



# DDS BRADY FARMS LIMITED

## Air Quality Screening and Dispersion Modelling

Report for: Environmental Protection Agency

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# 1. Introduction

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Ricardo Energy & Environment Ltd (Ricardo) was appointed by the Environmental Protection Agency (EPA) in July 2022 to prepare an Air Quality Screening Assessment and detailed dispersion modelling to inform a future Natura Impact Statement (NIS) as required.

This report relates to a pig farm installation located at the DDS Brady Farms Limited, Carrickboy Farms, Ballyglassin, Edgeworthstown, Longford in Ireland.

## 1.1 Background

As per latest letter from the EPA<sup>1</sup>, the EPA is currently undertaking a review of the licence P0408-01 in relation to DDS Brady Farms Limited, to ensure that the licence is up to date with current legislative requirements. The review was initiated in December 2014, and in order to be completed, requires 'an appropriate assessment in accordance with the Habitats Directive'.

The project is classified as 6.2(b) – intensive agriculture, in accordance with the EPA Act 1992, as amended: *'the rearing of pigs in an installation where the capacity exceeds (b) 2,000 places for production pigs which are over 30kg'*. The EPA has carried out an Appropriate Assessment Screening in March 2022 and has determined that an *'Appropriate Assessment is required for the activity, as the project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site(s)'*.

The Screening assessment considered 30 European designated sites as listed in the letter dated 14 March 2022<sup>2</sup> and determined that: *'the activities are not directly connected with or necessary to the management of any European site and that it cannot be excluded, on the basis of objective information, that the activities, individually or in combination with other plans or projects, will have a significant effect on any European site and accordingly that an Appropriate Assessment of the activities is required'*. It has been concluded that *'air emissions from the installation have the potential for adverse impact on sensitive receptors due to elevated ammonia levels and/or nitrogen deposition at European sites'*.

## 1.2 Purpose of the Report

The purpose of this report is to provide a baseline air quality assessment of the licensed process within the existing licence P0408-01 boundary only, to inform an Appropriate Assessment of any likely significant effects of ammonia emissions on European designated sites from operations under the existing licence.

# 2. Methodology

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## 2.1 Data Collection

This assessment has been based on the original license P0408-01, information in the original planning application, and desk-based research. Current exact numbers and classes of animals, specifications of housing ventilation and information regarding the use of emissions abatement technology or other mitigation has not been provided. Therefore this scenario represents licensed operations at DDS Brady Ltd.

### 2.1.1 Source locations, dimensions, and type

Information regarding the locations of animal houses and slurry storage was obtained from the scanned document "Site maps 1" provided by the client, in conjunction with Google Earth satellite imagery.

Measurements of areas of houses and slurry storage were made in Google Earth, as this information was not provided in the original Application Form. Building height was assumed to be 4.15m for all houses, as the "Site maps 1" document provided one architectural plan for a proposed sow house with a height above ground level of 4.15m.

Data regarding animal numbers and types per house, as well as ventilation for each house was taken from the scanned document "Application Form" (Page 57 titled "Attachment 9"), provided by the client – see Figure 1

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<sup>1</sup> Letter dated 5 April 2022 from the EPA, in response to the letter sent by DDS Brady Farms Limited on 7 January 2022.

<sup>2</sup> Letter dated 14 March 2022 from the EPA, to confirm the requirement for an Appropriate Assessment in respect of a licence review.

below. The “Application Form” also confirmed floor type as “Fully Slatted Floor”. The number of ventilation points per house was counted from Google Satellite imagery.

The total capacity of the farm when completes is 23,500 pigs according to page 53 of the license “Application Form.” However, the total capacity from the Rooms, Pen/Room and No.[Animals]/Pen data according to page 57 of the “Application Form” (Figure 1) is 19,591 pigs. The original license document IPC License 408<sup>3</sup> permits a total of 19,509 animal unit numbers (see Figure 2). A factor was applied to the numbers derived from the Rooms, Pen/Room and No.[Animals]/Pen data (Figure 1), adjusting the numbers of animals slightly per house so that the animal numbers and type inputted per house into the SCAIL model were in agreement with the total numbers and types of animals the site was licensed for in the license agreement.

