (as amended) to maintain soil nutrient balance and protect water sources. Water usage will be minimised on the pig farm by maintaining water fixtures in good working order and maintaining a low water to feed ratio, thus minimising volume pig manure production and metering the private water supply. Low protein diets and an odour management plan will be implemented to minimise odour impacts.

Residual and cumulative impacts

The residual impacts are considered to be not significant with standard mitigation measures. Potential cumulative impacts on traffic, air emissions, noise, ground water sources, tourist services and agricultural land from the next nearest pig farm located in Inchacoomb (2km south east of the 'Ballyfaskin' site) are not significant. Cattle organic manures are considered and assessed as part of the baseline and therefore not considered a cumulative effect.

Material assets (particularly generated traffic and construction activity) has the potential for significant interactions with Human Population and Human Health and Cultural Heritage, however, having considered these interactions, there is no significant change in the assessed impacts.

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10 LANDSCAPE

Chapter 10 of the EIAR assesses the impacts from the proposed development on the landscape.

Existing landscape

In Section 7.3.4 of the Limerick County Development Plan the landscape around the pig farm is categorised as '*Landscape Area No 2 Ballyhoura / Slieve Reagh'*. The site is located in the lowland component of this landscape area, approx. 1.4km from the eastern boundary with the Galtee Uplands. This area is generally a farmed landscape but a range of hills provides an upland backdrop. The lower reaches of Ballyhoura are pastoral in character but this changes as altitude increases and the vegetation cover changes to commercial forestry interspersed with upland grassland and the remnants of peat bogs. The pig buildings are generally low profile, being less than 5m high, and clustered into a 2.6ha site. The most prominent feature the site is the mill house which is dark green colour and approx. 18m high.

Predicted impacts

There will be no impact from the construction of the electrical substation which will be approx. 3m high, 22m^2 and hidden behind a tall screening hedge. The refurbishment of the pig houses will not create a visual impact. Any potential impact arises from the existing pig houses, and in particular

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the mill. The following are some general views of the existing pig farm. There are no views of the pig farm from the scenic route on the R513



Plate 10: View at main entrance to pig farm on R662



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Plate 11: View from Ballyfauskeen Cross Roads looking north along R662 (Site of substation behind tree line)

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Plate 12: View from nearest neighbour west of cross roads



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Plate 13:View from the east near Curraghkilbran

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Plate 14: Views looking north west towards pig farm from near Paradise Hill



Plate 15: Views from farmyard south east of pig farm in Ballyfauskeen

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Plate 16: View of the Galtee Mountains from the back of the pig farm site

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Mitigation

There is natural mitigation due to tree lines around the pig farm. The western half of the site is surrounded by dense hedgerows 4-5m tall and is also screened by cattle sheds to the west of the site. Similarly hedgerows and tree lines to the north of the site screen the pig buildings. Against these dark green tree lines the dark green colour of the mill effectively mitigates any adverse visual impacts. Tall feed silos can be visually intrusive and containing these within the mill building also reduces visual impact. The design includes native species planting mitigation as specified in the Landscaping Plan in Appendix 8 of Volume 3. Around the south east boundary of the site there will be screening planting with hedgerow and native and indigenous trees, which will include alder, common birches, common oaks, mountain ash and willow species. Some pines are recommended for screening mill from east and south east views.

Residual and cumulative impacts

A range of vantage points and views are examined in Section 10.7 and Table 10.2 of Volume 2. Overall the significance of impact on Landscape is not significant because the landscape has the ability to absorb this development due to natural screening and the dark green colour of the mill. Also, the pig farm does not interfere with views of the Galtees, which are very high sensitivity. The proposed landscaping will further mitigate impacts. Cumulative impacts with a pig farm in Inchaccomb 2km south east of the 'Ballfaskin' site is assessed as not significant.

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11 CULTURAL HERITAGE

Chapter 11 of the EIAR assesses the impacts from the proposed pig farm development on the Cultural Heritage.

From examination of earlier maps it is apparent that there were at least two farms at the cross roads. None of these buildings are likely to predate the 18th or early 19th century. There are no known monuments within the development area, but there are a considerable number of known sites in the vicinity, the nearest of which is 100m east of the site boundary. The National Inventory of Architectural Heritage has no buildings of interest within 1km radius of the site

The likelihood of material of archaeological interest existing in the footprint of the proposed substation is small, but must be considered. Whilst the development will have no impact on known archaeological monuments, there is the small risk of a significant or profound impact on a currently unknown site (within the small footprint of the new building a prehistoric burial could be fully removed by groundworks).

The proposed **mitigation** is monitoring the removal of topsoil in the footprint of the proposed electricity substation by an experienced field archaeologist.

The desktop assessment indicates that the **residual and cumulative impacts** of the proposed works and earlier works on site is unknown but probably not significant.

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12. INTERACTIONS, CUMULATIVE EFFECTS AND TRANSBOUNDARY EFFECTS

Chapter 12 assesses the interaction (inter-relationship) between the various environmental factors. All environmental factors are inter-related to some extent, and the relationships can range from tenuous to inextricable. Table 12.2 of Volume 2 examines the potential for environmental factor interactions. The information in this table can be summarised as follows;

1. There are potential interactions between *Human Population and Human Health* and *Risk of Major Accident and Natural Disaster* if workers do not adhere to health and safety guidelines;
2. There are potential interactions between *Land and Soils* and *Human Population and Human Health* due to potential leaching of nutrients to groundwater and or run-off of nutrients and pathogens to surface waters;
3. There are potential interactions between *Land and Soils* and *Water* due to due to potential leaching of nutrients to groundwater and run-off of nutrients to surface waters;
4. There are potential interactions between *Land and Soils* and *Air* due to due to emissions at land-spreading and from emissions of malodour, ammonia and nitrous oxide;
5. There are potential interactions between *Land and Soils* and *Climate* due to due to emissions at land-spreading and from the land of methane, ammonia and nitrous oxide;
6. There are potential interactions between *Land and Soils* and *Material Assets* due to potential impacts on private and public water sources, impact on agricultural land nutrient status and impacts due to slurry spreading traffic from the proposed development;
7. There are potential interactions between *Water* and *Human Population and Human Health* due to the potential of the pig farm groundwater and surface water to contaminate other water sources and due to the increased extraction of groundwater;
8. There are potential interactions between *Water* and *Biodiversity* due to the potential of the pig farm groundwater and surface water to adversely impact on aquatic habitats;

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9. There are potential interactions between *Water* and *Material Assets* due to the potential of the pig farm groundwater and surface water to contaminate water supplies to residences and businesses;
10. There are potential interactions between *Water* with *Risk of Major Accidents / Natural Disasters* due to the potential for a slurry or fuel spill, a burst tank or contaminated storm water affecting adjoining land or wells;
11. There are potential interactions between *Air* with *Human Population and Human Health* due to the potential for air emissions (including dust and particulate matter) from land spreading and the pig houses affecting human health;
12. There are potential interactions between *Air* with *Biodiversity* due to the potential for ammonia or dust deposition to affect biodiversity and aquatic habitats;
13. There are potential interactions between *Air* with *Water* due to the potential for ammonia or dust deposition to affect water quality;
14. There are potential interactions between *Air* with *Climate* due to the potential for increasing greenhouse gases and other gaseous emissions to atmosphere such as (ammonia, dust, hydrogen sulphide, carbon monoxide, non-methane volatile fatty acids);
15. There are potential interactions between *Climate* with *Human Population and Human Health* due to the potential for increasing greenhouse gases and Global Warming;
16. There are potential interactions between *Climate* with *Biodiversity* due to the potential for increasing greenhouse gases and Global Warming;
17. There are potential Interactions between Material Assets with Human Population and *Human Health* due to the potential for additional construction and operational traffic and noise;
18. There are potential interactions between *Material Assets* with *Cultural Heritage* due to the potential for construction work and land spreading pig manure to damage archaeology;
19. There are potential interactions between *Landscape* with *Human Population and Human Health* due to the potential for spoiling views of local residents;
20. There are potential interactions between *Risk of Major Accidents* / *Natural Disasters* with *Human Population and Human Health* due to the potential impact on health from construction accidents, accidents relating to fumes from slurry, accidents relating to machinery on the pig farm, fires and environmental incidents such as fuel or pig manure spills;
21. There are potential interactions between *Risk of Major Accidents / Natural Disasters* with *Biodiversity* due to the potential for contamination of aquatic habitats as a result of a spill of pig manure or fuel on site;
22. There are potential interactions between *Risk of Major Accidents / Natural Disasters* with *Water* due to the potential for contamination of water as a result of a spill of pig manure or fuel on site; and
23. There are potential interactions *between Risk of Major Accidents / Natural Disasters* with *Material Assets* due to the potential impact on material assets from accidents, fires and environmental incidents such as fuel or pig manure spills.

These interactions have been assessed in the individual chapters of the EIAR and there are no additional impacts or required mitigation as a result of these potential interactions.

Cumulative impacts have been assessed in the individual chapters of the EIAR and there are no additional impacts or required mitigation as a result of the potential cumulative or in-combination impacts from other pig farms in the vicinity of the 'Ballyfaskin' Pig Farm development, such as Inchacoomb Pig Farm (2km south east of the proposed development) and two licensed facilities

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in the Glen of Aherlow. Within County Limerick pig manure organic Nitrogen (N) is 2 – 3% of the total organic N from all livestock, therefore, there are no significant cumulative/in-combination effects from pig and cattle manure.

Given the location of the proposed pig development and the extent of its zone of influence no transboundary impacts will arise.

13. SUMMARY OF RESIDUAL IMPACTS AND ENVIRONMENTAL COMMITMENTS (MITIGATION)

Chapter 13 summarises the residual impacts before and after mitigation in Table 13.1 of Volume 2 and provides a list of the mitigation commitments in Table 13.2 of Volume 2.

Human Population and Human Health

Before mitigation there are not significant impacts on farms due to the value of pig manure to the receiving farmers or impact of soil nutrients. Before mitigation there are potential slight adverse impacts on human population and health due to potential impacts on ecosystem services and water supplies from poor land-spreading practices. There is a potential slight adverse effect on construction workers and farm operatives from noise without mitigation. There is a slight to moderate adverse effect before mitigation on the health of farm operatives due to air emissions and potential spread of pathogens within the pig confinement buildings. There will be an economic benefit to the local and wider economy but these impacts are not significant. After standard mitigation these potential adverse impacts are not significant.

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To mitigate potential impacts it is proposed to provide health and safety training to construction workers, to control dust and noise during construction and provide workers with personal protection safety devices. Adjoining landowners will be notified in advance of commencement of construction. During the operational phase there will be adherence to the regulations as set out in Si 605 of 2017 (Nitrates Regulations) which will protect water sources. There is 50 weeks of slurry storage on site which insures that the pig manure can be spread in suitable conditions. Odour and ammonia emissions will be mitigated by the feeding of low protein diets, a high degree of cleanliness and implementing an odour management plan. The pig farm commits to move towards low emission spreading where possible. A rodent and pest control programme will be implemented. A noise management programme will be implemented at the pig farm. There will be health & safety training for workers to show how to minimise and manage risks to their health, how to prevent exposure to slurry gases and minimise effects from dust and particulate matter.

Water

There are potential slight adverse impacts on surface waters at the site of the pig farm and in the study area which are not significant after standard mitigation.

To mitigate potential impacts on surface water a suite of standard construction and demolition mitigation measures will be implemented including controlling silt and sediment runoff, re fuelling in a bunded area on site, avoiding having machinery that leaks oil or fuel on site, and removing any contaminated soil (e.g. after an accidental fuels spill) to a licensed waste facility using a licensed waste contractor. All construction wastes will be segregated for re-use or re cycling and land-fill. During the operation phase mitigation measures to protect water quality at the site of the

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pig farm include on-going monitoring of ground and surface waters, bunding all over ground liquid and slurry storage tanks, monitoring existing leak-proof facilities under concrete tanks, collecting the run-off from concreted pig manure off-take points and pig walk-ways to slurry tanks and carrying out a tank and pipeline assessment every 5 years as per the EPA license requirements to insure pig manure storage tanks are leak-proof. During the operation phase there is a legal framework (SI 605 of 2017 as amended (contained in Appendix 2 of Volume 3), which governs how pig manure is land-spread, and within this legal framework there are adequate protections to insure that pig manure is applied without adverse environmental effects. The waste water treatment system on site will be regularly inspected as per EPA license requirements to show that it is functioning properly. In addition the pig farm will monitor the slurry spreading equipment entering the site to insure it is not leaking. There will be 50 weeks of slurry storage on site which insures that slurry can be stored long enough to avoid having to spread in unsuitable conditions. The exports of pig manure will monitored by DAFM to insure compliance.

Air & Climate

Before mitigation there is a slight to moderate adverse impact on workers due to potential health effects from dust and particulate matter. There is the potential for periodic odours in the vicinity of the pig farm.

To mitigate potential impacts during construction a water tanker will be available to douse exposed soil to control dust emissions. Workers will be equipped with the relevant personal protection equipment at all times (eye and ear protection and dust masks). During the operational phase dust and particulate matter will be mitigated by using an automatic sealed wet feed system. Pig houses will be effectively ventilated. The health and safety of workers is addressed by health and safety training, provision of personal protection equipment and administrative controls to minimise the amount of time workers are exposed to dust, ammonia (NH_3) and particulate matter. There will be adequate cleaning of pig houses. The 2% reduction in the growing pig diets will effectively reduce the odour levels and NH_3 emissions by 18% and 11%.

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After mitigation the proposed development at Ballyfauskeen will result in an increase in greenhouse gases of 17% compared to the existing pig farm. This represents a negative but not significant impact. However, pork is four times more efficient from a carbon emissions point of view (5 kgs CO_2 eq. / kg) than beef or sheep meat. This has to be considered as an underlying cumulative effect and advantage that pork has from a climate change perspective. Also the pig farm by reducing NH3 emissions, improving pig health and genetics and using low emission slurry spreading is achieving the additional measures outlined in Section 3.3 of the July 2020 EPA Report: *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040.* This report predicts that Ireland can and will meet its 2030 commitments by early adoption of a '*with additional measures scenario*' and a reduction of 12% in agricultural GHGs, requiring the pig sector to reduce protein and improve health status. Therefore with mitigation the impacts on Climate are not significant.

Material Assets

Before mitigation there is a positive but not significant impact on farms due to the value of pig manure to the receiving farmers. There is the potential for pre mitigation slight adverse impacts on public water supplies as a result of poor land spreading practices. After standard mitigation this potential adverse effect is not significant.

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To mitigate potential impacts on public water supplies there is a suite of standard construction and operational mitigation measures as discussed under the heading 'Water' above

Landscape

Before mitigation there is a not significant impact on landscape because of the scale of the electrical substation and the screening effect of existing tree lines and buildings.

The impact on Landscape from the existing pig farm is not significant because the landscape has the ability to absorb the existing development due to natural screening, the dark green colour of the mill and the not significant impact on views of the Galtees. The mill mitigates the visual impact of feed silos by containing the silos within this building. There will be native species planting mitigation as specified in the planning drawings around the boundary of the proposed site and along the entrance road to screen visual effects.

Cultural Heritage

There are no known monuments on or beside the development site, but there is the possibility of early settlement or burial remains on site. The desktop assessment indicates the residual impact is unlikely to be significant, but archaeological monitoring is proposed to mitigate potential effects.

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VOLUME 2

Main EIAR Text

For 'BALLYFASKIN PIG FARM'

BALLYFAUSKEEN, BALLYLANDERS, CO LIMERICK



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In relation to the application for; "increased capacity of the piggery from 600 sows to 1000 sows and their progeny in addition to new electrical substation will be constructed. The development requires EPA Industrial Emissions License (formerly Integrated Pollution Prevention and Control License)".

Prepared by

Curtin Agricultural Consultants Ltd, 12 The Paddocks, Kells Road, Kilkenny

October 2020

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Signed by;

Dated ; 12/10/2020



curtinagriculturalconsultant.com

EIAR VOLUME 2 CHAPTERS

- Chapter 1: Introduction and description of existing pig farm and proposed development, National and Local Policy and Planning, Need, Risks from Major Accidents and Natural Disasters, The Study Area;
- Chapter 2: Alternatives;
- Chapter 3: Human Population and Human Health;
- Chapter 4: Biodiversity;
- Chapter 5: Land and Soils;
- Chapter 6: Water;
- Chapter 7: Air;
- Chapter 8: Climate;
- Chapter 9: Material Assets;
- Chapter 10: Landscape (and visual);
- Chapter 11: Cultural Heritage (Archaeology);
- Chapter 12: Interactions, Cumulative Effects and Transboundary Effects;
- Chapter 13: Summary of Residual Impacts and Environmental Commitments (Mitigation)

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CHAPTER 1 - INTRODUCTION

Section 1.1 Introduction introduces the proposed development, sets out the structure of the EIAR, the relevant guidance followed and the environmental team involved. **Section 1.2** describes the local receiving environment and the existing pig farm, its operational history, existing structures, existing traffic levels and existing noise levels. **Section 1.3** describes the proposed development, the operational changes envisaged and changes in environmental emissions (e.g. noise, traffic, storm water and fugitive air emissions). **Section 1.4** discusses relevant National and local policy in relation to the proposed development. **Section 1.5** discusses the **Need** for the project. **Section 1.6** sets out the risks and responses to **Major Accidents and Natural Disasters** such as accidents, flooding and environmental incidents. **Section 1.7** discusses difficulties encountered in compiling the required information. **Section 1.8** describes the study area. **Section 1.9** contains photographs of the existing site. **Section 1.10** contains references for the chapter.

1.1 INTRODUCTION

A planning application was lodged on 20th November 2019 Ref No 191135 by 'Ballyfaskin' Enterprises Ltd to increase the capacity of the piggery from 600 sows to 1000 sows and their progeny in addition to the construction of a new electrical substation at Ballyfauskeen (also spelt Ballyfaskin[1]), Ballylanders, Co Limerick (V35KV12) – national grid reference **E**578,948, **N**623,425. The application was accompanied by an Environmental Impact Assessment Report (EIAR) and Appropriate Assessment (AA). Following a request for Further Information, Curtin Agricultural Consultants Ltd were requested by 'Ballyfaskin' Enterprises Ltd to submit a revised EIAR, AA and Natura Impact Statement to address issues highlighted in the Further Information Request. The existing pig enterprise has an EPA license Ref No P0915-01.

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In this planning application the only new building to be constructed will be a small electrical sub-station (22m^2). The proposed electrical sub-station is to allow the up-grading of the electricity supply to the site to enable the full operation of the feed mill. The application also proposes reconfiguring the pig herd; increasing the sow numbers from 600 to 1,000 and decreasing the number of finishers on-site to accommodate the extra sows. This will be accomplished by internal refurbishment and will not require any new construction.

The proposed development exceeds the thresholds as set out in Schedule 5[2] of the 2001 planning Act as amended and therefore an EIAR was submitted with the planning application on 20th November 2019.

The contents of the EIAR is set out in the Table of Contents. Volume 1 is the Non-Technical Summary. Volume 2 is the main body of the report – Environmental Impact Assessment Report. Volume 3 of the EIAR contains the appendices attached to the EIAR. Volume 4 contains the figures relating to the proposed development.

For guidance on content of this EIAR reference is made to;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in Environmental Impact Assessment Reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and

[1] Ballyfauskeen is used in this EIAR when referring to the geographical location – 'Ballyfaskin' is used when referring to the pig farm itself which is owned by 'Ballyfaskin' Enterprises Ltd
[2] The exceedance of 3,000 production pig places requires and EIAR

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- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

Table 1.1: Chapters of the EIAR - Responsibility and Competency for Chapter

Chapter Title	Responsibility and Competency for Chapter
1. Introduction 1.1. Introduction to the EIAR 1.2. Description of existing pig farm 1.3. Description of proposed development 1.4. National and local policy and planning 1.5. Need 1.6. Risk from Major Accidents and Natural Disasters 1.7. Study area 1.8. Photographs of the existing pig farm	Curtin Agricultural Consultants Ltd (CAC Ltd) has responsibility for this chapter with reference to Noise Impact Assessment Report (Appendix 1) by Panther Environmental Solutions Ltd. CAC Ltd has completed planning permission applications for large scale pig developments (500 – 2000 sows) in Counties Tipperary, Cork and Kilkenny and has coordinated and completed Environmental Impact Statements for these developments. CAC Ltd have made 9 IPPC applications for large scale piggeries and are familiar with the principles and processes of pig production and the environmental impacts. Panther Environmental Solutions Ltd have experience in noise and odour assessments in pig farms and waste treatment plants throughout Ireland. CAC ltd is familiar with noise and traffic effects and National and Local policy in relation to agriculture and pig farming.
2. Alternatives Considered	Curtin Agricultural Consultants Ltd (CAC Ltd) has responsibility for this chapter. CAC Ltd has completed planning permission applications for large scale pig developments and advises exiting pig farms on compliance issues in relation to IPPC licenses. CAC Ltd is familiar with the alternative technologies as out lined in BAT 2017 and conclusions of same report. CAC Ltd is a Teagasc ConnecTED client and keeps up to date with Teagasc research on pig farming and pig emissions.
3. Human Population and Human Health	Curtin Agricultural Consultants Ltd (CAC Ltd) has responsibility for this chapter. CAC ltd is familiar with the CSO information sources for Human Population and is familiar with the human health issue in relations to emissions related to organic manures and pig confinement buildings. CAC Ltd offers health and safety advice to farmer clients in compliance with TAMS Scheme. CAC Ltd in its involvement with planning applications is familiar with the issues that affect local populations.
4. Biodiversity	ASH Ecology & Environmental is responsible for this chapter. Aisling Walsh is a full member of the Chartered Institute of Ecological & Environmental Management (CIEEM) and her qualifications include MSc in Biodiversity and Conservation (TCD) and B.Sc. (Hons) Zoology (NUIG). Aisling has over 10 years of experience providing environmental consultancy and environmental impact assessment services.
5. Land and Soils	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this chapter. CAC Ltd has a wealth of experience in nutrient management planning and advising farmers on fertilizer application. CAC Ltd is familiar with the soils and subsoils of Ireland, the legislation relating to the application of organic manures.
6. Water	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for the ground water assessment and ASH Ecology & Environmental (AAE) is responsible for the surface water assessment. CAC Ltd is familiar with the interaction with Land, Soils and Water and how the application of agricultural manures can impact on ground

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Chapter Title	Responsibility and Competency for Chapter
	waters. DAFM regularly provide training on groundwater issues for FAS advisers. CAC Ltd has carried land suitability assessment for 4 large scale EPA licensed piggeries which involved depth of soil augering to verify land cover. Con Curtin has a Level 6 Certificate in Land Drainage. CAC Ltd is familiar with the concepts of aquifer status, vulnerability and how these represent risks to groundwater in relation to land-spreading. AAE carried out Q-tests on 30 samples throughout the study area and assessed available EPA data. AAE is experienced in assessing the impact on water quality and the interaction of water quality with Biodiversity.
7. Air	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this Chapter. CAC Ltd has competency in relation to air emissions from piggeries, their thresholds, potential mitigation and abatement and the relevant legislation. CAC Ltd liaises with the EPA in relation to odour emissions from pig farmer clients and approaches to odour abatement. CAC Ltd has submitted several odour management plans to EPA written to Guidance - AG9.
8. Climate	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this Chapter. CAC Ltd has competency in relation to air emissions from piggeries, potential mitigation and abatement, the relevant legislation and in particular Ireland's 'Climate Change' and 'Clean Air (National Emissions Ceilings)' commitments. CAC Ltd has carried out Carbon Navigators for its beef and dairy clients. CAC Ltd is acutely aware of Ireland's GHG commitments and the abatement technologies proposed by Teagasc and others.
9. Material Assets	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this Chapter. CAC Ltd is competent in relation to agricultural material assets and non-agricultural material assets. CAC Ltd is competent in the knowledge of how operating piggeries operate within the local environment and potential impact on raw materials and material assets.
10. Landscape	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this Chapter. CAC Ltd has carried out several planning applications for cattle farmers as well as pig farms and is familiar with the regulations and visual impacts that apply to agricultural developments. CAC Ltd are competent to determine impacts on landscape from agricultural developments
11. Cultural Heritage	Dave Pollock is responsible for this Chapter. Dave is an experience Archaeologist with competency in archaeological and cultural heritage issues.
12. Interactions, Cumulative Effects and Transboundary Effects	Curtin Agricultural Consultants Ltd (CAC Ltd) is responsible for this Chapter. CAC Ltd has been involved in more than 15 large scale EAIRs for road and overhead line projects, working with teams of specialists, and is familiar with the interactions involved in large scale developments
13. Summary of Impacts and Schedule of Commitments (Mitigation)	Curtin Agricultural Consultants Ltd is (CAC Ltd) responsible for this Chapter.

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1.1.1 Environmental Team involved in EIAR

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Con Curtin, (Curtin Agricultural Consultants Ltd, 12 The Paddocks, Kells Road, Kilkenny – curtinagriculturalconsultants.com) has a bachelor's degree in Agricultural Science (UCD 1987). He has a level 6 Certificate in Land Drainage. He is an Agricultural Scientist and Consultant with 32 years of experience in consultancy and set up his own company – Curtin Agricultural Consultants Ltd - in October 1996. As well as providing general agricultural consultancy services to farmers, the company provides environmental services and expertise to pig farmers in relation to IPPC Licenses and Planning Applications. Con has applied for Integrated Pollution Control (IPPC) Licenses for 10 pig farms and he advises on maintenance of licenses and liaises with the EPA on behalf of pig farmers. He has completed planning permission applications for large scale pig developments (500 – 2000 sows) in Counties Tipperary, Cork and Kilkenny and has coordinated and completed Environmental Impact Statements for these developments.

Con has a full understanding of the pig farm production process and how it relates to human impacts, water quality, air quality, climate, material assets and visual/landscape impacts. He has carried out several land suitability assessments, formerly required for IPC License Applications, and has a full understanding of the categorization of risk to groundwater in relation to the land-spreading of organic wastes and also has a full understanding of the regulations which relate to the land-spreading of agricultural organic manures. He has full understanding of the emissions to Air and the relevant national policy in relation to these. He regularly responds to the EPA in relation to odour issues on behalf of licensed pig farm clients and is familiar with potential odour control measures. Con is familiar with the Best Available Technologies that are available to pig farms as per BAT 2017, Intensive Rearing of Pigs and Poultry. He has a full understanding of the various issues that are likely to be raised during the planning process for a pig farm and has extensive knowledge of impacts and mitigation measures required.

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Ash Ecology & Environmental Ltd (AEE), Monine, Kilfinane, Co Limerick. The Biodiversity Chapter of the EIAR has been prepared by Ash Ecology & Environmental Ltd (AEE) whose managing director and leading ecologist is Aisling Walsh, who is a full member of the Chartered Institute of Ecological & Environmental Management (CIEEM) and whose qualifications include MSc in Biodiversity and Conservation (TCD) and B.Sc. (Hons) Zoology (NUIG). Aisling has over 10 years of experience providing environmental consultancy and environmental assessment services. Aisling has written numerous Ecological Impact Assessments (EcIA), Screening for Appropriate Assessment Stage I and Stage II Natura Impact Statement, Environmental Impact Assessments/Statements, Badger Surveys, Bat Surveys and Habitat Surveys. She has also provided input and reviewed Ecological and Environmental assessments for numerous EIS and EIARs and carried out ecological surveys for a range of projects including one-off houses, industrial developments, pipelines, quarries, agricultural units (pig farms in Counties Waterford, Tipperary and Cork).

Seamus Lynch is a Planning & Design Consultant with 20 years of experience. He has worked on many agricultural planning applications including pig farm developments. Seamus has provided technical advice on engineering matters.

Panther Environmental Solutions Ltd is an environmental consultancy firm who provide expert environmental advice to the Food Manufacturing and Planning Industry. They have a wealth of experience in carrying out noise and odour assessments for Waste Water Treatment facilities and intensive agriculture facilities.

Dave Pollock – Archaeologist, Archaeografix, Knockrower Road, Stradbally, Co Waterford is a firm of Archaeologists who are on the list of eligible archaeologists for excavation licenses (issued by National Monument Services). Dave has carried out several commissions for the National Monument Service and Local Authorities over the past 20 years and has carried out archaeological assessments for pig farm developments in Counties Waterford and Cork.

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1.2 DESCRIPTION OF EXISTING PIG FARM AT BALLYFAUSKEEN

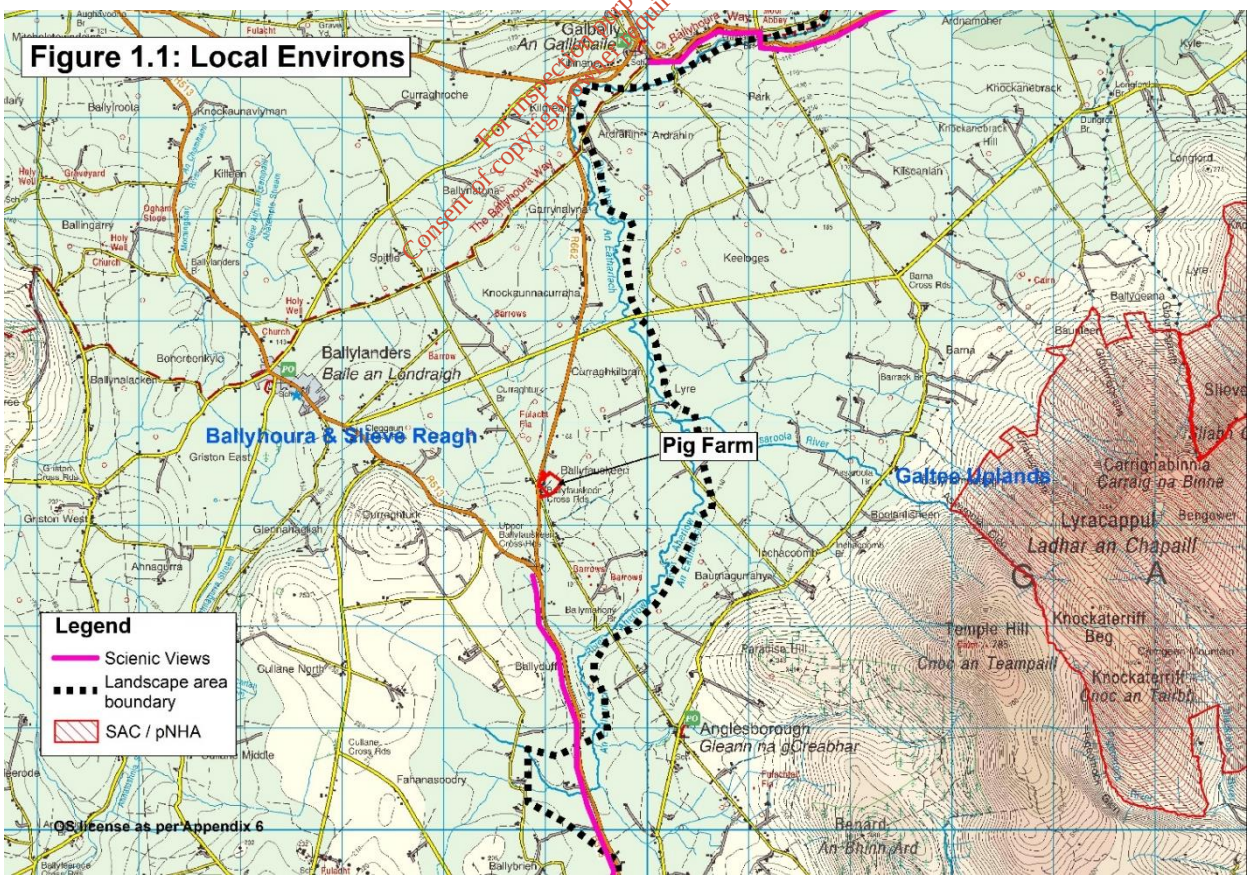
1.2.1 Local Environs

The study area for this EIAR is defined as the 48 townlands in which the pig development is being constructed and pig manure is being delivered. The locations of the townlands in the study area is illustrated in Figure 1.9 and Table 1.9.

The site consisting of approx. 2.6 hectares is situated in County Limerick, in Ballyfauskeen townland (**E**578,948, **N**623,425) (V35KV12) and is located 2.8km south east of Ballylanders, 4.1kms south of Galbally and 2.6kms north west of Anglesborough as illustrated in Figure 1.1. The entrance to the site is off the 'Strategic'[3] Regional Road R662 and approx. 130m north of 'Ballyfauskeen Cross Roads'. The elevation of the site is approximately 170 meters above sea level and the direct environs is generally flat to undulating topography. The pig farm is located in the *Ballyhoura/ Slieve Reagh* Landscape area[4]. The boundary between this landscape area and the *Galtee Uplands* to the east is located along the Aherlow River – 1.4km east of the pig farm site. The Galtee Mountains are located 2.5km to the east and south east and eastern fringe of the Ballyhoura Mountains is located approx. 5kms to the west. The surrounding lands are entirely grassland interspersed with once off dwellings, farmsteads, forestry and settlements; typical of rural County Limerick.

The soil type in the western part of the site is Ballylanders (1100e) (as described in Section 5.3.3 and Figures 5.1.1 – 5.1.2 of this EIAR); a free draining, fine loamy, brown earth – a deep well drained soil derived from acid parent material. In the eastern part of the site the soil type is Puckane (0660c) is a heavy coarse loamy, humic gley – a moderately well drained soil derived from acid parent material.

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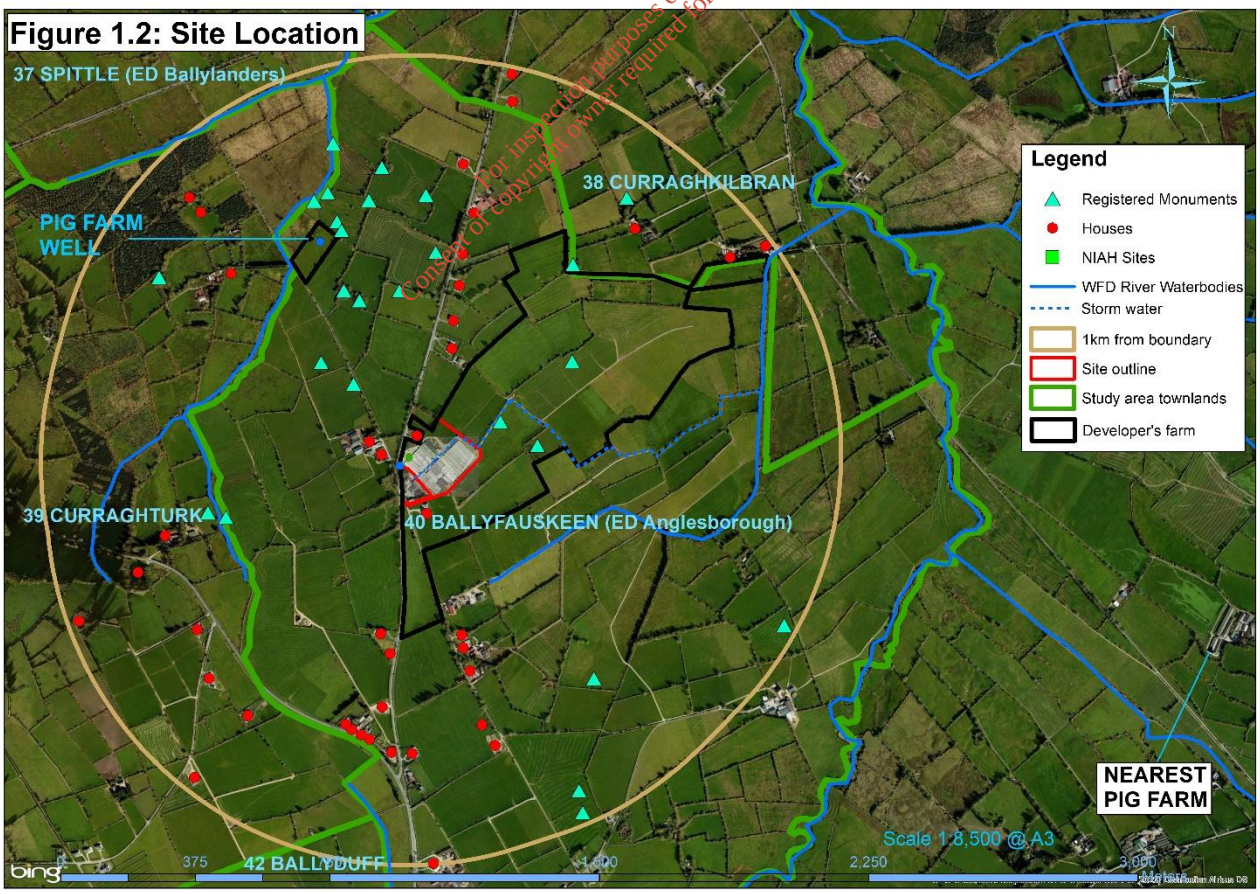
[3] Map 8.4 of the Limerick Co Co County Development Plan 2010 – 2016 (as extended)
[4] Map 7.4 of the Limerick Co Co County Development Plan 2010 – 2016 (as extended)

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The nearest Natura Site is located 3.8 kms east of the site boundary i.e. Galtee Mountains Special Area of Conservation (SAC) and proposed Natural Heritage Area (pNHA) (000646). The nearest national monument, an enclosure, is located 100m north east of the site boundary (LI049-198) and there are 25 other monuments (26 in total) within 1 km of the site boundary. There are two bridges which are on the National Inventory of Architectural Heritage located 1.5km SE and 1.6km NE of the site boundary. These sites are further discussed in Chapter 11 – Cultural Heritage.

The Aherlow River (EPA Code 16A01) flows north towards Galbally village before veering east towards the Glen of Aherlow and Cahir. The main storm water drainage from the site runs directly north east via open drainage ditch. This ditch links with a watercourse/stream approx. 800m east of the site. This stream flows into the Aherlow approx. 1.4km east of the site. A smaller storm water outlet diverts run-off from local road at the site of the electrical substation. There are tributary streams to the Aherlow River 570m and 480m south east and north west of the pig farm. The potential effects are assessed in Chapter 6 - Water. The site is located on *Broad Haven Rock Formation* (BN - see Figure 6.2.2 and Table 6.3) which is categorised as a locally important aquifer. Groundwater vulnerability at the site is 'medium' (Section 6.3.1.2). There is a domestic well supply in the farm yard just west of house 13 at the roadside (Figure1.4). This services the two family dwellings. The pig farm is serviced by a ground water supply located in Ballyfauskeen approx. 0.67km north west of the site as shown in Figure 1.2. This field is owned by the developer and the supply is piped along the roadside to the pig farm. This groundwater supply has a capacity of 14m^3 per hour (336m^3 / day). There is one mass concrete 73m^3 waste water collection tank (Ref No 21, Figure 1.3) located north of the office and staff facilities building. This collects the 0.36m^3 per day of waste water arising from the 6 employees. This has a capacity for 200 days. It is regularly de-sludged by a licensed operator.

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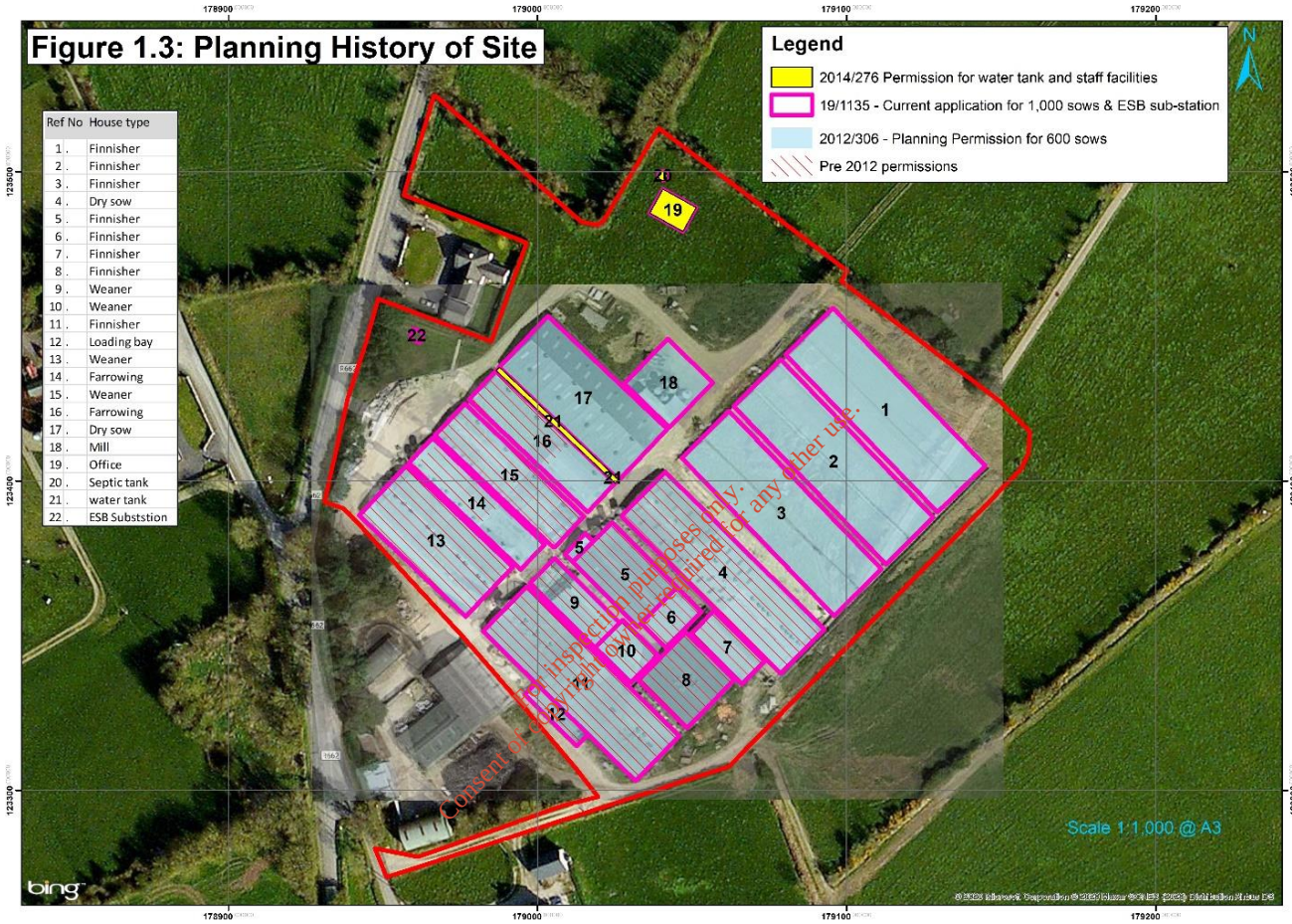
The owner has a dairy enterprise which adjoins the western boundary of the site. There are 40 dwellings within 1 km of the site boundary. The owner's family own the two nearest dwellings at 22m to the north and 45m to the south of the nearest pig houses. The next nearest dwellings are 60m and

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100m to the west, 195m and 270m to the north and 390m and 400m to the south (as illustrated in Figure 1.2). There is a pig farm 2km to the east (ESE) in Inchacoomb. This piggery is below EPA license threshold as it does not appear on EPA maps.ie. This piggery is considered throughout EIAR in the assessment of cumulative impacts.

1.2.2 Operational details of existing pig farm

The existing pig farm buildings on the 'Ballyfaskin Pig Farm' site date back as far the 1970s. Since 2006 permission there have been seven planning applications, including the existing application, which are related to this site;



1. 2006/3801 – Construction of a new loose house to comply with new welfare regulations, adjacent to existing farm;
2. 2007/2101 - The construction of a new store, cover existing open pig manure storage tank with a house for hospital pens, replace 4 No, existing pig houses with new modern design buildings, and construct a covered geomembrane lined pig manure storage basis adjacent to the pig farm. Planning permission granted;
3. 2009/588 – Extension of farrowing house D and replace existing farrowing house E and associated site works. Planning permission granted;
4. 10/234 – The construction of a mill House, dry sow house, extension to farrowing house D, replacing existing farrowing house E, and associated site works for animal welfare purposes. Planning application withdrawn;
5. 2012/306 - The expansion of the existing integrated sow unit to 600 sows. The development proposes to construct a new loose welfare friendly dry sow house Mo 3., Fattening houses, a new farrowing house, a feed mill, new site entrance including access road, and associated site works. The development proposes to replace two existing farrowing houses, an existing fattening house and a gilt house. Planning permission granted;

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6. 2014/276 - Construction of a single story staff facilities building which will be ancillary to the operation of existing pig production unit, including all associated works & services and construction of an underground rainwater harvesting tank with associated above ground pump house. Planning permission granted; and
7. 2019/1135 – (This is the current planning application for which this EIAR relates) – for increased capacity of the piggery from 600 sows to 1000 sows and their progeny in addition a new electrical substation will be constructed. Planning application is under consideration.

Buildings No 1 – 21 are in-situ at the time of application 2019/1135. Most of the existing buildings relate to the 2012 planning application (blue legend), except for the staff facilities, water tank and pump house (2014/276 – yellow legend). Figure 1.1 shows a schematic of the various planning permissions as they relate to the existing and proposed development. The hatch design represents pre 2012 planning application – which is prior to the existing 600 sow unit. Approx. 7,340m^2 pre-existed the 600 sow development. The only new structure required for the proposed development / existing planning application is structure No 22 – electrical substation.

1.2.3 Details of existing buildings / list of structures

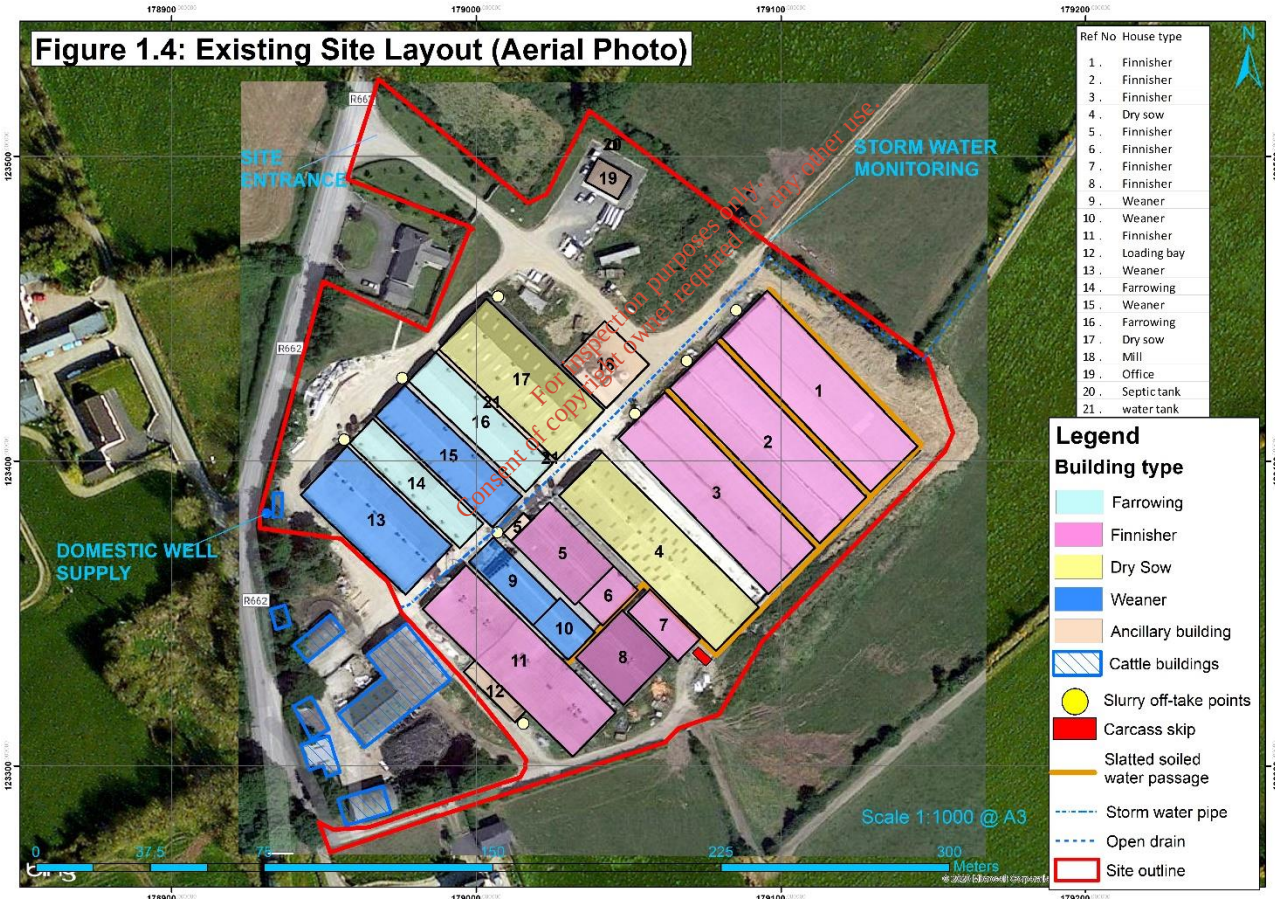


Table 1.2: Existing Structure List at the 'Ballyfaskin' Site

Ref No	Description	Length (m)	Width (m)	Height (m)	Area (m^2)	Depth of tank (m)	Slurry storage* (m^3)
1	Finisher house	71.7	21.3	5.1	1527	1.8	2077
2	Finisher house	71.7	21.3	5.1	1527	1.8	2077
3	Finisher house	71.7	21.3	5.1	1527	1.8	2077
4	Dry sow house +	71.7	21.3	5.2	1527	1.8	2077

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Ref No	Description	Length (m)	Width (m)	Height (m)	Area (m^2)	Depth of tank (m)	Slurry storage* (m^3)
5	Finisher house +	29.3	17.8	4.3	522	1.2	443
6	Finisher house +	11.4	16.4	4.3	187	1.2	159
7	Finisher house +	23.6	10.4	4.3	245	1.8	334
8	Finisher house +	21.7	21.5	4.3	467	1.8	635
9	Weaner house +	30.2	11.1	4	335	1.2	285
10	Weaner house +	15.5	12.6	4	195	1.2	166
11	Finisher House +	69.5	20	5	1390	1.8	1890
12	Loading bay +	23	4.6	-	106	-	
13	Weaner house	48.8	21.9	4	1069	1.2	908
14	Farrowing house + +	51.3	11	3.5	564	1.2	480
15	Weaner house	52.8	12.8	3.5	676	1.2	575
16	Farrowing house+ +	52.8	12.8	4	676	1.2	575
17	Dry sow house	52.8	22.5	5	1188	1.8	1616
18	Mill Building	20	20	18.3	400	-	-
19	Office and staff facilities	11	10	5	110	-	-
20	Septic tank	-	-	-	73m^3	-	-
21	Water Harvesting tank and pump house	1.8	52.8	-	110	1.8	-
		Totals =>			**14,238**		**17,336**

+ In-situ before 2012 + + Partially in-situ before 2012
* 200mm freeboard allowed and 10% reduction allowed for internal walls

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Figure 1.4 shows the existing site layout and Table 1.2 provides a list of the existing buildings and slurry storage. A more detailed site layout plan and detailed design drawings (Appendix 9) are provided in Volume 3 of the EIAR. Figures 1.2, 1.3 and 1.4 are printed at A3 size in Volume 4 of this EIAR. The existing 600 sow development involved increasing the pre-existing area of approx. 7,340m^2 to approx. 14,238m^2 of housing/structures – an increase of 6,900m^2.

The existing pig houses are primarily block wall with insulated core construction above ground level and mass concrete below ground level. The roofs are constructed of hygienic plastic panels on the inside and coated metal sheeting (with insulation underneath) on the outside supported on timber rafters and purlins. The pig houses are generally 4.5 – 5.3 meters high. The height to eave of roof is generally 2.5 meters – or less. The existing slurry tanks, under the pig houses, are constructed of mass concrete and plastered concrete block and are 1.2m – 1.8m deep. The mill house building is 18m high and 20m x 20m in area. It is a concrete plastered wall finish to 2.4m and clad in dark green coated sheeting above this. The existing pig buildings have grey coloured roofs. The area of the entire site is approximately 2.6 hectares, most of which is comprised hard-standing surfaces - generating approx. 32,600m^3 of storm water run-off each year. The roof water from sheds is piped to water tank 21 before being discharged. This water is used for power washing and there is a small pump room at the southern end of this tank.

In addition to the loading ramp No 12 (106m^2), soiled water is generated on uncovered pig passages to the NE of houses 1, 2 and 3, along the eastern side of the piggery from houses 1 to 7, between house 4 and 7 and between houses 7 & 8 and 6 & 10. These are approx. 385m long and 1.5m wide = 683.5m^2 and rainfall is 1.456[5]m for the 52 week period. Therefore 995m^3 of soiled water is collected in slurry tanks under these slatted passages. The slatted passages between houses 13 – 17 are covered. The once weekly movement of sows between houses 1 – 11 and houses 13 – 17 is limited

[5] Met Eireann Rainfall Grid data for 179000, 123000

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to a few minutes across the concrete yard which is then brushed down and cleaned manually to remove any contaminants. A transport box and fork-lift is used for the once weekly movement of weaners between houses 1 – 11 and houses 13 – 17.

1.2.4 Existing 600 sow and progeny system

The current piggery has an EPA license for 600 sows and progeny. The housing has been designed to accommodate finisher pigs up to 135kg finishing weight. This heavy weight is required under a specialized premium contract that 'Ballyfaskin' Enterprises Ltd had up until recently with a Northern Ireland Supplier for a major UK supermarket outlet. Compared to a standard system where finisher pigs are brought to approx. 100kgs after spending approx. 10 weeks in the finisher accommodation, these heavier pigs, with a slightly lower food conversion rate, will spend approx. 16-17 weeks in finisher accommodation and therefore extra finisher space is required compared to a standard 600 sow unit finishing progeny at 105kgs. The 600 sows produce approx. 27 pigs per sow .i.e.16,200 pigs per annum; with 3.1 batches per annum (16.8 weeks per batch); therefore 5236 finisher places are required for the current system. Current pig numbers and slurry production is shown in Table 1.3.

Table 1.3: Number of pigs in existing 600 sow herd and slurry produced

sows	600
Gilts	100
Boars	3
Pigs produced per annum	16,200
Weaners places	2500
Finisher places (3.1 batches)	5236
Finisher growth rate	0.85kgs/day
Weeks per batch	16.8
Breeding unit manure production (m^3 / sow / week)	0.174[6]
Finishing unit manure production (m^3 / finisher / week)	0.034[5]
Total manure produced from breeding unit (m^3)	5,429
Total manure produced from finisher unit (m^3)	9,257
Total (m^3) =>	14,686
Soiled water stored in slurry tanks=>	995
Total (m^3) =>	**15,681**

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There is slurry storage for approx. 17,000m^3 (Table 1.2), equivalent to approx. 52 weeks.

The existing 600 breeding sows will consume approx. 5,960tons of feed calculated as follows;

- 600 sows @ 1.32 tons;
- 16,200 weaners @ 0.057 tons / hd
- 16,200 finisher pigs at @ 0.262tons / hd (finished weight of 135kgs)

Allowing for a feed to water ration of approx. 2.6:1 water consumption is estimated at 15,500m^3 per annum.

1.2.5 Traffic to and from the existing pig farm

[6] Table 1 of schedule 2 of SI 605 of 2017

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The traffic to the pig farm consists of employee's vehicles, service and maintenance vehicles, feed delivery heavy goods vehicles (HGVs), livestock transport HGVs and tractors with slurry tankers. The existing 600 sow pig farm has approx. 14 traffic movements per day estimated as follows;

1. Employees – 7.4 journeys / day; There are five employees (including the owner) on the existing 600 sow unit. These come in four cars Monday to Friday – eight journeys. On Saturdays and Sundays there will be three employees attending the site – 6 journeys. Therefore weekly total = 52 journeys
2. Feed delivery – approx. 1.6 / day. Feed deliveries generally arrive on 4 days from Monday – Friday, and may arrive on a Saturday during bank holiday weekends. There are 5 - 6 deliveries per week (11-12 journeys). The compartmentalized feed lorry generally arrives between 0900 – 1000 and the average load is approx. 20t of compound mix.
3. Livestock transport – 0.5 / day. Approx. 16,200 finishers are produced each year. These are transported weekly in lorries with a capacity for 160-180 finished pigs 95 loads per year (190 journeys).
4. Service vans – 0.3 / day based on two per week.
5. Slurry tankers[7] - 3.7 journeys per day. 15,681m^3 of pig manure is removed from the site in 640 loads (1280 journeys) per annum. The peak will occur from March – June (inclusive) when there may be up to 30 journeys on a busy day.
6. Carcass and waste removal – 0.15 / day.
7. Miscellaneous – 0.5 journeys per day

The normal working hours are 0700 – 1600 hours Monday to Friday and 0700 – 1100 hours on Saturday to Sunday. Assuming no slurry tankers during the winter period the average slurry tanker movements during the summer will be 7 (double). Therefore the summer traffic will be approx. 16.5 per day and the winter traffic will be approx. 9.5. Generally, traffic movements will peak between 0700 and 1000 with approx. 4 - 5 traffic movements and between 1500 and 1600 with 3 – 4 traffic movements. A traffic survey was conducted by pig farm staff on September 1st and 4th 2020. The results are presented in Table 1.4.

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Table 1.4 Results of Traffic Survey at 'Ballyfaskin' Pig Farm Entrance

Hours	Actual Traffic Count	Expansion Factors	Adjusted for Weekly Traffic Index	Adjusted for Monthly Traffic Index	Annual Average Daily Traffic (AADT)
0800 – 0900*	98	0.084	0.99	1.07	1101
0900 – 1000*	58	0.065	0.99	1.07	842
1000 – 1100*	60	0.056	0.99	1.07	1011
1100 – 1200*	45	0.057	0.99	1.07	745
1200 – 1300*	65	0.06	0.99	1.07	1023
1300 – 1400**	90	0.063	1.16	1.07	1151
1400 – 1500**	71	0.064	1.16	1.07	894
1500 – 1600**	89	0.072	1.16	1.07	996
1600 – 1700**	72	0.083	1.16	1.07	699
1700 – 1800**	89	0.093	1.16	1.07	771
*September 1St		**September 4th			
				Average	**923**

[7] Estimated average tanker size based on 75% removed by 27.3m^3 tanker and 25% removed by 10m^3 tanker

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The results of the traffic count were adjusted using the expansion factors for short period traffic counts for the Mid-West (Limerick County) Region[8]. The AADT for the R672 at the site entrance location is approx. 923. There may be a small Covid-19 effect (reducing effect) but this would increase rather than decrease the results thus lessening proportional impacts. The existing pig farm is estimated to be approximately 14 movements per working day – therefore accounts for approximately 1.5% of the average annual daily traffic (AADT). This impact is not significant. Potential impacts from traffic on the local population are addressed in Chapter 3.

1.2.6 Noise levels at the Existing Pig Farm

The location of the closest sensitive receptor (dwelling) outside the existing site (and not owned by the developer) is located at approximately 60m west of the nearest existing pig house and 150m west of the mill house. The next nearest houses are located at approximately 110m and 200m west of and 250m and 260m north of the nearest existing pig houses and mill house. The EPA Guidance Note on Noise from Scheduled Activities (NG4) specify limits of 45 dBA, 40 dBA and 35 dBA at sensitive locations for daytime (0700 to 1900hrs), evening (1900 to 2300hrs) and night-time respectively at low background noise areas such as the existing site. A Noise Impact Report was carried out by Panther Environmental Solutions Ltd and this is attached in Appendix 1 of this EIAR. The background day-time noise levels in locality were assessed to be 35 dB and 28 dB for daytime and nighttime. Sources of noise at the existing pig farm include housed pigs, heavy goods vehicles, pig manure pumping and other farm machines and feed processing (pumps, augurs etc.).

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Livestock

Studies[9] [10] [11] [12] have recorded ambient noise levels of 60 – 75 dB in pig houses, the lower range from weaner and farrowing houses and the higher range from fattening and dry sow houses. Pigs create noise when being fed and this noise is confined mainly to feeding times and events (e.g. max twice daily for sows). When excited pigs emit sounds of 97+ Db(A). Much of this noise energy is absorbed by the walls of the pig houses which are well insulated. Noise from mechanically ventilated houses will generally be 5 – 10 dB higher than naturally ventilated houses - all of the existing pig houses are mechanically ventilated. Section 4.3 of EPA (UK) IPPC SRG 6.02 *Noise Management at Intensive Livestock Installations* document states that typical noise levels inside a pig house is 67dB and outside 43dB (including fans). A study; *'Level of noise made by pigs on slatted floors'* by *M Sistkova et AL (2015)'* also established that noise levels at 7 – 11m outside mechanically ventilated pig finisher building was reduced from 67db to 48db – a 28% reduction in the dB(a) rating. This would indicate a noise level of less than 30 - 35[13]dB at 60m (nearest dwelling) – even after allowing a penalty factor for fan malfunctions. Mechanically ventilated pig houses are generally silent at night-time. These noise levels are generally within the daytime EPA guidelines.

Heavy goods vehicles (HGVs), pig manure extraction and other farm machines

HGV deliveries occur only during daytime hours (Monday to Friday) and the resulting noise, which occurs for 10 – 20 minutes, is typical of noise in any farm yard. Tractors, diggers and loaders operate around the farm yard at various times but generally not continuously. These machines generate similar noise levels to that of machines on construction sites. However the noise will be of shorter

[8] TII Publications Project Appraisal Guidelines for National Roads Unit 16.1 - Short Period Traffic Counts For Mid-West
[9] C a Weeks (2008)
[10] M. Sistkova, A. Dolan, J. Broucek, and P. Bartos (2015)
[11] Talling J C; Lines J A, Wathes C M; Waran NK) (2008)
[12] EPA (UK) IPPC SRG 6.02
[13] Assumes noise source is 43dB @ 10m (distance 1 = 10m, distance 2 = 50m)

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duration on the pig farm. For example a tractor loading a 2,600 gallon tanker may take about 6 minutes to fill. During this period the tractor will rev its engine and the expected noise source would be 80 – 85 Db at 10 m (similar for lorries blowing feed into feed silos) and these operations may result in temporary daytime exceedances of 45 dBA (NGA) at the nearest part of the site boundary – but only for short periods. At a distance of 75m from nearest pig manure extraction point and 140m+ to nearest meal delivery point (Mill Building) the max daytime noises for slurry pumping and feed blowing at the nearest sensitive receptor would be 69dB and 63dB. These noises are similar to any typical operational farm yard and the noise source is tonal rather than sharp or clattering/banging. Given the short duration of these noises and background traffic noise on the R662, the impact is not significant.

Power washers have similar sound levels to farm machines. A typical model would generate 81dB @ 1 m (45[14]dB at 70m). Unlike farm machines such as tractors this noise source is continuous on the site for a few hours per day. However power washing is an indoor activity and because the noise energy is mitigated by the house walls the day time limit of 45dBA at the façade of nearest dwelling is not exceeded – and therefore adhering to EPA guidelines.

Feed processing

The feed augurs and pumps contain electric motors which generate noise. The noise source here will be mainly indoors and centered on the Mill, which has been discussed above. Internal pig house pumps and augers are considered part of the ambient in-house noise => 65 – 70dB, which is reduced to 43dB outside house and therefore predicted to be 30 – 35db at nearest sensitive receptor and therefore not significant.

There are potential negative impacts on humans from noise and these impacts are addressed in Chapter 3.

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1.2.7 Environmental Management System (EMS) at the Existing Pig Farm

This farm has been selected by EU PIG Innovation Group, as a 2020 Grand Prix Winner in an EU wide competition involving over 300 pig farms. The competition was in relation to Health Management and the Use of Slaughter Data Dashboard System to improve Pig Herd Health. The pig farm operates a level of food quality assurance that complies with the standards of the *Bord Bia Pigmeat Quality Assurance Scheme* and the *Red Tractor Food Quality Assurance Scheme*. The pig farm is audited annually for these two quality assurance schemes. The pig farm operates under a License from the EPA. The pig farm is subject to inspections by the Department of Agriculture, Food and the Marine (DAFM) in relation to recording animal movements and pig manure exports.

Best Available Technology (BAT) for the Pig and Poultry Intensive Agriculture industry recommends that an Environmental Management System is in place. The pig farm operates an EMS which incorporates the following features;

1. Commitment of the management, including a definition, by the management, of an environmental policy that includes the continuous improvement of the installation's environmental performance;
2. Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;
3. Implementation of procedures paying particular attention to:
    a) Structure and responsibility, training, awareness and competence of employees;
    c) Communication with employees and customer farmers for pig manure;
    d) Employee involvement;

[14] Assuming approx. 6dB reduction when the distance is doubled (inverse square law)

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e) Documentation and record keeping for EPA, Bord Bia (e.g. medicines), 'Red Tractor' and DAFM (e.g. pig manure exports);
f) Effective process control;
g) Maintenance programmes to achieve high operational standards;
h) Emergency preparedness and response;
i) Safeguarding compliance with environmental and health and safety legislation;

4. Checking performance and taking corrective action, paying particular attention to:
   a) Monitoring and measurement (Annual Environmental Reports are completed yearly showing records of storm water quality);
   b) Corrective and preventive action;
   c) Maintenance of records (livestock register, pig manure register, medicines records, waster registers, inspection records (surface water)
   d) Auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;
5. Review of the EMS and its continuing suitability, adequacy and effectiveness by senior management with the assistance of Teagasc Advisor;
6. Being open minded to the development of cleaner technologies;
7. Application of sectoral benchmarking on a regular basis based on membership with Teagasc discussion groups.
8. Implementation of a noise management plan;
9. Implementation of an odour management plan;
10. Implementation of an integrated pest and rodent control programme;
11. Implementation of Good House Keeping Measures such as;
    a) Reduce transport of animals and materials (including manure);
    b) take into account prevailing climatic conditions (e.g. wind and precipitation);
       - consider the potential future development capacity of the farm;
       - Prevent the contamination of water.
    c) Educate and train staff, in particular for relevant regulations, livestock farming, animal health and welfare, manure management, worker safety;
    d) Regular repair and maintenance of equipment and check, repair and maintain structures and equipment, such as:
       - slurry stores for any sign of damage, degradation, leakage;
       - slurry pumps, mixers, separators, irrigators;
       - water and feed supply systems;
       - ventilation system and temperature sensors;
       - Feed silos and transport equipment (e.g. valves, tubes);
       - Store dead animals in such a way as to prevent or reduce emissions.
       - High degree of cleanliness of the farm and pest management.

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1.3 DESCRIPTION OF PROPOSED DEVELOPMENT AT 'BALLYFASKIN' PIG FARM

1.3.1 The proposed 1000 sow and progeny system

The proposed electrical substation (22m^2) is required so that the milling equipment can be operated on a full capacity basis. The operation of the mill equipment currently requires the use of a diesel generator and as a result is not used to its full potential. When the mill is fully operational diets will be formulated on-site and the pig farm will not be reliant on conventional blended formulations. This will enable the pig farm to introduce low protein diets with specially formulated amino acid supplements. The photo below show a typical single mv electrical substation constructed to ESB standards. Typical

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dimensions (as per drawing A3D-205071-16A Rev C of Appendix 9 of Volume 3) are 4.93m x 4.4m x <3m high. The final specifications of the substation have to be agreed with ESB.


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Plate No 1.1 Typical Single MV Electrical Substation

The proposed housing is designed to accommodate standard finisher pigs up to 102kg requiring 10.4 weeks in the finisher accommodation. This change in system is required to adapt to market conditions. The 1,000 sows will produce approx. 27 pigs per sow .i.e.27,000 pigs per annum; with 5 batches per annum (10.4 weeks per batch) requiring 5357 finisher places – less space required per head than the existing system. To match the existing available housing 7,000 pigs are sold off site as weaners. Current pig numbers and slurry production is shown in Table 1.5.

Table 1.5: Number of pigs in proposed 1,000 sow herd and slurry produced

Sows	1,000
Gilts	166
Boars	5
Pigs produced per annum	27,000
Weaners places	4,000
Finisher places (5 batches = 20,000)	3,957
Finisher places sold off site (5 batches = 7,000)	-
Finisher growth rate	0.9kgs/day
Weeks per batch	10.4

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Breeding unit manure production (m^3 / sow / week)	0.174
Finishing unit manure production (m^3 / finisher / week)	0.034
Total manure produced from breeding unit (m^3)	5,762
Total manure produced from finisher unit (m^3)	9,048
Total (m^3) =>	14,810
Soiled water stored in slurry tanks =>	995
Total (m^3) =>	**15,805**

1.3.2 Details of proposed buildings / list of structures

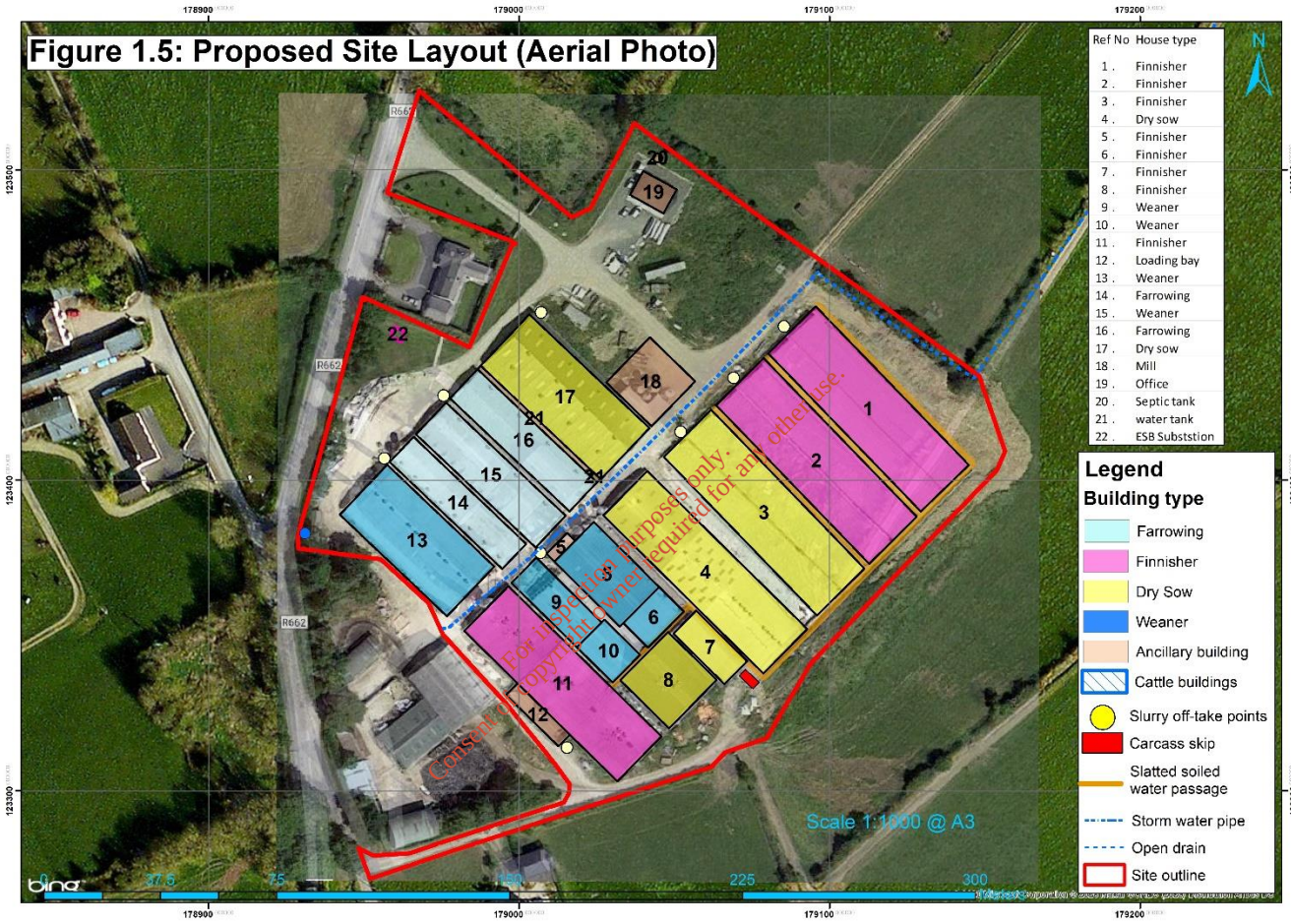


Table 1.6 and Figure 1.5 (printed to A3 size in Volume 4 of this EIAR) show that there is no change to the foot print area of the pig farm except for the addition of the electrical substation – a relatively small structure. The refurbishment works will involve changing in internal partitions, re-wiring, new water and feed fixtures etc. Most of the slats and floors will remain in situ with some minor exceptions. The following changes will occur;

- Houses 3, 7 and 8 will change from finisher to dry sow houses.
- Houses 5 and 6 will change from finisher houses to weaner houses; and
- House 15 will change from weaner house to farrowing house;

Table 1.6: Proposed Structure List at the 'Ballyfaskin' Site

Ref No	Description	Length (m)	Width (m)	Height (m)	Area (m^2)	Depth of tank (m)	Slurry storage (m^3)
1	Finisher house	71.7	21.3	5.1	1527	1.8	2077
2	Finisher house	71.7	21.3	5.1	1527	1.8	2077
3	Dry sow house	71.7	21.3	5.1	1527	1.8	2077

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Ref No	Description	Length (m)	Width (m)	Height (m)	Area (m^2)	Depth of tank (m)	Slurry storage (m^3)
4	Dry sow house	71.7	21.3	5.2	1527	1.8	2077
5	Weaner house	29.3	17.8	4.3	522	1.2	443
6	Weaner house	11.4	16.4	4.3	187	1.2	159
7	Dry sow house	23.6	10.4	4.3	245	1.8	334
8	Dry sow house	21.7	21.5	4.3	467	1.8	635
9	Weaner house	30.2	11.1	4	335	-	285
10	Weaner house	15.5	12.6	4	195	1.2	166
11	Finisher House	69.5	20	5	1390	1.8	1890
12	Loading bay	23	4.6	-	106	-	
13	Weaner house	48.8	21.9	4	1069	1.2	908
14	Farrowing house	51.3	11	3.5	564	1.2	480
15	Farrowing house	52.8	12.8	3.5	676	1.2	575
16	Farrowing house	52.8	12.8	4	676	1.2	575
17	Dry sow house	52.8	22.5	5	1188	1.8	1616
18	Mill Building	20	20	18.3	400	-	
19	Office and staff facilities	11	10	5	110	-	
20	Septic tank	-	-	-	73m^3	-	-
21	Water Harvesting tank and pump house	1.8	52.8	95	110	1.8	-
22	Electrical substation*	4.9	4.4	3	21.7	-	-
		Totals =>			**14,260**		**17,336**

* These are typical dimensions as per drawing A3D-205071-16A Rev C in Appendix 9 of Volume 3. The final specification has to be agreed with ESB.

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The gross area of buildings on site will increase by 21.7m^2. The slurry storage will remain the same and slurry production will rise by approx. 1% as a result of the proposed 1,000 sow system because 7,000 pigs will be sold off site as weaners. The construction of the new electrical substation and the refurbishment of existing pig building will take 4 months.

1.3.3 Environmental and operational changes as a result of the proposed development

The operation and management of the pig farm will require no changes in the labour work force. The production system at the 'Ballyfaskin' site will change from a breeding unit to a weaner and fattening unit. Pig numbers and associated inputs and emissions from the existing and proposed pig farm are shown in Table 1.7.

Table 1.7: Environmental and operational changes resulting from the proposed pig farm development.

Item	Existing	Proposed	Comment
1. Pig manure production (m^3)*	15,681	15,805	Addressed in Chapters 1, 3, 4, 5 & 9
2. Pig manure N, P (Kgs / year)*	65,860 12,545	66,381 12,644	Addressed in Chapter 5
3. Feed (tons) **	5,960	6,760	Addressed in Chapters 1 & 3
4. Water used (m^3) **	15,500	17,600	Addressed in Chapters 1, 3, 6 & 9
5. Storm water produced (m^3)***	32,600	32,600	Addressed in Chapters 1 & 6

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Item	Existing	Proposed	Comment
6. Traffic to pig farm (per day)	14	16	Addressed in Chapters 1 & 3
7. Noise	Not significant	Not significant	Addressed in Chapters 1, 3 & 4
8. Municipal Waste (tons)	1.0	1.0	Addressed in Chapters 1, 3 & 8
9. Sharps waste (kgs)+	0.004	0.01	Addressed in Chapters 1, 3 & 8
10. Carcass waste (tons) +	113	137	Addressed in Chapters 1, 3 & 8
11. Floor area (m^2)	14,238	14,260	Addressed in Chapter 1
12. Labour employed **	5	6	Addressed in Chapters 1 & 3
13. Power / electricity (MWtHr) +	470	590	Addressed in Chapters 1, 3, 8 & 9
14. NH_3 production (tons) ++ (with mitigation)	18.5	19.5 (16.4)	Addressed in Chapters 3, 7 & 8
15. CH_4 production (tons) ++ (with mitigation)	106.5	125.3 (125.3)	Addressed in Chapters 3, 7 & 8
16. N_2O production (tons) ++ (with mitigation)	0.108	0.116 (0.116)	Addressed in Chapters 3, 7 & 8
17. CO_2 equivalent (tons) ++ (with mitigation)	2,645	3,104	Addressed in Chapter 8
18. Odour units (with mitigation)	146,170	143,432 (119,196)	Addressed in Chapter 7

* Calculated based on Tables 1 and 7 of Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020)
** Estimated based on Teagasc data
*** Based on hard standing concrete yards and roof area of 22,400m^2 and 1,456 mm of rain.
+ Based on AER data available on EPA.ie
++ EPA IPPC AER/PRTR fugitive emissions tool for intensive agriculture

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The proposed 1,000 breeding sows will consume approx. 6,760tons of feed calculated as follows;

- 1,000 sows @ 1.32 tons;
- 27,000 weaners @ 0.057 tons / hd
- 20,000 finisher pigs at @ 0.195tons / hd (finished weight of 105kgs)

Feed consumption will increase to approximately 6,760 tons in the proposed development contributing to increased traffic levels which is further addressed in Section 1.3.5 and Sections 3.3.1.7 and 3.5.3.7 in Chapter 3 of this EIAR. Allowing for a feed to water ration of approx. 2.6:1 water consumption is estimated at 17,600m^3 per annum (48.2m^3 / day) – an increase of 13.5% compared to existing. Increased water extraction can potentially affect groundwater which is addressed in Chapter 6.

There is no soiled water production because all surfaces on which pigs walk are covered. Slurry production levels are projected to increase to approximately 15,805m^3 (+1%). The potential impact on traffic is addressed in Section 1.3.5 and Sections 3.3.1.7 and 3.5.3.7 in Chapter 3 and the potential effect on Land & Soils is addressed in Chapter 5 of this EIAR. Overall traffic levels are predicted to increase by 2 movement per day. Pig manure production may potentially impact on humans (land spreading / odour), traffic), biodiversity, land and material assets (fertilizer) and is further addressed in Chapters 3, 4, 5, 7, 8 and 9 of the EIAR.

The storm water produced currently discharges to open drain. The quantity will not change significantly. This clean roof and yard water will potentially impact on surface waters and is further addressed in Chapter 6 of the EIAR.

The electricity usage for 600 sows varies between 423.5 MWtHr and 517.5 MWtHr according to the EPA AER figures. The average is assumed to reflect the existing 600 sow enterprise (i.e. 470 MWtHr). This will increase due to the increased demand for milling feed, heating additional small piglets and additional power washing due to additional farrowing rooms. The area of the buildings will not change and therefore lighting and ventilation shall not change significantly. An increase of 25% is assumed.

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Based on discussions with owner of pig farm and his Teagasc Adviser. This increase is further addressed in Chapters 3, 8 and 9 of the EIAR.

The volume of municipal waste produced from the proposed development (from canteen, miscellaneous and packaging) will not change significantly compared to existing. Sharps waste (needles, syringes and other veterinary waste) will increase due to additional treatments required for sows and young progeny and additional numbers of pigs on site. Carcass waste is as a result of mortality and cleanings at birth and a high proportion of this occurs in the breeding part of the process. Mortality rates of 5% are quoted in Teagasc literature for sows and gilts and 10% for piglets at birth. Also material such as afterbirth and still born piglets add to the carcass waste. The mortality rate for fat pigs is generally 2%. The existing level is approximately 113 tons per annum based on AER figures and this is predicted to increase to 137 tons due to increased numbers of sows. All carcass material will be stored in sealed skips to mimimise odour nuisance. The transport of carcass material may potentially impact on traffic and Air and are further addressed in Chapters 3 and 7 of the EIAR. Construction and Demolition waste is discussed in following Section 1.3.7.

Labour employed on site will increase by one person. This is further addressed in Chapter 3 of the EIAR.

Pre-mitigation fugitive greenhouse gas emissions[15] of primarily carbon dioxide, methane, ammonia and nitrous oxide will increase due to additional pigs on site. Pre mitigation odour will reduce slightly (2%) due to less finisher pigs on site. These emissions may potentially effect humans, air and climate and are further addressed in Chapters 3, 7 and 8 of this EIAR. Standard emission factors have been used (Table 7.2 of the EIAR) in Chapter 8 of the EIAR to calculate emissions from the existing pig farm and proposed development. Other gaseous and particulate such as dust, PM_{10} and $PM_{2.5}$ are discussed in Chapters 3 and 7. Mitigating factors such chemical fertilizer replacement and mitigation such as low protein diets are further discussed in Chapters 7 and 8.

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1.3.4 Traffic to and from the proposed pig farm

The traffic to the proposed development is illustrated in Table 1.8;

Table 1.8: Estimated daily traffic counts at the existing and proposed 'Ballyfaskin' pig farm.

Type of Traffic Movement	Existing number	Proposed number
Staff movements	7.4	9.1
Feed delivery	1.6	1.4
Livestock transport	0.5	0.8
Service vans etc.	0.3	0.3
Slurry tanker	3.7	3.8
Carcass and waste removal	0.15	0.15
Miscellaneous	0.5	0.5
Total =>	**14**	**16**

Referring to Section 1.2.5 the pig farm traffic is approximately 14 movements per day which is less than 2% of the daily traffic count on the R662. The labour on the farm will increase by one person resulting in an increase of 12 journeys per week. Feed consumption on site will increase from 5,960tons to 6,760tons. However, following the construction of the electrical substation it will be possible to fully operate the mill house and therefore straights will replace compound feed for approx. 95% of the total feed usage. This will mean the average tonnage per load will increase from 20t per load to 28–29t per load – because straights are delivered by larger bulk lorries (not

[15] Measured Using the EPA AER / PRTR Spreadsh62eet tool for IPPC Licensed facilities.

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compartmentalized). Therefore, 6,760t will be delivered in approx. 247 loads[16] - which is slightly less to the existing situation. Pig transport will increase to 120 loads for the 20,000 finishers 20 loads for the 7,000 weaners each year. Service vans etc. will remain the same. Slurry production will only increase by 124m^3 per annum = 5-6 loads. (12 movements). Carcass transport will remain at once fortnightly (but heavier loads). Waste removal and miscellaneous transport will remain the same. The daily traffic movements from the pig farm will increase to approximately 14 to 16 - which is 1.5% of the projected daily traffic count on the R662. This will not have a significant impact.

1.3.4.1 Construction Traffic to and from the Proposed Pig Farm

The construction traffic will involve;

- For the construction of the electrical substation over a 4 week period;
  - 2 ready-mix lorries (4)
  - 4 builders in 2 vans for four weeks (224)
  - Deliveries (20)
- For the refurbishment of the pig buildings over a 4 month period
  - 3 fitters/labourers (2 vehicles) for 40 days (320)
  - Deliveries (20)

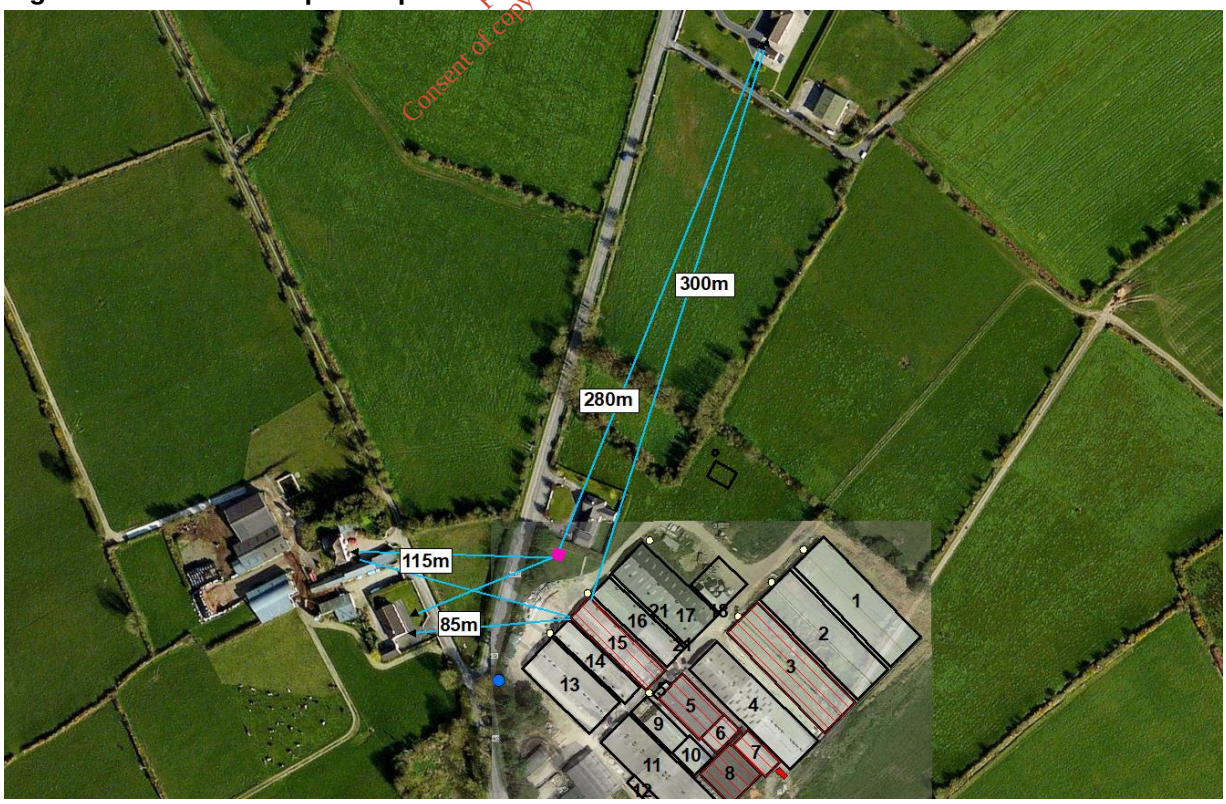
Allowing a contingency, this is approx. 650 traffic movements over a 120 day period which is an average of 5 - 6 movements per day. During the construction phase peak traffic will occur 0800 – 1000 with 6 – 8 traffic movements and from 1600 – 1700 with 5 movements, Monday to Friday. The construction traffic will increase the AADT by 6 movements per day for the construction period. The construction traffic is a temporary increase of approximately <1% of the AADT on the R662.

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1.3.5 Noise levels at the Proposed Pig Farm

1.3.5.1 Noise levels during construction phase

Figure 1.6: Noise Receptor separation distances



[16] 95% (6422t) in 230 loads and 338t in 17 loads.

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There are many similar construction activities in farm yards through out Ireland without any significant impacts due mainly to the short duration of works – approx. 4 month construction phase in this case. The construction work will involve the construction of the electrical substation house and the refurbishment of houses 3, 5, 6, 7, 8 and 15. The facades of the nearest dwellings

The electrical substation site and pig house 15 are both approx. 85m and 115m from the nearest facades to the west and 280m and 300m from the nearest house to the north - not including the owner's dwellings - as illustrated in Figure 1.6. The National Road Authority (NRA) Guideline Construction Noise Limits are 60 – 70 $L_{Aeq,1hr}$ dB at the façade of nearest house. Maximum potential construction noise levels are estimated at 115dB at source *(BS 5228: 2009)*. Un-mitigated, the predicted noise levels would be 80dB, 74dB and 66dB at the facades of the nearest houses (at distances of 85, 115m and 280m and 115dB @1m). However there are mitigating factors for the nearest two houses that are expected to exceed the EPA levels. Firstly, the refurbishment will be mainly indoors. As discussed in Section 1.2.6 above the housing materials can mitigate ambient inside-of-house noise from 65-70dB down to 43dB. Therefore it is expected that the source will be substantially lower outside the refurbishment houses – at least a 25% reduction. Secondly, houses 11, 13 and 14 will act as physical barriers to sound emissions towards the west. Combined the separation distance to the north these two factors will reduce emissions to within the 65-70 dB EPA guidelines for the refurbishment of houses 3, 5, 6, 7, 8 and 15. In relation to the electrical substation which is a relatively small structure noise mitigation/screening to the west can be provided

1.3.5.2 Noise levels during operational phase

Noise from electrical substation is assessed in Appendix 1 – Noise Assessment Report (Supplementary). This report concludes that at NSR2 and NSR3 there will be no audible noise from the electrical substation.

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There will be no change in the operational noise from the pig houses at these locations (NSR2 and NSR3). The mill house will be located 150m from these nearest sensitive receptor (not including houses owned by the developer). Section 4.3 of EPA (UK) IPPC SRG 6.02 *Noise Management at Intensive Livestock Installations* document states that typical noise levels inside the mill house is 90dB and outside 63dB, indicating a noise level of less than 40 - 45[17]dB at 150m (nearest dwelling). There will be no significant change from the noise emissions from the proposed houses (same as existing). Finisher and weaner pig are fed ad-lib to reduce potential noise events at feeding.

BAT 2017 (page 670) states that noise is still not considered an issue of importance for the intensive agriculture sector and, to minimize noise impacts, recommends operational procedures such as;

- Operating during daytime hours, particularly for feeding pigs, feed deliveries and slurry pumping / removal;
- Keep doors to pig houses closed;
- Minimise slurry agitation;
- Use a passive ad libitum feeding system to reduce stress and noise; and
- Keeping the feed delivery areas and pig transport areas as far away from sensitive receptors as possible.

A Noise Management Programme as outlined in Section 3.6 and Appendix 9 of Volume 3 will be implemented. This Noise Management Programme includes recommendations that;

- Construction activities to occur 0800 to 1800 hours;

[17] Assumes noise source is 63dB @ 10m (distance 1 = 10m, distance 2 = 140m)

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- Noisy operations such a slurry removal and feed deliveries to occur 0800 to 1800 hours;
- Inform and train on-site workers in relation to noise matters; and
- Timely maintenance of equipment.

The Noise Assessment in Appendix 1 concludes "*LAFmax noise from pig vocalisations and haulage lorries have been predicted to generate noise levels of 5 to 28 dB above day-time background noise levels and 12 to 35 dB above night-time background noise levels. As per the BS4142 methodology, this would be "an indication an adverse*, *to significant adverse impact*". The movement of pigs off-site occurs 2- 3 time per week for short durations. While noise impacts are within the acceptable limits the applicant is cognisant of the local submissions in respect of noise, particularly in relation to the loading of pigs. Therefore the applicant, subject to the agreement of Limerick County Council and as a condition of any permission if granted, will commit to insulate the loading bay enclosure with insulated walls and roof to mitigate noises at the point of loading.

It is assessed that there will not be a significant change in the existing noise environment.

1.3.6 Construction and Demolition (C & D) Waste from the proposed development

The proposed buildings are specifically designed for improved animal performance and because the specific housing needs vary between various categories of pigs, the proposed development will require refurbishment of existing houses. This which will generate C & D waste. The *Polluter Pays Principle* applies to the disposal of C & D Waste. Landfill charges of approximately €160 / ton necessitates that the developer minimizes the disposal of this waste and maximizes reuse, recovery and recycling. The developer will address the minimization and handling of C & D waste arising from the proposed development and insure that only waste contractors who hold valid waste collection permits issued by the National Waste Collection Permit Office (NWCPO) are employed and that the waste produced, if disposed of off-site, will go to waste receiving facilities that hold a valid Certificate of Registration or Waste Permit issued by the relevant Local Authority under the Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments or a waste or IED license granted by the EPA. The developer will ensure that National Legislation and guidelines for C & D waste are adhered to and followed, particularly in relation to the handling and disposal of materials such as batteries, chemicals and asbestos containing materials (ACMs). Although it is unlikely that the developer will encounter ACMs because the roof structures will not be altered, in the event that they are encountered ACMs must be handled by an approved contractor, following the HSA guidelines – *'Asbestos Containing Material in Workplaces – Practical guidelines on Management and Abatement*[18]*'* and adhering to the legislation below. The following national legislation and guidelines will be adhered to;

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National Legislation

- Protection of Environment Act 1992 as amended (S.I. No. 413 of 2003) as amended by the Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended;
- Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended by Protection of the Environment (amendment) Act 2003 as amended;
- Planning and Development Act 2000 as amended (S.I. No. 30 of 2010) as amended (S.I. No. 310 of 2015);
- Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No 27 of 2003) and 2011 (No. 20 of 2011). Sub-ordinate legislation includes: o European

[18] Available at https://www.hsa.ie/eng/Publications_and_Forms/Publications/Chemical_and_Hazardous_Substances/Asbestos_Guidelines.pdf

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Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended 2011 (S.I. No. 323 of 2011) and 2016 (S.I 315 of 2016);

- Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended 2008 (S.I No 87 of 2008), 2015 (S.I. No. 197 of 2015) and 2016 (S.I. No. 24 and 346 of 2016);
- Waste Management (Facility Permit and Registration) Regulations 2007,(S.I No. 821 of 2007) as amended 2008 (S.I No. 86 of 2008) as amended 2014 (S.I No. 320 and No. 546 of 2014) and as amended 2015 (S.I. No. 198 of 2015);
- Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended by European Communities (shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I No. 324 of 2011);
- Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended 2010 (S.I. No. 350 of 2010);
- Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended 2015 (S.I No 542 of 2015);
- European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015)
- Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997);
- Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015);
- Waste Management (Movement of Hazardous Waste) Regulations, 1998 (S.I. No. 147 of 1998);
- European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014);
- European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015);
- Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended 2015 (S.I. 190 of 2015) and European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of 2015);
- Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000); and,
- European Communities (Trans-Frontier Shipment of Waste) Regulations 1994 (S.I. No. 121 of 1994);
- Chemicals (Asbestos Articles) Regulations 2011 S.I. 248 of 2011;
- The Safety, Health and Welfare at Work (Exposure to Asbestos) (Amendment) Regulations, 2010 (S.I. No. 589 of 2010);
- The Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations, 2006 (S.I. No. 386 of 2006);
- The Safety, Health and Welfare at Work (Construction) Regulations, 2006 (S.I. No. 504 of 2006);
- REACH Regulation;
- Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No.619 of 2001);
- Safety Health and Welfare at Work (Carcinogens) Regulations 2001 (S.I. No. 078 of 2001)
- European Communities (Carriage of dangerous goods by road and use of transportable pressure equipment) Regulations 2011 (S.I. 349 of 2011); and
- Air Pollution Act 1989.

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Guidelines

- Department of the Environment and Local Government; July 2006, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects;*

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- EPA; *Design Out Waste* https://www.epa.ie/pubs/reports/research/waste/Design%20Out%20Waste%20Factsheets.pdf
- EPA website; Links to WRAP publications; *Practical solutions for sustainable construction - Setting a requirement for recycled content in building projects* http://www.wrap.org.uk/sites/files/wrap/Setting%20a%20requirement%20for%20recycled%20content%20in%20building%20projects.pdf
- EPA website; Links to WRAP publications; Linking demolition and new build – a step by step guide; http://www.wrap.org.uk/sites/files/wrap/MRE%20Step%20by%20Step%2014.pdf
- Health and Safety Authority, 2018; *Asbestos Containing Material in Workplaces – Practical guidelines on Management and Abatement.*

1.3.6.1 Regional Situation in relation to Construction and Demolition Waste

The Southern Waste Region Statistical Indicators Annual Report 2012 – 2015 and 2nd Annual Report in 2017 show that the southern regional collection of C & D waste was approximately 1[19] million tons in 2015 increasing to approximately 1.4[20] million tons in 2017 with corresponding pressure on licensed facilities to accept this waste. The EC (Waste Directive) Regulations 2011 set a 70% target for the reuse, recycling and recovery of man-made C&D waste in Ireland by December 2020. Section 11.2.3[21] of the Southern Region Waste Management Plan 2015 -2020 states that, in general this target is being achieved, but within the region backfilling activities account for a significant portion of the recovery rate, with recycling of C&D wastes not as prevalent. Approximately 80% of this waste within the region is soil and stone.

1.3.6.2 Management of Proposed Construction and Demolition Waste

Figure 1.7 – Waste Hierarchy



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Construction waste may arise from the refurbishment works in houses. In the case of the proposed development any excavated soil and stones will be re used on the site to facilitate landscaping around the perimeter of the site and as a sub-layer for roads, yards and hard-core areas. The construction waste from the proposed development will be minimized by insuring electrical, non-painted or treated timbers and metal waste items are recycled. C & D waste will be carefully segregated on site and stored in separate skips. Records of all wastes will be kept in accordance to the requirements of the

[19] Page 8 of Southern Region Statistical Indicators Annual Report 2012 -2015
[20] Page 8 of Southern Region Waste Management Plan 2015 -2021
[21] http://www.southernwasteregion.ie/sites/default/files/Part%202b.pdf

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IPPC License. The waste hierarchy pyramid principles will be implemented to prevent and minimize waste as illustrated in Figure 1.7).

Hazardous waste and electrical components (20 01 35 and 20 01 36)

If Asbestos Containing Materials (ACMs – 17 06 05) are suspected then an approved licensed contractor will be employed to test, handle and dispose of these materials.

Electrical components in the buildings such as fluorescent tubes and wiring will be removed from the buildings and stored in dedicated covered receptacles for Waste Electrical and Electronic Equipment (WEEE) recycling. There are no activities that give rise to contaminated soil on the site, however, if paints, glues, batteries, oils or chemicals are encountered they will be stored in a dedicated leak-proof covered container and recycled appropriately.

Concrete and Concrete Blocks (17 01 01)

Prior to refurbishment works slurry tanks will be emptied and slurry will be land-spread. The concrete recovered from the internal walls partitions and floors is an inert material and will be re used on site as a sub-layer for hard-standing yards and road-ways.

Timber (17 02 01 and17 09 04)

It is assumed that more 50% of the timber encountered will have to be sent for land-fill or incineration because it will be painted or treated. Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be segregated into separate skips. Timber panels from doors and vent shutters will be segregated and stored in skips for land-fill or incineration.

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Metal (17 04 05 and 17 04 07)

Metals will be segregated into high grade stainless steel (roofing members), steel alloys (roof sheeting) and feed silos and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Glass (17 02 02)

Glass will be dismantled from the pig houses prior to refurbishment and stored in a skip for recycling.

Pre-fabricated panels with insulation (17 08 02)

There are currently a number of recycling services for plasterboard in Ireland. Where tin foil or insulation is attached land-fill is the only option.

By segregating materials and re-using the heavier concrete rubble the rate of re use and recycling is expected to be in excess of the EC (Waste Directive) Regulations 2011 which sets a 70% target and proposed construction waste produced during the refurbishment of the pig houses should be less than 10 tons – which is a tiny proportion of the regional capacity.

1.3.6.3 Cumulative Construction and Demolition Waste from 600 sow unit

In the construction of the 600 sow unit larger quantities of Construction and Demolition Waste was produced from the same site. This included Asbestos waste which was transported from the site by

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specialized licensed contractor – records are maintained on site as required by the IPPC license. A high proportion of the C & D waste produced during the construction following the 2012 planning permission 2012/306 was concrete rubble and soil which was re-used as fill material for the new building foundations, yards and hard-standing areas, site roads and landscaping embankments. The residual waste (estimated at less than 100 tons) was a tiny proportion of the regional waste capacity

1.3.7 Environmental Management System (EMS) at the Proposed Pig Farm

It is proposes to continue the existing EMS (Section 1.2.7) and implement programs to monitor and control odour, noise, pests and rodents.

1.3.8 Proposed lighting

In Appendix 7 of Volume 3 of this EIAR there is a specification drawing for the proposed lighting. The light spill from the proposed lighting will be mainly within the site boundary.

1.4 NATIONAL AND LOCAL POLICY AND PLANNING

The proposed development complies with the objectives and policies of the Limerick County Development Plan (2010 – 2016 including variations 1-3, 5 & 6)[22] in following ways;

1. Section 5.6.1 of the Development Plan (DP) recognizes that agriculture *has an important role to play in the County's economy* and furthermore, *will continue to play a key role as a building block for a strong and diversified rural economy*. Section 5.6.1 states that *The Planning Authority will support and facilitate agricultural developments and improvements where the developments are considered in relation to their likely impact on the character and amenity of the surrounding area*. The proposed development has assessed the likely impacts on the character and amenity of the surrounding area. This pig farm has operated for over 40 years on this site without significantly adversely affecting the character or the amenity of the wider surrounding area. The surrounding area is primarily agricultural with farm steads and once off housing without distinction from any other rural part of the County. The objectives and policies of the plan support agriculture (e.g. Policy CP 08). It recognizes that the employment in agriculture has halved up until 2006 and therefore it is important to support rural employment. In the policy framework of the DP (Section 5.2) *the overall importance of agriculture, and of the County's natural resource base, is given specific recognition*.

2. There are several references to creation of employment and maintaining rurally based employment (and communities) in the DP. The proposed development will create 1 job on site, create 6-7 jobs in the agri services and food sector and sustain 30-35[23] jobs in the rural economy of County Limerick (see Section 3.5.3.3 of Chapter 3). The pork and bacon processing industry is an important source of employment in rural County Limerick and the wider region with many food processors relying on local Irish high quality pork and bacon.

3. Objective ED O22 of the PD in relation to Agricultural developments states *the Council will normally permit development proposals for agricultural development where*:
   (a) they are appropriate in nature and scale to the area in which they are located;

[22] Available at https://www.limerick.ie/council/services/planning-and-property/development-plans/county-development-plan

[23] Teagasc M A Martin (Jan 2011) Introduction to the Pig Production Sector in Ireland – one job on farm supports 6-7 jobs in processing and agri services. Existing = 5 jobs on farm.

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The proposed development is located on a site which has had pig production for over 40 years. The scale is reflective of normal and appropriate industry trend.

(b) *the proposal is necessary for the efficient use of the agricultural holding or enterprise;*
The growing trend in scale is necessary for the viability of the pig industry which faces ever increasing demands to produce high quality, high welfare produce at lower costs.

(c) *where the proposal involves the erection of buildings, there are no suitable redundant buildings on the farm holding which would accommodate the development;*
The proposed development re-uses and re-furbishes existing pig houses and therefore makes maximum use of existing resources;

(d) *the development is not visually intrusive in the local landscape and, where the proposal is for a new building(s) and there are no suitable redundant buildings, the proposal is sited adjacent to existing buildings and suitably visually integrated in the holding;*
The proposed buildings are low profile – generally less than 5.5m high – except for the proposed mill. They are built adjoining the existing farmyard and there are limited views from local roads. The mill development is high at 18m. However it is surrounded by trees on the north, west and south of the site. It is coloured dark green to blend in with the agricultural landscape and it reduces the impacts of un-covered silver coloured silos and augers which can also be visually intrusive;

(e) *the proposal demonstrates that it has taken into account traffic, environmental and amenity considerations and is in accordance with the policies, requirements and guidance contained in this Plan.*
The proposed development demonstrates in the attached EIAR that the environmental impacts (including traffic) are not significant.

4. Objective EH O8 (Ballyhoura / Slieve Reagh Landscape Character Area) encourages the use of species native to this particular area (mountain ash and birch) in landscaping developments. The proposed development includes extensive landscaping proposals to minimize visual impact.

5. Section 7.4.4 of the plan states; one of the challenges facing the County is that of climate change and that Limerick County Council intends to pursue the goal of a low carbon economy by presenting a renewable energy strategy as part of the review of the County Development plan. The pig sector offers a more carbon efficient solution to the increasing demand for protein and as discussed in Section 8.8.1 of this EIAR, pigmeat is 4 times more carbon efficient than beef or lamb. The pig and poultry sector offer one of the best opportunities for developing renewable energy because they provide a 365 source of substrate i.e. pig manure. As discussed in Section 8.8.1 of this EIAR where adequate state interventions are available in other jurisdictions and adequate grid access, the pig and poultry sector has responded by developing anaerobic digestion (AD).

6. In section 10.8 of the DP it stipulates that roof colouring should be a dark colour including dark grey. The existing colouring is grey, but will darken with time. The DP stipulates that;

- *All effluent storage tanks should be constructed to Department of Agriculture and Food specifications.*
  All tanks are built to a leak proof specification and have leak detection facilities.
- *The capacities of all slurry, effluent and soiled water tanks and all other tanks for pollutants shall comply with the current Department of Agriculture Guidelines and any subsequent documents/guidelines.*
  There is more than 50 weeks slurry storage on site in the proposed development.

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- *The applicant may be required to demonstrate that sufficient lands of suitable nutrient status are available within a reasonable distance for the disposal/recycling of organic waste from a proposed agricultural development.*
  Chapter 5 of the attached EIAR demonstrates that there is adequate capacity in the areas where pig manure is delivered.

7. In compliance with Section 10.8.1 of the DP the proposed developer will provide the following information;
   - *An EIAR attached to the planning application and an IPPC license also applies to the site;*
   - *Cumulative impacts are considered and assessed throughout the EIAR;*
   - *The pig farm has a stable and long-standing clientele for the pig manure and information is presented in Chapter 5 (Land & Soils) of the EIAR in relation to the capacity of the baseline environment to receive pig manure;*
   - *Details of leak detection facilities and proposed monitoring of ground water quality;*
   - *Information is presented on how the proposed development intends to improve emission control methods and procedures to reduce ammonia emissions and odour;*
   - *Information on aquifers, groundwater vulnerability and ground water quality is presented in the EIAR;*
   - *Information is provided in relation to the housing design, ventilation and procedures for maintaining a clean site; and*
   - *Information is provided in relation to landscaping proposals;*

The proposed development complies with National Objectives and Policies in following ways;

1. The most recent EPA GHG report (July 2020): *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* identifies the key measures which apply to the pig sector to insure Ireland meets its 2030 climate obligations *; i.e. nitrogen use efficiency, improved animal health, reducing crude protein in pigs, and low emission slurry spreading.* The proposed development will include a commitment to reduce the protein in the growing pig diet by 2%. The pig farm will move towards low emission spreading where possible. The replacement of chemical fertiliser will improve nitrogen use efficiency. As verified by the recent EU 2020 Grand Prix award in relation to Health Management and the use of Slaughter Data Dashboard System to improve Pig Herd Health; this farm complies with the '*improved animal health'* measure. Also, genetic improvements in the Irish sow herd since 2011[24] has seen the quantity of pig meat produced per sow has increase by 21% - this genetic improvement also leads to a reduction in greenhouse gases.

2. *National Spatial Strategy[25] (to disperse investment throughout the economy and promote rural development);*

3. *Food Wise 2025*[26]
   The context of Food Wise 2025 is that world population is set to grow to over 9 billion by 2050 (an increase of over 12% from current levels) and there is an increased demand for protein from developing countries where it is estimated that an additional 3 billion people will join the middle classes in the next 20 years. To meet the food demands of a 9.1 billion population food production must increase by 70% compared to 2005 levels, while at the

[24] Teagasc National Pig Herd Performance Report 2017
[25] Available at http://www.irishspatialstrategy.ie/
[26] Available at: https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/report/FoodWise2025.pdf

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same time meeting carbon emission reductions of a similar scale. Among the actions specified for the pig sector include;

- Investment in pig production facilities particularly energy efficiency to reduce input costs;
- Explore feasibility of alternative pig manure usage and disposal options, such as anaerobic digestion;
- Roll out a carbon foot printing assessment and improvement programme for pigs; and,
- Opening of upgraded pig research facility in Moorepark with prompt dissemination of research findings to the industry.

4. *National Mitigation Plan, 2017*[27] *and Climate Action Plan; 2019*[28]

Page 30, Figure ES10 of the EC JRC 2010 report on the Evaluation of the livestock sector's contribution to EU GHG emissions shows that Pork is 4 times more carbon efficient for every kg of meat produced compared to beef or lamb. The carbon footprint of 1 kg of Pork in Ireland is approx. 5 kgs CO_2 eq. whereas the carbon footprint of 1 kg of beef or lamb exceeds 20 kgs CO_2 eq. In a human environment with increasing population, increased demand for protein must be supplied by the lowest possible carbon footprint. Therefore supporting the national pig industry complies with the general national objective of producing food at the lowest possible carbon footprint.

The 2017 National Mitigation Plan recognised the multiple objectives of agriculture in a vibrant rural economy and promoting sustainable intensification of food production, reducing the carbon intensity of food production and contributing to both food security and greenhouse gas mitigation. Page 16 of the 2019 National Climate Action Plan states;

'With a majority of emissions in this sector (agriculture) coming from biogenic sources agriculture presents challenges that are not fully amenable to technological solutions to emission abatement, as may exist or evolve in other sectors. The EU has recognised the limited mitigation potential within agriculture in its climate policy framework for 2021 to 2030, and will also recognize a more holistic approach to land use policies in climate mitigation. This is not to exempt agriculture from making its fair contribution to national emissions reduction efforts, but instead highlights that Ireland's specific emissions profile may influence the cost and potential for emissions reduction in the time horizon to 2030 and beyond.'

Furthermore, page 19 states; *'The Plan also outlines an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise on national capacity for sustainable food production.'*

To deliver on the 2030 GHG emission commitments agriculture will be required to reduce emissions by 10 – 15% (Figure 11.1 of the Climate Action Plan, page 101). In relation to agriculture the plan states in page 101 that this may be achieved by;

- Reducing nitrogen emissions by replacing 50% of CAN fertiliser with protected urea products and by nitrogen-use efficiency through increasing soil pH;
- Advancing manure management by changing 50% of slurry spreading technology and timing to low-emission trailing-shoe slurry spreading;

[27] Available at: https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/7/National%20Mitigation%20Plan%202017.pdf
[28] Available at: https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

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- Improving animal production efficiency through increasing the EBI and improving animal health;
- Carbon sequestration through LULUCF measures will also contribute to emissions reduction in the sector. This includes:
- Increasing afforestation;
- Rewetting 40,000 ha of organic grassland soils (maintaining 40k p.a. average); and
- Better management of 450,000 ha of grassland.

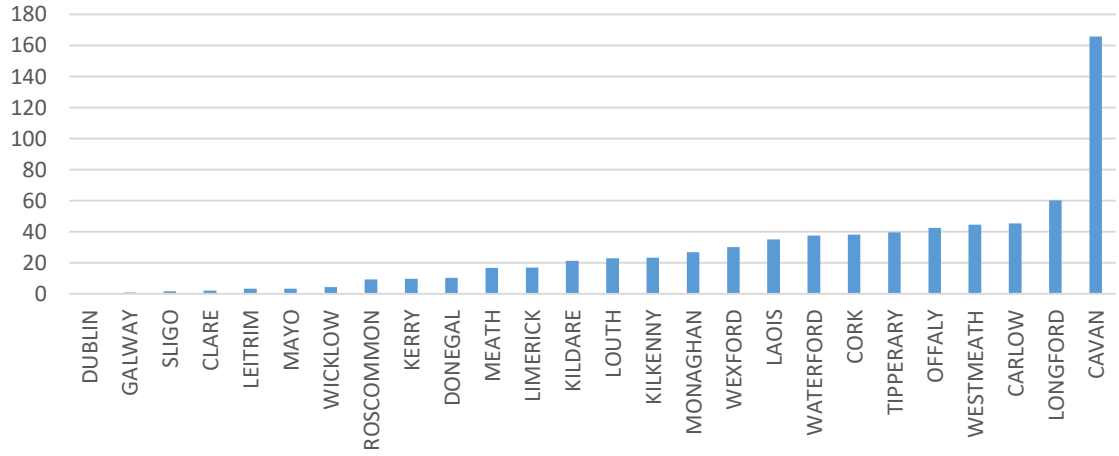
The Climate Action Plan specifies actions for agriculture (i.e. actions 101 to 134) and these are further addressed in Section 8.8.1 of Chapter 8 (Climate) of this EIAR. Certain specific actions relate to potential mitigation measures which are ideally suited to the pig sector, for example action 102 relating to the adoption of Low Emission Slurry Spreading (LESS). Action 106 relates to low protein diets which will be implemented in the proposed pig farm as addressed in Sections 2.7.4 and 7.6 of this EIAR. Actions 109, 112 and 114 are policy and research actions which will apply to all agricultural sectors. Many of the alternatives considered in Chapter 2 of this EIAR may become more economically viable if there are future policy changes and incentives. Actions 69, and 130 relate to anaerobic digestion (AD) which is discussed in detail in Sections 2.8.3 and Section 8.8.1 of Chapter 8 of this EIAR and other mitigation measures are mentioned in Chapters 7 and 8 which demonstrate that the proposed development can comply with the plan's targets and actions. For example the adoption of a low protein diets will reduce ammonia emissions by 11%.

There is a strong potential for the production of green energy from the pig manure due to the nature and scale of the proposed development. In other jurisdictions where national policy promotes renewable energy production many pig facilities of a similar scale produce biogas. The national policy (e.g. *Renewable Energy Directive 2001/77/EC)* will require such incentive payments to make Anaerobic Digestion more economically feasible and these types of farms will then provide a valuable waste stream source and renewable energy source.

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The Nitrates Directive & Regulations Si 605 of 2017 and the Water Framework Directive WFD (2000/60/EC) (as amended in SI 65 of 2018 and SI 40 of 2020) are relevant and important regulations which apply to this development and which form the core of the proposed mitigation in terms of the design (e.g. provision of 50+ weeks of slurry storage) and operation of the proposed development.

Figure 1.8: pigs / km²



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National pig numbers have been relatively static since 2005. County Limerick has 3,435 breeding sows according to Table 2 of the 2019 National Pig Census which shows that there are 4,071 breeding sows and 45,567 pigs in County Limerick – just under 3% of the national pig numbers and just under 4% of the national area. Figure 1.8 illustrates that the concentration of pigs/km^2 is quiet low compared to other counties (17 / km^2) – 73% of the study area is in County Limerick. Therefore the pressure from pig manure on organic nitrogen in County Limerick is relatively low.

5. *European Communities (National Emissions Ceilings) Regulations 2004 incorporated into SI No 10 of 2004 and Code of Good Practice for Reducing Ammonia Emissions* are regulations which require Ireland to restrict ammonia production to 116 kt per annum (98% of which is produced by agriculture. Low protein diets comply with BAT 2017[29] and reduces ammonia emissions by approx. 11% in the proposed development.

6. *Code of Good Practice for Reducing Ammonia Emissions from Agriculture*[30] published in November 2019 sets out measures such as replacing chemical urea fertilizer, increased use of low emission slurry spreading, farm cleanliness and covered external slurry stores. The proposed development will comply with these measures.

1.5 NEED

The proposed electrical substation is required to upgrade the electricity supply to the mill to allow it to operate to it full capacity. This will allow the pig farm to formulate low protein diets which will enable a reduction in ammonia and odour emissions and minimize transport through managing full truck-loads of ingredients.

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The increased sow numbers is in response to the to a marketplace change. The market for heavier pigs (135 kgs) was specialized and is no longer available thereby requiring the production of lighter pigs (100 – 105 kgs). If the sow herd size remained unchanged at 600 sows then a substantial percentage of the existing housing would remain empty and consequently the business would be unviable.

The current investment is necessary because;

- The shift towards 100 – 105 kg liveweight pigs makes it essential to reconfigure to 1,000 sows and move some finisher pigs off-site, to improve overall efficiency of the operation and make best use of the existing buildings;
- By having a fully operational mill the farm can produce bespoke diets to reduce protein levels and lower emissions. It also allows the pig farm to make improved feed efficiencies;

For each job supported on a pig farm there are 6 – 7[31] jobs supported in the wider economy. The proposed development is essential to maintain the 5 jobs at the site and 30-35 jobs in the wider local economy. Pigs from the proposed development will be supplied to Irish meat processing companies which are an important source of employment. €890 million of pig meat products were exported from Ireland in 2019[32]. These Irish companies rely on the supply of Irish produced pork and bacon. Meat

[29] Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs
[30] Available at: https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/codeofgoodagpracticeammoniaemissions/1CodeofGoodAgriculturalPracticeforreducingAmmoniaEmissions081119.pdf
[31] Teagasc M A Martin (Jan 2011) Introduction to the Pig Production Sector in Ireland
[32] https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/publications/TradeFactsheetFullyear2019230420.pdf

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demand is increasing world-wide and, currently, the most widely consumed meat is pork, therefore, inevitably rising demand requires an increasing supply chain.

Food production and supply is critically important for the national interest, particularly for the rural economy producing a €2.9 billion operating surplus in 2018. Approximately 105,000 people are employed in primary agricultural production and approximately 173,000 are employed in the agri-food industry[33]. In addition, tens of thousands of jobs are supported in the services industries. The importance of agriculture to the rural economy is immense and the industry has to sustain itself with continued investment.

From a Global warming point of view the imperative is to provide this rising demand for meat in a carbon efficient manner. Pig meat is 4 times more carbon efficient than beef of sheep and therefore from a Climate change perspective it is essential to increase the proportion of pig and / or poultry meat in the supply chain.

1.6 RISK FROM MAJOR ACCIDENTS AND NATURAL DISASTERS

1.6.1 Risk from Climate Change / natural disasters

The construction materials of the building will conform to engineer approved specification insuring proposed sheds will withstand the strongest winds and the tanks will be leak-proof. There is no risk of subsidence, landslides or earthquake at this site due to its flat nature and no risk from natural bush fires because site is surrounded by pasture. There is no history of flooding at the site. Flood maps were referred to on floodinfo.ie. There is no risk from flooding along the Aherlow River and the pig farm site is 30m higher than this river.

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1.6.2 Accidents and environmental incidents

Accidental spillage of pig manure might occur on-site or off-site. Such instances are possible on-site if a tanker valve is inadvertently opened or if a tanker overturns or if a suction hose disconnects from a tanker when loading. Risks are minimized because all slurry tanks are under ground. Also slurry tankers are high-pressure containers and are not likely to leak and thus the probability of spillage from a tanker is remote. There is a risk that liquid feed and fuel storage tanks at the site could leak. The flat topography of the site and surrounding area means that the velocity of a spilt liquid material will be slow (relative to a site located on a slope) and therefore the risk from spillages is further reduced. To minimize the risk of an on-site spillage the following procedures are in operation:-

- Over ground liquid and slurry storage tanks will be bunded to contain potential spillages;
- Slurry off-take points will have concrete surfaces which will contain any drips or spills from tanker pipes and will drain back to the slurry tank;
- Pig manure handling equipment and pumps are serviced regularly; and
- There will be an emergency response procedure in place which will be displayed in the office and all employees made aware of it. Employees will receive safety training on a regular basis. The operatives must contact the EPA and or Local Authority where an incident involves;
    - A release to atmosphere of environmental significance;
    - An emission which does not comply with the requirements of the IPPC license;

[33] Irish Agriculture Fact Sheet – Full year 2018. Available at: https://www.agriculture.gov.ie/media/migration/publications/2019/IrishAgricultureFactsheetFullYear2018010519.pdf

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- Any malfunction or breakdown of control equipment or monitoring equipment set out in the relevant schedules to the IPPC license, which is likely to lead to loss of control of the abatement system; and
- Any incident with the potential for environmental contamination of surface water or groundwater, or posing an environmental threat to air or land, or requiring an emergency response by the Local Authority.

Under Section 14 of the Local Government (Water Pollution) Act 1977 and Section 29 of the Air Pollution Act, 1987 and pursuant to the powers conferred by Section 99 (2) of the Protection Agency Act (Licensing) Regulation, 1994 (S.i. No.85 of 1994), IPPC facilities must contact the Environmental Protection Agency as soon as practicable after an incident and or the Local Authority. Procedures and contact numbers are in place for in office and out of office hours. All incidents are recorded using incident notification sheets. The following details are recorded;

- Name of parties involved in the incident;
- Contact person and telephone number(s);
- Location of incident;
- Date and time of the incident and its duration;
- Details of the occurrence;
- Materials emitted;
- Environmental significance of the incident;
- Weather conditions i.e. wind, rain, etc.;
- Vulnerable receptors;
- Whether emergency services were contacted;
- What other regulatory bodies were contacted including Local Authorities and Regional Fisheries Boards; and
- The steps taken to minimise the emissions and avoid recurrence.

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As soon as possible after an incident occurs, a report is prepared for the Agency detailing the circumstances giving rise to the incident and all actions taken to minimise the effect on the environment and minimise wastes generated. The risk of off-site spills (e.g. during transportation of pig manure) is minimized by employing reputable contractors and farmers, and regular inspection of their slurry spreading equipment. Farmers and contractors are notified of procedures to contact the management in the case of an environmental incident.

Staff will be trained and supervised to adopt work practices which avoid risks to health and safety and minimizes risks of work place accidents. Staff will be required to wear appropriate health and safety protection (e.g. ear and eye protection and masks for protection from dust). Health and safety training is an on-going responsibility of the pig farm management and an up-to-date safety statement is maintained on site. This statement includes procedures in relation to contacting the emergency services if there is an accident on site.

Continuous checking of equipment and electrical installations will take place to insure the risk from fire is minimized. Fire extinguishers are installed and regularly maintained in all pig houses. There will be procedures in place to contact the emergency services if there is a fire and to remove staff and other personnel from the site. Environmental incidents, accidents and natural disasters (fire) are rare on pig farms.

'Ballfaskin' Farms Ltd have an IPPC License for the existing pig farm. This license has standard environmental controls and procedures for environmental protection and reporting.

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1.7 DIFFICULTIES ENCOUNTERED IN COMPILING THE REQUIRED INFORMATION

The processes and technology involved in the construction and operation of the proposed development are standard for pig farm developments and well understood. The principle practices are substantially similar to those of existing pig farms and the technical information on which the assessment of pre mitigation and post mitigation impacts on the environment is readily available in the public domain. The technical information relies on sources such as Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs; 2017, and other scientific sources – as discussed in the various sections of the EIAR (e.g. Odournet UK Report) – and from widespread knowledge from existing pig farms in Ireland. There is a high degree of certainty of known consequences and or cross media effects due to standard practices such as low protein diets in terms of NH_3 emissions and odour emissions. There were no particular difficulties encountered compiling data and projections of impacts arising from emissions from the proposed development.

1.8 THE STUDY AREA

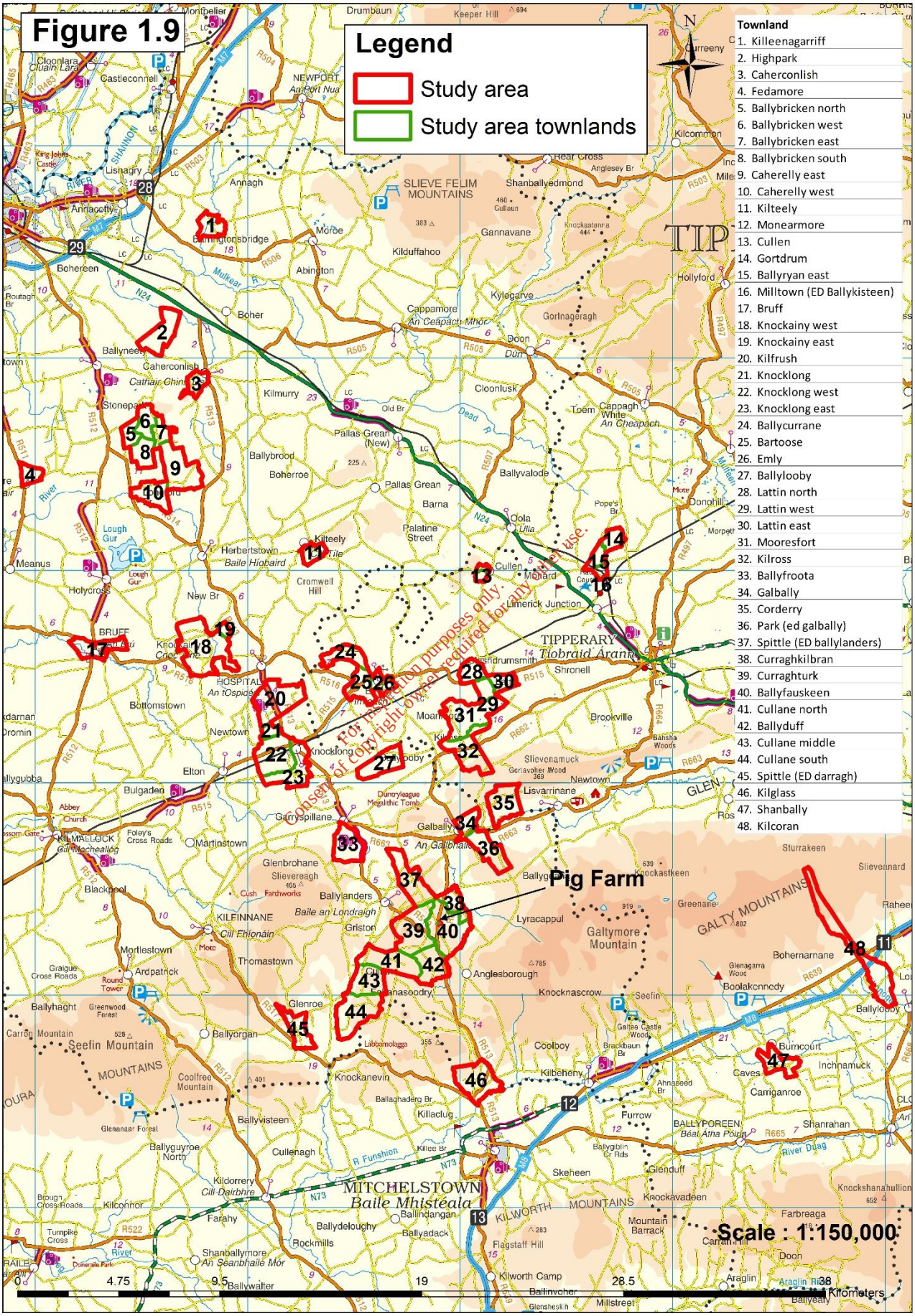
The study area for this EIAR is defined by the boundaries of the 48 townlands within which the proposed development is being constructed and within which it is proposed to deliver the pig manure from the 'Ballyfaskin' Pig Farm development. This is illustrated in Figure 1.8 and a list of the townlands is provided in Table 1.9. Approx. 73% of the study area is within County Limerick and 27% is within County Tipperary (townlands 12, 13, 14, 15, 16, 24, 25, 26, 28, 29, 30, 31, 32, 35, 47 and 48 are in Tipperary).

Table 1.9; List of Townlands within which proposed development is constructed and the pig manure is delivered

Townland Name	Townland Name
1. Killeenagarriff	26. Emly +
2. Highpark	27. Ballylooby
3. Caherconlish	28. Lattin North +
4. Fedamore	29. Lattin West +
5. Ballybricken North	30. Lattin East +
6. Ballybricken West	31. Mooresfort +
7. Ballybricken East	32. Kilross +
8. Ballybricken South	33. Ballyfroota
9. Caherelly East	34. Galbally
10. Caherelly West	35. Corderry +
11. Kilteely	36. Park (ED Galbally)
12. Monearmore +	37. Spittle (ED Ballylanders)
13. Cullen +	38. Curraghkilbran
14. Gortdrum +	39. Curraghturk
15. Ballyryan East +	40. Ballyfauskeen
16. Milltown (ED Ballykisteen)	41. Cullane North
17. Bruff	42. Ballyduff
18. Knockainy West	43. Cullane Middle
19. Knockainy East	44. Cullane South
20. Kilfrush	46. Kilglass
21. Knocklong	47. Shanbally +
22. Knocklong West	48. Kilcoran +
23. Knocklong East	
24. Ballycurrane +	
25. Bartoose +	
+ Tipperary townlands	

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1.9 PHOTOS OF EXISTING PIG FARM



Plate 1.2: Entrance to 'Ballyfaskin Pig Farm' (mill House in background)



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Plate 1.3: Site of proposed electrical substation

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Plate 1.4: Looking south east with house 13 on left-hand-side



Plate 1.5: Covered slatted pig-walk passage.

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Plate 1.6: Un-covered slatted pig-walk passage.



Plate 1.7: View from R662

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Plate 1.8: Building No 11 on Left-hand-side and looking SE onto loading bay (No 12)



Plate 1.9: Buildings 3-11 on left-hand-side and mill and buildings 13-15 on right-hand-side

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1.10 REFERENCES

British Standard 5288 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 Noise, 2009*

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Ammonia Emissions from Agriculture is available at: https://www.agriculture.gov.ie/media/migration/ruralenvironment/climatechange/bioenergy/codeofgoodagpracticeammoniaemissions/1CodeofGoodAgriculturalPracticeforreducingAmmoniaEmissions081119.pdf.

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M. Sistkova1**, A. Dolan**1**, J. Broucek**2**, and P. Bartos**1 Time of day and season affect the level of noise made by pigs kept on slatted floors; 1University of South Bohemia, 370 05 C˘ eské Bude˘jovice, Czech Republic 2National Agricultural and Food Centre, Research Institute of Animal Production Nitra, 951 41 Luzianky, Slovak Republic

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CHAPTER 2 - ALTERNATIVES

Section 2.1 Introduction sets out the relevant guidance followed and the information sources referred to. **Section 2.2** discusses the 'Do Nothing' alternative. **Section 2.3** discusses the do-something alternative. **Section 2.4** looks at alternative locations**. Section 2.5** examines alternative layouts. **Section 2.6** examines alternative design types. **Section 2.7** looks at alternative processes. **Section 2.8** examines alternative mitigation measures including anaerobic digestion, slurry amendments and alternative pig diets. Conclusions regarding alternatives are provided in **Section 2.9**. **Section 2.10** contains reference for the Chapter.

2.1 INTRODUCTION

The EIA Directive as amended by Directive 2014/52/EU requires that the Environmental Impact Assessment Report (EIAR) contains *"a description of the reasonable alternatives studies by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment"*. This chapter of the EIAR describes the reasonable alternatives (in terms of design, technology, location, size and scale) considered by the developer, which are relevant to the proposed development and its specific characteristics and an indication of the main reasons selecting the chosen option, including a comparison of the environmental effects.

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017); and
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018.
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

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In compiling this chapter the following sources of information were referred to;

- Odournet UK; 2001, *Odour impacts and odour emission control measures for intensive agriculture*;
- Teagasc; Dec 2011; Project No 5669, *Chemical amendment of slurry to control phosphorous losses in run-off*;
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- Teagasc Crops Research Centre, Oak Park, Carlow Author: D. Ryan (2005); *A Slurry Spreader to Meet Farming Needs and Environmental Concerns* (comparison of spreading techniques)

2.2 'DO-NOTHING' ALTERNATIVE

The do nothing alternative will result in a zero change in livestock numbers and therefore emissions of odour, greenhouse gases and soil nutrients (pig manure) will remain unchanged at the 'Ballyfaskin' site. For the proposed reconfiguration of the herd the vast majority of the infrastructure is in place – except for the electrical substation. Now that the majority of the investment has been made it is essential from an economical point of view to operate the optimum enterprise to secure the viability of the pig farm. The do-nothing alternative does not respond to the change in the market place which has switched from the specialized market for heavier pigs (135 kgs) towards a mid-sized finisher weights (100 – 105 kgs). In the do-mothing alternative the sow herd size remains unchanged at 600 sows and therefore a substantial percentage of the existing housing remains empty and consequently the business becomes unviable. The do-nothing alternative would not result in an up-graded power supply for the operation of the mill.

Therefore the 'do nothing' alternative would result in a sub-optimum enterprise mix on the farm reducing the viability of the enterprise, it would not allow the specialization required in the milling operation for the formulation of low protein diets and resulting reduction in emissions, and, it would potentially increase traffic due to feed deliveries in smaller loads.

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As shown in Figures 8.2 and 8.4 of Chapter 8 the pig numbers in Ireland are more or less static for the past 10+ years but concentrated in fewer more modern and well equipped farms. Therefore the proposed development does not represent an increase in pig numbers on a regional basis where numbers may be declining in older less well equipped pig farms. Also, the overall density of pig production, expressed as the agricultural area used (AAU) per sow, in Ireland (25.7ha/sow) is low when compared to the Netherlands (1.9ha), Denmark (2.0ha) and Belgium (2.2ha); and the pig density in Limerick is low compared to other counties (see Figure 1.8 of Chapter 1).

In the do nothing scenario the economic benefits of the proposed expenditure will not accrue to the economy. The current pig farm supports approx. 25 - 30 jobs in the agri-sector and the proposed development will create additional employment in the agri and the construction sectors (Sections 1.5 and 3.5.3.3 of the EIAR). This economic benefit accruing to local farmers from pig manure fertiliser (€140,000 / annum) would also be in jeopardy and if pig manure is not produced on this site this will potentially increase the import of a non-renewable chemical fertilizer.

2.3 'DO-SOMETHING' ALTERNATIVE

This 'Ballyfaskin' site has a long history of producing pigs (since the 1960s). The do-something alternative will result in the construction of the electrical substation. This will allow the reconfigured herd to minimise impacts on traffic by ensuring full loads of ingredients and will allow the pig farm to formulate bespoke low protein diets which will enable a reduction in ammonia and odour emissions. In the do-something alternative the sow herd size increases to 1,000 sows insuring that the use of existing pig space is optimized and the viability of the enterprise is made more secure. The do-something alternative will not result in increased pig house area. The category and number of pigs will be altered such that the production of pig manure will be almost the same. The emissions to surface waters (storm water) at the 'Ballyfaskin' site will not change significantly. There will be economic investment with knock-on benefits to the local economy.

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Having considered the benefits of the 'do nothing' scenario it is considered that the urgent viability and economic requirements require a 'do something' scenario and that environmental impacts can be managed at an acceptable level.

2.4 ALTERNATIVE LOCATIONS

In order to prevent or reduce the environmental impact and improve overall performance, Best Available Technology (BAT) conclusion No 2 requires, where possible, the proper location of the plant/farm and spatial arrangements of activities on the farm. This is a rural and agricultural setting with an existing pig farm which has been on this site since the 1970's. The proposed development makes use of the existing site, and, in adherence to Objective ED 022 (c) and (d) of the Limerick County Development Plan, minimising visual impact by building in the existing site and by re-using/refurbishing existing buildings. Therefore this site represents the best use of existing resources. Having the fattening and the breeding unit on the same site is the most efficient scenario from a labour and welfare point of view. There is adequate slurry storage in the existing site. This reduces the amount of pig transport required and thus reduces stress on pigs. There are no reasonable alternative locations within lands owned by the developer which would accommodate the proposed new buildings. Leasing facilities is not an option because none are available close enough to this farm.

Having considered the option of alternative sites it is considered that none are as suitable as the existing site.

2.5 ALTERNATIVE LAYOUTS

Within the confines of the site boundary the existing layout optimises the land use and operation of the proposed pig farm. Existing pre 2012 planning application buildings were refurbished or replaced on the same site with new buildings. The proposed location offers the advantage of a low visual impact because of existing screening and existing farmyard. The mill is located towards the back of the site thus reducing potential noise impacts. The houses are aligned in north west to south west axis which is perpendicular to prevailing south west winds thereby maximising dispersion of gaseous emissions. The cluster of housing minimises visual impact.

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Having considered the option of alternative locations within the site it is considered that none are as suitable as the existing location which has the least visual impact and least impact on neighbours.

2.6 ALTERNATIVE DESIGNS

In considering what type of pig house to use the developer has chosen the most up-to-date concepts in pig house design. Building design concepts for pigs have been well developed over the last 20 years to maximize efficiency of production and health of the pigs and the Developer has consulted with his Teagasc adviser to build the optimum building. The developer has opted for slurry tanks that are slightly deeper than the norm to provide additional slurry storage which means there is more control over the timing of slurry exports. The design incorporates a modern efficient mechanical ventilation system in all but houses 1 – 3 (which are naturally ventilated). The roofs and walls are insulated to a standard that enables climate control within the buildings such that the houses will not get too hot in the summer and will retain heat in the winter. The naturally ventilated houses use an automated control system to open and close vents/shutters. Slurry tanks are underground which minimises risks of spillages and all tanks have leak detection facilities to monitor integrity of tanks.

In compliance with BAT 6 the area of soiled water is eliminated by restricting the movements of pigs to slatted passages that are over the slurry tanks and covering many of the slatted walk passages. Storm water is harvested and re-used for power washing to minimise water usage.

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Alternative low energy lighting is used with timer switches to minimise energy usage as per BAT 8. Houses 1 – 3 are naturally ventilated trowbridge design houses, which minimised energy usage.

In order to minimise dust emissions as per BAT 11 the design incorporates an automatic wet feed system, which takes feed from sealed containers (Silos) and mixes with water before distributing to the feeders in the rooms, on an ad-lib basis, as per pig's natural requirements, thereby significantly reducing the dust levels in the internal, and external environment. The mill building contains the main feed storage silos and feed augers which reduces potential dust emissions from un-covered feed silos.

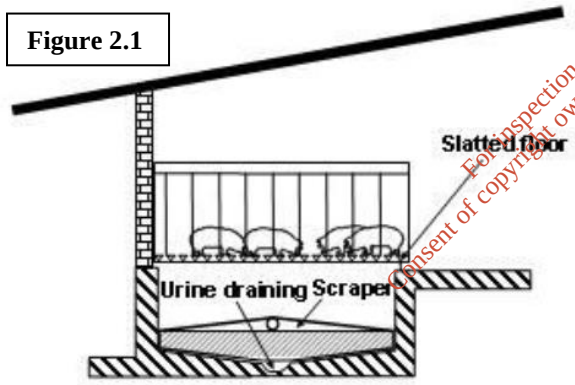
In consideration of the existing house design more novel capital intensive housing systems were considered.

2.6.1 Low emission housing design options

1. **Under-slat scrapping system to constantly remove slurry from pig house for storage in separate covered tanks.**

The under-slat scrapper system combined with storage of manure in separate covered tanks conforms to BAT 2017[1] guidelines for low emission housing with reductions of 40+% quoted for ammonia and odour and significant reductions in other greenhouse gases also (see Section 1.3.2.1). This system has the advantage of combining the use of fully slatted housing with a system for frequent slurry removal which reduced emissions.

Figure 2.1



Source: [292, Italy 2001]

In addition a slatted floor offers good environmental mitigation by reducing ammonia emissions by 30 – 40%[2] compared to straw bedded systems. This option is more expensive than the standard slatted tank housing and on-going running costs and power consumption is higher. There are benefits for animal health and performance. The figure here is a copy of Figure 4.51 of page 429 of BAT (Figure 2.1).

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2. **Partial solid floors combined with slats and an under-slat slurry discharge system (flushing).**

[1] Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs
[2] *Ammonia in the UK* – Department of the Environment Food & Rural Affairs – 2002;

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This housing system is more suited to sow housing than fattening pigs. The slurry has to be flushed out daily, usually using the separated urine. This requires additional power and slurry handling/pumping but can achieve reductions in NH_3 emissions (40% - 65%) if managed properly. Peaks in odour emissions can be associated with flushing events. This system is shown in Figure 4.54 of BAT (Figure 2.2). If water is used for flushing additional slurry is produced and must be stored.

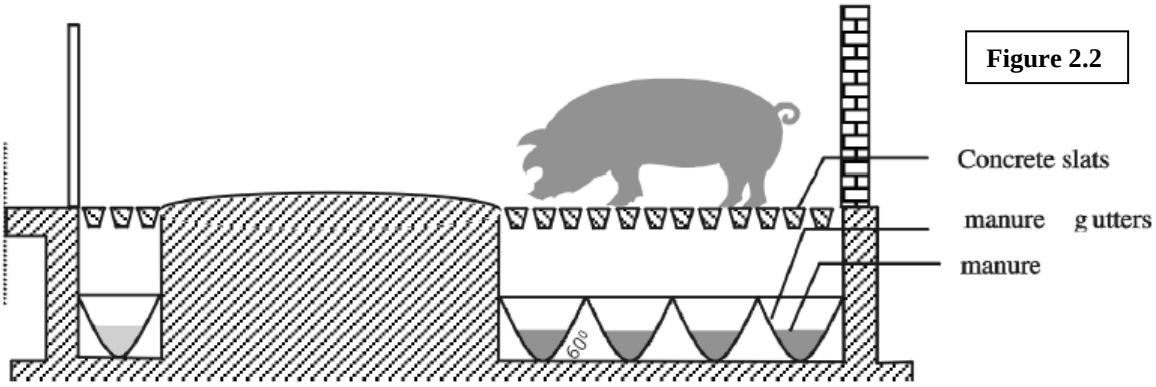


Figure 2.2

Source [42, Netherlands 1999]

Another variation of the under slat slurry flushing system is shown in Figure 4.60 of BAT (Figure 2.3). The V shaped channels reduce the surface area of the liquid slurry thus reducing the surface area of the slurry – and therefore reducing ammonia emissions.

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3. Fully slatted floors and an under-slat slurry discharge system (flushing).

Fully slatted floors are preferable for fattening pigs for ease of management and cleanliness. The above systems can also be adapted for fully slatted floors as shown in the figure below. These flushing systems require a lot of liquid, usually obtained by separating the urine from the solids, requiring additional separate storage and slurry handling and potentially increasing odour spikes. An example of a vacuum discharge system is shown in the figure below which is a copy of Figure 4.28 of BAT (Figure 2.4). The slurry is allowed to accumulate and is discharged one or twice per week through a pipe system under the floors and slats. The results in emission reductions are variable and in general it is not as effective as flushing. It also involves considerable complexity in construction and leak detection. A similar system shown above is a copy of Figure 4.32 of BAT where walls are slanted or gutters installed.

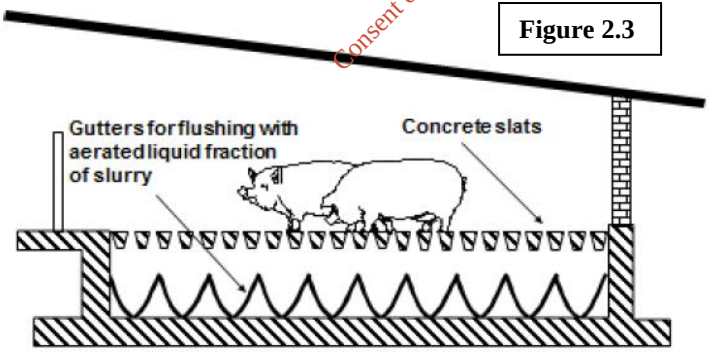
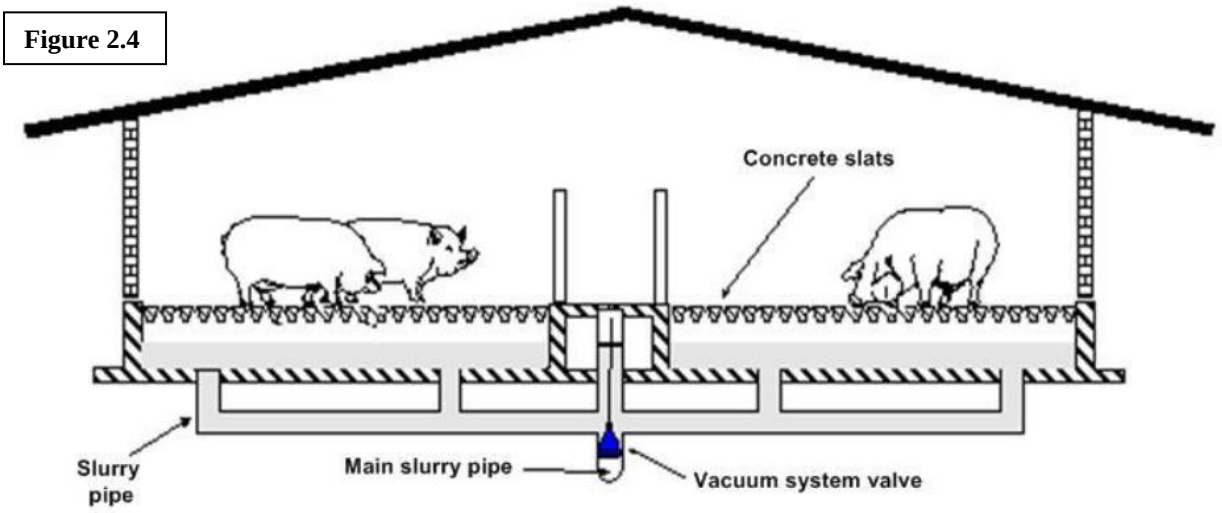


Figure 2.3

Source: [42, Netherlands 1999]

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Figure 2.4



Source: [292, Italy 2001]

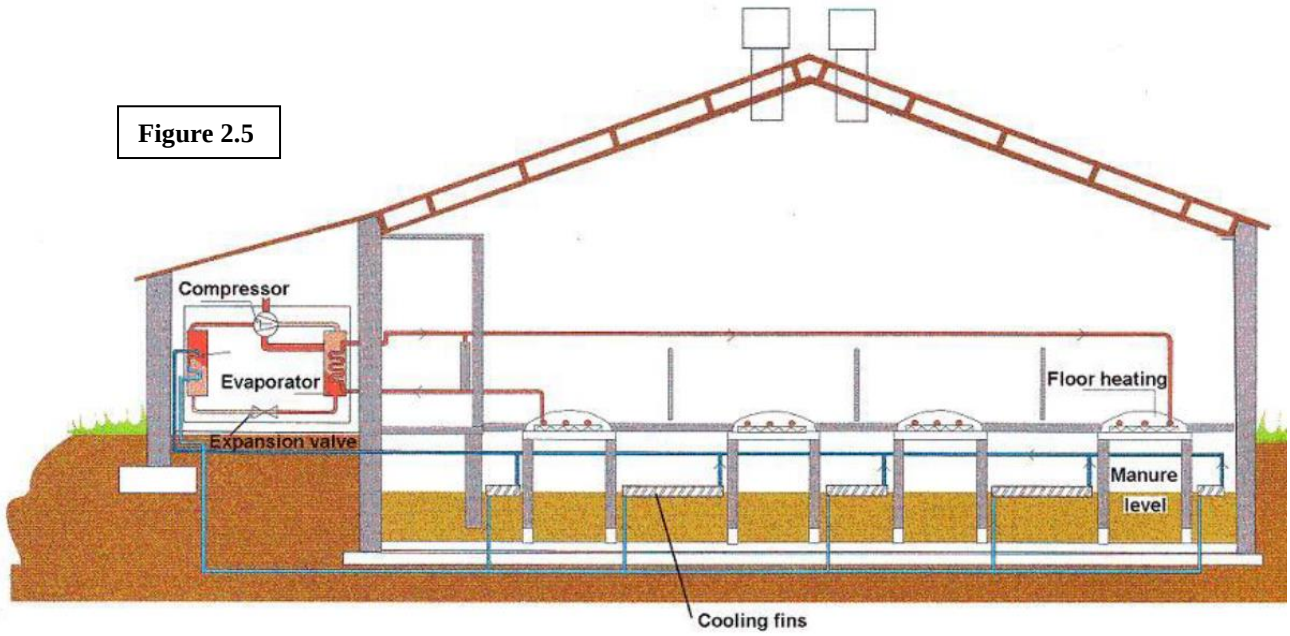
Slanted walls at the sides of slurry tanks have the effect of reducing the area of the surface of the slurry in the store. These are difficult to construct, and more suited to channels rather than slurry tanks and therefore considered to be not practical in the proposed development.

4. Slurry cooling

Figure 4.31 of BAT (Figure 2.5) illustrates a slurry cooling system where floating cooling fins are installed into existing slurry tanks. The heated water in the cooling pipes is pumped to a heat exchanger where water can be heated for use in the heating of pig houses. In a new build the pipes are installed into the concrete floor and walls of the slurry tanks. This system is more suitable where the heat generated can be used on the pig farm i.e. for heating piglet houses. The heat is not required for fat pig houses or larger weaners. The system is expensive to install and maintain but it generates renewable energy which can reduce electricity bills. Ammonia emissions are reduced by 45 – 75% (page 381 BAT) and odour by 20 – 25%.

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Figure 2.5



Source: [546, TWG ILF 2002]

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Having considered the option of alternative building designs for performance, management and low emissions it is considered these options are not feasible due to the potential disturbance to existing infrastructure and that these may only considered for new build situations.

Bio scrubbers and bio filters treat the exhaust air from the pig house. These are generally end-of-pipe treatments which require centralising the ventilation system to one exhaust point, for a house or group of houses, and treating in a single treatment unit. Wet scrubbers and acid scrubbers work by pumping the vented air through a staged filtering system removing dust, ammonia and odour. In Bio-filters the exhaust air is passed through a bio-filter filter, often woodchip or peat based. BAT 2017 Reports odour and ammonia reductions of 70-90%. These is an end- of-pipe system and therefore no benefit is experienced within the house for the workers or pigs. Water and energy usage will increase and soiled water production can increase by at least 0.4 – 1 m3 / pig place (Table 4.152 of BAT for IRPP 2017) due to circulation of water in bio scrubbers (bio trickling filter systems would have a lower water usage and a lower soiled water production). Also the disposal of acid in waste water, which must be land-spread, creates its own environmental concerns. Soiled water has to be stored and land-spread or treated (at additional cost) or re-used by pigs. Up front capital costs plus on-going maintenance costs are reported to be in the region of €11 - €24 / pig / annum (Tables 4.135 and 4.153 of BAT for IRPP 2017) which is €80,000 per annum for 4,000 pig places (assuming the up-front capital can be obtained).

Having considered the various options available; in the context of this development these options are not suitable as the housing is already constructed and retrofitting these technologies would not be possible or would be uneconomic.

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2.7 ALTERNATIVE PRODUCTION PROCESSES

The alternative to indoor pig production is outdoor production. However, the Irish climate and soil types do not suit this type of production system. Also winter rainfall run-off would cause serious impacts on the local water environment. Pigs are reared in housing systems that have been developed over many years of research and the proposed housing design and production system is optimum for animal welfare and economic and environmental performance. Pigs are fed standard high quality diets based mainly on cereals and soybean. The markets dictate the size and age of pigs sold from the exiting pig farm. The trend is towards slaughter weights of 100 - 110kgs. Land spreading organic wastes/manures is a recognized and approved production process with many benefits and some potential negative effects which can be addressed with mitigation.

Alternative diets are considered in Section 2.7.3.

Having considered the option of alternative processes it is considered that the standard indoor system, with ventilated houses and slatted floors is the only economically viable production system because the existing houses are already in place and modifications would not be feasible.

2.8 ALTERNATIVE MITIGATION MEASURES

Mitigation measures to minimize environmental impacts are discussed in the various chapters of the EIAR. In this chapter alternative mitigation measures are discussed in relation to the pig diets and potential treatment and processing of pig manure. However the major constraint in relation to alternative mitigation measures is that the pig houses are already in situ.

2.8.1 Alternative pig manure application techniques

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The pig slurry is spread by local farmers using their own slurry spreading equipment and by slurry contractors. It is not practical to oblige local farmers to use alternative equipment (e.g. band spreaders, injection units and trailing shoe), however there is an increasing trend towards low emission slurry spreading techniques such as band spreading and 'trailing shoe'. The pig unit will comply with any future changes in legislation relating to slurry spreading techniques including DAFM Code of Good Agricultural Practice for reducing Ammonia Emissions from Agriculture (November 2019) and where available the pig farm will use contractors with trailing shoe equipment.

Nearly all the land where it is proposed to spread the pig manure is grassland. As mentioned land spreading pig manure is a recognized and approved disposal technique with many benefits. Potential negative impacts include the release of Green House Gases (GHG) during spreading and the potential for run-off. Slurry spreaders differ considerably in their performance in relation to ammonia emissions. Table 2.1 illustrates the performance of various type of spreaders. The splash plate spreader has the highest rate of emission. Emissions after band spreading were only 30% to 60% of that from a splash plate with the trailing shoe spreader offering similar benefits. Emissions available from injectors are 10% to 40% of splash plate loss and in a trial with the Direct Ground Injector (DGI) losses were only 23% (Hol and Huijsmans, 1998).

Table 2.1 Loss of NH3 in a range of slurry spreading trials reported in the literature

	Ammonia Emissions (% of splash plate)							
Source*	a	b	c	d	e	f	g	h
Splash plate	100	100	100	100	100	100	100	100
Band spreader			61	26				47
Trailing Shoe		38	57		31	20-50	20-50	28
Slurry injection	12.5	15	43	8	15			

*Source: (a) Phillips etal., (1991), (b) Huijsmans and Monteney, (1999), (c) Smith etal., (2000), (d) Huijsmans (2003), (e) Huijsmans et al., (1997), (f) van Lent etal., (1993), (g) Shurer (1998), (h) Misselbrook et al., (2002)

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Harmful pathogens exist in manure applied to land. Generally these are assimilated by way of natural decomposition into the soil complex without causing harm. While the risk from aerosol spread is higher using splash plate, the rate of decline of pathogens in the manure is quicker because the manure is spread more finely and thinly over the soil and is exposed to weathering and ultraviolet light (sun). Where the manure is layered (band spreading) and injected pathogens can survive for longer periods.

Having considered the alternative pig manure spreading techniques, it is concluded that;

- Although soil injection has the lowest potential emissions it would not be practical to use this type of equipment due to the cumbersome nature and size of the injector and the cost of hiring such equipment. It is not suited to the topography of the land spread area which consists of undulating land and small fields. Transport along small country roads would be cumbersome and the weight of the soil injection unit would cause compaction problems in fields. The soil injection machine would have restricted traffic ability (due to its weight), and access through field gates could be restricted due to the size of the unit. There are higher costs associated with this system because the large injector unit generally stays in the field while feeder units transport the slurry to it;
- There are significant environmental benefits from using bandspreading or trailing shoe slurry spreading equipment. The potential negative aspect of pathogens surviving longer in the soil is not a significant consideration. Trailing shoe spreaders are being promoted through the agri environmental scheme - GLAS[3] and grants available to purchase this type of equipment. Both

[3] GLAS – Green Low-carbon Agri-Environmental Scheme.

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of these spreaders are cumbersome and expensive. Where contractors are being employed to spread slurry the pig farm will seek to employ contractors who use band spreading or trailing shoe equipment. There is an increasing trend for tillage farmers to use this type of equipment to apply pig slurry to growing tillage crops in the early spring time; and

- Splash plate spreading is the most popular method of spreading used by customer farmers and the least environmentally beneficial. However because customer farmers remove a significant portion of the manure this will remain the most popular method of land spreading. National legislation may address ammonia emissions in the future insisting on an alternative to splash plate being used on all farms and the pig farm will implement that requirement.

2.8.2 Alternative pig manure application timing

Since 2018 Teagasc and DAFM are promoting the spreading of pig manure in the early part of the growing season (before June) when temperatures are low and uptake of nitrogen is high. This strategy has been proven to reduce ammonia emissions significantly. Where possible the pig unit will encourage the spreading of pig manure in the early part of the growing season.

2.8.3 Alternative pig manure treatment techniques

Various slurry treatment techniques can reduce GHG emissions and reduce environmental effects.

- Anaerobic Digestion (AD) treatment produces methane biogas which can be harnessed to produce heat or electricity. AD also reduces ammonia losses from the land spreading operations. This treatment requires additional capital investment and on-going increased operational costs. Like many pig farmers the developer is keenly interested in AD and the potential economic spin-offs which exist in other jurisdiction. It is not currently financial viability unless a sufficient premium is paid for the electricity sold from the AD plant and obstacles to grid connections removed. National policy is promised in this area but has not yet been delivered. It is noted in a Teagasc publication[4] that in Northern Ireland, which has less than 25% of the agricultural area of the Republic of Ireland, there are more than one hundred AD plants, the vast majority of which are farm fed, compared with less than ten in the Republic of Ireland. It is economically advantageous for farmers in Northern Ireland to invest in AD and also environmentally advantageous. The available tariff in 2015 was 100% higher in Northern Ireland. In Germany where higher incentives are available there are almost 8000 AD plants.
- Nitrogen and phosphorous nutrient availability can be reduced (or removed) from pig manure using various techniques (e.g. breakpoint chlorination, ion exchange, nitrification of ammonium, biological phosphorous removal being mentioned in the OdourNet UK report https://www.epa.ie/pubs/reports/research/air/Odour%20Impacts%20Final.pdf.). Generally these techniques have only been applied at an experimental level (and in industrial applications) and because of the very high costs associated with them are not yet viable on a commercial production scale on pig farms.
- In a presentation at the Teagasc 2018 Soil Fertility Conference data was presented on slurry 'amendments' such as sulphuric acid, acetic acid, ferric chloride and alum and agricultural waste products such as sugar beet molasses and dairy processing waste. These additives/amendments have the ability to reduce ammonia emissions from pig manure. However some of these products have zero impact on GHG emissions because of corresponding increases in N_2O and carbon emissions and 'pollution swapping'. The paper presented by Ian Kavanagh and Dominika Krol of Teagasc, Johnstown Castle, concludes;

[4] Teagasc Pig Letter, September 2015

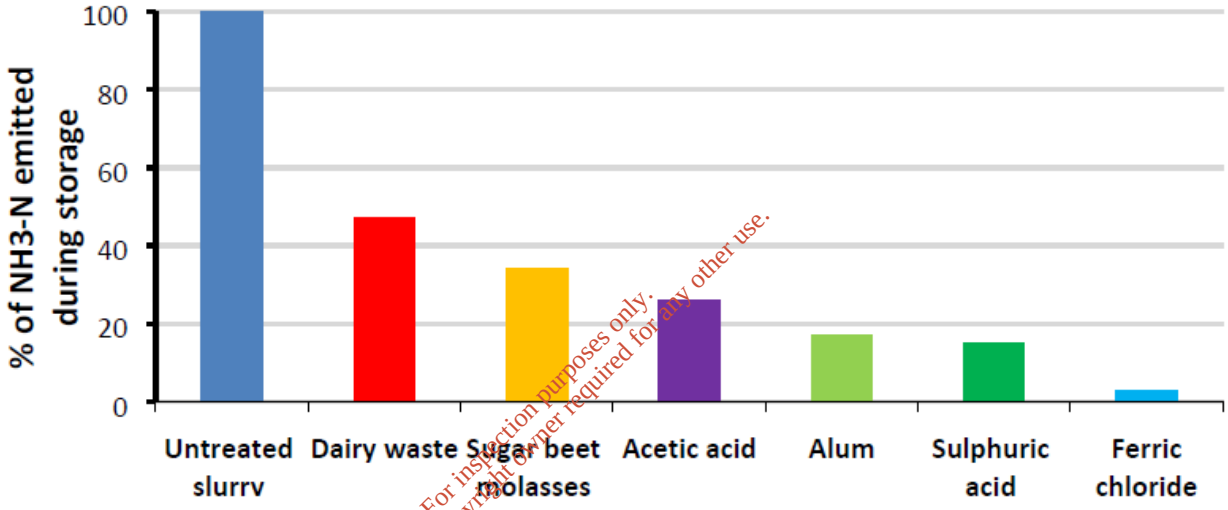
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The use of selected amendments during winter slurry storage significantly reduced N emissions leading to increased plant available N at slurry spreading time. Following the incubation experiment a pilot-scale study is planned for winter 2019 to further investigate the effects of slurry amendments on gaseous emissions to air, plant availability of slurry nutrients and grass growth response post slurry application. In particular, the use of amendments such as ferric chloride and alum may have an effect on phosphorous availability. Furthermore, different slurry spreading methods, such as low emission slurry spreading techniques, will be used to evaluate the full potential of ammonia savings and improved N use efficiency of slurry. The financial cost-benefit of each amendment will also be evaluated.

Results of this work are non-conclusive at this stage but do offer encouragement that technologies are being worked on to mitigate GHG emissions from slurry – and hopefully such technologies will be available at a commercial scale for pig farms in the future.

Figure 2.6 Ammonia-N % reductions when compared to untreated slurry



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- Aerobic treatment of manure is possible by installing pumping systems in slurry tanks – particularly for newly constructed tanks. However the installation costs are high and the continuously pumping of the slurry dramatically increases the energy consumption.
- Slurry odour masking additives are widely used and can be beneficial where a nuisance arises from land spreading or from pig houses. These agents can be applied in a misting system.
- Scrubbing the emissions from the pig houses is a potential mitigation which is very capital intensive and also incurs on-going additional operational costs. This requires the ventilation system to be directed through a scrubbing system which uses diluted acid to remove ammonia before the exhaust is filtered through a bio-filter.

Alternative treatments of pig manure, such as Aerobic Treatment and Anaerobic Digestion, while reducing emissions of GHG, do not remove the phosphorous content from the pig manure and the residual manure will still have to be land spread.

Having considered the alternative manure treatment techniques, it is concluded that improved economic incentives are required to promote AD. In other jurisdictions where such incentives are provided AD is a popular choice for pig farms of this scale. However in the absence of financial incentives the on-going running costs and initial capital investments cost are prohibitive.

2.8.4 Alternative Pig Diets

BAT No 4 promotes the use of Low protein diets, balanced for the essential amino acids, as a recognized way of minimizing the amount of nitrogen excreted from the growing pig. Certain additives

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(e.g. Bactocell) have been trialed in pigs and improve food conversion efficiency, particularly the nitrogen in the feed, resulting in more retained nitrogen in the carcass and reduced ammonia emissions. EPA July 2020 report *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* identifies low protein diets as one of the principle alternatives for pig farming in order for agriculture to meet its climate change commitments.

Low phosphorous diets can result in lower excretion of phosphorous from the growing pig but also result in poorer growth rates and poor bone formation. Phytase is an additive used in meal fed to pigs which enhances the availability of phosphorous, thereby allowing a lower rate to be fed in the diet. The result is a lower emission of phosphorous in the pig manure. However, the use of phytase has shown to restrict growth and therefore is generally not economically viable because of the poorer growth rates and additional costs.

Having considered the alternative pig diets it is concluded that the use of carefully formulated low protein diets offer a realistic option to mitigate and minimize ammonia emissions and odour from growing pigs. The proposed development will result in a fully operational mill allowing the developer to formulate his own diets specifically to reduce protein and optimize phosphorous. The pig farm will not be reliant on proprietary feed products with standardized protein levels.

2.8.5 Alternative renewable energy systems

Slurry cooling has already been discussed. This system can generate heated water through the heat exchange system but this system is very expensive to retro fit and not economical. Electricity production from photovoltaic panels is possible in pig and poultry farms as large roof surfaces are available on houses. Government incentives, such as 'Feed-In Tariffs' applied in many EU Member States, have reduced payback times of the investment in solar energy production to 5–10 years. Section 2.14 of BAT reports costs of approx. €450–600 per m^2 in 2013. However costs for photovoltaic panels have falling and this option is one that could be adopted in the future to off-set Carbon emissions. Section 8.8.1 of this EIAR shows that 50% of the roof area (7,000m^3) could produce 910,000 kWh off-setting more than 400 tons CO_2; but this would require further state incentives and improved grid access to make this option viable.

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2.9 CONCLUSIONS ON ALTERNATIVES CONSIDERED

- The proposed design is best available technology for this type of pig farm, optimising both the environmental and economic performance and not entailing excessive costs;
- The current location offers the best alternative because this site has a history of pig production. The existing pig buildings will be refurbished;
- Alternative manure spreading techniques such as band spreading or using a trailing shoe are viable alternatives for applying pig manure. Where possible the pig farm will encourage customer farmers to use these spreaders and will employ contractors who have these spreaders;
- AD is a priority for pig farms such as the proposed development. However National Policy changes are required to make this alternative treatment option viable;
- Slurry amendments are being trialed by Teagasc. If these products are tested and proven and are cost effective the pig farm will use them;
- Low protein diets will be used by the pig farm. This will help mitigate emissions by reducing ammonia and odour emissions from growing pigs; and
- Slurry odour masking agents will be used routinely to minimize odours and in particular may be used as a tool to address odour complaints if they arise.

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CHAPTER 3 - HUMAN POPULATION AND HUMAN HEALTH

Section 3.1 introduces the topic of human population and human health and refers to other sections of the EIAR where this topic is addressed. **Section 3.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 3.3** looks at the receiving environment. **Section 3.4** describes the characteristics of the proposed development relevant to this topic. **Section 3.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. **Section 3.6** sets out proposed mitigation. **Section 3.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 3.8** and conclusions regarding impacts on human population and human health are provided in **Section 3.9. Section 3.10** contains the references for the chapter.

3.1 INTRODUCTION

This section of the EIAR addresses potential impacts under the heading of Human Population and Human Health. This is a broad ranging topic which *"covers the existence, activities and health of people, usually considering people as groups or 'populations'"* (EPA 2015). Elsewhere in the EIAR issues relevant to human beings such as ecosystem services, air quality, nuisance, water quality, built and natural heritage and material assets are dealt with in the following chapters:

- Chapter 4, Biodiversity;
- Chapter 6, Water;
- Chapter 7, Air;
- Chapter 8, Climate;
- Chapter 9, Material Assets Agriculture;
- Chapter 10, Landscape;
- Chapter 11, Cultural Heritage; and
- Appendix 8, Noise Impact Assessment Report.

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This chapter specifically addresses issues which relate to impacts on human socio-economic activities and assets (business and economic activity, tourism assets, ecosystem services, cultural heritage assets, traffic) and on local community health (water quality, air quality, odour, potential spread of pathogens and noise).

3.2 METHODOLOGY

3.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017 and September 2015);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

In compiling this chapter the following sources of information were referred to;

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- Windshield surveys of the study area conducted in September 2020 during which premises and local businesses were recorded from roadside surveying;
- Aerial photography (Google maps);
- Ordnance survey mapping;
- Central Statistics Office, Small Area Maps data;
- Literature review of relevant human health information;
    - Teagasc Crops Research Centre, Oak Park, Carlow Author: D. Ryan, (2005); A *Slurry Spreader to Meet Farming Needs and Environmental Concerns* (odour and pathogens information);
    - Health & Safety Authority: Health and Safety of Swine Workers Information Sheet.
    - Health & Safety Authority and NUIG, (2007); *Exposure assessment to airborne contaminants in the indoor environment of swine farms*.
    - Teagasc Oak Park, Carlow; 28 January 2011;
    - Odournet U.K. Ltd 2001; *Odour Impacts and Odour Emission Control Measures for Intensive Agriculture*;
    - Teagasc Pig Farmers Conference Papers 18th – 20th October 1999;
    - National Climate Change Strategy Ireland – Department of the Environment and Local Government;
    - CSO 2016 Pig Census report;
    - EPA Report No 193; *Ambient Atmospheric Ammonia in Ireland, 2013-2014*; and
    - Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs; 2017.

3.2.2 Assessment of Significance

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The assessment of impacts involves:

1. Evaluation of the baseline environment and the sensitivity of the individual receptors which may be affected by the proposed development. Towns such as Bruff and Caherconlish and villages such as Fedamore, Knockainy and Kiltealy are very high sensitive receptors with shops, public houses and public amenities. Tourist assets (e.g. Lough Gur which is 2km from the study area) are very high sensitivity. Commercial premises and rural based enterprises are generally medium to high sensitive receptors. Public water sources are very high sensitivity receptors. The human population health receptors include rural dwellings and settlements and are generally high or very high sensitivity. Ecosystem services such as the Aherlow, Camogoe, Mulkear and Morningstar Rivers and forestry plantations have both socio economic and human health and amenity value with sensitivities ranging from low – medium in the case of forests to very high for rivers.
2. Evaluation of the nature and magnitude of the effects on each receptor.
3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the impact significance is predicted based on criteria set out in the EPA (Draft) 2017 guidelines.

The significance of impact criteria are set out in Table 3.1.

Table 3.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*.

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Significance Level	Criteria
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example, no significant effect on local businesses or tourist amenities and no significant human health impact.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example a minor impact on a sensitive local businesses (café) reported due to persistent nuisance (noise, traffic or odour) from pig buildings. A minor impact on reported symptoms but no change in health status can be attributed to the proposed development.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example a moderate impact local businesses reported due to persistent nuisance (noise, traffic or odour) emanating from the pig buildings. An increase in reported health symptoms as a result of a moderate impact on health status but no change in morbidity or mortality can be attributed to the proposed development.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*. For example a permanent negative impact on local businesses due to continuous nuisance (noise, traffic or odour) emanating from the pig buildings. This change would mean a negative impact on business which could require laying off staff. The proposed development has the potential to impact on health status of individuals with an associated change in morbidity.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As with a Significant impact however the effects are more widespread, not confined to one business, and affects groups of people or the majority of the community.
Profound Impact	*An effect which obliterates sensitive characteristics*. For example local businesses and tourism assets cannot operate due to negligent land spreading or proximity to the pig houses. Continuous nuisance (noise, traffic or odour) has a profound effect on the local environment and population. From a health perspective the proposed development has the potential to impact on the health status of communities.

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3.2.3 Duration of Impact

The construction phase will last approximately 4 months. Unless otherwise noted in the individual sections of this Chapter the following duration of impacts apply:

- Temporary Impact - impact lasting for one year or less.
- Short term Impact - impact lasting one to seven years.
- Medium Term Impact - impact lasting seven to fifteen years.
- Long Term Impact - impact lasting fifteen to sixty years.
- Permanent Impact - impact lasting over sixty years.

Construction effects will be temporary. The duration of potential impact from nuisance can be temporary (due to land spreading odours). The duration of potential impacts due to emissions from the pig buildings is generally permanent – even though there may be intermittent effects over a long period of operation. Similarly potential impacts on water, air and the wider environment are

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general permanent in nature. Notwithstanding this, future developments in technology may mitigate some of these potential effects. Potential benefits to the wider economy are either medium term or permanent (provision of labour).

3.3 RECEIVING ENVIRONMENT

3.3.1 Receiving Socio Economic Environment

The receiving socio economic environment is illustrated in Figure 3.1.1 – 3.1.5 (A3 versions are printed in Volume 4 of this EIAR). Within the study area which is comprised of 48 townlands where the development is proposed to be built and where the pig manure is delivered there are;

- Rural dwellings and settlements (human population)
- Farms;
- Commercial businesses (not including tourism assets);
- Tourism assets;
- Public water sources;
- Ecosystem services (rivers, woodlands/forests, clean air); and
- Cultural heritage assets.

3.3.1.1 Human Population

Table 3.2: Population trends (CSO 2016 census)

Census	National	Limerick City & County	Limerick Rural
2016	4,761,865	194,899	91,192
% change since 2011 census	3.8	1.6	1.6

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The 2016 census data for Limerick County and City shows that the 194,899 population has increased 1.6% since 2011, compared to a national trend of 3.8%. The rural population of Limerick in 2016 was 89,852 which has increased by 1.6% (similar to the urban growth) since 2011. Similar overall growth trends are assumed for the study area. The 2006 Limerick County Development Plan states (Section 1.7.5) that the rural population density of Limerick is approx. 48. However this includes Electoral Divisions (EDs) with population densities of 804, 507 and 370 persons / sq.km. In practice these EDs include settlements which will be somewhat removed from activities such as land-spreading. The actual population density of the countryside around these settlements would be lower than 48.

The countryside population of the study area can be determined by selecting the small areas outside the larger settlements (there are 13 settlements inside and within 500m of the study area). There are 39 small areas which represent the extent of the study area (see Figures 3.1.1 – 3.1.5) as presented in Table 3.3. Based on this representative sample the population density of the countryside of the study area (outside the larger settlements) is approx. 30 residents per square kilometre. Therefore the population of the study area not located in settlements is approx. 2,500[1] residents. There are a further approx. 3,450 residents in the larger settlements of Bruff, Caherconlish, Fedamore and Emly. There are 40 dwellings within 1km of the proposed site boundary. Section 1.7.9 of the Development Plan indicates an average household size of 2.8 persons per household – 112 persons. Within 1km from site boundary the land area is 3.9km. This represents a rural population of approx. 29 persons in the direct vicinity of the pig farm.

[1] Approx. 8,250ha = 82.5 km^2 @ 30 / km^2

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Table 3.3: Study Area Population (CSO 2016 Census)

Small Area id	Location	Total population	Population / sq km	
			Rural	Settlement
A127006001	Anglesborough	339	13.6	
A127017004	Ballybricken	252	27.5	
A127020001	Ballylanders	295	31.2	
A127027011	Ballyvarra	197	28.6	
A127031002	Bruff	245	50	180
A127031004	Bruff	213	-	213
A127031005	Bruff	229	50	135
A127031001	Bruff	-	-	272
A127036002	Caherconlish West	268	50	230
A127036003	Caherconlish West	267	50	256
A127036006	Caherconlish West	345	25.3	
Others	Caherconlish	-	-	990
A127038001	Caherelly	364	31.8	
A127055001	Cullane	200	23.8	
A127055002	Cullane	174	16.9	
A127057001	Darragh	308	16.6	
A127067001	Duntryleague	333	20.0	
A127069003	Fedamore	374	13	329
A127072001	Galbally	-	-	100
A127072002	Galbally	281	14.3	151
A127076002	Glenbrohane	195	25.2	
A127093001	Kilglass	302	23.5	
A127100002	Kilteely	275	18.4	171
A127102002	Knockainy	292	27.2	
A127103001	Knocklong	198	34.8	
A127103002	Knocklong	184	19	128
A127103003	Knocklong	238	36	128
A217018002	Ballykisteen +	328	52.1	
A217037002	Burncourt +	259	23.9	
A217053001	Clonbeg +	244	20.2	
A217063001	Cullen +	289	24.9	
A217072001	Emly +	167	14.8	
A217072002	Emly +	-	-	16
A217072003	Emly +	185	-	185
A217072004	Emly +	101	-	101
A217095001	Kilcoran +	236	7.4	

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Small Area id	Location	Total population	Population / sq km	
			Rural	Settlement
A217119001	Lattin +	240	37.8	
A217119002	Lattin +	253	26.5	
A217151001	Rodus +	250	14.5	
	Average Rural =>		**30**	**3,448**
+ Co Tipperary				

There are 13 settlements within the study area itself or within 500m of the study area boundary as illustrated in Figure 3.1.1 – 3.1.5. Ballylanders, which is the closest settlement, is 2.8km NW of the 'Ballyfaskin Pig Farm' site – but is 650m outside the study area. There are shops, public houses, hardware store, health clinic, GAA grounds, rugby club grounds, a bed/mattress manufacturing company and a furniture company located in the village. Within the study area, or within 500m of it's boundary, the settlements are;

1. Bruff is located 20.5km NW of the site. It has a population of 809 (CSO 2016). This historic town is a satellite town to Limerick City. It has public houses, restaurants, shops, pharmacies, post office, schools, garda station, bank, credit union, clothes shop, barber, museum, church and GAA pitches;
2. Burncourt is a small settlement in South Tipperary located 16.7km SE of the site. It has a church, school, public houses and community centre;
3. Caherconlish, a town with a population of approx. 1,476, is located 28km NNE of the site. It is a commuter town to Limerick City. It has school, church, community centre, nursing home, GAA pitch, Credit Union, pharmacy, post office, shops/filing station, veterinary clinic, public houses and small businesses such as take-away restaurants and beauty salons;
4. Emly is located approx. 11.5km NNW of the site in County Tipperary. It has a population of 302 and public houses, church, shop, café, GAA pitch, school and engineering business.
5. Fedamore, a settlement with a population of approx. 329, is located 29km NW of the site. It has schools, church, GAA pitch, shop, post office and public house;
6. Galbally, a settlement with a population of approx. 251, is located 4.5km NNE of the site. It has school, church, GAA pitch, rugby pitch, shop, post office and public house and small rural based businesses (e.g. carpentry business, undertakers, accommodation);
7. Garryspillane is a small settlement located 7km NW of the site. It has a filling station and car retailing business and a co-op store south of the settlement;
8. Glenroe, is a small settlement located 8.5km SW of the site. It has a GAA pitch, filling station and garage, church and community centre;
9. Kilross/Knockballymaloo, is a small settlement located 8.5km NE of the site. It has a public house and school;
10. Kilteely is a small settlement with a population of approx. 171, is located 19km NNW of the site. It has school, church, GAA pitch, shop, public houses and day care centre;
11. Knockainy is a small settlement located 16.5km NW of the site. It has a public house, GAA pitch, school, church and small rural based business (sports injury clinic);
12. Knocklong, is a settlement with a population of approx. 256, is located 10.5km NW of the site. It has school, church, GAA pitch, public house, filling station and car servicing and retailing business; and

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13. Latin (Co Tipperary) is a small settlement located 12km NNE of the site. It has school, church, GAA pitch, tennis club, shop, post office and public house and small rural based businesses (e.g. carpentry business, undertakers, accommodation).

3.3.1.2 Farms

The study area is comprised of 8,250[2]ha. The main land use in the study area is agricultural grassland. Tables 1 and 2 of the 2010 Agricultural Census (CSO) indicates that approximately 24% and 22% of the farmers in County Limerick and County Tipperary are dairy farmers and 3% and 6% of farmers County Limerick and County Tipperary are tillage farmers. The remaining 73% and 72% of farmers in County Limerick and County Tipperary are beef and or sheep and grass cropping farmers. There are significant stud farms in Kilfrush, Fedamore and Knockainy.

There is at least 5,543ha of agricultural land available in the study area after deductions are made for forestry, roads, houses, scrub, farm yards, buffer strips, source protection zones and zones of contribution (see Section 5.3.4 of this EIAR). The customer farmers for the pig manure will replace required chemical fertiliser with the pig manure. Each m^3 of pig manure is worth €9[3] (replacement value of chemical fertiliser), therefore the value of the existing and proposed pig manure to local farmers is approx. €140,000 per annum.

3.3.1.3 Commercial businesses (not including tourism services)

There are 13 settlements and small villages within or adjoining the study area (i.e. within 500m). There are a range of small commercial businesses throughout the study area. Most settlements have a church, public houses, shops, post offices and GAA pitches. Some of the larger settlements (Caherconlish & Bruff) have credit unions and a bank. In the rural area there are manufacturing businesses such as car retailer businesses in Garryspillane and Knocklong. There is a co-op retail/hardware/farm supply store south of Garryspillane. There is a window fitting business in Ballybricken and a farm equipment manufacturer in Lattin. There is a waste contractor business in Luddenmore (north of townland 6). In the environs of the pig farm site there are furniture manufacturing businesses in Ballylanders, a metal fabricator between Ballylanders and Spittle and two rurally based bakeries located 1.5km S and 2km SE from the site. These businesses, and other similar rurally based businesses could potentially be affected by traffic and odour nuisance associated with land-spreading.

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3.3.1.4 Tourism Services

The 'Ballyhoura Way' walking route crosses from Tipperary town, north of the Glen of Aherlow, through Galbally and on to Ballylanders. It is 2.2kms north of the site at its closest point. The Lough Gur centre is 2km south west of the study area and the Ballyhoura and Galtee mountains are at least 1km from the study area boundary. The southern part of the R513 is a scenic route to from 0.75km south of the site and a scenic route on the R663 extends east from Galbally. There are guest houses throughout the study area and south east of the pig farm near Anglesborough.