Figure 1: Animal house use, capacity, and ventilation information, from Attachment 9 on page 57 of the “Application Form” scanned document.

<b>Attachment 9</b>										
<b>Current use and relevant management features of all the pig houses on the farm.</b>										
House	Use	Part	Rooms	Pens / Room	Pen Area	No./ Pen	Vent. System	Opt Temp °C	Feed System	Clean freq.
A1	1 W 1	All	9	24	1.8	10	A-24V	28-23	Man	Batch
A2	1 W 2	Part	5	20	1.8	10	A220V	28-23	Man	Batch
A2	FW 1	Part	6	18	3.5	1	A220V	24	Man	Each use
A2	FW 2	Part	4	18	3.5	1	A220V	24	Comp	Each use
A2	FW 2	Part	2	12	3.6	1	Man	24	Comp	Each use
A3	1 W 3	All	2	10	1.8	10	A220V	28-23	Man	Batch
A4	GT 1	All	1	6	12.7	6	Nat	21	Comp	Batch
A5	GT 2	Part	1	44	10.0	5	ACNV	21	Comp	Batch
A5	SA 1	Most	1	300	1.4	1	ACNV	21	Comp	Batch
A6	DS 1	Part	1	600	1.4	1	ACNV	21	Comp	Batch
A7	2 W 2	Most	4	16	5.8	18	A220V	23-26	Comp	2/3batch
A7	2 W 2	Most	1	12	5.8	18	A220V	23/26	Comp	2/3batch
A8-A	2 W 1	All	1	17	10.8	24	ACNV	23-26	Comp	2/3batch
A8-B	2 W 1	All	1	15	10.8	24	ACNV	23-26	Comp	2/3 batch
A9	FW 3	Part	12	12	3.6	1	Man	24	Comp	Each use
A10	GT 3	Part	1	44	10.0	5	ACNV	21	Comp	Batch
A11	DS 2	Part	1	325	1.3	1	A-24	21	Comp	Batch
A12	FW 4	Part	10	12	3.6	1	Man	24	Man	Each use
A13	1 W 4	All	10	6	7.2	40	A-24	28-33	Man	Batch
A14	SA 2	Not	Yet in	Use						
A15	DS 3	Not	Yet in	Use						
B1	FT 1	All	8	18	14.4	18	ACNV	22	Comp	Yearly
B2	FT 2	All	1	26	14.4	18	ACNV	22	Comp	Yearly
B3	FT 3	All	5.5	12	12.6	18	A220V	22	Comp	Yearly
B4	FT 4	Most	5.5	14	12.6	18	A220V	22	Comp	Yearly
B5	FT 5	All	3	22	12.6	20	A-24V	22	W+D	Yearly
B6	FT 6	All	3	22	12.6	20	A-24V	22	W+D	Yearly
B7	FT 7	All	2	22	19.2	20	A-24V	22	W+D	Yearly
C1	FT 8	Part	1	3	76.8	100	Nat	22	M,W+D	Yearly
C1	FT 9	Part	1	6	38.4	50	Nat	22	M,W+D	Yearly
C2	GT 4	Part	1	2	72.0	25	Nat	21	Man	Batch

<sup>3</sup> [https://epawebapp.epa.ie/licences/lic\\_eDMS/090151b28058e196.pdf](https://epawebapp.epa.ie/licences/lic_eDMS/090151b28058e196.pdf) Page 12 - Accessed in August 2022.



Figure 2: Animal numbers by class in EPA license 408<sup>3</sup>

<b>Schedule 1(i) Animal Numbers Housed at the Facility</b>	
<b>Animal Class</b>	<b>Numbers</b> <sup>Note 1, 2</sup>
<b>Farrowing/Suckling Sows</b>	456
<b>Dry Sows</b>	1539
<b>Maiden Gilts</b>	288
<b>Boars</b>	22
<b>Weaners</b>	7084
<b>Finishers</b>	10120

Note 1: This excludes suckling pigs maintained on site.

Note 2: Variation in these numbers is allowed providing the overall number of units remains unchanged.