3.3.1.5 Ecosystem Services

[2] As measured by Curtin Agricultural Consultants Ltd using GIS software.
[3] Each m^3 has 2.1, 0.8 and 2 kgs available N, P and K. Each kg is worth €1.185, €4.5 and €0.7 when C.A.N., Super P and Muriate of K are €320, €475 and €370 per ton based on 2020 fertiliser prices

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Figures 3.1.1 – 3.1.5 illustrate watercourses / rivers, public water supplies and forests / woodlands. These surface and groundwater ecosystems are high and very high sensitivity and provide a valuable amenity to humans in the study area. The Aherlow River is an important surface water body which flows though the Glen of Aherlow (outside the study area) where it is an important tourist amenity. It is an important brown trout fishery. The Arra River (and it's tributary the Shroughnagowneen) flows eastwards near Lattin before joining the Aherlow. This is also a good trout fishery. The Ballynamona River and its tributary streams are a source for the Camoge River. The Camoge River which is a tributary of the Maigue is also fished for brown trout – but mainly downstream from the study area. The Drumcamogue River and its streams feed the Camoge River. The River Funshion flows south from the Galtees through Kilbeheny and flows directly South to join the Araglin River. The River Funshion is an important local trout (and sometimes salmon) fishery. The Groody River is a small river that flows North West from Caherconlish. The Killeengarrif River flows South through Barringtonsbridge to feed the Mulkear River. The Mahore River flows east through Hospital, where the WWTP discharges to it, and joins the Camoge further east. The Morningstar River (also a tributary of the Maigue) is fished for trout and provides amenity value (river walks) as it passes through Bruff. The Mulkear River is located between townlands 1 and 2 and is an important local angling resource. The Shanbally River is a short river that flows South from the Galtees before joining the Tar River east of Burncourt. The Tar River is an important local fishery flowing through Clogheen before joining the Suir. The River Sheep flows from the southern end of the study area to join the Funshion River. The Thonoge River flows south from the Galtees through Ballylooby to join the Suir north of Ardfinnan. The bridge and area adjoining the river in Ballylooby is an amenity for the village.

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Fifteen public water sources have been identified within the study area, or within 500m of it, as illustrated in Figure 3.1.1 – 3.1.5. These include:

- Ballybricken Ground Water Supplies (Ref No 8 and 9) and P serve a population of 541 with 119m^3 per day. The zone of contribution for this GWS is within the study area;
- Fedamore Ground Water Supply (Ref No 11) serves a population of 492 with 330m^3 per day. The source protection zone is within the study area;
- Kilteely Ground Water Supply (Ref No 14) serves a population of 475 with 110m^3 per day;
- Bruff Ground Water Supplies (Ref No 15 & 16) serve a population of 1410 with 550m^3 per day. The source protection zones are within the study area;
- Knockainey/Kilballyowen Ground Water Supply (Ref No 17) serves a population of 117 with 25m^3 per day The zone of contribution is within the study area;
- Knocklong Ground Water Supplies (Ref No 21, 22 & 23) serves a population of 1,169 with 582m^3 per day. The source protection zones are within the study area;
- Galbally Ground Water Supply (Ref No 28) serves a population of 361 with 350m^3 per day;
- Ballylanders Ground Water Supply (Ref No 29 & 30) serves a population of 549 with 164m^3 per day;
- Ballyduff Ground Water Supply (Ref No 33) serves a population of 86 with 18m^3 per day. The zone of contribution for this GWS is within the study area; and
- Kilcoran Ground Water Supply (Ref No 35) serves a population of 100 with 18m^3 per day.

Forests and woodlands have a commercial value and an amenity value and may be regularly used by the public for trekking and amenity purposes. While there are important amenity woodlands throughout the Ballyhoura Mountains, there are no significant woodland amenities within the study area. There is a loop walk though woodland north of Galbally.

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3.3.1.6 Cultural Heritage Assets

The study area is rich in Archaeology and Cultural Heritage. There 468 registered National Monuments[4] within the study area (see Figure 3.1.1 – 3.1.5 and Figure 11.4) which are generally high to very high sensitivity. These include 5 historic town sites, Knockainy East and Knockainy West. Emly, and Galbally. The nearest monuments to the site of the proposed development are two enclosure sites (LI049-198, LI049-199) at 95m and 160m. Also, within the study area there are 228 recorded structures on the National Inventory of Architectural Heritage. Of these 50 are of regional importance and 54 are of local importance. The list include 12 bridges which are not of local or regional importance.

Table 3.4: Structures on the National Inventory of Architectural Heritage

Structure on the NIAH	Regionally Important	Locally Important
Chapel / church / mausoleum	12	-
Country house / house	16	46
Creamery	2	-
Mausoleum	6	-
Monument	2	-
Post box	4	-
Presbytery/parochial/curate's house	4	4
RIC Barracks	4	-
School	-	2
Shop	-	2
Total =>	**50**	**54**

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3.3.1.7 Effects on Local Traffic

A traffic survey was conducted at the entrance road to the pig farm on September 1st and 4th to include the hours 0800 – 1800. The results are presented in Sections 1.2.5 and Section 1.3.4 of Chapter 1 - the results of existing traffic count and traffic projections are presented in Table 3.4.

Table 3.5: Estimated traffic counts at the existing and proposed 'Ballyfaskin Pig Farm'.

Type of Traffic Movement	Existing number	Proposed number
Staff movements	7.4	9.1
Feed delivery	1.6	1.4
Livestock transport	0.5	0.8
Service vans etc.	0.3	0.3
Slurry tanker	3.5	3.5
Carcass and waste removal	0.15	0.15
Miscellaneous	0.5	0.5
Total	**14**	**16**

The Annual Average Daily Traffic (AADT) on the R662 road at the entrance to 'Ballyfaskin Pig Farm' is approx. 923 per day. The proposed development will account for approx. 1.7% of this traffic. The traffic to the site will increase slightly due to the proposed development – from 14 - 16.

[4] https://webgis.archaeology.ie/historicenvironment/

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Outside of operational hours (7 am – 4 pm, Monday to Friday, 8 am – 11 am, Saturday to Sunday) there is virtually no traffic to the site. In the proposed development traffic movements will peak between 0700 and 1000 with approx. 5 - 6 traffic movements and between 1500 and 1600 with 4 – 5 traffic movements. Feed deliveries will be via the R662 and the number of deliveries will fall slightly due to using straights, which will come in 27t loads[5], when the new mill is fully operational. Livestock movements will increase significantly due to transport of additional finisher pigs and weaner pigs from the site. The transport of pig manure throughout the study area will increase by a very small amount and therefore there will be no effect the local road network of approx. 125km of regional roads and 250km of local roads within the study area.

The construction phase is estimated to last approximately 4 months. During this period peak traffic will occur during pouring of concrete with up to 20 HGV trips per day for a 1 – 2 week period. Combining this with other construction traffic, the average traffic count will increase the ordinary daily traffic by an estimated 6 movements per day for the construction period. This is a temporary increase of approximately 3% of the traffic on the local road.

3.3.2 Receiving Local Human Health Environment

3.3.2.1 Water Quality

Surface watercourses and rivers are high sensitivity receptors being sensitive to nutrient run off from soils. The main watercourses in the study area are the Aherlow, Camogue, Funshion, Morningstar, Mulkear, Sheep, and Tar rivers. Ground water extraction points are located in this region. Public water sources (as identified in Section 3.3.1.5 above) are very high sensitive receptors and the private wells are medium – high sensitive receptors - being sensitive to nutrients run off from soils. The quality of the groundwater of wells in the study area is critical to local human health because many rural dwellers in the study area rely on private untreated water supplies. Complete information on private wells is not available. The construction phase of the proposed development may present risks to water quality when buildings are refurbished and soil is disturbed or stored at the site.

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3.3.2.2 Air Quality and nuisance

Dust emissions during construction are a potential source of nuisance for adjoining rural dwellings. The rural air quality in for this area is rated as 'Good' by the EPA Air Quality Index for Health (http://www.epa.ie/air/quality/). Odour nuisance from land spreading is generally related to weather conditions, rates of application and proximity to sensitive receptors. Effects are generally dissipated within a few hours and are temporary. Emissions of dust, odour, ammonia and GHGs from cattle and pig farm yards, buildings and manure stores are common place in this rural environment and may periodically be perceived as a nuisance by the local rural population. The ammonia emissions from the site will be mitigated by using low protein diets. Reducing protein in the diet will also reduce odour emissions (Sections 7.7 of this EIAR).

For the personnel working in pig confinement buildings air quality is an important health issue. The air of pig confinement buildings is very complex and may contain many contaminants that are hazardous to human health. The potential respiratory hazards to which pig workers are exposed include gases, pig confinement dusts and microorganisms or their components that can become airborne and be inhaled. As with any kind of potential contaminated working environment, pig

[5] See section 3.5 of Volume of the EIAR

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workers health and safety can be addressed using different approaches as discussed in Section 3.5 and 3.6 (Mitigation).

3.3.2.3 Potential spread of pathogens

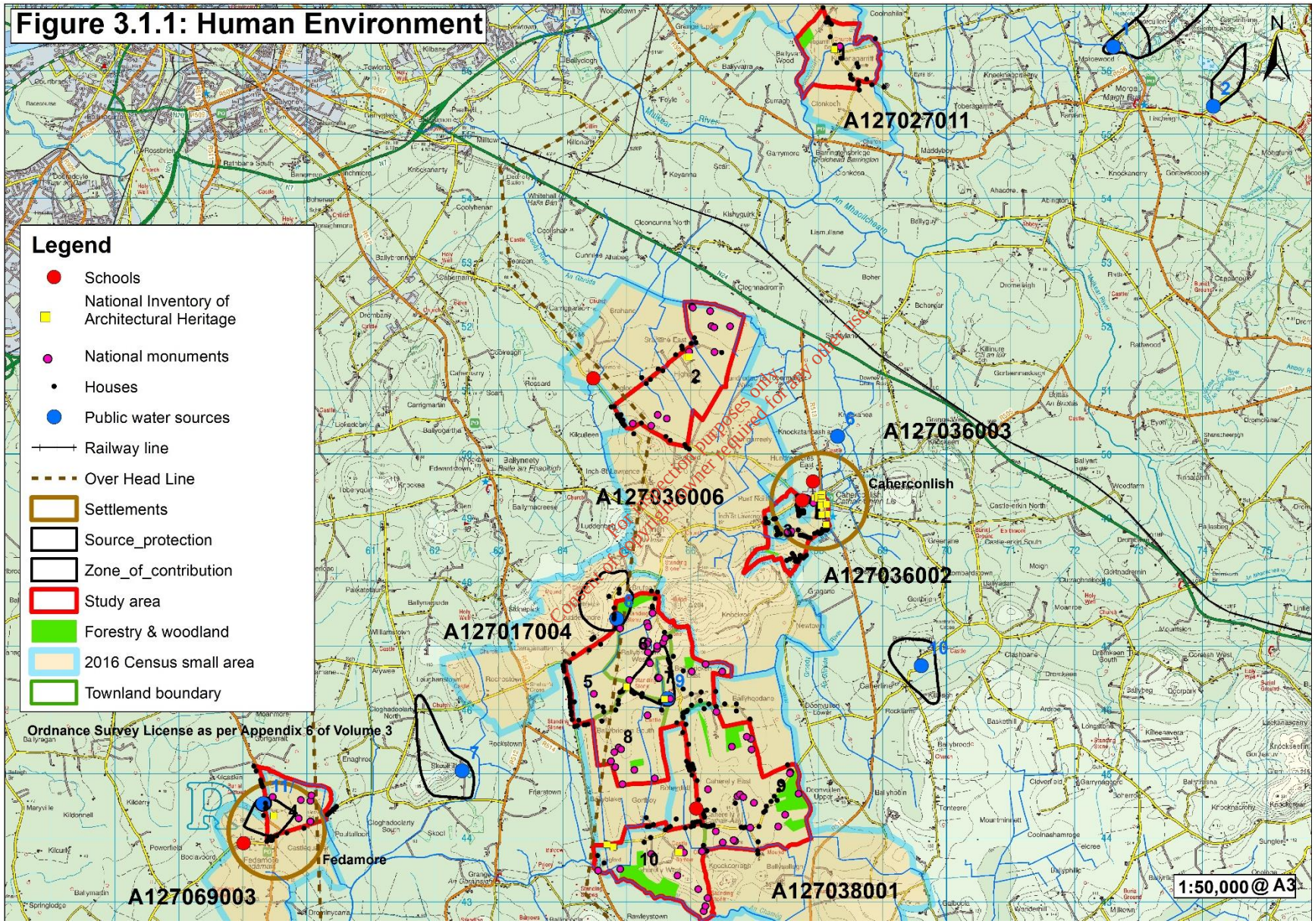
Livestock manure may be contaminated with one or more organisms from a large group of pathogens. These develop in the manure under the livestock house or slurry store. They are transferred to the field by spreading where some organisms can persist for a period of days, weeks or months. This suggests that infection of humans from spread-lands should be common but in fact disease transmission rates are very low. The risk of infection is real but in many cases it is so small that control measures are difficult to justify. Land spreading of organic manures is accepted as a safe practice from a pathological point of view. Flies and rodents can sometimes be associated with pig farms and these may potentially be vectors for disease if not controlled satisfactorily.

3.3.2.4 Noise

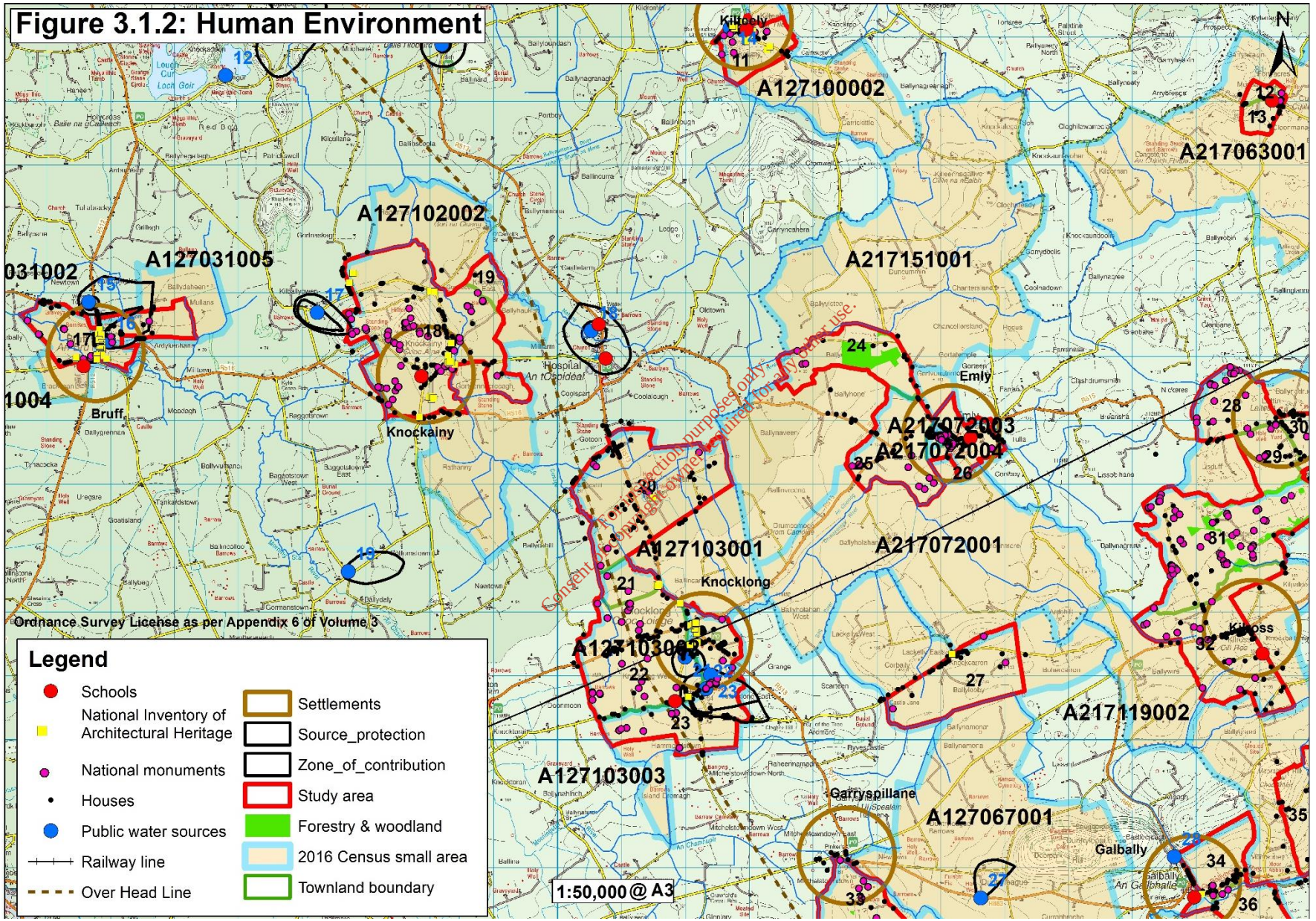
Noise can have adverse effects to workers within pig confinement buildings and to dwelling located near the proposed development. Activities such as slurry pumping, feed mixing, feed loading/blowing and feeding and moving pigs can lead to noise nuisance at sensitive receptors. A baseline noise impact assessment has been conducted and is attached in Appendix 1 of Volume 3 of the EIAR. There are potential noise impacts from the proposed ESB Substation and the operation of the Mill when connected to the new power supply. Construction noise due to the construction of the ESB Substation and the refurbishment of the pig houses may have potential effects on adjoining properties.

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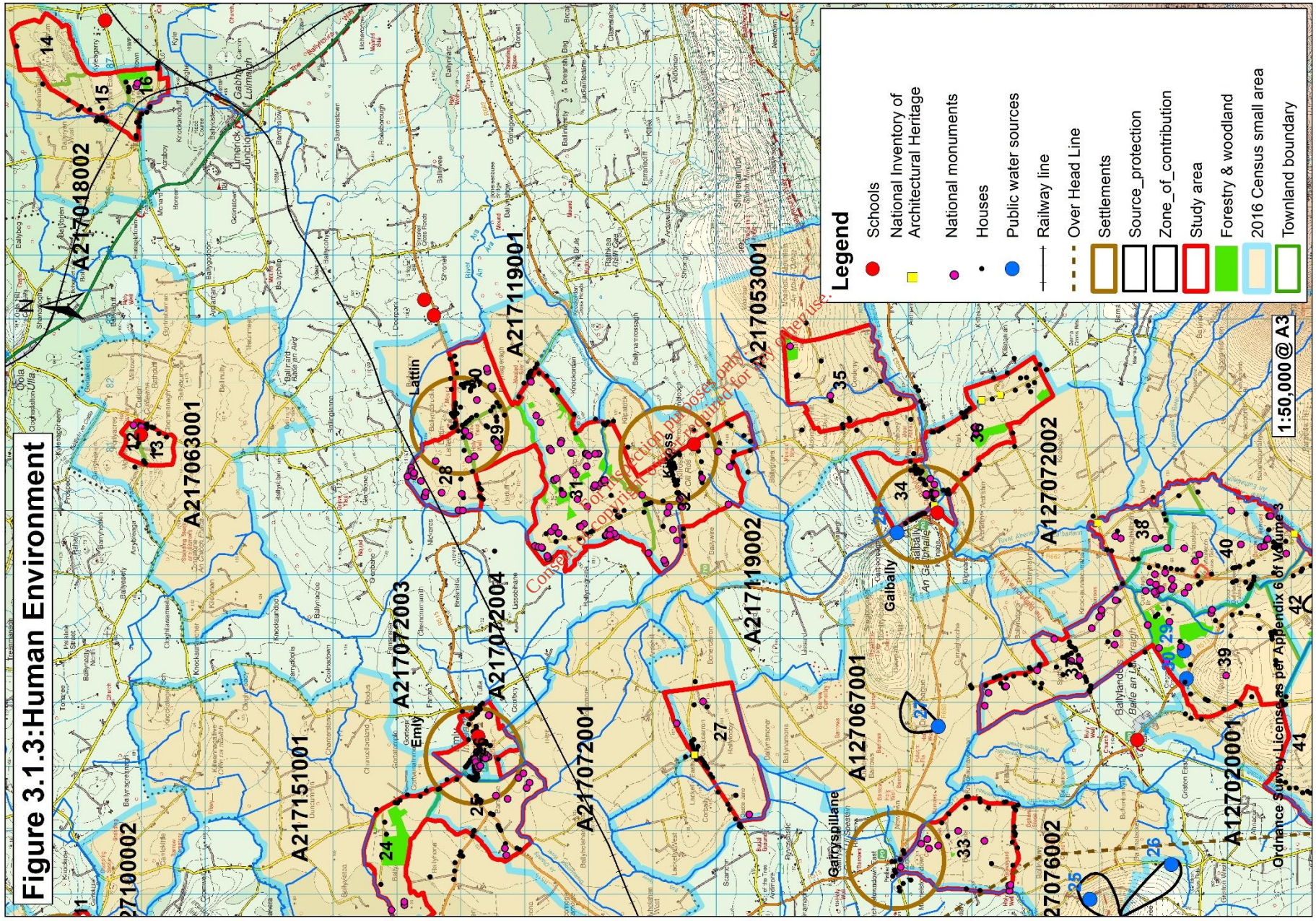
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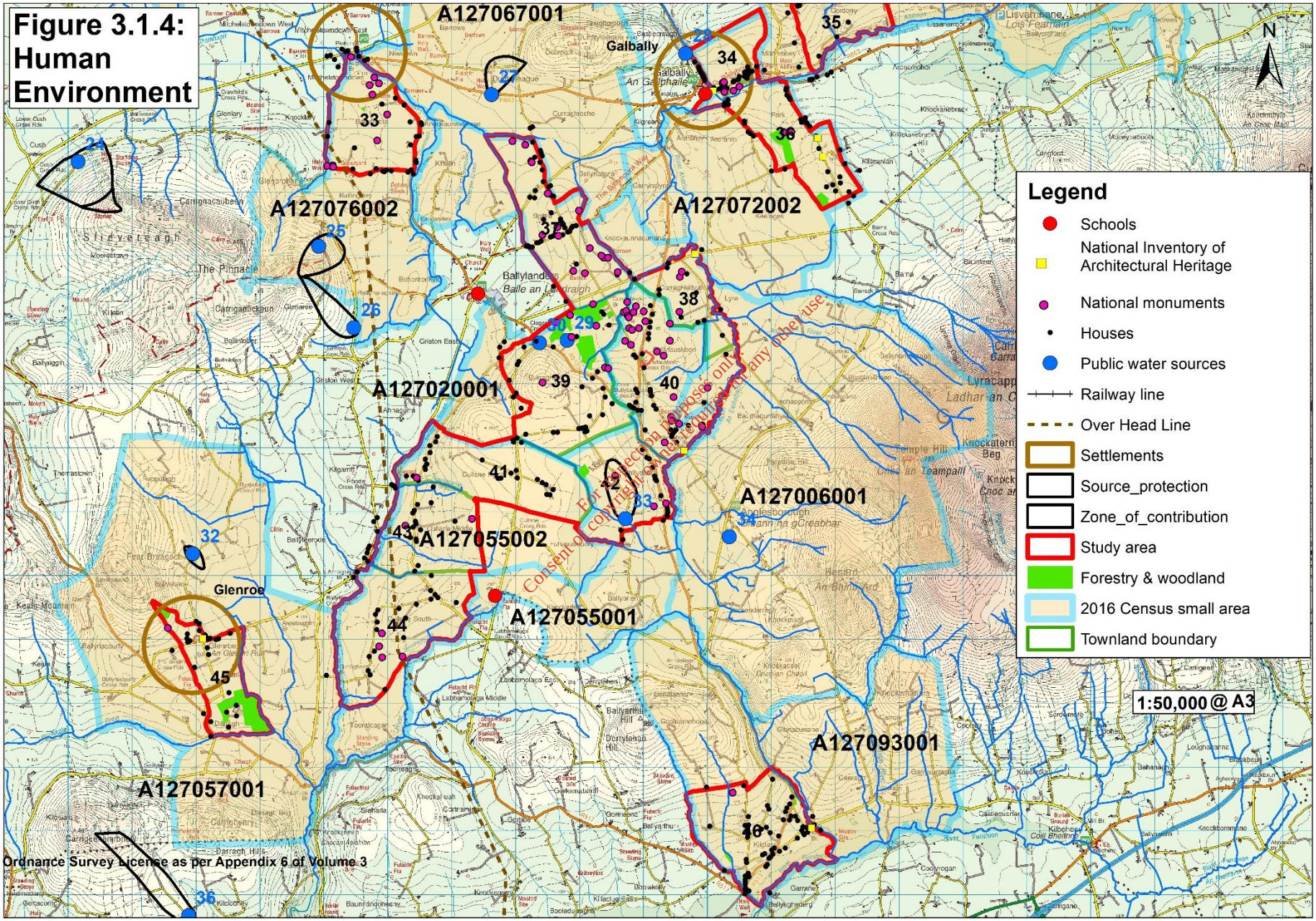
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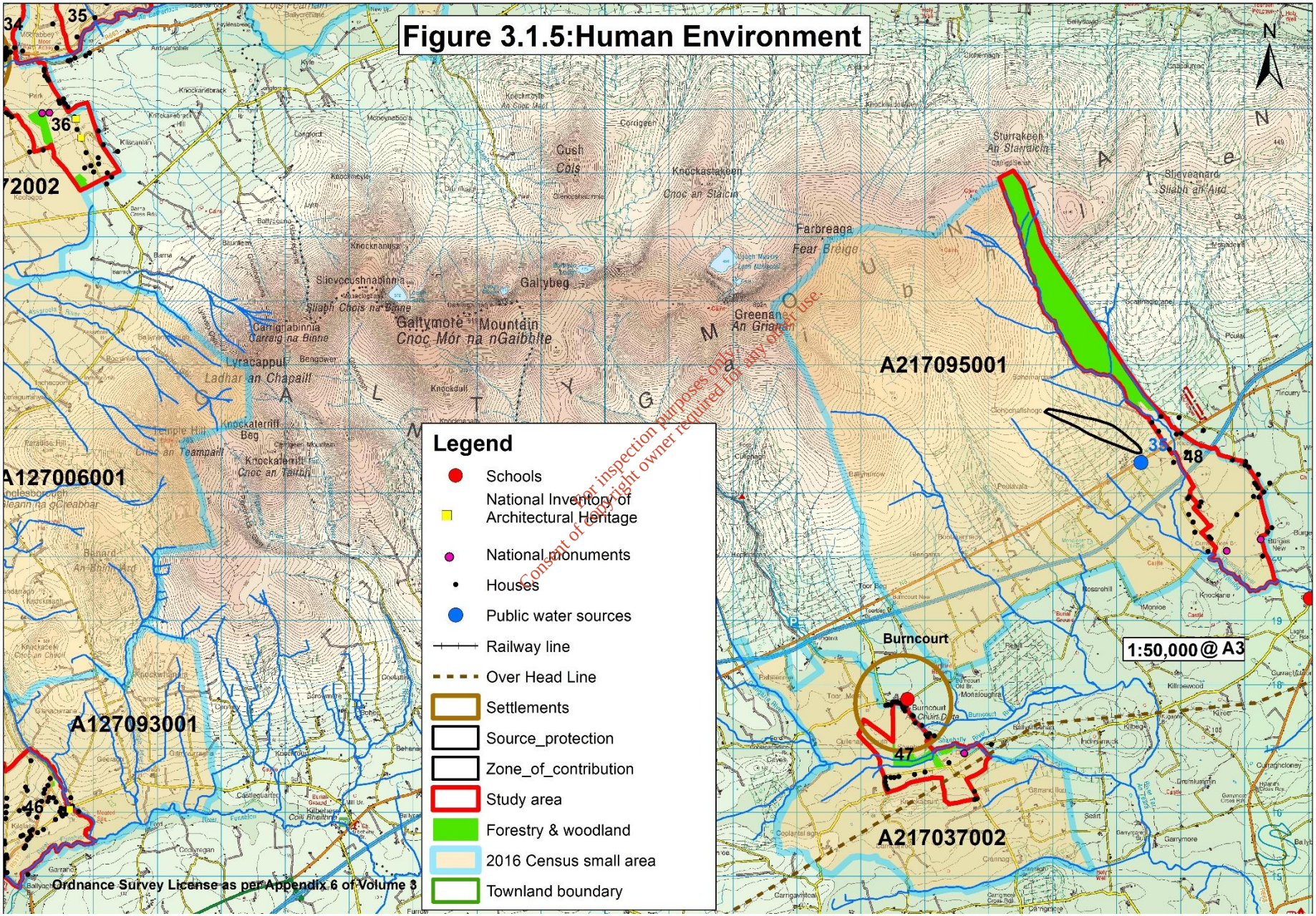


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Figure 3.1.4: Human Environment
A127067001
A127076002
A127072002
A127020001
A127006001
A127055002
A127055001
A127093001
A127057001
Galbally
Glenroe
Legend
Schools
National Inventory of Architectural Heritage
National monuments
Houses
Public water sources
Railway line
Over Head Line
Settlements
Source_protection
Zone_of_contribution
Study area
Forestry & woodland
2016 Census small area
Townland boundary
1:50,000 @ A3
N
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3.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The characteristics of the proposed development that are considered in this appraisal are;

- Noise impact – construction activities and during operation from machinery, slurry pumping, HGV deliveries, new ESB Substation, mill operation and the pigs themselves;
- Visual impact – from the proposed ESB Substation;
- Impact from odour, dust and gas emissions - from refurbishment of existing pig buildings and the construction of proposed ESB Substation;
- Land spreading of pig manure from the existing pig farm and the proposed development;
- The economic value of the proposed development.

3.5 RESULTS OF ASSESSMENT

3.5.1 Assessment of pre-mitigation impacts

The impact assessment uses the criteria set out in Table 3.1 and based on the sensitivities as described in Section 3.2 a significance of impact is applied to potential impacts.

3.5.2 Do Nothing' impact

There is no change to the baseline environment in a do-nothing scenario.

3.5.3 Potential pre-mitigation impacts

The assessment of impacts on the receiving socio economic environment is presented in Sections 3.5.3.1 to 3.5.3.7. The assessment of impacts on the receiving local human health environment in Sections 3.5.3.8 to 3.5.3.11.

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Potential pre-mitigation impacts on receiving Socio Economic Environment

3.5.3.1 Human Population

Land spreading of organic manures is common place in rural Ireland and in the study area. The risk to human population from this is negligible. Many rural dwellings have private groundwater supplies which can be at risk from land spreading – from nutrient runoff and pathogens. There are potential impacts on human health from ammonia emissions from land spreading and from the pig houses. The potential air quality impacts are addressed in Section 3.5.3.9. There are potential noise effects – but these are restricted to workers within the pig farm i.e. within the pig confinement buildings and the mill. The nearest dwelling to the mill is approx. 150m - at these separation distances there are no significant effects (Section 1.3.5.2). The baseline emissions from the pig houses themselves will not change significantly due to the proposed development. Without mitigation there is a potential slight adverse impact on human population due to poor land spreading practices and potential impacts on water supplies. Impacts from rodents and flies will not be significant where houses are well ventilated and feed stored in sealed containers. An Environmental Management System (EMS) will be implemented (as it is currently) to monitor and control odour, noise, rodents and flies.

3.5.3.2 Farms

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The farming community benefit to the degree of approximately €140,000 (15,800m^3 x €9) each year from the free supply of manure from the existing 'Ballyfaskin Pig Farm'. This will not change significantly.

3.5.3.3 Commercial businesses (not including tourism assets)

Local commercial businesses (shops, public houses etc.) will generally benefit from increased economic activity and employment. Without continued investment in a pig farm existing jobs are in jeopardy in the medium to long term. Each job maintained on the pig farm results in 6 – 7 jobs (M.A. Martin 2011, Teagasc) [6] in the wider services and manufacturing industry. This investment secures the viability of the existing 'Ballyfaskin Pig Farm' which currently supports 5 jobs on the existing farm (including the owner) – this is predicted to increase by one job in the proposed farm. However without investment all jobs will decline. Therefore this investment sustains 6 jobs on the farm and 36 - 42 jobs in the wider agri-business community. The economic value to the local community from the construction costs are considerable. Every €1 million euro invested in a construction project creates 12 full time job years. Therefore, it is estimated that this project will create an estimated 6 full time job years[7]. Thus this investment has the potential to sustain 1[8] construction job in the medium term (seven years). Without mitigation, the proposed development will have a positive but not significant impact on the local business environment.

3.5.3.4 Tourism Services

There are no sensitive tourist assets close enough to the pig farm to be directly affected by the pig house emissions. Walking trails such as the Ballyhoura Way will not be significantly affected by land-spreading. The scenic routes on the R513 and R662 are separated by 0.75km and 4.7km respectively. There is no significant views of the proposed development from the R513 and no views from the R663. Rivers used for angling are not a significant tourism attraction within the study area.

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3.5.3.5 Ecosystem Services

The construction of the proposed development could lead to surface run-off of silt or potential spillages of concrete or fuel. Taking the separation distance and the likelihood of these occurrences the impact is not significant without mitigation. The Aherlow River is approx. 1.4km east of the proposed development. The water quality in this section of the river is good and it is 'not at risk status'. Emissions from the proposed development will not significantly affect this ecosystem/river. Therefore there are likely to be no significant pre-mitigation impacts from activities at the 'Ballyfaskin' site.

Without mitigation, poor practices in the application of pig manure could lead to an adverse effects on the natural water environment (ground and surface) resulting in impacts that could be slight adverse without mitigation.

[6] 6 – 7 jobs in the wider services economy for every job employed on-farm. These may not all occur within the study area.
[7] Public Capital Programme 2016 – 2021; Labour Intensity of Public investment; Summary; Page 4; 12 job years per €1 million invested in construction
[8] (2 on-farm) => (12 – 14 off-farm) + (6 construction job years =>6 ÷ 7 years = say 1 in construction)

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3.5.3.6 Cultural Heritage Assets

Land spreading of pig manure will not affect the existing up-standing or below ground cultural heritage assets. There are no registered monuments on the site of the pig farm. In the absence of mitigation (monitoring during construction) there is likely to be no significant impact on Archaeology according to Chapter 11 - Cultural Heritage assessment.

3.5.3.7 Effects on Local Traffic

The proposed development will increase traffic on the R662 leading to the pig farm entrance from 14 to 16 movements per day. Construction traffic is a temporary effect resulting in a 3% increase in traffic levels. Operational traffic will increase the existing levels by approx. 1.7%. Feed and pig transport will be confined mainly to the R662 and pre-mitigation the impact will be not-significant. Pig manure transport will remain relatively unchanged due to the small increase in the volume of pig manure. Therefore, without mitigation the proposed development will not significantly impact local traffic and journey times. The existing road surface is sound and fit for purpose.

Potential pre-mitigation impacts on receiving Local Human Health Environment

3.5.3.8 Water Quality

There are 14 groundwater bodies in or adjoining the study area – see Figures 3.1.1 – 3.1.5 and 6.4.1 and 6.4.2 of Chapter 6. The groundwater status of the study area is good (Section 6.3.1.3). In excess of 98% of the study area groundwater is classified as good quality. The majority of the study area is either 'not at risk' or 'under review' (75%) in terms of risk of good status deteriorating and 25% is at risk of status deteriorating.

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The majority of the 30 river bodies assessed within the study area are moderate or good status and the majority are at risk, reflecting the overall status of the wider region. Agriculture is listed as a main pressure in 7 of the 30 relevant river sub-basins (Section 6.3.2.2).

Human health requires a clean supply of water. Many of the rural dwellers in the study area rely on untreated private ground water supplies. Without mitigation, poor practices in the application of pig manure could lead to adverse effects on the natural water environment resulting in slight adverse impact on human health without mitigation.

3.5.3.9 Air Quality and nuisance

Section 7.5.3.2 of the EIAR shows that at the emission levels predicted for ammonia there will be no health effects. Emissions of carbon dioxide, methane, nitrous oxide will not add significantly to Climate change. The odour impacts as assessed in Section 7.7 of this EIAR indicate an increased impact due to the proposed development before mitigation. Dust emissions during construction are likely to have a not significant pre mitigation impact on neighbouring sensitive receptors because there will be minimal excavation and refurbishment works will take place inside the houses. Dust and other operation phase gases such as volatile fatty acids, Carbon Monoxide and Hydrogen Sulphide are emitted at such low levels as to have a pre-mitigation impact which is not significant. The potential impact on health of farm workers at the pig farm is addressed below in Section 3.5.3.10.

3.5.3.10 Potential Spread of pathogens

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Poor practices in the application of pig manure could lead to adverse effects on human health due to the spread of pathogens in the manure. The before mitigation impacts on the health of the study area community due to this risk are imperceptible.

Air emissions from the pig houses contains dust and harmful pathogens. However, without mitigation, the dispersion of the exhaust from the pig houses means that there is no significant health effects outside the pig houses.

There will be 6 workers in the proposed development. These workers will encounter dust and gas emissions in these pig confinement buildings. Hoppin and co-workers (2003), in a study aimed at investigating the role of animal exposures and wheeze, found that among European farmers, swine farmers had more work related symptoms and were fifty per-cent more likely to wheeze than cattle farmers.

Pre mitigation the potential impact on the health of workers during construction and operation is slight - moderate adverse.

3.5.3.11 Noise

3.5.3.11.1 Construction noise

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The construction activity at the ESB Substation will occur approx. 80m and 115m from the nearest two dwellings to the west. The construction hours will be 0800 – 1900. The substation building is very small (21.7m^2) and unlikely to require heavy duty construction machinery for any significant length of time (except for a few hours pouring the concrete foundation). Therefore the impacts from this site are not significant. Un-mitigated, the predicted noise levels from the refurbishment of the pig houses would be 80dB, 74dB and 66dB at the facades of the nearest houses (at distances of 85, 115m and 280m and source of 115dB @1m) (Section 1.3.5.1 of Chapter 1 of this EIAR). However there are mitigating factors for the nearest two houses that are expected to exceed the EPA levels. Firstly, the refurbishment will be mainly indoors. As discussed in Section 1.2.6 above the housing materials can mitigate ambient inside-of-house noise from 65-70dB down to 43dB. Therefore it is expected that the source will be substantially lower outside the refurbishment houses – at least a 25% reduction. Secondly, houses 11, 13 and 14 will act as physical barriers to sound emissions towards the west. Combined with the separation distance to the north these two factors will reduce emissions to within the 65-70 dB EPA guidelines for the refurbishment of houses 3, 5, 6, 7, 8 and 15. The construction noise impacts are not likely to be significant because of short-term duration and working hours being limited to 0800 to 1900 hours.

3.5.3.11.2 Operational noise

As shown in Appendix 1 (supplementary noise report) there will be no noise effect from the operation of the ESB Substation. There will be no significant change in the operational noise from the pig houses due to the proposed development. The mill will become fully operational when the new power supply is installed (it operates part-time currently using a generator). As outlined in Section 1.3.5.2 of this EIAR, the noise level at 150m (closest sensitive receptor) is expected to be approx. 40 – 45dB which is acceptable for day-time operation. Therefore, without mitigation, there will be no significant impact from the proposed development.

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The Noise Assessment in Appendix 1 concludes "L_{AFmax} *noise from pig vocalisations and haulage lorries have been predicted to generate noise levels of 5 to 28 dB above day-time background noise levels and 12 to 35 dB above night-time background noise levels. As per the BS4142 methodology, this would be "an indication an adverse, to significant adverse impact"*. The movement of pigs off-site occurs 2- 3 time per week for short durations. While noise impacts are within the acceptable limits the applicant is cognisant of the local submissions in respect of noise, particularly in relation to the loading of pigs. Therefore the applicant, subject to the agreement of Limerick County Council and as a condition of any permission if granted, will commit to insulate the loading bay enclosure with insulated walls and roof to mitigate noises at the point of loading.

3.6 MITIGATION

3.6.1 Construction Phase Mitigation

- The pig farm, or its construction contractors, will be required to provide health and safety training for their workers. There will be a designated liaison officer to deal with issues. Construction workers will be equipped with the relevant personal protection equipment at all times. This includes eye and ear protection for dust and noise effects;
- A water tanker will be available to douse exposed soil during dry weather to prevent dust nuisance;
- The contractor(s) will employ silt control mitigation measures including silt fences to prevent sediment run-off from the construction site;
- The contractor(s) will use wheel wash facilities to ensure that soil is not transported out onto the public road;
- The contractor(s) will confine construction works to normal operational hours 8am to 6pm Monday to Saturday; and
- Pig farm management staff will notify adjoining land owners in advance of commencement of sudden loud construction works in case there are any sensitive livestock nearby (e.g. horses or cows at the point of calving).

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3.6.2 Operational Phase Mitigation for potential Socio Economic effects

- Pig manure will be applied in adherence to S.I. 605 of 2017[9] (as amended in SI 65 of 2018 and SI 40 of 2020) as set out in Section 5.6 of Chapter 5 and Section 6.6 in Chapter 6. This requires adequate setback distances to be allowed along watercourses and wells to protect surface waters. Manure must be applied in ground and weather conditions conducive to not allowing run-off;
- Existing commercial premises are located far enough away to avoid nuisance from the pig buildings. The pig farm management will engage with pig manure customer farmers to ensure that land spreading will be practised in accordance with Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). Because nutrients are being restricted to crop requirements, application frequency at any one location will rarely exceed 2 – 3 times per year thus reducing potential for nuisance from land spreading;
- Customers for the pig manure will be advised that a minimum 50m setback distance is allowed around all dwellings and 200m for schools;
- The pig farm operates only at a reduced rate of staffing over the weekends. Access for manure is generally only allowed during the working week, thus reducing potential nuisance to visitors to the area during weekends; and

[9] Available at: http://www.irishstatutebook.ie/eli/2020/si/40/made/en/pdf

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- The pig farm will monitor complaints and advise caution when spreading manure at these locations (e.g. adjoining settlements).

3.6.3 Operational Phase Mitigation for potential Human Health effects

- Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) sets out strict rules for the application of organic manures. Adherence to these rules will minimise impacts on water quality and human health;
    - A setback distance of 200m is allowed around public water sources;
    - A setback of 15m is required around karst features;
    - A setback distance 25m is required around domestic wells; and
    - Pig manure is only used to replace chemical fertiliser requirement;
- The slurry storage at the pig unit exceeds 40 weeks thus allowing the pig farm to store the manure when conditions are not suitable for land-spreading in the wetter shoulders of the grazing season;
- Land spreading is an effective way of neutralising the pathogen risk from pig manure. Land spread manure is exposed to sunlight and weathering which kills harmful pathogens.
- Low trajectory and low emission spreading is used which minimises aerosol production, thus reducing risk of spreading pathogens. Where possible the pig farm will choose contractors with low-emission spreading equipment;
- Low protein diets will reduce emissions of odour and ammonia. Mitigation to reduce odour impact are discussed in detail in Section 7.6 also include measures such as high cleanliness standards and having an Odour Management Plan in place;
- A rodent and pest control programme will be implemented and inspection records maintained on site. Staff will be trained in the use of rodenticides and pesticide products which are routinely used on pig farms. Records of usage will be maintained on site.
- A key contact person will be responsibility for communication with locals regarding noise and odour issues;
- Noise impacts are reduced because there are no significant operational noises outside of normal working hours (Monday to Friday 0700 to 1600 hours and Saturday to Sunday 0700 to 1100 hours). Noise emissions from pig houses will not change significantly. Noises associated with pumping manure and blowing feed will be short term (6 - 10 minutes). There will be an ad-lib feeding system which eliminates peak noises associated with feeding events;
- A Noise Management Programme will be implemented as per draft programme supplied in Attachment B of Appendix 1. Also staff will be trained to minimise noise emissions;
- To mitigate the noise impact from loading pigs it is proposed to construct an insulated roof and sides around the loading bay to mitigate noises at the point of loading (subject to planning conditions agreed with Limerick County Council);
- There is an emergency response procedure in place on the pig farm;
- A safety statement is in place at the pig farm and this addresses the health and safety of workers and visitors.
    - To protect workers from noise they are provided with standard approved eye and ear protection devises along with protective foot ware;
    - Noises from pigs occurs mainly at feeding time. Noise from the proposed fattening houses will be minimised due to using modern ad-lib feeding system;
    - All visitors to the site are expected to sign in at the office and will be provided with eye and ear protection devises; and,

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  - Train workers on site how to minimise and manage risks to their health and how to prevent exposure to slurry gases minimise effects from dust and particulate matter.
- As with any kind of working environment with potential health hazards, workers health and safety can be addressed using different approaches that can be grouped as:
  - Engineering control; properly designed fans will be used with adequately designed air outlets and inlets and automatic controls. The slopes to the roof apex will be adequate to insure maximum ventilation;
  - Administrative control; minimise the amount of time workers are exposed to dust; and insure adequate cleaning of pig houses; safety and awareness training will be undertaken; and,
  - Personal protection equipment (PPE) i.e. ear and eye protection devices and dust masks will be provided to all workers.

3.7 RESIDUAL IMPACTS (post mitigation)

The pig farm and study area are predominantly rural with a population density (living in the countryside) of approx. 30 persons per sq.km. The pig farm and the land-spreading activities will not significantly affect the continued weak upward growth trend in rural population. Having considered the sensitivity of the existing socio-economic and local community health environment and the magnitude of impacts, the residual impacts are considered to be not significant with standard mitigation measures. While land spreading of organic manures has the potential to cause nuisance, the study area is predominantly a rural setting where land spreading is common practise. Potential effects from land spreading are transitory and not significant. The impacts from emissions to air from the pig farm and the proposed development are assessed in Chapters 7 and 8 and the impact is not significant.

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Impacts on water quality and knock-on effects on the human population are not significant with adherence to the SI 605 of 2017 (as amended) regulations.

Deterioration of water quality and impacts on the health of workers at the pig farm are identified as potential impacts on the local human population but with standard mitigation these impacts are not significant.

Pre-mitigation effects on local traffic are not significant due to a predicted 1.7% increase in traffic levels and an adequate local road network.

Residual noise effects on nearest neighbours to the site are not significant because construction noise will be a short term effect mitigated by operating during working hours (0800 – 1800). During the operational phase all noises will be in compliance with EPA guidance (NG4) and predicted impacts will be not significant due to short term nature of high emission sources (i.e. loading pigs, loading/blowing feed, pumping slurry, operating ventilation fans at full capacity).

3.8 CUMULATIVE IMPACTS (post mitigation)

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*". Cumulative effects are defined in EC guidance (2017) 12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

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There is a pig farm in Inchacoomb located 2km east of the proposed development. This pig farm delivers pig manure to some of the townlands within the study area and therefore there is a potential cumulative impact residents due to odour nuisance. This assessment assumes farmers using the pig manure from the Inchacoomb Pig Farm apply it not as a waste, but as a fertiliser commodity adhering to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). Therefore it will be applied just a few times per year at any one location. Therefore cumulative impacts are considered not significant.

There will be no cumulative impact from the Inchacoomb Pig Farm on emissions to air or noise emissions from the 'Ballyfaskin' site because of the separation distance of 2kms. Neither will there be a cumulative landscape effect (See Section 10.8 of the EIAR). Cumulative traffic impacts are ruled out because of the low total traffic count, for example, if the Inchacoomb piggery traffic is the same or less than the proposed 'Ballyfaskin' development (No 16) then the additional traffic would not be significant. There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. There is no potential for cumulative impacts on air (Section 7.8), water (Section 6.8), traffic or noise at this separation distance.

The land spreading of cattle manure in the study area is considered part of the baseline environment because it would occur whether the pig farm existed or not. There is a potential for a cumulative nuisance effect when pig manure and cattle manure are applied at the same location. However, with adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) the application of organic manures will occur only at a frequency of a few times each year at any one location because quantities have to be restricted to supply only what is required by the cropping on the receiving farm. As illustrated in Table 5.5 of Chapter 5 pig manure organic nitrogen accounts for approximately 2% of the total organic nitrogen produced in County Limerick. Therefore it is considered that this cumulative impact is not significant.

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Interactions with other environmental topics have been considered. The interaction between Human Population and Human Health with the Risk of Major Accidents or Incidents is the only interaction with potential to give rise to significant impacts. This interaction will not give rise to significant change in the assessed impacts.

3.9 CONCLUSIONS

The proposed development is located in a rural setting and neither the pig buildings nor the land spreading of pig manure will have a significant residual effect on human socio-economic, local community and human health environments when mitigation measures are employed.

3.10 REFERENCES

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S.I. No. 605/2017 - European Union (Good Agricultural Practice for Protection of Waters) Regulations 2017, available at: http://www.irishstatutebook.ie/eli/2017/si/605/made/en/print. Amended on 31st March 2018 – S.I. No. 65/2018 European Union (Good Agricultural Practice for Protection of Waters) (Amendment) Regulations 2018, available at: http://www.irishstatutebook.ie/eli/2018/si/65/made/en/print. Amended on 14th February 2020 - European Union (Good Agricultural Practice for Protection of Waters) (Amendment) Regulations 2020, available at: http://www.irishstatutebook.ie/eli/2020/si/40/made/en/pdf

TII, **2014**; Document; Good Practice Guidelines for the Treatment of Noise during the Planning of National Road Schemes. Available at https://www.tii.ie/technical-services/environment/planning/Good_Practice_Guidance_for_the_Treatment_of_Noise_during_the_Planning_of_National_Road_Schemes.pdf

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CHAPTER 4 - BIODIVERSITY

Section 4.1 introduces the topic of Biodiversity. **Section 4.2** sets out the relevant guidance followed and the information sources referred to, and describe the methodology of determining significance of impact. **Section 4.3** looks at the receiving environment including designated conservation areas, EPA Biological Monitoring results and designations and Water Framework Directive results and designations. The results of a site survey are presented. **Section 4.4** describes the characteristics of the proposed development relevant to this topic. **Section 4.5** examines the results of the assessment and sets out the potential impacts before mitigation. **Section 4.6** sets out proposed mitigation measures. **Section 4.7** describes the residual impacts after mitigation. Cumulative impacts are described in **Section 4.8** and conclusions regarding impacts on Biodiversity are provided in **Section 4.9.**

4.1 INTRODUCTION

This Chapter was written by Aisling Walsh of Ash Ecology and Environmental Ltd on behalf of Curtin Agricultural Consultants Ltd for their client 'Ballyfaskin Pig Farm'. The Chapter presents the factual biodiversity information gathered during the desk study and field study as a description of the existing environment at the 'Ballyfaskin Pig Farm'.

'Biological diversity' or biodiversity is, according to the UN Convention on Biological Diversity (BCD) defined as being the '*variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.'*

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

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

The actual and potential impacts (direct, indirect and cumulative) of the facility on biodiversity present within the site and surroundings are qualitatively assessed in this section and illustrated in Figures 4.1 to 4.4.

This chapter of the EIAR assessed the potential impact of the proposed development on the flora and fauna on-site and in the local vicinity.

The potential impacts of the activity on the Natura 2000 network of sites (European sites known as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) have been assessed in a standalone Natura Impact Statement which accompanies this application and should be read in conjunction with this chapter.

4.2 METHODOLOGY

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017);

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- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018.

4.2.1 Site Visit

The existing pig farm site is located at Ballyfauskeen, Ballylanders, Co. Limerick. A survey was carried out at the site on 28th of July 2020. The likelihood of additional ecological impacts occurring, which have not been identified in this EIAR, is considered remote. The following surveys were carried out.

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

A visual assessment of potential habitats in the study area (comprising of 48 townlands) was conducted during August 2020. A visual assessment of the surrounding landscape was identified in a selection of townlands and classified according to Fossitt (2000)[1].

4.2.2 Desktop Assessment

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

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- EPA, Guidelines on the Information to be contained in Environmental Impact Assessment Reports, Draft August 2017
- EPA, Advice Notes for Preparing Environmental Impact Statements, Draft, September 2015
- EPA, Advice Notes on Current Practice (in preparation of Environmental Impact Statements), September 2003
- EPA, Guidelines on the information to be contained in Environmental Impact Statements, March 2002
- Environment, Community and Local Government, Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, March 2013
- Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, (Department of Environment, Heritage and Local Government, 2010);
- Appropriate Assessment Under Article 6 of the Habitats Directive: Guidance for Planning authorities;
- European Commission (Nov 2018) Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC
- Assessment of Plans and Projects Significantly Affecting Natural 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC Environment Directorate-General, 2000).
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.
- CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

[1] Fossitt, J. (2000). A *Guide to Habitats in Ireland*. The Heritage Council, Kilkenny.

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- CIEEM (2017) Guidelines on Ecological Report Writing. Chartered Institute of Ecology and Environmental Management, Winchester.
- Flora (Protection) Order 2015
- Red Data Books & NPWS Red Lists
- The Water Framework Directive (2000/60/EC)
- NRA (2008) Management of Noxious Weeds and Non-Native Plant Species on National Road Schemes
- NRA (2009, Rev 2) Guidelines for the Assessment of the Ecological Impacts of National Road Schemes
- NRA (2005) Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes
- NRA (2006) Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes
- NRA (2006) Guidelines for the Treatment of Bats during the Construction of
- National Road Schemes
- IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters
- River Basin Management District 2018-2021;
- The NPWS site synopsis for the Lower River Suir SAC
- The NPWS Conservation Objectives maps for the Lower River Suir SAC
- IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, Inland Fisheries Ireland;
- Limerick County Development Plan 2010-2016
- Natura Impact Report (January 2018) As part of the preparation of the Proposed Variation No. 6, Limerick County Development Plan 2010-2016 (as extended)

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The following sites have been consulted in the preparation and development of this chapter of the EIAR;

- National Parks and Wildlife Service (NPWS) on line data (www.npws.ie);
- NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Ordinance Survey Ireland Maps and Ariel Photography (www.heritagemaps.ie);
- Data in relation to water quality in the area from the EPA (www.epa.ie);
- EPA Biodiversity Plan http://www.epa.ie/pubs/reports/biodiversity/
- National Biodiversity Data Centre (www.biodiversityireland.ie);
- Birdwatch Ireland (www.birdwatchireland.ie);
- EPA Maps: https://gis.epa.ie/EPAMaps/
- Water Framework Ireland website: http://www.wfdireland.ie/maps.html
- National Biodiversity Data Centre: www.NBDC.ie
- Heritage Maps www.hertiagemaps.ie
- Bing Maps and Google Earth;
- Geohive Maps www.geohive.ie

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

European

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive);
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (The Birds Directive);

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- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (The Water Framework Directive);
- Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (The Fish Directive (consolidated)).

Republic of Ireland

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

4.2.3 Assessment of Significance

An ecological assessment of the site was completed by Aisling Walsh MSc MCIEEM of Ash Ecology & Environmental Ltd. The assessment of significance is based on guidance from the NRA and CIEEM 2016 which compares the results of the habitat and fauna surveys to the importance scale, which ranges from:

- international → national → county → local

'*The local scale is approximately equivalent to one 10 km square. Because most sites will fall within the local scale, this is sub-divided into high local importance and low local importance*.'
The results of the surveys are then assessed against the following criteria in Table 4.1. and then assessed against the criteria in **Tables 4.1, 4.2 and 4.3.**

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Table 4.1 Criteria used in Assessing the Ecological Importance of Sites

ECOLOGICAL VALUATION SCHEME
International Importance: • 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. • Proposed Special Protection Area (pSPA). • Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: Ø Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or

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ECOLOGICAL VALUATION SCHEME
Ø Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man & the Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. • Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance: • Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: • Species protected under the Wildlife Acts; and/or • Species listed on the relevant Red Data list. • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
County Importance: • Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the County level) of the following: • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; • Species protected under the Wildlife Acts; and/or • Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfill the criteria for valuation as of International or National importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value): • Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Ø Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;

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ECOLOGICAL VALUATION SCHEME	
	Ø Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Ø Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Ø Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; Ø Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value): • Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; • Sites or features containing non-native species that have some importance in maintaining habitat links.	

SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area
BAP = Biodiversity Action Plan (these have been published for many local authority areas)

Table 4.2 Criteria for Assessing Impact Type

IMPACT TYPE	CRITERIA
Positive Impact	A change is likely to improve the ecological feature in terms of its ecological value.
Neutral	No effect.
Negative Impact:	The change is likely to adversely affect the ecological value of the feature.

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Table 4.3 Criteria for Assessing Impact Magnitude

IMPACT MAGNITUDE	DEFINITION
No change:	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	A change in the ecology of the affected site, the consequences of which are strictly limited to within the development boundaries.
Minor Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution or abundance of species or habitats of conservation Importance.
Moderate Impact:	A change in the ecology of the affected site which has noticeable Ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable Ecological consequences outside the development boundary. These consequences are considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area.
Major Impact:	A change in the ecology of the affected site which has noticeable Ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in

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	the wider area 2 is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).

4.2.4 Duration of impact

The proposed construction period is approx. 4 months. Unless otherwise noted in the individual sections of this EcIA the following duration of impacts apply:

- Temporary Impact - Impact lasting for one year or less.
- Short term Impact - Impact lasting one to seven years.
- Medium Term Impact - Impact lasting seven to fifteen years.
- Long Term Impact - Impact lasting fifteen to sixty years.
- Permanent Impact - Impact lasting over sixty years.

4.3 RECEIVING ENVIRONMENT

4.3.1 Designated Conservation Areas

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

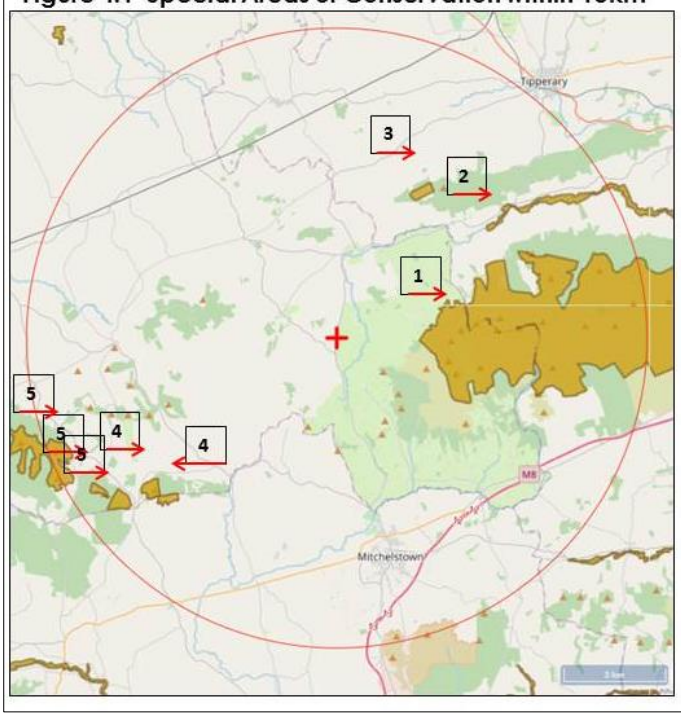
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There are no environmental designations pertaining to the study area itself. Thus, the site of the proposed development does not form part of any Natural Heritage Area (NHA), proposed National Heritage Area (pNHA), Special Protection Area (SPA), Special Area of Conservation (SAC), candidate Special Area of Conservation (cSAC), Nature Reserve, or National Park. There are 5 SACs within 15km of the site and are shown in Figure 4.1 (SACs) and listed in Table 4.4. There are no SPAs within 15km of the site. A total of 9 pNHA also occur within 15km of the proposed development (a total of 2 overlap with the SACs), see Figure 4.2. There are no fully designated NHAs within 15km of the site.

Due to the potential for impacts upon the Lower River Suir SAC, an Appropriate Assessment of the impacts of the proposed development, on its own, or in combination with other plans or projects, was required with a Natura Impact Report completed. The NIR was submitted as a separate report along with this application. The standalone NIS report goes into greater depth regards the conservation objectives of the Natura 2000 sites within 15km of the proposed development. As a result of the proposed mitigation measures, this Natura Impact Statement is able to conclude that the proposed development will not result in impacts on the integrity of the Lower River Suir SAC or any other Natura 2000 sites.

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Figure 4.1 Special Areas of Conservation within 15km



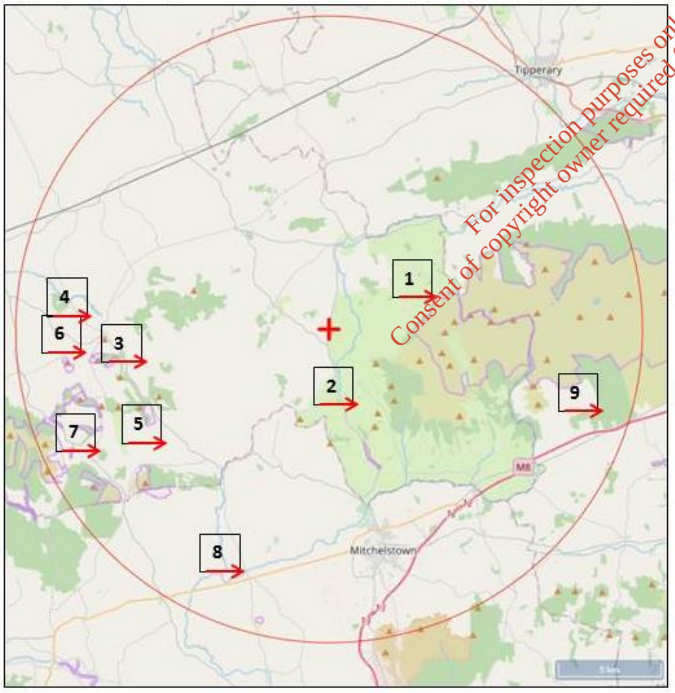
No.	Site Code	Name	Distance
1	000646	Galtee Mountains SAC	3.9km E, SE
2	002137	Lower River Suir	8.9km NE
3	002257	Moanour Mountain SAC	7.6km NE
4	002037	Carrigeenamronety Hill SAC	10.8km SW
5	002036	Ballyhoura Mountains SAC	12.7km SW

N

Special Area of Conservation (SAC)

Site Location

Figure 4.2 Proposed National Heritage Areas within 15km



No.	Site Code	Name	Distance
1	000646	Galtee Mountains pNHA	3.9km E, SE
2	002035	Glenacurrane River Valley pNHA	5.7km SE
3	002087	Ballynacourty Wood pNHA	9.3km SW
4	002089	Ballyroe Hill & Mortlestown Hill	10.3km SW W
5	002037	Carrigeenamronety Hill pNHA	10.8km SW
6	002090	Castleoliver Woods pNHA	11.7km SW
7	002036	Ballyhoura Mountains pNHA	14km SW
8	000899	Ballindangan Marsh pNHA	14.2km S
9	000651	Mitchelstown Caves pNHA	14.9km SE

N

Proposed Natural Heritage Area (pNHA)

Site Location

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Table 4.4 Designated Sites and their Location Relative to the Proposed Site Works

Code	Site	Designation Status	Qualifying Interests	Approx. distance at closest point
000646	Galtee Mountains	SAC/pNHA	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030]	3.9km E, SE No evidence of pathway from the site of proposed development to the SAC/pNHA given the distance for

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Code	Site	Designation Status	Qualifying Interests	Approx. distance at closest point
			Alpine and Boreal heaths [4060] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220]	disturbance and lack of hydrological connection.
002137	Lower River Suir	SAC	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Taxus baccata woods of the British Isles [91J0] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095]	8.9km NE – A tenuous hydrological connection via site drainage to Lyre Stream, a tributary of the Aherlow River (which becomes part of this SAC). The Aherlow River is directly 1.3km northeast of the site as the crow flies.

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Code	Site	Designation Status	Qualifying Interests	Approx. distance at closest point
			Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Alosa fallax fallax (Twaite Shad) [1103] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355]	
002257	Moanour Mountain	SAC	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030]	7.6km NE - No evidence of pathway from the site of proposed development to the SAC given the distance for disturbance and lack of hydrological connection
002037	Carrigeenamronety Hill	SAC	European dry heaths [4030] Trichomanes speciosum (Killarney Fern) [1421]	10.8km SW – No evidence of pathway from the site of proposed development to the SAC given the distance for disturbance and lack of hydrological connection
002036	Ballyhoura Mountains	SAC/pNHA	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Blanket bogs (* if active bog) [7130]	12.7km SW (SAC) and 14km SW (pNHA) – No evidence of pathway from the site of proposed development to the SAC/pNHA given the distance for disturbance and lack of hydrological connection
002035	Glenacurrane River Valley pNHA	pNHA	5.7km SE - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
002087	Ballynacourty Wood pNHA	pNHA	9.3km SW - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
002089	Ballyroe Hill & Mortlestown Hill	pNHA	10.3km SW, W - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
002037	Carrigeenamronety Hill pNHA	pNHA	10.8km SW - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
002090	Castleoliver Woods pNHA	pNHA	11.7km SW - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
000899	Ballindangan Marsh pNHA	pNHA	14.2km S - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	
000651	Mitchelstown Caves pNHA	pNHA	14.9km SE - No evidence of pathway from the site of proposed development to the pNHA given the distance for disturbance and lack of hydrological connection	

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4.3.2 EPA Biological Monitoring

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

The intermediate ratings Q1-2, Q2-3, Q3-4 and Q4-5 are used to denote transitional conditions, while ratings within parenthesis indicate borderline values. Great importance is attached to the EPA biotic indices, and consequently it is these data that are generally used to form the basis of water quality management plans for river catchments. The drainage network from the existing site drain goes to the Lyre Stream which flows to the Aherlow River.

The EPA has several stations along the Aherlow River, the most recently monitored in 2017, see Figure 7. The station is located approx. 1.8km northeast of the site as the crow flies. The station monitored in 2017 by the EPA downstream of the site i.e. downstream of the confluence of the Lyre Stream with the Aherlow River) is:

- 'Br SW of Keeloges ' Q4-5 High 2017

Previous years' data are shown in Table 4.5 below. The EPA assessment of the Aherlow River in 2017 was:

*"*Results of the biological water quality analysis of the Aherlow were mixed in 2017, with a return to High ecological condition recorded at the uppermost site assessed (Station 0080) and an improvement from Moderate to High ecological condition at Station 0500. However, Station 0700 was found to have declined to unsatisfactory condition for the first time. Station 0200, downstream of Galbally, which historically has had the most unsatisfactory results for this river, remains at moderate ecological condition, as does Station 0300, the next site downstream. High ecological condition was recorded at the two lowest sites on the river (**0800** and 0900)*."*

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Table 4.5 EPA Monitoring of Aherlow River Downstream of confluence with Lyre Stream

Station	2002	2006	2008	2011	2014	2017	Status
RS16A010080 Br SW of Keeloges	Q3-4	Q4	Q4	Q4-5	Q4	Q4-5	High – Improvement on 2014

4.3.3 Water Framework Directive – Aherlow River

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

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

A) The Water Frameworks Directive (WFD) assesses the water quality of rivers and coastal waters and ranks their status as follows: High, Good, Moderate, Poor, Bad, Yet to be determined. The status

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of the Lyre River and Aherlow_010. The WFD River basin status 2013-2018 gave a 'Good' Status'. See Figure 7.

B) The Water Framework Directive also determines the "Risk" level of river and coastal waters as follows:1a – At risk of not achieving Good Status, 1b – Probably at risk of not archiving Good Status, 2a – Expected to achieve Good Status, 2b – strongly expected to achieve Good Status. The 2013-2018 WFD Risk status of the Aherlow_010 was assessed as 'Not at Risk'.

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

D) The 2013-2018 WFD Groundwater Risk Status of the 'Knockaskallen' area on which the site is located is 'Not at Risk' and the Groundwater Status (2013-2018) was 'Good'. The Geological Survey of Ireland (GSI) website was consulted for available geological/hydrological information. The bedrock geology of the area is 'Broad Haven Formation.' The rock underlying the study area is classified by the Geological Survey of Ireland as a 'Locally Important Aquifer".

Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease at which groundwater may be contaminated by human activities. Vulnerability in the vicinity of the site is 'High'.

4.3.4 Site Survey

4.3.4.1 Habitats

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A site inspection was carried out on the 28th July 2020. The terrestrial and aquatic habitats within or adjacent to the proposed 'Ballyfaskin Pig Farm' site were classified using the classification scheme outlined in the Heritage council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Annex 1 Habitats where required. No rare species were noted were noted during the site inspection; see **Figure 4.3** (Habitat Map).

The habitats in the study area, which will be affected by the proposed electrical substation will be on existing hard-standing - Buildings and Artificial Surfaces (BL3). Other habitats in the site are mostly more Buildings and Artificial Surfaces (BL3) in the form of the existing structures and roadways. There are also areas of Amenity Grassland (GA2), Scrub/Grassy Meadows and Verges mosaic (WS1/GS2) with Improved Agricultural Grassland (GA1) on the margins. Other habitats onsite include Treelines/Hedgerows (WL2/WL1), Recolonising Bare Ground (ED3) and drains (FW4). The Buildings and Artificial Surfaces (BL3) which make up the majority of the study area is of no ecological importance. The ecological value of habitats has defined by utilising the classification scheme outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009)**.** It should be noted that the value of a habitat is site specific and will be partially related to the amount of that habitat in the surrounding landscape. The habitats present and their ecological value are described below in **Table 4.6.**

Table 4.6 Habitats Present within the proposed 'Ballyfaskin Pig Farm' Site and their Relative Value

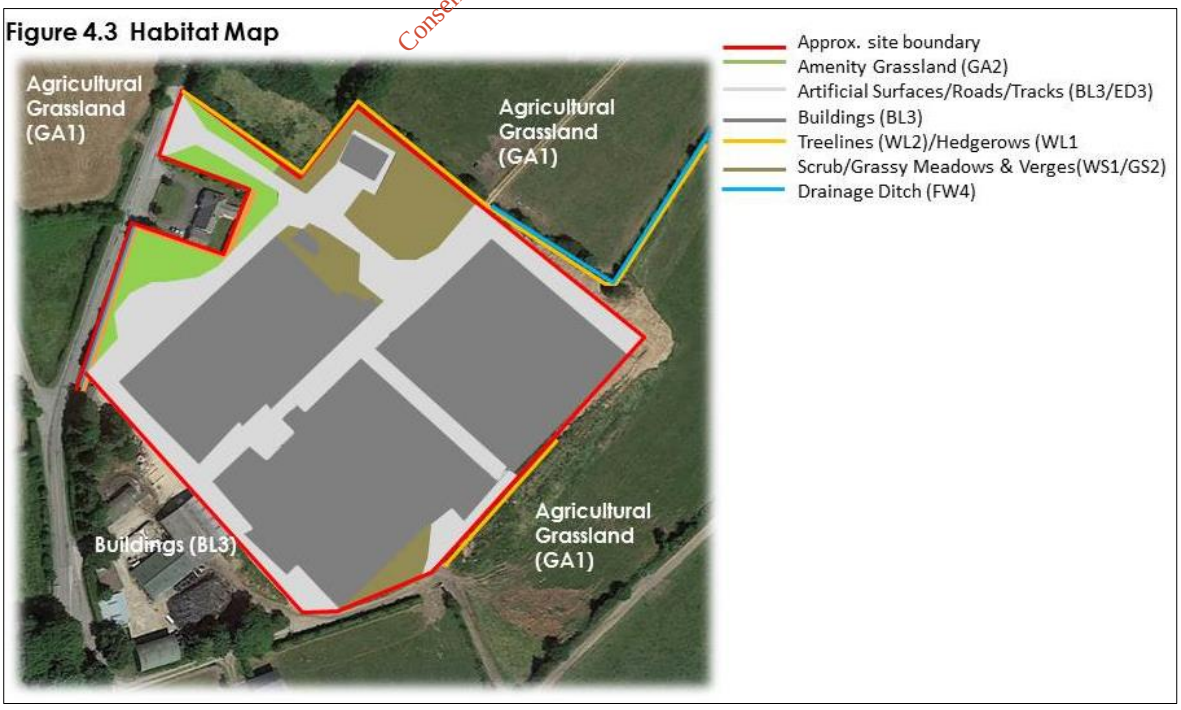
HABITAT	COMMENTS	ECOLOGICAL VALUE (NRA GUIDELINES)
Buildings and artificial surfaces	The majority of existing site is Buildings and Artificial Surfaces (BL3) made up of hardstanding and existing	Local importance (Lower value)

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HABITAT	COMMENTS	ECOLOGICAL VALUE (NRA GUIDELINES)
(BL3)/ Amenity Grassland (GA2)/ Non-Native Treeline (WL2), (southwest corner of site).	buildings. There are also some landscaped areas of grass best described as Amenity Grassland (GA2). These habitats are deemed to be of low biodiversity.	
Scrub and Grassy Verges (WS1/GS2)	Scattered about the edges of site are some areas of scrub (WS1) and grassy Verges. Some wilder areas of flora occur in these sections so can be considered of local importance.	Local importance (Higher value)
Treelines/Hedgerows (WL2/WL1)	Treelines and hedgerows abound much of the site. Treelines and hedgerows can provide important habitats for local wildlife such as birds, insects and possibly bats and also play host to numerous insect species which are prey items for both bird and bat species. Large mature trees within a woodland habitat/treeline are of particular importance as they can provide essential refuge and breeding sites for many species of mammals and birds, as well as for many invertebrates. In general, these habitats are somewhat fragmented from the wider landscape but add to the diversity in a local context.	Local importance (Higher value)
Drainage Ditches (FW4)	A drainage ditch runs along the western (run-off from road) and north-eastern boundary (residual surface water drainage after usage and collection from attenuation tank). No standing water noted.	Local importance (Lower value)

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Figure 4.3 Habitat Map



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4.3.4.2 Flora

The proposed 'Ballyfaskin Pig Farm' lies within Ordnance Survey National Grid 10km square R72. The National Biodiversity Data Centre (NBDC) online database provides data on the distribution of mammals, birds, and invertebrates within 10km grid squares.

Some 126 vascular plants are listed by the NBDC as present in the grid square R72 with no threatened flora species listed, No other rare species were recorded during the site survey, nor are they expected to occur given that the habitats within the study area are relatively common or of no ecological importance i.e. amenity grassland, scrub and hard-standing and buildings.

4.3.4.3 Mammals

Bats

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

A review of existing bat records within a 10km radius of the study site (sourced from NDBC records) showed that the bat species listed in **Table 4.7** have been recorded locally. It is noted that other species which have not been included within this database may also occur.

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Table 4.7 Presence of Irish Bat Species for 10km Grid Square R72

COMMON NAME	SCIENTIFIC NAME
Lesser Noctule	*Nyctalus leisleri*
Common Pipistrelle	*Pipistrellus pipistrellus sensu lato*
Soprano Pipistrelle	*Pipistrellus pygmaeus*
Daubenton's Bat	*Myotis daubentonii*

All bat species are protected under the Wildlife Acts (1976-2018) which make it an offence to wilfully interfere with or destroy the breeding or resting place of all species; however, the Acts permit limited exemptions for certain kinds of development. All species of bats in Ireland are listed in Schedule 5 of the 1976 Act and are therefore subject to the provisions of Section 23 which make it an offence to:

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

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

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

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

No buildings are to be demolished and in that regard a bat survey was deemed unnecessary due to the nature of the proposed development.

Otter

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

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

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

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

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

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A review of existing records within a 10km radius of the study site (Grid Square R72) showed that otter or signs of otter have been recorded on 4 occasions, the most recent being in September 2015. No Otter spraint, tracks, runs, holts or resting areas (couches) were recorded on the site in the vicinity of the drainage ditches, or expected to be. Otter is likely to occur along the Aherlow River (1.3km northeast).

Other Protected Terrestrial Mammals

A total of 20 other species of terrestrial mammal have been recorded within 10km^2 R72, seven of which are protected under the Irish Wildlife Act;

- Eurasian Badger (Meles meles)
- Eurasian Pygmy Shrew (Sorex minutus)
- Eurasian Red Squirrel (Sciurus vulgaris)
- Fallow Deer (Dama dama)
- Irish Hare (Lepus timidus subsp. hibernicus)
- Irish Stoat (Mustela erminea subsp. hibernica)
- West European Hedgehog (Erinaceus europaeus)

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

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

Red Squirrel (*Sciurus vulgaris*) also listed on Appendix III of the Berne Convention can be found throughout Ireland. They are found in all types of habitat but typically are in higher densities in mature mixed broadleaved forests. They can also survive in monoculture coniferous woodland. Red Squirrel is unlikely to occur within the site due to lack of habitat.

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

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

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

Hedgehog (*Erinaceus europaeus*), also listed on Appendix III of the Berne Convention can be found throughout Ireland, with male hedgehogs having an annual range of around 56 hectares. A number

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of factors are thought to influence the distribution of hedgehogs in a habitat, with nest sites, food availability and the presence of predators believed to be major contributory factors. Due to the habitats recorded within the site, it is possible that hedgehog could occur.

4.3.4.4 Amphibians and Reptiles

Common Frog (*Rana temporaria)* is recorded in grid square R72 and may occur within the drainage ditches along the northeast boundary. One reptile species is recorded; Common Lizard (Zootoca vivipara) - unlikely to occur on site.

4.3.4.5 Birds

The National Biodiversity Centre online database (accessed 15th July 2020) lists 74 species of bird from within grid square R72. Of these 74 species, 30 are protected and of these 5 are listed under Annex I of the Birds Directive, namely,

- Common Kingfisher (Alcedo atthis)
- Corn Crake (Crex crex)
- Hen Harrier (Circus cyaneus)
- Merlin (Falco columbarius)
- Peregrine Falcon (Falco peregrinus)

None of the protected species were noted during site visit.

During surveys of the site and surrounding landscape the species listed in **Table 4.8** were recorded.

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Table 4.8 Bird Species Recorded July 2020

SPECIES PRESENT		**BIRDS DIRECTIVE ANNEX**			**BOCCI**	
Latin Name	Common Name	**I**	**II**	**III**	**Red List**	**Amber List**
Erithacus rubecula	Robin					X
Turdus merula	Blackbird					
Troglodytes troglodytes	Wren					
Corvus frugilegus	Rook					
Corvus monedula	Jackdaw					
Pica pica	Magpie					
Fringilla coelebs	Chaffinch					
Corvus cornix	Hooded Crow					
Parus caeruleus	Blue Tit					
Motacilla alba yarrellii	Pied Wagtail					
Parus major	Great Tit					
Turdus philomelos	Song Thrush					
Symbol	**Description**					
I	**Annex 1**: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.					
II	**Annex 2**: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.					
III	**Annex 3**: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With					

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	certain restrictions, Member States can allow some of these activities for species listed here.

Overall, the study area is of local value for a range of terrestrial bird species that are relatively common in the Irish countryside.

4.3.4.6 Invasive Species

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

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

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed and Himalayan balsam, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

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The NBDC lists a number of both aquatic and terrestrial high impact invasive species (or listed on SI 477) which have been recorded within grid square R72 (**Table 4.9**). However, no high risk invasive species were recorded within the site.

Table 4.9 NBDC List of High Impact Invasive Species (10km² R72)

COMMON NAME	LATIN NAME	SI 477	High Impact
Curly Waterweed	Lagarosiphon major	*X*	*X*
Giant Hogweed	Heracleum mantegazzianum	*X*	*X*
Japanese Knotweed	Fallopia japonica	*X*	*X*
Rhododendron	Rhododendron ponticum	*X*	*X*
American Mink	Mustela vison	*X*	*X*
Eastern Grey Squirrel	Sciurus carolinensis	*X*	*X*
Fallow Deer	Dama dama	*X*	*X*

4.3.4.7 Other species listed by NBDC as present within the 10km grid square R72

Table 4.10 Species Recorded within the 10km Grid Square R72

SPECIES GROUP	NAMED SPECIES
Other Mammals	Other mammals (11) afforded no protection include American Mink (Mustela vison), Bank Vole (Myodes glareolus), Eastern Grey Squirrel (Sciurus carolinensis), European Rabbit (Oryctolagus cuniculus), Fallow Deer (Dama dama), Feral Goat (Capra hircus), Greater White-toothed Shrew (Crocidura russula), Irish Hare (Lepus timidus subsp.

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SPECIES GROUP	NAMED SPECIES
	Hibernicus), Irish Stoat (Mustela erminea subsp. hibernica), Red Fox (Vulpes vulpes), Wood Mouse (Apodemus sylvaticus)
Annelida	2 species recorded, none protected.
Crustacea	1 species recorded, protected, Freshwater Crayfish
Insects	209 species recorded, 8 threatened.
Bryophytes (Mosses, Hornworts and Liverworts)	132 species recorded, 110 threatened.
Mollusc	25 species recorded, none protected/threatened.

The National Biodiversity Centre online database lists a range of other species from within grid square R72. **Table 4.10** lists other species recorded within the 10km grid square R72, along with any species considered under threat and provided with legal protection. None which are protected are likely to occur within the confines of the proposed development.

4.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The characteristics of the proposed development with the potential to affect ecology are;

- Construction phase – potential destruction of habitat due to construction of new electrical substation, refurbishment of existing pig houses and disturbance to adjoining habitats;
- Gaseous emissions from the pig houses;
- Storm water run-off to receiving surface waters;
- Potential for introduction / spread of invasive species during construction; and
- Land spreading of pig slurry with resulting risks of run-off and gaseous emissions.

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4.5 RESULTS OF ASSESSMENT

4.5.1 Do Nothing' Impact

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

4.5.2 Assessment of 'Do Something' impacts before mitigation

During the construction phase of the proposed development, before mitigation potential impacts could arise from increased noise and disturbance from site activities which could result in the disturbance/displacement of birds and mammals. Impacts on water quality could also potentially arise during the construction and subsequent operation of the proposed development.

Before mitigation potential impacts on designated Natura 2000 sites (SACs and SPAs) are specifically addressed in a Natura Impact Statement Report (NIS). The Natura Impact Statement Report states that following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the proposed development will not have an adverse effect on the integrity of Natura 2000 sites, specifically the Lower River Suir SAC.

Slurry spreading can potentially affect habitats outside of the pig farm site. Because slurry is applied in adherence to S.I. 605 of 2017 (as amended) i.e. nutrients are applied to replace chemical fertiliser required for the production of arable crops and grass and therefore is confined mainly to improved

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Grassland Habitats (GA1). Other local habitats have been screened out of this assessment. However an assessment of water quality of the spread-lands for the pig farm is included in the Water Chapter 6 of the EIAR.

The potential impacts of the proposed development are detailed below which have been assessed via a site and study area surveys by Ash Ecology and Environmental Ltd.

4.5.2.1 Pre mitigation impacts to Natura 2000 Sites

Impacts to the Natura 2000 sites within 15km as a result of the proposed development are addressed in the standalone NIS report. Overall the Lower River Suir SAC was the only site with a tenuous hydrological link to the site via the Lyre Stream and Aherlow River (the site is located within the Aherlow_010 River Sub-Basin. The Aherlow River is located approx. 1.3km northeast at the closest point however the Lower River Suir SAC boundary is 8.9km northeast. All impacts from the proposed development were ruled out.

4.5.2.2 Pre mitigation impacts on Habitats

Impacts on terrestrial habitats are generally restricted to direct removal of habitats and possible impacts from the spread of invasive species; in this instance the affected habitats at the site of the proposed development are mainly hard-standing – 'Buildings and Artificial Surfaces' (BL3) which is of no ecological importance.

Overall, the habitats within the site boundary are relatively common and no Annex I habitats or rare or uncommon habitats or floral species will be directly affected by the proposed development. Habitats adjoining the study area are assessed in Sections 4.5.2.6 and 4.5.2.8.

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4.5.2.3 Pre mitigation impacts on Protected Mammals

Treeline and woodland habitat provides potential feeding/commuting habitat for bats. Any existing treelines along the boundaries are to be retained and buildings that may contain bats are affected buildings, the overall impact, given the fact that all other treelines and hedgerows around the site boundaries will remain, is negligible.

No other protected species such as badger and otter occur within the site.

Other mammal species which are protected under the Irish Wildlife Acts 1976-2018 such as Pygmy Shrew, Hedgehog, Stoat etc. could potentially occur within the site, although no signs of these species were recorded. The impact on this species from the proposed development is negligible.

4.5.3.4 Pre mitigation impacts on Birds

The terrestrial bird species recorded during bird surveys are typical of the types of habitat noted on site and are generally common. Sections of treeline and hedgerows along the site boundaries have some potential to provide suitable nesting and feeding resources for other common bird species.

Disturbance can cause sensitive species to deviate from their normal, preferred behaviour, resulting in stress, increased energy expenditure and, in some cases, species mortality. However the existing pig farm has been operational for some time, the levels of activity are established and stabilised with birds in the surrounding landscape habitualised to the noise and disturbance factors created by the day to day operations of the existing pig farm. Additional noise emanating during construction of the electrical substation will be temporary and short-term.

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4.5.3.5 Pre mitigation impacts on other Fauna

No works are taking place near drainage ditches and in that respect any impact to Common Frog (which may use the drainage ditches for breeding) as a result of the proposed development are negligible.

4.5.3.6 Pre mitigation impacts on Water Quality

Potential impacts on aquatic habitats which could arise from increased silt levels in surface water run-off, inadvertent spillages of hydrocarbons from fuel and hydraulic fluid and increased nutrients from treated waste water flowing from the site towards drainage ditches which connect to the Lyre Stream (a tributary of the Aherlow River).

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

Assuming good management practices are maintained on site and taking into account the low risk of fuel (or other toxic liquid spills), negative water quality impacts on receiving watercourses/drainage ditches arising from the proposed development are unlikely. In the unlikely situation of poor management practices spills or leaking storage vessels could lead to a slight - moderate negative adverse effect on the receiving water environment. Mitigation measures including construction of leak-proof slurry tanks with leak detection facilities and bunded liquid storage tanks are addressed in Sections 4.6 and 6.6 of the EIAR.

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4.5.3.7 Pre mitigation impacts of Invasive Species

There is potential for significant negative impacts (if left unmanaged) as a result of the introduction of highly invasive plant species such as Japanese knotweed or other non-native invasive species during construction as viable reproductive material is carried to the site on the wheels and tracks of machinery.

4.5.3.8 Pre mitigation impacts on GA1 Improved Agricultural Grassland habitats and adjoining areas in the Study area

A habitat assessment of the complete study area was mainly that of (GA1 Fossitt Habitat Code). This is considered a habitat of low biodiversity due to the limited number of species it comprises of. Another common, low biodiversity habitat in the study area included Conifer woodland of mainly Sitka Spruce (WD4) and Improved Grassland (GA1). Small pockets of higher diversity habitat such as scrub and wet grassland were rare in the spread-land townlands and tend to occur away from the more intensive farms and would therefore not be affected by outputs due to the proposed pig farm. A selection of plates illustrating the more common habitat types are shown as **Plates 4.1 to 4.12** overleaf.

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Plate 4.1 Improved Agricultural Grassland (GA1) & Hedgerows (WL1), KILLEENAGARRIFF (1)



Plate 4.2 Wet Grassland (GS4) CAHERELLY EAST (9) with Treelines (WL2) and Hedgerows (WL1)



Plate 4.3 Morningstar River (FW2) at BRUFF (17) With stone wall (BL1)



Plate 4.4 Broadleaf woodland (WD1) and Scrub (WS1) , KNOCKAINY WEST (18)



Plate 4.5 Agricultural Grassland (GA1), Treelines (WL2) & Hedgerows (WL1)



Plate 4.6 Wet Grassland (GS4) and Scrub (WS1) at CURRAGHTURK (39)

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Plate 4.7 Conifer Plantation (WD4) with broadleaved (WD1) at CURRAGHTURK (39)



Plate 4.8 Arable Crops (BC1) at BALLYFROOTA (33)



Plate 4.9 Kilteely Village (BL3) in KILTEELY (11)



Plate 4.10 Grassy Verges (GS2) along road (BL3) KNOCKAINY WEST (18)



Plate 4.11 Morningstar River (FW1) with Wet Grassland (GS4) – BALLYFROOTA (33)



Plate 4.12 Amenity Grassland (GA2) and Buildings and Artificial Surfaces (BL3) at Emly (26)

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4.6 MITIGATION & MONITORING

4.6.1 Mitigation for Water Quality

As drainage ditches occur to the northern boundary of the site, general best practice is required for pollution prevention during the construction and operational phase of the proposed development. Mitigation measures for uncontrolled surface water run-off and accidental spills of fuels, oils and greases are addressed in Section 6.6.1 of Chapter 6 – Water, and will be in line with best practice guidelines e.g. *CIRCA C532* and IFI protocol (2016)[2]. The storm water and septic tank will be monitored regularly as this facility is licensed by EPA and surface water quality is addressed in Section 6.3.3 of the EIAR.

4.6.2 Mitigation for Noise Pollution

Noise will be restricted to normal working hours at the site. Although noise pollution during the works has the potential to impact on the ecology of the site, without noise mitigation the impacts are not likely to be significant within the site. There is a low density of sensitive fauna on the site. Construction impacts are not expected to be significant due to low sensitivity of site, mitigation by distance and screening of existing buildings and short duration of works. The recent DEFRA guidelines should be taken account of.[3]

The operational impacts will not vary significantly, see Section 1.3.5 of this EIAR - Noise.

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4.6.5 Mitigation for Invasive Species

As stated in Section 4.3.4.6 *no high risk invasive species were recorded within the site*. Wheel wash facilities will be used to insure that vehicles entering and exiting the site are clean. In the event of unintended introduction of an invasive species such as Japanese Knotweed, as mentioned in the *Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads*; (NRA, 2008)[4] a person with sufficient training, experience and knowledge in the control of non-native invasive species will be employed to assist in the planning and execution of control measures in relation to Japanese knotweed. All excavated material will be removed from the site by a licensed haulier to an approved waste facility.

4.7 RESIDUAL IMPACTS (post mitigation)

With mitigation any residual impacts on the habitats and species that occur on the site due to the proposed development is considered to be neutral in the long-term and the predicted residual impact on flora and fauna will be not significant.

4.8 CUMULATIVE IMPACTS (post mitigation)

A pig farm located in Inchacoomb, 2km east of the 'Ballyfaskin Pig Farm' on the eastern side of the Aherlow River. This existing pig farm is not predicted to significantly increase the long term noise and

[2] IFI (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters https://www.fisheriesireland.ie/documents/624-guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters/file.html

[3] Radford et al (2019) The Effects of Noise on Biodiversity (NO0235) - Final Report for Defra, University of Bristol

[4] http://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf

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disturbance levels within the vicinity of the 'Ballyfaskin' site due to the separation distance, or affect the water quality of the drainage ditches, and therefore, no significant cumulative impacts in respect of noise disturbance have been identified that will affect the flora and fauna that occurs within the site. Having assessed the existing baseline water quality of nearby watercourses there will be no significant cumulative effects either during the construction phase due to mitigation measures imposed or during the long term operational phase.

There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. Due to the separation distance cumulative effects on Biodiversity are not predicted.

Interactions between Biodiversity and other environmental topics is assessed to be negligible because Biodiversity will not have an impact on any other environmental factor (although many other environmental factors have potential impacts on Biodiversity).

4.9 CONCLUSION

The proposed pig farm site supports a range of relatively low value habitats which are common in the wider landscape. A range of common countryside birds occur within the site. Common Frog may use the drainage ditches for breeding and pollution prevention measures will be put in place. Any additional noise during the construction phase of the works will not negatively affect fauna. Fauna, including various bird species that occur within the site have habituated to ongoing noise activity at the existing pig farm. Impacts on Buildings and Artificial Surfaces (BL3) will not be significant from a biodiversity perspective Overall therefore the impact on ecology from the proposed development is considered minor to negligible.

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CHAPTER 5 - LAND AND SOILS

Section 5.1 introduces the topic of Land and Soils and refers to other sections of the EIAR where this topic is addressed. **Section 5.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 5.3** describes the receiving environment, subsoil and topsoil types and vulnerability rating of the study area. The phosphorous requirement of the study area is presented in Table 5.3. **Section 5.4** describes the characteristics of the proposed development relevant to Land and Soils. **Section 5.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. **Section 5.6** sets out proposed mitigation measures. **Section 5.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 5.8.** In **Section 5.9** the Land Suitability Assessment is presented in Figures 5.3 – 5.34 and conclusions regarding impacts on Land and Soils are provided in **Section 5.10. Section 5.11** contains references for the chapter.

5.1 INTRODUCTION

This chapter addresses impacts on Land and Soils in terms of the loss of land due to the construction of the proposed electrical substation and refurbishment of existing pig houses and the impact on soil nutrients resulting from slurry produced by the proposed pig farm development at Ballyfauskeen, Ballylanders, Co Limerick. Subsoils and vulnerability of groundwater is addressed in section 5.3 and is also addressed in Chapter 6 in relation to groundwater. The study area for the assessment is defined as the 48 townlands to which pig manure from the proposed development will be delivered.

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The European Court of Justice Decision (C-416/02 European Court of Justice 8 September 2005) found that pig manure generated on a pig farm is not a 'waste'. It is recognised by the European Court as a bye product fertiliser and this product (pig manure) is exported to farmers and used in a similar manner to any chemical fertiliser. Therefore this environmental assessment takes cognisance of the fact that the pig manure is a fertiliser and that it is unlikely that farmers would waste this resource.

5.2 METHODOLOGY

5.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in Environmental Impact Assessment Reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

The following sources of information were referred to;

- Visual assessment from road side surveys conducted by Curtin Agricultural Consultants Ltd in June 2019;
- Aerial mapping (Bing maps and Google maps;

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- Si 605 of 2017 (Nitrates Regulations) (as amended in SI 65 of 2018 and SI 40 of 2020);
- Surface Water Quality Assessment carried out by Ash Ecology;
- Land suitability appraisal conducted by Curtin Agricultural Consultants Ltd based on examination of aerial photography and roadside surveys (Section 5.9);
- Teagasc soil analysis summary results for 2019;
- Teagasc Soils Information System; and
- GSI map downloads in relation to groundwater vulnerability.

5.2.2 Assessment of Significance

The assessment of impacts involves:

1. Evaluation of the baseline environment within the site boundary and within the study area comprising of 19 townlands;
2. Evaluation of the nature and magnitude of the effects on Land and Soils; and
3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the impact significance is predicted based on criteria set out in the EPA (Draft) 2017 guidelines and professional judgement of author.

The significance of impact criteria are set out in Table 5.1.

Table 5.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*. For example, the loss of a small area of land to an agricultural building / development. A not significant impact on soil nutrients due to application of fertiliser.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example, the loss of a small area of land to an agricultural building / development, maybe affecting one land holding significantly but not significant at a local level. A small or localised increase in soil nutrients due to application of fertiliser which is noticeable but not a risk to water.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example, the loss of an area of land to an agricultural building / development with a slight adverse impact on agriculture at a local level. An increase in soil nutrients due to application of fertiliser which is noticeable and is a low risk to water.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example, the loss of an area of land to an agricultural building / development with a moderate adverse impact on agriculture at a local level. An increase in soil nutrients due to application of fertiliser which is a high risk to water.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*. For example, the loss of a large area of land to an agricultural building / development with a significant adverse impact on agriculture at a local level and is noticeable at a regional level. An increase in soil nutrients due to application of fertiliser which is a high risk to water features of high sensitivity.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As per significant but effects are widespread throughout the study area and is noticeable at a regional level.

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Significance Level	Criteria
Profound Impact	*An effect which obliterates sensitive characteristics*. For example, the loss of a large area of land to an agricultural building / development with a profound impact on agriculture at a local level and slight adverse at a regional level. An increase in soil nutrients due to application of fertiliser which is a high risk to water features of very high sensitivity.

5.2.3 Duration of Impact

The construction phase will last approximately 4 months. Unless otherwise noted in the individual sections of this Chapter the following duration of impacts apply:

- Temporary Impact - impact lasting for one year or less.
- Short term Impact - impact lasting one to seven years.
- Medium Term Impact - impact lasting seven to fifteen years.
- Long Term Impact - impact lasting fifteen to sixty years.
- Permanent Impact - impact lasting over sixty years.

Land and Soil impacts which occur during the construction phase will generally be permanent.

5.3 RECEIVING ENVIRONMENT

Pig manure has been spread onto soils in the study area for at least 20+ years. The majority of land usage (approx. 70 - 75%) is comprised of grassland for drystock enterprises (beef, sheep, and forage).

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5.3.1 Subsoils/bedrock of the pig farm site (GSI data)[1]

The pig farm site is located in the townland of Ballyfauskeen (Townland Reference No 40). The townland overlies bedrock of the *Broad Haven Formation* (BN - see Figure 6.2.2 and Table 6.4) which is a dark grey/black shale and greywacke rock which is categorised as a locally important aquifer which is moderately productive only in local zones. The land upon which the proposed electrical substation is to be built is a green area between the R662 and the pig buildings. The refurbishment works will be carried out in existing buildings. The site is comprised of approx. 2.6 hectares.

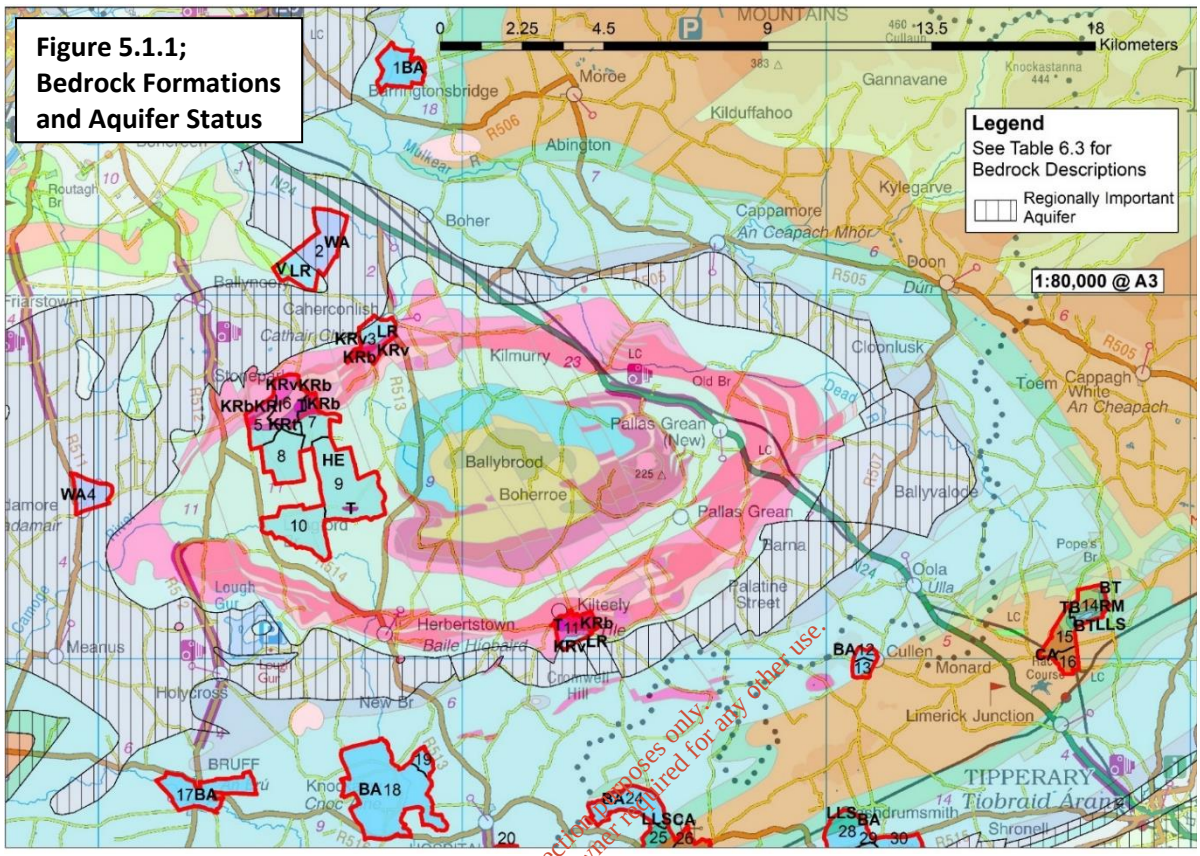
5.3.2 Subsoils/bedrock of the study area (GSI data)

The study area overlies 36 rock formations which are classified as regionally important, locally important and poor aquifers. Locally important aquifers are the dominant rock types comprising approx. 79% of the study area and the site of the pig farm. The *Ballysteen (BA), Inchacoomb (IB), Ballygeana (BN)* and *Herbertsown Limestone (HE)* Formations are the main local important aquifers of the study area. These rock types are widespread across the study area. The regionally important aquifers are comprised of the *Kiltorcan (KT) (yellow sandstones), Kilsheelan (KS)* and *Waulsortian Limestones (WA)* bedrocks accounting for 16% of the study area. *Knockordan Limestone (KD), Johnstown Red Marble (JM)* and *Rathronan (RR*) formations are also regionally important aquifers that make up less than 1% of the study area. As illustrated in Figures 6.1.1 and

[1] https://www.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228

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6.1.2 and Table 6.4, approx. 16.6% of the study area is comprised of regionally important aquifers; occurring mainly in townlands 2, 3 and 4 in the north of the study area, in townlands 22, 23, 31 and


Figure 5.1.1; Bedrock Formations and Aquifer Status
Legend
See Table 6.3 for Bedrock Descriptions
Regionally Important Aquifer
1:80,000 @ A3
0 2.25 4.5 9 13.5 18 Kilometers
Moroe
Gannavane
Kilduffahoo
Abington
Kylegarve
Boher
Cappamore
An Ceapach Mhor
Doon
Dún
Cloonlusk
Kilmurry
Old Br
Toem
Cappagh White
An Cheapach
Pallas Grean (New)
Ballybrood
Boherroe
Pallas Grean
Ballyvalode
Barna
Oola
Ulla
Pope's Br
Palatine Street
Kiltealy
Herbertstown
Baile Hiobaird
Mearlus
Lough Gur
Holycross
New Br
Cullen
Monard
Limerick Junction
TIPPERARY
Tiobraid Árann
Shronell
BRUFF
Knocknacnoc
Ballydrumsmith
Ballyhahill
Ballyhahill Br
Ballyhahill Cross
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33 – 36 in the mid-section of the study area (Galbally/Knocklong) and in the southern townlands 16 and 48. Poor aquifers occur mainly in the mid-section of the study area in townlands 20 – 32. Regionally important aquifers are of higher importance/sensitivity than locally important aquifers, which in turn are more sensitive than poor aquifers. The bedrock geology is illustrated in Figures 6.2.1 and 6.2.2 (which are replicated in Volume 3 of the EIAR at A3 size) as well as Figures 5.1.1 and 5.1.2.

5.3.3 Soils of the study area (Teagasc Soils Information System)[2]

Soil is the top layer of the earth's crust, comprising of mineral particles, organic matter, water, air and living organisms. It is in an extremely complex, variable and living medium formed over extremely long periods and is considered a non-renewable resource. It has many vital functions: food and other biomass production, storage, filtration and transformation of many substances including water, carbon and nitrogen. It is a habitat and a gene pool and is a platform for human activities, landscape and heritage and acts as a provider of raw materials. It contains around twice the amount of carbon than the atmosphere and three times the amount to be found in vegetation. These functions are worthy of protection because of their socio-economic as well as environmental importance. While the EU Commission decided to withdraw the proposal for a Soil Framework Directive in May 2014, the Seventh Environment Action Programme, which entered into force on 17 January 2014, recognises that soil degradation is a serious challenge globally. The Action Programme provides that in the EU by 2020 land is managed sustainably, soil is adequately protected and the remediation of contaminated sites is well underway. It commits the EU and its Member States to increasing efforts to reduce soil erosion and increase soil organic matter and to remediate contaminated sites.

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Table 5.2 Typical Water Infiltration Rates for various Irish Soil Types[3]

Site No	Name	Soil Type *	Summer infiltration Rate (mm / hour)
1	Clonroche	Acid Brown Earth	- (N/A)
2	Kinsealy	Grey Brown Podzolics	29
3	Birr	Grey Brown Podzolics	54
4	Gurteen	Minimal Grey Brown Podzolics	114
5	Castlecomer	Gleys	5.3
6	Clonmel	Minimal Grey Brown Podzolics	30
7	Kilcock	Gleys	96
8	Cappoquin	Brown Podzolic	160
9	Midleton	Acid Brown Earth	103
10	Dundalk	Acid Brown Earth	96



* Ireland General Soil Map 1985

Typical summer infiltration rates of Irish soils is illustrated in Table 5.3. The range is from 5.3mm / hour for Surface Gleys such as located in Castlecomer (e.g. *Kilrush 0700b*) to 160mm / hr for Acid

[2] http://gis.teagasc.ie/soils/

[3] J.Diamond and T.Shanley, Teagasc: *Infiltration Rate Assessment of some Major Soils*; 1998; Tables 1 and 4.

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Brown Earths. The hydraulic loading of a typical application of organic manure would be approx. 2.5mm. Therefore, in the context of Irish Soils, provided they are not waterlogged most soils will absorb an application of organic manure in less than half an hour. The higher infiltration rates associated with Brown Earths and Luvisols can be assumed to be in excess of 100mm / hr. Moderately well drained Gleys and Podzolics (Kilcock, Kinsealy, Birr) will have mid – lower infiltration rates (30+mm / hr) and poorly drained gleys and peats will have low infiltration rates of 5mm / hr or less (Castlecomer).

There are 8 soil groups in the study area according to the Irish Soils Information System – as illustrated in Table 5.3 and Figures 5.2.1 and 5.2.2.

Table 5.3 Soil Types within the study area

Soil series	Gross Area (ha)	% of study area	Drainage
Peats *(1xx)*	143	1.5	Poorly drained. Typical summer infiltration rates of less than 5mm / hour.
Alluvial soils *(05RIV)*	953	11.5	Poor – moderate drainage, depending on location and drainage outlet. Typical summer infiltration rates vary from less than 5mm / hour – 30mm / hour.
Groundwater gleys *(0660c)*	1,316	16	Moderately - well drained. Typical summer infiltration rates of 30 mm / hour.
Surface water gleys *(0700b, 077c)*	554	7	Moderately - well drained. Typical summer infiltration rates of 30 mm / hour.
Podzols *(0880c)*	273	3	Moderately - well drained. Typical summer infiltration rates of 30 – 90mm / hr.
Brown podzols *(0900d)*	138	2	Moderately - well drained. Typical summer infiltration rates of 30 – 90mm / hr.
Luvisols *(1000x)*	3,181	39	Generally well drained. Typical summer infiltration rates of 100+mm / hour.
Brown earths *(1100a, 1100d, 1100e, 1100n, 1100s, 1150a)*	1,698	21	Generally well drained. Typical summer infiltration rates of 100+mm / hour.
Total=>	**8,250**		

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The principle soil is a Luvisol type soil – *Elton (1000x)* which is a fine loamy drift with limestones. Luvisol soils are generally deep and fertile, with an accumulation of clay in the lower horizons. In the previous Teagas-EPA soils classification system these were described as deep well drained soils derived from basic parent materials (Code 12 - BminDW). This soil series accounts for approx. 39% of the study area and is associated with intensive grassland use and in some cases tillage – occurring mainly in the upper two thirds of the study area, in townlands 3 – 12, 14 – 18 and 22 - 32.

Approximately 23% of the study area is comprised of Surface and Groundwater Gleys. These soils are coarse clayey drift and under the previous Teagasc-EPA Mapping Project were classified as a deep poorly drained mineral soils derived from acidic parent materials (IFS Code 31 – AminPD). While heavy in nature, when drained for agriculture these soils make excellent quality grassland. The *Puckane* series *(0660c)* is the principle of these (16% of the study area) and is the soil type of pig farm site and occurs mainly across the southern parts of the study area (townlands 34 - 44),

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but also in townland No 1. The *Howardstown (0760c)* series which occurs mainly towards the middle of the study area and accounts for 5% of the study area, is a heavy type soil – a clayey drift with limestones (townlands 20 – 22). The remainder of these gleys are the *Kilrush (0700b)* and *Drumkeeran (0700c)* which tend to be poorly drained (townlands 2 and 32).

Approximately 21% of the study area is comprised of Brown Earth type soils consisting of series such as *Clonroche* (*1100a*), *Ballyvorheen* (*1100d*), *Ballylanders (1100e), Clashmore (1100n), Broomhill (1100s)* and *Baggotstown (1150a)* series. These are fine loamy soils with siliceous stones and under the previous Teagasc-EPA Soils were classified as deep well drained mineral soils derived from acid parent materials (Code 11 – AminDW). They are typically associated with intensive grassland use and are also suitable for tillage. The soils occur mainly west of Tipperary Town (townlands 29, 31, 32) and in the southern parts of the study area (townlands 38 – 48).

Alluvial Soil (Boyne - *05RIV*) occurs low in the landscape, throughout the study area, along streams and rivers, particularly where there is (or was in the past) an influence of flooding. This soil occupies approximately 11.5% of the study area. This is silty loam soil and under the previous Teagasc-EPA Soils and Subsoils Mapping Project was classified as mineral alluvial (Code 51 – AlluvMIN). These soil types are deep and can be very productive where drained, however, typically they are seasonally restricted in terms of agricultural traffic.

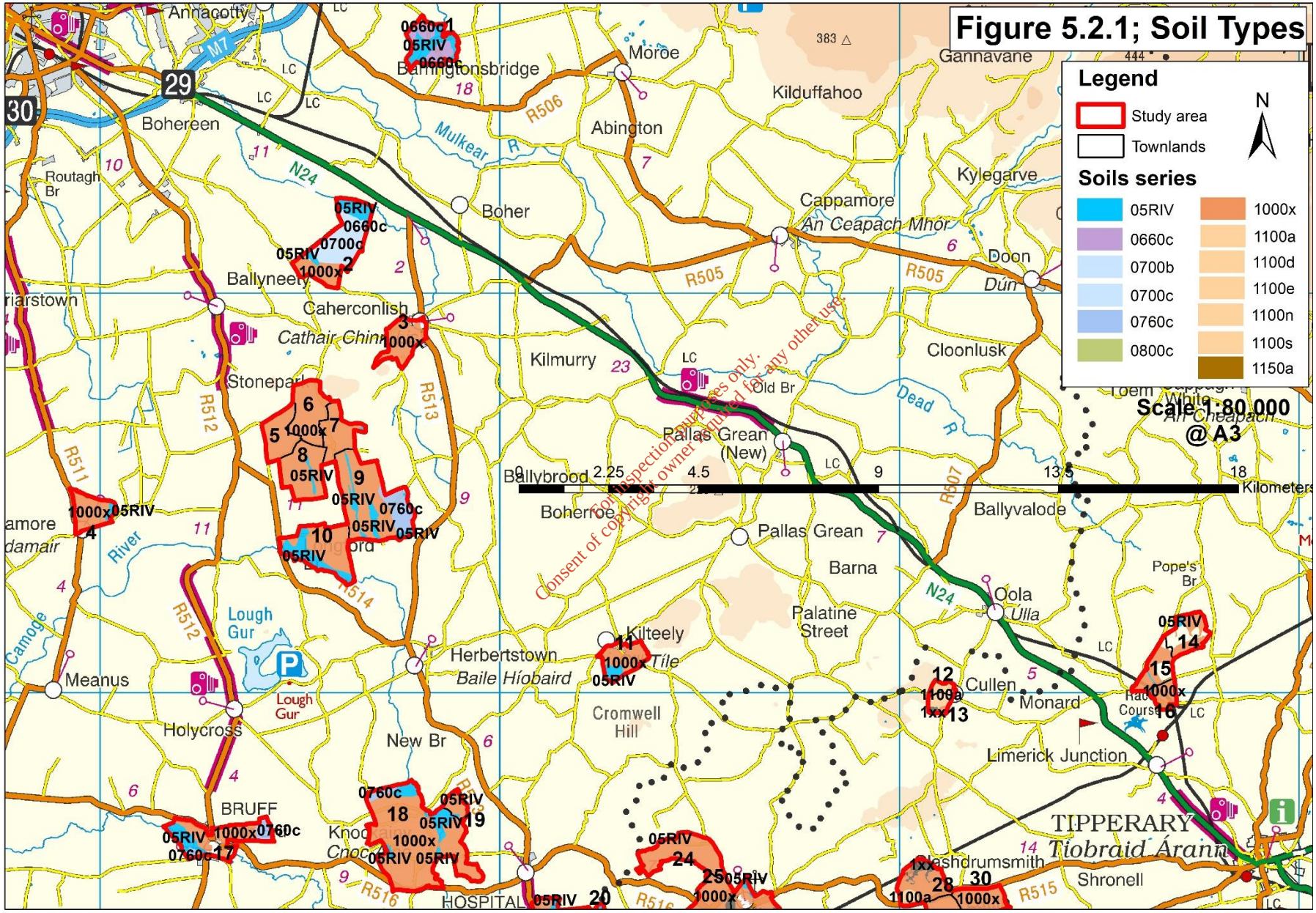
Podzols and Brown Podzols account for 5% of the study area. These soils usually occur higher in the landscape and have a leached upper layer and in some cases an iron pan lower in the soil profile. (Brown Podzols are not as leached as Podzols). *Ballycondon (0800c)* is a loamy drift with Siliceous stones which occurs mainly in the southern part of the study area (townlands 35 and 36). *Knockaceol (960d*) is located mainly south of the study area (townland 46). These are coarse loamy type soils which are mainly suited to grassland due to elevation, rainfall and topography. Under the previous Teagasc-EPA Soils and Subsoils Mapping Project these soil types were classified as a deep well drained mineral soils derived from acidic parent materials (Code 11 – AminDW). These soils are generally good quality with moderate – good drainage.

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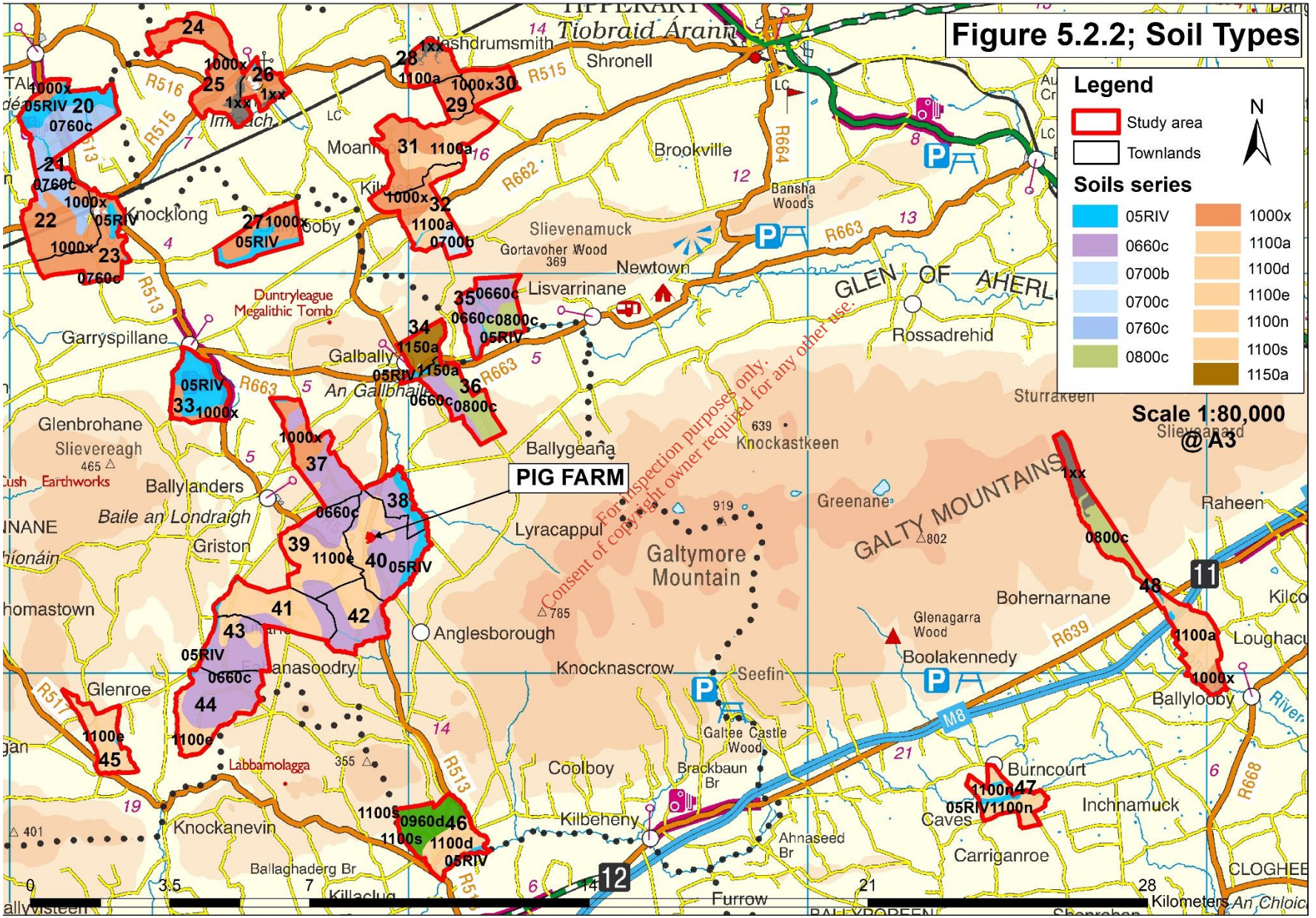
Peats (1xx) account for 1.5% of the study area. These are generally poor quality soils.

With the exception of peats and some poorly drained gleys (e.g. *Kilrush (0700b)* and *Drumkeeran (0700c)* all these soils with improved grassland are suitable for land-spreading, subject to weather and soil conditions. Luvisols and Brown Earths (59% of the study area) are generally well drained and are very suitable for land-spreading pig manure. Surface and Groundwater Gleys, Podzols, Brown Podzols and Alluvial soils (39.5% of the study area) are generally moderately well drained. The main restriction in terms of land-spreading of pig manure on moderately well drained soils is going to be at the shoulders of the season – requiring additional slurry storage to avoid waterlogged soils. Peats (1.5% of the study area) are poorly drained and generally unsuited to land-spreading pig manure.

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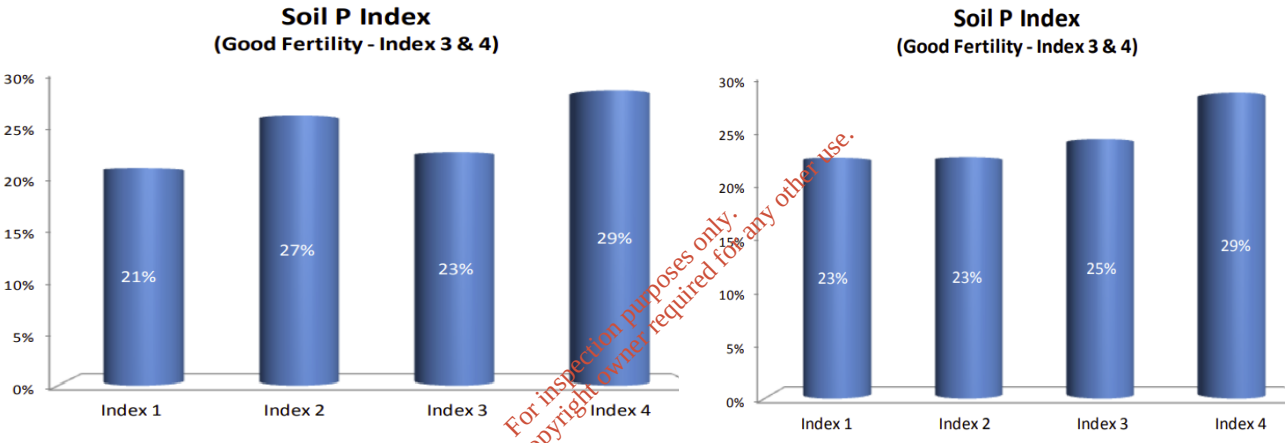
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5.3.4 Nutrient Management of Pig Manure P & N in the existing Study Area

Phosphorous

As discussed in Section 3.3.1.2 of the EIAR the prominent land use is grassland. The results of the land availability assessments are presented in Section 5.9 and illustrated in Figures 5.4.1 to 5.4.33. The gross map area of the study area is 8,250 hectares, with at least 5,543 hectares of this suitable and available for pig manure application in accordance with SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) and, additionally minimising risk to water by excluding 'rock near surface' and allowing 50m around private dwelling to allow for private supply wells. The pig manure is applied to replace chemical nitrogen (N) and phosphorous (P) fertiliser. The chemical P requirement will dictate the potential of the study area to take pig manure.

Figure 5.3: 2019 Soil Analysis Results (5,630 samples)[4] for Counties Limerick (left) and Tipperary (right)



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Figure 5.3 shows that 21%, 27%, 23% and 29% of the soil samples taken in County Limerick in 2019 were P index 1, 2, 3 and 4 respectively and 23%, 23%, 25% and 29% of the soil samples taken in County Tipperary in 2019 were P index 1, 2, 3 and 4 respectively. Based on these results, the average P requirement for grass is 14[5]kgs / ha and the requirement of the entire study area is at least 77,602kgs (5,543ha x 14kgs/ha).

According to Tables 13A and 16 of SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) chemical phosphorous can be applied at maintenance rates (P index 3). This would equate to 10kgs P per hectare. This is lower that the P requirement as indicated from the soil sample results for Counties Limerick and Tipperary, and therefore, adopting a conservative approach, this lower application rate is assumed to be the capacity of the land to take pig manure. With this application rate it would require 1,580 hectares to accommodate the pig manure from the proposed development. The 5,543ha of land (net area) within the study area can accommodate 55,430[6]kgs of P or 69,288m^3 of pig manure – the proposed development will produce approx. 12,644kgs of P or 15,805m^3 of pig manure. The pig manure is supplying approx. 23% of the required P. This low contribution to the total P requirement indicates that the study area has sufficient capacity to take

[4] https://www.teagasc.ie/media/website/crops/soil-and-soil-fertility/Teagasc-Soil-Fertility-Report-2020.pdf
[5] 73% of study area is in Limerick – [(21% @ 30kgs / ha, 27% @ 20kgs / ha and 23% @ 10kgs / ha) x 0.73 + (23% @ 30kgs / ha, 23% @ 20kgs / ha and 25% @ 10kgs / ha) x 0.27].
[6] According to SI 605 of 2017 (as amended), which is lower than the soil results would indicate

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the pig manure from the proposed development. Table 5.4 shows the available land and potential capacity of the study area.

Table 5.4 Phosphorous requirement of the receiving environment

Townland	Gross Area (ha)	Net Area* (ha)	Total P Requirement for Study Area (kgs)
1. Killeenagarriff	113	84	842
2. Highpark	212	180	1796
3. Caherconlish	89	35	350
4. Fedamore	76	49	490
5. Ballybricken North	83	68	683
6. Ballybricken West	117	53	534
7. Ballybricken East	88	48	476
8. Ballybricken South	132	111	1114
9. Caherelly East	293	211	2114
10. Caherelly West	170	85	850
11. Kilteely	81	53	526
12. Monearmore	18	6	56
13. Cullen	26	15	148
14. Gortdrum	82	22	224
15. Ballyryan East	71	33	328
16. Milltown (ED Ballykisteen)	36	20	205
17. Bruff	159	74	737
18. Knockainy West	465	294	2942
19. Knockainy East	29	23	227
20. Kilfrush	324	249	2489
21. Knocklong	46	44	438
22. Knocklong West	285	212	2122
23. Knocklong East	223	107	1075
24. Ballycurrane	135	95	950
25. Bartoose	153	135	1348
26. Emly	82	43	430
27. Ballylooby	181	153	1525
28. Lattin North	108	94	938
29. Lattin West	74	66	657
30. Lattin East	84	62	620
31. Mooresfort	330	275	2753
32. Kilross	249	188	1876
33. Ballyfroota	198	173	1733
34. Galbally	96	74	741
35. Corderry	216	170	1701
36. Park (ed galbally)	186	131	1305
37. Spittle (ED Ballylanders)	245	199	1988

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Townland	Gross Area (ha)	Net Area* (ha)	Total P Requirement for Study Area (kgs)
38. Curraghkilbran	114	108	1081
39. Curraghturk	325	103	1026
40. Ballyfauskeen	336	209	2093
41. Cullane North	258	149	1494
42. Ballyduff	204	93	935
43. Cullane Middle	200	166	1664
44. Cullane South	305	209	2086
45. Spittle (ED Darragh)	149	86	863
46. Kilglass	274	204	2038
47. Shanbally	144	110	1096
48. Kilcoran	389	178	1779
Totals =>	**8,250**	**5,543**	**55,430**
* Deductions as per section 5.9.			

Nitrogen (N)

The chemical allowance for the typical receiving farmer is 206 kgs / ha as per Table 12 of SI 605 of 2017 (as amended) - 1,142 tons of N required within the study area. The pig farm will produce 66,381m^3 of pig manure N which is 50% available according to the regulations. Therefore the pig farm will supply 3% of this N requirement.

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5.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The characteristics of the proposed extension which will impact on Land and Soils are;

- The loss of grassland under the proposed buildings is not significant – i.e. the footprint of the electrical substation is 21.7m^2; and
- The supply of soil nutrients (Nitrogen and Phosphorous) in the pig manure. The proposed development will not significantly increase pig manure production.

5.5 RESULTS OF ASSESSMENT

The impact assessment uses the criteria set out in Table 4.1.

5.5.1 Do Nothing' impact

There is no change to the baseline Land and Soils environment in a do-nothing scenario. Chemical fertiliser will continue to meet crop requirements.

5.5.2 Potential pre-mitigation impacts on Land and Soils – Pig Farm Site

The construction of the proposed development on the 'Ballyfaskin' site will require an additional approx. 0.01 m^2 of agricultural land for the substation site which is not significant. The land part of the existing pig farm site.

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5.5.3 Potential pre-mitigation impacts on Land and Soils – Study Area

Soil is a valuable resource, the source of almost all land-based food and filters our water. Soils should managed and protected from effects such as wind erosion, erosion from water, degradation, salination and contamination from excessive nutrients. There is also the potential to over supply nutrients and potentially reduce earthworm populations if over-applied. There is also a potential to cause compaction and wheel rutting (erosion) when applying the pig manure in unsuitable weather conditions / high soil moistures.

The pig farm will supply approx. 23% of the P requirement of the study area. This demonstrates that the study area has adequate capacity for the pig manure to replace chemical fertiliser. Where applied to replace chemical fertiliser the application rates will not significantly affect the soil nutrient status.

5.6 MITIGATION

5.6.1 Mitigation for Land and Soils

- Maintain a pig manure export register for inspection by EPA as required by the IPPC license and submit records of slurry movement to DAFM each year so that slurry movements can be monitored;
- There is a legal framework (SI 605 of 2017 as amended) which governs how pig manure is land-spread, and within this legal framework there are adequate protections to insure that pig manure is applied without adverse environmental effects;
- Adherence to the mandatory regulations as specified in SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020 attached in Appendix 2 of Volume 3 of EIAR) is a requirement for the land spreading of any fertiliser (including pig manure). The relevant regulations to be adhered to in relation to pig manure applications are;
    - Application of fertiliser at rates which is '*reasonable to apply for the purposes of promoting growth of the crop'.* These rates are set out in Tables 12 - 17 of the 2017 regulations;
    - Pig manure will only be applied to replace chemical fertiliser requirement;
    - Pig manure is allowable on GLAS area based options (Low Input Permanent Pasture and Traditional Hay Meadow);
    - Organic N on receiving farms cannot exceed 170 kg / ha;
    - Upward-facing splash plate will not be used;
    - Spreading from a road or passageway is not allowed;
    - Spreading when;
        - The land is waterlogged;
        - The land is flooded, or it is likely to flood;
        - The land is frozen, or covered with snow;
        - Heavy rain is forecast within 48 hours (forecasts from Met Éireann should be checked);
        - The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account;

      is not allowed,
    - Buffer zones of 200 m, 25 m, 20 m and 15 m around public water supply wells and reservoirs, private wells, lakes and rock outcrops / karst features respectively;

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  - A buffer zone of 10m is required for any surface watercourse where the slope towards the watercourse exceeds 10%; and
  - A buffer zone of 5m is required for other water courses (increased to 10 metres for a period of two weeks preceding and two weeks following the periods when application of fertilisers to land is prohibited as set out in Schedule 4 of the 2017 Regulations);
- In addition to the regulations the following mitigation measures are going to be implemented;
  - The pig farm management will record slurry movements and submit to DAFM[7] each year. This requires a collaborative approach between customer farmers and the pig farm to discuss and advise how pig manure can most effectively be used to replace chemical fertiliser and protect water quality;
  - A 50m buffer strip will be advised by the pig farm around rural dwellings to avoid impacts on unknown private wells (and reduce nuisance);
  - Only 1.5% of the study area is categorised as extremely vulnerable and regionally important aquifer – this represents a very low risk to groundwater.
- To prevent degradation of soils the pig manure will be applied in suitable weather conditions by ensuring that there is sufficiently extra slurry storage on site (i.e. the proposed storage is greater than 50 weeks);
- To minimise the risks from spreading on heavy moderately drained soils in the shoulders of the spreading season the pig farm has sufficiently extra storage so that pig manure exports are not necessary during these high risk periods and
- By adhering to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020, nutrient over loading is avoided.

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5.7 RESIDUAL IMPACTS (post mitigation)

The study area has a conservatively calculated requirement of at least 55,484kgs of chemical fertiliser P (Table 5.4), some or all of which can be replaced by pig manure P. The risk to groundwater as assessed in Section 6.3.1.2 and in Section 5.9 is low overall with only 1.3% of the study area consisting of extreme vulnerable land overlying regionally important aquifers.

Having considered the area of suitable land available to the pig farm and the magnitude of impacts, the residual impacts on Land and Soils are considered to be not significant before and after mitigation measures are employed. Furthermore, replacing chemical fertiliser with this organic manure will enhance the organic matter content of the soil and prevent degradation. The proposed development will not result in a significant increase in top-soil nutrients or have significant effects on subsoils/bedrock within the study area with adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020).

5.8 CUMULATIVE IMPACTS (post mitigation)

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*". Cumulative effects are defined in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

[7] Department of Agriculture, Food and the Marine.

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There is a pig farm in Inchacoomb located 2km east of the proposed development. The Inchacoomb pig farm delivers pig manure to some of the townlands within the study area and therefore there is a potential cumulative impact on soil nutrients. As stated in Section 5.1, the European Court of Justice Decision (C-416/02 European Court of Justice 8 September 2005) found that pig manure generated on a pig farm is not a 'waste'. As such it must be assumed that farmers using the pig manure from the Inchacoomb Pig Farm apply it not as a waste, but as a fertiliser commodity and adhering to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) it will replace chemical fertiliser. The Inchaccomb piggery is smaller scale than the proposed development and given the relatively low concentration of pigs per sq. km (Figure 1.8 of Chapter 1 of this EIAR) cumulative impacts are considered not significant. Furthermore, when the total contribution of pig manure to County Limerick organic manure levels (i.e. <2% see Table 5.5 below) is considered the cumulative impact of pig farms to organic N and P production is not significant.

There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. There is a very low potential for overlap in the land-spreading areas at this separation distance and therefore cumulative effects are unlikely.

According to Table 2 of the 2019 Pig Census (DAFM) there are approx. 4,071 breeding sows in County Limerick producing approx. 354,177kgs of organic nitrogen on an agricultural area of 206,690 hectares (Table 1 of 2010 Agricultural Census). There are approx. 13,868 breeding sows in County Tipperary producing approx. 1,206,516kgs of organic nitrogen on an agricultural area of 313,152 hectares. Therefore the rate of organic N is approx. 2.4kgs / ha which is not significant in the overall context of livestock farming within the county – i.e. 2% of total organic N (Table 5.5).

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Table 5.5 : Estimated Total Organic Nitrogen Production Co Limerick

Livestock Category	Numbers Limerick	Numbers Tipperary	Organic N Produced in Co Limerick (Kgs)	Organic N Produced in Co Limerick (Kgs)
Dairy cows *(CSO June 2019)*	118,800	175,100	10,335,600	14,883,500
Other cows *(CSO June 2019)*	26,200	55,800	1,703,000	3,627,000
0 - 1 Yr Old *(CSO June 2019)*	122,000	197,100	2,928,000	4,730,400
1 - 2 Yr Old *(CSO June 2019)*	108,800	189,600	6,201,600	10,807,200
>2 Yr Old *(CSO June 2019)*	51,400	81,800	3,341,000	5,317,000
Bulls *(CSO June 2019)*	400	500	26,000	32,500
Deer *(CSO 2010)*	203	92	2,639	1,196
Horses/Ponies *(CSO 2010)*	4,314	9,049	215,700	452,450
Laying Hens *(CSO 2010)*	16,325	7,809	9,142	4,373
Breeding Birds *(CSO 2010)*	121,117	305	67,826	171
Table Birds *(CSO 2010)*	1,180,443	987	283,306	237
Other Birds *(CSO 2010)*	1,224	7,035	1,224	7,035
Ewes *(CSO 2010)*	10,389	68,993	135,057	896,909

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Livestock Category	Numbers Limerick	Numbers Tipperary	Organic N Produced in Co Limerick (Kgs)	Organic N Produced in Co Limerick (Kgs)
Hoggets *(CSO 2010)*	2,563	17,618	15,378	105,708
Goats *(CSO 2010)*	125	573	1,125	5,157
Total Estimated Org N (kgs) produced in the County (excl. pigs)			**25,266,597**	**40,870,836**
Agricultural area (ha) *(CSO 2010)*			**206,690**	**313,152**
Rate of Organic kgs N / ha (excl. pigs)			121	130.5
Rate of Organic kgs N / ha (excl. pigs) (73% study area in Limerick)				**123.6**
Sows *(DAFM 2019)*	4,071	13,868	354,177	1,206,516
Total Org N (kgs) produced in the County (incl. pigs)			**25,383,174**	**42,077,352**
Rate of Organic kgs N / ha (incl. pigs)			122.8	134.4
Rate of Organic kgs N / ha (incl. pigs) (73% study area in Limerick)				**126**

Land and Soils and land spreading of pig manure has the potential for significant interactions with Human Population and Human Health, Water, Air, Climate and Material Assets, however, having considered these interactions, there is no significant change in the assessed impacts.

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5.9 LAND AVAILABILITY ASSESSMENT

In order to determine the capacity of the study area to accommodate the pig manure from the proposed development it must be determined how much agricultural land is available. A conservative approach was taken when deciding the availability of agricultural lands for organic manure land-spreading and the following areas were deducted[8];

- Areas identified as 'rock near surface' on GSI mapping are excluded;
- A 50m exclusion is allowed around rural dwellings to allow for unknown private water supplies;
- A mandatory 200m around public water supplies are excluded;
- Source protection zones and Zones of Contribution for public water supplies were excluded (using GSI data);
- 200m zones around schools is excluded (to reduce potential for nuisance);
- Mandatory buffer strips along watercourses are excluded (10+m allowed in this assessment),
- In-eligible areas such as roads (public and private), farm yards, forestry, scrub and waterbodies are excluded; and,
- Wet lands with obvious rush growth are excluded.

[8] That is not to say that all the lands deducted are unsuitable for organic manure applications – but this exercise adopts a conservative approach.

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Groundwater vulnerability is also addressed in Chapter 6, Section 6.3.1. The risk to groundwater can be assessed by calculating how much of the study area overlies regionally important aquifers and how much of this land is categorised as 'extreme vulnerability'. Figures 6.2.1 and 6.2.2 of Volume 3 and Table 6.4 of Chapter 6 of this EIAR shows that 1.5% of the study area which is located on these regionally important aquifers is also categorised as extremely vulnerable. This is a very small proportion of the study area and represents a low risk when best practise is adhered to.

The results of the Land Availability Assessment are presented in Figures 5.4.1 to 5.1.33 at the end of this chapter and is summarised as follows;

- The gross map area of the study area, comprising of 48 townlands to which pig manure is delivered, is approx. 8,250 hectares;
- When deductions are made (see Figures 5.4.1 – 5.1.33 of this chapter) the available area is reduced to approx. 5,543 hectares. The deductions include 428 hectares of forestry and approx. 2,280 hectares of other deductions; and
- The 5,543 hectares of available land is suitable for land spreading pig manure at application rates of 10 kgs P / ha assuming P index 3[9] and mainly grassland. Therefore the P requirement of the entire study area is at least. 55,430 kgs. Based on average available soil analysis results for Limerick and Tipperary the P requirement is 77,602 (14kgs / ha).

5.10 CONCLUSIONS

The production of pig manure from the proposed pig development at will not change significantly. Therefore the nutrient loading on soils in the study area will not change significantly. The proposed development will supply a relatively low proportion of the total P requirement of the study area. The risk of pig manure nutrients affecting sub soils (and groundwater) is low because a very small percentage of the study area on regionally important aquifers is classified as extremely vulnerable. It is predicted that the application of this organic manure will enhance the organic matter content and prevent soil degradation.

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[9] The soil sample results for County Limerick as Figure 5.3 indicate an average requirement of 14kgs / ha

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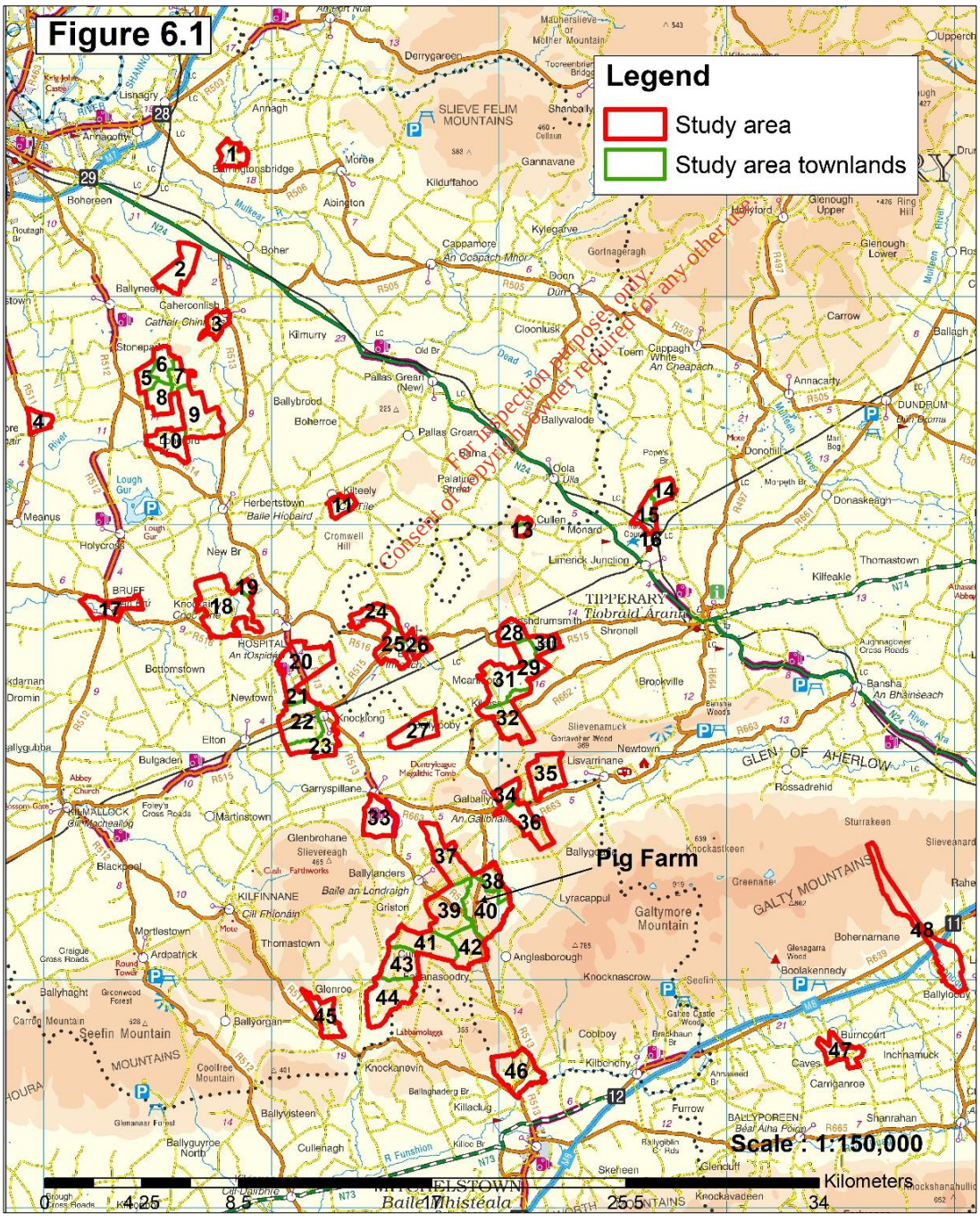
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CHAPTER 6 - WATER

Section 6.1 introduces the topic of Water and briefly describes the proposed development and how it may affect Water. **Section 6.2** sets out the relevant guidance followed, the information sources referred to, and describes the methodology of determining significance of impact. **Section 6.3** looks at the receiving water environment. **Section 6.4** describes the characteristics of the proposed development. **Section 6.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. **Section 6.6** sets out proposed mitigation measures. **Section 6.7** describes the residual impacts after mitigation is employed. Cumulative impacts and potential interactions are described in **Section 6.8** and conclusions regarding impacts on Water are provided in **Section 6.9.**

6.1 INTRODUCTION



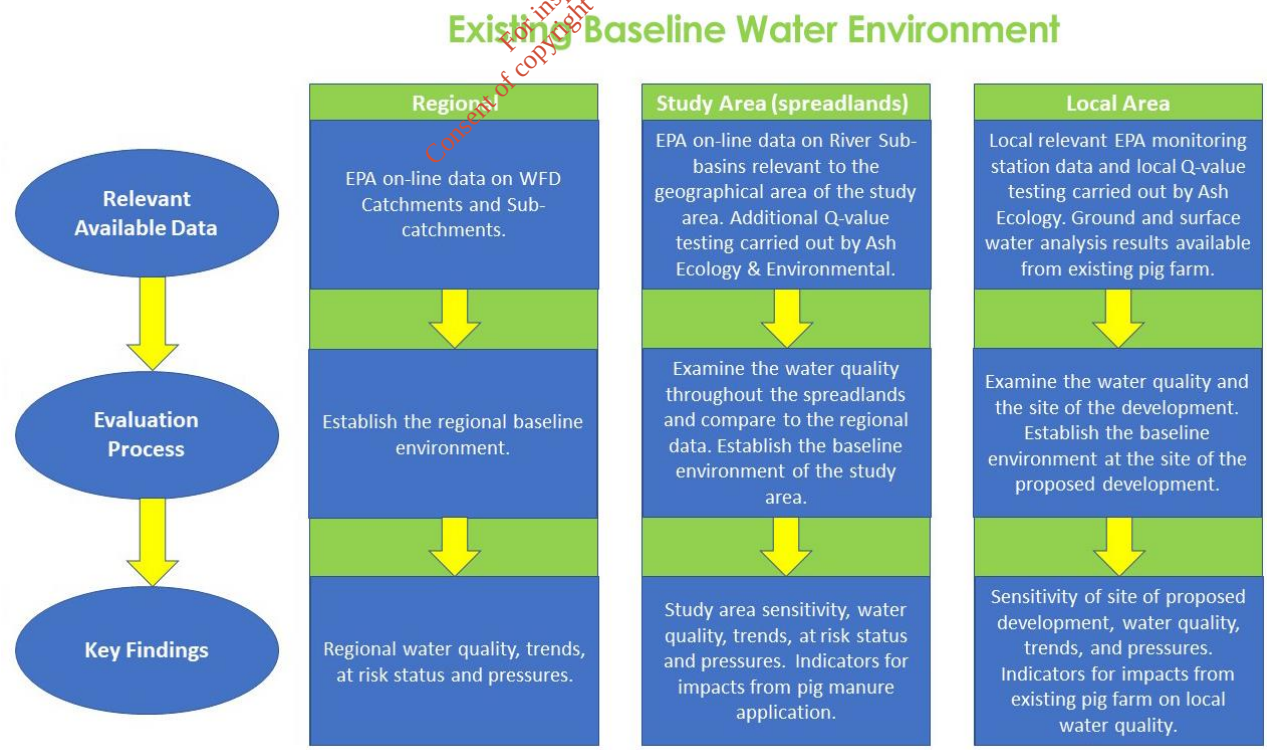
This chapter addresses impact on Water. This assessment was carried out by Aisling Walsh of Ash Ecology and Environmental Ltd (surface water assessment) and Curtin Agricultural Consultants Ltd (groundwater assessment) for their client Ballyfaskin Enterprises Ltd located in Ballyfauskeen, Ballylanders, Co. Limerick. The proposed development as described in Chapter 1 of this EIAR involves the construction of an electrical substation house and an increase in sow numbers from 600 to 1,000 along with increased progeny numbers as set out in Table 1.5 of Chapter 1. The main potential pre-mitigation environmental impacts in relation to the Water Environment are potential impacts at the site from construction activities and storage and handling of pig manure and, potential impacts off-site is the land-spreading of pig manure. Ammonia emissions on-site and off-site may potentially impact on Water.

This report describes the existing quality of water bodies within the Study Area[1] (see Figure 6.1), assesses if the quality is within the expected quality values, assesses existing impacts arising from the existing pig farm and land-spreading of existing pig manure and assesses potential impacts of the proposed development (mainly from land-spreading of pig manure) in the local environs and throughout the study area. The impacts on groundwater and surface waters are assessed and potential cumulative effects from similar developments in the vicinity of the study area are also examined.

6.2 METHODOLOGY

This assessment addresses the water environment by evaluating the groundwater quality and the surface water quality of the receiving environment and assesses the potential impacts from the proposed development in Ballyfauskeen and from the land-spreading of pig manure throughout the study area.

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[1] The study area is comprised of 48 townlands where pig manure is delivered and where the existing development is located.

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To evaluate the groundwater baseline;

- The hydrogeology of the pig farm site at Ballyfauskeen and the wider study area is described in Section 6.3.1.1 using aquifer data from GSI to determine the groundwater aquifer status. GSI groundwater assessment reports, GSI well / borehole data and EPA data[2] on drinking supplies for 2018 and 2019 were examined to determine well yields within the study area – this is addressed in Sections 6.3.1;
- In section 6.3.1.2 the groundwater vulnerability is described for the study area. The interaction between aquifer status and groundwater vulnerability determines the overall risk to groundwater;
- Groundwater quality and risk status is described in Section 6.3.3. The analysis results from the 'Ballyfaskin Pig Farm' and from public water sources throughout the study area[3] were examined to determine groundwater quality at the development site and the study area;
- Having assessed the characteristics of the proposed development as set out in Section 6.4 the potential pre mitigation impacts on groundwater are assessed in section 6.5.2.1. Consideration is given to the existing baseline groundwater vulnerability, quality and sensitivity and pig manure as a contributing risk factor. The existing groundwater environment is assessed and the predicted change due to the proposed development; and
- Having considered the mitigation measures in Section 6.6 the residual and cumulative impacts are addressed in Section 6.7 and 6.8.

To evaluate the surface water baseline;

- Firstly, the regional available background data is examined to set out the regional status and allow comparison of the study area to the regional status. EPA and Water Framework Directive (WFD) monitoring data for the relevant sub-catchments was examined to give an assessment of the regional surface water quality and trends. The source of the baseline data is presented in Sections 6.2.1 and is examined in Section 6.3.2;
- Secondly, available data which most closely relates to the study area and its environs is examined to determine the water status of the study area. EPA and Water Framework Directive (WFD) monitoring data for the relevant sub-basins and waterbodies relevant to the study area was examined. A visual assessment of a selection of waterbodies in the study area was carried out in August 2020 by Ash Ecology and Environmental Ltd and 20 Q-samples were taken to get additional information on surface water quality within the study area.
- Thirdly, the available data was examined for water quality close to the pig farm development. This data is from the EPA monitoring station data and additional sampling of Q-Values by Aisling Walsh of Ash Ecology and Environmental Ltd at previous EPA stations with no recent data and also from other sampling spots where there was no water quality available to ensure a full snapshot of the study area was undertaken.

Having assessed the baseline water quality, its sensitivity to the application of pig manure and the existing pressures, trends and nutrient loading within the study area; the potential pre mitigation impacts from land-spreading of pig manure (and construction of electrical substation) are determined. Finally, having considered the mitigation measures proposed the residual and cumulative impacts are determined.

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[2] https://www.epa.ie/pubs/advice/drinkingwater/drinkingwatersupplies2018

[3] waterquality.limerick.ie and https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/Source-Protection-Zone-Reports.aspx

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6.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in Environmental Impact Assessment Reports, (Draft May 2017); and
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – SI 296 of 2018;

The following legislation applies to the land spreading of organic manure;

- Statutory Instrument S.I. No. 605 of 2017 [European Union (Good Agricultural Practice for Protection of Waters) Regulations 2017];
- Statutory Instrument S.I. No.65 of 2018 [European Union (Good Agricultural Practice for Protected of Waters) (Amendment) Regulations 2018];
- Nitrates Explanatory Handbook for Good Agricultural Practice for the Protection of Waters Regulations 2018, Department of Agriculture, Food and the Marine, Johnstown Castle, Co. Wexford (Dec 2017);
- S.I. 155 of 2012 European Communities (Sustainable Use Of Pesticides) Regulations 2012; and,
- Water quality Regulations and Parameters; SI 272 of 2009 (Surface Water); SI 9 of 2010 (Groundwater); SI 122 of 2014 (Drinking Water Standards)

It is assumed that farmers receiving pig manure adhere to this legislation and enforcement is applied through the Department of Agriculture, Food and the Marine (DAFM) and Local Authorities who inspect farms to insure compliance[4]. This pig farm is licensed by the EPA, who along with DAFM, monitor the manure exports from the pig farm at Ballyfauskeen.

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In compiling this chapter the following sources of information were referred to;

- Geological Survey of Ireland – metadata
- Google Maps and Google Streetview;
- Information on water quality and water body mapping in the area available from EPA mapping; http://maps.epa.ie/internetmapviewer/mapviewer.aspx
- EPA monitoring data www.epa.ie/QValue/webusers
- EPA Publications: Trodd, W. & O'Boyle, S. (2018) Water Quality in 2017: An Indicators Report. Environmental Protection Agency Ireland https://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%202017%20-%20an%20indicators%20report.pdf
- River Basin Management Plan for Ireland 2018 – 2021 (Department of Housing, Planning and Local Government) https://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf
- Suir Catchment Assessment 2010-2015 (HA 16) (Dec 2018) Catchment Science & Management Unit Environmental Protection Agency https://www.catchments.ie/wp-content/files/catchmentassessments/16%20Suir%20Catchment%20Summary%20WFD%20Cycle%202.pdf
- Munster Blackwater Catchment Assessment 2010-2015 (HA 18) (Dec 2018) https://www.catchments.ie/wp-content/files/catchmentassessments/18%20Blackwater%20(Munster)%20Catchment%20Summary%20WFD%20Cycle%202.pdf

[4] DAFM enforce adherence to this legislation by inspecting approximately 5% of farmers each year

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- Shannon South Estuary Catchment Assessment 2010-2015 (HA 24) (Dec 2018) https://www.catchments.ie/wp-content/files/catchmentassessments/24%20Shannon%20Estuary%20South%20Catchment%20Summary%20WFD%20Cycle%202.pdf
- Lower Shannon & Mulkear & Mulkear Catchment Assessment (HA 25D) (Dec 2018) https://www.catchments.ie/wp-content/files/catchmentassessments/25D%20Lower%20Shannon%20Catchment%20Summary%20WFD%20Cycle%202.pdf

6.2.1.1 EPA Data

Groundwater

Article 8 of the Water Framework Directive requires the establishment of programmes for monitoring of groundwater. The groundwater monitoring programmes primarily focuses on providing information that can be used to assess the environmental status of groundwater bodies.

Based on the latest EPA data[5] (2014-2017) published in November 2018 the following is the state of the nation's groundwater resources;

- Faecal bacteria were detected at 43% of groundwater monitoring sites in 2017 (42% in 2016);
- In 2017 the average nitrate concentration exceeded the Irish groundwater threshold value of 37.5 mg/l NO^3 at seven monitoring sites, with one site having average concentrations greater than the Drinking Water Standard of 50 mg/l NO^3. The south and south-east of the country continue to have the greatest proportion of monitoring sites with higher nitrate concentrations; and
- 94% of the 195 groundwater sites monitored in 2017 had average phosphorus concentrations less than 0.035 mg/l P (Irish groundwater WFD threshold value).

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Aquifer and groundwater vulnerability classifications are available from GSI and EPA Data download websites. The analyses results for Limerick public water supplies is available on waterquality.limerick.ie and in the groundwater protection schemes section of GSI website. Water analysis at the pig farm was provided by the developer.

Surface water bodies

Ireland has more than 73,000 km of river channels. Three-quarters of these channels are very small streams that typically flow into larger rivers. The national monitoring programme assesses the quality of over 13,000 km of main channels across the country.

The Environmental Protection Agency (EPA) carries out a biological assessment of most river channels in the country on a regular basis. The presence or absence of macroinvertebrates (tiny animals without backbones e.g. insects, snails and worms) have been widely used to assess water quality and the general health of rivers since the 1970s. Their presence or absence is used to derive Q-Values which are indicators of the biological quality of the water. The biological health of a

[5] Trodd, W. & O'Boyle, S. (2018) Water Quality in 2017: An Indicators Report. Environmental Protection Agency Ireland https://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%202017%20-%20an%20indicators%20report.pdf

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watercourse provides an indication of long term water quality. See below in Table 6.2 for a summary of what the Q-Values relate to. Great importance is attached to the EPA biotic indices, and consequently it is this data that is generally used to form the basis of water quality management plans for river catchments.

Table 6.1: **EPA Q-value classification system and its relationship to water quality**

Q Value	WFD Status	Pollution Status	Condition*	EPA Quality Class
Q5, Q4-5	High	Unpolluted	Satisfactory	Class A
Q4	Good	Unpolluted	Satisfactory	Class A
Q3-4	Moderate	Slightly polluted	Unsatisfactory	Class B
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory	Class C
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory	Class D

*'Condition' refers to the likelihood of interference with beneficial or potential beneficial use.

Rivers are divided into segments or water bodies for management and reporting purposes. Where there is more than one site in a river, the quality is reported as the lowest class recorded in the water body. The national monitoring programme revisits each site at least once every three years.

Based on the latest EPA data[6] (2014-2017) published in November 2018, 1,298 (56%) of the river water bodies were in high or good biological quality. The remaining 1,018 (44%) river water bodies were of moderate (Q3-4), poor (Q3, Q2-3) or bad quality (Q2, Q1-2, Q1). The report had these main findings for rivers and groundwater:

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Rivers

- River biological quality fell by 3% (72 water bodies) since 2013–2015;
- 56% of our rivers are at high or good biological quality with the remaining 44% being at moderate or worse quality;
- The reduction in the number of river water bodies at bad quality is continuing. The number of water bodies in this category fell from five in 2016 to just two in 2017;
- The decline in high-quality sites (Q4–5 and Q5) is continuing;
- There is a relatively stable picture with regard to nitrate concentrations in our rivers. This decreasing trend may be slowing down, with evidence of increasing nitrate concentration at some river sites; and
- The number of river sites with phosphorus concentrations needed to support high-quality rivers dropped from 58% in 2014–2016 to just over 48% in 2015–2017. There is also an increase in the percentage of sites with higher phosphorus concentrations that are likely to lead to water quality issues.

From 2016-2017 a total of 24 catchments were surveyed by the EPA and of the 24 only five showed an overall improvement in the number of river water bodies classified as satisfactory (high or good) based on their biological quality, none of which are within the study area. The number of river water bodies at satisfactory quality (high or good) declined in 16 catchments including two within the study area; Suir (HA16) and Shannon Estuary South (24D).

[6] Trodd, W. & O'Boyle, S. (2018) Water Quality in 2017: An Indicators Report. Environmental Protection Agency Ireland
https://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%202017%20-%20an%20indicators%20report.pdf

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6.2.1.2 Water Framework Directive Data for Surface Waters

The EU Water Framework Directive (WFD) is an important piece of environmental legislation which aims to improve our water quality. It applies to rivers, lakes, groundwater, estuaries and coastal waters. The Water Framework Directive was agreed by all individual EU member states in 2000, and its first cycle ran from 2009 – 2015. The Directive runs in 6-year cycles, so the second cycle runs from 2016 – 2021. Having one framework for water quality for all waterbodies in Ireland, and all those in Europe, allows us to compare our results. By doing this, we can see what works, which helps us to make sure all our surface and ground water achieves at least 'good' status, and no deterioration occurs. A key part of the Water Framework Directive is Article 14, which requires all member states to genuinely engage with the people who live, work and play in a catchment.

Rivers, lakes, estuaries and coastal waters can be awarded one of five statuses:

1. High
2. Good
3. Moderate
4. Poor
5. Bad

Groundwater has just two statuses – '*Good*' and '*Poor*.'

Status is assessed under the following headings:

1. Biological Quality
2. Fish
3. Benthic Invertebrates (These are small animals that live at the bottom of a waterbody or in sediment, and have no backbone)
4. Aquatic Plants
5. Hydromorphological Quality – this is how a river flows, and can be affected by river bank structure, river continuity, or the substrate of the river bed.
6. Physical-chemical quality such as temperature, oxygenation and nutrient conditions
7. Chemical quality for specific pollutants

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An important point to note is that the rule when assessing the waters is *'one out, all out'.* In other words, if, for example, a water body is at 'good' status in three of the above categories, but 'poor' in the fourth, the entire waterbody is judged to be poor. It is the lowest result that determines status.

6.2.1.3 Field Assessment

A site visit of the Study Area was undertaken to visually assess a selection of watercourses where a watercourse crossed a road or where a watercourse shared a boundary of two/three townlands. These chosen representative areas were visited on various dates in August 2020. Photos were taken upstream and downstream of the watercourses (if possible). These habitats of the study area are classified mainly as Improved Agricultural Grassland (GA1) as defined by Fossit (2000) which are considered habitats of low biodiversity. Special Areas of Conservation are excluded from land-spreading pig manure.

6.2.2 Assessment of Significance

The assessment of significance of impacts involves:

1. Evaluation of the baseline water environment within the study area with reference to EPA data;

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2. Evaluation of the nature and magnitude of existing effects on the water environment; and,
3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the significance of impact is predicted based on criteria set out in the EPA (Draft) 2017 guidelines. Main surface waters rivers are high and very high sensitivity – open ditches and drains are medium – high sensitivity. Groundwater sources are high or very high sensitivity. Land overlying over-lying regionally important aquifers with high or extreme vulnerability is high or very high sensitivity. Land overlying over-lying locally important aquifers with high and extreme vulnerability is medium - high sensitivity.

The significance of impact criteria are set out in Table 6.2.

Table 6.2: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*. For example, a change in the water quality of the affected site, the consequences of which are strictly limited to within the site boundaries.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example, a change in the water quality of the affected site which has noticeable consequences outside the development boundary, but these consequences are not considered to significantly affect water quality outside the development boundary. Very low risks associated with once off spill incidents.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example, a change in the water quality of the affected site which has noticeable consequences outside the development boundary, but these consequences are considered to have minor effects on water quality outside the development boundary or affect low importance water features.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example, a change in the water environment within or outside the development boundary with noticeable consequences. These consequences are considered to significantly affect water features of low - medium importance within a study area.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive* aspect of the environment. For example, a change in the water environment within or outside the development boundary with noticeable consequences. These consequences are considered to significantly affect water features of high conservation importance.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As per Significant Impact but more widespread; potentially affecting the overall water quality in the wider area.
Profound Impact	*An effect which obliterates sensitive characteristics*. For example, a change in the water quality within or outside the development boundary with consequences which are considered to be such that the overall quality of water features of high importance in the wider area is under a very high degree of threat or negative impact.

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6.2.3 Duration of Impact

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The construction phase will last 4 months for the substation house and refurbishment of existing pig houses. Unless otherwise noted in the individual sections of this Chapter the following duration of impacts apply:

- Temporary Impact - impact lasting for one year or less;
- Short term Impact - impact lasting one to seven years;
- Medium Term Impact - impact lasting seven to fifteen years;
- Long Term Impact - impact lasting fifteen to sixty years; and
- Permanent Impact - impact lasting over sixty years.

Construction effects are generally temporary. However a diesel spill or other extreme event could have medium term or long term effect on water quality. Generally the trends in ground waters and surface waters quality are slow to change and studies show that river catchment quality can take up to 6–12[7] years for improvements to occur. Therefore the impacts discussed are generally medium or long term.

6.3 RECEIVING ENVIRONMENT

6.3.1 Groundwater Environment

Reference is made throughout the groundwater section to Geological Survey of Ireland on-line data regarding bedrock geology, aquifers and groundwater vulnerability. Shapefiles were downloaded in September 2020 from the GSI website. EPA maps and Catchment.ie on-line sources were also consulted.

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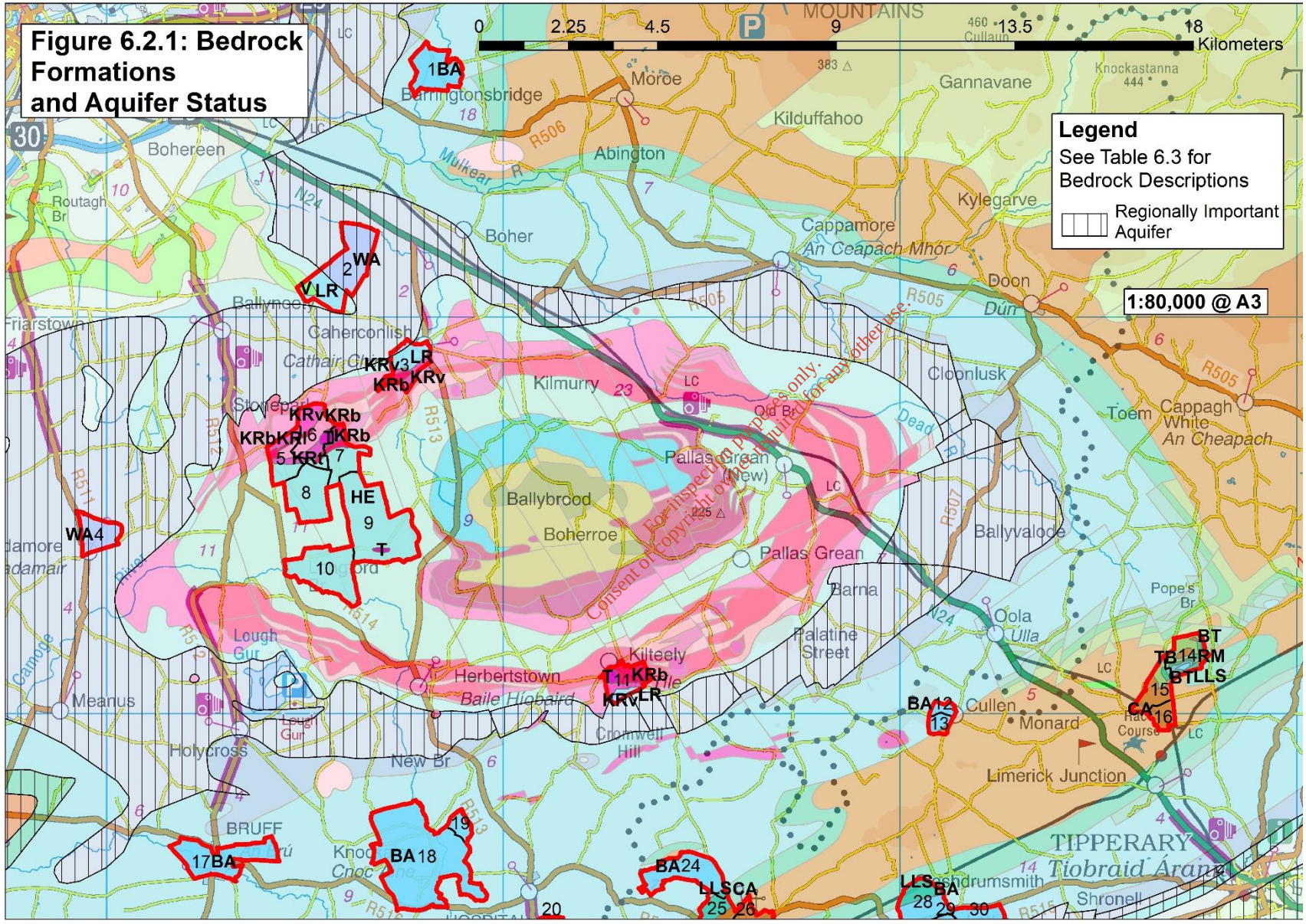
6.3.1.1 Bedrock and Hydrogeology

The pig farm site is located in the townland of Ballyfauskeen (Townland Reference No 40). The townland overlies bedrock of the *Broad Haven Formation* (BN - see Figure 6.2.2 and Table 6.4) which is a dark grey/black shale and greywacke rock which is categorised as a locally important aquifer which is moderately productive only in local zones.

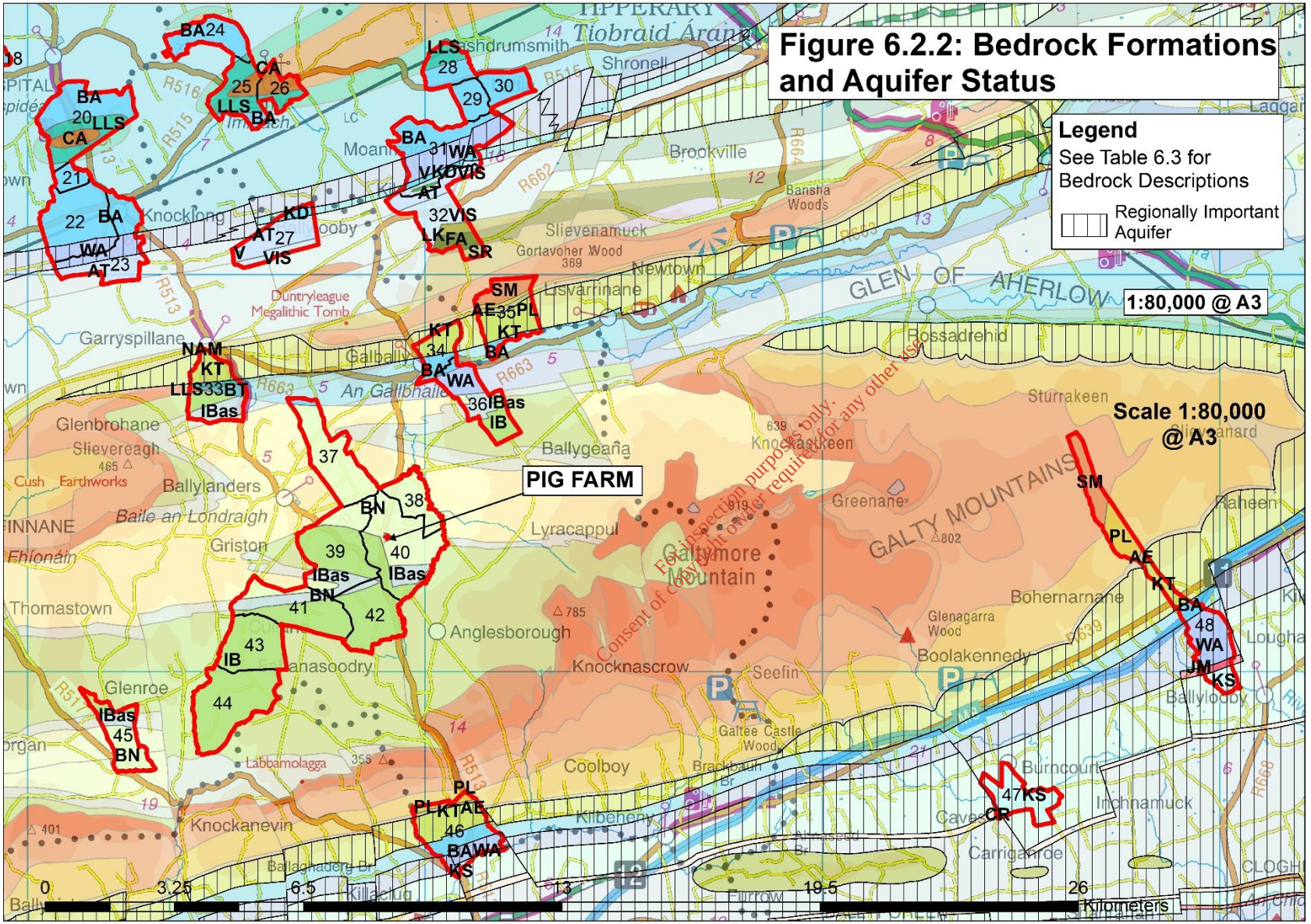
The study area overlies 36 rock formations which are classified as regionally important, locally important and poor aquifers. Locally important aquifers are the dominant rock types comprising approx. 79% of the study area and the site of the pig farm. The *Ballysteen (BA), Inchacoomb (IB), Ballygeana (BN)* and *Herbertsown Limestone (HE)* Formations are the main local important aquifers of the study area. These rock types are widespread across the study area. The regionally important aquifers are comprised of the *Kiltorcan (KT) (yellow sandstones), Kilsheelan (KS)* and *Waulsortian Limestones (WA)* bedrocks accounting for 16% of the study area. *Knockordan Limestone (KD), Johnstown Red Marble (JM)* and *Rathronan (RR*) formations are also regionally important aquifers that make up less than 1% of the study area. As illustrated in Figures 6.1.1 and 6.1.2 and Table 6.4, approx. 16.6% of the study area is comprised of regionally important aquifers; occurring mainly in townlands 2, 3 and 4 in the north of the study area, in townlands 22, 23, 31 and 33 – 36 in the mid-section of the study area (Galbally/Knocklong) and in the southern townlands 16 and 48. Poor aquifers occur mainly in the mid-section of the study area in townlands 20 – 32. Regionally important aquifers are of higher importance/sensitivity than locally important aquifers, which in turn are more sensitive than poor aquifers.

[7] Teagasc: *Lag time: a methodology for the estimation of vertical and horizontal travel & flushing timescales to nitrate threshold concentrations in Irish aquifers* Owen Fenton1, Rogier P.O. Schulte1, Phillip Jordan2, Stanley T.J. Lalor1, Karl G. Richards1 1Teagasc, Johnstown Castle, Environmental Research Centre, Co Wexford, Rep. of Ireland. 2School of Environmental Sciences, University of Ulster, Coleraine, N. Ireland.

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Table 6.3 Bedrock Geology and Aquifer Status within the Study Area

ID (as per Fig 6.1.1 & 6.1.2)	Occurrence within study area (%)	Rock Unit Name	Aquifer Status
Regionally Important Aquifers			
WA	9%	Waulsortian Limestones	Rkd Regionally Important Aquifer - Karstified (diffuse)
KT	4.6%	Kiltorcan Formation	Rf Regionally Important Aquifer - Fissured bedrock
KS	2.3%	Kilsheelan Formation	Rkd Regionally Important Aquifer - Karstified (diffuse)
KD, JM and RR (Knockordan Limestone Formation, Johnstown Red Marble Formation and Rathronan Formation) which comprise 0.7% of the study area			
Locally Important Aquifers			
BA	24.1%	Ballysteen Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
IB	15.1%	Inchacoomb Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
BN	9.6%	Ballygeana Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
HE	8.4%	Herbertstown Limestone Formation	Lm Locally Important Aquifer - Bedrock which is Generally Moderately Productive
IBas	3.6%	Assaroola Member	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
AT	3.6%	Athassel Limestone Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
CA	2.7%	Cappagh White Sandstone Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
VIS	1.8%	Visean Limestones (undifferentiated)	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
SM	1.7%	Slievenamuck Conglomerate Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
LR	1.4%	Lough Gur Formation	Lm Locally Important Aquifer - Bedrock which is Generally Moderately Productive
PL	1.3%	Poulgrania Sandstone Formation	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
KRb	1.1%	Knockroe Basalt Lava Flow Member	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
KRv	1.1%	Knockroe Vitric-Lithic Tuff Member	Ll Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
KRI, FA, BT, KRt, AE, T, LK, SR, V, SH, NAM and CR (Knockroe Lithic Tuff Member, Farranacliff Formation, Ballymartin Formation, Knockroe Trachyte Lava Flow Member, Ardane Formation, Trachyte, Lackantedane Formation, Shrough Formation, Volcaniclastic Rocks, Slievereagh Conglomerate Formation, Namurian (undifferentiated) and Croane Formation) which make up 3.3% of the study area			
Poor Aquifers			
LLS	3.7%	Lower Limestone Shale	Pl Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
RM and TB (Ringmoylan Formation, Trachyte Breccias Rocks) which make up 0.3% of the study area			

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6.3.1.2 Groundwater vulnerability

Pig manure is not an organic waste and, in this report is assessed as an organic fertiliser. Groundwater vulnerability, as illustrated in Figures 6.3.1 and 6.3.2, is a term used to represent the natural ground characteristics that determine the ease with which groundwater may be contaminated by human activities. It indicates the level of risk when assessed in combination the aquifer status. At the site of the pig farm the groundwater vulnerability is medium (Figure 6.3.2). The Groundwater vulnerability within the study area can be summarised as follows;

- Approx. 2% (1.3 + 0.6) of the study area is comprised of extreme vulnerable land and rock over regionally important aquifers. This is a very high risk category in relation to land-spreading organic manures;
- Approx. 27% of the study area is extreme vulnerable land overlying locally important and poor aquifers; and high vulnerable land over regionally important aquifers. This is a high risk;
- Approx. 71% of the study area is high vulnerable land overlying locally important and poor aquifers and medium – low vulnerable land. This is a low - medium risk;

Table 6.4 : Groundwater Vulnerability and Aquifer Status within the Study Area

Groundwater Vulnerability	% of the Study area (Gross Area)	% of the study area (Gross Area)		
		Regionally Important Aquifer	Locally Important Aquifer	Poor Aquifers
Extreme	10	1.3	8.5	0.1
High	31	7.3	23.8	0.04
Medium	38	1.2	6.8	1.9
Low	10	6.3	28.8	2.5
Rock	11	0.6	10.9	0.3
Total	100	16.6%	78.6%	4.8%

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6.3.1.3 Groundwater bodies and groundwater quality

There are 21 ground waterbodies throughout the study area as listed in Table 6.5. Approximately 80% of the study overlies poorly productive waterbodies and 20% overlies productive karstic and fissured rock – this is consistent with the GSI data for aquifers bedrocks in Section 6.3.1.1 above. Approximately 1.2% of the study area overlies groundwater bodies of poor status as per EPA Maps.ie. The Mitchelstown (SE_G_082) and Industrial Facility (SE_G_219) waterbodies are poor quality – townlands 14, 15, 16 and 46 are the relevant townlands. Approximately 55% of the study area overlies ground waterbodies that are *not at risk* from deteriorating water quality and 20% of the study area overlies groundwater bodies that are under *review* due to increased pressures. Approx. 25% of the study area overlies groundwater bodies that are *at risk* due to deteriorating water quality. This compares with approx. 40%, 37% and 23% of groundwater bodies in County Limerick that are not at risk, under review and at risk[8]. The pressures within the relevant ground waterbodies is highlighted in Table 6.5. On the EPA mapping system (https://gis.epa.ie/EPAMaps/Water) there are five ground waterbodies where agriculture is the significant pressure on groundwater quality – these make up 15% of the study area.

[8] As measured by Curtin Agricultural Consultants Ltd using GIS software and EPA data on Ground Waterbodies and Groundwater Risk

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Table 6.5 Groundwater bodies within the Study Area and their Quality and Risk Status

ID (Code)	Name of Waterbody	Occurrence within the study area	Description of waterbody	Quality Status (EPA Maps.ie)	Risk Status (EPA Maps.ie)	Agriculture is the significant pressure
SH_G_107	Hospital	20%	Pl	Good	Not at Risk	-
SE_G_087	Knockaskallen	17%	Pl	Good	Not at Risk	-
SW_G_010	Ballyhoura	10%	Pl	Good	Not at Risk	-
SH_G_055	Charleville	9%	Pl	Good	At Risk	Yes
SH_G_106	Herbertstown	8%	Rkd	Good	At Risk	-
SE_G_131	Templemore	8%	Pl	Good	Review	-
SE_G_040	Clonmel	4%	Karstic	Good	Review	-
SH_G_213	Slieve Phelim	4%	Pl	Good	Not at Risk	-
SH_G_130	Knockroe Northwest	3%	Pl	Good	Not at Risk	-
SH_G_036	Ballyneety	2%	Karstic	Good	Review	-
SH_G_193	North Kilmallock	2%	Karstic	Good	At Risk	Yes
SE_G_016	Bansha	2%	Rkd	Good	At Risk	-
SE_G_145	Tipperary	2%	Karstic	Good	Review	-
SE_G_091	Lisvarrinane	2%	Pl	Good	Review	-
SW_G_082	Mitchelstown	2%	Karstic	Poor	At Risk	Yes
SW_G_011	Ballyhoura Kiltorcan	1%	Rkd	Good	At Risk	Yes
SH_G_084	Fedamore	1%	Karstic	Good	Review	-
SH_G_138	Limerick City East	1%	Rkd	Good	At Risk	Yes
SH_G_131	Knockroe Southwest	1%	Pl	Good	Not at Risk	-
SE_G_024	Cahir	0.5%	Rkd	Good	Review	-
SH_G_219	Industrial Facility (P0331-01)	0.2%	Pl	Poor	At Risk	-

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The well for the existing site is located 0.67km north west of the site in land owned by the developer The existing site well is tested for E.coli and Coliforms – and tests show that there is no bacteria contamination (See Appendix 5 of Volume 3 of the EIAR). The water quality results and yields for public groundwater supplies in the vicinity of the study area as shown in Table 6.6 are derived from waterquality.limerick.ie, from online GSI Groundwater Protection Schemes and from well data from GSI.ie.