## 2.2 SCAIL Screening Assessment for Impacts of Ammonia and Nitrogen

With regards to screening the impacts of air emissions, in particular airborne ammonia and nitrogen deposition, the EPA guidance<sup>4</sup> was followed. An initial step to confirm the background of ammonia concentration and nitrogen deposition at the Natura 2000 site, and indicate whether there is already an exceedance of the ammonia critical level or nitrogen critical load was implemented. The critical loads for each habitat are dependent on whether lichens and bryophytes are integral to the Natura 2000 site and are a qualifying interest for the site. If applicable, the critical level is 1 µg/m<sup>3</sup>, and if not then it is 3 µg/m<sup>3</sup>. Background levels of ammonia concentration and nitrogen deposition were obtained from the free online tool, ‘Simple Calculation of Atmospheric Impacts Limits’<sup>5</sup>. For screened-in licence applications affecting designated habitat sites where background levels are already exceeded, detailed modelling of emissions, including in-combination effects, in support of an Appropriate Assessment is likely to be required.

The screening distance, as detailed within the guidance was implemented: if the farm is located within 500m of a Natura 2000 site, an Appropriate Assessment using detailed modelling is automatically required. Additionally, in the case of a farm located within 10km of the following Nature 2000 sites, Slieve Beagh SPA, Kilroosky Lough Cluster SAC, and Lough Oughter SAC / SPA, then an Appropriate Assessment using detailed modelling which includes cumulative impacts is required. None of these conditions apply, therefore the next step was to proceed to a SCAIL screening assessment.

This was undertaken using the Simple Calculation of Atmospheric Impact Limits screening tool SCAIL Agriculture<sup>6</sup>, hereafter referred to as SCAIL. SCAIL was run in conservative mode with no mitigation included and the full existing animal numbers onsite, based on the licensed animal numbers.

### 2.2.1 SCAIL Inputs and Assumptions

Table A1 detailing all numerical inputs to SCAIL can be found in Appendix 1.

As stated in section 2.1.1, the number of ventilation points per house was counted from Google Satellite imagery. Two houses (A8 and B2) did not have visible roof ventilation in Google Satellite imagery, so it was determined that ventilation may be located on the side of the building (following the SCAIL recommendation to select side of building if unsure on fan location).

No information was provided in the planning application documents regarding fan diameter and flow rate. Assumptions were made based on the following SCAIL recommended options if variables are unknown:

- Fan diameter - 0.5m was the default option and was used for all houses on the farm with rooftop ventilation fans.

<sup>4</sup> EPA, 2021. Licence Application Guidance : Assessment of the impact of ammonia and nitrogen on Natura 2000 sites from intensive agriculture installations.

<sup>5</sup> <http://www.scaill.ceh.ac.uk> – Accessed in August 2022.

<sup>6</sup> <https://www.scaill.ceh.ac.uk/cgi-bin/agriculture/input.pl> - Accessed in August 2022.

- Fan location was specified as “Side of building” in the absence of information on the location of ventilation fans. Rooftop ventilation could not be identified via Google Satellite Imagery for animal houses A8 and B2. Attachment 9 stated there was ventilation for these buildings. It was therefore assumed ventilation is located on the building sides for these houses.
- Fan flow rate – where fan flow rates are not provided SCAIL suggested using typical ventilation rates for agricultural buildings as taken from Seeford et al. (1998) and presented in the SCAIL Sniffer ER26: Final Report March 2014<sup>7</sup> as shown below in Figure 3. (The average rate for Sows on slats 0.020m<sup>3</sup>/s was also used for Gilts and Farrowers).