Table 6.6: Water analysis for Public Groundwater Supplies in the vicinity of the Study Area

Public Supply	Map Label*	NH_4-N (mg/l)	Coliforms	E.coli	NO_3 (mg/l)	Ortho P (mg/l)	Population served	M^3/day
Anglesborough	34	0.02	1.9	0.75	21	0.01	34	2
Baggotstown	19	-	-	-	-	-	149	32
Ballybricken (1 & 2)	8, 9	0.03	2.5 [1]	0.01	15	0.01	541	119
Ballyduff	33	0.02	22 [2]	0	17	0.02	86	18

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Public Supply	Map Label*	NH_4-N (mg/l)	Coliforms	E.coli	NO_3 (mg/l)	Ortho P (mg/l)	Population served	M^3/day
Ballylanders	29, 30	0.03	0.05	0	6.9	0.01	549	164
Ballyvorneen	10	-	-	-	-	-	-	-
Bohernane	36	-	-	-	-	-	-	-
Bruff (1 & 2)	15, 16	0.03	0.46	0.08	8.5	0.01	1410	550
Bulgaden	20	0.03	0.03	0	7.9	0.01	304	372
Caherconlish	6	0.02	0.22	0.06	15	0.02	436	550
Carnane	7	0.02	1.3 [3]	0.01	14	0.02	931	204
Cooga Upper	4	0.03 [4]	0.09	0	13	0	102	20
Cush	24	-	-	-	-	-	-	-
Duntryleague	27	-	-	-	-	-	-	131
Farnanefranklin	3	-	-	-	-	-	-	-
Fedamore	11	0.02 [5]	2.3	0.21	19	0.01	492	330
Galbally	28	0.02	6.2 [6]	0.71	12 [7]	0.03	361	350
Garranmore	2	-	-	-	-	-	-	-
Griston (1 & 2)	25, 26	0.03	0.25 [8]	0	19	0.01	165	36
Herbertstown	13	0.02	0.47	0.06	17	0.03	674	306
Hospital	18	0.03	17 [9]	1.1	24 [10]	0.04	1076	366
Kilcoran	35	0.02	0	0	2.6	-	-	227
Kilfinnane	30	0.02	5.2 [11]	0.01	21 [12]	0.06	-	414
Kilteely	14	0.02	0.71	0.04	17	0.01	475	110
Knockainey / Kilballyowen	17	0.02	0.76	0.01	7	0	117	25
Knocklong (1,2 & 3)	21, 22, 23	0.02	31 [13]	0.13	22 [14]	0.21	1169	582
Lough Gur	12	0.02	0.08	0	21	0.06	1439	560
Moroe (Murroe)	1	0.03	3.5 [15]	0.05	15	0	2332	807
Pallasgreen	5	0.02	75 [16]	62 [17]	21	0.02	1129	373
Ruppulagh	32							
Threshold values		0.3	0	0	37.5	0.03	-	-
Average		**0.02**	**8.14**	**3.11**	**15.3**	**0.03**	**-**	**279**
Maximum		0.03	75	62	24	0.21	-	807
Minimum		0.02	0.03	0	2.6	0	-	2

Table Notes

* (Labels from Figures 6.3.1 and 6.3.2)

[1] One spike in 2016 – otherwise zero

[2] One spike in 2017 – otherwise zero

[3] One spike in 2006 – otherwise zero

[4] One exceedance in 2007

[5] One spike in 2019 – otherwise zero

[6] One spike in 2012 & 2013

[7] Exceedance in 2011

[8] One spike in 2004 – otherwise zero

[9] One spike in 2012

[10] Large spike in 2013

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Public Supply	Map Label*	NH_4-N (mg/l)	Coliforms	E.coli	NO_3 (mg/l)	Ortho P (mg/l)	Population served	M^3/day
[11] One spike in 2018 – otherwise zero [12] Large spike in 2013 [13] Large spike in 2015 [14] Large spike in 2013 [15] One spike in 2013 [16] Large spike in 2011 [17] Large spike in 2011								

The water analysis results from the public water supplies (Table 6.6) shows that;

- Average Ammonium–N levels in the study area is approx. 0.02 mg/l which is satisfactory and below threshold levels. High Ammonium–N in groundwater indicates contamination from organic materials such as farmyard effluents / manures or waste materials from domestic septic tanks and domestic and industrial waste water treatment systems;
- The presence of Coliform and or E.coli bacteria indicates contamination from waste organic materials, and in the case of Coliforms, indicates the presence of agricultural or human excrement. Therefore the threshold for these bacteria is zero. Many of the wells have had one-off spikes in bacterial counts, but generally levels are acceptably low;
- Nitrate–N levels are generally satisfactory, ranging from 7 to 24 mg / l NO_3 –N and averaging 16.4 mg / l NO_3 –N. Nitrate–N arises from land-spreading organic manures, waste water treatment materials and chemical fertilisers. There is a weak upward trend in Nitrates in the groundwater bodies in the vicinity of the study area, and
- Ortho – Phosphate levels are generally low with the average increased to threshold levels due to one high Phosphate source in Knocklong (Label 21, 22 & 23).

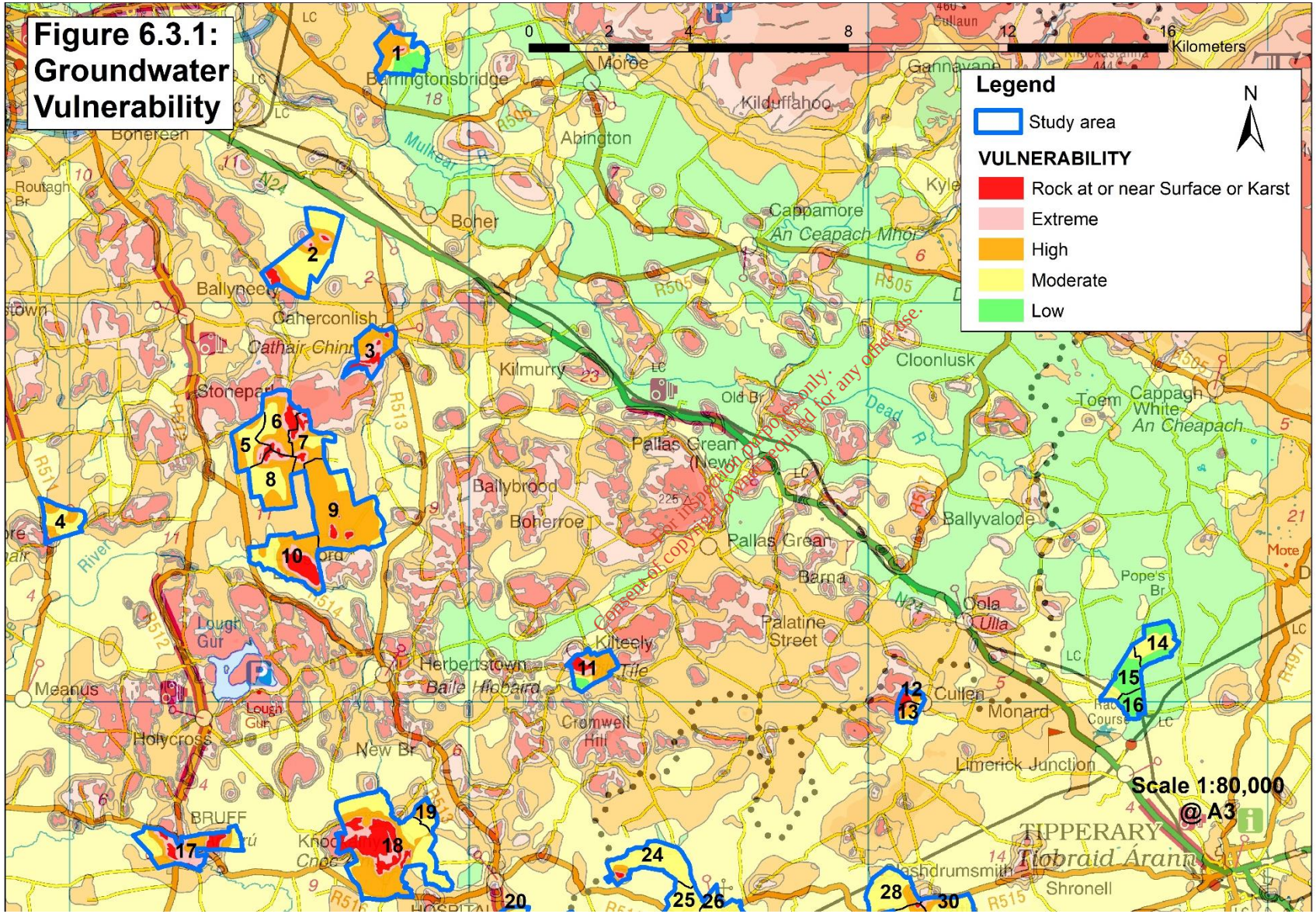
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The average daily yield of the public water sources is approx. 279m^3 indicating relatively productive aquifers in the study area. The site well supplies 14,000m^3 - 15,500m^3 per annum (42m^3 / day) which is safely within the normal range of yields of public wells within the study area. Within 2km of the site there are 7 records on the GSI website – the average yield per day is 62m^3 per day. Unconfirmed reports from the site owner state that the site well capacity as measured by the original drilling company was 3,000 gallons per hour = 330m^3 per day. The requirement in the proposed development will be approx. 48m^3 per day. Therefore there is sufficient groundwater supply for the proposed development

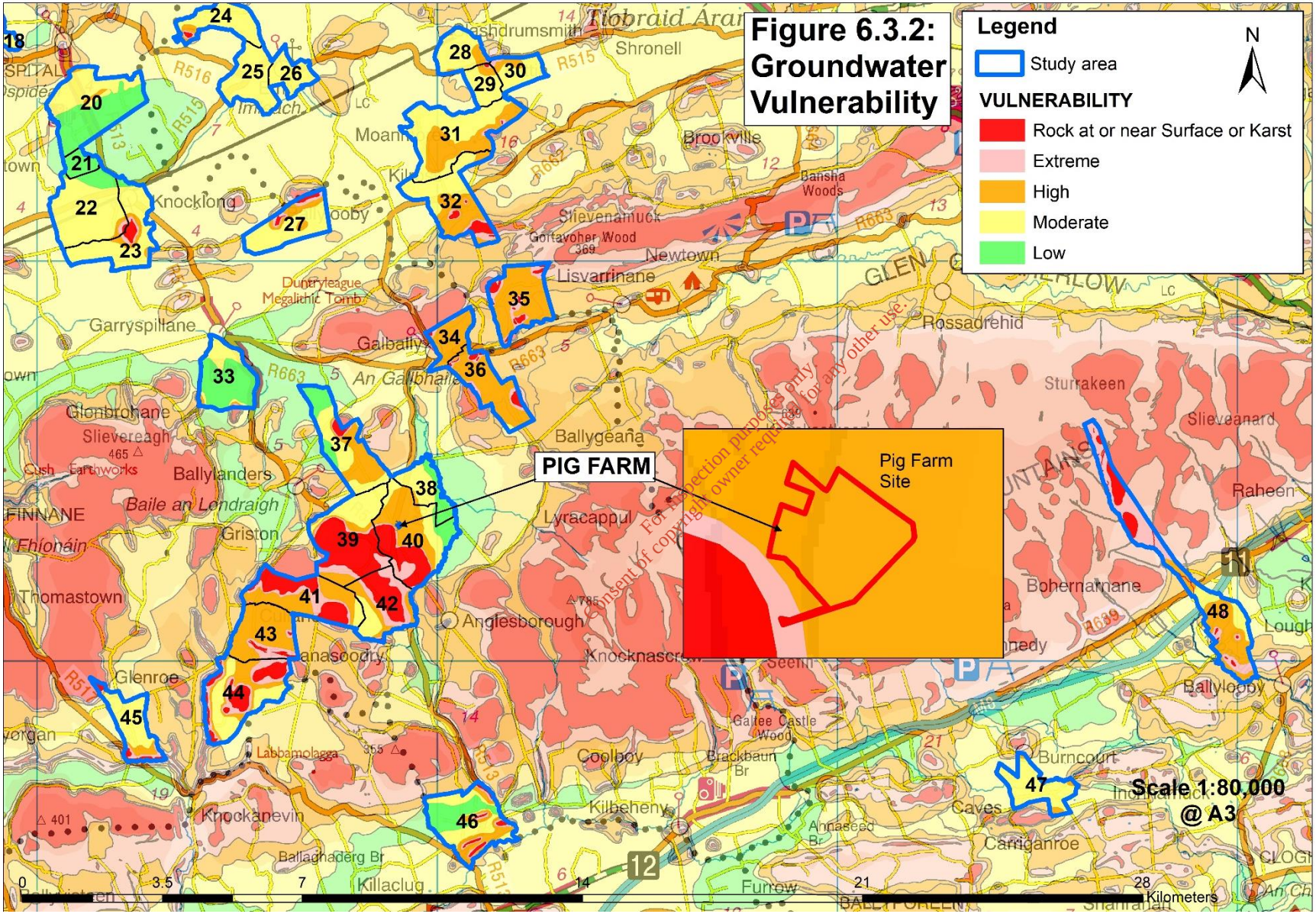
The overall sensitivity of the groundwater environment is high due to;

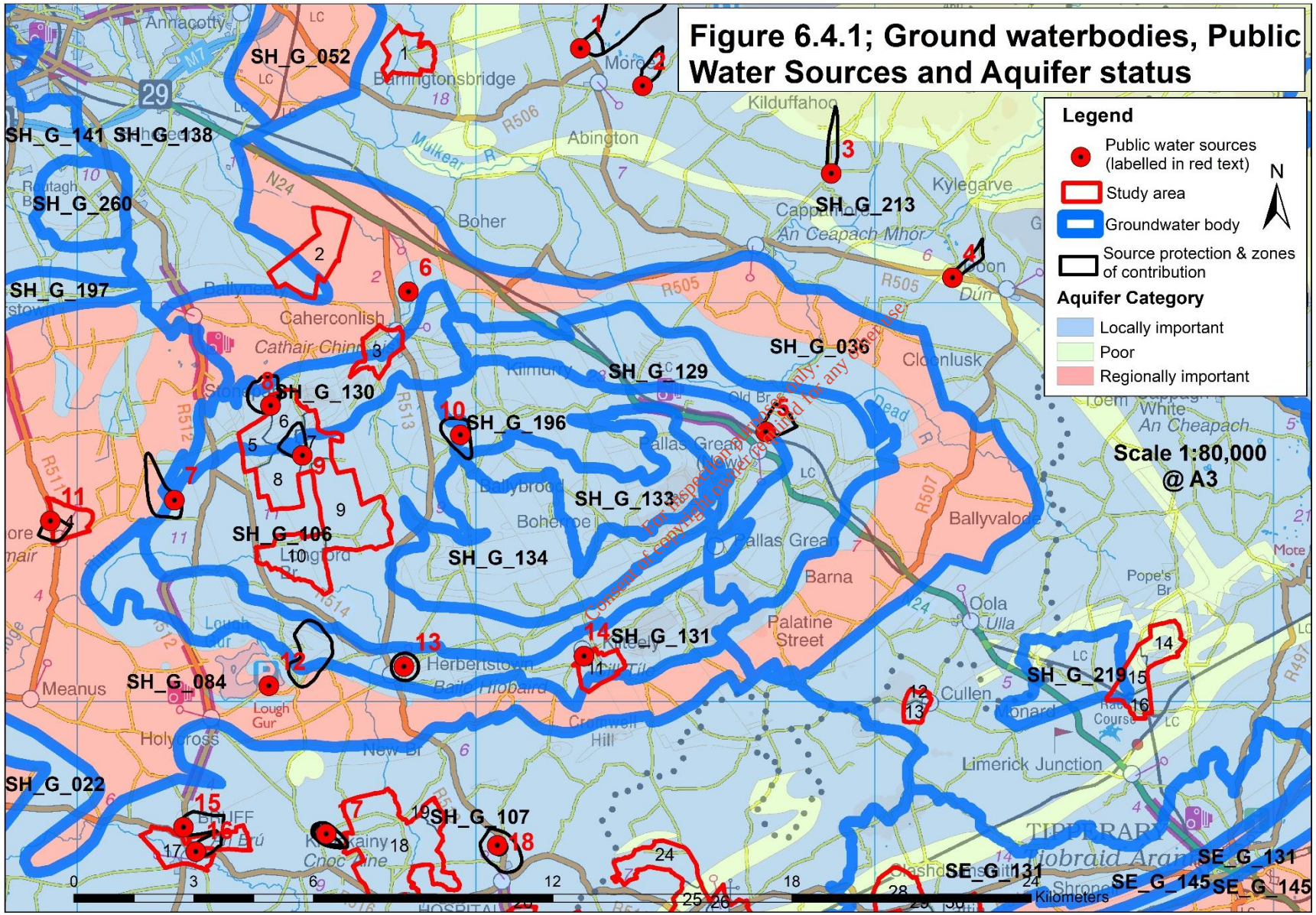
- Existing water quality status is good and water quality of relevant water sources is satisfactory;
- 25% of the study area is at risk of deteriorating water quality. Agriculture is identified as the main pressure on 15% of ground waterbodies;
- A low proportion of the study area is comprised of regionally important aquifers (16.6%); and
- Approx. 2% (a small percentage) of the study area overlies regionally important aquifers and is categorised as extreme vulnerability and rock.

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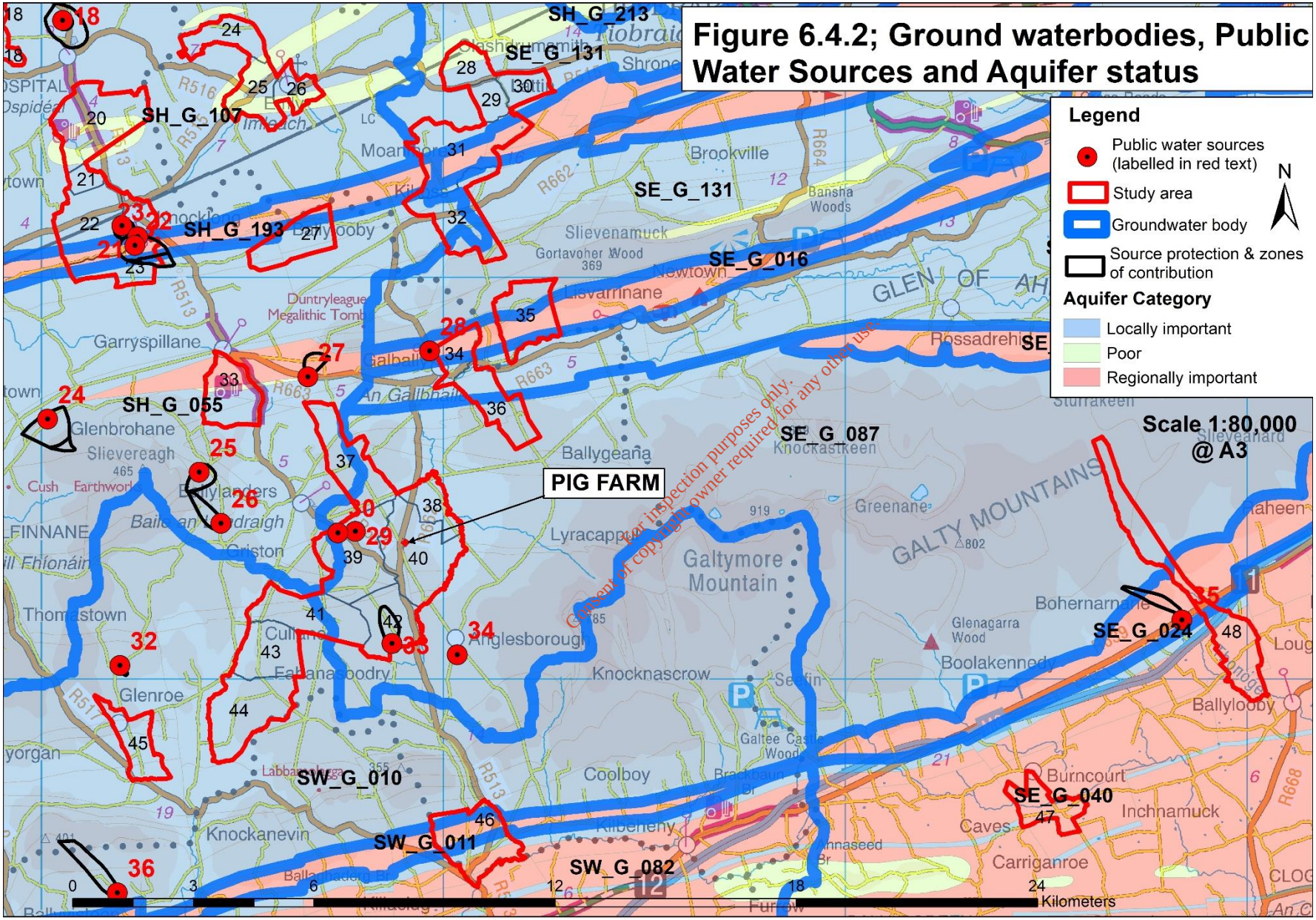


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Figure 6.3.2:
Groundwater
Vulnerability
Legend
Study area
VULNERABILITY
Rock at or near Surface or Karst
Extreme
High
Moderate
Low
N
PIG FARM
Pig Farm
Site
Scale 1:80,000
@ A3
Kilometers
Tiobraid Arann
Shronell
Brookville
Newtown
Lisvarrinane
Rossadrehid
Sturrakeen
Slieveanard
Raheen
Ballygeana
Lyracappul
Anglesborough
Garryspillane
Glenbrohane
Slievereagh
Ballylanders
Baile an Londraigh
Griston
FINNANE
Thomastown
Glenroe
Knockanevin
Coolboy
Kilbeheny
Furrow
Killaclug
Burncourt
Caves
Carriganroe
Ballyloopy
Bohernamane
Knocknascrew
Knocknagoorey
Slievenamuck
Gortavoher Wood
Bansha Woods
Galtee Castle Wood
Duntryleague Megalithic Tomb
Cush Earthworks
Labbamolagga
Ballaghaderg Br
Annaseed Br
Brackbaun Br
Galbally
An Gallbhaile
Knocklong
Moanmore
Kilbeheny
Ballyooby
Lough
CLOGH
BALLYFOREEN
Shanrahan
Furrow
Seefin
Ballyooby
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Ballyooby



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6.3.2 Surface Water

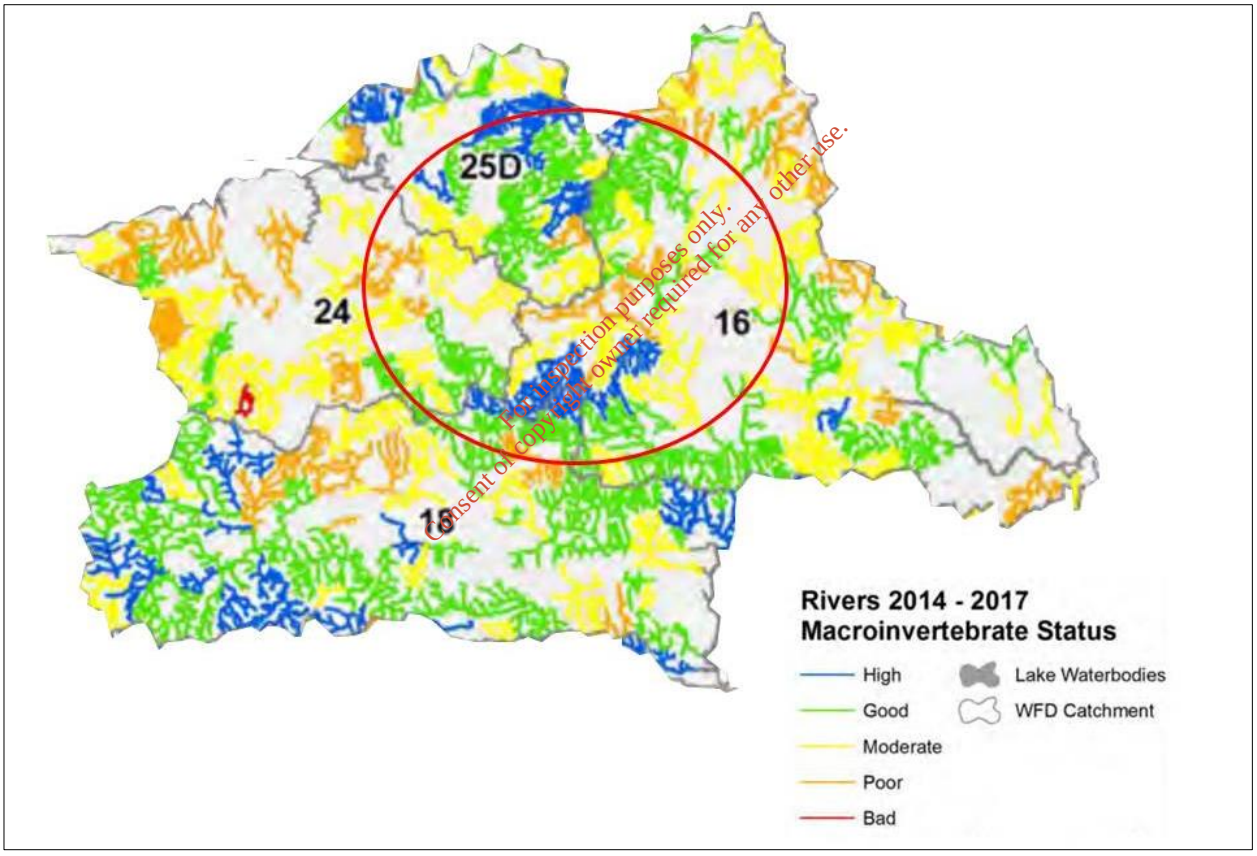
6.3.2.1 Baseline Regional Surface Water Quality

There are 46 catchments and 583 sub-catchments across Ireland and four are relevant to the study area of the proposed development; Suir (HA16), Munster Blackwater (HA18), Shannon South Estuary (HA 24) and Lower Shannon & Mulkear & Mulkear (HA 25D).

EPA Q-Values for the four Catchments

Derived from EPA 'Water Quality in Ireland Report 2017' (2018)[6] the macroinvertebrate assessment by the EPA during the period 2014-2017 showed the monitored river water bodies were mainly the status '*Moderate*' (Q3-4) or '*Good*' (Q4) for the relevant areas within the four catchments (Figure 6.5).

Figure 6.5 Macroinvertebrate Status within the four catchments, Suir (HA16), Munster Blackwater (HA18), Shannon South Estuary (HA 24) and Lower Shannon & Mulkear (HA 25D) for the period 2014-2017 carried out by the EPA



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Nitrate & Phosphate Levels for the Four Catchments

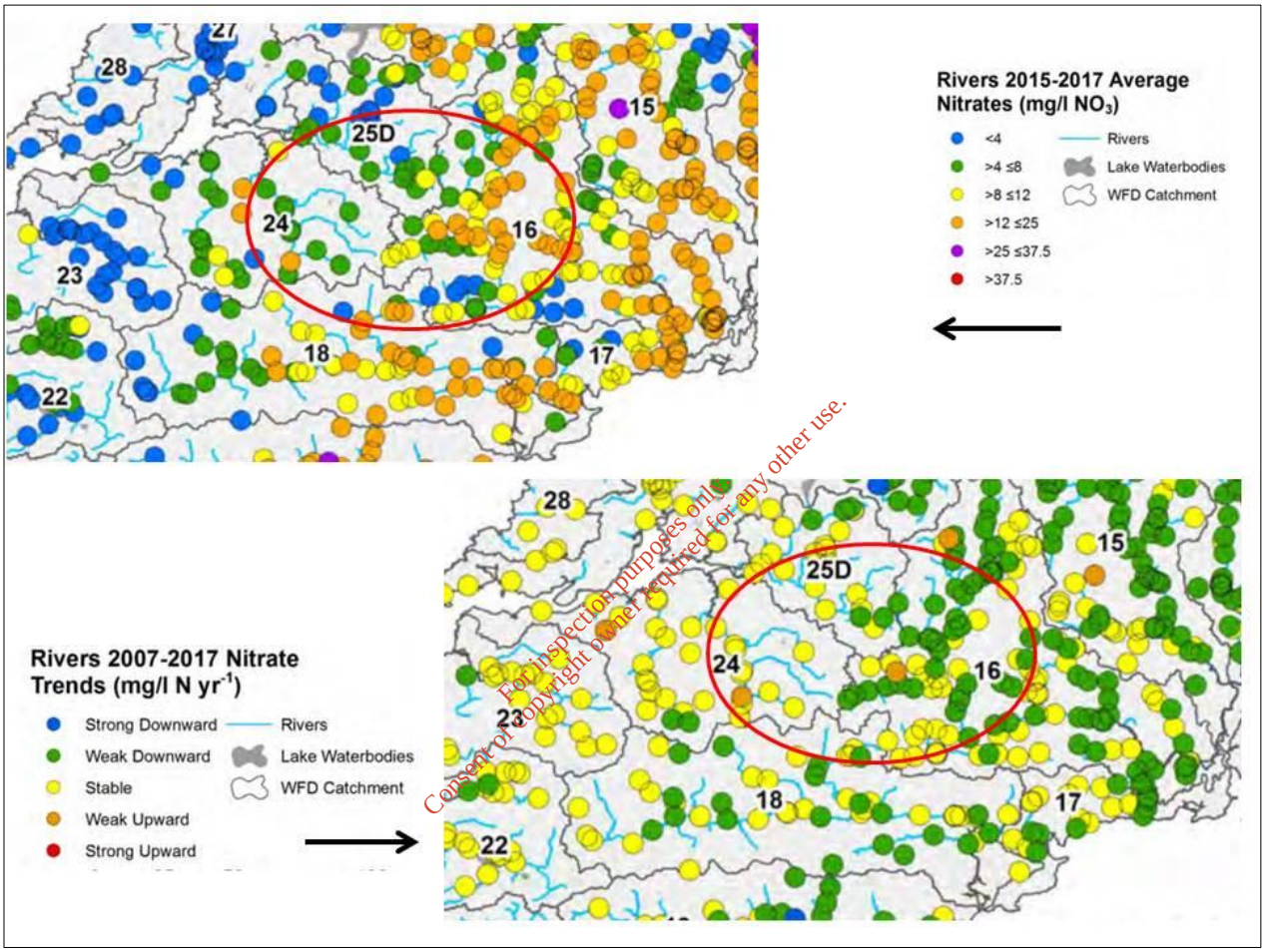
The concentration of nitrate (NO_3) in rivers is an indicator of nutrient enrichment and a potential human health indicator in drinking water. There are no environmental quality standards for nitrate but average nitrate concentration values less than 4 mg/l NO_3 (0.9mg/l N) and less than 8 mg/l NO_3 (1.8mg/l N) are considered by the EPA to be indicative of high and good quality respectively.

Phosphate is essential for plant growth, but too much phosphate can significantly damage the ecological health of rivers. Phosphate enters waters from a variety of sources, but primarily from sewage and industrial discharges and agricultural land where animal manure and inorganic fertilisers

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have been spread. Average phosphate concentrations of less than 0.025 mg/l P and less than 0.035 mg/l P have been established in Ireland as legally binding environmental quality standards (EQS) to support the achievement of high and good ecological status as required by the WFD. Concentrations of phosphate consistently greater than 0.035 mg/l P are likely to lead to nutrient pollution. Derived from EPA 'Water Quality in Ireland Report 2017' (2018) the river nitrate and phosphate levels and trends in the maps for the Suir (HA16), Munster Blackwater (HA18), Shannon Estuary South (HA24) and Lower Shannon & Mulkear (HA25D) catchments are illustrated in Figures 6.6 and 6.7.

Figure 6.6 River NO_3 in the 4 catchments (HA16, HA18, HA24, HA25D), 2014-2017 *(Source: EPA)*



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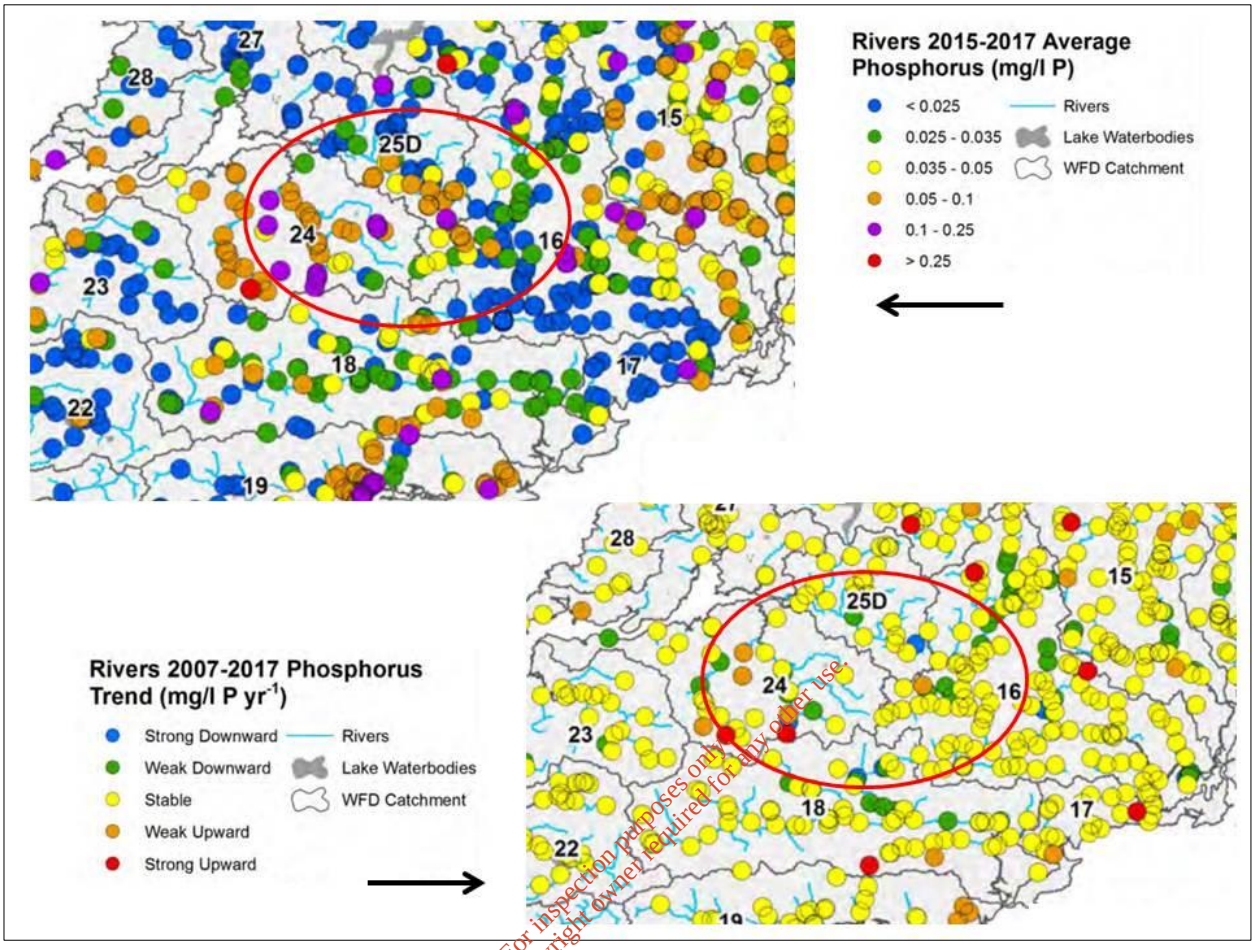
The data for the four catchments presented can be summarised as follows:

Suir Catchment (HA16)

- The Suir catchment comprises 29 sub catchments with 168 river water bodies;
- Overall there were 76 (43%) river and lake water bodies at Good or High status, and 57 (33%) at less than Good status in 2015. Forty-two (24%) river and lake water bodies are unassigned;
- Nine river water bodies and sites within the catchment have a high ecological status objective. In 2015, five (56%) of these water bodies were at High status, and four were at Good;
- Since 2007-09 when WFD monitoring began, 21 water bodies have an improved status whereas 17 have deteriorated;
- There are 76 surface Not at Risk water bodies within the catchment and these require no additional investigative assessment or measures to be applied, other than those measures that are already in place;

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Figure 6.7 River Phosphorous levels in the four catchments, (HA16, HA18, HA24 and HA25D) for the period 2014-2017 *(Source: EPA)*



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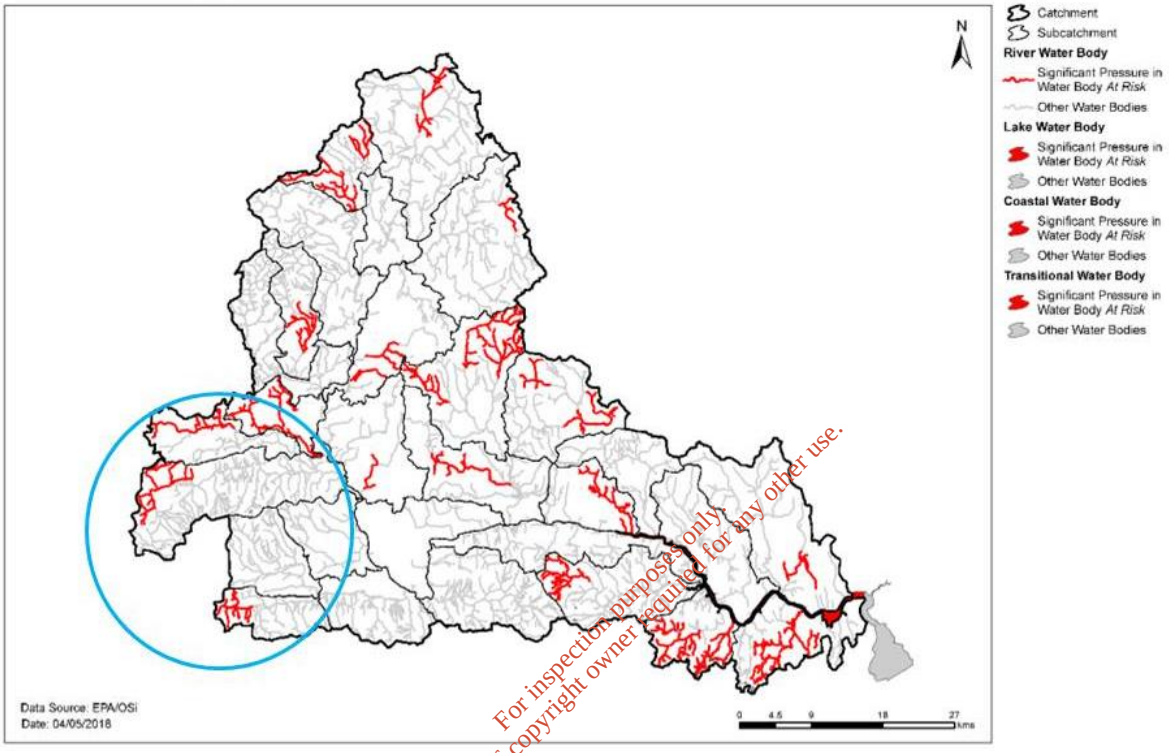
- There are 34 surface water bodies in Review within the catchment. This includes 29 water bodies where more information is required, three water bodies where measures have recently been implemented and improvements have not yet been realised;
- Sixty five surface water bodies in the catchment are At Risk of not meeting their water quality objectives and therefore require measures to improve the water quality outcomes;
- Significant pressures have been identified through the initial characterisation process, in 68 water bodies, 24 of which have multiple pressures;
- The significant pressure affecting the greatest number of river and lake water bodies is agriculture; followed by forestry, hydromorphological pressures, peat drainage, other, diffuse urban, urban waste water, industry, domestic waste water, and mines and quarries;
- The significant pressure affecting the three At Risk transitional water bodies is agriculture;
- Of the 175 river and lake water bodies within the catchment, 65 are At Risk of not meeting their WFD objectives (37%);
- Excess phosphorus leading to eutrophication is a major issue in a significant number of water bodies. While excess ammonia is also of concern, it is only for a small number of water bodies;
- Agriculture is a significant pressure (see Figure 6.8) in 29 river water bodies, two lake water bodies and three transitional water bodies; the water bodies affected by farming are shown in Figure 6.8. The issues related to farming in this catchment are phosphorus loss to surface waters from, for example, direct discharges; or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. Sediment can also be a problem from land drainage works, bank erosion from animal access or stream crossings. Of the 10 sub-

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basin that are relevant to the study area, agriculture is the significant pressure in 4 (see Table 6.8).

- Of the 29 sub catchments in the Suir catchment, 4 are relevant to this study, i.e. Ara_SC_010, Suir_SC_090, Suir_SC_100 and Tar_SC_010; see Figures 6.12 and 6.13, and Tables 6.7 and 6.8.

Figure 6.8 Agriculture as a pressure in the Suir Catchment (HA16); affected area circled in blue *(Source: Catchments.ie)*



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Munster Blackwater (HA18)

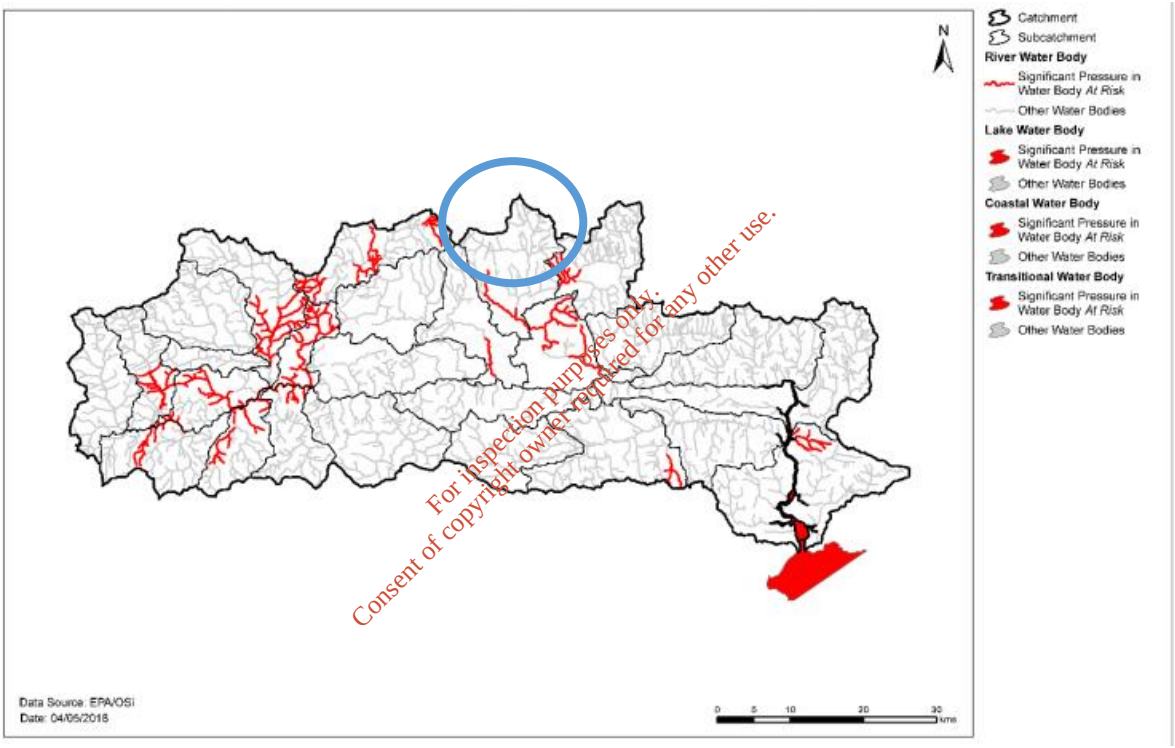
- The Munster Blackwater catchment comprises 28 sub catchments with 158 river water bodies
- There were 96 (61%) river water bodies within the catchment at Good or High status, and 40 (25%) at less than Good status in 2015. Twenty-two (14%) river water bodies are unassigned.
- Thirty-one river water bodies and sites within the catchment have a high ecological status objective. In 2015, 17 (55%) of these water bodies were at High status, 12 (39%) were at Good, and two (6%) were at Moderate
- Since 2007-09 when WFD monitoring began, 14 water bodies have an improved status whereas 45 have deteriorated.
- There are 91 Not at Risk river water bodies within the catchment and these require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- There are 15 river water bodies in Review within the catchment. This includes 11 water bodies where more information is required, and four water bodies where Good ecological status was recorded in 2010-2015, but nutrient concentrations are elevated.
- Significant pressures have been identified through the initial characterisation process in 86 surface water bodies, 55 of which have multiple pressures.
- The significant pressure affecting the greatest number of river water bodies is agriculture (see Figure 6.9), followed by forestry, hydromorphological pressures, urban waste water, other

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pressures (unknown and waste), industry, diffuse urban, mines and quarries, and domestic waste water.

- Of the 158 river water bodies within the catchment, 52 are At Risk of not meeting their WFD objectives (33%).
- Hydromorphological (or physical) conditions (including the input of excessive fine sediment) and poor habitat quality are a major issue for several surface water bodies. This is caused by several pressures, which include forestry, agriculture, anthropogenic unknown and quarries.
- Excess phosphorus leading to eutrophication is also a concern in several water bodies. While excess ammonium is also of concern, it is only for a limited number of water bodies. This is caused by several pressures which include agriculture, urban waste water, industry and domestic waste water.

Figure 6.9 Agriculture as a pressure in the Blackwater (Munster) Catchment (HA18); affected area circled in blue *(Source: Catchments.ie)*



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- Agriculture is a significant pressure in 17 river water bodies, one coastal and one transitional water body. The water bodies affected by farming are shown in Figure 6.9. In river water bodies, the issues related to farming in this catchment are diffuse phosphorus loss to surface waters from, for example, direct discharges; or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. Sediment can also be a problem from land drainage works, bank erosion from animal access or stream crossings. Agriculture is not the significant pressure in the 3 sub-basins that are relevant to the study area.
- Of the 28 sub catchments in the Munster Blackwater catchment, 2 are relevant to this study, i.e. Funshion_SC_010 and Funshion_SC_020 - see Figures 6.12 and 6.13, and Tables 6.7 and 6.8.

Shannon Estuary South Catchment (HA24)

- The Shannon Estuary South Catchment comprises 18 sub catchments with 95 river water bodies;

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- There were 22 (23%) river and lake water bodies at Good or High status, and 37 (38%) at less than Good status in 2015. Thirty-eight (39%) river and lake water bodies are unassigned.
- One lake water body has a high ecological status objective (Bleach). In 2015 this water body was at High status.
- Since 2007-09 when WFD monitoring began, 12 river water bodies and two lake water bodies have an improved status whereas 10 river water bodies have deteriorated.
- There are 15 river water bodies and one lake water body Not at Risk and these require no additional investigative assessment or measures to be applied, other than those measures that are already in place.
- There are 37 river water bodies in Review. This applies to 32 water bodies where more information is required and five water bodies where measures have recently been implemented and improvements have not yet been realised.
- Forty-three river water bodies and one lake water body in the catchment are At Risk of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes.
- Significant pressures have been identified through the initial characterisation process in 43 river water bodies, 25 of which have multiple pressures. The significant pressures will be refined as further characterisation is carried out.
- The significant pressure affecting the greatest number of the river water bodies is agriculture (see Figure 6.10), followed by urban waste water, domestic waste water, hydromorphological pressures, industry, peat, diffuse urban, mines and quarries and forestry.
- Further work is required to determine the significant pressures impacting on the fish and benthos in the Upper and Lower Shannon & Mulkear Estuary.
- Assuming resources are available and actions are taken in the recommended areas for action, of the 11 At Risk water bodies, it is predicted that three (27%) will achieve improvements by 2021, eight (73%) will achieve their objective by 2027.
- For the four Review water bodies, the absence of information on these water bodies means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set for these water bodies.
- Sixteen water bodies have met their 2015 environmental objective. One of the 16 Not at Risk water bodies met their 2015 environmental objectives for ecological status but failed to meet their protected areas objectives.
- As action is not yet planned to be taken in the remaining 38 At Risk surface water bodies, a 2027 date is applied to all these water bodies. For the 36 Review water bodies, the absence of information on these water bodies means that there is no scientific basis to quantify an environmental objective date and therefore a 2027 date is set for these water bodies.
- Excess phosphate leading to eutrophication is the dominant issue in river and lake water bodies, while excess ammonia is also of concern, but not to the same extent.
- Agriculture is a significant pressure in 40 surface water bodies and eight groundwater bodies within the catchment (See Figure 6.10 and Table 6.8). The issues related to agriculture in this catchment is diffuse phosphorus loss to surface waters mainly occurring in areas of poorly draining soils and nutrient losses from impermeable areas, such as farmyards, tracks and storage areas, resulting in excess nutrients (phosphate and ammonia) in surface waters. Of the 12 sub-basins relevant to the study area agriculture is the significant pressure in 2.
- Another issue from agriculture is sedimentation, due to animal access (poached banks), tilled soils and land drainage.
- Specific acute pollution due to issues such as slurry or silage leaks causing fish kills. In 2015 there was a slurry discharge to a tributary of the Camoge which resulted in >4000 fish mortalities. On the Drumcomoge there was also a fish kill between Knocklong and Hospital in

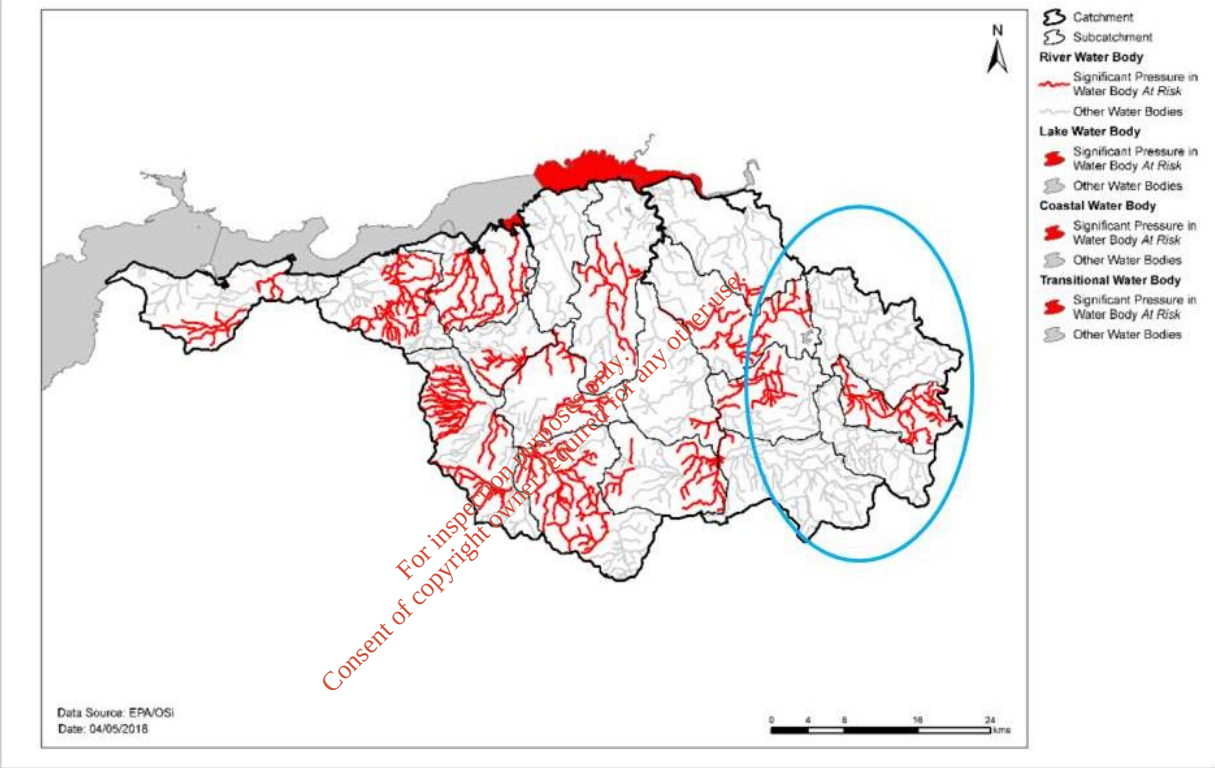
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2015. Investigation identified the cause to be farms with direct discharges and poor slurry containment.

- Hydromorphological (or physical) conditions are also an issue of concern in rivers and lakes in Shannon South Estuary Catchment due to drainage and impacts by excess sediment. Such impacts have altered the morphology of water bodies and in turn, altered habitat conditions.
- Of the 29 sub catchments in the Shannon Estuary South Catchment, 6 are relevant to this study, i.e. Ballynaclogh_SC_010, Drumcomoge_SC_010, Drumcomoge_SC_020, Maigue_SC_030, Maigue_SC_050 and Morningstar_SC_010; see Figures 6.12 and 6.13, and Tables 6.7 and 6.8.

Figure 6.10 Agriculture as a pressure in the Shannon Estuary South Catchment (HA24); affected area circled in blue *(Source: Catchments.ie)*



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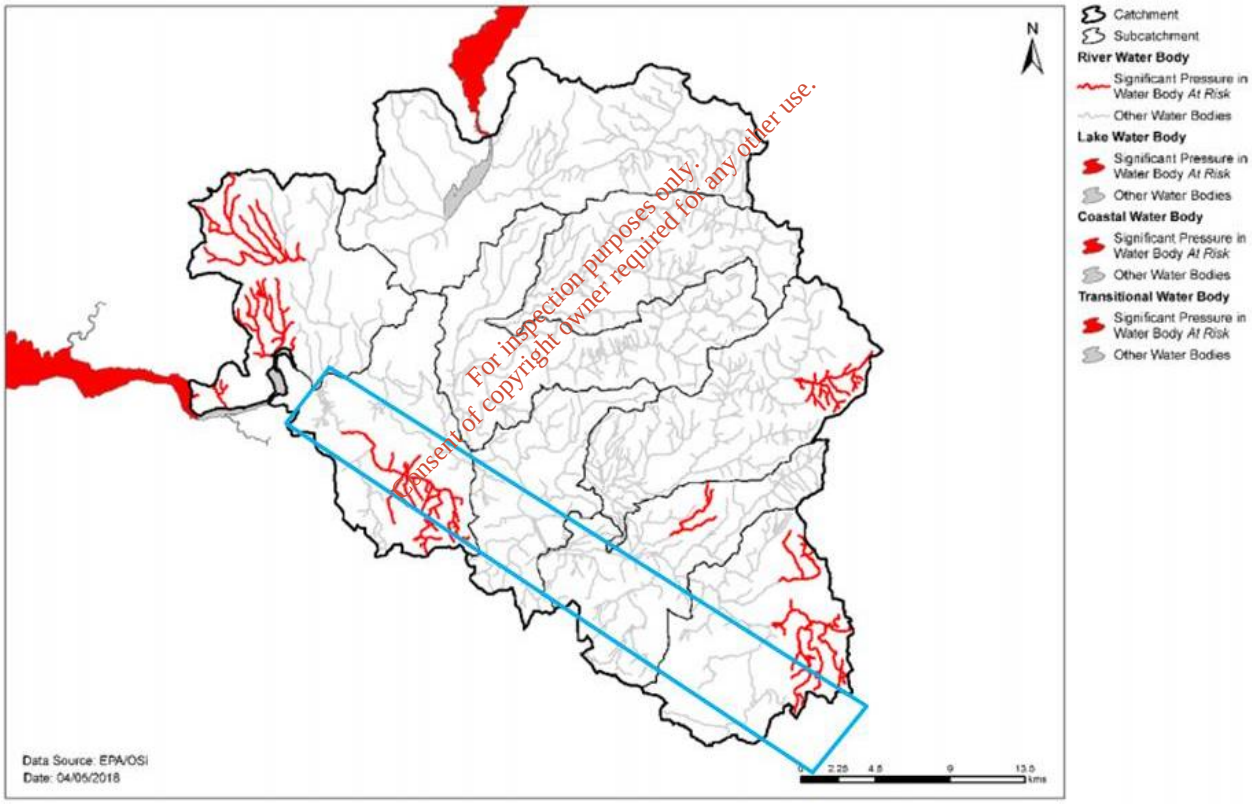
Lower Shannon & Mulkear Catchment (HA25D)

- The Lower Shannon & Mulkear Catchment comprises 9 sub catchments with 48 river water bodies;
- There were 28 (56%) river and lake water bodies at Good or High status, and 13 (26%) at less than Good status in 2015. Nine (18%) river and lake water bodies are unassigned.
- Five river water bodies and sites have a high ecological status objective. In 2015, two of these water bodies were at High status, and three were at Good.
- Since 2007-09 when WFD monitoring began, seven water bodies have an improved status whereas seven have deteriorated.
- There are 23 Not at Risk river water bodies (and these require no additional investigative assessment or measures to be applied, other than those measures that are already in place).
- There are eight surface water bodies in Review. This applies to two water bodies where more information is required and six water bodies where measures have recently been implemented and improvements have not yet been realised.
- Seventeen river water bodies are At Risk of not meeting their water quality objectives. Measures will be needed in these water bodies to improve the water quality outcomes.

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- Excess phosphate leading to eutrophication is the dominant issue in river and lake water bodies. While excess ammonia is also of concern, it is only for a limited number of water bodies.
- Where water bodies have been classed as At Risk, by water quality or survey data, significant pressures have been identified.
- The significant pressure affecting the greatest number of water bodies is agriculture (see Figure 6.11), followed by hydromorphological pressures, other, urban waste water, forestry, extractive industry, industry, diffuse urban and domestic waste water.
- Agriculture is a significant pressure in 12 water bodies across several subcatchments. The water bodies affected by agricultural activities are shown in Figure 6.11. Of the 5 sub-basins relevant to the study area agriculture is the significant pressure in 2.
- Of the 29 sub catchments in the Shannon Estuary South Catchment, 3 are relevant to this study, i.e. Dead_SC_010, Kileengarrif_SC_010 and Shannon [Lower]_SC_090; see Figures 6.12 and 6.13, and Tables 6.7 and 6.8.

Figure 6.11 Agriculture as a pressure in the Lower Shannon & Mulkear Catchment (HA25D); affected area circled in blue *(Source: Catchments.ie)*



6.3.2.2 Baseline study area water quality status

Within the four regional catchments (Suir (HA16), Munster Blackwater (HA18), Shannon Estuary South Catchment (HA24); Lower Shannon & Mulkear Catchment (HA25D), there are 15 relevant WFD sub-catchments and within this there are 30 relevant WFD river sub-basins which intersect with the study area. These are shown in Figure 6.12 and 6.13[9] and Table 6.7 and Table 6.8. These figures illustrate the baseline surface water environment that is relevant to the study area, including the WFD sub catchments, sub basins, and waterbodies that are relevant to the study area. The possible beneficial uses of surface waters in the land-spreading area include; the support of fish life and

[9] Printed @ A3 in Volume 4 of this EIAR.

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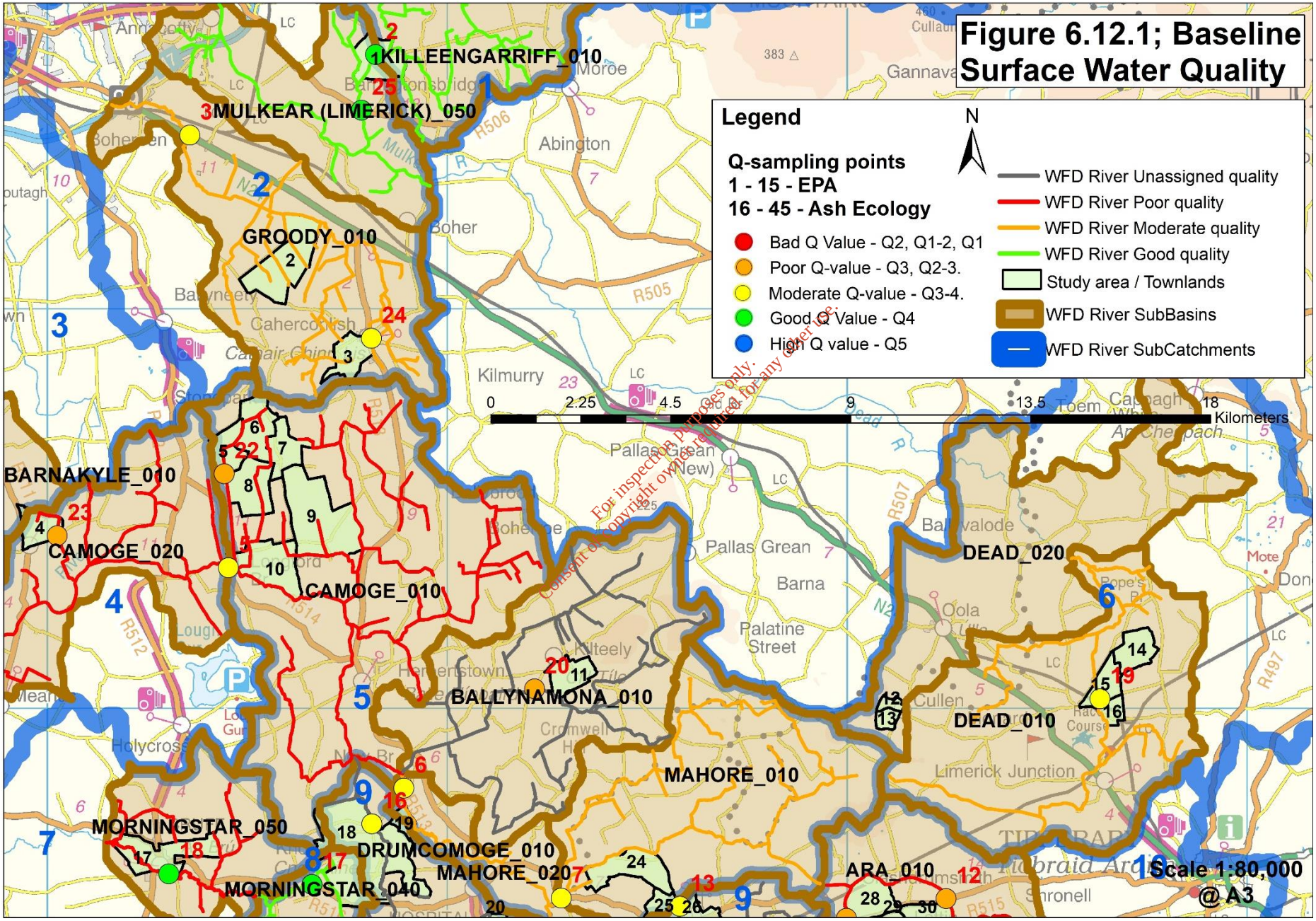
invertebrates, water for livestock, abstraction for use in industry, abstraction for drinking water with treatment; and bathing, tourist activity, boating and angling. There are 30 river sub-basins (which include their tributaries) and these are illustrated in Figures 6.12, 6.13 and Tables 6.7 and 6.8**.**

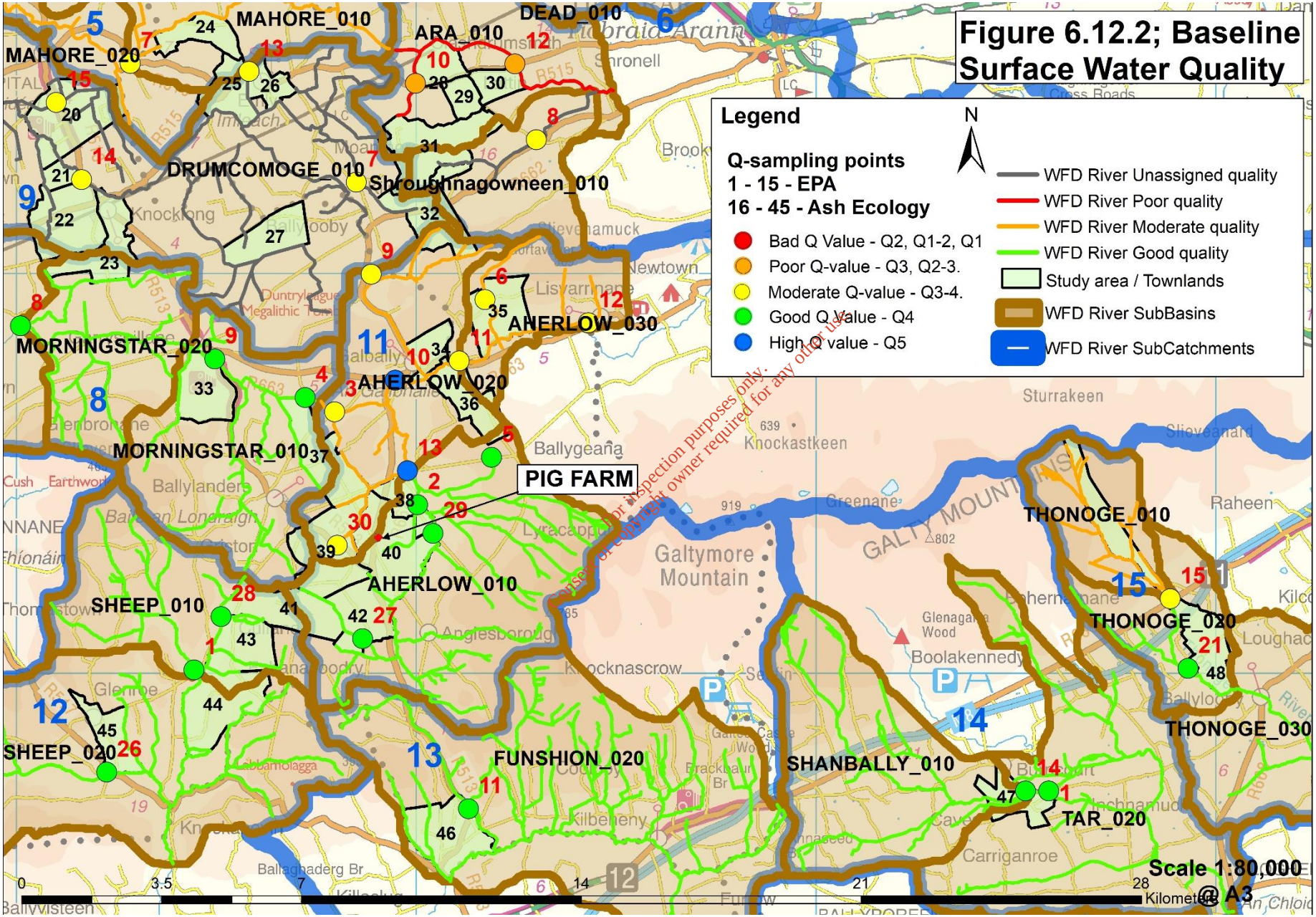
Table 6.7 Regional hydrometric areas, relevant sub catchments and relevant sub basins

Hydrometric Area	Sub Catchment	Map label (Fig 6.12)	River Sub Basin (Waterbodies)
Suir (16)	ARA_SC_010	10	ARA_010
			SHROUGHNAGOWNEEN_010
	SUIR_SC_090	11	AHERLOW_010
			AHERLOW_020
			AHERLOW_030
	SUIR_SC_100	15	THONOGE_010
			THONOGE_020
			THONOGE_030
	TAR_SC_010	14	SHANBALLY_010
			TAR_020
Munster Blackwater (18)	FUNSHION_SC_020	12	FUNSHION_020
	FUNSHION_SC_010	13	SHEEP_010
			SHEEP_010
Shannon Estuary South Catchment (24)	BALLYNACLOGH_SC_010	3	BARNAKYLE_010
	DRUMCOMOGE_SC_010	9	DRUMCOMOGE_010
	DRUMCOMOGE_SC_020	5	BALLYNAMONA_010
			CAMOGE_010
			MAHORE_010
			MAHORE_020
	MAIGUE_SC_030	7	MORNINGSTAR_050
	MAIGUE_SC_050	4	CAMOGE_020
	MORNINGSTAR_SC_010	8	MORNINGSTAR_010
			MORNINGSTAR_020
			MORNINGSTAR_030
			MORNINGSTAR_040
Lower Shannon & Mulkear Catchment (25D)	DEAD_SC_010	6	DEAD_010
			DEAD_020
	KILEENGARRIF_SC_010	1	KILLEENGARRIFF_010
	SHANNON[LOWER]_SC_090	2	GROODY_010
			MULKEAR (LIMERICK)_050

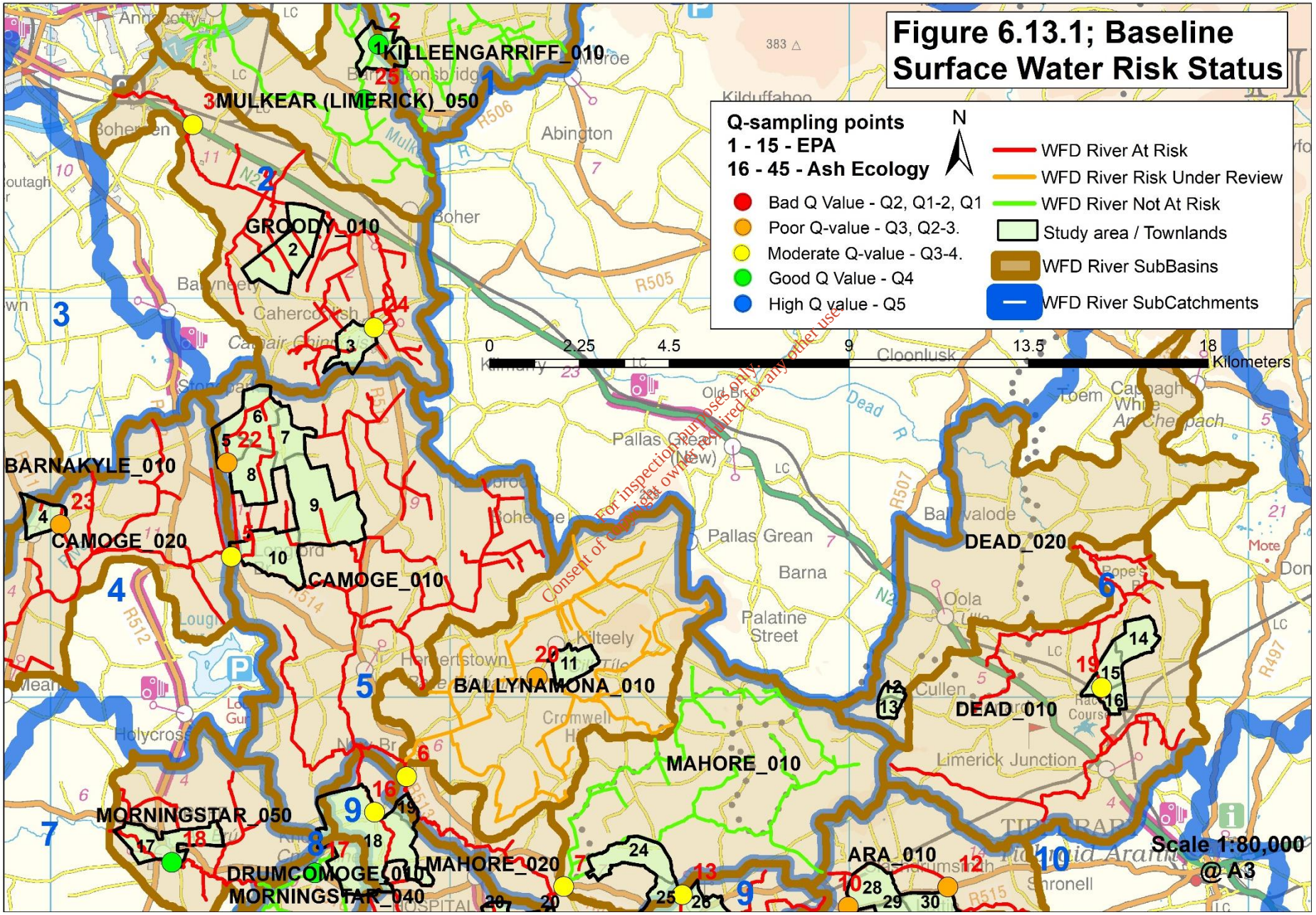
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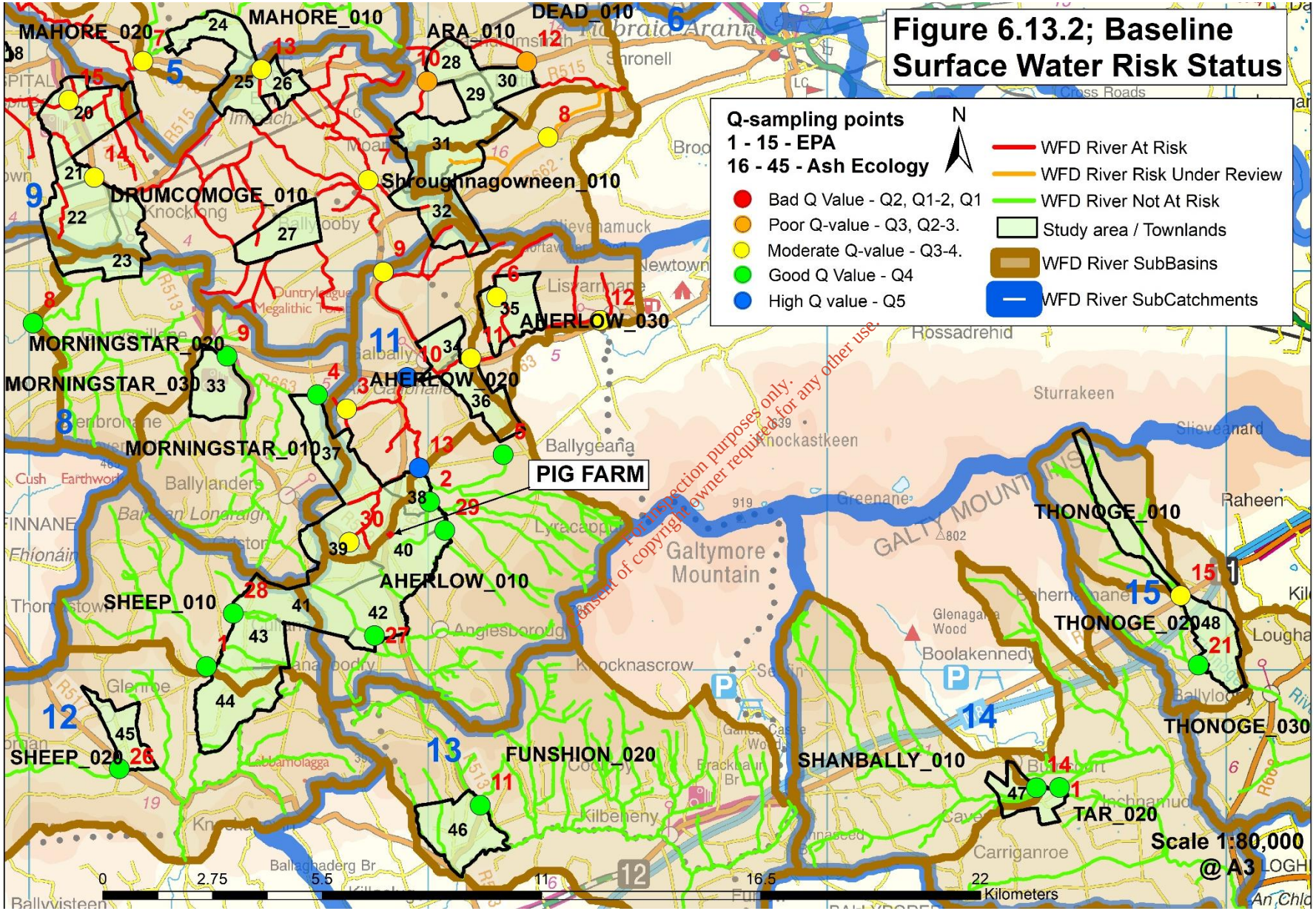

Figure 6.12.1; Baseline Surface Water Quality
Legend
Q-sampling points
1 - 15 - EPA
16 - 45 - Ash Ecology
Bad Q Value - Q2, Q1-2, Q1
Poor Q-value - Q3, Q2-3.
Moderate Q-value - Q3-4.
Good Q Value - Q4
High Q value - Q5
WFD River Unassigned quality
WFD River Poor quality
WFD River Moderate quality
WFD River Good quality
Study area / Townlands
WFD River SubBasins
WFD River SubCatchments
N
0 2.25 4.5 9 13.5 18 Kilometers
KILLEENGARRIFF_010
MULKEAR (LIMERICK)_050
GROODY_010
BARNAKYLE_010
CAMOGE_020
CAMOGE_010
BALLYNAMONA_010
MAHORE_010
DEAD_020
DEAD_010
MORNINGSTAR_050
DRUMCOMOGE_010
MAHORE_020
MORNINGSTAR_040
ARA_010
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Table 6.8: List of relevant WFD catchments, sub catchments and sub basins which intersect with the study area (Source: https://gis.epa.ie/EPAMaps/ and https://www.catchments.ie/maps/

Hydrometric Area (4 No.)	Sub-Catchment (15 No.)	River Sub-basins (30 No.)	Townland Ref No. within/partially within River Sub-basin	Total townlands in River Sub-basin	Percentage of Townlands (of the total 48), note there is overlap	Waterbody Status 2013-2018	Waterbody Risk 2013-2018	Pressures
Suir (16)	Ara_SC_010 (map label 10)	ARA_010	28,29,30,31,32	5	10.4%	Poor	At Risk	Ag
		Shroughnagowneen_010	31,32	2	4.2%	Unassigned	Review	
	Suir_SC_090 (map label 11)	AHERLOW_010	36,38,39,40,41,42	6	12.5%	Good	Not at Risk	-
		AHERLOW_020	32,34,36,37,38,39	6	12.5%	Moderate	At Risk	Ag, UWW
		AHERLOW_030	35,36	2	4.2%	Moderate	At Risk	Ag
	Suir_SC_100 (map label 15)	THONOGE_010	48	1	2.1%	Moderate	Not at Risk	-
		THONOGE_020	48	1	2.1%	Good	Not at Risk	-
		THONOGE_030	48	1	2.1%	Good	Not at Risk	-
	Tar_SC_010 (map label 14)	SHANBALLY_010	47	1	2.1%	Good	Not at Risk	-
		TAR_020	47	1	2.1%	Good	Not at Risk	-
Blackwater (Munster) (18)	Funshion_SC_010	FUNSHION_020	46	1	2.1%	Good	Not at Risk	
	Funshion_SC_020	SHEEP_010	41,43,44	3	6.3%	Good	Not at Risk	-
		SHEEP_020	44,45	2	4.2%	Good	Not at Risk	-
Shannon Estuary South (24)	Ballynaclogh_SC_010 (map label 3)	BARNAKYLE_010	4	1	2.1%	Poor	At Risk	Ag
	DRUMCOMOGE_SC_010 (map label 9)	DRUMCOMOGE_010	18,19,20,21,22,23,25,26,27,31,32	11	22.9%	Unassigned	At Risk	Ag
	DRUMCOMOGE_SC_020 (map label 5)	BALLYNAMONA_010	11	1	2.1%	Unassigned	Review	-
		CAMOGE_010	3,5,6,7,8,9,10,18	8	16.7%	Poor	At Risk	UWW
		MAHORE_010	24,25	2	4.2%	Moderate	Not at Risk	-
		MAHORE_020	19,20,25	3	6.3%	Moderate	At Risk	UWW

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Hydrometric Area (4 No.)	Sub-Catchment (15 No.)	River Sub-basins (30 No.)	Townland Ref No. within/partially within River Sub-basin	Total townlands in River Sub-basin	Percentage of Townlands (of the total 48), note there is overlap	Waterbody Status 2013-2018	Waterbody Risk 2013-2018	Pressures
	Maigue_SC_030 (map label 7)	MORNINGSTAR_050	17	1	2.1%	Poor	At Risk	DU, Hymo
	Maigue_SC_050 (map label 4)	CAMOGE_020	4,5,10	3	6.3%	Poor	At Risk	Ag, Hymo
	Morningstar_SC_010 (map label 8)	MORNINGSTAR_010	33,37,39	3	6.3%	Good	Not at Risk	-
		MORNINGSTAR_020	23	1	2.1%	Good	Not at Risk	-
		MORNINGSTAR_030	22,23	2	4.2%	Good	Not at Risk	-
		MORNINGSTAR_040	18	1	2.1%	Good	Not at Risk	-
Lower Shannon (25D)	Dead_SC_010 (map label 6)	DEAD_010	14,15,16	3	6.3%	Moderate	At Risk	Ind, UWW
		DEAD_020	12,13	2	4.2%	Moderate	Reveiw	-
	Kileengarrif_SC_010 (map label 1)	KILLEENGARRIFF_010	1	1	2.1%	Good	Not at Risk	-
	Shannon[Lower]_SC_090 (map label 2)	GROODY_010	2,3	2	4.2%	Moderate	At Risk	Ag, DU
		MULKEAR (LIMERICK)_050	1	1	2.1%	Good	Not at Risk	-

*__Ag__ = Agriculture, __DU__ = Diffuse Urban, __UWW__ = Urban Waste Water, __Hymo__ = Hydromorphology, __Ind__ = Industry cc

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The 15 sub-catchments are as per EPA mapping. Each river basin represents a segment of the river/stream. These 30 river sub-basins are reviewed in this assessment as the most relevant available data for the study area. The river sub-basin data is reviewed for WFD waterbody status (2013-2018) and WFD waterbody risk and the results are presented in Table 6.8. The waterbody quality and risk status along with monitoring station data is presented in Figures 6.12 and 6.13. Also in Table 6.8 of the 11 River Sub-Basin classed 'At Risk' a total of 7 River Sub-basins has 'Agriculture' listed as a pressure while the 4 others are pressures other than Agriculture.

These 7 River Sub-basins where Agriculture is listed as the main pressure (or partial pressure) of the 30 River sub-basins represent approx. 23% of the study area.

6.3.2.3 Surface Water Quality in the vicinity of the Pig Farm

'Ballyfaskin Pig Farm' is located within sub-catchment 'Suir_SC_090,' and River Sub-Basin 'Aherlow_010'' within the Townland of Ballyfauskeen and within the Hydrometric Area 16 – Suir. The drainage network from the site is to the Lyre Stream (16L43), a tributary of the Aherlow River approx. 300m east/southeast of the site. Table 6.9 lists these parameters.

A visual assessment of the open drains on the perimeter the existing site showed a section of them to be temporarily dry and generally not to contain flowing water or to contain pools of standing water.

Table 6.9: Aherlow River Parameters with River Waterbody WFD Status 2013-2018

Catchment	Suir
HA Code	16
Sub Catchment	'Suir_SC_090
River Sub-Basin	'Aherlow_010''
Rivers Waterbodies Risk	Not at Risk
River Waterbody WFD Status 2013-2018	Good
Closest EPA Monitoring Station relevant to the site (d/s of confluence with Lyre stream)	1.8km northeast as the crow flies. Station 'Br SW of Keeloges and last sampled in 2017 and recorded a Q4-5 High Status. EPA station '
Most Recent sampling by AEE in 2020 (also a EPA station) (u/s of confluence with Lyre stream)	1.3km east as the crow flies. Station 'AHERLOW - Br E of Ballyfauskeen Crossroads' last sampled by EPA in 1993 (Q4-Good) and resampled by AEE in 2020 (Q4- Good)
European_Code	IE_SE_16A010080
EPA Code	16A01 (order 3)
WFD Groundwater Status (Knockaskallen)	Good
WFD Groundwater Risk (Knockaskallen)	Not at Risk

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6.3.2.4 Summary of the Study Area Baseline Surface Water Assessment

For the 2013-2018 Water Framework Directive (WFD) assigned water quality (and looking at Table 6.9) this amounts to the following percentage of townlands (with overlap included) being located within or partially within river sub-basins as:

- 14 of the 48 townlands contain River Sub-Basins classed as 'Good' – 29%
- 8 of the 48 townlands contain River Sub-Basins classed as 'Moderate' – 17%
- 5 of the 48 townlands contain River Sub-Basins classed as 'Poor' – 10%
- 14 of the 48 townlands contain River Sub-Basins that are 'Unassigned' – 29%

For the 2013-2018 WFD risk status this amounts to the following percentage of townlands (with overlap included) being located within or partially within river sub-basins as:

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- 45 of the 48 Townlands contain River Sub-Basins classed as 'At Risk' – 94%
- 28 of the 48 Townlands contain River Sub-Basins classed as 'Not at Risk' – 58%
- 5 of the 48 Townlands contain River Sub-Basins classed as 'Review' – 10%

Compared to the wider regional data (4 hydrometric areas combined, the study area has no high quality river sub-basins, however there is a slightly higher percentage of 'Good' and 'Moderate' status and slightly less 'Poor'. There were no 'Bad' quality water bodies as illustrated in Table 6.10.

Table 6.10. Summary of surface water body status & risk categories

Catchment	Number of rivers	2010 – 2015 Status						Risk Category		
		High	Good	Mod	Poor	Bad	Unassigned	Not at risk	Review	At Risk
		Number								
16	168	5	71	31	22	0	39	73	33	62
18	158	22	74	29	11	0	22	91	15	52
24	95	0	21	14	22	0	38	15	37	43
25D	48	3	24	10	2	0	9	23	8	17
Total for four catchments	**469**	**30 (6%)**	**190 (41%)**	**84 (18%)**	**57 (12%)**	**0**	**108 (23%)**	**202 (43%)**	**93 (20%)**	**174 (37%)**
Within the Study Area (2013-2018 Data)	**30 River Sub-basins**	**0**	**14 (47%)**	**8 (27%)**	**5 (17%)**	**0**	**3 (10%)**	**16 (53%)**	**3 (10%)**	**11 (37%)**

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6.4 CHARAERISTICS OF THE PROPOSED DEVELOPMENT

The characteristics of the proposed development that may potentially impact on water are;

- Construction activities of the electrical substation and refurbishment of existing houses could lead to silt and sediment run-off from the construction site;
- The increased abstraction of groundwater at the proposed pig farm could potentially impact on groundwater resources if the re charge capacity of the aquifer does not exceed the rate of abstraction;
- The proposed development will not increase slurry production significantly as described in Section 1.2.4 and Tables 1.3. and 1.7 of Chapter 1 of the EIAR. Pig manure is produced each year with nutrients which are land spread in the study area with potential for run-off to watercourses and streams;
- Pig manure is stored on site – this has the potential to cause groundwater and surface water pollution; and
- The emissions to air (e.g. ammonia) from the pig farm can potentially affect the baseline water quality through enrichment of the nutrient status of surface waters.

6.5 RESULTS OF ASSESSMENT

The impact assessment uses the criteria set out in Table 6.2 and assesses EPA water quality and mapping data.

6.5.1 'Do nothing' impact

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There is no change to the baseline environment in a do-nothing scenario. The study area river quality in the vicinity of the existing pig farm is stable and groundwater quality is good.

6.5.2 'Do something' impact

6.5.2.1 Potential pre-mitigation impacts on Groundwater

At the site

The water quality in the site wells is good – see Appendix 5 of Volume 3 of this EIAR. The site overlies a locally important aquifer and is located on medium vulnerability land. The groundwater status is good and 'not at risk'. Therefore this represents a low risk to groundwater before mitigation (see Figure 6.3.2). Excavation work for the site of the substation will be over a small area, will be above the depth of adjoining field drainage and therefore will not significantly impact on groundwater flow. The current abstraction rate of the existing well is approx. 42m^3 per day[10]. Data from local wells suggest yields of 62m^3 / day and throughout the study area the average abstraction rate for public water sources is 279m^3 (Table 6.6). The site owner states that when the existing site well was originally drilled the yield test was 13.6m^3 per hour (327m^3 per day). Therefore, overall, there is no significant pre mitigation impact on groundwater at the site of the pig farm development.

In the study area

The overall groundwater environment of the study area, consisting of 21 waterbodies, is high sensitivity and its quality status is good. Six groundwater bodies are under review status due to pressure from rising nitrates. The volume of pig manure from the proposed pig farm will not increase significantly (see Tables 1.5 and 1.7 of Chapter 1) compared to existing production and therefore the impact from land-spreading will not change significantly. The estimated application rate is approximately 10m^3/ha (Section 5.4.3 of Chapter 5) replacing 21kgs chemical N and 8kgs of chemical P per hectare. This pig manure replaces chemical fertiliser and will replace 23% of the P requirement for the receiving environment (Table 5.4 of Chapter 5). The EPA rating for groundwater quality is good and the study area groundwater ammonia and phosphate levels are satisfactory (Section 6.3.1.3). From a hydraulic loading point of view the typical infiltration rates of soils in the study area will exceed 30 – 90mm rainwater per hour (see Section 5.3.3 and Table 5.2 of Chapter 5 of this EIAR) whereas the proposed hydraulic loading will be approximately 1 - 2mm per application of pig manure. 67% of the study area is medium - high (Table 6.4) vulnerability with 21% of the area rated as extreme vulnerability/rock. Less than 2% of the extreme vulnerable/rock land and 8% of the high vulnerable spreadable land overlies regionally important aquifers.

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Any risk to groundwater would arise mainly from the miss use of pig manure, poor practise at land-spreading and non-adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). The existing pig farm has been in operation for over 40 years and there is no evidence that it has adversely affected the groundwater quality. The proposed development will not change this effect and the pre-mitigation impact on groundwater in the study area is not significant.

6.5.2.2 Potential pre-mitigation impacts on Surface Water within the Site of the Pig Farm.

As mentioned 'Ballyfaskin Pig Farm' is located the Townland of Ballyfauskeen. The drainage network from the site is to the Lyre Stream (16L43), a tributary of the Aherlow River. The storm water drain joins this stream approx. 780m east of the site. The source of surface water from the site of the

[10] 2019 AER states 14,023m^3 water used per annum

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proposed development is natural drainage and run-off from green areas and from storm water generated on hard-standing and roof surfaces. The storm water is be piped to unnamed drainage network (as illustrated in Figure 1.2 of Chapter 1) which connects to the Lyre Stream (16L43 EPA Maps).

The EPA has several stations along the Aherlow River, the most recently monitored in 2017, see Figure 6.12. The station is located approx. 1.8km northeast of the site as the crow flies. The station monitored in 2017 by the EPA downstream of the site i.e. downstream of the confluence of the Lyre Stream with the Aherlow River) is:

- 'Br SW of Keeloges ' Q4-5 High 2017

Previous years' data are shown in Table 6.11 below. The EPA assessment of the Aherlow River in 2017 was:

*"Results of the biological water quality analysis of the Aherlow were mixed in 2017, with a return to High ecological condition recorded at the uppermost site assessed (Station 0080) and an improvement from Moderate to High ecological condition at Station 0500. However, Station 0700 was found to have declined to unsatisfactory condition for the first time. Station 0200, downstream of Galbally, which historically has had the most unsatisfactory results for this river, remains at moderate ecological condition, as does Station 0300, the next site downstream. High ecological condition was recorded at the two lowest sites on the river (**0800** and 0900)."*

Table 6.11 EPA Monitoring of Aherlow River Downstream of confluence with Lyre Stream

Station	2002	2006	2008	2011	2014	2017	Status
RS16A010080 Br SW of Keeloges	Q3-4	Q4	Q4	Q4-5	Q4	Q4-5	High – Improvement on 2014

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A visual assessment of the open drains on the perimeter the existing site showed a section of them to be temporarily dry and generally not to contain flowing water, or else had deep pools of non-moving water. This monitoring point is downstream of the pig farm and so future monitoring will indicate if the development affects these watercourses.

As per the WFD 2013-2018 Waterbodies Status, a total of 29% was found to be unassigned when taking the 48 townlands (study area) into account which incorporate the 30 River Sub-Basins (when overlap) is taken into account. Because of this a series of Q-Value sampling was undertaken at 30 locations, Of the 30 locations chosen, 6 of these overlap as EPA monitoring stations, however EPA data available for these stations were considered dated and not relevant e.g. sampled in 1990's. In Table 6.13 the EPA station is named but AEE has done the recent sample.

Because the design of the proposed development includes leak-proof slurry storage tanks with leak detection facilities and bunded liquid feed tanks there is no significant impact at the proposed site.

6.5.2.3 Potential pre-mitigation impacts on Surface Water within the Study Area.

Risk Status and Catchment Pressures

As stated in Section 6.3.2.4, the 2013-2018 Water Framework Directive (WFD) assigned water quality this amounts to the following percentage of townlands (with overlap included) being located within or partially within river sub-basins as:

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- 14 of the 48 Townlands contain River Sub-Basins classed as 'Good' – 29%
- 8 of the 48 Townlands contain River Sub-Basins classed as 'Moderate' – 17%
- 5 of the 48 Townlands contain River Sub-Basins classed as 'Poor' – 10%
- 14 of the 48 Townlands contain River Sub-Basins that are 'Unassigned' – 29%

For the 2013-2018 WFD risk status this amounts to the following percentage of townlands (with overlap included) being located within or partially within river sub-basins as:

- 45 of the 48 Townlands contain River Sub-Basins classed as 'At Risk' – 94%
- 28 of the 48 Townlands contain River Sub-Basins classed as 'Not at Risk' – 58%
- 5 of the 48 Townlands contain River Sub-Basins classed as 'Review' – 10%

Pressures include:

- Suir (HA16)

  Agriculture; followed by forestry, hydromorphological pressures, peat drainage, other, diffuse urban, urban waste water, industry, domestic waste water, and mines and quarries. Of the 10 sub-basin that are relevant to the study area, agriculture is the significant pressure in 4 (see Table 6.8)

- Blackwater (Munster) (HA18)

  Agriculture, followed by forestry, hydromorphological pressures, urban waste water, other pressures (unknown and waste), industry, diffuse urban, mines and quarries, and domestic waste water. Agriculture is not the significant pressure of the three sub-basins that are relevant to the study area.

- Shannon Estuary South (HA24)

  Agriculture, followed by urban waste water, domestic waste water, hydromorphological pressures, industry, peat, diffuse urban, mines and quarries and forestry. Of the 12 sub-basins relevant to the study area agriculture is the significant pressure in two.

- Lower Shannon & Mulkear (HA25D)

  Agriculture, followed by hydromorphological pressures, other, urban waste water, forestry, extractive industry, industry, diffuse urban and domestic waste water. Of the 5 sub-basins relevant to the study area agriculture is the significant pressure in two.

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The EPA data shows that agriculture is the dominant pressure on water quality in the wider catchment areas, and within the sub-basins relevant to the study area, agriculture is the dominant pressure for 23% of the study area (7 of the 30 River Sub-Basins, See Table 6.8) reflecting the mainly rural and agricultural nature of activities within the study area. It is notable that other pressures such as Urban Waste Water and Industry also listed as the main pressures for these areas either 'At Risk' or under 'Review'.

Trends

The closest EPA monitoring station downstream of the existing pig farm along the Aherlow River was sampled in 2017 and recorded a 'Q4-5 – High Status'. Trends in average regional nitrate concentration (ml/g N yr^{-1}) during 2007 and 2017 inclusive showed a '*Stable*' or '*Weak Downward*' trend (see Figure 6.6). Trends in phosphate regional concentrations (ml/g P yr-1) for the period 2007–2017 was mainly 'Stable' overall (see Figure 6.7). The spread-lands within the 48 townlands are largely unassigned and

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designated. Because of this AEE conducted a series of Q-Sampling points (No. 30) to give an overall picture of the water status which is combined with recent EPA monitoring (No. 15) in Table 6.13.

The proposed pig farm is part of the baseline environment. Having, considered that;

- The water quality downstream of the pig farm site is high (Q4-5, EPA 2017);
- The upstream EPA point of 1993 was sampled and has retained its 'Q4' Good Status
- The dominant pressure on water quality is agriculture, however urban waste water and industry is also identified as the main pressure which affects the Suir catchment include forestry, hydromorphological pressures, peat drainage, other, diffuse urban, urban waste water, industry, domestic waste water, and mines and quarries.
- The waterbody status of the of study area of the pig farm is after sampling of unassigned waterbodies showed:
    - 'High & Good' status increased by 6.3%;
    - 'Moderate' status increased by 27%; and,
    - 'Poor' status decreased by 2.1% (updating older EPA data).

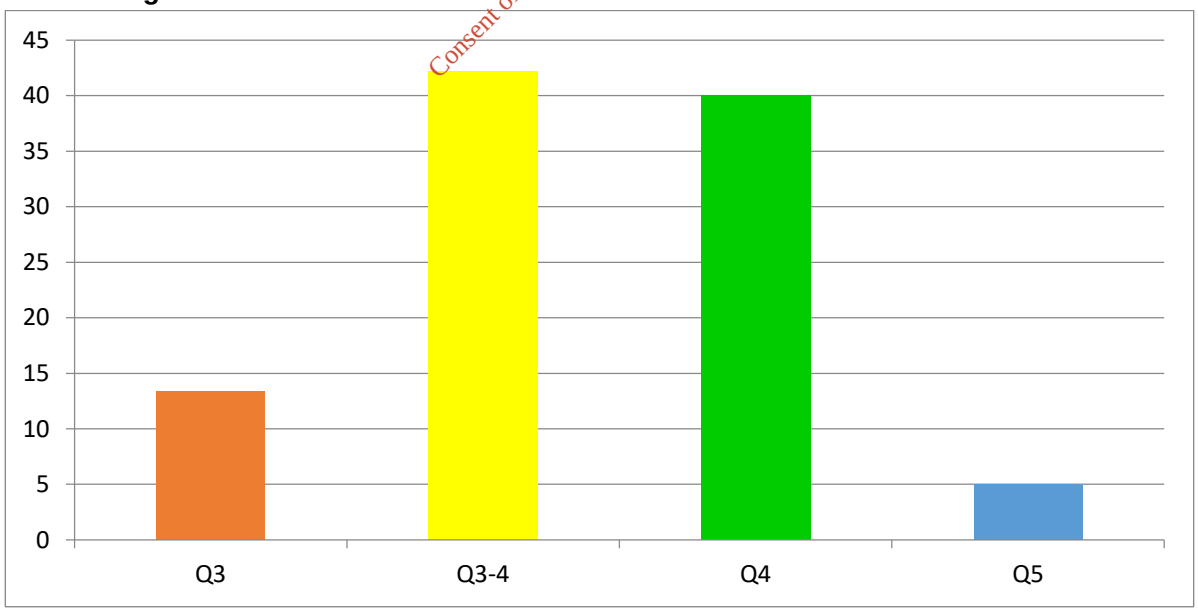
- The dominant trend in water quality within the study area is 'At Risk' (or unassigned)

The pre mitigation impact from the existing pig farm is slight adverse due to the potential of pig manure to impact on water quality if not applied according to the relevant regulations. The proposed development will not change the existing potential pre mitigation impact.

The most recent EPA stations in the vicinity of the pig farm and wider study area are shown in Tables 6.12 sampled between 2017 and 2018 and the sampling point locations by AEE carried out in August 2020 are shown in Figures 6.13 – 6.13 and the results in Tables 6.12 and 6.13.

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Figure 6.14 Percentage of the 45 points (EPA, 2017-2018 and AEE Sampling 2020) and Q Value assigned



Of the 30 AAE river samples (Q-Values) and the 15 EPA (45 in total) points monitored between 2017-2018, the following water quality status was found when combined within study area of 48 townlands;

5% - High Quality

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40% - Good Quality
42% - Moderate Quality
13% - Poor Quality

For 'High' and 'Good Status' water quality combined this is typical of the 4 hydrometric areas combined (45%) for 'Good Status'. It is significantly higher for 'Moderate Status' water quality (28%) and also higher for 'Poor Status' water quality (7%) (see Table 6.8). Many of the sample points noted cattle poaching so it is worth noting that fencing of 1.5m from watercourses will be mandatory on most dairy farms from January 2021 so improvements to water quality in water courses are anticipated.

The results of the 20 Q-samples assessed by Ash Ecology are presented in in Table 6.12 below – numbered 16 -45. Samples 1 – 15 are recent EPA Monitoring Data. The sampling/monitoring points are labelled 1 – 45 in Figure 6.12.1, 6.12.2, 6.13.1 and 6.13.2.

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Table 6.12: Samples and Q-Value Results taken by Ash Ecology, August 2020 (Samples 1 – 15 are recent EPA Monitoring Data)

Taxa/Group & Sample Location	Ephemeroptera (Heptageniidae)	Ephemeroptera (Siphlonuriidae)	Plecoptera (Peridae)	Ephemeroptera (Leptophlebidae)	Plecoptera (Leutra spp)	Trichoptera (Cased)	Coleoptera (Dystiscus sp.)	Crustacea (Gammarus spp.)	Diptera (Culicidae)	Diptera (Simuliidae)	Diptera (Tipulidae)	Ephemeroptera (Baetis rhodani)	Hydracarina	Platyhelminthes	Trichoptera (Uncased)	Gastropoda (ex Lymnea peregra	Gastropoda (Lymnea peregra	Hirudinea	Diptera (Chironomus	Oligochaeta (Tubificidae)	Q Value Result	Q Quality
Group	A	A	A	B	B	B	C	C	C	C	C	C	C	C	C	C	D	D	E	E		
Sample No.																						
16		1	1		2			1				1	1		1			1			Q4	Good
17	3	3		1		4		4	1	1				1	4			1	1		Q4	Good
18		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
19	6				1			1					1						1		Q4	Good
20	6	2			2	6		5	1	2		1									Q4	Good
21		1	1		2			1				1		1	1			1			Q3-4	Moderate
22		2				5	1	3	3	3		6	1		3		6	1			Q3-4	Moderate
23		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
24		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
25							1	5	6	6									2		Q3	Poor
26		1	1		2			1				1			1			1			Q4	Good
27							1	5	6	6				1					2		Q3	Poor
28		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
29		2				5	1	3	3	3		6	1		3		6	1			Q3-4	Moderate
30		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
31		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
32	1					7		4							1				1		Q4	Good
33	6				1			1											1		Q4	Good
34		2				5	1	3	3	3		6			3		6	1			Q3-4	Moderate
35							1	5	6	6							1		2		Q3	Poor

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Taxa/Group & Sample Location	Ephemeroptera (Heptageniidae)	Ephemeroptera (Siphlonuridae)	Plecoptera (Peridae)	Ephemeroptera (Leptophlebidae)	Plecoptera (Leutra spp)	Trichoptera (Cased)	Coleoptera (Dystiscus sp.)	Crustacea (Gammarus spp.)	Diptera (Culicidae)	Diptera (Simuliidae)	Diptera (Tipulidae)	Ephemeroptera (Baetis rhodani)	Hydracarina	Platyhelminthes	Trichoptera (Uncased)	Gastropoda (ex Lymnea peregra	Gastropoda (Lymnea peregra	Hirudinea	Diptera (Chironomus	Oligochaeta (Tubificidae)	Q Value Result	Q Quality
36	3	3		1		4		4	1	1					4			1	1		Q4	Good
37							1	5	6	6						2			2		Q3	Poor
38							1	5	6	6			1						2	1	Q3	Poor
39		2				4	1	3	3	4		6			3		6	1	1		Q3-4	Moderate
40	6	2			2	6		5	1	2		1									Q4	Good
41		1	1		2			1				1			1			1			Q4	Good
42	6				1			1	1										1		Q4	Good
43	6	2			2	6		5	1	2		1									Q4	Good
44	1					7		4							1				1		Q4	Good
45		2				4	1	3	3	3		6			3		6	1			Q3-4	Moderate

Present 1-2 Individuals	1		Q4-5	High	Unpolluted
Scare/Few <1%	2		Q4	Good	Unpolluted
Small Numbers <5%	3		Q3-4	Moderate	Slightly Polluted
Fair Numbers 5-10%	4		Q2-3, Q3	Poor	Moderately Polluted
Common 10-20%	5				
Numerous 25-50%	6				
Dominant 50-75%	7				

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Table 6.13: EPA Recent Q-Values and Q- Value Sampling by AEE Tabulated Results (Samples 1 – 15 are EPA data; Samples 16 – 45 are Ash Ecology 2020 samples)

No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
1	Killeenagarriff	Lower Shannon (25D)	Kileengarrif_SC_010	KILLEENGARRIFF_010	Good	Not at Risk	Br d/s Annagh Br	RS25K020150	2018 - EPA	Q4	Good	EPA2	52.657625, -8.470016
1	Killeenagarriff	Lower Shannon (25D)	Shannon[Lower]_SC_090	MULKEAR (LIMERICK)_050	Good	Not at Risk	KILLEENGARRIFF - Barrington's Br (K4)	RS25K020200	2020 - AW	Q4	Good	40	52.645087, -8.475059
2	Highpark	Lower Shannon (25D)	Shannon[Lower]_SC_090	GROODY_010	Moderate	At Risk	Killonan Br	RS25G050150	2018 - EPA	Q3-4	Moderate	3(EPA)	52.639200, -8.538454
3	Caherconlish	Lower Shannon (25D)	Shannon[Lower]_SC_090	GROODY_010	Moderate	At Risk			2020 - AW	Q3-4	Moderate	37	52.593793, -8.470824
3	Caherconlish	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	39	52.563151, -8.524823
4	Fedamore	Shannon Estuary South (24)	Ballynaclogh_SC_010	BARNAKYLE_010	Poor	At Risk	Br SW of Kilpeacon Crossroads	RS24B050300	2017 - EPA	Q3	Poor	(EPA)4	52.579337, -8.646037
4	Fedamore	Shannon Estuary South (24)	Maigue_SC_050	CAMOGE_020	Poor	At Risk			2020 - AW	Q3	Poor	38	52.548908, -8.586189
5	Ballybricken North	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	37	52.563151, -8.524823
5	Ballybricken North	Shannon Estuary South (24)	Maigue_SC_050	CAMOGE_020	Poor	At Risk			2020 - AW	Q3	Poor	38	52.548908, -8.586189
6	Ballybricken West	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	37	52.563151, -8.524823
7	Ballybricken East	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	37	52.563151, -8.524823

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No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
8	Ballybricken South	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	37	52.563151, -8.524823
9	Caherelly East	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk			2020 - AW	Q3	Poor	37	52.563151, -8.524823
10	Caherelly West	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk	Longford Br	RS24C010200	2018 - EPA	Q3-4	Moderate	(EPA)5	52.541994, -8.523055
10	Caherelly West	Shannon Estuary South (24)	Maigue_SC_050	CAMOGE_020	Poor	At Risk	Longford Br	RS24C010200	2018 - EPA	Q3-4	Moderate	(EPA)5	52.541994, -8.523055
11	Kilteely	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	BALLYNAMONA_010	Unassigned	Reveiw			2020 - AW	Q3	Poor	35	52.515251, -8.409910
12	Monearmore	Lower Shannon (25D)	Dead_SC_010	DEAD_020	Moderate	Reveiw			2020 - AW	Q3-4	Moderate	39	52.549430, -8.236526
13	Cullen	Lower Shannon (25D)	Dead_SC_010	DEAD_020	Moderate	Reveiw			2020 - AW	Q3-4	Moderate	39	52.549430, -8.236526
14	Gortdrum	Lower Shannon (25D)	Dead_SC_010	DEAD_010	Moderate	At Risk			2020 - AW	Q3-4	Moderate	34	52.513522, -8.201595
15	Ballyryan East	Lower Shannon (25D)	Dead_SC_010	DEAD_010	Moderate	At Risk			2020 - AW	Q3-4	Moderate	34	52.513522, -8.201595
16	Milltown (Ed Ballykisteen)	Lower Shannon (25D)	Dead_SC_010	DEAD_010	Moderate	At Risk			2020 - AW	Q3-4	Moderate	34	52.513522, -8.201595
17	Bruff	Shannon Estuary South (24)	Maigue_SC_030	MORNINGSTAR_050	Poor	At Risk			2020 - AW	Q4	Good	33	52.473091, -8.544134
18	Knockainy West	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk	DRUMCOMOGE - Gortacloona Bridge	RS24D040400	2020 - AW	Q3-4	Moderate	(EPA)5	52.484683, -8.469502
18	Knockainy West	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	CAMOGE_010	Poor	At Risk	Longford Br	RS24C010200	2018 - EPA	Q3-4	Moderate	31	52.541994, -8.523055

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No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
18	Knockainy West	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_040	Good	Not at Risk			2020 - AW	Q4	Good	32	52.470928, -8.491388
19	Knockainy East	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk	DRUMCOMOGE - Gortacloona Bridge	RS24D040400	2020 - AW	Q3-4	Moderate	(EPA)6	52.484683, -8.469502
19	Knockainy East	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	MAHORE_020	Moderate	At Risk	Br at Riverville	RS24M040900	2017 - EPA	Q3-4	Moderate	31	52.492750, -8.457789
20	Kilfrush	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	(EPA)7	52.459331, -8.426870
20	Kilfrush	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	MAHORE_020	Moderate	At Risk	Ballynaveen Br	RS24M040500	2017 - EPA	Q3-4	Moderate	30	52.468199, -8.399610
21	Knocklong	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	30	52.459331, -8.426870
22	Knocklong West	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	(EPA)8	52.459331, -8.426870
22	Knocklong West	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_030	Good	Not at Risk	Ballynahinch Br	RS24M020300	2017 - EPA	Q4	Good	30	52.409051, -8.439506
23	Knocklong East	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk	DRUMCOMOGE - Ballincaroona Bridge	RS24D040200	2020 - AW	Q3-4	Moderate	(EPA)8	52.441997, -8.417338
23	Knocklong East	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_020	Good	Not at Risk	Ballynahinch Br	RS24M020300	2017 - EPA	Q4	Good	(EPA)8	52.409051, -8.439506
23	Knocklong East	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_030	Good	Not at Risk	Ballynahinch Br	RS24M020300	2017 - EPA	Q4	Good	29	52.409051, -8.439506
24	Ballycurrane	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	MAHORE_010	Moderate	Not at Risk	Ballynaveen Br	RS24M040500	2017 - EPA	Q3-4	Moderate	(EPA)7	52.468199, -8.399610

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No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
25	Bartoose	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	(EPA)7	52.466505, -8.355927
25	Bartoose	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	MAHORE_010	Moderate	Not at Risk	Ballynaveen Br	RS24M040500	2017 - EPA	Q3-4	Moderate	(EPA)7	52.468199, -8.399610
25	Bartoose	Shannon Estuary South (24)	DRUMCOMOGE_SC_020	MAHORE_020	Moderate	At Risk	Ballynaveen Br	RS24M040500	2017 - EPA	Q3-4	Moderate	28	52.468199, -8.399610
26	Emly	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	28	52.466505, -8.355927
27	Ballylooby	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk			2020 - AW	Q3-4	Moderate	28	52.466505, -8.355927
28	Lattin North	Suir (16)	Ara_SC_010	ARA_010	Poor	At Risk			2020 - AW	Q3	Poor	27	52.468490, -8.258046
29	Lattin West	Suir (16)	Ara_SC_010	ARA_010	Poor	At Risk			2020 - AW	Q3	Poor	27	52.468490, -8.258046
30	Lattin East	Suir (16)	Ara_SC_010	ARA_010	Poor	At Risk			2020 - AW	Q3	Poor	27	52.468490, -8.258046
31	Mooresfort	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk	Bridge d/s Aughaclareen Br	RS24E020050	2020 - AW	Q3-4	Moderate	22	52.441722, -8.316288
31	Mooresfort	Suir (16)	Ara_SC_010	ARA_010	Poor	At Risk			2020 - AW	Q3	Poor	23	52.468490, -8.258046
31	Mooresfort	Suir (16)	Ara_SC_010	Shroughnagowneen_010	Unassigned	Review			2020 - AW	Q3-4	Moderate	27	52.451473, -8.250067
32	Kilross	Shannon Estuary South (24)	DRUMCOMOGE_SC_010	DRUMCOMOGE_010	Unassigned	At Risk	Bridge d/s Aughaclareen Br	RS24E020050	2020 - AW	Q3-4	Moderate	22	52.441722, -8.316288
32	Kilross	Suir (16)	Ara_SC_010	ARA_010	Poor	At Risk			2020 - AW	Q3	Poor	23	52.463999, -8.294688
32	Kilross	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk			2020 - AW	Q3-4	Moderate	24	52.421045, -8.310626
32	Kilross	Suir (16)	Ara_SC_010	Shroughnagowneen_010	Unassigned	Review			2020 - AW	Q3-4	Moderate	25	52.451473, -8.250067
33	Ballyfroota	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_010	Good	Not at Risk	Br W of Pinker's Cross	RS24M020200	2017 - EPA	Q4	Good	(EPA)9	52.401839, -8.368002

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No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
34	Galbally	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk	AHERLOW - Second Ford d/s 0100	RS16A 010160	2017 - EPA	Q4-5	High	(EPA)10	52.397273, -8.301637
35	Corderry	Suir (16)	Suir_SC_090	AHERLOW_030	Moderate	At Risk			2020 - AW	Q3-4	Moderate	21	52.415473, -8.268758
36	Park (Ed Galbally)	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk			2020 - AW	Q4	Good	(EPA)11	52.379992, -8.266171
36	Park (Ed Galbally)	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk	d/s Galbally STW	RS16A 010200	2017 - EPA	Q3-4	Moderate	(EPA)12	52.401652, -8.278173
36	Park (Ed Galbally)	Suir (16)	Suir_SC_090	AHERLOW_030	Moderate	At Risk	Stagdale Br	RS16A 010300	2017 - EPA	Q3-4	Moderate	20	52.410312, -8.230725
37	Spittle (Ed Ballylanders)	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_010	Good	Not at Risk			2020 - AW	Q4	Good	18	52.393276, -8.334701
37	Spittle (Ed Ballylanders)	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk			2020 - AW	Q3-4	Moderate	19	52.390097, -8.323882
38	Curraghkilbran	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk			2020 - AW	Q4	Good	(EPA)13	52.369297, -8.293225
38	Curraghkilbran	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk	Br SW of Keeloges	RS16A 010080	2017 - EPA	Q4-5	High	17	52.376931, -8.297064
39	Curraghturk	Shannon Estuary South (24)	Morningstar_SC_010	MORNINGSTAR_010	Good	Not at Risk			2020 - AW	Q4	Good	19	52.393276, -8.334701
39	Curraghturk	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk	AHERLOW - Br E of Ballyfauskeen Crossroads	RS16A 010060	2020 - AW	Q4	Good	44	52.362876, -8.287555
39	Curraghturk	Suir (16)	Suir_SC_090	AHERLOW_020	Moderate	At Risk			2020 - AW	Q3-4	Moderate	45	52.360081, -8.322703
40	Ballyfauskeen	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk	AHERLOW - Br E of Ballyfauskeen Crossroads	RS16A 010060	2020 - AW	Q4	Good	44	52.362876, -8.287555
41	Cullane North	Blackwater (Munster) (18)	Funshion_SC_020	SHEEP_010	Good	Not at Risk			2020 - AW	Q4	Good	43	52.343933, -8.365225
41	Cullane North	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk	AHERLOW - Br E of	RS16A 010060	2020 - AW	Q4	Good	44	52.362876, -8.287555

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No.	Townland	Hydrometric Area	Sub-Catchment	River Sub-basins	WFDStatus 2013-2018	WFD Risk 2013-2018	Closest EPA monitoring Station	Station No.	last monitored	Status		Ref No.	Grid Ref
							Ballyfauskeen Crossroads						
42	Ballyduff	Suir (16)	Suir_SC_090	AHERLOW_010	Good	Not at Risk			2020 - AW	Q4	Good	42	52.339109, -8.313237
43	Cullane Middle	Blackwater (Munster) (18)	Funshion_SC_020	SHEEP_010	Good	Not at Risk	Annaglug Br	RS18S030200	2018 - EPA	Q4	Good	(EPA)1	52.331918, -8.375006
44	Cullane South	Blackwater (Munster) (18)	Funshion_SC_020	SHEEP_010	Good	Not at Risk	Annaglug Br	RS18S030200	2018 - EPA	Q4	Good	(EPA)1	52.331918, -8.375006
44	Cullane South	Blackwater (Munster) (18)	Tar_SC_010	SHEEP_020	Good	Not at Risk			2020 - AW	Q4	Good	41	52.308839, -8.406873
45	Spittle (Ed Darragh)	Blackwater (Munster) (18)	Funshion_SC_020	SHEEP_020	Good	Not at Risk			2020 - AW	Q4	Good	41	52.308839, -8.406873
46	Kilglass	Blackwater (Munster) (18)	Funshion_SC_020	FUNSHION_020	Good	Not at Risk			2020 - AW	Q4	Good	26	52.300986, -8.274151
47	Shanbally	Suir (16)	Tar_SC_010	SHANBALLY_010	Good	Not at Risk	Br SSE of Burncourt	RS16S010400	2017 - EPA	Q4	Good	(EPA)14	52.305259, -8.069824
47	Shanbally	Suir (16)	Tar_SC_010	TAR_020	Good	Not at Risk			2020 - AW	Q4	Good	16	52.305296, -8.061316
48	Kilcoran	Suir (16)	Suir_SC_100	THONOGE_010	Moderate	Not at Risk	THONOGE - Kilcoran Br	RS16T020010	2017 - EPA	Q3-4	Moderate	(EPA)15	52.348494, -8.016820
48	kilcoran	Suir (16)	Suir_SC_100	THONOGE_020	Good	Not at Risk	THONOGE - Curraghmore Br	RS16T020050	2020 - AW	Q4	Good	36	52.332888, -8.010281

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Table 6.14 Summarised Tablulated Results from AEE Sampling and Recent EPA results.

WFD Status (2013-2018)	TL No.	Total TLs with WFD Status	% TL with Status	Total TLs after Sampling or using recent EPA data	TL Note	New Total	New % TL with Status	Overall % change after sampling
High	N/A	0	0	2	TL 34,38	2	4.2	+4.2
Good	1,18,22,23,33,36,37,38,39,40,41,42,43,45,46,47,48	18	37.5	19	TL 17	19	39.6	+2.1

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Moderate	2,3,12,13,14,15,16,19,20,24,25,32,34,35,36,37,38,39,48	19	39.6		TL 10,18 from Poor, and TL 18,19,20,21,22,23,25,26,27,31,32 from unassigned	32	66.7	+27.1
Poor	3,4,5,6,7,8,9,10,18,28,29,30,31,32,17	15	31.3	1	10,18 upgraded to Mod, TL11 from unassigned	14	29.2	-2.1
Unassigned	11,18,19,20,21,22,23,25,26,27,31,32	12	25.0	-12	Reassigned	0	0.0	-25.0

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6.6 MITIGATION

6.6.1 Construction phase mitigation

- Sediment erosion and pollution prevention techniques such as silt fences, bunds and settlement ponds will be used during the construction phase e.g. adjoining stock piled heaps of clay. Also allowing the establishment of vegetation on the exposed soil will prevent run-off;
- Dust mitigation will involve employing a dousing tanker to prevent dust contaminating surface waters;
- Where possible re fuelling will take place off site. Any re-fuelling tankers will be inspected for leaks (and not allowed on site if found leaking). All refuelling will take place in a bunded area;
- Machinery will be inspected to insure machinery leaking oils or fuel will not be allowed on site;
- Washout from concrete mixers will be handled off-site in the concrete depot; and
- Any soil contaminated by concrete, fuel or other harmful material will be removed from site by an approved waste contractor.

6.6.2 Operational phase mitigation for pig farm site

- Surface and ground water monitoring quality will continue on site;
- Pig manure is stored in leak proof tanks. Concrete tanks have leak detection chambers;
- Overground slurry/liquid tanks (e.g. diesel tanks) are bunded;
- Pig manure off-take points are concreted and pig walk-ways are slatted and concrete with run-off drained to slurry tanks;
- The septic tank will be inspected twice annually and de-sludged when required;
- Good operational practise at the pig farm includes a high degree of cleanliness. The housing has minimal external walk ways and therefore soiled yards are not an issue (pigs walk on slats). Internal houses are cleaned regularly. Slatted floors minimise wetness and routine maintenance of drinkers and water fixtures minimises groundwater usage; and
- The site well will be metered to monitor usage and thereby minimise wastage by picking up irregularities in flow.

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6.6.3 Operational phase mitigation for land spreading

- There is a legal framework (SI 605 of 2017 as amended) which governs how pig manure is land-spread, and within this legal framework there are adequate protections to insure that pig manure is applied without adverse environmental effects;
- The pig farm management will regularly engage with customer farmers for pig manure, using a collaborative approach to encourage and insure best practices are adhered to when land spreading;
- The pig farm will insure that leaking tankers are not allowed on-site;
- There is more than 50+ weeks manure storage on-site. This will allow manure to be spread at suitable times of the year;
- Reducing the protein level in balanced diets will reduce the level of nitrogen in the manure thereby reducing potential NO_3 leaching;
- Keep application rates to those specified in SI 605 of 2017 (as amended), i.e. replace chemical fertiliser, and therefore no increase in nutrient levels in the soil;
- A manure register is maintained to monitor movements of manure and is available for inspection by the EPA. This register records slurry movement from the pig farm;
- A record of all slurry movements is given to DAFM who inspects approx. 5% of farmers to insure cross compliance with regulations;

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- A buffer zone of at least 25m is allowed all private wells, 200m around public water sources and 15m around karst features to protect ground-waters;
- To prevent the pollution of watercourses by the farmers using manure from the proposed development (during the appropriate spreading time frame) the following measures are to be implemented as per SI 605 of 2017 (as mended) and the 'Nitrates Explanatory Handbook for Good Agricultural Practice for the Protection of Waters Regulations 2018. This includes not spreading organic manures between October 15th and January 12th. Along with the precautionary principle of spreading organic fertiliser and soiled water as accurately and as evenly as possible, and as early in the season as possible, the following mitigation measures are part of the 2017 regulations:
    - Not using an upward-facing splash plate or sludge irrigator on a tanker or umbilical system for spreading organic fertiliser or soiled water.
    - Not spreading from a road or passageway, even if the road or passageway is personally owned.
    - Not spreading when:
        - The land is waterlogged;
        - The land is flooded, or it is likely to flood;
        - The land is frozen, or covered with snow;
        - Heavy rain is forecast within 48 hours (forecasts from Met Éireann should be checked).
        - The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
    - A buffer zone of 10m is required for any surface watercourse where the slope towards the watercourse exceeds 10%; and
    - A buffer zone of 5m is required for other water courses with 5 metre buffer zone is increased to 10 metres for a period of two weeks preceding and two weeks following the periods when application of fertilisers to land is prohibited as set out in Schedule 4 of the Regulations.

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6.6.4 Monitoring

- Site monitoring of groundwater and storm water to continue
- It is proposed to monitor 6 locations for 3 years (in addition to EPA monitoring stations) with particular attention to surface waters 'at risk'. The sampling points as identified in Figures 6.12.1 and 6.12.2 are Nos 16, 19, 20, 22, 24 and 30.

6.7 RESIDUAL IMPACTS (post mitigation)

Having considered, the baseline EPA and Catchments.ie data, the field assessment results, the sensitivity of receptors in the study area, the magnitude of pre-mitigation impacts and the proposed mitigation measures, the residual impacts on water from the proposed pig farm are considered to be not significant when mitigation measures are employed. The proposed development will not change the residual post mitigation residual impact.

6.7.1 Residual (post mitigation) impacts on Groundwater;

Pig manure is stored in leak-proof slatted tanks which have leak detection facilities to monitor potential risks to groundwater. There will an on-going groundwater monitoring programme at the pig farm site

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and groundwater is generally of satisfactory quality at the site. The site is located on medium vulnerable land overlying a locally important aquifer. The groundwater status of the underlying ground waterbody (SE_G_087 – Knockashallen) is good and not a risk. Therefore the risks on groundwater are not significant at the site of the proposed development.

The groundwater status for the study area is good. In excess of 98% of the study area groundwater is classified as good quality. The majority of the study area is either 'not at risk' or 'under review' (75%) in terms of risk of good status deteriorating and 25% is at risk of status deteriorating. The existing pig manure is not significantly impacting on the nitrates levels where pig manure is applied in accordance with SI 605 of 2017 (as amended). The groundwater phosphate and ammonia levels are generally satisfactory throughout the study area (Table 6.6), with an upward trend and agriculture identified as key pressure. There is no evidence that the existing pig farm had a detrimental effect on the groundwater quality in the study area. The proposed development of 'Ballyfaskin Pig Farm' will not significantly increase the amount of slurry or the organic manure loading in the study area (Section 5.8 of Volume 2 of the EIAR). Therefore the residual impact from the proposed development at this pig farm on the hydrology and groundwater is not significant.

6.7.2 Residual (post mitigation) impacts on Surface Water;

The surface (storm) water quality will be monitored as required by the current IPPC license. The water quality of the sub basin in which the pig farm is located (Aherlow_010) is assigned as 'Good' water status and risk status is 'Not at Risk'. It is noted that the EPA monitoring in 2017 of the Aherlow River downstream of the confluence with the Lyre Stream (Station "AHERLOW - Br E of Ballyfauskeen Crossroads" No. RS16A010060) was 'Q4-5 High Status'.

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Overall this represents an acceptable baseline water quality and the operation of the existing pig farm is not expected to adversely affect the existing water environment. The operation of the proposed development has modern buildings and management standards, and high environmental standards in the operation of the pig farm. With the mitigation of adherence to SI 605 of 2017 (as amended), which means that pig manure is used to replace chemical fertiliser, land spreading will not significantly affect the baseline water quality.

6.8 CUMULATIVE IMPACTS (post mitigation) AND INTERACTIONS

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*". Cumulative effects are defined in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

There is a pig farm located in Inchacoomb, 2km directly east of the proposed development. This site is located on the same ground waterbody as the 'Ballyfaskin Pig Farm' i.e. SE_G_087 and east of the Aherlow River. The general groundwater flow from the Inchaccomb site will be north aligned with the Aherlow River flow, and away from the 'Ballyfaskin Pig Farm' Site. Therefore there will be no cumulative effects from the slurry stored at the Inchacoomb site in terms of groundwater flows. The water quality in PWS Refs No 29 and 30 (Ballylanders) is the closest supply to both farms and NH_4-N, NO_3 and E.coli are 0.02mg/l, 6mg / l and zero respectively confirming EPA Good status of groundwater in this area.

The pig manure from the Inchacoomb site is spread in the Ballyfauskeen Townland (Ref No 40) and therefore may potentially impact surface and ground waters. However the Inchacoomb piggery has

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also been operational for the past 30+ years and the water quality in this part of the Aherlow_010 sub-basin is good and not at risk. Therefore the cumulative effects of the inchacoomb pig farm is not significant based on the existing baseline assessment.

There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. These pig farms are located close to the Aherlow river and therefore there are potential cumulative effects on the Aherlow River and Suir catchment. These two farms are located on different ground waterbodies (SE_G_024 (Cahir) and SE_G_091 (Lisvarrinane)) and therefore there are no potential cumulative effects from the sites. There is very low potential for overlap in land-spreading areas due to separation distance. The baseline water quality in the upper Aherlow is good, indicating that the 'Ballyfaskin' farm will not have an in-combination effect with these two piggeries.

The land spreading of cattle manure in the study area is considered part of the baseline environment. In combination effects of pig, cattle and other intensive agriculture facilities are considered in so far as this assessment recognises that agriculture is one the main pressure on water quality within the study area. Section 6.5.3.2 highlights that within the sub-basins relevant to the study area, agriculture is the dominant pressure for 23% of the study area (7 of the 30 River Sub-Basins, See Table 6.8) reflecting the mainly rural and agricultural nature of activities within the study area. However, pressures such as Urban Waste Water and Industry also listed as the main pressures for these areas either 'At Risk' or under 'Review'. SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) takes into account the addition of pig manure organic nitrogen to the existing loading on farms. Section 5.8 of Chapter 5 of this EIAR states pig manure adds an average of 2.6 kgs / ha of organic nitrogen (an increase of 2%) to the County Limerick organic nitrogen loading. The proposed development will not significantly increase the organic N loading of the study area or County. Also pig manure replaces chemical fertiliser and there will be a corresponding reduction in chemical fertiliser usage.

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Having considered the potential impacts of the 'Ballyfaskin Pig Farm' development and other potential cumulative impacts from agricultural organic nitrogen on Water there are no significant cumulative effects.

Interactions between Water and other environmental topics have been considered throughout this assessment; such as interactions with;

- Biodiversity due to storm water run-off from construction site or the operational site impacting on aquatic habitats; or due to contaminated groundwater affecting aquifers and indirectly affecting surface water habitats; or due to the local hydrology affected by draw down of water table due to extraction of groundwater;
- Material Assets due to potential impacts on aquifers due to groundwater extraction and knock-on effects on public water supplies; or due to groundwater contamination at the site affecting groundwater quality used for human consumption; or due to contaminated storm water; or pig manure impacting on tourism or local businesses; and
- Major Accidents and Natural disasters due to flooding of adjoining properties from storm water arising on the site.

Having considered these interactions there are no additional significant impacts from the proposed development.

6.9 CONCLUSIONS

Groundwater in farm well is good quality and the quality of 19 of the 21 groundwater bodies within which the study area is located is rated as good. The risk status is 'not at risk' and 'under review' for

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75% of the study area and 'at risk' for 25% of the study area. Agriculture is the main pressure on groundwater quality for 15% of the study area. The majority of the study area overlies land that is low - medium risk from land-spreading organic manures. It is considered that the replacement of chemical fertiliser with pig manure fertiliser will not significantly affect groundwater quality.

The water quality of the sub basin in which the pig farm is located (Aherlow_010) is assigned a 'Good' water status and has a risk status of 'Not at Risk'. The last record (2017) by the EPA downstream of the Lyre Stream with the Aherlow River was 'Q4-5 High Status' with ongoing stable 'Good' status looking at historic data.

Overall this represents an acceptable baseline water quality and the operation of the proposed pig farm is not expected to adversely affect the existing water environment. Agriculture is the dominant pressure for 23% of the study area (7 of the 30 River Sub-Basins, See Table 6.8). There is no indication that surface water discharges from the existing pig farm have impacted on surface water quality and it is considered that the proposed development will not impact significantly on water quality of the Aherlow River or its tributaries.

It is not proposed to increase significantly the production of pig manure at the proposed development and therefore, provided the farmers currently receiving pig manure implement and adhere to the regulations set out in SI 605 of 2017 (as amended), that is, that the pig manure replaces a chemical fertiliser requirement, thus replacing rather than increasing nutrient load; it can be summated that there will be no quantifiable impact on surface waters.

Having considered other pig farms in the local area there are no significant cumulative effects. Having considered interactions with Biodiversity, Material Assets and Major Accidents and Natural disasters there are no significant interactions with other environmental topics.

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https://catchments.ie/wp-content/files/catchmentassessments/18%20Blackwater%20(Munster)%20Catchment%20Summary%20WFD%20Cycle%202.pdf
https://www.catchments.ie/wp-content/files/catchmentassessments/24%20Shannon%20Estuary%20South%20Catchment%20Summary%20WFD%20Cycle%202.pdf
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CHAPTER 7 - AIR

Section 7.1 introduces the topic of air quality and refers to other sections of the EIAR where this topic is addressed. **Section 7.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 7.3** looks at the receiving environment. **Section 7.4** describes the characteristics of the proposed development relevant to this topic, in particular emissions of ammonia, methane, nitrous oxide, carbon dioxide, dust, particulate matter and malodour. **Section 7.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. Potential impacts on dwellings, businesses, tourist service, ecosystems and water resources are considered. The impacts from land spreading and from the pig buildings are assessed. **Section 7.6** sets out proposed mitigation measures. **Section 7.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 7.8** and conclusions regarding impacts on air are provided in **Section 7.9**. **Section 7.10** contains references for the chapter.

7.1 INTRODUCTION

The existing pig farm and the proposed development at 'Ballyfaskin Pig Farm' are described in Chapter 1 of this EIAR. This chapter addresses air quality issues and potential odour impacts at the existing and proposed development. Certain aspects of air quality is also addressed in Chapter 2 (Alternatives), Chapter 3 (Human Population and Human Health) and Chapter 8 (Climate) of the EIAR. The main topics addressed in this chapter are ammonia, methane, nitrous oxide, dust and odour emissions. Other gaseous emissions e.g. Hydrogen Sulphide, Carbon Monoxide and Sulphur Dioxide are also discussed. Carbon dioxide emissions are addressed in Chapter 8 of this EIAR. Reference is made to EPA; *Irelands Final Greenhouse Gas Emissions in 2018* (April 2020), EPA Report No 193; *Ambient Atmospheric Ammonia in Ireland, 2013-2014*; *Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs*; 2017 and Government of Ireland: *Climate Action Plan 2019 – to Tackle Climate Breakdown*. The EPA / Odournet UK Ltd 6 o.u. contour model is referred to a guide to assess odour impacts.

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7.2 METHODOLOGY

7.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

In compiling this chapter the following sources of information were referred to;

- Aerial photography;
- Calculation of emissions from pigs is explained in Sections 7.4, 8.3.1 and 8.3.2 of Chapter 8 of the EIAR; and
- Literature review of relevant Air Quality information;

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- Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs; 2017.

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7.2.2 Assessment of Significance

The assessment of impacts involves:

1. Evaluation of the baseline environment and the sensitivity of the individual receptors which may be affected by the proposed development. Rural dwellings are high sensitive receptors. Schools, settlements and public houses are high to very high sensitivity receptors. Habitats and water resources are high to very high sensitivity.
2. Evaluation of the nature and magnitude of the effects on each receptor. Reference is made to the OdourNET UK odour emissions per pig type. The EPA emissions calculator spreadsheet tool for intensive agriculture is used to calculate emissions of ammonia, methane and nitrous oxide. These tools have limitations and are used only for guidance purposes. For example the EPA AER/PRTR emissions calculation tool for intensive agriculture (in conventional housing types) estimates emissions of ammonia, methane and nitrous oxide based on the numbers and categories of pigs and the area of uncovered slurry stores. It does not factor in dietary protein or individual site specific factors such as housing type (solid vs slatted floors). Similarly the Odournet UK model does not take into account site specific factors such as topography.
3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the impact significance is predicted based on criteria set out in the EPA (Draft) 2017 guidelines.

The significance of impact criteria are set out in Table 7.1.

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Table 7.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example, no significant effect on air quality. In the majority of situations this includes the short-term effects from land spreading when best practise is employed.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example a small impact on a sensitive receptor (dwelling / habitat) due to persistent nuisance (odour) from pig buildings. Complaints are rare.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example a moderate impact on a sensitive receptor (dwelling / habitat) due to persistent emissions (odour) from pig buildings. Complaints are common but limited to low numbers.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*. For example a significant negative impact on a sensitive receptor (dwelling / habitat) due to persistent emissions (noise, traffic or odour) from pig buildings. This impact results in a reduction in life quality but no permanent health effects. Complaints are persistent and reflect a high degree of anxiety but limited to low numbers.

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Significance Level	Criteria
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As with a significant impact, however the effects are more widespread and affects groups of sensitive receptors.
Profound Impact	*An effect which obliterates sensitive characteristics*. For example sensitive receptors cannot coexist with the pig farm due to negligent land spreading or proximity to the pig houses. Continuous emissions (noise, traffic or odour) have a profound effect on the local environment and population.

7.2.3 Duration of Impact

The construction phase will last approximately 4 months. Unless otherwise noted in the individual sections of this chapter the following duration of impacts apply:

- Temporary Impact - Impact lasting for one year or less.
- Short term Impact - Impact lasting one to seven years.
- Medium Term Impact - Impact lasting seven to fifteen years.
- Long Term Impact - Impact lasting fifteen to sixty years.
- Permanent Impact - Impact lasting over sixty years.

Construction effects will be temporary. The duration of potential impact from nuisance can be temporary (due to land spreading odours). The duration of potential impacts due to emissions from the pig buildings is generally permanent – even though there may be intermittent effects over a long period of operation. Notwithstanding this, future developments in technology may mitigate some of these potential effects. Potential benefits to the wider economy are either medium term or permanent (provision of labour).

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7.3 RECEIVING ENVIRONMENT

The rural air quality in the study area (Rural West – Region 6) is rated as '3-Good' by the EPA Air Quality Index for Health (http://www.epa.ie/air/quality/ and gis.epa.ie/EPAMaps/). The sensitive receptors in the receiving environment within the study area are illustrated in Figures 3.1.1 – 3.1.5 of Chapter 3 (and Volume 3). These are;

- Agricultural land holdings;
- Rural dwellings;
- Commercial businesses, tourist services, settlements;
- Public water sources;
- Ecosystems (watercourses, rivers, woodlands/forests, clean air, special areas of conservation, habitats); and
- Cultural heritage assets.

7.3.1 Agricultural land

According to Section 5.3.4 there is at least 5,548ha of agricultural land available in the study area after deductions are made for forestry roads, houses, scrub, farm yards, buffer strips, source protection zones and zones of contribution (see Section 5.3.4 and 5.9 of this EIAR). The main land use in the study area is agricultural grassland which accounts for approx. 99.5% of County

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Limerick[1]. Tables 1 and 2 of the 2010 Agricultural Census (CSO) indicates that approximately 73% of the farmers in County Limerick are drystock[2] farmers, 3% are tillage farmers and the remaining 24% are dairy farmers. The CSO data indicates 72% of the farmers in Co Tipperary are drystock farmers, 6% of Tipperary farmers are tillage farmers and the remaining 22% are dairy farmers.

7.3.2 Rural Dwellings

According to Section 3.3.1.1 of the EIAR there are approx. 2,500 rurally based residents in the study area and a further approx. 3,450 residents in settlements throughout the study area. There are 40 dwellings within 1km of the proposed site boundary.

7.3.3 Commercial businesses, tourism services and settlements

There are several rurally based businesses in the study area as outlined in Section 3.3.1.3, including car retailer businesses in Garryspillane and Knocklong, retail/hardware/farm supply store south of Garryspillane, a window fitting business in Ballybricken, a farm equipment manufacturer in Lattin, a metal fabricator between Ballylanders and Spittle and a waste contractor business in Luddenmore. There are B & B properties in the vicinity of the pig farm in Ballylanders and in Anglesborogh. There are 13 settlements within the study area itself or within 500m of the study area boundary as illustrated in Figure 3.1.1 – 3.1.5. These include Bruff, Burncourt, Caherconlish, Emly, Fedamore, Galbally, Garryspillane, Glenroe, Kilross/Knockballymaloo, Kilteely, Knockainy, Knocklong and Latin. Ballylanders, which is the closest settlement, is 2.8km NW of the 'Ballyfaskin Pig Farm' site – but is 650m outside the study area. There are shops, sports grounds, credit unions, banks, garda stations, post offices, public houses, hardware store, health clinics, community centres, cafés and manufacturing businesses in these settlements.

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7.3.4 Public ground water sources

Fifteen public water sources have been identified within the study area, or within 500m of it, as illustrated in Figure 3.1.1 – 3.1.5. These include;

- Ballybricken Ground Water Supplies (Ref No 8 and 9) and P serve a population of 541 with 119m^3 per day. The zone of contribution for this GWS is within the study area;
- Fedamore Ground Water Supply (Ref No 11) serves a population of 492 with 330m^3 per day. The source protection zone is within the study area;
- Kilteely Ground Water Supply (Ref No 14) serves a population of 475 with 110m^3 per day;
- Bruff Ground Water Supplies (Ref No 15 & 16) serve a population of 1410 with 550m^3 per day. The source protection zones are within the study area;
- Knockainey/Kilballyowen Ground Water Supply (Ref No 17) serves a population of 117 with 25m^3 per day The zone of contribution is within the study area;
- Knocklong Ground Water Supplies (Ref No 21, 22 & 23) serves a population of 1,169 with 582m^3 per day. The source protection zones are within the study area;
- Galbally Ground Water Supply (Ref No 28) serves a population of 361 with 350m^3 per day;
- Ballylanders Ground Water Supply (Ref No 29 & 30) serves a population of 549 with 164m^3 per day;
- Ballyduff Ground Water Supply (Ref No 33) serves a population of 86 with 18m^3 per day. The zone of contribution for this GWS is within the study area; and

[1] 2010 Census of Agriculture
[2] Beef and or sheep and mainly grass cropping

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- Kilcoran Ground Water Supply (Ref No 35) serves a population of 100 with 18m^3 per day.

7.3.5 Ecosystems (watercourses, rivers, woodlands/forests, clean air, habitats);

The ecosystems (other than agricultural grassland and tillage) in the study area include watercourses / rivers, wells and forests / woodlands. The sensitivity of these ecosystems ranges from low for commercial forests and medium to very high for woodland and water ecosystems (e.g. Aherlow).

There are no Special Areas of Conservation within the study area.

The study area is comprised mainly of Improved Agricultural Grassland (GA1 Fossitt Habitat Code) (Section 4.5.3.8 of Chapter 4 of the EIAR). These are low value habitats from an ecological point of view.

7.3.6 Cultural Heritage Sites

Within the study area there are 468 registered National Monuments and 228 recorded structures on the National Inventory of Architectural Heritage (Section 11.3.2) (see Figure 3.1 and Figure 11.4) which are generally high to very high sensitivity. The nearest monuments to the site of the proposed development are two enclosure sites (LI049-198, LI049-199) at 95m and 160m.

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7.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The main gaseous emissions are ammonia (NH_3), methane (CH_4), nitrous oxide (N_2O), dust, particulate matter (PM) and malodour. Ammonia, methane, nitrous oxide and malodour are emitted from land spreading and ammonia, methane, nitrous oxide, dust, PM and malodour are emitted from the pig houses. Gases such as carbon monoxide (CO), hydrogen sulphide (H_2S), Sulphur Dioxide (SO_2) and non-methane volatile organic compounds are also emitted from the pig houses at very low quantities – seldom considered significant in the case of pig farms. The pre-mitigation emissions discussed below are calculated before the proposed mitigation of low protein diet is taken into account.

There is wide variation in quoted production figures for ammonia, methane and nitrous oxide. The AER/PRTR calculation spreadsheet tool[3] for intensive agriculture in standard conventional housing types is provided by the EPA to licensed IPPC pig facilities to enable them to calculate annual fugitive emissions of ammonia (NH_3), methane (CH_4) and nitrous oxide (N_2O). This tool is used extensively throughout this EIAR to calculate ammonia, methane and nitrous oxide produced by various categories of pigs and the quantities are set out in Table 7.2.

Table 7.2: Annual emission figures for NH_3, CH_4 and N_2O per category of pig based on the AER/PRTR spreadsheet tool

Category of pig	NH_3	CH_4	N_2O
Suckling sow & litter	4.72	22.96	0.031
Dry sow	3.17	22.96	0.031
Boars	3.34	22.96	0.025

[3] Downloaded at http://epa.ie/pubs/advice/aerprtr/pigpoultryaerprtrguidance/eprintensiveagriculture emissionscalculationtool.html

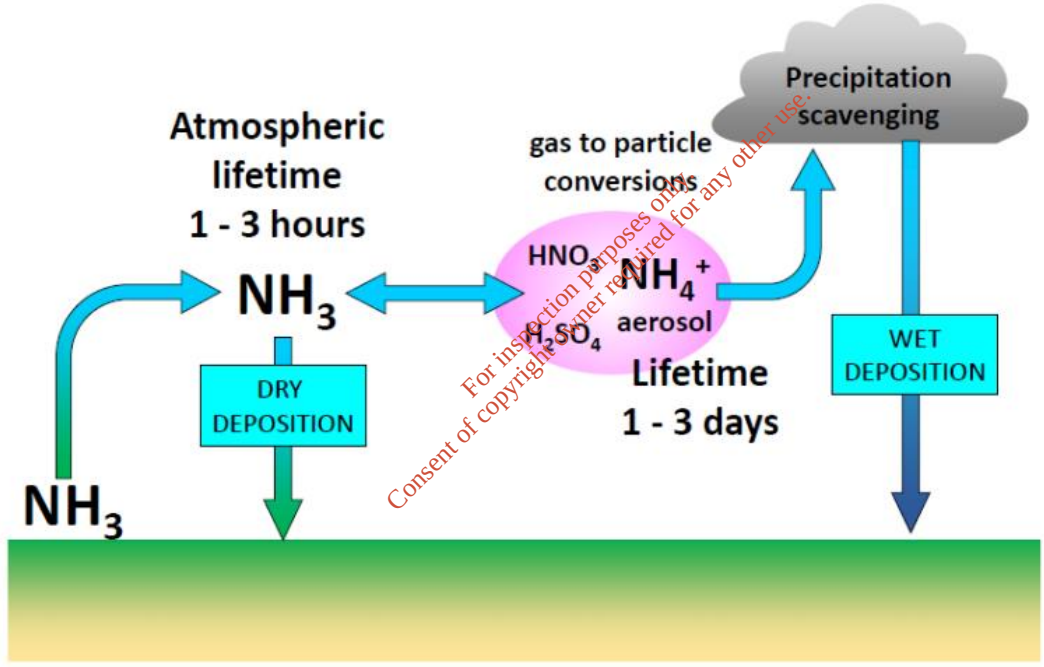
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Category of pig	NH_3	CH_4	N_2O
Maiden gilts	2.6	11.5	0.014
Weaners	0.986	8.7	0.005
Fattening pigs	2.6	13.3	0.014

7.4.1 Ammonia (NH_3) emissions

Emission of gaseous NH_3 (from pig houses and land-spreading pig manure) to the atmosphere, is either deposited back onto terrestrial surfaces by dry deposition, or, is converted to ammonium (NH_4^+) in particulate matter through reaction with atmospheric acids, has a short lifetime in the atmosphere of just a few hours, and is deposited back to terrestrial surfaces by wet deposition (Figure. 7.1). The particulate matter has a longer lifetime in the atmosphere of a few days on average and is removed from the atmosphere primarily by rain and snow as wet deposition.

Figure 7.1: Ammonia Emissions to atmosphere, transformation to particulate matter and removal by dry and wet deposition



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In pig farming, it is estimated that over 60%[4], or thereabouts, of NH_3 emissions comes from housing. The remaining 40% is assumed to arise from land spreading mainly. Approximately 50% of the land-spreading nitrogen in pig manure is in an organic matter form which when applied to the land is made available at a more or less constant rate from season to season. Of this organic portion 50% will be available to plant growth in the season after application as microbes convert the organic matter nitrogen to nitrate and 50% of the remaining organic nitrogen will be made available in the following season and so on.

The other 50% of the nitrogen in the applied pig manure is ammonia which is either taken up by plants as ammonia, converted to nitrates by soil microbes or is lost to the atmosphere by volatilization. Volatilized NH_3 is usually deposited in rainfall usually within a few kilometres of the source. The baseline ammonia deposition levels for the study area is approximately 17.5 kgs / ha

[4] Page 48 of DEFRA 2002, Ammonia in the UK.

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/ year [5] of NH_3-N or approx. 21[6] kgs NH_3 / ha. Agriculture in the study area is the source of 98%+ of these emissions (this assumes that the study area reflects the national situation).

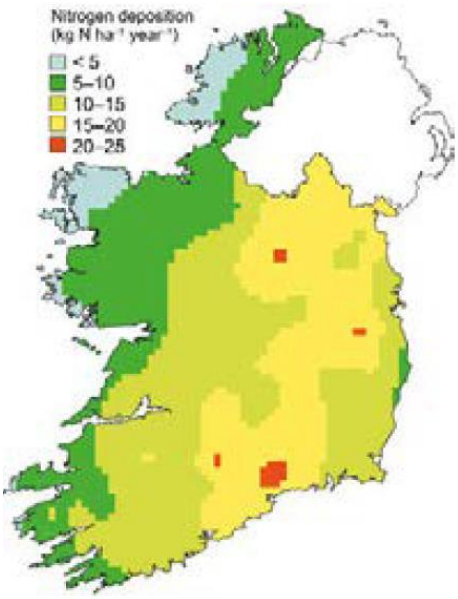


Fig 7.2: Nitrogen Deposition

The quantity of ammonia produced by the existing and the proposed pig farm is calculated using the EPA AER / PRTR calculation tool for licensed intensive agricultural enterprises. The emission factors used in this tool are shown in Table 7.2. The exiting 600 sow unit produces 18.5 tons per year of NH_3[7]. Approximately 60% is emitted from housing and 40% is emitted mainly from land spreading. Therefore approximately 7.4t (40% of 18.5t) of NH_3 is deposited over the study area by land spreading from the existing pig farm which is part of the baseline environment. The proposed pig farm will produce approx. 19.6t before mitigation using the EPA calculation tool. Pre-mitigation, the land-spread NH_3 is projected to increase by 6.5%[8] to 7.8t in the proposed development representing an increased loading of approx. 0.05 kgs NH_3 / ha / year within the study area (8,250ha). Each m^3 of pig manure replaces approximately 2.1 kgs of chemical N fertiliser. Therefore the pig manure off-sets NH_3 released from chemical N fertiliser – but this is not quantified in this assessment.

Approximately 11.1t (60% of 18.5t) of the existing 600 sow unit NH_3 is emitted from the pig houses and is deposited within a few kilometres of the pig farm at average rates of approximately 12 kg / ha / year (11.1t within 1–2 kms[9] = 960 hectares[10]). Before mitigation, the NH_3 from housed pigs is projected to increase to 11.8t (60% of 19.6t), therefore, the overall increase will be approx. 0.7t over 1–2 kms; = 1 kgs / ha in the vicinity of the pig farm (pre mitigation).

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Ammonia deposition can have potential adverse human health impacts and potentially lead to nutrient enrichment and acidification of surface waters and sensitive habitats leading to modifications over time.

Table 7.3: Annual emission figures; NH_3, CH_4 and N_2O for the 600 sow unit and the 1000 sow unit based on AER/PRTR spreadsheet tool

Category of pig	Number	NH_3 (kgs)	CH_4 (kgs)	N_2O (kgs)
600 sows				
Suckling sow & litter	100	470	2300	3
Dry sow	500	1600	11500	16
Boars	3	10	69	0.1

[5] Figure 2.3 'N deposition map' in page 6 of EPA Report; Ambient Atmospheric Ammonia in Ireland, 2013-2014.

[6] NH_3 = atomic weight 14 for N and 3 for H_3, therefore N makes up 82% of NH_3 => 21 x 0.85 = 17.5kgs N.

[7] Using EPA calculation tool for intensive agriculture; **Existing** - Based on inputs of 100, 500, 3, 100, 2500 and 5236 lactating sows, dry sows, boars, maiden gilts, weaners and finishers respectively and no uncovered slurry storage; **Proposed** - 167, 833, 5, 166, 5357 and 3957 lactating sows, dry sows, boars, maiden gilts, weaners and finishers respectively.

[8] Total = 19.6t (Table 1.7) x 40% = 7.8t => 6.5% increase from 7.4t.

[9] Figure 2.6, page 20 of DEFRA 2002, Ammonia in the UK.

[10] 1.75km radius = 3.14 x 1750m^2 = 6,616,250m^2 – 962ha

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Category of pig	Number	NH_3 (kgs)	CH_4 (kgs)	N_2O (kgs)
Maiden gilts	100	260	1150	1
Weaners	2500	2500	21750	12
Fattening pigs	5236	13613	69638	76
Total =>		**18,454**	**106,407**	**108**
1000 sows Suckling sow & litter	167	785	3841	5
Dry sow	833	2666	19159	26
Boars	5	17	115	0.1
Maiden gilts	166	432	1909	2
Weaners	5357	5357	46607	25
Fattening pigs	3957	10289	52630	57
Total =>		**19,545**	**124,261**	**116**
% change		**+ 6%**	**+ 17%**	**+ 8%**

7.4.2 Methane (CH_4) emissions

Methane (CH_4) gas is emitted from two sources: firstly from the digestive process of organic matter in pigs (Enteric) and secondly from the anaerobic decomposition of organic matter in manure (Manure Management). The latter source is far more important producing over 90%[11] of the CH_4. This methane dissipates to the atmosphere where it contributes to the greenhouse gas effect and is not locally deposited as is the case with ammonia. Table 1.7 in Chapter 1 sets out the amount of methane produced by the existing and the proposed pig farm based on the EPA calculation tool for licensed intensive agricultural enterprises. The exiting 600 sow unit produces 106.5 tons per year of CH_4 which is entirely dissipated to the atmosphere of the study area and surrounding area. The existing pig farm is part of the baseline environment. For the 1,000 sow unit the CH_4 is projected to increase to 124.3 tons, which is a 17% increase

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7.4.3 Nitrous oxide (N_2O) emissions

Nitrous oxide (N_2O) gas is released from agricultural soils due to the breakdown of chemical and organic nitrogen. Once released into the atmosphere it contributes to the Green House effect and is not locally deposited. It is also associated with poor air quality. Table 1.7 in Chapter 1 sets out the amount of nitrous oxide produced by the existing and the proposed pig farm based on the EPA calculation tool for licensed intensive agricultural enterprises. The exiting 600 sow unit produces 108 kgs per year of N_2O which is entirely dissipated to the atmosphere. The existing pig farm is part of the baseline environment. Pre-mitigated emissions of N_2O are projected to increase by 8% to 116 kgs per year.

7.4.4 Dust and particulate matter

[11] EPA; 2016; *Emission and Waste Transfer Reporting Guidance Document for the Intensive Agriculture Sector* Table 2 of page 13, Methane emission factors for pigs

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Dust emissions from construction activities may occur where exposed soil is exposed to drying conditions.

Dust particles emitted from pig houses are made airborne by mechanical disintegration of solid particles, ranging in size from less than 1 µm to greater than 100 µm. The dust generated within indoor pig buildings may contain many types of particles including: animal dander, faecal material and urine of both pigs and rodents, feed components, bedding materials, absorbed gases, chemicals, viruses, bacteria, yeasts, moulds and their by-products. Dust can contribute to malodour emissions as discussed in Section 7.4.6.

Along with dust particulate matter (PM_{10} and $PM_{2.5}$) is also found in emissions from pig buildings – but at very low levels which are readily dissipated in the atmosphere to harmless levels. At a national level NH_3/NH_4 emissions (particularly from land-spreading) are linked with national particulate matter emissions. Agriculture accounts for 36% and 14% of national PM_{10} and $PM_{2.5}$ emissions (Tables 10 and 11 of CSO, 2016, Environmental Accounts for Air Emissions).

7.4.5 Malodour

Malodour substances released from pig production are the result of anaerobic metabolism of microorganisms. This conversion starts in the digestive system of the pig but accelerates within hours after excretion. In combination with ammonia, substances such as dust, hydrogen sulphide (H_2S), sulphur and volatile fatty acids contribute to the characteristic malodour. The concentration of these latter compounds may be negligible in a measurable sense but combined they create odour.

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At land spreading locations the odour results from the decay of pig manure on the ground and from the production of aerosols during spreading. Odour nuisance from land spreading is generally related to weather conditions, rates of application and proximity to sensitive receptors. Effects are generally dissipated within a few hours and are temporary. Odour emissions from pig buildings are from the pigs themselves and from the storage of pig manure. Bacterial growth during storage results in release of volatile compounds which are emitted to the atmosphere from the manure surface and particularly at agitation. Odour nuisance from pig houses is generally related to the extent of the source (i.e. number of pigs, volume of pig manure and area uncovered slurry surfaces), weather conditions and proximity to sensitive receptors and while effects may not persist indefinitely (due for example to changes in wind direction) they are viewed as permanent. Odour may also arise from the storage of carcass material on site – particularly if not stored in sealed containers and collected regularly.

A significant source of these odour emissions is from the storage of pig slurry in slurry tanks. Bacterial growth during storage results in release of volatile compounds which are emitted to the atmosphere from the slurry surface and particularly at agitation. As outlined in Section 7.8 and Table 7.4 pre mitigation odour is predicted to decrease by approx. 2% from 146,170 to 143,432 odour units.

Table 7.4: Annual odour emission figures for the 600 sow unit and the 1000 sow (based on Table 5 of Odournet UK Report[12])

[12] Odour Impacts and Odour Emission Control Measures for Intensive Agriculture

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Category of pig	Number	Odour emissions / animal (o.u.)	Total Odour emissions (o.u.)
600 sows Suckling sow & litter	100	18	1800
Dry sow	500	19	9500
Boars	3	20	60
Maiden gilts	100	20	2000
Weaners	2500	6	15000
Fattening pigs	5236	22.5	117,810
Total =>			**146,170**
1000 sows Suckling sow & litter	167	18	3006
Dry sow	833	19	15827
Boars	5	20	100
Maiden gilts	166	20	3320
Weaners	4000	6	32143
Fattening pigs	3957	22.5	89036
Total =>			**143,432**
% change			**- 2%**

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7.4.6 Other gaseous emissions

Sulphur dioxide (SO_2) is a harmful gas produced mainly by the combustion of fuel and particularly associated with the power generating industry. Very small quantities will be produced from the combustion of fuels at the proposed development (e.g. heating, diesel engines). Hydrogen sulphide (H2S) is a gas associated with slurry storage and may be vented from the site during slurry agitation and pumping. Agriculture accounts for less than 2% of the national carbon monoxide production, which again is produced from the decomposition of slurry. Non-methane volatile organic compounds area produced from slurry storage. The concentration of these latter compounds may be negligible in a measurable sense but combined they create odour (and contribute to particulate matter) and are emitted via the ventilation in very small quantities.

7.5 RESULTS OF ASSESSMENT

7.5.1 Assessment of pre-mitigation impacts

The impact assessment uses the criteria set out in Table 7.1 and based on the sensitivities as described in Section 7.2 a significance of impact is applied to potential impacts.

7.5.2 'Do Nothing' impact

There is no change to the baseline environment in a do-nothing scenario. Odour emissions may be slightly higher due to higher numbers of finisher pigs.

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7.5.3 'Do Something' impact

7.5.3.1 Potential pre mitigation impacts of Ammonia emissions on agricultural land

The predicted rates of ambient deposition of ammonia (taking into account the pre-mitigation increase) does not significantly affect agricultural production or food quality.

7.5.3.2 Potential pre mitigation impacts of ammonia (NH_3) emissions on rural dwellings

The rural air quality for this area is rated as good by the EPA Air Quality Index for Health (http://www.epa.ie/air/quality/). The baseline deposition of ammonia which includes the existing pig farm is estimated to be average for the South West of Ireland i.e. 21 kgs / ha / year (see Figure 7.2). The additional pre-mitigation loading (7.8t – 7.4t = 0.4t – See Tables 7.4 and 7.5), within the 8,250ha study area and environs, due to the proposed development is 0.05 kgs / ha / year which is not significant. Within 1-2 kilometres of the pig unit the pre-mitigation NH_3 deposition levels are elevated by approximately 1 kgs / ha / year due to the proposed development (total proposed is 13kgs/ha/yr pre mitigation). The average value of NH_3 in the atmosphere for Ireland is 1.45[13] µg NH_3 / m^3 and measurements from the UK at sites near pig and poultry farms were 8.68 µg NH_3 / m^3. These levels are far less than exposure limits for NH_3 set by the Occupational Safety and Health Administration (OSHA) in the USA (ATSDR, 2004) – 8[14] hours exposure : 17000 µg NH_3 / m^3. Without mitigation there are no known significant effects on rural dwellings at these acceptably low levels.

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7.5.3.3 Potential pre mitigation impacts of ammonia (NH_3) emissions on commercial businesses, tourism services and settlements

The nearest commercial business in Ballylanders (also nearest settlement) are 2.8km north west of the proposed pig buildings. These will not be significantly affected due to the separation distance. The existing Ballyfauskeen site has been in operation for more than 30 years with little or none complaints regarding nuisance. Land spreading of organic manures is common place in rural Ireland and in the study area. There are no significant tourist assets within the study area (Lough Gur is approx. 2km from the study area). The risk to human population from land-spreading is negligible and nuisance can be effectively avoided by insuring adequate separation distances and using low emission spreading where possible (band-spreading or trailing shoe). Without mitigation there will be no significant effects on commercial businesses, tourism services or settlements.

7.5.3.4 Potential pre mitigation impacts of ammonia emissions on public water sources

As mentioned in Section 7.4.1 ammonia deposition can potentially lead to nutrient enrichment and acidification of surface waters. The water sources in the study area are groundwater and therefore are less susceptible to surface deposition. The baseline deposition of ammonia which includes the existing pig farm is estimated to be average for South West Ireland i.e. 21 kgs / ha / year and the additional pre-mitigation loading, within the study area, due to the proposed development is 0.05kg / ha / year. Therefore, without mitigation, water sources will not be significantly affected by ammonia deposition at these low levels.

[13] Section 2.1 EPA Report No 193 *Ambient Atmospheric Ammonia in Ireland,* 2013-2014

[14] Table 2.1 EPA Report No 193 *Ambient Atmospheric Ammonia in Ireland,* 2013-2014

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7.5.3.5 Potential pre mitigation impacts of ammonia (NH_3) emissions on ecosystems (watercourses, rivers, woodlands/forests, clean air, habitats);

Within the study area and environs the increased deposition of ammonia before mitigation will not affect existing sensitive ecosystems. The Aherlow River is 1.4km from the site boundary. The baseline water quality in this river is good and not at risk. There are no very high sensitive ecosystems (Natura Sites) within the study area. Pre mitigation ammonia are set to increase slightly (6%) - this will not significantly affect sensitive ecosystem.

7.5.3.6 Potential pre mitigation impacts of ammonia (NH_3) emissions on Cultural Heritage sites

Without mitigation the ambient deposition of ammonia does not significantly affect Cultural Heritage sites in the study area.

7.5.3.7 Potential pre mitigation impacts of methane (CH_4) and nitrous oxide (N_2O) emissions on agricultural land

Methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on agricultural land.

7.5.3.8 Potential pre mitigation impacts of CH_4 and N_2O emissions on rural dwellings

Without mitigation methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on rural dwellings.

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7.5.3.9 Potential pre mitigation impacts of CH_4 and N_2O emissions on commercial businesses, tourism services and settlements

Without mitigation methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on commercial businesses, tourism services or settlements.

7.5.3.10 Potential pre mitigation impacts of CH_4 and N_2O emissions on public water sources

Without mitigation methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on public water sources.

7.5.3.11 Potential pre mitigation impacts of CH_4 and N_2O emissions on ecosystems

Without mitigation methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on ecosystems within the study area.

7.5.3.12 Potential pre mitigation impacts of CH_4 and N_2O emissions on Cultural Heritage assets

Without mitigation Methane and nitrous oxide levels in the atmosphere within the study area will not have measurable effects on cultural heritage sites within the study area.

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7.5.3.13 Potential pre-mitigation impacts from dust and particulate matter

Construction dust arising from agricultural developments rarely gives rise to nuisance or significant effects due to the relatively short duration of construction and separation distances to nearest dwelling houses. Pre-mitigation construction dust emissions are unlikely to cause significant effects on human health or on adjoining ecosystems due to the short duration of the construction period. For construction workers dust arising from refurbishment of houses presents a potential hazard – but effects are likely to be not significant without mitigation.

Dust particles and particulate matter will be ventilated from the pig houses but will dissipate quickly to harmless quantities within a few meters of the exhaust vents. Dust can accumulate on house roofs and get washed into storm water run-off. Without mitigation this has the potential to cause a not significant – slight adverse impact on receiving waters. Dust can arise from un-sealed dry feed systems, or open/uncovered dry feed stores. However the proposed feeding system is a sealed wet feed system. Odour causing compounds (e.g. volatile fatty acids and ammonia) can cling to dust, therefore dust particles are associated with transmitting odour. There are potential pre mitigation slight to moderate adverse effects on worker's health in the pig confinement buildings which is addressed in Sections 3.5.3.10 and 3.6.3 of Chapter 3.

7.5.3.14 Potential pre-mitigation impacts from Malodour / Odour

According to section 4.10.1.1 of the Best Available Techniques (BAT) - reference document for the intensive rearing of poultry or pigs - the odorant concentration depends, essentially, on the degree of dilution of the odorants emitted during atmospheric transport in the airstream. Important factors (other than the number of pig) affecting odour concentration are:

1. The distance from the source;
2. The effective source height and relative elevation of the source and receptor(s);
3. The odorant flow rate;
4. Atmospheric conditions; and
5. Local topography and features (surface roughness).

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The location of the closest sensitive receptor (dwelling) outside the existing site (and not owned by the developer) is located at approximately 60m west of the nearest existing pig house. The next nearest houses are located at approximately 110m and 250m west and north of the nearest existing pig houses. The ventilation rates in the existing and proposed houses are relatively low (controlled natural ventilation in the finisher houses). The surrounding topography is flat which minimises interference with odour dispersion.

7.5.3.14.1 Results of Odour Assessment

There are 40 dwellings within 1km of the proposed site boundary as illustrated in Figure 1.2 of this EIAR. In the existing 600 sow unit there is the potential for periodic nuisance odours from the pig farm at 2 – 3 houses closest to the pig farm. This is projected to reduce slightly before mitigation (-2%) – which is not a significant change.

7.5.3.15 Potential pre-mitigation impacts from other gaseous emissions

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Sulphur dioxide although harmful, will be emitted in such small quantities as to have no significant effect – particularly when any boilers or diesel engines will be maintained according to the prevailing regulations for these devices.

The volumes of odourous gasses such as non-methane volatile organic compounds are negligible in a measurable sense and therefore will have no significant effect outside the site of the proposed pig farm – except in the case of potential odour nuisance which is addressed in section 7.5.3.14. Therefore the pre-mitigation effect of these gases is not significant.

Hydrogen Sulphide and Carbon monoxide are dangerous gases associated with slurry agitation and pumping. The effects of these outside the site will not be significant. However the pre-mitigation impacts i.e. the absence of health and safety measures could have a moderate adverse –significant adverse effect on worker's health on the pig farm.

7.6 MITIGATION

7.6.1 Construction Phase Mitigation

- Construction workers will be equipped with the relevant personal protection equipment at all times to mitigate construction and refurbishment dust. This includes eye and ear protection and dust masks;
- Material from refurbishment works will be segregated and stored in skips to minimise dust production;
- A water tanker will be available to douse exposed soil during dry weather to prevent dust nuisance, if required. Material drop heights from plant to plant or from plant to stockpile will be minimised; and
- The contractor(s) will confine construction works to normal operational hours 8am to 6pm Monday to Friday.

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7.6.2 Operational Phase Mitigation for land spreading emissions

- Low trajectory splash plate is the minimum requirement for adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). However, the pig farm will use only contractors who have low emission spreaders such as trailing shoe and band spreading where possible. These methods are proven to reduce NH_3 on average by 36% (see Table 2.1 of Chapter 2);
- The pig farm will encourage farmers to apply the pig manure in the early season and because applying pig manure in cooler weather and early in the year can reduce NH_3 emissions by over 30%[15] (and result in lower odour emissions);
- The pig farm will monitor complaints and will inform the customers for the manure to allow set back distances of at least 50m from dwellings and 200m from sensitive receptors such as schools;
- Customer farmers for the pig manure will be advised to notify neighbours regarding planned pig manure applications in sensitive areas (near villages or where there is a history of complaints);

[15] Teagasc Technology Updates; Project Number: 5508; Dec 2011

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- Customer farmers for the pig manure are required to keep application rates to those specified in Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) i.e. to replace chemical fertiliser. Therefore typically low rates per hectare will be applied (10 m3 / ha see Section 5.3.4 of Chapter 5). Applying pig manure in adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) means that chemical nitrogen will be replaced thus off-setting NH_3 and N_2O emissions from chemical fertiliser. The Department of Agriculture, Food and the Marine will be supplied with records of slurry movement so that it can monitor pig manure exports and inspect farmers who use it to ensure that the land spreading of pig manure is in compliance with the Regulations; and
- Reducing the protein level in balanced diets can reduce the level of NH_3 loss in manure by 20 - 30%. It is proposed to reduce the protein in the growing pig diet by 2% compared to conventional diets – i.e. 11% reduction in the NH_3 produced compared to existing (see Tables 7.5 and 7.6 below).

7.6.3 Operational Phase Mitigation for emissions from the pig houses;

- In order to mitigate potential adverse effects of dust on surface water run-off there is a surface water monitoring programme in place as required by an IPPC license for the pig farm;
- Pigs in the proposed development will be fed through a sealed wet feed system, which takes feed from sealed containers (Silos) and distributes it to the feeders in the rooms, on an ad-lib basis, as per pig's natural requirements, thereby significantly reducing the dust levels in the internal, and external environment. This mitigates dust emissions and, because dust particles will carry some of the odorous compounds, it will also mitigate odour;
- The feed silos and augers are completely housed in the new feed mill building, thus confining dust;
- Pig houses will be effectively ventilated;
- Good operational practise to minimise odour at the pig farm will include;
    - Cleanliness; the existing and proposed housing has minimal external walk ways and therefore soiled yards are not an issue. Internal houses are cleaned regularly;
    - Dryness; the slatted houses are well ventilated to remove moisture. Slatted floors along with routine maintenance of drinkers and water fixtures will reduce wetness and therefore reduce NH_3 emissions;
    - Pig manure levels in pig manure tanks are kept to a minimum during the summer season (highest risk of odour nuisance); and
    - An Air Quality (Odour) Management Plan which adheres to EPA Odour Emissions Guidance Note (AG9), September 2019, will be implemented on the farm to comply with IPPC license requirements (Appendix 4 of Volume 3 of this EIAR).
- Pig carcasses will be stored in air tight containers and will be collected at least every two weeks;
- Reducing the protein level in balanced diets can reduce the level of NH_3 loss in manure by 20 - 30%. It is proposed to reduce the protein in the diet by 2% compared to conventional diets – i.e. 20% reduction in the NH_3 produced from the pig houses (see Table 7.5 below). A 20% reduction in the growing pig ammonia emissions will result in a 16% reduction overall – or 11% less than existing;
- The Odournet UK report (page 64) states that odour reductions in the order of 25-30% are achievable by reducing protein in the diet. Hayes et al (2004) found that odour reductions of 33% and 38% can be achieved by reducing the protein from 19% CP to 16% and 13%

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respectively. Therefore a 2% reduction in the finisher diet protein should give a 20% reduction in odour emissions.

- Procedures for the safe handling (agitation and pumping) of slurry and warning signs will be used to protect workers from the effects of H_2S and CO (Carbon Monoxide);
- The pig farm will adhere to the current *Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture* as published by DAFM in November 2019 and contained in Appendix 3 of Volume 3 of this EIAR; and
- Other alternative technologies to reduce emissions (e.g. anaerobic digestion (AD) and slurry amendments) are considered in Section 2.7.2 of the EIAR. These technologies (e.g. AD) require state incentives before they are viable.

7.6.4 Operational Phase Mitigation for emissions within the pig houses;

The health and safety of workers is addressed in the safety statement of the pig farm which includes administrative controls to minimise the source of, and the amount of time workers are exposed to dust, NH_3, and particulate matter and insures adequate cleaning of pig houses, safety and awareness training, and the provision of personal protection equipment i.e. dust masks and eye and ear protection. Procedures for the safe handling (agitation and pumping) of slurry and warning signs will be used to protect workers from the effects of H_2S and CO (Carbon Monoxide).

From a human health perspective the adoption of low protein diet is in compliance with Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture and therefore in compliance with National objectives to reduce NH_3 emissions (and NH_4, $PM_{2.5}$ and PM_{10}) below Ireland's National Emission as discussed in Chapter 8.

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7.7 RESIDUAL IMPACTS (post mitigation)

Ammonia

Table 7.5: Summary of the effect of a reduction of dietary protein and the use of low-protein diets on nitrogen excretion and ammonia emission[16]

Parameters	Effect of 1 percentage point reduction of dietary protein (%)	Using low-protein diets	
		Frequent cumulative effect (%)	Best cumulative effect (%)
Total nitrogen excreted	-10	-25	-50
Ammonia content in slurry	-10	-30	-50
Slurry pH	-	-0.5 points	-1 point
Ammonia emission to air	-10	-40	-60
Water consumption (ad libitum)	-2 to -3	-10	-28
Slurry volume	-3 to -5	-20	-30

In a literature review carried out by Ajinomoto Animal Nutrition and reported in Section 4.1 of BAT Guidelines for Intensive Agriculture 2017, data from reported trials on the effects of low-protein diets (supplemented with synthetic amino acids) on the nitrogen and manure output from pigs were selected from a large variety of sources within and outside Europe. The conclusion that could be reached was that the excretion of nitrogen drops by 10 % per percentage point reduction in dietary protein for pigs between 25 kg and 110 kg, with a linear trend in the range of a 12 % to 20 % crude

[16] Table 4.17 BAT 2017.

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protein level. Table 7.5 summarises the effects of a reduction in dietary crude protein levels and the use of low-protein diets. Low protein diets reduces the nitrogen in the slurry those reducing emission from housing and land-spreading. When combined with early season timing[17] it should be possible to further reduce overall NH_3 emissions.

Table 7.3 shows that the growing pigs in the proposed development produce 79% of the NH3 [(5,357 + 10,289)kgs out of a total 19,698kgs]. Therefore a 2% reduction in the growing pig diet will result in 16% (20% x 79%) reduction in projected NH3 emissions, reducing the 19.6 tons to 16.4 tons. This represents a reduction of approx. 11% compared to existing. This assumption is further enforced because pig manure will displace chemical N fertiliser. With mitigation the impact of the proposed development is not significant.

Methane and Nitrous Oxide

The EPA tool uses a standard emission rate of 13.3 kgs CH_4 per finisher pig per year (Table 7.2 of this chapter). The level of increase of methane post mitigation is approx. 17% above the existing pig farm. If this is assigned to the study area it represents an increase of approx. 2.2kgs CH_4 / ha compared to an existing baseline of 65kgs CH_4 / ha[18]. This is not a significant effect.

The EPA tool uses a standard emission rate of 0.014 kgs N_2O per finisher pig per year (Table 7.2 of this chapter). The level of increase of nitrous oxide post mitigation is approx. 8% above the existing pig farm baseline representing an increase of 8kgs. If this is assigned to the study area it represents an increase of approx. 0.001kgs N_2O /ha compared to an existing baseline of 13[19] kgs / ha / year. This is not a significant effect.

The post mitigation increases in methane and nitrous oxide do not represent a significant effect on the baseline environment around the site or within the study area.

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Other Gasses

Pre mitigation dust and particulate matter (PM_{10} and $PM_{2.5}$) will not cause significant effects outside the pig houses due to adequate dispersion of tiny quantities. Similarly the emissions of gases such as sulphur dioxide, hydrogen sulphide, carbon monoxide and non-methane volatile organic compounds will be emitted at very low quantities and will not cause effect outside the pig confinement buildings. The implementation of a safety statement which includes administrative controls to minimise the source of, and the amount of time workers are exposed to dust, NH_3, and particulate matter and insures adequate cleaning of pig houses, safety and awareness training, and the provision of personal protection equipment i.e. dust masks and eye and ear protection will adequately address the potential negative adverse effects on human health. Procedures for the safe handling (agitation and pumping) of slurry and warning signs will be used to protect workers from the effects of H_2S and CO (carbon monoxide).

Post mitigation dust, particulate matter (PM_{10} and $PM_{2.5}$) and other gases such as sulphur dioxide, hydrogen sulphide, carbon monoxide production and non-methane volatile organic compounds will not cause significant effects.

[17] >30% reduction spreading in early season according to DAFM COP on reducing NH_3 emissions
[18] 548,200 tons (Table 4 CSO Environmental Accounts, 2016) over land area of 8.4 million hectares (Ireland)
[19] 112,300 tons (Table 6 CSO Environmental Accounts, 2016) over land area of 8.4 million hectares (Ireland)

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Odour

While land spreading of organic manures has the potential to cause nuisance, the study area is predominantly a rural setting where land spreading is common practise. The required statutory mitigation, (i.e. adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020)) will ensure that chemical fertiliser is replaced by the pig manure thus minimising application rates and number of applications. Also using low emission spreaders, where possible, will reduce odours. In general, potential nuisance effects from land-spreading are transitory and not significant.

Pre-mitigation, the odour unit production from the pig farm will reduce by 2% due to lower numbers of finishers on site. Reducing protein in the diet has a similar effect on odour and ammonia. The Odournet UK report (page 64) states that odour reductions in the order of 25-30% are achievable by reducing protein in the diet. Hayes et al (2004) found that odour reductions of 33% and 38% can be achieved by reducing the protein from 19% CP to 16% and 13% respectively. Therefore a 2% reduction in protein is predicted to give a 20% reduction in odour. Table 7.4 shows that approx. 84% of the odour units are produced by the growing pigs [(32,143 + 89,036)o.u. out of a total of 143,432 o.u.]. Therefore the post mitigation decrease in odour output is approx. 16-17% reducing the proposed pre mitigation odour units from 143,432 (Table 7.6) to 119,196[20]. This is a reduction of 18% compared to existing. Further mitigation is expected from the following;

- Carcass skip will be located at the eastern side of the proposed pig houses - at the furthest point of the site from the nearest dwelling; and
- Implementation of an odour management plan (see Appendix 4 of Volume 3 of this EIAR);

With low protein diets combined with good management practices the odour impact will reduce, therefore the proposed development will not result in a significant adverse effect.

Having considered the sensitivity of receptors in the existing land spreading area and the area around the pig farm, the long history of pig production at the existing site and the magnitude of impacts, the residual impacts of the proposed development are considered to be not significant when mitigation measures are employed. Table 7.6 provides a summary of the gaseous emissions pre and post mitigation.

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Table 7.6: Summary of existing and proposed pre and post mitigation gaseous emission from 'Ballyfaskin Pig Farm'

Gaseous emission	Existing	Proposed	
		Pre-mitigation	Post-mitigation
NH_3 (tons)	18.5 (100%)	19.6 (106%)	16.4 (89%)
CH_4 (tons)	106.5 (100%)	125.3 (117%)	125.3 (117%)
N_2O (kgs)	108 (100%)	116 (108%)	116 (108%)
Odour (odour units)	146,170 (100%)	143,432 (98%)	119,196 (82%)
Dust & PM	Not significant	Not significant	Not significant
Other[21]	Not significant	Not significant	Not significant

[20] Growing pig odour units are reduced by 20% from 121,179 o.u. (32,143 + 89,036) = 24,236o.u. This represents an 18% reduction compared to the existing 600 sow enterprise (figures taken from Table 7.4)

[21] SO_2, H_2S, CO, Non-methane Volatile Fatty Acids

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7.8 CUMULATIVE IMPACTS (post mitigation)

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*". Cumulative effects are defined in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

There is a pig farm in Inchacoomb located 2km east of the proposed development. Due to the separation distance of the pig farms there is no cumulative odour impacts from the pig houses. Similarly the NH3, CH_4 and N_2O emissions from the pig houses will not contribute to a significant effect because the emissions from the Inchacoom piggery are smaller in scale and at a separation distance of 2km the cumulative effect is not significant. The inchacoom farm delivers pig manure to some of the townlands within the study area and therefore there is a potential cumulative impact on air at these land-spreading locations. The contribution of NH3, CH_4 and N_2O to the large geographical area of the spread-lands of both piggeries is not significant

There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. There is a very low potential for overlap in the land-spreading areas at this separation distance and therefore cumulative effects are unlikely.

7.9 CONCLUSIONS

Mitigation such as having a health and safety management plan for construction workers and dousing dry clay surfaces will mean that impacts on Air during construction phase will not be significant.

There is no significant impact on Air throughout the study area due to spreading pig manure from proposed development at Ballyfauskeen.

At the Ballyfauskeen site the post mitigation ammonia emissions will reduce by 11%.

Emissions such as methane and nitrous oxide will increase by 17% and 8% respectively, but the increase is not significant when considered over the entire study area.

Dust and particulate matter will not significantly impact on Air, either throughout the study area or in the locality around the proposed 'Ballyfaskin Pig Farm' development.

Post mitigation odour emissions will reduce by 18% and therefore there is no significant adverse effect from the proposed development.

There is no significant cumulative impact on Air throughout the study area due to spreading pig manure from the Inchacoomb Pig Farm located 2km from the site of the proposed development.

7.10 REFERENCES

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CHAPTER 8 - CLIMATE

Section 8.1 introduces the topic of Climate and refers to other sections of the EIAR where this topic is addressed. Ireland's climate obligations and national policy are discussed in this section. **Section 8.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 8.3** looks at the receiving environment and national trends. **Section 8.4** describes the characteristics of the proposed development relevant to this topic, in particular emissions of methane, nitrous oxide and ammonia. **Section 8.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. **Section 8.6** sets out proposed mitigation measures. **Section 8.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 8.8** and conclusions regarding impacts on Climate are provided in **Section 8.9. Section 8.10** contains references for the chapter.

8.1 INTRODUCTION

This chapter addresses impact on Climate and discusses the proposed development at 'Ballyfaskin Pig Farm' in relation to National Policy on Climate Action. More specific aspects of the micro climate and air quality within the study area are addressed in Chapter 2 (Alternatives), Chapter 3 (Human Population and Human Health) and Chapter 7 (Air) of the EIAR. Methane and nitrous oxide are the main agricultural GHGs. Ammonia, which is almost entirely sourced from agriculture, is relevant mainly to air quality regulations.

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Ireland's climate obligations

The European Plan on Climate Change was launched in early 2007. In December 2008, the European Union (EU) Climate Change and Renewable Energy Package[1] was adopted by the EU Parliament and this package set out a number of commitments. This package commits to reduce the EU's Greenhouse Gas (GHG) emissions from non-Emission Trading Scheme (ETS) sectors (such as transport, agriculture, residential and waste) by 20% on 1990 levels by 2020 or by a more ambitious 30% in the event of a comprehensive global agreement. As part of the effort-sharing proposal of this package, Ireland is one of the countries facing the highest target of a 20% reduction on 1990 levels for non-ETS sectors. This will result in a limit of approximately 38 million tonnes of carbon dioxide equivalent (Mt CO_2 eq) for Ireland's non-ETS emissions in 2020, together with annual binding limits for each year from 2013 to 2020. In October 2014, EU leaders agreed the 2030 Climate and Energy Policy Framework to reduce greenhouse gas emissions by at least 40% compared to a 1990 baseline. Following on from the 2014 agreement, the proposal for an Effort Sharing Regulation (ESR), announced in 2016, provides a binding annual greenhouse gas emissions target for Ireland of 30% below the 2005 level by 2030.