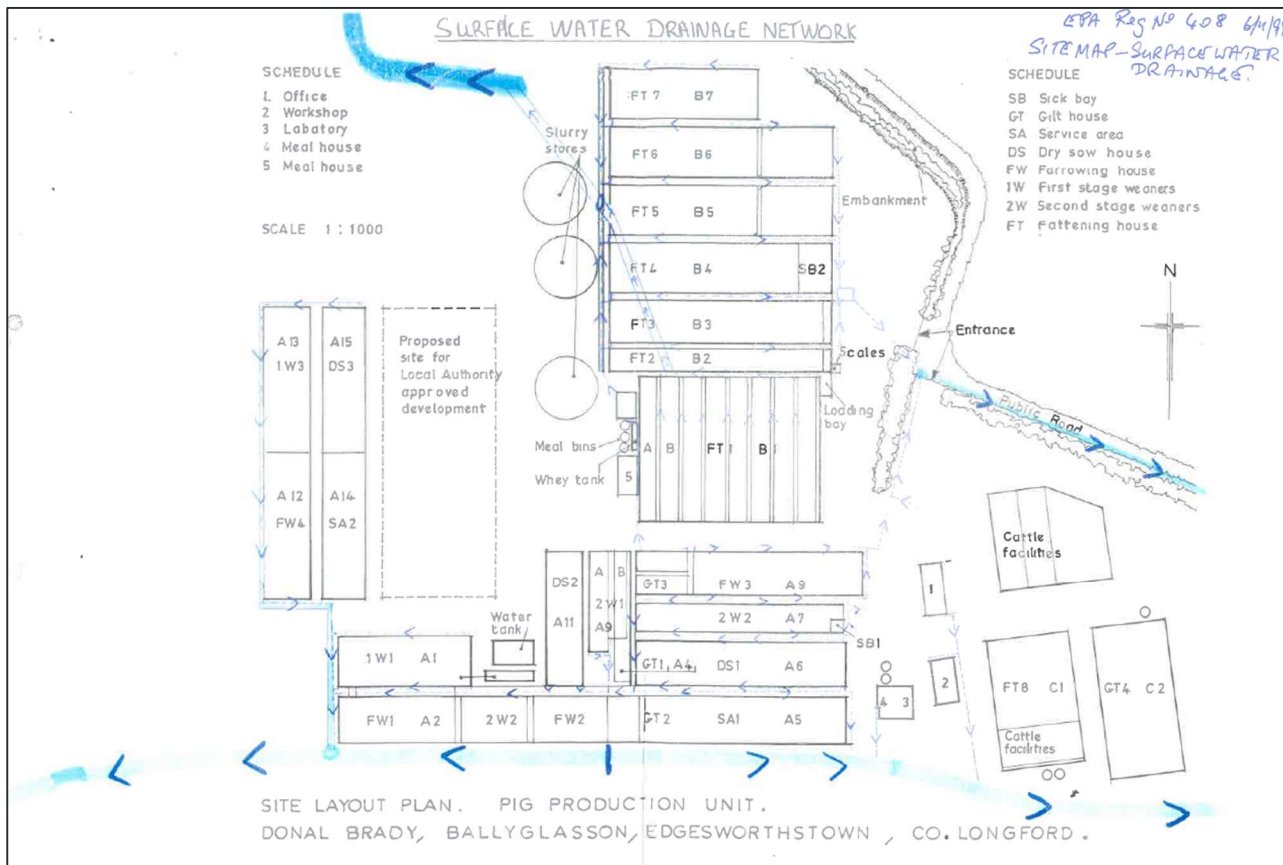
Figure 3: Typical ventilation rates for agricultural buildings as taken from Seeford et al. (1998). (Used rates highlighted in yellow).

Type	Winter (m <sup>3</sup> /s per animal)	Summer (m <sup>3</sup> /s per animal)	Average (m <sup>3</sup> /s per animal)
Pig, Sows on litter	0.031	0.058	0.044
Pig, Sows on slats	0.018	0.023	0.020
Pig, Weaners on slats	0.0025	0.0033	0.0029
Pig, Fatteners on litter	0.013	0.023	0.018
Pig, Fatteners on slats	0.0056	0.014	0.010
Poultry, Layers (Aviary)	0.00056	0.0014	0.0010
Poultry, Layers (Caged)	0.00056	0.00083	0.00069
Poultry, Broilers (litter)	0.00028	0.00056	0.00042

The building labelled “Proposed site for Local Authority approved development” in the site map (see Figure 4) has been built according to Google Satellite imagery, however no information is available regarding the use of the building. If it is animal housing, number of animal places and animal type is unknown. However, as the model has been run for the total animal places (and class) as set out in the license (in Figure 2), it is assumed that no additional animals are housed in this building over and above those assessed in the Screening Assessment.