National Policy on Climate Action

The Climate Action and Low-Carbon Development National Policy Position for Ireland was published in 2014. The Position provides a high-level policy direction for the adoption and implementation by Government of plans to enable the State to move to a low carbon economy by 2050. The Climate Action and Low Carbon Development Act (S.I. 46/2015) was published by

[1] The 2020 energy goals are to have a 20% (or even 30%) reduction in CO_2 emissions compared to 1990 levels, 20% of the energy, on the basis of consumption, coming from renewables and a 20% increase in energy efficiency https://www.recs.org/glossary/european-20-20-20-targets

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government in January 2015. The Act sets out the national objective of transitioning to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. The act provides for the preparation of National Mitigation Plans and Sectoral Plans which will specify policies to reduce greenhouse gas emissions for each sector, including agriculture.

The first National Mitigation Plan was published in July 2017 by the Department of Communications, Climate Action and Environment. The Plan is designed to be a whole-of-Government approach to tackling greenhouse gas emissions, particularly, in the key sectors i.e. electricity generation, the built environment, transport and agriculture. In relation to agriculture it sets out high level strategies and objectives relating to research, collaboration between institutions, strategy on land use (forestry) and strategy relating to biomass and identifies broad mitigation policies. The second National Climate Action Plan (*Climate Action Plan to Tackle Climate Breakdown*) was published on 17th June 2019 by the Department of Communications, Climate Action and Environment. This plan sets specific policy actions for the individual sectors of the economy. The roadmap set out for agriculture includes;

- Delivery of substantial verifiable greenhouse gas abatement through adoption of a specified range of improvements in farming practice in line with recommendations from Teagasc;
- Delivery of expansion of forestry planting and soil management to ensure that carbon abatement from land-use is delivered over the period 2021 to 2030 and in the years beyond;
- Support diversification within Agriculture and land use to develop sustainable and circular value chains and business models for lower carbon intensity farming, including, organic production, and protection and enhancement of biodiversity and water quality; and
- Production of bio-based products and bioenergy through the Common Agricultural Policy and implementation of the National Policy Statement on the Bio-economy.

The 2019 National Climate Action Plan to Tackle Climate Breakdown sets out specific targets (refer to Table 8.7 for relevant targets for the proposed development) and dates by which these actions should be implemented. The plan also outlines an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise on national capacity for sustainable food production. While recognising there are no zero emission options for agriculture and that agriculture presents challenges that are not fully amenable to technological solutions for emission abatement, as may exist or evolve in other sectors, the plan also expects agriculture to contribute to the 2030 goals by effectively reducing emissions by 10 – 15% from current levels (page 101 of the plan).

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The most recent EPA Report (July 2020): *Ireland's Greenhouse Gas Emissions Projections; 2019 – 2040* predicts that Ireland can and will meet its 2030 commitments by early adoption of a '*with additional measures scenario*' and a reduction of 12% in agricultural GHGs. The targets mentioned in relation to agriculture in Section 3.3 of that report focus mainly on the primary GHG emitting sectors (dairy, beef and sheep) but specifically mentions; *some of the key measures include nitrogen use efficiency, use of protected urea products, improved animal health, extended grazing, reducing crude protein in pigs, low emission slurry spreading, inclusion of clover in pasture swards.* The proposed reconfiguration of the herd will include *reducing crude protein in pigs* and *low emission slurry spreading* and will also help reduce nitrogen usage on farms leading to improved *nitrogen use efficiency.*

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EU Clean Air Policy[2]

[2] https://www.dccae.gov.ie/en-ie/environment/topics/air-quality/eu-clean-air-policy/Pages/default.aspx

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Following the EU 2013 Clean Air Policy Package to further reduce emissions of air pollutants until 2030 the National Emissions Ceilings (NEC) Directive entered into force on 31/12/2016. In Ireland the National Emission Ceilings Regulations (S.I. No 232/2018) sets a ceiling for ammonia is 116 kt – which it currently exceeds by a few percentage points (118.5 kt in 2017[3]). From 2020 Ireland will have an ammonia ceiling of 112.2 kilotons representing a 1% ammonia reduction relative to the 2005 level. A further reduction target of 5% relative to the 2005[4] level is to be achieved by 2030 – i.e. a ceiling of 107.6 kilotons - this is a 7.24% reduction on the 116 kt ceiling and a 9.2% reduction on the latest 2018 levels. Under the NEC Directive Ireland has to adopt and implement a '*Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture*' – DAFM November 2019. Measures within the code of practice (COP) include low emission spreading (e.g. trailing shoe), applying early in the year in cool conditions and storage in covered manure stores.

8.2 METHODOLOGY

8.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

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The following sources of information were referred to;

- Literature review of relevant Air Quality information;
    - Odournet U.K. Ltd 2001; *Odour Impacts and Odour Emission Control Measures for Intensive Agriculture*;
    - Teagasc Pig Farmers Conference Papers 18th – 20th October 1999;
    - National Climate Change Strategy Ireland – Department of the Environment and Local Government;
    - EPA (Inventories and Projections 1997 – 2000);
    - Air and Waste Management Association (AWMA) U.S.A. June 2000 meeting – paper on dispersion models (ADM AERMOD and ISC3) by Steven R. Hanna, Bruce A. Eyer, John Purdum and Jen Wagler;
    - Environmental Impact Conference Papers – Johnstown Castle September 1991.
    - Health & Safety Authority and NUIG, (2007); *Exposure assessment to airborne contaminants in the indoor environment of swine farms*;
    - Irish Agriculture, Greenhouse Gas Emissions and Climate Change: *opportunities, obstacles and proposed solutions;*
    - Teagasc; Dec 2011; Project Number 5508; *An evaluation of strategies to control ammonia emissions from the land - spreading of cattle slurry and cattle wintering facilities;*

[3] EPA ; 2019, *Ireland's Air Pollutant Emissions 2017 (1990-2030), Table 1.*

[4] 116 kt NH_3

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- Teagasc; March 2019; *An Analysis of Abatement Potential of Greenhouse Gas Emissions in Irish Agriculture 2021-2030*; Prepared by the Teagasc Greenhouse Gas Working Group;
- *Ammonia in the UK* – Department of the Environment Food & Rural Affairs – 2002;
- The Biogas Handbook Published by University of Southern Denmark, Authors - Teodorita Al Seadi, Dominik Rutz, Heinz Prassl, Michael Köttner, Tobias Finsterwalder, Silke Volk, Rainer Janssen;
- Alnarp; 2010; Measures to reduce ammonia emissions in pig production – Review Swedish University of Agricultural Sciences - Faculty of Landscape Planning, Horticulture and Agricultural Science : Report 2010:12 ISSN 1654-5427 ISBN 978-91-86373-19-1;
- ADAS: Feb 2015; Study to Model the Impact of Controlling Endemic Cattle Diseases and Conditions on National Cattle Productivity, Agricultural Performance and Greenhouse Gas Emissions - Final Report;
- F.-X. Philippe, B. Nicks / Agriculture, Ecosystems and Environment 199 (2014) 10–25 *Review on Greenhouse gas emissions from pig houses; Production of CO_2, CH_4 and N_2O by animals and manure;*
- EPA; 2016; *Emission and Waste Transfer Reporting Guidance for the Intensive Agriculture Sector;*
- EPA Report No 193; *Ambient Atmospheric Ammonia in Ireland, 2013-2014*; and
- Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs; 2017;
- University of Bath; *Inventory of Carbon & Energy V1.6a,* Prof Geoff Hammond and Craig Jones;
- EPA ; 2019, *Air Pollutant Emissions in Ireland 1990-2017*
- RICS; *Methodology to calculate Embodied Carbon*; 1st edition
- Air Quality Standards (AQS) from Regulations 2011 (S.I No. 180 of 2011) Pollutant
- EPA; *Irelands Final Greenhouse Gas Emissions in 2018* (April 2020);
- Department of Communications, Climate Action & Environment; 2017; *National Mitigation Plan*;
- Anaerobic digestion power plants in Ireland and Germany (Sept. 2016): Policy & Practice. Agathe Auer, Nathan H Vande Burgt et al
- Teagasc National Farm Survey 2017 Sustainability Report Cathal Buckley, Trevor Donnellan, Emma Dillon, Kevin Hanrahan, Brian Moran and Mary Ryan;
- Teagasc and NUI Galway; C. Dennehya*, P. G. Lawlorb, G. Gardinerc and X. Zhana *Greenhouse Gas Mitigation Potential of Anaerobic Digestion on Irish Pig Farms;*
- Government of Ireland: *Climate Action Plan 2019 to Tackle Climate Breakdown;* and
- EPA (July 2020): *Ireland's Greenhouse Gas Emissions Projections; 2019 - 2040*

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8.2.2 Assessment of Significance

The assessment of impacts involves:

1. Evaluation of the baseline environment. In the context of Climate the baseline study area is classified based on national classifications. The baseline sensitivity is assumed to be very high sensitivity to any increases in Climate Emissions given the commitments made by the Government of Ireland to reduce emissions.
2. Evaluation of the nature and magnitude of the effects on the climate and contribution to climate change.

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3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the impact significance is predicted based on criteria set out in the EPA (Draft) 2017 guidelines.

The significance of impact criteria are set out in Table 8.1.

Table 8.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*.
Profound Impact	*An effect which obliterates sensitive characteristics*.

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8.2.3 Duration of Impact

The construction phase will last approximately 4 months. Impacts on Climate are generally cumulative and are long term – although future policy and technology will mitigate impacts.

8.3 RECEIVING ENVIRONMENT

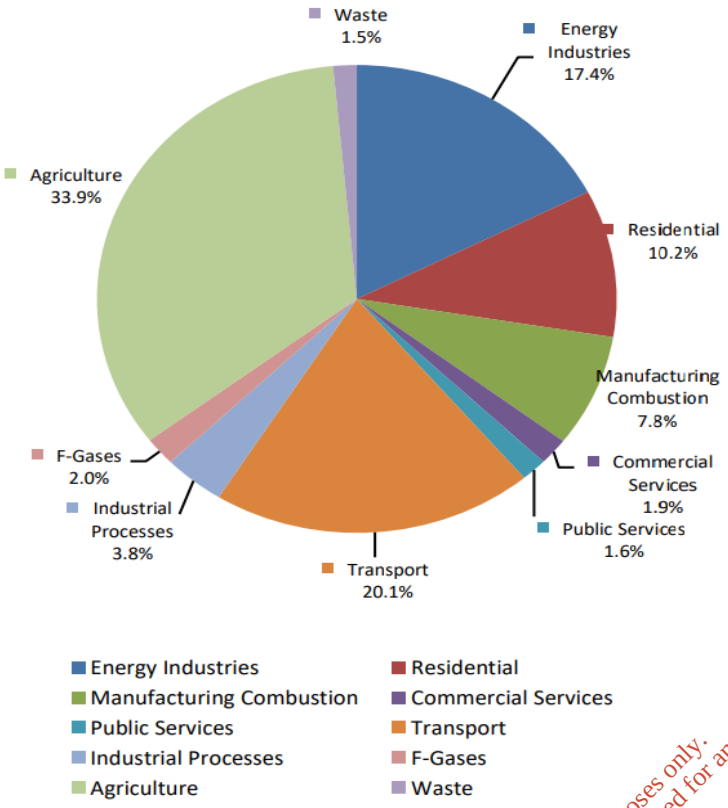
For Climate the sensitive receptor is the receiving national atmosphere. The local air quality effects are assessed in Chapter 7 of the EIAR with specific reference in that Chapter to local sensitive receptors.

8.3.1 The National Baseline Greenhouses Gases

In the 2018 provisional EPA figures, agriculture accounts for 34% of the national emissions i.e. 60.93 million tons. Agriculture emissions increased by 1.9% or 0.38 Mt CO_2eq in 2018 following an increase in 2017 of 2.9%. The most significant drivers for the increased emissions in 2018 are higher dairy cow numbers (+2.7%) with an increase in milk production of 4.4%. In the last 5 years, dairy cow numbers have increased by 27% and corresponding milk production by 40%. This reflects national plans to expand milk production under Food Wise 2025 and the removal of the milk quota in 2015. In 2018, there were also increased CO_2eq emissions from synthetic fertiliser application on agricultural soils (+10.7%). Other cattle and sheep numbers decreased by approx. 1%, and 1.7% respectively, whereas pig numbers increased by 0.7% in 2018. Total fossil fuel consumption in agriculture/forestry/fishing activities increased by 7.8% in 2018. Figure 8.2 illustrates that current national pig numbers are less than the baseline year (2005).

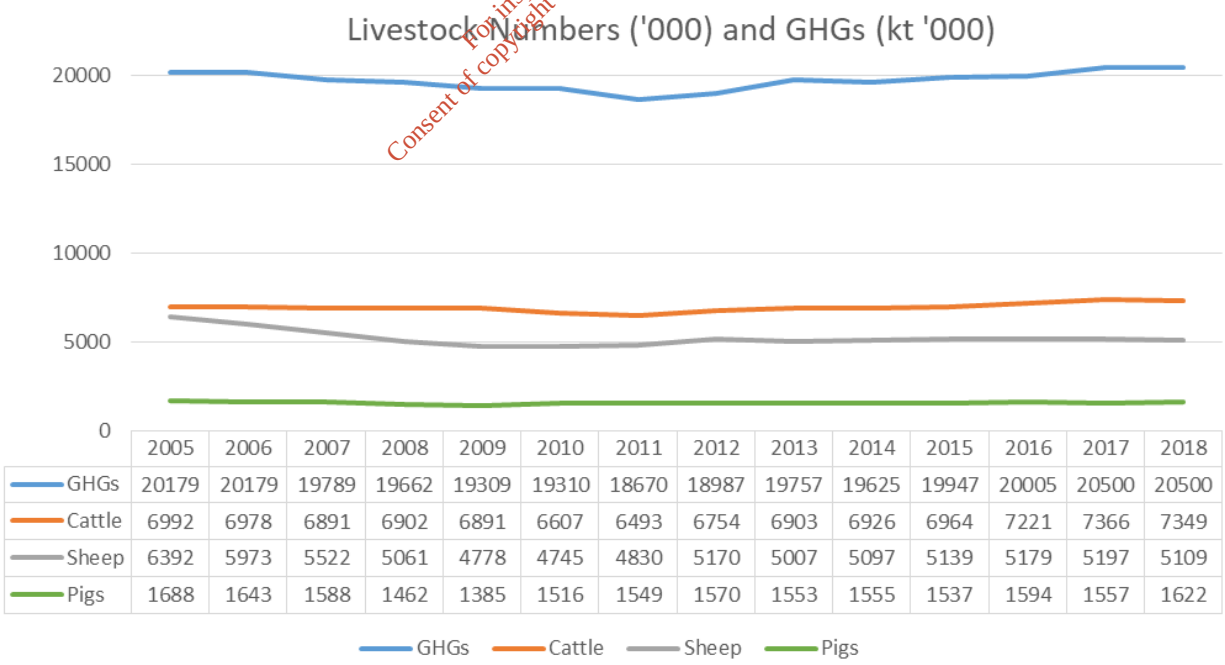
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Figure 8.1; 2018 GHG Emissions per sector (EPA, April 2020)



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Figure 8.2 Trends in National Livestock Numbers and Greenhouse Gases (CSO[5])



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GHGs	20179	20179	19789	19662	19309	19310	18670	18987	19757	19625	19947	20005	20500	20500
Cattle	6992	6978	6891	6902	6891	6607	6493	6754	6903	6926	6964	7221	7366	7349
Sheep	6392	5973	5522	5061	4778	4745	4830	5170	5007	5097	5139	5179	5197	5109
Pigs	1688	1643	1588	1462	1385	1516	1549	1570	1553	1555	1537	1594	1557	1622

Agricultural GHGs are dominated by methane from enteric fermentation (90%+ from the cattle and sheep sectors) and from nitrous oxide associated with the release from land due to chemical and

[5] Table 2 of crops and livestock June 2018 final results

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organic manure applications. Table 8.2 below illustrates that, nationally, the pig sector is responsible for approximately 367 Kt CO_2 equivalent emissions which is approximately 2% of the agricultural total. The figures in Table 5.2 *Emissions from Agriculture 1990-2018* of the EPA National Inventory report show the contribution from the pig section is 330 Kt CO_2 equivalent emissions. The figures in Table 8.2 (below) are calculated using the EPA AER / PRTR Calculator Tool for Intensive Agriculture and CSO data for the comparable national pig numbers in December 2018 (see Table 7.2 for emission factors). This tool is used throughout this assessment and the information in Table 8.2 illustrates that it is broadly in line with the National Inventory data (367 Kt using the tool vs 330 Kt in the National Inventory) – and the calculations using this tool are higher and therefore the resulting assessment of impact on Climate will be over-estimated rather than under-estimated.

Table 8.2: National GHG emissions from the National Pig Sector

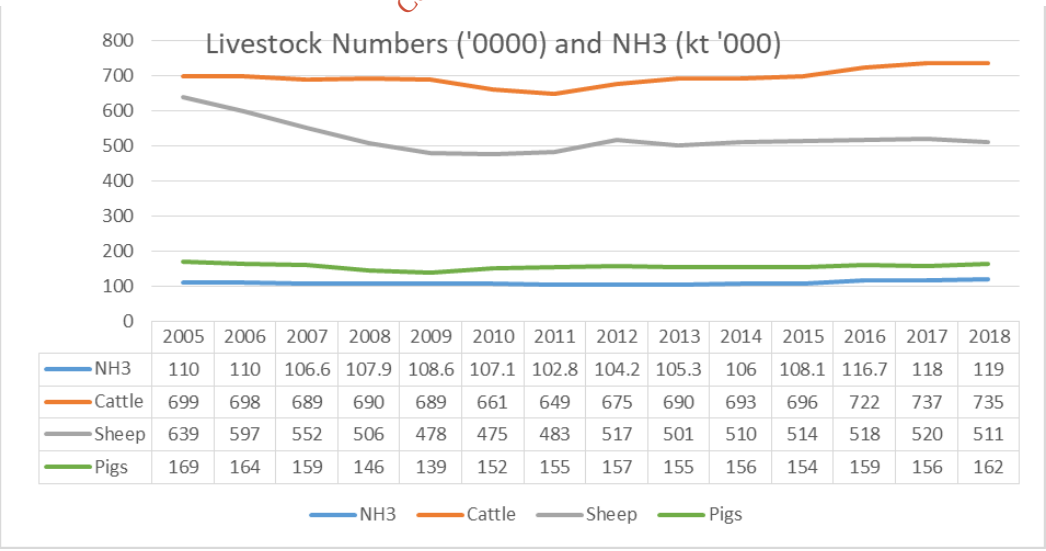
December 2019 National Pig Numbers (CSO[6])		NH3 (tons/yr)	CH_4 (tons / yr)	N_2O (tons / yr)	CO_2 (tons equiv.)
Breeding Gilts and sows	28,100	2,387[7]	14,467[8]	14.3 [5]	365,933[9]
Dry sows	99,400				
Piglets	451,600				
Maiden Gilts	16,500				
Boars	1,000				
Weaner Pigs	477,800				
Fattening Pigs	539,110				
Total Pigs (CSO) =>	1,613,300				

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8.3.2 The National Baseline Air Quality

8.3.2.1 The National Ammonia (NH_3) Baseline

Figure 8.3 Trends in National Livestock Numbers and Ammonia (CSO)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NH3	110	110	106.6	107.9	108.6	107.1	102.8	104.2	105.3	106	108.1	116.7	118	119
Cattle	699	698	689	690	689	661	649	675	690	693	696	722	737	735
Sheep	639	597	552	506	478	475	483	517	501	510	514	518	520	511
Pigs	169	164	159	146	139	152	155	157	155	156	154	159	156	162

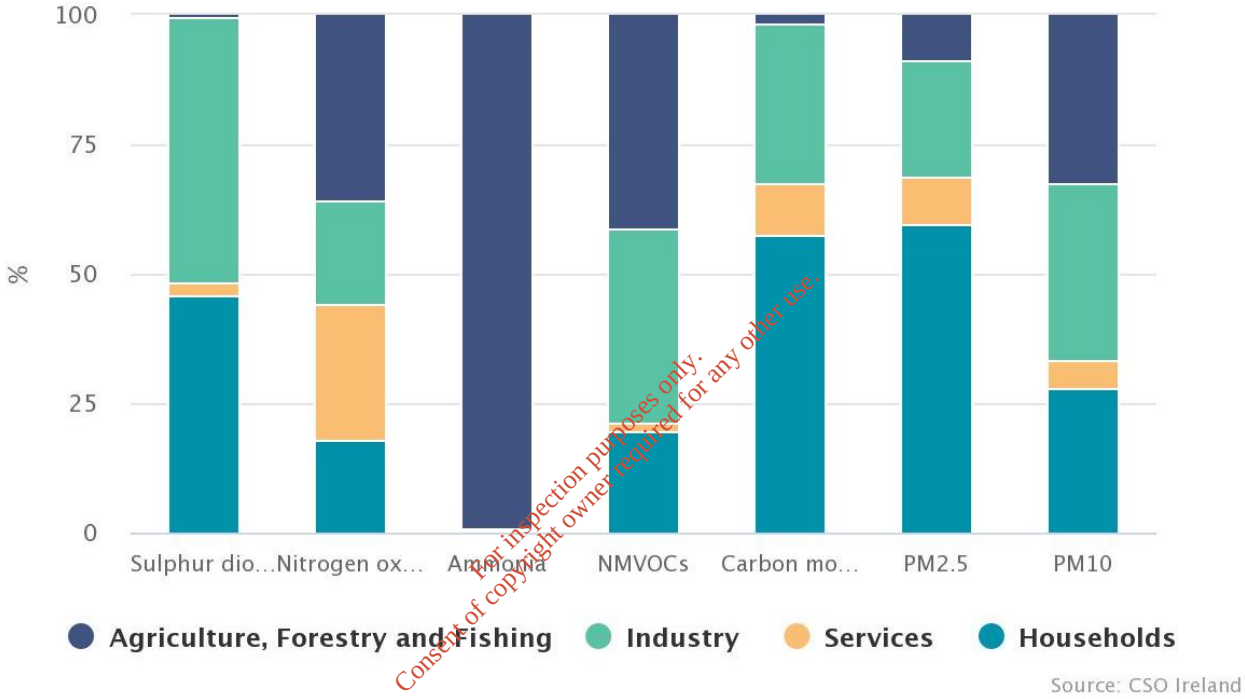
[6] Table 2 Livestock Survey December 2019
[7] Using the EPA AER / PRTR Emissions Calculator Tool for intensive agriculture
[8] Using the EPA AER / PRTR Emissions Calculator Tool for intensive agriculture
[9] CH_4 x 25 and N_2O x 298 = CO_2 equivalence.

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In 2017 national ammonia emissions were 118.5kt – an increase of 2% mainly due to an increase in dairy cow numbers and fertiliser use. The source of ammonia in the atmosphere is almost entirely due to agricultural production and management of animal manure. The national pig herd is responsible for approximately 2,387[10] tons NH_3 per year based on 2019 livestock numbers (approx. less than 2% of national emissions). As mentioned in Section 8.1 the national ceiling for NH_3 is the 2010 level - 116 kt. The dispersion of ammonia in the study area and locally is addressed in Chapter 7.

8.3.2.2 The National Baseline of other harmful gases and particulate matter

Figure 8.4; National Air Pollutants by sector *(Sources CSO)*.



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Sulphur dioxide (SO_2) is a harmful gas produced mainly by the combustion of fuel and particularly associated with the power generating industry. Ireland's emissions of sulphur dioxide have fallen from an annual average of 174,300 tonnes in 1990-1994 to 13,200 tonnes in 2017. Agriculture contributes less than 1% to national SO_2 emissions in 2017. Agriculture accounts for less than 2% carbon monoxide (CO) and total CO levels in the atmosphere has fallen 43% from 2009 to 2017 – there was a 13% decrease from 2016 to 2017. Non-methane volatile organic compounds (NMVOCs) has remained constant from 2009 to 2017 with agriculture producing approximately 41% of the emissions. National PM_{10} and $PM_{2.5}$ levels have fallen by over 28% and 32% respectively from 2009 to 2017 and Ireland is well below EU threshold levels. Agriculture accounts for 32% of the national PM_{10} production and 9% of the national $PM_{2.5}$ production in 2017. The rural environment of the study area is expected to have very low levels of these gases and particulate matters.

8.4 CHARAERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development will produce the following GHG emissions to the climate;

[10] Using EPA PRTR Calculation tool (which tends to over-estimate)

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- The construction of the proposed electrical substation and refurbishment of pig buildings will result in an increased output of GHGs due to Embodied Carbon. Embodied Carbon is the carbon footprint of materials used in the construction of the pig houses. It considers what quantity of (GHGs) are released throughout the supply chain and is often measured from cradle to (factory) gate, or cradle to site (of use). When assessing the impact of Embodied Carbon it is generally accepted that the up-front amount of CO_2 equivalence should be spread over the life of the building and added to the operation GHG emissions. In this case the operational life of the pig house is approx. 25 years;
- Greenhouse gasses comprised mainly of methane and nitrous oxide will be emitted from the reconfigured herd during its operational phase. Greenhouse gas emissions from the pig sector accounts for less than 2% of agricultural emissions;
- Carbon dioxide emissions from pig respiration and energy and fuel used on site; and
- Gaseous emissions other than GHGs, comprised mainly of ammonia (and nitrous oxide to a lesser extent), will be emitted in combination with lower quantities of other gases/pollutants and particles mentioned in Table 16.1 of S.I. No 180 of 2011. These include carbon monoxide, sulphur dioxide, non-methane volatile organic compounds (NMVOCs), PM_{10} and $PM_{2.5}$. The health implications of the particles and gases for workers in the pig houses have been addressed in Chapter 3 and Chapter 7. On a national scale emissions of NH_3/NH_4^+ and the inter-relationship with transboundary particulate matter (PM_{10} and $PM_{2.5}$) deposition is related to national health. The EPA website states that '*the number of premature deaths attributable to air pollution is estimated at 1,510 people and is mainly due to cardiovascular disease'.*

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8.5 RESULTS OF ASSESSMENT

The impact assessment uses the criteria set out in Table 8.1.

8.5.1 Do Nothing' impact

There is no change to the baseline environment in a do-nothing scenario.

8.5.2 Potential pre-mitigation impacts on Climate

Using the EPA AER / PRTR Emissions Calculator Tool for intensive agriculture (see Table 7.2 for emission factors) the CO_2 equiv. emissions can be calculated for the existing and proposed pig unit as illustrated in Table 8.3. The existing pig unit produces equivalent to 2,708 tons of equivalent CO_2 – this calculation is based on pig numbers and their methane and nitrous oxide production and using the conversion factors of 25 and 298 for CH_4 and N_2O.

Table 8.3; Estimated GHG emissions from the existing and proposed pig unit (before mitigation)

Pig Numbers	CH_4 (tons)	N_2O (tons)	CO_2 Equiv. (tons) / annum	% of National Agri Emissions
Existing (600 sows) 100, 500, 3, 100, 2,500 and 5,236 lactating sows, dry sows, boars, maiden gilts, weaners and finishers (no uncovered slurry storage / lagoons).	107	0.109	2,708	

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Pig Numbers	CH_4 (tons)	N_2O (tons)	CO_2 Equiv. (tons) / annum	% of National Agri Emissions
Less displacement of chemical fertiliser CO_2 (approx. 63 tons of CO_2 equiv)			**2,645**	**0.013%**
Proposed (1,000 sows) 167, 833, 5, 166, 5,357 and 3,957 lactating sows, dry sows, boars, maiden gilts, weaners and finishers (no uncovered slurry storage / lagoons).	125.3	0.118	3,167	
Less displacement of chemical fertiliser CO_2 (approx. 63 tons of CO_2 equiv)			**3,104**	**0.016%**
Increase in CO_2 emissions =>			**17%**	

The existing GHG emissions, which are part of the baseline environment, are predicted to increase by approximately 17% i.e. 459 tons of CO_2 equiv. per annum based on pig numbers and the predicted methane and nitrous oxide production – and excluding embodied carbon. The proposed pig development represents 0.016% of the national agricultural emissions and therefore without mitigation will not significantly impact on the Climate.

The displacement of chemical fertiliser should be considered. GHG emissions and energy consumption representing European production technology in 2011, as provided by Fertilizers Europe in 2014 (calculated with FertEU Carbon Footprint calculator V 1.0), suggest that each kg of nitrogen (source - calcium ammonium nitrate), phosphorous (source - triple super phosphate) and potassium (source - muriate of potash) have production carbon footprints of 3.7 kgs, 0.3 kgs and 0.1 kgs of CO_2 equivalent respectively. Therefore each m^3 of pig manure can potentially displace 4[11]kgs of CO_2 equivalent required for chemical fertiliser. The existing baseline 600 sow unit production of pig manure (15,681m^3 – Table 1.7) displaces approx. 63 tons of CO_2 equiv. from chemical fertiliser each year. The reconfigured herd will displace a similar quantity.

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Table 8.4; Estimated Embodied Carbon of Proposed Buildings

Building Component	Area / tons / litres	Kg CO_2 equiv.	Total CO_2 equiv. (tons)	Total CO_2 equiv. (tons over 25 years)
Existing embodied carbon (600 sows built since 2012)				
6,900m^2 existing buildings	6,900	435[12]	3,000	
Concrete tanks (m^3)	3,830	198[13]	760	
Aggregate back fill (tons)	2,000	0.005[11]	100	
Transport (8 hours / day @ 12 litres / hr) for 360 working days (litres)	34,560	2.7[14]	93	
Miscellaneous (+10%)			400	
		Total =>	**4,353**	174

[11] 1m^3 pig manure contains 2.1, 0.8 and 1.5 kgs of available N, P & K. 4kgs CO_2 equiv. /m^3 (does not include transport).
[12] RICS guidance note, Method to calculate embodied carbon, 1st edition. Figure 8, Small Light Industrial
[13] University of Bath' Inventory of Carbon & & Energy (ICE), Version 1.6.a (Table 1 – Reinforced concrete)
[14] Various internet carbon converters

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Building Component	Area / tons / litres	Kg CO_2 equiv.	Total CO_2 equiv. (tons)	Total CO_2 equiv. (tons over 25 years)
Proposed embodied carbon (1000 sows involving refurbishment of 3,624m2 and new electrical substation Electrical substation (m^2)	22	435	10	
Replacement slats (3,624m^2 = 360m^3)	360	198	51.5	
Walls / sub-divisions, miscellaneous concrete	360	198	51.5	
Aggregate back fill (tons)	500	0.005	2.5	
Transport (8 hours / day @ 12 litres / hr) for 180 working days (litres)	17,280	2.7	47	
Miscellaneous (+10%)			20	
		Total =>	**183**	**7.5**
		Increase in Embodied Carbon =>		**4.3%**

For this exercise it is assumed that pre 2012 most of the buildings were in-situ for 25 years and that there is no follow through of embodied carbon. The existing 600 sow embodied carbon (CO_2 equiv. of infrastructure) is expressed on an annual basis based on the life span of the building and tanks – which is assumed to be 25 years. The proposed embodied carbon (1,000 sows) is estimated based the construction of 22m^2 substation and refurbishment of houses 3, 5, 6, 7, 8 and 15 – 3,624m^2. This will require replacing slats and re-organising the internal divisions in the houses. The estimated embodied carbon for the proposed development is 200tons – spread over 25 years = 7.5 tons per year. This represents an increase of 4.3% due to the proposed development. During discussions in Section 8.7 and Section 8.8 the embodied carbon is not included because the GHG national inventory does not include this criteria.

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8.5.3 Potential pre-mitigation impacts from ammonia emissions

As discussed in Section 7.5.31 and the ambient deposition of ammonia, dust and malodour do not significantly impact on the receiving environment. The ammonia emissions were calculated using the EPA AER / PRTR emissions calculator tool for intensive agriculture (and shown in Table 1.4). Approximately 18.5 tons is produced by the existing 600 sow development and 19.7 tons of ammonia will be produced each year by the proposed 1,000 sow unit pig farm (before mitigation). When compared to the national total of 116 kt this will not significantly affect the existing Climate. However, it is recognised that it is national policy to reduce NH3 emissions.

8.5.4 Potential pre-mitigation impacts from other gaseous emissions and particulate emissions

Carbon monoxide, sulphur dioxide, non-methane volatile organic compounds (NMVOCs), PM_{10} and $PM_{2.5}$ are produced in very small quantities. In general, these emissions are not mentioned in the literature relating to pig farming and the environment as being significant issues for the Climate – except in the case of the confined pig house environments where potential health and safety of workers may be an issue. The national trend in all these gases and particulate matters is downwards, and all are below national emission ceiling targets; except NMVOCs. The quantities produced will be insignificant relative to national production and therefore without mitigation the effects are not significant.

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8.6 MITIGATION

8.6.1 Construction Phase Mitigation

- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor through regular servicing of machinery;
- During dry periods when dust generation is likely or during windy periods, construction areas and vehicles delivering material with dust forming potential will be sprayed with water, as appropriate;
- To control and minimise construction dust emissions materials will be handled and stockpiled to minimise their exposure to wind. Stockpiles of earth or building materials shall be kept to the minimum practicable height with gentle slopes. Material drop heights from plant to plant or from plant to stockpile will be minimised;
- To reduce GHG emissions haul distances will be minimised by selecting locally sourced materials where possible. The number of deliveries will be minimised by ordering in bulk. Materials will be handled efficiently on site to minimise waiting times for loading and unloading;
- Engines will be turned off when machinery is not in use;
- The regular maintenance of plant and equipment will be carried out to ensure efficient fuel consumption;
- Where possible replacement material will be considered such as Ground Granulated Blast Furnace Slag (GGBS) and Pulverised Fly Ash (PFA) as replacements for Portland cements; and
- Recycled materials will be used where possible. Re-using and recycling 90% of the waste construction materials on site (see Section 1.3.1.3 of Volume 2 of the EIAR) will reduce CO_2 emissions during the construction phase by reducing the amount of fill material imported into the site and by reducing the transport of waste material from the site.

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8.6.2 Operational Phase Mitigation for land spreading emissions

- Land-spreading mitigation measures such as moving towards using only contractors who have low emission spreaders such as trailing shoe and band spreading where possible. Applying pig manure in cooler weather and early in the year can reduce NH_3 emissions by 30% (and result in lower odour emissions).
- Keep application rates to those specified in Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020), i.e. replacing chemical fertiliser, and therefore low rates per hectare will be applied (see Section 5.3.4 of Chapter 5).
- Applying manure in adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) means that chemical nitrogen will be replaced thus off-setting NH_3 and N_2O emissions from chemical fertiliser;
- Reducing the protein level in balanced diets will reduce the level of NH_3 and N_2O loss in manure by up to 10% (Section 7.7); and
- The pig farm will employ only contractors with low emission slurry spreaders where possible.

8.6.3 Operational Phase Mitigation for emissions from the pig houses;

- The pig farm will implement an Energy Management System and carry out energy audit;

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- Machinery and motors will be switched off when not in use;
- There will be thermostatic controls on all heating systems;
- Automatic controls on the ventilation system will insure optimum efficiency;
- Night rate electricity will be used where possible;
- The buildings will be properly insulated, high U-value materials used;
- The use of low energy equipment and lighting will be used (all LED lights). Timers will be standard for lighting equipment;
- Good operational practise at the pig farm will include cleanliness and dryness to minimise dust and particulate matter emissions;
- Using a sealed wet feed system which takes feed from sealed containers (silos) and distributes to the feeders via pipes to the individual rooms significantly reduces the dust levels;
- Adhere to the National *Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture* – November 2019;
- An Air Quality (Odour) Management Plan which adheres to EPA Odour Emissions Guidance Note (AG9), September 2019, will be implemented;
- Continued investment in advanced genetics and improved management systems to achieve improvements in feed efficiency with resulting reductions of inputs and emissions; and
- Other alternative technologies (e.g. anaerobic digestion) are realistic mitigation options but will require State incentives before they are viable.

8.7 RESIDUAL IMPACTS (post mitigation)

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Table 8.5: Pre and Post mitigation Green House Gas production (excluding embodied carbon) from 'Ballyfaskin Pig Farm'

	Pre-mitigation (tons CO_2 equiv)	Post-mitigation (tons CO_2 equiv)
Existing pig farm	2,645 (100%)	-
Proposed pig farm	3,104 (117%)	3,104 (117%)

The GHG calculations are calculated in Section 8.5.2 of this EIAR (Table 8.3). There is a dearth of information in relation to the impact of low protein diets on emissions of CH_4 and N_2O. There are studies that suggest that low protein diets reduce CH_4 in barley based diets. F-X. Philippe et al (2006) reported a reduction of 13% in CH_4 and an increase of 100% in N_2O. Even though N_2O is a potent GHG (x 298 CO_2 equivalent) it will be produced in very low quantities compared to CH_4. Using the data from this one study would suggest that the proposed equivalent CO_2 emissions could be reduced a further 3 – 4% by the low protein diet. The most recent EPA report identifies the key measures which apply to the pig sector to insure Ireland meets its 2030 climate obligations; i.e. *nitrogen use efficiency, improved animal health, reducing crude protein in pigs,* and *low emission slurry spreading.*

- The proposed development will include a commitment to reduce the protein in the growing pig diet by 2%;
- The pig farm will move towards low emission spreading where possible;
- The replacement of chemical fertiliser will improve nitrogen use efficiency; and
- As verified by the recent EU 2020 Grand Prix award in relation to Health Management and the use of Slaughter Data Dashboard System to improve Pig Herd Health; this farm complies with the 'improved animal health' measure. Also, genetic improvements in the

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Irish sow herd since 2011[15] has seen the quantity of pig meat produced per sow has increase by 21% - this genetic improvement also leads to a reduction in greenhouse gases.

Therefore, the pre and post mitigation impacts are not significant and the proposed development is compliant with the specific measures for the pig sector which the EPA July 2020 report outlines in order for Ireland to meet its 2030 GHG commitments.

Section 8.8.1 demonstrates that available mitigation will make it possible for the proposed development to adhere to national policy on climate change further on into 2050 – but these measures will require policy changes from the government to become viable (e.g. anaerobic digestions and solar energy).

The National Emission Ceiling targets seeks to reduce emissions from agriculture to approx. 107.6 kt – which represents a 9% reduction on current rising levels. As discussed in Section 7.8 of Chapter 7, NH_3 post mitigation emissions will reduce by 3.1 tons to 16.6 tons. This is a reduction of approx. 11% compared to the existing farm. Having considered total national emissions, the residual impacts of the proposed development are considered to be not significant – with mitigation.

8.8 CUMULATIVE IMPACTS (post mitigation)

All impacts from existing pig farms have to be considered in light of the 2%[16] contribution that the national pig herd makes to the total national agricultural CO_2 emissions – as mentioned in Section 8.3.1 above.

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There is a pig farm in Inchacoomb located 2km east of the proposed development. The scale of the Inchacoom piggery is smaller than the existing 'Ballyfaskin' enterprise. The impacts of the existing 'Ballyfaskin Pig Farm' are considered not significant and the in-combination effects of NH3, CH_4 and N_2O from both pig farms to the large geographical area is not significant

There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. There is a very low potential for overlap in the land-spreading areas at this separation distance and therefore cumulative effects are unlikely.

Interactions between Climate and other environmental topics have been considered throughout this assessment; such as interactions with;

- Human Population and Human Health due to ammonia emissions from the pig houses and land-spreading and potential effects on human population due to climate change;
- Biodiversity due to ammonia, methane and nitrous oxide emissions from land spreading and the pig houses having potential effects on Biodiversity due to increase in greenhouse gases (GHGs) and global warming.

Having considered these interactions there are no additional significant impacts from the proposed development.

8.8.1 Cumulative impacts in the context of National policy;

[15] Teagasc National Pig Herd Performance Report 2017

[16] Table 5.2 Emissions from Agriculture 1990-2018 of the EPA National Inventory report show the contribution from the pig section is approx. 330 Kt CO2 equivalent emissions – total = 20,00Kt.

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Like many agricultural sectors, pig farming will face a requirement to reduce its carbon footprint. However this will depend on National Policy and, for example, decisions based on the fact that it is more four times more carbon efficient for the country to produce pork protein than beef protein, may affect future policy towards these agri sectors. All these decisions have to be made in light of the fact that Irish and World populations are set to increase by approx. 26-28% by 2050 (Section 1.4 of Chapter 1). The 2011 figures supplied by the Food and Agriculture (FAO) organisation in Table 8.6 shows the projected growth in the various meat commodities.

Table 8.6 Projected Global Population and meat consumption from 2010 to 2050 (FAO 2011)

Projected human population (in billion people) and global meat consumption (in million tons) from 2010 to 2050.
Source: adapted from FAO, 2011.

	2010	2020	2030	2050	Growth 2010–2050
Human population	6.91	7.67	8.31	9.15	+32%
Meat consumption					
Pig meat	102.3 (38%)	115.3 (36%)	129.9 (34%)	140.7 (30%)	+38%
Poultry meat	85.9 (32%)	111.0 (35%)	143.5 (38%)	193.3 (42%)	+125%
Bovine meat	67.3 (25%)	77.3 (24%)	88.9 (23%)	106.3 (23%)	+58%
Sheep/goat meat	13.2 (5%)	15.7 (5%)	18.5 (5%)	23.5 (5%)	+78%
All meat	268.7 (100%)	319.3 (100%)	380.8 (100%)	463.8 (100%)	+73%

When compared with beef or sheep meat products pork has a lower CO_2 footprint than. Page 30, Figure ES10 of the EC JRC 2010 report on the Evaluation of the livestock sector's contribution to EU GHG emissions illustrates that Irish beef and sheep meat have a footprint of approx. 20kgs CO_2 eq. / kg product. Pork has a footprint of approx. 5 kgs CO_2 eq. / kg product and thus is four times more efficient from a carbon emissions / climate point of view in satisfying increasing demand for meat protein at home and abroad. This fact has to be considered as an underlying cumulative effect and advantage that pork has from a climate change perspective where displacing 1kg of beef or pork can reduce the CO_2 emissions associated with that kg of product by 75%.

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The Government's National Mitigation Plan published in 2019 balances the need to feed an increasing population and the requirement for a transition to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. Parallel to the 2019 Mitigation plan the Government will seek to get flexibility credits based on LULUCF[17]. The 2019 Mitigation Plan sets out actions where the agricultural industry aided by research and incentives will contribute to the national mitigation. The following measures are identified in the 2019 report;

- Reducing nitrogen emissions by replacing 50% of CAN fertiliser with protected urea products and by nitrogen-use efficiency through increasing soil pH;
- Advancing manure management by changing 50% of slurry spreading technology and timing to low-emission trailing-shoe slurry spreading;
- Improving animal production efficiency through increasing the EBI and improving animal health; and
- Carbon sequestration through LULUCF measures will also contribute to emissions reduction in the sector, which involves, increasing afforestation, rewetting 40,000 ha of organic grassland soils (maintaining 40k p.a. average) and better management of 450,000 ha of grassland.

While the pig sector is not mentioned specifically in the 2019 Climate Mitigation Plan, the listed actions in Table 8.7 are relevant to the proposed development;

[17] Land use, land-use change and forestry (LULUCF) is defined by the United Nations Climate Change Secretariat as a 'greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities

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Table 8.7: National Climate Mitigation Plan Actions relating to the Proposed Development[18].

Action Number	Action	Time line
69	Complete the rollout of the SSRH (Support Scheme for Renewable Heat), including support for biomass and anaerobic digestion heating systems. Open the second phase of the SSRH providing multi-annual support payments to anaerobic digestion and biomass heating systems and review tariffs on an annual basis.	Q3 2019
101	Bring forward proposals for the introduction of measures to implement the full suite of options set out in the June 2018 Teagasc Report, 'An Analysis of Abatement Potential of Greenhouse Gas Emissions in Irish Agriculture 2021–2030'	Q2 2020
102	Implement suite of measures to improve nitrogen use efficiency – including Improve adoption of Low Emissions Slurry Spreading equipment.	Q2 2020
106	Establish feed modification programme including establishment of an Animal Feed Network Stakeholder group to review the environmental standards in all livestock rations and to ensure industry wide engagement in role of feed supplements and altered crude protein and oil levels to reduce methane and ammonia emissions.	Q4 2019
109	Improve on-farm slurry management; including; • Establish further research into slurry amendments, impact on GHG/ammonia emissions and potential impact on soil fertility and quality; and • Undertake a cost benefit study to underpin manure storage choices and recommendations;	Q4 2019 Q4 2020
110	Actively engage all stakeholders to develop a roadmap to ensure the future development of the agriculture and land-use (including forestry) sector will be built on environmental sustainability, and contribute fairly to Ireland's climate, air and energy targets.	Q3 2019
112	Develop exemplar networks with leaders in adopting best practice to improve soil fertility and optimise fertiliser use leading to reduced GHG emissions and enhanced carbon sequestration in soil / biomass. This involves engaging with individuals and groups to explore establishment of exemplar "sign-post" networks and communities within the agricultural sector to be leaders in adopting best practice to improve soil fertility leading to reduced N20 emissions and enhanced carbon sequestration in soil/ biomass.	Q2 2020
114	Undertake a review of nitrogen fertiliser management and imports on nitrates derogation farms in 2019 in view of impacts on soil fertility, as well as EU climate and nitrate obligations. This involves undertaking an analysis for the development of a recording system to improve traceability of fertiliser movements and simplify NMP record keeping and enforcement.	Q 4 2020
130	Set a target for the level of energy to be supplied by indigenous bio methane injection in 2030, taking account of the domestic supplies of sustainable feedstock and consider how the supports necessary to reach such a target would be funded Set a target for the level of energy to be supplied by indigenous bio methane injection in 2030. The development of this target will take into account the most recent evidence in relation to domestic supplies of sustainable	Q3 2019

[18] Section 11.4 of the 2019 Climate Mitigation Plan

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Action Number	Action	Time line
	feedstock, sustainability, and consider how the supports necessary to reach such a target would be funded (e.g. exchequer support, a levy on consumers, obligation etc.)	
	Assimilate policy relevant findings of ongoing research, commissioned by DAFM, SEAI and GNI, in regard to AD technologies more suited to the small-scale applications for biogas in the Irish context.	Q1 2020
	Development of a system of certification for renewable gas use in the national grid.	Q2 2020
	Assess potential impacts of moving anaerobic digestion above composting in the waste management hierarchy. Consider in particular impacts for the development of the bio economy.	Q2 2020
	Develop updated feasibility study on the availability of sustainable feedstocks for an AD industry in Ireland, particularly availability of biodegradable materials including surplus grass in dairy/pig intensive catchments for use in AD and potential fertiliser displacement value.	Q4 2020
	Consider options to avail of AD infrastructure to manage animal manure production	Q4 2020

The pig sector is not identified as a critical sector in terms of GHG production (being less than 2% of the agricultural emissions), however, the proposed development will move as far along the road to carbon neutrality as is possible in a cost-effective manner. This will be achieved by the proposed development by;

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- **Actual committed mitigation**
  - Minimising C&D waste and maximising recycling and reuse of the existing materials.
  - Lower protein diets achieving reductions in ammonia.
  - Improvements in land spreading technology and methodology including a move towards employing only contractors with low emission slurry spreading equipment and emphasis in applying manure in cooler conditions and earlier in the year;
  - Whilst the 2019 Mitigation Plan focuses on improving EBI (cattle genetics) and health, the proposed pig farm will adopt best practise management techniques incorporating advanced genetics and improved feed efficiency. The additional space for the existing pig numbers is a critical factor which will improve pig welfare, health and overall efficiency of production;
  - High degree of cleanliness and ventilation;
  - Replacement of non-renewable imported chemical fertiliser with a renewable fertiliser (pig slurry) and provision of organic matter; and
  - Training for management staff and membership of Teagasc discussion groups.

- **Future mitigation**
  It is important to demonstrate that there are technologies which, if supported by national government, can result in the types of reductions required to meet future CO_2 emission targets. The potential mitigation measure show that the proposed development has the potential capacity to reduce future CO_2 emissions by a further 50%;

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- Anaerobic (AD) is a practical solution to increasing GHG mitigation. Actions 69 and 130 of the 2019 National Mitigation Plan relate to bio methane production for energy through the AD process. By Q3 of 2019 the Government have committed to set a target for the level of energy to be supplied by indigenous bio methane injection in 2030 and within the short term to develop a strategy for the AD sector. The 2017 mitigation plan set a target *to analyse the barriers to the diversification of farm incomes related to supply of materials and residues for renewable energy and adoption of AD*. These actions and strategies recognise that there are barriers in the electricity regulatory system which make it uneconomical for the pig sector to adopt this technology. These barriers include supply of supplementary fibrous material sources, grid connection costs and low available tariffs for renewable energy. The use of AD in pig farms is of particular interest in Ireland as, unlike the dairy industry, pig farms can generate a uniform quantity throughout the year of seasonally stable fresh manure. The yield of biogas from pig slurry is quite low. Coupled with the low tariff paid for energy generated by on-farm AD plants in the Republic of Ireland, this means that on-farm AD plants treating pig manure alone are not currently viable. The pig farm has agreement from the owner of the adjoining land that if additional land is required for an anaerobic digestor the owner will provide an adjoining site.

  The agricultural area in Northern Ireland is approximately 1 million hectares. In October 2017 there were 43[19] AD plants in Northern Ireland and a further 103 plants either being constructed or already approved. The majority of these are farm fed. In the Republic of Ireland there are approximately 30[20] AD plants either operational or in the planning stages on an agricultural land area of approximately 4.5 million hectares. The majority of these are not farm fed. There are approx. 8,000 AD plants in Germany **(**Agathe Auer**,** Nathan H Vande Burgt et al**)** which has four times the Irish agricultural area (16.7m ha according to Eurostat Statistics). The tariff for AD energy is 11 – 15[21]c / kWh in the Republic of Ireland versus 22 – 28 c / kWh in Northern Ireland. Additional GHG and water quality benefits would accrue from AD on a pig farm because the plant could use brown bin waste (or similar) as a feedstock thus providing a valuable alternative waste stream. Reported benefits are up to 40%[22] reduction in NH_3 emissions, 80% CH_4 and odour reductions, improved availability of N in the residue manure and a potential 3.2kg CO_2 equivalent reduction in Greenhouse gases for every m^3 of biogas produced (page 604 of BAT). Typical yields of biogas from pig manure are approx. 22[23] m^3 per ton of manure. Thus the AD of 14,800m^3 (Table 1.7 of Chapter 1) could mitigate approx. 1,000 tons of CO_2 each year – in addition to the other benefits. This is equivalent to approx. 32% of the post mitigation CO_2 production at the 'Ballyfaskin' site (3,104 tons - Table 8.5).
- Installation of solar panels on roofs. According to SEAI[24] each m^2 of roof panel can generate 130 kWh. The roof area is approximately 14,000 m^2. If solar panels were

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[19] http://www.agriland.ie/farming-news/103-anaerobic-digestion-plants-approved-in-northern-ireland-as-ad-sector-booms/

[20] Excluding Irish Water Waste Water Treatment Plants (Irish Bioenergy Map 2017)

[21] Teagasc Pig Letter, September 2015.

[22] Page 600 – 604 of BAT for Intensive Rearing of Pigs and Poultry, 2017

[23] BAT P.603 say 22t / m3 @6%.

[24] https://www.seai.ie/publications/FAQs_on_Solar_PV.pdf

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installed on 70% of this area the mitigation would be equivalent to approx. 596[25] tons per annum. This is equivalent to approx. 19% of the post mitigation CO_2 production at the 'Ballyfaskin' site.

- Use of Slurry Amendments. These are is currently being researched (for residues and effectiveness) and offer opportunities to reduce the emissions from manure management.

Interactions between Climate and other environmental topics have been considered throughout this assessment; such as interactions with;

- Human Population and Health due to ammonia, methane and nitrous oxide emissions from land spreading and the pig houses impacting on the human environment due to increase in greenhouse gases (GHGs), and
- Biodiversity due to ammonia, methane and nitrous oxide emissions from land spreading and the pig houses impacting on habitats due to increase in greenhouse gases (GHGs);

Having considered these interactions there are no additional significant impacts from the existing pig farm or the proposed development.

8.9 CONCLUSIONS

The proposed development at the 'Ballyfaskin' site without mitigation will have a not significant effect on Climate pre and post mitigation accounting for less than 0.016% of total agricultural emissions.

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National policy is to mitigate carbon output from agriculture by adopting new technologies for land spreading, implement production efficiencies (genetic improvement and diet formulation) and introduce new technology (e.g. Anaerobic Digestion). The proposed development conforms to national policy in relation to Climate because it is 4 times more Carbon efficient than beef or sheep meat and it can achieve reductions in GHGs of 50% with adoption of new technology – should this technology be supported by government policy. This is achieved by adopting existing committed to mitigation such as;

- low protein diets;
- move towards low emission land spreading techniques;
- adopt low emission management techniques for spreading manure for example increase supply in early spring when weather conditions are cooler;
- low emission management measures for the pig buildings (including an Air Quality (Odour); Management Plan); and
- Adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020).

To achieve further reductions certain national policies, legislations, additional research and incentives will have to be implemented to reduce its carbon emissions by 50%. However these technologies show that the pig farm can adapt to future more stringent CO_2 emission reduction targets;

- Anaerobic digestion – this has the potential to mitigate 1,000t of CO_2, (equivalent to approx. 32% reduction of proposed);

[25] 9,800m² of roof area @ 130 kWh / m² = 1,274,000 kWh @ 468 gCO_2/kWh = 596 tons CO_2. 468 gCO_2/kWh is the average CO_2 intensity per kWh in Ireland: https://www.seai.ie/publications/Energy-Related-Emissions-in-Ireland-2016-report.pdf

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- Slurry amendments; and
- Solar panel mitigation – this has the potential to mitigate 596t of CO_2, (equivalent to 19% reduction in proposed);

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CHAPTER 9 - MATERIAL ASSETS

Section 9.1 introduces the topic of Material Assets and refers to other sections of the EIAR where this topic is addressed. **Section 9.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 9.3** describes the material assets in the receiving environment. **Section 9.4** describes the characteristics of the proposed development relevant to this topic, in particular potential impacts on road infrastructure and public services (water, power and waste). **Section 9.5** examines the results of the assessment and sets out the potential impacts before mitigation is employed. **Section 9.6** sets out proposed mitigation measures. **Section 9.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 9.8** and conclusions regarding impacts on Material Assets are provided in **Section 9.9**. The references for the Chapter are in **Section 9.10.**

9.1 INTRODUCTION

Material Assets are defined in the EPA Advice notes on current practice in the preparation of EIS (EPA 2003) as "*resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons*". The EPA revised Advice notes (2015) state that the "*assessment shall be concerned primarily with ensuring equitable and sustainable use of resources*". Material assets of natural origin include renewable and non-renewable resources and material assets of human origin include cultural heritage, cities/towns/settlements, transportation infrastructure, utilities/services infrastructure, land use, ownership and access, agriculture, property and tourism/recreational infrastructure, roads and waste facilities.

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Material assets have been addressed in other parts of this EIAR; e.g. Section 3 Human Beings, Population and Human Health, Section 5 Land and Soils, Section 6 Water and Section 11 Cultural Heritage.

9.2 METHODOLOGY

9.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

In compiling this chapter the following sources of information were referred to;

- Windshield survey September 2020;
- Discussions with pig farm management

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9.2.2 Assessment of Significance

The assessment of impacts involves:

1. Evaluation of the baseline environment and the sensitivity of the individual material asset receptors which may be affected by the proposed development. Public utilities such as ground water sources, over-head transmission lines and wind farms are high or very high sensitivity. The road infrastructure is medium sensitivity. Agricultural land is generally medium sensitivity (stud farms may be high e.g. Knockainy, Fedamore and Kilfrush) and commercial forestry is generally low sensitivity. Settlements such as Bruff, Caherconlish, Fedamore, Knockainy and Kiltealy are very high sensitive receptors with shops, public houses, businesses and public amenities. Commercial premises (car retailer businesses in Garryspillane and Knocklong, co-op retail/hardware/farm supply store south of Garryspillane, window fitting business in Ballybricken, farm equipment manufacturer in Lattin and a waste contractor business in Luddenmore) are generally medium to high sensitive receptors. Private dwellings are high sensitivity. Public houses are high - very high sensitivity. The importance of receptors is also a consideration.
2. Evaluation of the nature and magnitude of the effects on each receptor. The magnitude often is dependent on the proportion of, or the capacity of a material asset impacted by the proposed development.
3. Having considered the sensitivity of the baseline environment and the magnitude of effects, the impact significance is predicted based on criteria set out in the EPA (Draft) 2017 guidelines.

The significance of impact criteria are set out in Table 9.1.

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Table 9.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*. For example the capacity of a commercial operation is not significantly affected. The capability or proportion of farm, forest, private property, public utility or service affected is insignificant in relation to its total size or capacity.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example the capacity of a commercial operation may be affected without consequences for the operation of the enterprise. The capacity, potential or proportion of a farm, forest, private property, public utility or service affected is small enough relative to its total size or capacity as to not significantly affect it.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example the capacity of a commercial operation may be affected in a minor way. The effect on capacity, potential or proportion of a farm, forest, private property, public utility or service affected results in a minor impact. The effects may be widespread at a low level of magnitude on widespread low sensitivity receptors or will be confined to a low number of medium sensitivity receptors.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example the capacity of a commercial operation may be affected in a moderate way. This would mean that the operation can continue but with additional inconvenience and costs. The effect on capacity, potential or proportion of a farm, forest, private property, public utility or service

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Significance Level	Criteria
	affected results in a moderate impact which means the present use can continue but with additional difficulties / costs. The effects may be widespread at a low – medium level magnitude of impact on mainly medium sensitivity receptors or will be confined to a low number of medium – high level magnitude of impact on mainly medium - high sensitivity receptors.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*. For example the capacity of a commercial operation may be affected in a significant way resulting in change of capacity and output (and potentially employment). The effect on capacity, potential or proportion of a farm, forest, private property, public utility or service affected results in a change which means the present use can continue but with major additional difficulties / costs. The effects may be widespread at a medium - high level magnitude of impact on mainly medium sensitivity receptors or will be confined to high magnitude of impact on a low number of medium - high sensitivity receptors.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As per Significant effect but a larger number of receptors affected, and with a higher number of high and very high sensitivity receptors affected.
Profound Impact	*An effect which obliterates sensitive characteristics*. For example the capacity of a commercial operation may be affected in a profound way resulting in a dramatic change of capacity and output (and potentially employment). The effect on capacity, potential or proportion of a farm, forest, private property, public utility or service affected results in a dramatic change which means the present use cannot generally continue, or if it does, at a much smaller scale. The effects may be widespread at a high level of magnitude on high sensitivity receptors, ow will be confined to a high magnitude on a low number of very high sensitivity receptors.

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9.2.3 Duration of Impact

The construction phase will last approximately 4 months. Unless otherwise noted in the individual sections of this Chapter the following duration of impacts apply:

- Temporary Impact - Impact lasting for one year or less.
- Short term Impact - Impact lasting one to seven years.
- Medium Term Impact - Impact lasting seven to fifteen years.
- Long Term Impact - Impact lasting fifteen to sixty years.
- Permanent Impact - Impact lasting over sixty years.

Construction effects will be temporary. The duration of potential impact from nuisance can be temporary (due to land spreading odours). The duration of potential impacts due to emissions from the pig buildings is generally permanent – even though there may be intermittent effects over a long period of operation. Similarly potential impacts on water, air and the wider environment are general permanent in nature. Notwithstanding this, future developments in technology may mitigate some of these potential effects.

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9.3 RECEIVING ENVIRONMENT

The material assets identified in the study area are;

1. Roads.
    - The M8 between Cahir and Mitchelstown crosses the southern part of the study area. This road may be used by service vehicles and heavy goods vehicles but would not be used by agricultural vehicles (i.e. slurry tankers);
    - National roads adjoining or within the study area include the N24 Cahir to Limerick road and the N73 Mitchelstown Ring Road which links the R513 to the R639 in the south of the study area;
    - Connecting the townlands within the study area there are approx. 125km of regional roads. These regional roads include;
        - R506 in the north of the study area;
        - R513 which runs from the N24 south through Caherconlish, Herberstown, Hospital, Knocklong, Garryspillane, Ballylanders and on to Mitchelstown passing through Ballyfauskeen cross roads beside the 'Ballyfaskin Pig Farm' development. This is one of the main access routes for heavy good vehicles accessing the pig farm. The southern part of this route, as far as its junction with the R662, is designated a scenic route;
        - R514 links the R512 and R513;
        - The R512 runs south from Limerick City through Bruff and on into Kilmallock;
        - The R516 links the R512 and R513 further south between Bruff and Hospital and continues east through Emly and Lattin on to Tipperary Town;
        - The R662 joins the R513 AT Ballyfauskeen Cross Roads and the pig farm site entrance is located on this road. The R662 continues north to Galbally and Kilcross and the north east to Tipperary Town. This is one of the main access routes for heavy good vehicles accessing the pig farm and for slurry tankers;
        - The R663 runs from Garryspillane through Galbally and east to Bansha through the Glen of Aherlow. East of Galbally this route is designated as a scenic route;
        - The R517 runs from Kilmallock through Glenroe and south to Mitchelstown; and,
        - The R639 runs from Mitchelstown to Caher crossing through the southern part of the study area.
    - The local roads that service the study area are approximately 250 km in length.

2. Public utilities and services; There is a gas pipeline 150m north of the pig farm boundary. There are two wind turbines located in Slievereagh 3.5km west of the study area. There are two high voltage transmission lines within the study area. The main one is a 220 kV line which runs between Mitchelstown and Limerick City passing through Cullane Middle (43),Cullane South, Ballyfroota (33), Knocklong West (22), Knocklong (21), Kilfrush (20), Ballybricken South (8), Ballybricken West (6), Ballybricken North (5) and Highpark (2). The second transmission line is a 110 kV line which runs north / south through Fedamore (4). There is a railway line which runs across the study area from Knocklong to Limerick Junction. The local roads used by slurry tanker cross this line in at least 6 places within the study area. These crossings are all public road bridge crossings. These utilities and services are shown in Figures 3.1.1 – 3.1.5 in Volume 3 of this EIAR. There nearest wind

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turbines are located approx. 1,800m south west of Ballyfroota (33) on the eastern slopes of Slievereagh/The Pinnacle and 4,500m north, north west of Killeenagarriff (1).

3. Public water services; As referred to in Section 3.3.1.5 of this EIAR, fifteen public water sources have been identified within the study area, or within 500m of it, as illustrated in Figure 3.1.1 – 3.1.5 in Volume 3 of this EIAR. These include;
    - Ballybricken Ground Water Supplies (Ref No 8 and 9) and P serve a population of 541 with 119m3 per day. The zone of contribution for this GWS is within the study area;
    - Fedamore Ground Water Supply (Ref No 11) serves a population of 492 with 330m3 per day. The source protection zone is within the study area;
    - Kilteely Ground Water Supply (Ref No 14) serves a population of 475 with 110m3 per day;
    - Bruff Ground Water Supplies (Ref No 15 & 16) serve a population of 1410 with 550m3 per day. The source protection zones are within the study area;
    - Knockainey/Kilballyowen Ground Water Supply (Ref No 17) serves a population of 117 with 25m3 per day The zone of contribution is within the study area;
    - Knocklong Ground Water Supplies (Ref No 21, 22 & 23) serves a population of 1,169 with 582m3 per day. The source protection zones are within the study area;
    - Galbally Ground Water Supply (Ref No 28) serves a population of 361 with 350m3 per day;
    - Ballylanders Ground Water Supply (Ref No 29 & 30) serves a population of 549 with 164m3 per day;
    - Ballyduff Ground Water Supply (Ref No 33) serves a population of 86 with 18m3 per day. The zone of contribution for this GWS is within the study area; and
    - Kilcoran Ground Water Supply (Ref No 35) serves a population of 100 with 18m3 per day.

    There are waste water treatment plants in Bruff, Caherconlish, Emly and Knocklong and treatment plants in Hospital, Oola and Limerick junction which are in the vicinity of the study area.

4. There are thirteen settlements and small villages within or adjoining (within 500m) of the study area (as illustrated in Figures 3.1.1 – 3.1.5 in Volume 3 of this EIAR). There are a range of small commercial businesses and Material Assets throughout the study area. Within the settlements there is a range of commercial material assets such as churches, banks, credit unions, bars, community halls, guesthouses, shops, post office, schools, playing/GAA pitches, pharmacies, restaurants, garage/car sales, garda barracks and veterinary businesses. Outside of the settlements within the study area (or adjacent to it) there are a range of businesses such as car retailers (Garryspillane and Knocklong), hardware / farm supply stores (Garryspillane), window fitting business (Ballybricken), farm equipment manufacturer (Lattin) and waste contractor (Luddenmore). In the environs of the pig farm site there are furniture manufacturing businesses in Ballylanders, a metal fabricator between Ballylanders and Spittle and two rurally based bakeries located 1.5km S and 2km SE from the site. The walking route 'Ballyhoura Way' is 2.2kms north of the pig farm and there are guest houses near Angelsborough 2km south of the pig farm. These settlements and businesses use the same road network and rely on the same water infrastructure and power supply.

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5. The study area is rich in architectural and archaeological heritage. As discussed in Chapter 11, (Cultural Heritage) there are approx. 468 registered National Monuments[1] and 228 recorded structures on the National Inventory of Architectural Heritage within the study area. Of note from a material assets point of view are 12 bridges which are not of local or regional importance.

9.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The main characteristics of the proposed development which might potentially affect material assets in the study area are;

- Traffic generated by the proposed development on road infrastructure which may impact on access to businesses and rural dwellings;
- Potential effects on water quality and indirectly on water services which rural dwellings and businesses rely on;
- Impact due to additional waste produced during construction and operational phases;
- Impacts from emissions and nutrients due to land spreading and from pig buildings; and,
- Impacts on private property and loss of agricultural land and potential to develop land adjoining pig farm or spread lands.

9.5 RESULTS OF ASSESSMENT

The impact assessment uses the criteria set out in Table 9.1 and based on the sensitivities as described in Section 9.3 a significance of impact is applied to potential impacts.

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9.5.1 Do Nothing' impact

There is no change to the baseline environment in a do-nothing scenario, however there may be a not significant to slight adverse impact on the local farming environment due to loss of additional soil nutrients.

9.5.2 Potential pre-mitigation impacts on Material Assets

9.5.2.1 Assessment of pre-mitigation impacts on the public road network

Referring to Tables 1.4 in Chapter 1 the existing AADT is approx. 923. The existing pig farm traffic is approx. 14 movements per day with the proposed pig farm predicted to add 2 to this.

The 'Ballyfaskin Pig Farm' is connected to the study via a network of approx. 125km of regional roads. Construction traffic will rise to 6 movements per day for the 4 month construction period adding <1% to the daily traffic for this temporary period (Section 1.3.4.1), with peaks of 11-13 per day in busy construction periods and far less on slacker days. The site is well service by regional roads that are capable of accommodating the construction traffic.

Table 9.2: Estimated traffic counts at the existing and proposed 'Ballyfaskin Pig Farm'.

Type of Traffic Movement	Existing number	Proposed number
Staff movements	7.4	9.1
Feed delivery	1.6	1.4
Livestock transport	0.5	0.8

[1] https://webgis.archaeology.ie/historicenvironment/ and illustrated in Figures 3.1.1 – 3.1.5 of Vol. 3 of this EIAR

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Type of Traffic Movement	Existing number	Proposed number
Service vans etc.	0.3	0.3
Slurry tanker	3.5	3.5
Carcass and waste removal	0.15	0.15
Miscellaneous	0.5	0.5
Total =>	**14**	**16**

The operational pig farm traffic represents a very small proportion of the total traffic on these roads which, because they adjoining roads are regional roads and have good weight bearing capacity for feed and livestock deliveries. The R662 at the site of the pig farm is in good condition (see plate 9.1). In addition to this there are approx. 250km of local roads that interconnect with the regional roads facilitating access to fields and farms for the land-spreading of pig manure. The roads in the study area are generally in good condition and suitable for the transport of pig manure via tractors and slurry tankers – which is normal agricultural traffic. The pig manure transport traffic will not change significantly. Therefore without mitigation the impact on roads is imperceptible.


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Plate 9.1: R662 looking NNE from Ballyfauskeen Cross Roads

9.5.2.2 Assessment of pre-mitigation impacts on public utilities

Agricultural land spreading equipment can operate safely under overhead powerlines lines and the risk of collision with the ESB poles or pylons is negligible. Similarly, land-spreading equipment can operate safely over gas pipelines which are more than 1m under the surface. There are no wind turbines within the study. There may be future planning applications and energy infrastructure

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developments within or adjacent to the study area. Without mitigation there will be no effect on wind farms or gas pipelines from land-spreading.

As discussed in Sections 3.5 and 6.5 without mitigation, poor practices in the application of pig manure could lead to slight adverse effects on the natural water environment, including public groundwater sources, resulting in slight adverse impact on human health without mitigation (Section 3.5.3.8 of Chapter 3). There will be no effect on the operation of waste water treatment plants due to land-spreading. The impact on material assets is considered to be comparatively less sensitive than human health and therefore the pre mitigation impact not significant – slight adverse (see Chapters 3 and 6).

9.5.2.3 Assessment of pre-mitigation impacts on towns / settlements

Impacts on water services, transport/road services, power services or nuisance from odour could potentially affect local settlements. The nearest settlement is Ballylanders at 2.8kms NW of 'Ballyfaskin Pig Farm'. There are no significant effects from the pig farm itself at this separation distance and the existing pig farm has been operational here for more than 30 years. The land spreading of manure could potential act as a nuisance and slurry tankers on the public road network could potentially impact on local users. However these impacts are assessed to be not significant because the land-spreading of animal manures and agricultural traffic is a common feature of rural areas and there is a very comprehensive road network.

The potential impacts of emissions on dwellings in the vicinity of the pig farm are addressed in Sections 7.4 and 7.5 of the EIAR. Before mitigation there is a not significant impact to slight adverse impact on these dwellings due to poor practice from land-spreading affecting private wells. Land-spreading odours will not cause a significant impact due to their temporary nature.

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9.5.2.4 Assessment of pre-mitigation impacts on property and commercial businesses

Local businesses could potentially be affected by developments that affected water services, transport/road services, and power services or due to nuisance from odour. The nearest business premises are located in Ballylanders. There is a bed/mattress manufacturing company and a furniture company located in this village. Access to these businesses is via the existing R513 which may also be used to deliver goods to the pig farm site during operation and construction. The increased traffic during the operational phase and the construction phase on the study area road network will not be significant, accounting for approx. <2% of the traffic on the R662 which joins the R513. At a separation distance of 2.8km there will be no affect from odours or air emissions from the pig farm.

During the construction and operational phases, without mitigation, there will be no effect on the power supply, traffic and road network to the businesses described in Section 9.3 (with potential beneficial commercial spin-offs due to the additional capital expenditure at the pig farm).

The rural population of the study are is estimated to be approx. 2,500 and the population of the largest 4 settlements (Bruff, Caherconlish, Fedamore, Emly) is a further 3,450 (Section 3.3.1.1). This population will share the 250km local road and 125km regional road network, within the extent of the study area, with traffic related to the operation of the pig farm (e.g. slurry tankers, feed delivery lorries). Without mitigation, there will be no significant impact on the road network either during construction or during the operational phase of the proposed development.

The potential impacts of emissions from pig buildings or land spreading are addressed in Sections 3.5, 3.7, 7.5 and 7.7 of the EIAR and the conclusions are that there is a no significant adverse

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effect before mitigation on local dwellings from land-spreading malodour. The potential impacts of emissions on dwellings in the vicinity of the pig farm are addressed in Sections 7.4.5, 7.5.3.14 and 7.7 of the EIAR.

Without mitigation there will no significant effect on the potential to develop private property in the study area as a result of the proposed development. The proposed development does not involve the demolition of private property outside of the pig farm site. The refurbished buildings on the pig farm site will be upgraded to more environmentally and economically efficient buildings on the same site. The ESB Substation will require a very small amount of land (approx. 0.1ha) at the 'Ballyfaskin' site (including access etc.). The land around the pig farm is owned by the developer and is almost entirely in agricultural use without significant development potential.

9.5.2.5 Assessment of pre-mitigation impacts on tourist services

There are no significant tourist assets within the environs of the proposed development and without mitigation this assessment concludes that these potential impacts are not significant on tourist assets.

9.5.2.6 Assessment of pre-mitigation impacts on farms and agricultural land

The proposed development (ESB Substation) will take approximately <0.1 hectares of grassland within the pig farm site. This is not significant from an agricultural impact point of view. The nutrients (N, P and K[2]) in the pig manure are an asset from a Land and Soils point of view. However because they will replace chemical fertiliser (which is not a renewable material) the soil nutrient status will not change. The farming community will benefit by approximately €9 / m^3 of slurry = €140,000 each year through the receipt of free organic fertiliser – which replaces a non-renewable chemical fertiliser. The organic fertiliser will benefit soil organic matter composition. The proposed development will have a not significant to slight positive on the agricultural land.

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9.5.2.7 Assessment of pre-mitigation impacts on commercial forestry and woodland

Without mitigation the proposed development will not have a significant effect on local forestry plantations and woodland.

9.5.2.8 Assessment of pre-mitigation impacts on Cultural Heritage

Without mitigation the proposed development will not have a significant effects on above and below ground Cultural Heritage sites. The 12 listed bridges on the National Inventory of Architectural Heritage are regularly used by the existing agricultural traffic and because there will not be a significant increase in the pig manure transport traffic there will be no significant impact on these bridges.

9.5.2.9 Assessment of pre-mitigation impacts on waste facilities

Construction and Demolition Waste and municipal and recyclable waste

Currently between 1.75 - 2.0 million tons of C&D waste is produced in the southern region. The waste produced from the proposed development (<10 tons) will account for <0.01% of the southern

[2] Nitrogen, Phosphorous and Potassium are the main nutrients in pig slurry

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regional annual production. The C & D waste produced during the construction phase is a once-off temporary effect. All wastes will removed by a licensed haulier for treatment off-site.

These activities will be monitored by the EPA through its enforcement of the conditions of the IPPC license which is also being applied for. The volumes of additional materials destined for waste treatment in approved waste facilities is considered small relative to regional production and therefore, without mitigation, the proposed development will not have a significant effect on licensed waste facilities. Licensed companies such as Mr Binman and Greenstar have sufficient licensed capacity to take the segregated C & D waste from the site.

During the operational phase quantities of sharps and municipal waste will not change significantly, however, there will be an increase of 20% in carcass waste (estimated in Table 1.7). This increase is not significant in terms of national production and won't put pressure on the capacity of receiving facilities. These wastes will be disposed of in accordance with an IPPC license requirements (i.e. licensed hauliers and receiving facilities).

9.6 MITIGATION

9.6.1 Construction Phase Mitigation

- Waste Construction materials will be stored in approved waste contractor skips and building materials will be secured to prevent weather damage;
- Haul distances will be minimised by selecting locally sourced materials where possible;
- Order in bulk to minimise deliveries and resulting wear and tear on local road network;
- Materials will be recycled where possible;
- Use silt and sediment control measures during construction to control run-off;
- Wheel wash facilities will be available to prevent soiling of road network.

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9.6.2 Operational Phase Mitigation

- Adhere to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) to maintain soil nutrient balance and to protect water abide by statutory setback distances around public and private water supplies i.e. 200m and 25m;
- Implement an Odour Management plan and other measures to reduce odour (reduced protein diets and high hygiene standards) as discussed in Section 7.6,
- All waste contractors will have the necessary waste licenses;
- The use of low energy equipment and lighting with automatic controls and timing switches will help reduce consumption of energy;
- In line with its obligations under any future IPPC license the pig farm will maintain a policy of waste reduction to minimise waste produced; and,
- Minimise water usage on the pig farm by maintaining a low water to feed ration and insuring water fixtures in good working order. Low water usage minimises manure production and thus reduces manure deliveries on the local road network.

9.7 RESIDUAL IMPACTS (post mitigation)

Having considered the sensitivity of the material asset environment and the magnitude of impacts, the residual impacts are considered to be not significant with standard mitigation measures and

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there is a not significant to slight positive effect on agricultural land and farming due to supply of valuable fertiliser.

9.8 CUMULATIVE IMPACTS (post mitigation)

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*". Cumulative effects are defined in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

There is a pig farm in Inchacoomb located 2km east of the proposed development. This pig farm delivers pig manure to some of the townlands within the study area and therefore there is a potential cumulative impact residents due to odour nuisance and local traffic. Because pig manure will be applied just a few times per year at any one location the cumulative impacts are considered not significant.

There will be no cumulative impact from the Inchacoomb Pig Farm on emissions to air or noise emissions from the 'Ballyfaskin' site because of the separation distance of 2kms. Cumulative traffic impacts are ruled out because of the low total traffic count, for example, if the Inchacoomb piggery traffic is the same as the proposed 'Ballyfaskin' development (No 16) then the cumulative traffic would not be significant. There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin' Pig Farm' site. There is no potential for cumulative impacts on air (Section 7.8), water (Section 6.8), traffic or noise at this separation distance.

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There is potential for a cumulative nuisance effect when pig manure and cattle manure are applied at the same location. However, with adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) the application of organic manures will occur only at a frequency of a few times each year at any one location because quantities have to be restricted to supply only what is required by the cropping on the receiving farm. Therefore it is considered that this cumulative impact is not significant.

Interactions between Material Assets (particularly generated traffic and construction activity) and other environmental topics have been considered throughout this assessment; such as interactions with;

- Human Population and Human Health due to construction or operational traffic potentially impacting on human beings or noise impact;
- Noise, odour or other nuisance impacting on human economic activity in settlements and businesses; and
- Cultural Heritage assets could be adversely affected by generated traffic and construction activity.

Having considered these interactions there are no additional significant impacts from the existing pig farm or the proposed development.

9.9 CONCLUSIONS

There are no significant residual or cumulative effects on the material asset environment.

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CHAPTER 10 - LANDSCAPE

Section 10.1 introduces the topic of Landscape. **Section 10.2** sets out the relevant guidance followed, the information sources referred to and describes the methodology of determining significance of impact. **Section 10.3** looks at the receiving environment referring to Waterford County Council's Scenic Sensitivity Map, 2011. **Section 10.4** describes the visual characteristics of the proposed development. **Section 10.5** examines the results of the visual assessment and sets out the potential impacts before mitigation is employed. **Section 10.6** sets out proposed mitigation measures. **Section 10.7** describes the residual impacts after mitigation is employed. Cumulative impacts are described in **Section 10.8** and conclusions regarding impacts on Landscape are provided in **Section 10.9.** References for the chapter are provided in **Section 10.10.**

10.1 INTRODUCTION

This chapter addresses the potential landscape and visual impacts due to the proposed pig farm development in Ballyfauskeen, Ballylanders, Co Limerick (V35 KV12). A visual assessment of the surrounding area was conducted by Curtin Agricultural Consultants Ltd on October 8th 2020. The assessment considers the existing pig houses and the potential impacts on landscape due to the proposed development.

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10.2 METHODOLOGY

10.2.1 Sources of Information

For guidance on content of this EIAR reference is made to;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in Environmental Impact Assessment Reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

The following information was referred to;

- Field assessments and photos / photo montages; and
- Limerick County Development Plan 2010 – 2016 (incl. variations 1 – 3, 5 & 6);

The significance of impact criteria are set out in Table 10.1.

10.2.2 Assessment of Significance

Table 10.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*. For example, a building / structure / development which results in a change in the Landscape Character, the consequences of which are not significant.

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Significance Level	Criteria
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*. For example, a building / structure / development which results in a change in the Landscape Character which has noticeable consequences but these consequences are not considered significant because the area has the potential to absorb the effect. The affected landscape would be categorised as 'Normal' or 'Robust'
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*. For example, a building / structure / development which results in a change in the Landscape Character which has noticeable consequences. These consequences are considered to give a slight effect because of the scale of the development or the receiving area is characterised as Sensitive with ability to absorb only some visual effects.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*. For example, a building / structure / development which results in a change in the Landscape Character which has noticeable consequences. These consequences are considered to give a moderate effect because of the scale of the development or the receiving area is characterised as Sensitive with ability to absorb only limited visual effects.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*. For example, a building / structure development which results in a significant change in the Landscape Character which is noticeable. These consequences are considered to give a significant effect because of the scale of the development or the receiving area is characterised as Highly Sensitive or Vulnerable to any visual effects.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*. As per Significant Impact but more widespread; potentially affecting the majority of a Highly Sensitive or Vulnerable Landscape.
Profound Impact	*An effect which obliterates sensitive characteristics*. For example, a building / structure development which results in a dramatic change in the Landscape Character which is noticeable. These consequences are considered to give a Profound effect because of the scale of the development or the receiving area is characterised as Highly Sensitive or Vulnerable to any visual effects.

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10.2.3 Duration of Impact

The construction phase will last approximately 4 months. Unless otherwise noted in the individual sections of this Chapter the following duration of impacts apply:

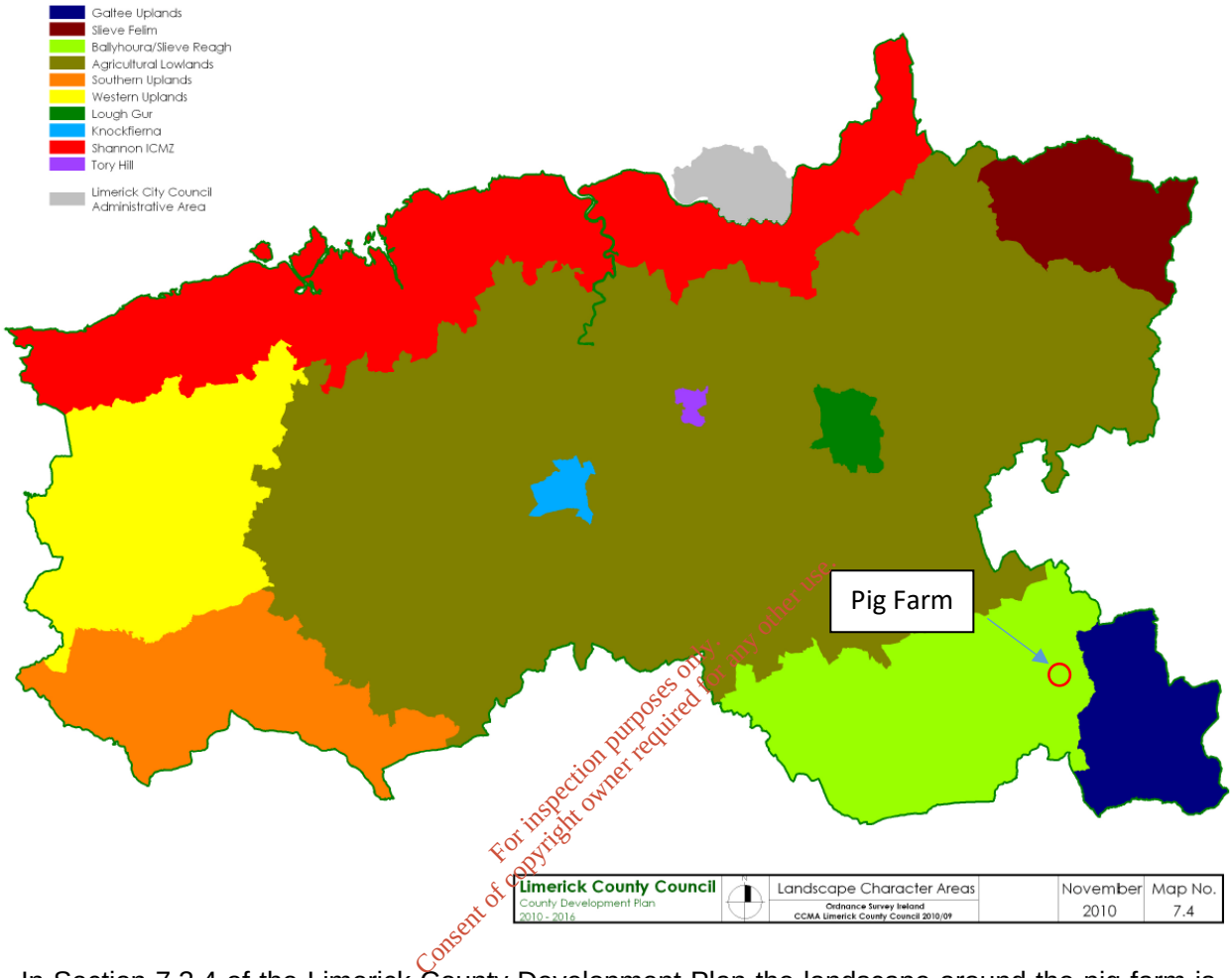
- Temporary Impact - Impact lasting for one year or less.
- Short term Impact - Impact lasting one to seven years.
- Medium Term Impact - Impact lasting seven to fifteen years.
- Long Term Impact - Impact lasting fifteen to sixty years.
- Permanent Impact - Impact lasting over sixty years.

Because the construction period is approximately 4 months the impacts are unlikely to be significant but the effects of the proposed buildings are long term. Any planting landscape mitigation would take at least fifteen years to fully mitigate effects.

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10.3 RECEIVING ENVIRONMENT

Figure 10.1: Landscape Character Map[1]



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In Section 7.3.4 of the Limerick County Development Plan the landscape around the pig farm is categorised as '*Landscape Area No 2 Ballyhoura / Slieve Reagh'* (light green in Figure 10.1). The site is located approx. 1.4km from the eastern boundary of this area which follows the Aherlow River in a north south direction. The site is located at approx. 170m above sea level in the lowland component of this area. The lowland component is described in Section 7.3.4.2 of the Development Plan as; '*generally a farmed landscape but the range of hills provides an upland backdrop. The lower reaches of Ballyhoura are pastoral in character but this changes as altitude increases and the vegetation cover changes to commercial forestry interspersed with upland grassland and the remnants of peat bogs*'. The study area extends north through the *Agricultural Lowlands* of County Limerick (excluding the *Lough Gur Landscape Area*) and into the *Plains of West Tipperary*. Townland 46 is located in the *Galtee Uplands Area* and townlands 47 & 48 are located in the *River Suir Central Plain (*please refer to Figure 1.9 of Volume 3 of this EAIR for townland location*)*. This assessment is concerned primarily with the site itself and there are no landscape impacts from the land-spreading of organic manure from the proposed development.

In closer proximity to the pig farm site the topography is generally undulating. The dominant landscape feature is the Galtee mountain range. The edge of the Galtee Mountains runs from the

[1] Reference to Landscape Character Map 7.4; Limerick County Development Plan 2010 – 2016 (as extended)

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north east to the south west towards the settlement of Anglesborough (2.8km SE of site). The edge of the Galtee is approx. 2.5kms from the site and these mountains rise dramatically from this edge.



Plate 10.1: Looking ENE towards Galtee Mountains from the R513 in Ballyfauskeen

East-wards from the site the topography gently falls as far as the Aherlow River (1.4km E of site) which has a broad flat river valley at this point. To the west of the pig farm the land rises gradually towards the R513 as it enters Ballylanders. The western backdrop to the R513 between its junction with the R662 and Ballylanders is Curraghturk Hill with some small conifer plantations on its eastern slopes. This landscape in the direct vicinity of the pig farm is generally 'open' to the east with land-cover comprising of a mosaic of regularly shaped fields, typically large in size, indicating removal of hedgerows due to agricultural use, and bounded with a mixture of mature broadleaf hedgerows (white/blackthorn spp.) and lengths of gorse hedgerows. The views from Ballyfauskeen in an east and south easterly direction are impressive and highly sensitive (Plate 10.16).

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To the north (towards Galbally on the R662) the general topography falls gently towards the settlement of Galbally and breaks in the hedgerow along the R662 offer views beyond Galbally onto Deerpark Hill / Castlreagh to the NW of Galbally and Mooreabbey Hill and Moanour Mountain to The NE of Galbally. Here also, the Galtees to the east dominate the landscape.

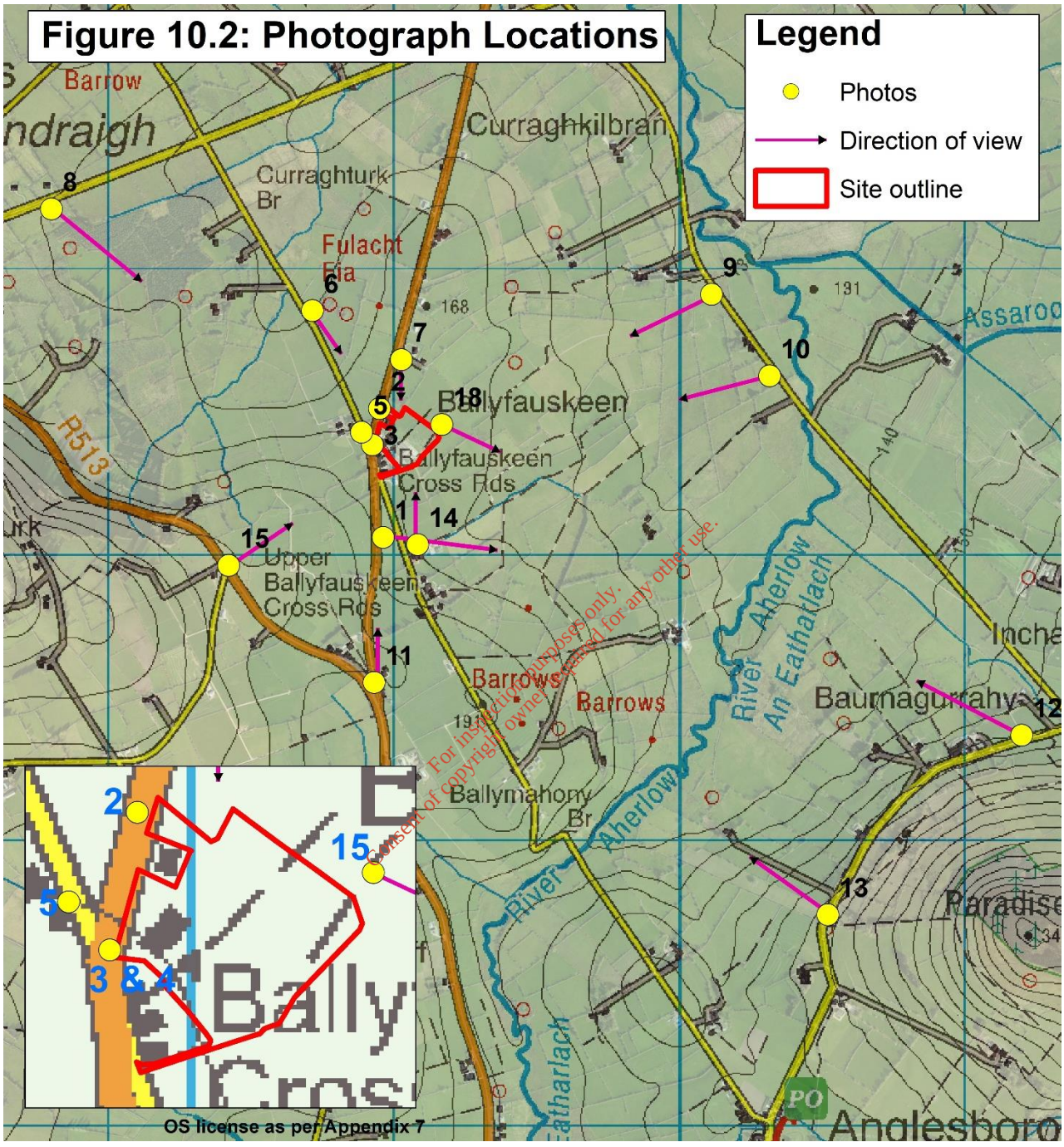
Travelling NW towards Ballylanders on the R513 local views to the east and towards pig farm site are restricted due to a typical land-cover comprised a mosaic of tall dense mature broadleaf hedgerows and conifer plantations. Travelling on the R513 towards Ballylanders there are views of the Galtees and to the north views beyond Galbally onto Deerpark Hill / Castlreagh. The western views are dominated by Curraghturk Hill. There are No views of the piggery from this section of the R513.

Travelling south on the R513 from the pig farm, views to the west are restricted due to a ridge which extends north south between Curraghturk and Knockadea. To the east is the Aherlow River valley and 1km beyond this the Galtee Mountains dominate.

The lowland component of the *Ballyhoura / Slieve Reagh* is dominated by hedgerows and farmsteads comprised of houses as well as metal sheds and traditional out buildings, most of which are relatively well screened by the hedgerows. Public roads are typically bounded by tall dense hedgerows. While some local views are curtailed by the prevalence of hedgerows the eastern

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fringe of the *Ballyhoura / Slieve Reagh* is a relatively open landscape with a mixture of mature broadleaf hedgerows (white/black thorn spp.) and lengths of lower gorse hedgerows.



There is a scenic route[2] along the R513 from the southern county boundary as far as Upper Ballyfauskeen Cross Roads which is approx. 0.75km south of the site boundary. The views from the R513 are as per plate 10.1. Another scenic route extends from Galbally along the R663 as far as the county boundary with Tipperary. These scenic routes are illustrated in Figure 1.2 of Chapter 1 of this EIAR.

[2] As per Map 7.6 of the Limerick County Development Plan 2010 – 2016 (as extended)

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The site is located in the lowland component of *Ballyhoura / Slieve Reagh* landscape area and close to the Galtee Mountain landscape area. Therefore the landscape value is categorised as medium - high, the landscape sensitivity is categorised as medium - high and the landscape importance is categorised as locally important.

10.4 CHARAERISTICS OF THE PROPOSED DEVELOPMENT

The area of existing buildings (14,238m^2) will be increased by 22m^2 with a relatively small structure (electrical substation). The substation will have a not significant effect on Landscape because of its size and screening. However, the impact must be considered in combination with the existing pig farm. The characteristics of the existing and proposed development that may potentially visually impact on the Landscape are the existing pig buildings and the existing mill which is 18m high.

10.5 RESULTS OF ASSESSMENT

This evaluation is based on the capacity of the environment to absorb the existing and proposed development. Photographs were taken in the vicinity around the pig farm as illustrated in Figure 10.2

10.5.1 Do Nothing' impact

In the 'do nothing' scenario the existing visual impact remains unchanged. The western side of the site is surrounded by dense hedgerows 4+m tall and is also screened by cattle sheds (Plate 10.3 and 10.4). Similarly hedgerows and tree lines to the north of the site screen the pig buildings. The mill building which is 18m high is visible from locations west of the site (Plate 10.5 and 10.6) and to the north of the site (Plate 10.7).

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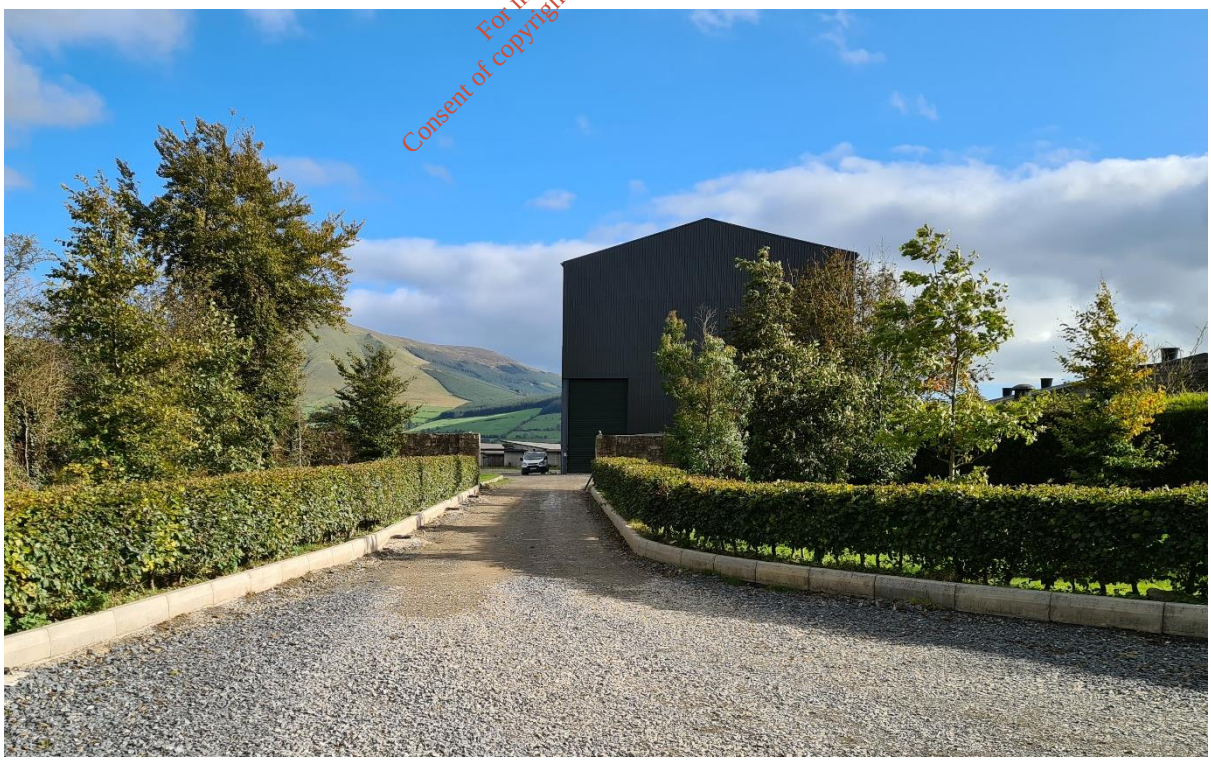


Plate 10.2: View at main entrance to pig farm on R662

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Plate10.3: View towards old entrance (not used) to pig farm on R662 looking east



Plate 10.4: View from Ballyfauskeen Cross Roads looking north along R662 *(Site of substation behind tree line)*

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Plate 10.5: View from nearest neighbour west of cross roads



Plate 10.6: View from road near Curraghturk Bridge

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Plate 10.7: View from nearest neighbour to the north

Further partial views of the mill building is possible along the country road to the north west that links the R662 to Ballylanders (Plate 10.8). These views of the mill building are generally limited by the screening of tree lines and the dark green colour mitigates the impact. The pig farm does not interfere with views of the Galtees from these locations.

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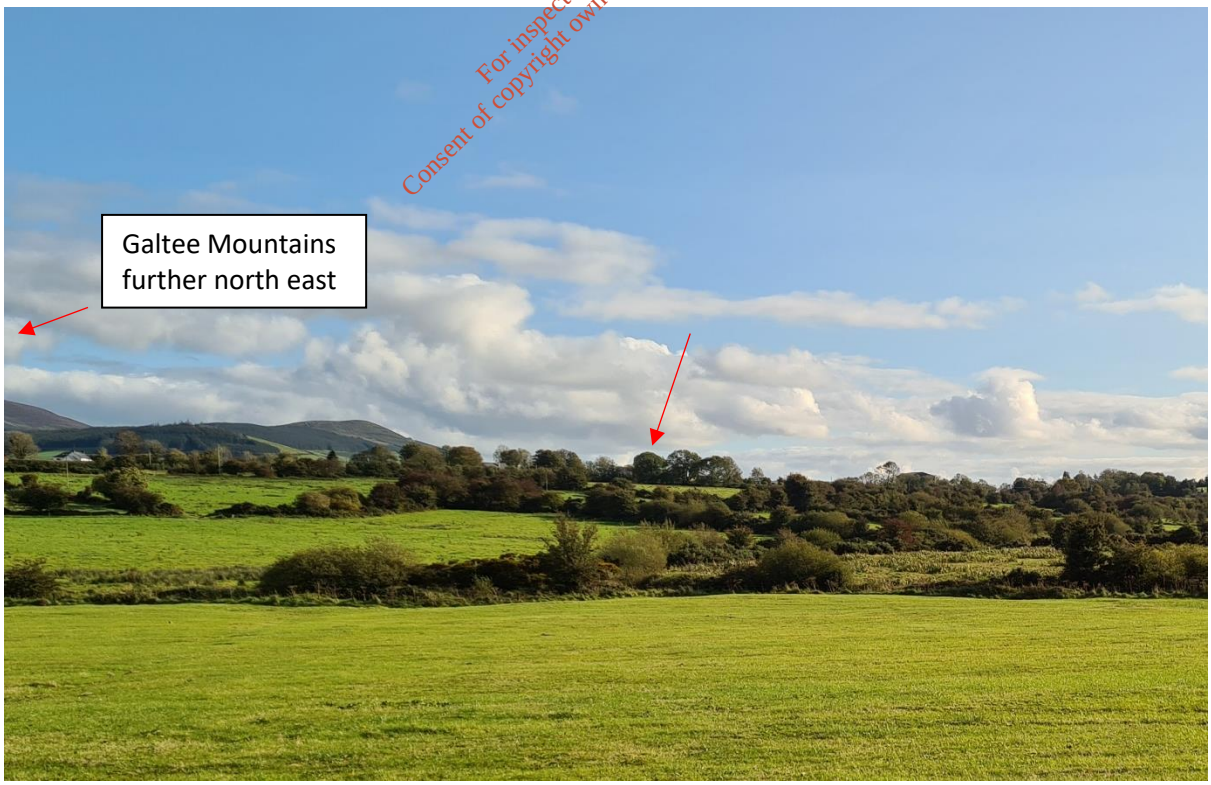


Plate 10.8: View from north west towards pig farm

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From the east there are views of the mill house and roofs of pig buildings from the country road that runs from Curraghkilbran to Inchacoomb. However as can be seen from plates 10.9 to 10.10 the mill house does not break the sky line the views are against the back-drop dark green tree lines on the eastern side of Curraghaturk Hill.



Plate 10.9:View from the east near Curraghkilbran



Plate 10.10: View from the east near Inchacoomb

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From the south a scenic route extends north along the R513 as far as its junction with the R662 (750m south of the pig farm). There are sensitive views of the Galtees along this route (plate 10.1). The view from the R513/R662 north towards the pig farm is shown in Plate 10.11 and shows that the pig farm is not visible from this route and does not restrict views of the Galtees along this route.



Plate 10.11: View north towards the pig farm (northern most point of scenic route on R513)

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Further to the south east, the road from Anglesborough to Bara Cross Roads, along the eastern edge of the Galtees, offers long distance views across the Aherlow River valley towards the pig farm. While visible at a distance of 2km the impact is not significant - Plates 10.12 and 10.13.



Plate 10.12: Views looking north west towards pig farm from near Baurnagurrahy

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Plate 10.13: Views looking north west towards pig farm from near Paradise Hill

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Travelling north towards the pig farm from Anglesborough there is a sharp dip in the topography as the road crosses the Aherlow River at Ballymahony Bridge. The eastern ridge of the river valley and dense roadside hedgerows screen the pig farm up to a distance of about 300m south of the pig farm (Plate 10.14).



Plate 10.14: Views from farmyard south east of pig farm in Ballyfauskeen

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Plate No 10.15: View looking NE towards pig farm from R513 towards Ballylanders.

Travelling north on R513 towards Ballylanders there are no views of the pig farm because of the high ground to the west of the pig farm. Further north along the R513 approaching Ballylanders there are No views due to screening of high hedgerows and forestry.

Overall the setting of the pig farm is well screened and, even considering the height of the mill house the impacts on landscape are not significant because of the dark green colour of the mill house blends in with tree lines in the vicinity of the pig farm. The grey roof colour of the pig houses will darken with age and currently do not cause a significant visual impact. The pig farm does not interfere with views of the Galtee Mountains.

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10.5.2 Do something potential pre-mitigation impacts on Landscape



Plate No 10.16: Location of the site of the proposed substation behind roadside treeline.

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Plate No 10.17: Example of single mv electrical substation

In the 'do something' scenario the existing visual impact remains unchanged because the proposed development is relatively small and screened. The height of the substation will be approx. 3m and its footprint is 22m^2. An example of the proposed building is provided in Plate No 17 above. It will not be visible behind the screen of evergreen trees at the road side at this location.

10.6 MITIGATION

No mitigation is required for the proposed electrical substation which is concealed behind a tree line to the west and screened by pig houses to the east. For the remainder of the pig farm there is natural mitigation to the north and west. The western half of the site is surrounded by dense hedgerows 4+m tall and is also screened by cattle sheds to the west of the site. Similarly hedgerows and tree lines to the north of the site screen the pig buildings.

The colour of the pig house roofs is grey and this grey colour will darken with time. The low height of the buildings (generally 4m of less) reduces the visual impact. The mill building is dark green in colour and this colour, along with tall tree lines to the north and west, reduces it visual impact. Tall feed silos can be visually intrusive and containing these within the mill building also reduces visual impact.

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The design includes planting mitigation as specified in the Landscaping Plan in Appendix 8. Around the south east boundary of the site there will be screening planting with hedgerow and native and indigenous trees, which will include alder, common birches, common oaks, mountain ash and willow species. Some pines are recommended for screening mill from east and south east views. Planting sizes will be from 75cm to 400cm in height and tree species will be planted at average 5.0m centres within the wider planting mix. The new hedgerow will 80% blackthorn / hawthorn and supplemented with a mixture to be selected from a list of native and indigenous species, which will include elder, hazel, holly, guelder rose, spindle, willows and other plants found locally. Planting sizes will vary from 30 to 75cm in height and shrub species will be planted at between 1.0 and 1.5m centres.

10.7 RESIDUAL IMPACTS (post mitigation)

The proposed development will not increase the impact on landscape because it is completely screened from view.

Table 10.2: Residual Impacts

View (E-East; W-West; N-North; S-South)	Photo	Magnitude	Sensitivity	Significance of Impact
Proposed development				
From W	10.4	Low	Low	Not significant
Existing development				
From W	10.2	Medium	Medium	Slight adverse
From W	10.3	Low	Low	Not significant
From W	10.5	Low	Medium	Not significant
From W	10.6	Low/very low	High	Not significant
From N	10.7	Low - medium	Low – medium	Not significant – slight adverse
From NW	10.8	Very low	High	Not significant
From ENE	10.9	Low/very low	Medium	Not significant
From E	10.10	Low/very low	Medium	Not significant
From S (R513)	10.11	Low/very low	Low	Not significant
From S (R513)	10.1	Very low	Very High	Not significant
From SE	10.12, 10.13	Low	Medium – High	Not significant
From South	10.14	Low – medium	Medium – High	Not significant
From SW	10.15	Very low	High / Very High	Not significant

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Direct close up views of the mill house are limited due to screening along R662, however, any close up views looking east are slight adverse. From properties to the north the sensitive views are eastwards and the pig farm is to the south where views are medium – high. Therefore the low-medium magnitude gives not significant – slight impact. Overall the Landscape impact of the existing pig farm is not significant.

10.8 CUMULATIVE IMPACTS (post mitigation)

Cumulative effects are defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects*".

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Cumulative effects are defined in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". EC guidance (2017) also states that "*it is important to consider effects not in isolation, but together, that is cumulatively*".

The impact of the proposed development has to be considered in combination with the existing 600 sow pig farm. In the closer environs and at nearest dwellings to the west and north of the pig farm, the views of the pig farm are confined to the upper half of the mill house. Although 18m tall, this house is dark green and it blends in with the cluster of tree lines around the existing farmstead and the farmstead to the western side of the road (R662). This reduces the impact. Views from east, south east and south are generally at distances of 750m – 2km and at this distance, the upper part of the mill house is visible and the views are back-dropped by evergreen plantations on the eastern side of Curraghturk Hill and higher ground to the west of the pig farm.

The sensitive views in this locality are towards the Galtee Mountains which dominate the landscape. The pig farm does not interfere with these views, either on the R513 to Ballylanders or the R662 to Galbally. There are no views of the pig farm from the scenic route on the R513 south of the junction with the R662. There are no views of the pig farm from the scenic route on the R663 which runs east from Galybally to Tipperary Town.

As discussed in Section 10.3 the site is located in the lowland component of *Ballyhoura / Slieve Reagh* landscape area and close to the Galtee Mountain landscape area. Therefore the landscape value is categorised as medium - high, the landscape sensitivity is categorised as medium - high and the landscape importance is categorised as locally important. The impact magnitude is low and therefore the residual and cumulative effects of the proposed and existing development is not significant.

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There is a pig farm in Inchacoomb located 2km east of the proposed development. The Inchacoomb pig farm is well screened from view by tall hedgerows and there are no cumulative views of both pig farms. Neither pig farm interferes with the views of the Galtee Mountains. There are two EPA licensed pig farms in the Glen of Aherlow located 8km east of the study area and >13km from the 'Ballyfaskin Pig Farm' site. There are no cumulative views of these pig farms and the 'Ballyfaskin Pig Farm'. These pig farms are farmsteads scattered throughout the rural landscape and do not change the character of the wider landscape or the local landscapes. Therefore there are no cumulative effects on Landscape.

Interactions between Landscape and other environmental topics have been considered throughout this assessment; such as interactions with Human Population and Human Health due to potential impact from the proposed buildings on the visual character of the locality and views from sensitive receptors (dwellings). Having considered these interactions there are no additional significant impacts from the existing pig farm or the proposed development.

10.9 CONCLUSIONS

The proposed development will be completely screened and there will be no impact on landscape from it. The in combination impact from the existing and proposed development is not significant due to natural screening in the landscape, due to the character of the landscape which has farmstead clusters and tall hedgerows and tree lines and due to the dark green colour of the mill house. The landscape has the ability to absorb this development due to natural screening and the dark green colour of the mill. The proposed landscaping will further mitigate impacts. Cumulative impacts with a pig farm in Inchaccomb 2km south east of the 'Ballfaskin' site is assessed as not

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significant. The proposed and existing pig farm will not significantly interfere with views of the Galtees.



Plate 10.18: View of the Galtee Mountains from the back of the pig farm site

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10.10 REFERENCES

Environmental Protection Agency (EPA), 2016, Sector Specific AER – PRTR Guidance Document: Intensive Agriculture**.** Available at: https://www.epa.ie/pubs/advice/aerprtr/pigpoultryaerprtrguidance/AER%20PRTR%20Guidance%20Doc%20Intensive%20Agri%20Version%203.1%20January%202016.pdf

Environmental Protection Agency (EPA) (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Report. Available from: https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

Limerick County Development Plan 2010 – 2016 (incl. variations 1 – 3, 5 & 6) Chapter 7

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CHAPTER 11 - CULTURAL HERITAGE

11.1 INTRODUCTION

The following archaeological impact assessment has been prepared to accompany a planning application in the townland of Ballyfauskeen, Co. Limerick, for:

> *Increased capacity of the piggery from 600 sows to 1000 sows and their progeny in addition a new electrical substation will be constructed. The development requires an EPA Industrial Emissions License (formerly Integrated Pollution Prevention and Control License.*
>
> Planning file 191135, Limerick County Council.

11.2 METHODOLOGY

This assessment is based on a site visit, on surviving maps, accessible aerial photographs, and the Archaeological Survey Database of the National Monuments Service (www.archaeology.ie). The site was visited on 25 September 2020.

11.3 EXISTING SITE



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Figure 11.1: Digital globe aerial photo c.2012, with development site outlined.

The Site

Ballyfaskin/ Ballyfauskeen is in the south eastern lobe of Co. Limerick, at the west end of the Glen of Aherlow, near the foot of the Galtee Mountains. The ground is elevated above the wide coastal plain

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to the west, but relatively level, pitching gently to the northeast. The pig farm is at Ballyfauskeen crossroads, in the wide northeast angle.





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Plates 11.1, 11.2, Site of proposed ESB substation (behind hedge) from NW, and SW.

11.3.1 Archaeological background at site of proposed development

The road from Ballylanders to the pass between the Galtee and Ballyhoura mountains runs approximately N/S through Ballyfauseen crossroads. The crossroads is shown on the first edition OS 1/10560 survey of c.1840, and it appears that the main road south of the crossing is a relatively new limb, cutting across field boundaries aligned with the other three legs of the crossing, all of which have been laid out by professional surveyors, in the 18th or early 19th century. The late limb at the crossroads was probably inserted (sometime before 1840) to avoid a steep slope on the road south to Anglesborough. Road improvements in the 19th century are largely associated with reducing slopes, to adapt routes for horse drawn vehicles.

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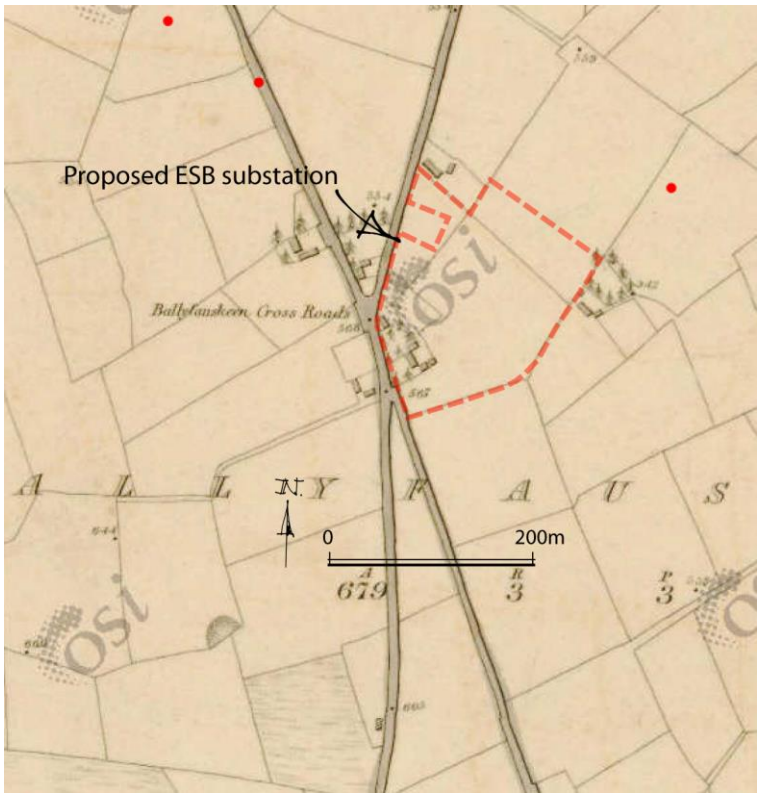


Figure 11.2 Site superimposed on detail from OS 1/10560 survey of c.1840.

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Much of the land at Ballyfauskeen may have been unenclosed before the straight roads were built through the crossing. Buildings shown around Ballyfaskin crossroads on the first edition OS survey appear to represent at least two farms. None of these buildings are likely to predate the straight roads of the 18th or early 19th century.

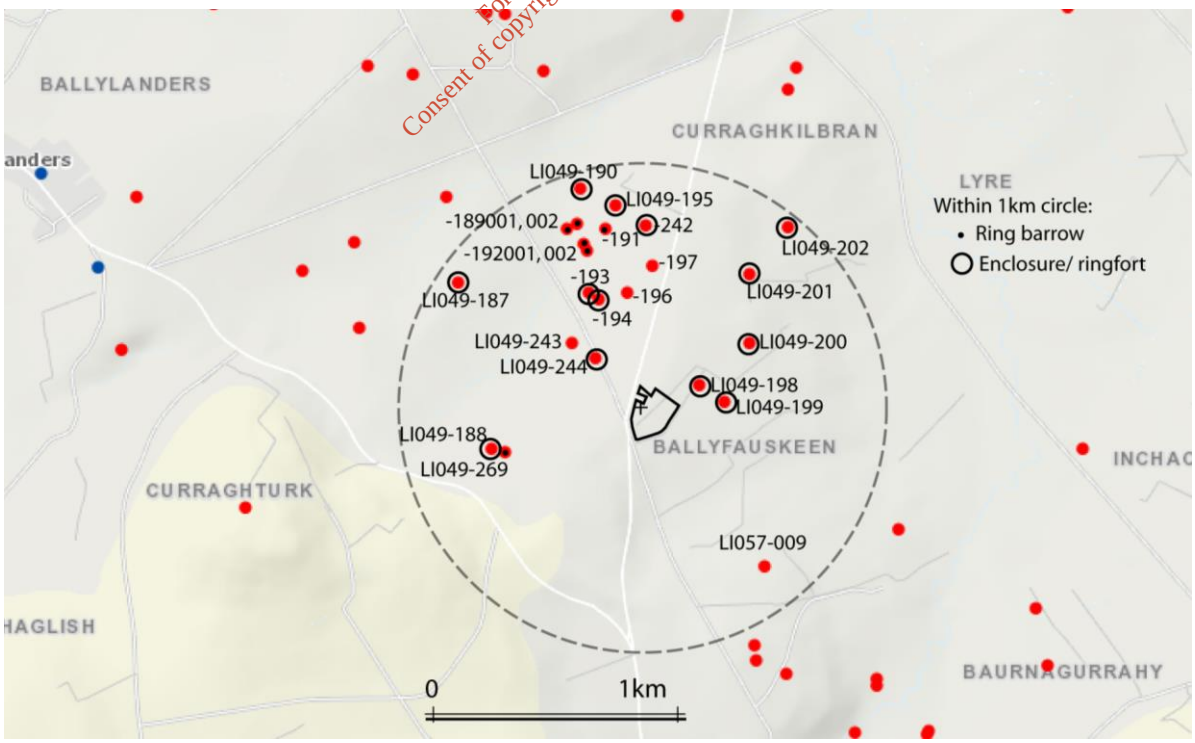


Figure 11.3. Site (outlined in black) and known monuments, labelled within 1km radius from centre of site.

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There are no known monuments within the development area, but the DCHG's Archaeological Survey Database shows a considerable number of known sites in the vicinity. A large area, from the west side of the Ballyhoura Hills to the west end of the Glen of Aherlow has a dense distribution of late prehistoric ring barrows and early historic ringforts. The ring barrows are burial monuments, with one or more (normally) cremated individuals buried in pots and occasionally in stone cists under a small mound surrounded by a circular ditch. This form of burial was popular in the Bronze Age and Iron Age. Ringforts are more recent, enclosed farms or homes of the second half of the first millennium AD. The term "enclosure" is used for many of the likely ringforts in the archaeological survey database. The known monuments are listed below, but no description is currently available from the database (www.archaeology.ie):

LI049-187. Enclosure.
LI049-188. Enclosure.
LI049-189001. Ring barrow.
LI049-189002. Ring barrow.
LI049-190. Enclosure.
LI049-191. Ring barrow.
LI049-192001. Ring barrow.
LI049-192002. Ring barrow.
LI049-193. Enclosure.
LI049-194. Enclosure.
LI049-195. Enclosure.
LI049-196. Fulacht fia.
LI049-197. Earthwork.
LI049-198. Enclosure.
LI049-199. Enclosure.
LI049-200. Enclosure.
LI049-201. Enclosure.
LI049-202. Enclosure.
LI049-242. Enclosure.
LI049-243. Earthwork.
LI049-244. Enclosure.
LI049-269. Ring barrow.

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The National Inventory of architectural Heritage has no buildings of interest within 1km radius of the site.

The site is on ground falling away from the adjacent roads, and is largely masked from the roads by trees and hedging.

11.3.2 Archaeological background of Study Area.

On examination of the gis[1] files for national monuments and inventory of architectural heritage it was concluded that the study area is relatively rich in Cultural Heritage sites. There are 468 registered national monuments within the study area which are of varying importance (Table 11.1). Also, within the study area there are 228 recorded structures on the National Inventory of Architectural Heritage (Table 11.2). Of these 50 are of regional importance and 54 are of local importance. The list includes 12 bridges which are not of local or regional importance. The nearest of these bridges are 1.5km SE and 1.6km NE of the site boundary The proper practice of land-spreading farm manures onto

[1] https://webgis.archaeology.ie/historicenvironment/

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agricultural land will not affect these sites because agricultural traffic will avoid above ground structures and have no effect on below ground sites.

Table 11.1: Summary list of National Monuments within the Study Area

Register Monument type	No.
Altar	1
Architectural fragment	7
Barrow - ditch, embanked, ring, unclassified	136
Bawn	1
Bridge, Clapper bridge	2
Burial ground / sites	4
Cairn - unclassified	2
Castle - motte, ringwork, tower house, unclassified	16
Cathedral	1
Church	17
Cross - high cross, slab, crucifixion plaque	3
Cursus	1
Designed landscape feature	1
Dovecote	1
Earthwork, linear earthwork	10
Enclosures, ecclesiastical enclosure (1)	121
Excavation - miscellaneous	6
Field system	7
Flat cemetery	1
Ford	1
Fulacht fia	1
Graveyard, graveslab, headstone	19
Hillfort	1
Historic town	5
Hut site	2
Megalithic structure	1
Megalithic tomb - wedge tomb	1
Memorial stone	1
Mill - unclassified, water mill	3
Moated site	3
Mound	5
Pit	1
Redundant record	8
Ring-ditch	5
Ringfort - cashel, rath	34
Ritual site - holy well	13
Road - road/trackway	1
Sheela-na-gig	1
Souterrain	1
Standing stone	17
Stone circle	1
Tomb - chest tomb	2

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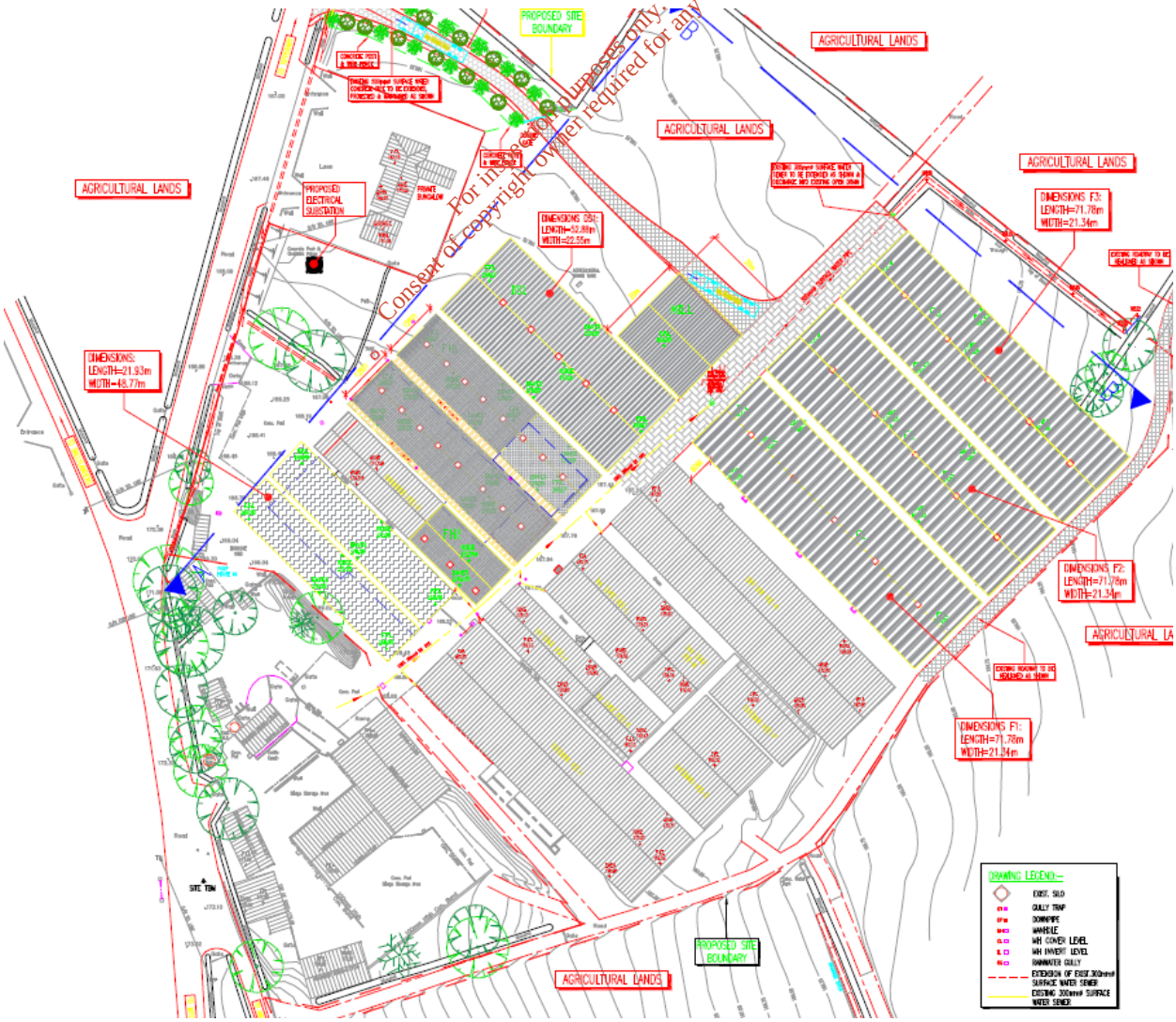
Wall monument	3

Table 11.2: Summary list of structures on the National Inventory of Architectural Heritage

Structure on the NIAH	Regionally Important	Locally Important
Chapel / church / mausoleum	12	-
Country house / house	16	46
Creamery	2	-
Mausoleum	6	-
Monument	2	-
Post box	4	-
Presbytery/parochial/curate's house	4	4
RIC Barracks	4	-
School	-	2
Shop	-	2
Total =>	**50**	**54**

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development involves the construction of one new building, an electricity substation. This will be a relatively small structure, with a small footprint (22m^2).



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Figure 11.4, Proposed site location map.



Plate 11.3: Location of proposed electrical sub station

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11.5 RESULTS OF ASSESSMENT

11.5.1 Do Nothing' Impact

The do nothing impact would result in no changes to the archaeological environment.

11.5.2 Potential Pre-mitigation Archaeological Impacts

There are no known monuments on or beside the development site, and no reports of chance discoveries during the earlier development of the site. However there was no archaeological monitoring of groundworks in the past and material of interest may have escaped notice.

The likelihood of material of archaeological interest existing in the footprint of the proposed substation is small, but must be considered. Whilst the development will have no impact on known archaeological monuments, there is the small risk of a significant or profound impact on a currently unknown site (within the small footprint of the new building a prehistoric burial could be fully removed by groundworks).

11.6 MITIGATION & MONITORING

It is recommended that the removal of topsoil in the footprint of the proposed electricity substation is monitored by an experienced field archaeologist, to record and investigate any material of likely archaeological significance. Groundworks may be halted to allow proper investigation and in exceptional circumstances the National Monuments Service may be called in to advise.

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11.7 RESIDUAL IMPACTS

The desktop assessment indicates that there is unlikely to be any significant residual impact, but this assessment should be reviewed during monitoring. If material of archaeological interest is discovered during development works investigation and recording may be sufficient, but in exceptional circumstances the National Monuments Service, DCHG, will be called in to advise on appropriate mitigation.

11.8 CUMULATIVE IMPACTS

The cumulative archaeological impact of the proposed works and earlier works on site is unknown but probably not significant.

11.9 CONCLUSION

The desktop assessment indicates the residual impact is unlikely to be significant, but this assessment will be reviewed as the works are being carried out.

The above recommendation is advisory, for the consideration of the National Monuments Service, DCHG.

Dave Pollock, MIAI. 28/08/20.

ArchaeoGraFix is the partnership of Jo Moran and Dave Pollock, VAT No. 9518363E

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11.10 REFERENCES.

Archaeological Survey Database. www.archaeology.ie.
National Inventory of Architectural Heritage. www.buildingsofireland.ie.

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CHAPTER 12 - INTERACTIONS, CUMULATIVE EFFECTS AND TRANSBOUNDARY EFFECTS

Section 12.1 Introduction introduces the concept of Interactions, cumulative effects and transboundary effects. **Section 12.2** discusses the methodology employed. **Section 12.3** looks at potential interactions. **Section 12.4** examines potential cumulative effects. **Section 12.5** examines potential transboundary effects. Conclusions regarding Interactions, cumulative effects and transboundary effects are provided in **Section 12.6**.

12.1 INTRODUCTION

Interactions

The definition of 'impact interactions' and 'cumulative impacts' can overlap. EC guidance (2017) states '*Cumulative effects are changes to the environment that are caused by an action in combination with other actions. They can arise from;*

- *The interaction between all of the different projects in the same area*
- *The interaction between various impacts within a single project"*

During the preparation of this EIAR, the potential for significant interactions of impacts between various impacts within this proposed development were examined and any potential impacts were identified. The impacts of the existing and proposed pig farm development have been considered. These potential impacts were addressed in the baseline and impact assessment studies for each of the relevant environmental topics and were addressed in each individual topic assessment. The interaction of impacts and the mitigation measures of each of the environmental factors have been identified and addressed in detail in the respective chapters dealing with each environmental factor in this EIAR. Thus no additional mitigation is proposed in this chapter. This chapter presents a summary of each assessment of the interaction (inter-relationship) of impacts (from the proposed pig farm development) between the various environmental factors and summarises the mitigation measures relative to those interactions. Table 12.2 presents the potential interactions between the environmental factors in a matrix format. The paragraphs following Table 12.2 present an assessment of the potential interactions of impacts, mitigation measures and residual impacts.

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Cumulative Effects

Cumulative effects are also defined in EPA guidance (2017) 13 as "*The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects;* and in EC guidance (2017)12 as: "*Changes to the environment that are caused by activities/projects in combination with other activities/projects*". During the preparation of the EIAR for the proposed development, the potential for significant cumulative impacts were examined and any potential impacts were identified. These potential impacts were included in the scope and addressed in the baseline and impact assessments for each of the relevant environmental topics. Section 12.4 and Table 12.3 sets out a summary of these potential cumulative effects. No additional significant cumulative effects were identified.

Transboundary effects

Annex IV (5) of the EIA Directive as amended by Directive 2014/52/EU states that the EIAR shall contain: *The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative,* ***transboundary****, short-term,*

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medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project". Potential Transboundary effects are discussed in Section 12.5.

12.2 METHODOLOGY

12.2.1 Sources of Information

In compiling this chapter the following guidance documents were followed;

- EPA (Environmental Protection Agency): Guidelines on the information to be contained in environmental impact assessment reports, (Draft May 2017);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 – Si 296 of 2018; and
- European Commission (2017) Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report. (Office for Official Publications of the European Communities 2017).

12.2.2 Assessment of Significance

The assessment of impacts involves the assessment of individual impacts of environmental topics identified in the left hand column of Table 12.2 on other environmental topic identified in the top row of the table. The significance of impact criteria are set out in Table 12.1.

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Table 12.1: Significance of impact criteria (based on EPA 2017 Guidance)

Significance Level	Criteria
Imperceptible Impact	*An effect capable of measurement but without significant consequences*.
Not Significant	*An effect which causes noticeable changes in the character of the environment without significant consequences*.
Slight Impact	*An effect which causes noticeable changes in the character of the environment without affecting its sensitivities*.
Moderate Impact	*An effect that alters the character of the environment in a manner that is consistent with existing emerging trends*.
Significant Impact	*An effect which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment*.
Very Significant Impact	*An effect which by its character, magnitude, duration or intensity alters the majority of a sensitive aspect of the environment*.
Profound Impact	*An effect which obliterates sensitive characteristics*.

12.2.3 Duration of Impact

The duration of impact is determined by referring to each chapter in the EIAR. In general impacts during the 4 month construction period are temporary and other potential impacts discussed in this chapter are permanent.

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12.3 INTERACTIONS

All environmental factors are inter-related to some extent, and the relationships can range from tenuous to inextricable. The interactions between the identified environmental impacts have already been considered and assessed within the individual chapters of this EIAR. Consideration of interactions when recommending mitigation measures in the various topics has helped to identify and minimise the potential for significant interaction of impacts. For example, where it has been established in **Chapter 7, Air** that there will be ammonia emissions from land spreading, then **Chapter 3 Human Population and Human Health** has assessed the effect of those emissions on human health and **Chapter 6 Water** has assessed the effect of those emissions on water. Resulting from these interactions mitigation measures to minimise impacts have been employed. This assessment is based on information contained within this EIAR and having considered the potential interactions there are no additional significant impacts or required mitigation to those already identified in the individual EIAR chapters.

Table 12.2 examines the potential for the environmental factor or issue in the left hand column to have an impact on the environmental factor listed in the top row of the matrix as a result of the proposed road development. As discussed above, these potential interactions of impacts were identified within the individual chapters of this EIAR. If there is the potential for an impact during the construction phase, this is indicated by a 'C'. An 'O' indicates the potential for an impact during the operational phase and 'CO' indicates the potential for an impact during both phases. If it is considered that there will be no potential for an impact, this is indicated by 'N' (none). Where it is considered that interactions exist the paragraphs following Table 12.2 present an assessment of the potential interactions of impacts, mitigation measures and residual impacts.

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Table 12.2 Typical Relationships between the Environmental Topics

Typical Inter-Relationship Matrix – Environmental Elements	Human Population, and Human Health	Biodiversity	Land & Soils	Water	Air	Climate	Material Assets	Landscape, Visual	Cultural Heritage, Archaeology	Risk of Major Accident / Natural Disaster
Human Population and Human Health		N	N	N	N	N	N	N	N	CO
Biodiversity	N		N	N	N	N	N	N	N	N
Land & Soils	O	N		O	O	O	O	N	N	N
Water	CO	O	N		N	N	CO	N	N	CO
Air	CO	CO	N	O		O	N	N	N	N
Climate	CO	CO	N	N	N		N	N	N	N
Material Assets	CO	N	N	N	N	N		N	C	N
Landscape, Visual	O	N	N	N	N	N	N		N	N
Cultural Heritage, Archaeology	N	N	N	N	N	N	N	N		N
Risk of Major accident / disaster	CO	CO	N	CO	N	N	CO	N	N	

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12.3.1 Interaction of Human Population and Human Health with Risk of Major Accidents / Natural Disasters.

Potential Interactions

- Construction related accidents could occur during the construction phase;
- Lack of training of farm workers and failure to implement health and safety measures could lead to accidents and / or environmental incidents (e.g. spills or fires);
- Natural disasters (flooding) are not likely due to the location of the site; and
- Exposure to harmful emissions could impact on farm worker's health.

Mitigation

- Contractors employed during construction will have to have up to date safety statements and procedures in place;
- The risk of off-site spills (e.g. during transportation of pig manure) is minimized by employing reputable contractors and regular inspection of pig manure spreading equipment entering the site;
- Staff are trained to adopt work practices which avoid risks to health and safety and minimizes risks of work place accidents;
- Staff are required to wear appropriate health and safety protection (e.g. ear, eye and dust protection);
- Health and safety training is an on-going responsibility of the pig farm management and an up-to-date safety statement is maintained on site; and
- The safety statement includes procedures in relation to contacting the emergency services if there is an accident on site. Farmers who are customers for the pig manure are provided with an emergency contact number for a member of the pig farm management staff; and
- Continuous checking of equipment and electrical installations takes place to insure the risk from fire is minimized. There are procedures in place to contact the emergency services if there is a fire and to remove staff and other personnel from the site.

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Residual Impacts (post mitigation)

With adequate training the risk of major accidents / natural disasters is minimised and not significant.

12.3.2 Interaction of Land and Soils with Human Population and Human Health

Potential Interactions

- Leaching and run-off of soil nutrients has the potential to impact on water quality and therefore a knock-on effect on human health; and
- Land spreading pig manures increases the risk of pathogens infecting water.

Mitigation

- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and adherence to specified buffers for the protection of private wells (25 m) and surface waters (5m minimum);

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Residual Impacts (post mitigation)

The impacts on human health are not significant with standard mitigation. Land spreading pig manure is an acceptably safe method of recycling nutrients to the soil.

12.3.3 Interaction of Land and Soils with Water

Potential Interactions

- Leaching and run-off of soil nutrients has the potential to impact on water quality; and
- Land spreading pig manures increases the risk of pathogens infecting water.

Mitigation

- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and adherence to specified buffers for the protection of private wells (25 m) and surface waters (5m minimum);
- Replacing non-renewable chemical fertiliser with organic pig manure will off-set nutrients from chemical fertiliser;
- Bunding of over ground storage tanks;
- Storage of pig manure in leak-proof tanks; and
- Surface water monitoring is an on-going requirement of the IPPC license to monitor the quality of storm water run-off.

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Residual Impacts (post mitigation)

The impacts on Water from Land and Soils are not significant with standard mitigation.

12.3.4 Interaction of Land and Soils with Air

Potential Interactions

- Land spreading of pig manure has to potential to impact on air quality caused by emissions of malodour, ammonia and nitrous oxide.

Mitigation

- Using low protein diets will reduce odour and NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters; and
- Replacing non-renewable chemical fertiliser with organic pig manure will off-set emissions from chemical fertiliser.

Residual Impacts (post mitigation)

The impacts on Air from Land and Soil are not significant.

12.3.5 Interaction of Land and Soils with Climate

Potential Interactions

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- Land spreading of pig manure has to potential to impact on Climate caused by emissions of methane, ammonia and nitrous oxide.

Mitigation

- Using low protein diets will reduce odour and NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Replacing non-renewable chemical fertiliser with organic pig manure will off-set emissions from chemical fertiliser; and
- Alternative technologies such as AD have been considered in Chapter 2 and with Government incentives these options for CO_2 mitigation will become viable.

Residual Impacts (post mitigation)

The impacts on Climate from Land and Soil are not significant (when cumulative effects are considered) with standard mitigation because the pig farm and land spreading will not add significantly to baseline levels of GHGs.

12.3.6 Interaction of Land and Soils with Material Assets

Potential Interactions

- Addition of organic fertiliser to agricultural land will increase soil nutrients; and
- Land spreading could affect private and public water sources;

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Mitigation

- Using low protein diets will reduce odour and NH_3 emissions;
- Minimise water usage to minimise pig manure production and the traffic related to the volume of pig manure produced;
- A move towards low emission slurry spreading will reduce air emissions. Timing of pig manure application early in the year and in cool weather reduces emissions; and
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will insure low application rates and protection of private wells and surface waters;

Residual Impacts (post mitigation)

The impacts on Material Assets from Land and Soil are not significant.

12.3.7 Interaction of Water with Human Population and Human Health

Potential Interactions

- Construction activities might potentially lead to contaminated run-off potentially impacting on public water supplies (e.g. fuel spills);
- The storage of pig manure on site could potentially lead to groundwater contamination and potentially impact on water quality of public water supplies;
- Groundwater extraction on-site has the potential to impact on groundwater supplies; and

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- The storm water run-off from the pig farm could potentially impact on water quality of public water supplies;

Mitigation

- Construction sediment mitigation (silt traps, wheel washing) will reduce impact on water during construction;
- Where possible re fuelling will take place off site. Any re-fuelling tankers will be inspected for leaks (and not allowed on site if found leaking). All refuelling will take place in a bunded area;
- Storage of pig manure in leak-proof tanks;
- Existing water supply exceeds (330m^3/day) exceeds the proposed daily requirement of 48m^3/day;
- Good operational practice at the pig farm will include cleanliness around the pig farm. The design of the new pig buildings means that all pig walk ways are slatted and soiled water collected to slurry tanks; and
- Surface water monitoring will take place to insure maintenance of high water quality from storm water run-off.

Residual Impacts (post mitigation)

The impacts on Human Population and Human Health from Water are not significant with standard mitigation.

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12.3.8 Interaction of Water with Biodiversity

Potential Interactions

- Construction activities might potentially lead to contaminated run-off potentially impacting on aquatic biodiversity (e.g. fuel spills);
- The storage of pig manure on site could potentially lead to groundwater / surface water contamination and potentially impacting on aquatic biodiversity; and
- The storm water run-off from the pig unit could potentially impact on aquatic biodiversity.

Mitigation

- Construction sediment mitigation (silt traps, wheel washing) will reduce impact on water during construction;
- Where possible re fuelling will take place off site. Any re-fuelling tankers will be inspected for leaks (and not allowed on site if found leaking). All refuelling will take place in a bunded area;
- Storage of pig manure in leak-proof tanks;
- Good operational practice at the pig farm will include cleanliness around the pig farm. The design of the new pig buildings means that all pig walk ways are slatted and soiled water collected to slurry tanks;
- Surface water monitoring will take place to insure maintenance of high water quality from storm water run-off; and
- Existing water supply exceeds (330m^3/day) exceeds the proposed daily requirement of 48m^3/day.

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Residual Impacts (post mitigation)

The impacts on Biodiversity from Water are not significant with standard mitigation.

12.3.9 Interaction of Water with Material Assets

Potential Interactions

- Construction activities might potentially lead to contaminated run-off potentially resulting on impacts to the supply of public water to businesses and local residents;
- The storage of pig manure on site could potentially lead to groundwater contamination and potentially impacting on the supply of public water to businesses and local residents;
- Groundwater extraction will increase locally; and
- The storm water run-off from the pig unit could potentially impact on the supply of public water to businesses and local residents.

Mitigation

- Construction sediment mitigation (silt traps, wheel washing) will reduce impact on water during construction;
- Storage of pig manure in leak-proof tanks;
- Existing water supply exceeds (330m^3/day) exceeds the proposed daily requirement of 48m$^{3;}$
- Good operational practice at the pig farm will include cleanliness around the pig farm. The design of the new pig buildings means that all pig walk ways are slatted and soiled water collected to slurry tanks; and
- Surface water monitoring will take place to insure maintenance of high water quality from storm water run-off.

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Residual Impacts (post mitigation)

The impacts on Material Assets from Water are not significant with standard mitigation.

12.3.10 Interaction of Water with Risk of Major Accidents / Natural Disasters

Potential Interactions

- The storm water run-off from the pig unit could potentially cause flooding on adjoining property; and
- Slurry tanks could overflow from the site.

Mitigation

- Storm water is piped to open watercourse with adequate capacity to take the proposed volumes of water; and
- Pig manure tanks are underground; and
- There is >40 weeks slurry storage.

Residual Impacts (post mitigation)

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The impacts on Risk of Major Accidents / Natural Disasters from Water are not significant with standard mitigation.

12.3.11 Interaction of Air with Human Population and Human Health

Potential Interactions

- Potential impact on human health from construction dust;
- Potential impacts on air quality from land spreading and the pig houses (e.g. ammonia and odour emissions) have potential effects on human health as identified in Chapters 3 and 7;
- Farm workers are exposed to confined environments where dust and other harmful air emissions exist; and
- Potential nuisance impacts on commercial premises were identified in Chapters 3 and 7;

Mitigation

- Using low protein diets will reduce odour and NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Construction dust mitigation (dousing with water) will reduce impact on humans;
- A noise management programme will be implemented to minimize nuisance;
- Good operational practice at the pig farm will include cleanliness, dryness, and keeping slurry storage to a minimum during the summer season (highest risk of odour nuisance) and having an Air Quality (Odour) Management Plan in Place (Appendix 4 of Volume 3 of EIAR); and
- Health and Safety controls which minimise the amount of time workers are exposed to dust and insures adequate cleaning of pig houses, safety and awareness training, and the provision of personal protection equipment (PPE) i.e. dust masks.

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Residual Impacts (post mitigation)

The impacts on Human Population and Human Health from Air are not significant with standard mitigation.

12.3.12 Interaction of Air with Biodiversity

- Potential impact on Biodiversity from construction dust; and
- Ammonia emissions from land spreading and the pig houses can have potential effects on Biodiversity due to ammonia deposition locally;

Mitigation

- Using low protein diets will reduce NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;

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- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates surface waters and aquatic habitats;
- Construction dust mitigation (dousing with water) will reduce impact on biodiversity; and
- Good operational practice at the pig farm will include cleanliness and dryness will help mitigate ammonia production from soiled wet surfaces.

Residual Impacts (post mitigation)

The impacts on Biodiversity from Air are not significant with standard mitigation because the pig farm and land spreading will not add significantly to the baseline levels. No sensitive habitats were identified in the vicinity of the pig farm.

12.3.13 Interaction of Air with Water

- Potential impact on Water from construction dust;
- Ammonia emissions from land spreading and the pig houses can have potential effects on Water due to ammonia deposition locally;

Mitigation

- Using low protein diets will reduce NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Construction dust mitigation (dousing with water) will reduce impact on biodiversity; and
- Good operational practice at the pig farm will include cleanliness and dryness will help mitigate ammonia production from soiled wet surfaces.

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Residual Impacts (post mitigation)

The impacts on Water from Air are not significant with standard mitigation because the pig farm and land spreading will not add significantly to the baseline levels of ammonia.

12.3.14 Interaction of Air with Climate

- Ammonia, methane and nitrous oxide emissions from land spreading and the pig houses can have potential effects on Climate due to increase in greenhouse gases (GHGs).

Mitigation

- Using low protein diets will reduce NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Good operational practice, efficiency and investing in genetic improvement will minimise impact on GHGs; and
- Replacing chemical fertiliser will mitigate GHGs.

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Residual Impacts (post mitigation)

The impacts on Climate from Air are not significant with standard mitigation because the pig farm and land spreading will not add significantly to the baseline levels of GHGs. The pig farm will adhere to any specific changes required by Government Policy.

12.3.15 Interaction of Climate with Human Population and Human Health

- Ammonia, methane and nitrous oxide emissions from land spreading and the pig houses can have potential effects on the human environment due to increase in greenhouse gases (GHGs).

Mitigation

- Using low protein diets will reduce NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Good operational practice, efficiency and investing in genetic improvement will minimise impact on GHGs; and
- Replacing chemical fertiliser will mitigate GHGs.

Residual Impacts (post mitigation)

The impacts on Human Population and Human Health from Climate Change are not significant with standard mitigation because the pig farm and land spreading will not add significantly to the baseline levels of GHGs.

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12.3.16 Interaction of Climate with Biodiversity

- Ammonia, methane and nitrous oxide emissions from land spreading and the pig houses can have potential effects on Biodiversity due to increase in greenhouse gases (GHGs).

Mitigation

- Using low protein diets will reduce NH_3 emissions;
- A move towards low emission slurry spreading will reduce air emissions at land spreading. Timing of pig manure application early in the year and in cool weather reduces emissions;
- Adherence to SI 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) will ensure low application rates and protection of private wells and surface waters;
- Good operational practice, efficiency and investing in genetic improvement will minimise impact on GHGs; and
- Replacing chemical fertiliser will mitigate GHGs.

Residual Impacts (post mitigation)

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The impacts on Biodiversity from Climate Change are not significant with standard mitigation because the pig farm and land spreading will not add significantly to the baseline levels of GHGs.

12.3.17 Interaction of Material Assets with Human Population and Human Health

- Construction traffic could potentially impact on human beings;
- Construction and operational noise could potentially impact on human beings; and
- Operational traffic (e.g. feed deliveries and slurry tankers) could potentially impact on human beings;

Mitigation

- The contractor(s) will use wheel wash facilities to ensure that soil is not transported out onto the public road;
- The contractor(s) will confine construction works to normal operational hours 0800am to 1900pm Monday to Friday; and
- Pig farm management staff will notify adjoining land owners in advance of construction commencement in case there are any sensitive livestock nearby (e.g. horses or cows at the point of calving).

Residual Impacts (post mitigation)

The impacts on Human Population and Human Health from Material Assets (e.g. traffic) are not significant with standard mitigation.

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12.3.18 Interaction of Material Assets with Cultural Heritage

- Construction works could potentially impact on Cultural Heritage; and
- Operational traffic (e.g. slurry tankers) could potentially impact on Cultural Heritage sites in the spread lands;

Mitigation

- Removal of topsoil at the start of building works will monitored by an experienced field archaeologist, to record any material of archaeological significance. Groundworks may be halted to allow proper investigation, and in exceptional circumstances the National Monuments Service may be called in to advise. This recommendation is advisory, for the consideration of the National Monuments Service, DAHG.
- Pig manure spreading will not disturb soil surface therefore it will not impact on unknown archaeology.

Residual Impacts (post mitigation)

The Archaeological Assessment of the proposed development indicates no known archaeology, therefore initial indications are that there won't be a significant impact and the site works will be monitored to address potential impacts of unknown archaeology.

12.3.19 Interaction of Landscape with Human Population and Human Health

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- The construction of ESB Substation could potentially impact on views of sensitive human receptors.
- Cumulative visual impact of existing 600 sow unit

Mitigation

- The site is screened with existing vegetation;
- There is a detailed landscaping plan; and
- The design of the pig houses mitigates potential visual impacts because of their low profile (low height relative to length).

Residual Impacts (post mitigation)

The visual impact is not significant because local views of the proposed development are restricted and only the proposed roofs will be visible.

12.3.20 Interaction of Risk of Major Accidents / Natural Disasters with Human Population and Human Health

- Construction accidents could impact on human health;
- The occurrence of environmental incidents or accidents such as diesel oil, slurry and liquid feed spills could impact on human health; and
- The occurrence of incidents such as fires or accidents related to machinery or slurry could impact on human health.

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Mitigation

- Construction contractors will be required to have a safety statement and active safety policy for their workers. There will be a designated liaison officer to deal with issues. Construction workers will be equipped with the relevant personal protection equipment at all times. This includes eye and ear protection for dust and noise impacts;
- A safety statement will be in place at the pig farm and this addresses the health and safety of workers and visitors;
    - To protect workers from noise they are provided with standard approved eye and ear protection devises;
    - Noises from pigs occurs mainly at feeding time. Noise from the proposed fattening houses will be minimised due to using modern ad-lib feeding system; and
- All visitors to the site will be expected to sign in at the office and will be provided with eye and ear protection devises;
- Staff will be trained in health and safety; and
- There will be an emergency response procedure in place on the pig farm.

Residual Impacts (post mitigation)

The pig farm operates a safe place of work policy. There is a safety statement in place which is constantly updated. The safety record of the pig farm is very good. The risk of Major Accidents / Natural Disasters is very low and therefore the overall impact to Human Population and Human Health is not significant.

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12.3.21 Interaction of Risk of Major Accidents / Natural Disasters with Biodiversity

- The occurrence of environmental incidents or accidents such as diesel oil, slurry and liquid feed spills could impact on Biodiversity by impacting on aquatic habitats.

Mitigation

- During construction, where possible re fueling will take place off site. Any re-fueling tankers will be inspected for leaks (and not allowed on site if found leaking). All refueling will take place in a bunded area. Machinery will be inspected to insure machinery leaking oils or fuel will not be allowed on site.
- Staff will be trained in health and safety and avoiding environmental incidents;
- The pig farm management will have 'An Incident Response Plan' detailing the procedures to be undertaken in the event of spillage of fuel or other harmful material that could lead to a pollution incident;
- Sediment erosion and pollution prevention techniques such as silt fences, bunds and settlement ponds will be used where required e.g. adjoining stock piled heaps of clay. Also allowing the establishment of vegetation on the exposed soil will prevent run-off;
- It is a requirement of the IPPC license to undertake a tank and pipeline integrity test every 5 years to insure tanks are leak-proof; and
- Slurry spreading equipment extracting pig manure will be monitored by the pig farm to insure farmers do not use leaking equipment for spreading pig manure.

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Residual Impacts (post mitigation)

The risk of Major Accidents / Natural Disasters is very low and therefore the overall impact to Biodiversity is not significant.

12.3.22 Interaction of Risk of Major Accidents / Natural Disasters with Water

- The occurrence of environmental incidents or accidents such as diesel oil, slurry and liquid feed spills could impact on water quality.

Mitigation

- During construction, where possible re fueling will take place off site. Any re-fueling tankers will be inspected for leaks (and not allowed on site if found leaking). All refueling will take place in a bunded area. Machinery will be inspected to insure machinery leaking oils or fuel will not be allowed on site.
- Staff will be trained in health and safety and avoiding environmental incidents;
- The pig farm management will have 'An Incident Response Plan' detailing the procedures to be undertaken in the event of spillage of fuel or other harmful material that could lead to a pollution incident;
- Sediment erosion and pollution prevention techniques such as silt fences, bunds and settlement ponds will be used where required e.g. adjoining stock piled heaps of clay. Also allowing the establishment of vegetation on the exposed soil will prevent run-off; and

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- It is a requirement of the IPPC license to undertake a tank and pipeline integrity test every 5 years to insure tanks are leak-proof; and
- Slurry spreading equipment extracting pig manure is monitored by the pig farm to insure farmers do not use leaking equipment for spreading pig manure.

Residual Impacts (post mitigation)

The risk of Major Accidents / Natural Disasters is very low and therefore the overall impact to Water is not significant.

12.3.23 Interaction of Risk of Major Accidents / Natural Disasters with Material Assets

- The occurrence of incidents such as fires could impact on Material Assets.
- Traffic accidents associated with the operation of the pig farm could affect local traffic; and
- The occurrence of environmental incidents or accidents such as diesel oil, slurry and liquid feed spills could impact on public water supplies.

Mitigation

- A safety statement is in place at the pig farm and this addresses the health and safety of workers and visitors;
    - To protect workers from noise they are provided with standard approved eye and ear protection devises;
    - Noises from pigs occurs mainly at feeding time. Noise from the proposed fattening houses will be minimised due to using modern ad-lib feeding system; and
- Staff will be trained in health and safety and fire prevention; and
- There will be an emergency response procedure in place on the pig farm.
- Sediment erosion and pollution prevention techniques such as silt fences, bunds and settlement ponds will be used where required e.g. adjoining stock piled heaps of clay. Also allowing the establishment of vegetation on the exposed soil will prevent run-off; and
- It is a requirement of the IPPC license to undertake a tank and pipeline integrity test every 5 years to insure tanks are leak-proof

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Residual Impacts (post mitigation)

The pig farm operates a safe place of work policy. There is a safety statement in place which is constantly updated. The safety record of the pig farm is very good. Slurry tankers are high pressure vessels with robust construction and rarely if ever leak or burst. The risk of road accidents involving tractors and slurry tankers is very low and therefore the overall impact to Human Population and Human Health is not significant.

12.4 CUMULATIVE IMPACTS (post mitigation)

The individual cumulative assessments for each environmental topic has been considered in each chapter of the EIAR. No additional mitigation measures are required for any cumulative effects of the proposed development with other projects. This EIAR assesses the cumulative impacts of the existing and proposed pig farm developments in the individual environmental topic chapters. A summary of all cumulative impacts assessments is presented below in Table 12.3. No additional

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cumulative impacts other than those already identified in the individual assessments arise when all cumulative impacts are considered as a whole. The following developments have been examined for potential cumulative effects and the potential effects are summerised in Table 12.3;

- The existing pig farm is part of the baseline environment, however the cumulative impacts of the proposed development have been considered in combination with the existing pig farm. So for example when considering the potential Landscape and Visual impact and the impact from construction the impact of the existing pig farm has been assessed;
- Other pig farms in the vicinity of the 'Ballyfaskin Pig Farm' such as the pig farm at Inchacoomb (2km east of the proposed development) and two pig farms located in the Glen of Aherlow (approx. 13km north east of the proposed development);
- The issue of spreading cattle slurry on the same land as the pig manure has been assessed. The potential nuisance impact is not significant due to the limited frequency with which this would occur at any one site in any one year because pig manure quantities will be limited by adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). Chemical fertiliser recommendations are calculated assuming the on-farm cattle manure has already been recycled. Therefore cattle manure is part of the baseline soil nutrient status if P index 3 is being assumed. As illustrated in Table 5.5 of Chapter 5 of this EIAR pig manure accounts for less than 2% of the organic N in County Limerick. EPA monitoring of water quality and the water quality assessment that was carried out by Ash Ecology within the study area captured the baseline effects which includes the effect from cattle manure. Therefore there are no significant cumulative effects from cattle; and

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Table 12.3 Summary of Cumulative Impacts

Other Relevant Developments	Potential Cumulative Impacts on Environmental Topics	Cumulative Impacts
Other pig farm developments within or near the study area	There is a pig farm located in Inchacoomb, 2km directly east, south east of the proposed development at the 'Ballyfaskin Pig Farm'.	• The manure from the pig farm in Inchacoomb is mainly spread outside the study area. However it is spread in Ballyfauskeen townland where pig manure from the 'Ballyfaskin' site is also spread. As long as pig manure from either site is applied in accordance to SI 605 of 2017 (as amended) the cumulative impacts will not be significant. • Ground water flows from the Inchacoomb site are north and away from the 'Ballyfaskin' site and therefore cumulative effects are not significant. • By assessing the regional water environment area where pig manure from both pig farms is applied, the in-combination effects of both pig farms on the baseline Human Health and Human Population, Land and Soil, Water, Air, Climate and Material Assets environment is taken into account. The cumulative assessments in Chapters 3, 5, 6, 7, 8 and 9 of the EIAR address potential cumulative effects from the proposed 'Ballyfaskin' and Inchacoomb developments on human health, air, water quality and supply and traffic. Noise, odour, air and landscape effects from the Inchacoomb Pig Farm are too remote from the Ballyfaskin Pig Farm to be significant. The land spreading activities of the pig manure will not impact on known and unknown archaeological features and therefore there is no cumulative effect on Cultural heritage. • The Biodiversity, Water and Air effects of the existing Inchacoomb Pig Farm and the 'Ballyfaskin Pig Farm' are part of the baseline effects. Therefore when the Water and Air effects of the proposed development at Ballyfauskeen are considered in relation to the existing baseline, the potential cumulative effects of the existing pig farms are captured. For example, Section 7.4.1 of the EIAR refers to ammonia baseline deposition rates of approximately 17.5 kgs / ha NH_3-N year with reference to EPA Report No 193; *Ambient Atmospheric Ammonia in Ireland, 2013-2014.* The baseline NH_3 emissions would include both of the existing pig farms and Section 7.8 considers the in-combination effects of the Inchacoomb site in combination with the proposed development in Ballyfauskeen. Similarly the baseline methane and nitrous oxide levels in the atmosphere would include both of the existing pig farms. The cumulative effects of the Inchacoomb Pig Farm on Biodiversity, Water and Air are not significant. • All the environmental factors in the baseline were assessed in the various chapters of the EIAR and there were no significant cumulative effects from the Inchacoomb Pig Farm.
Other pig farm developments	Within Counties Limerick and Tipperary there are	• Within Counties Limerick and Tipperary there are approximately 17,939 sows which account for approx. 13% of the national pig herd and less than 0.26% of the national agricultural GHG emissions. Table 5.5

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Other Relevant Developments	Potential Cumulative Impacts on Environmental Topics	Cumulative Impacts
within County Waterford	approximately 17,939 (2019 DAFM Pig census) breeding sows/gilts which account for approx. 13% of the national sow herd. The spreading of pig manure from other pig farms outside the study area could have a cumulative effect.	of Volume 2 of the EIAR shows that pigs account for 2% of the organic N in this part of Limerick and Tipperary. • The next nearest pig farms are located 13 km east of the 'Ballyfaskin' site in the Glen of Aherlow. These pig farms are remote from the study area there will no significant cumulative impact from this farm. • Any potential effects on Air and Water are captured in the baseline assessment.
Poultry farms	The spreading of poultry manure outside the study area could have a cumulative effect.	• No poultry houses were noted in the study area.
Cattle	The spreading of cattle manure and the organic manure from cattle, sheep and other ruminants and poultry is considered to be the main agricultural activity contributing to the baseline.	• There is potential for a cumulative nuisance effect when pig manure and cattle or poultry manure are applied at the same location. However, with adherence to Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) the application of organic manures will occur only at a frequency of a 1 - 2 times each year at any one location because quantities have to be restricted to supply only what is required by the cropping on the receiving farm. Therefore it is considered that this cumulative impact from cattle manure on Land and soils is not significant. • As previously discussed the land spreading of cattle manure in the study area is considered part of the baseline environment. Based on Table 5.5 from Section 5.8 the total organic nitrogen production from cattle, sheep, poultry and other ruminants in Counties Limerick and Tipperary is approximately 123.6 kgs per hectare of utilizable land and this increases to 126 kgs per hectare of utilizable land when pig sector organic nitrogen is added (+2%). In general 80 - 90% of national methane emissions are associated with ruminant (cattle and sheep). It is considered that proposed development will not significantly add to the cumulative emissions from cattle, sheep, poultry and other ruminants. • In the background of an increasing demand for meat based protein and climate change commitments pork is 4 times more carbon efficient than beef or sheep meat. Therefore there is a positive cumulative effect in increasing the proportion of pork in this food/protein supply chain.

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12.5 TRANSBOUNDARY EFFECTS

Transboundary impacts relate to potential impacts on other Member States, i.e. outside of the Republic of Ireland. There is the potential for the interaction of NH4-No with particulate matter in the atmosphere and dry deposition which in other parts of Europe can have transboundary effects. Given the location of the proposed pig farm development, the scale of the existing and proposed development and the extent of its zone of influence no transboundary impacts will arise.

12.6 CONCLUSIONS

Interactions between environmental topics have been considered and there are no significant impacts that have not already been considered in the individual chapters.

The individual cumulative assessments for each environmental topic has been considered in each chapter of the EIAR and summarised in Table 12.3. There are no additional significant cumulative impacts.

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CHAPTER 13 - SUMMARY OF RESIDUAL IMPACTS AND ENVIRONMENTAL COMMITMENTS (MITIGATION)

13.1 INTRODUCTION

This chapter summarises the impact before and after mitigation for each of the topics and the required mitigation measures to be employed. Table 13.1 summarises the impacts in the various topics. Table 13.2 summarises the mitigation measures for each of the environmental topics.

13.2 SUMMARY OF RESIDUAL IMPACTS

Table 13.1 Summary of residual impacts before and after mitigation

Chapter	Topic	Residual Impact	
		Pre mitigation	Post mitigation
CH 3; Human Population and Human Health	Human Population	Slight adverse	Not significant
	Farms	Not significant	Not significant
	Commercial businesses	Not significant	Not significant
	Tourist assets	Not significant	Not significant
	Ecosystem Services	Slight adverse	Not significant
	Cultural Heritage Assets	Not significant	Not significant
	Local Traffic	Not significant	Not significant
	Water quality (public supplies)	Slight adverse	Not significant
	Air quality / nuisance (odour)	Not significant	Not significant
	Spread of pathogens	Slight adverse – moderate adverse	Not significant
	Noise	Not significant	Not significant
CH 4; Biodiversity	Natura 2000 sites	Not significant	Not significant
	Habitats at pig farm site	Not significant	Not significant
	Impact on mammals (bats, badger, otter)	Not significant	Not significant
	Impact on Birds	Not significant	Not significant
	Aquatic Habitats	Slight adverse	Not significant
	Impact from invasive species	Not significant	Not significant
	Impacts on GA1 Improved Agricultural Grassland habitats and adjoining areas in the Study area	Not significant	Not significant
CH 5; Land & Soils	Pig farm site (loss of land)	Not significant	Not significant
	Study area land & soils	Not significant	Not significant
CH 6; Water	Groundwater at the site	Not significant	Not significant
	Groundwater in the study area	Not significant	Not significant
	Surface water at the site	Not significant - Slight adverse	Not significant
	Surface water in the study area	Slight adverse	Not significant
CH 7; Air	Impact from NH_3 on agricultural land	Not significant	Not significant
	Impact from NH_3 on rural dwellings	Not significant	Not significant
	Impact from NH_3 on businesses, tourist assets, settlements	Not significant	Not significant
	Impact from NH_3 on public water sources	Not significant	Not significant
	Impact from NH_3 on ecosystems, rivers, woodlands and habitats	Not significant	Not significant

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Chapter	Topic	Residual Impact	
		Pre mitigation	Post mitigation
	Impact from NH_3 on Cultural Heritage	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on agricultural land	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on rural dwellings	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on businesses, tourist assets, settlements	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on public water sources	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on ecosystems, rivers, woodlands and habitats	Not significant	Not significant
	Impact from greenhouse gases (CH_4, N_2O, CO_2) on Cultural Heritage	Not significant	Not significant
	Potential impacts from dust and PM on farm workers	Slight-moderate adverse	Not significant
	Potential impacts from construction dust	Not significant	Not significant
	Potential impacts from dust and PM on study area	Not significant	Not significant
	Odour impact on local dwellings	Not significant – slight adverse	Not significant
Ch 8; Climate	Impact from GHG emissions from proposed development	Not significant	Not significant
	Impact from NH_3 emissions from proposed development	Not significant	Not significant
	Impact from other gaseous emissions and particulate emissions	Not significant	Not significant
Ch 9; Material Assets	Impacts on roads	Not significant	Not significant
	Impacts on public utilities (water & power)	Not significant – slight adverse	Not significant
	Impacts on settlements	Not significant	Not significant
	Impacts on property (private dwellings, local businesses)	Not significant	Not significant
	Impacts on tourist assets	Not significant	Not significant
	Impacts on agricultural land	Not Significant	Not significant
	Impacts on forestry / woodland	Not significant	Not significant
	Impacts on cultural heritage	Not significant	Not significant
	Impacts on waste facilities	Not significant	Not significant
Ch 10; Landscape	Impact on sensitive views (the adverse impact is due only to the existing wind-turbine)	Not significant	Not significant
Ch 11; Cultural Heritage	Impact on archaeology at the site	Not significant*	Not significant
	Impact on archaeology within 1 km	Not significant*	Not significant

* Assumes archaeological monitoring will take place.

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13.3 MONITORING COMMITTMENTS

1. Groundwater monitoring (Nitrates, COD or BOD, Ammonia, E.coli) will be undertaken at the site of the proposed development as agreed with EPA under the conditions of an IPPC License;
2. Storm water will be monitored on a quarterly basis as agreed with EPA under the conditions of an IPPC License; and

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3. Surface water monitoring will take place as agreed with EPA under the conditions of an IPPC License;
4. It is proposed to monitor 6 locations for 3 years (in addition to EPA monitoring stations) with particular attention to surface waters 'at risk'. The sampling points as identified in Figures 6.12.1 and 6.12.2 are Nos 16, 19, 20, 22, 24 and 30.

13.4 SUMMARY OF MITIGATION MEASURE COMMITMENTS

In Table 13.2 the environmental topics are as follows;

- Environmental Topic No 3 = Human Population and Human Health;
- Environmental Topic No 4 = Biodiversity;
- Environmental Topic No 5 = Land & Soils;
- Environmental Topic No 6 = Water;
- Environmental Topic No 7 = Air;
- Environmental Topic No 8 = Climate;
- Environmental Topic No 9 = Material Assets;
- Environmental Topic No 10 = Landscape;
- Environmental Topic No 11 = Cultural Heritage;

Table 13.2 Summary environmental commitments / mitigation measures and the relevant environmental topics

Mitigation Measure	Environmental Topic / Chapter								
	3	4	5	6	7	8	9	10	11
Construction Mitigation									
1. The developer and construction contractors will be required to provide health and safety training for their workers. There will be a designated liaison officer to deal with issues. Construction workers will be equipped with the relevant personal protection equipment at all times. This includes eye and ear protection for dust and noise effects;	X								
2. Contractors and developer will implement a safety plan.	X						X		
3. The developer and construction contractors will provide a water tanker or similar equipment to douse exposed soil during dry weather to prevent dust nuisance where required. Stockpiles of earth or building materials shall be kept to the minimum practicable height with gentle slopes. Material drop heights from plant to plant or from plant to stockpile will be minimised.	X				X	X			
4. The developer and construction contractors will employ silt control mitigation measures to prevent sediment run-off from the construction site; such as silt fences, bunds and settlement ponds on or adjoining stock piled heaps of clay. Also allowing the establishment of vegetation on the exposed soil will prevent run-off.	X			X					
5. The developer and construction contractors will use wheel wash facilities to ensure that soil is not transported out onto the public road;	X	X							
6. Where possible re fuelling will take place off site. Any re-fuelling tankers will be inspected for leaks (and not allowed on site if found leaking). All refuelling will take place in a bunded area.				X					

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Mitigation Measure	Environmental Topic / Chapter								
	3	4	5	6	7	8	9	10	11
7. The developer and construction contractors will confine construction works to normal operational hours 0800am to 1800pm Monday to Friday;	X								
8. Construction machinery will be inspected to insure machinery leaking oils or fuel will not be allowed on site				X					
9. Washout from concrete mixers will be handled off-site in the concrete depot				X					
10. Adjoining land developers will be notified in advance of construction in case there are any sensitive livestock nearby (e.g. horses or cows at the point of calving).	X	X							
11. The following noise control measures shalt be implemented by all contractors: o All contractors will ensure that the plant and construction methods employed are the quietest available for the required purpose insofar as practicable. o Equipment and vehicles to be shut down when not in use o Normal working hours are adhered to 0800 – 1800 o A noise Management Plan is implemented	X	X							
12. A Noise Management Programme (Appendix 1 of Volume 3) will be implemented to control construction and operational noise.	X						X		
13. In the event of unintended introduction of an invasive species such as Japanese Knotweed, as mentioned in the Guidelines on the Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads, (NRA, 2008) - a person with sufficient training, experience and knowledge in the control of non-native invasive species will be employed to assist in the planning and execution of control measures in relation to Japanese knotweed.		X							
14. Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the developer and construction contractor through regular servicing of machinery.						X			
15. To reduce GHG emissions during construction haul distances will be minimised by selecting locally sourced materials where possible. The number of deliveries will be minimised by ordering in bulk. Materials will be handled efficiently on site to minimise waiting times for loading and unloading.						X			
16. Engines will be turned off when machinery is not in use.						X			
17. The regular maintenance of plant and equipment will be carried out to ensure efficient fuel consumption.						X			
18. Where possible replacement material will be considered such as Ground Granulated Blast Furnace Slag (GGBS) and Pulverished Fly Ash (PFA) as replacements for Portland cements.						X			
19. Any excavated material destined for off-site treatment will be removed from the site by a licensed haulier to an approved waste facility including any soil contaminated by concrete, fuel or other harmful material.							X		

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Mitigation Measure	Environmental Topic / Chapter								
	3	4	5	6	7	8	9	10	11
20. Store construction wastes in skips supplied by approved waste contractor.						X	X		
21. Secure building materials on site to prevent weather damage. Materials will be handled in a way that minimises wastage.				X		X	X		
22. Monitoring of the removal of topsoil at the start of building works by an experienced field archaeologist, to record any material of archaeological significance, will be carried out if recommended by National Monuments Service or if specified as a condition of planning by County Council. Groundworks may be halted to allow proper investigation, and in exceptional circumstances the National Monuments Service may be called in to advise. This recommendation is advisory, for the consideration of the National Monuments Service.								X	X
23. Plant native species around perimeter of development (as specified in Section 10.6 of Volume 2 of the EIAR) and along entrance road to minimise landscape impact and also have a positive effect on bats		X						X	
Operational Phase Mitigation									
24. Existing commercial premises are located far enough away to avoid nuisance from the pig buildings. Land spreading will be practised in accordance with Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020). Because nutrients are being restricted to crop requirements, application frequency at any one location will rarely exceed 2 times per year thus reducing potential for nuisance from land spreading.	X								
25. Farmers using the pig manure will be asked to allow a 50m buffer around all dwellings and 200m buffer for schools.	X								
26. The pig farm operates only at a reduced rate of staffing over the weekends. Access for manure is generally only allowed during the working week, thus reducing potential nuisance to visitors to the area	X								
27. Caution will be advised when spreading manure adjoining settlements to avoid wind direction towards the settlement.	X								
28. Pig manure users will be told that pig manure cannot be spread in source protection zones	X			X					
29. Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) sets out mitigation measures for the application of organic manures. Adherence to these measures will minimise impacts on water quality and human health; ○ A setback distance of 200m is allowed around Public Ground Water Supplies (see Figure 6.6 for location of Public Ground Water Supplies); ○ Application of fertiliser at rates which is '*reasonable to apply for the purposes of promoting growth of the crop'.* These rates are set out in tables 12 - 17 of the 2017 regulations; ○ Pig manure will only be applied to replace chemical fertiliser requirement;	X	X	X	X	X	X	X		

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Mitigation Measure	Environmental Topic / Chapter								
	3	4	5	6	7	8	9	10	11
○ The estimated application rate of approx. 10m^3 of pig manure per hectare applies N and P at maintenance rates, i.e. at rates that replaces off-take from crops without increasing or decreasing soil nutrient levels; ○ The estimated application rate of 10m^3 of pig manure per hectare is allowable on GLAS area based options such as Low Input Permanent Pasture and Traditional Hay Meadow; ○ Organic N on receiving farms cannot exceed 170 kg / ha; ○ Upward-facing splash plate will not be used; ○ Spreading from a road or passageway is not allowed; ○ Spreading in the following situations is not allowed; ▪ The land is waterlogged; ▪ The land is flooded, or it is likely to flood; ▪ The land is frozen, or covered with snow; ▪ Heavy rain is forecast within 48 hours (forecasts from Met Éireann should be checked); ▪ The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account; ○ Buffer zones of 200m, 25m, 20m and 15m around public water supply wells and reservoirs, private wells, lakes and rock outcrops / karst features respectively; ○ A buffer zone of 10m is required for any surface watercourse where the slope towards the watercourse exceeds 10%; and ○ A buffer zone of 5m is required for other water courses (increased to 10 m for a period of two weeks preceding and two weeks following the periods when application of fertilisers to land is prohibited as set out in Schedule 4 of the 2017 Regulations);									
30. In addition to the Si 605 of 2017 (as amended in SI 65 of 2018 and SI 40 of 2020) regulations the following mitigation measures are going to be implemented; ○ The pig farm should use only contractors who have low emission spreaders such as trailing shoe and band spreading; where possible; ○ Training for management staff and membership of Teagasc discussion groups; ○ A pig manure register is maintained on site. The pig farm management records slurry movements and reports to DAFM each year. This requires a collaborative approach between customer farmers and the pig farm to discuss and advise how pig	X	X	X	X	X	X	X		

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manure can most effectively be used to replace chemical fertiliser and protect water quality; ○ A 50m set back distance will be advised around rural dwellings to avoid impacts on unknown private wells (and reduce nuisance); ○ The pig farm management will regularly engage with customer farmers for pig manure and their advisers, using a collaborative approach to encourage and insure best practices are adhered to when land spreading; ▪ Timing of pig manure applications e.g. applying early in the day in sensitive areas would mean that some of the odour has dissipated before people return home from work. Apply in cooler weather and early in the year can reduce NH_3 emissions by 30% (and result in lower odour emissions). ○ Slurry spreading equipment entering the pig farm is monitored by the pig farm to insure farmers do not use leaking equipment for spreading pig manure. ○ There will be 50+ weeks manure storage on-site. This will allow manure delivery at suitable times of the year. ○ The pig farm management will monitor complaints and engage with customer farmers in these localities to insure nuisance or environmental damage is not being caused.									
31. The slurry storage at the pig unit exceeds 50+ weeks thus allowing the pig farm to store the manure when conditions are not suitable for land spreading in the wetter shoulders of the grazing season	X			X					
32. Land spreading is an effective way of neutralising the pathogen risk from pig manure. Land spread manure is exposed to sunlight and weathering which kills harmful pathogens	X								
33. Low trajectory spreading is used which minimises aerosol production, thus reducing risk of spreading pathogens	X				X	X			
34. Mitigation to reduce odour impact are discussed in detail in Section 7.6 and include measures such as low protein diets, high cleanliness standards and having an Odour Management Plan in place	X				X				
35. Noise impacts are reduced because there are no operational noises outside of normal working hours. Noise emissions from pig houses are mitigated by distance from sensitive receptors. A noise management programme will be implemented.	X								
36. The pig farm management will have 'An Incident Response Plan' and an 'Emergency Response Plan' detailing the procedures to be undertaken in the event of an accident, fire,	X			X					

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spillage of fuel or other harmful material that could lead to a pollution incident;									
37. A safety statement will be in place at the pig farm and this addresses the health and safety of workers and visitors. Workers health and safety can be addressed using different approaches that can be grouped as; ○ Engineering control; properly designed fans will be used with adequately designed air outlets and inlets and automatic controls. The slopes to the roof apex will be adequate to insure maximum ventilation; ○ Administrative control; minimise the amount of time workers are exposed to dust; and insure adequate cleaning of pig houses; ○ Safety and awareness training will be undertaken; ○ Personal protection equipment (PPE) i.e. ear and eye protection devices and dust masks will be provided to all workers along with protective foot ware. ○ Noises from pigs occurs mainly at feeding time. Noise from the proposed fattening houses will be minimised due to using modern ad-lib feeding system; ○ All visitors to the site are expected to sign in at the office and will be provided with eye and ear protection devises; ○ Dust masks will be used by farm workers where required;	X				X		X		
38. Surface and ground water monitoring quality will be undertaken at the site as conditioned by an IPPC license.				X					
39. Pig manure will be stored in leak proof tanks which are integrity tested according to the requirements of EPA license.				X			X		
40. All slurry tanks have been built to leak-proof specifications and have leak detection facilities				X					
41. All slurry tanks are underground to minimise risk of spills.				X					
42. Pig manure off-take points are concreted and run-off drained to slurry tank. Pig walk-ways are slatted.				X					
43. Good operational practise at the pig farm will include; ○ Cleanliness; the existing and proposed housing has minimal external walk ways and therefore soiled yards are not an issue. Internal houses are cleaned regularly; ○ Dryness; the slatted houses are well ventilated to remove moisture. Slatted floors minimise wetness. Routine maintenance of drinkers and water fixtures is important; ○ Pig manure levels in pig manure tanks are kept to a minimum during the summer season (highest risk of odour nuisance); and ○ An Air Quality (Odour) Management Plan will be implemented on the farm to comply with IPPC license requirements.				X	X	X			

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44. The well will be metered to monitor usage and thereby minimise wastage by picking up irregularities in flow.				X			X		
45. Reducing the protein level in balanced diets will reduce the level of nitrogen in the manure thereby reducing potential NO_3 leaching to groundwater; reducing odour and ammonia emissions. A 2% reduction in protein will reduce NH_3 and odour emissions by 20% - it will also reduce N in slurry.	X			X	X				
46. To mitigate dust and odour pigs in the proposed development will be fed via an automatic wet sealed feed system, which takes feed from sealed containers (Silos) and distributes to the feeders in the rooms on an ad-lib basis as per pigs natural requirements. The silos and the shed that encloses them along with sealed feeding system significantly reduces the dust levels in the internal, and external environment.	X				X				
47. The pig farm will operate a Noise Management Programme to minimise operation noise effects.	X								
48. The pig farm commits to adhere to the current *Code of Good Agricultural Practise for reducing Ammonia Emissions from Agriculture* as published by DAFM in November 2019.					X	X			
49. Other alternative technologies (e.g. anaerobic digestion (AD) and slurry amendments) are considered in Section 2.7.3 of the EIAR. These technologies (AD) require state incentives before they are viable – but these technologies demonstrate it is possible reduce GHG emissions by approx. 50% if required.					X	X			
50. The pig farm will implement an Energy Management System and carry out regular energy audits.						X			
51. There will be thermostatic controls on all heating systems.						X			
52. A modern low energy ventilation system will be installed in the mechanically ventilated houses and the finisher houses have a climate controlled natural ventilation system.						X			
53. Night rate electricity will be used where possible						X			
54. The buildings will be properly insulated, high U-value materials used						X			
55. The use of low energy equipment and lighting will be used (all LED lights). Timers will be standard for lighting equipment						X			
56. Continued improvements in feed efficiency and continued investment in advanced genetics to minimise inputs and emissions						X			
57. In line with its obligations under the IPPC license the pig farm will maintain a policy of waste reduction to minimise waste produced							X		
58. Minimise water usage on the pig farm by maintaining water fixtures in good working order. Keep the water to feed ratio as low as possible. Low water usage minimises manure production and thus reduces manure deliveries on the local road network				X			X		
59. Landscaping measure will be implemented at the perimeter of the site.								X	

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60. A rodent and pest control programme will be implemented and inspection records maintained on site. Staff will be trained in the use of rodenticides and pesticide products which are routinely used on pig farms. Records of usage will be maintained on site.	X								
61. The developer will appoint a key contact person who will be responsibility for communication with locals regarding noise and odour issues.	X								
62. On-going training will be implemented on the pig farm. This will include training in the requirements for monitoring for IPPC licensed facilities, implementation of a noise management plan, implementation of Odour Management Plan, Noise Management Plan and Health & Safety training.	X		X	X	X	X	X		
63. While noise impacts are within the acceptable limits the applicant is cognisant of the local submissions in respect of noise, particularly in relation to the loading of pigs. Therefore the applicant, subject to the agreement of Limerick County Council and as a condition of any permission if granted, will commit to insulate the loading bay enclosure with insulated walls and roof to mitigate noises at the point of loading.	X								

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