<sup>7</sup> [https://www.scail.ceh.ac.uk/agriculture/Sniffer%20ER26\\_SCAIL-Agriculture%20Final%20report\\_Issue\\_11032014.pdf](https://www.scail.ceh.ac.uk/agriculture/Sniffer%20ER26_SCAIL-Agriculture%20Final%20report_Issue_11032014.pdf) - Accessed in August 2022.

Figure 4: Site map located on page 3 of the scanned document "Site maps 1" provided by the client



Regarding the slurry/manure storage sources, the locations and area of the sources were identified and measures using Google Earth. All four storage sources were determined to be uncovered based on Google Satellite Imagery. The height of the three circular slurry tanks was assumed to be 4m based on market research of above ground storage tank dimensions. The height of the slurry lagoon was estimated to be 0.5m. Volumes were calculating multiplying the measured source area and estimated height. Total slurry weight capacity was derived from volume, based on the 1m<sup>3</sup> of manure weighing 400kg<sup>8</sup>. For the slurry lagoon, it was estimated that maximum capacity would be less than 100%, as satellite imagery showed the lagoon did not have a wall on one side. Maximum capacity of the lagoon was estimated to be 75% capacity, which is likely if anything to be an over-estimate estimate.

Manure spreading was not considered as part of this screening assessment, as this occurs on third party farms outside the licensed farm site.

No specific information in the application form confirmed that animals would be kept in houses for the full year. The model assumes this is the case, and there is some evidence in the application form supporting this – i.e. no pasture fields in the site boundary; no discussion or details of pasturing the animals; and information that land spreading occurs on third party farms outside the licensed farm site.

### 2.2.2 SCAIL limitations

SCAIL is a screening tool and should not be used as substitution for detailed dispersion model. For example, it does not account for factors such as ammonia deposition and plume depletion, distribution of sources within the licence boundary.

Another limitation is that SCAIL does not allow for multiple animal types in one house. As demonstrated when cross-referencing the site map (Figure 4) with Figure 1, there were a lot of houses with more than one type of

<sup>8</sup> <https://www.aqua-calc.com/calculate/volume-to-weight/substance/manure> Accessed in September 2022.



animal in. For these houses (A2, A3, A4, A5, A6, A12, A13), a conservative approach was taken, and the animal type was selected as the most polluting pig type.

SCAIL caps the total number of sources which can be modelled at an installation at 20. For this assessment there were 21 total sources (17 houses and 4 slurry storage). 1 slurry storage source (was modelled separately, and the results have been added together).

Finally, there were limitations as to the number of designated sites selected (i.e. the extent of the search radius), as SCAIL would not complete a model run beyond 17km (17 habitat sites).

The EPA License Application Guidance “*Assessment of the Impact of Ammonia and Nitrogen on Natura 2000 sites from Intensive Agriculture Installations*”<sup>9</sup> does not specify a screening distance for assessment of the zone of influence for one installation. It specifies screening distances at which an Intensive Agriculture Installation would require a detailed AA assessment using detailed modelling and a NIS (the criteria for which are not met for DS Brady Farms), and it also specifies that all licensed installations within 10km of Natura sites should be considered for in-combination assessment in Step 5<sup>9</sup>.

## 2.3 Dispersion Modelling

### 2.3.1 Model selection

Ireland’s Environmental Protection Agency, Office of Environmental Enforcement released a guidance document in December 2019 titled Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)<sup>9</sup>. This highlights the role of new generation models AERMOD, ADMS 5 and CALPUFF for use in assessing the air quality impacts of regulated processes. Ricardo’s experience is that ADMS and AERMOD provide robust, defensible data on impacts at distances up to 15 km from a source. Additionally, the contribution of emissions from low-level sources such as intensive livestock installations located more than 10 km from a source will be relatively low, and as a result, uncertainty due to dispersion over this distance would also be low. In contrast to the Gaussian models, the CALPUFF model has significantly higher resource requirements due to data inputs, model processing time, and limitations on results.

In view of these considerations, a Gaussian dispersion model (ADMS 5) was used for this study.

### 2.3.2 Deposition

Modelling of dry and wet deposition of nitrogen from airborne gaseous ammonia (NH<sub>3</sub>) was modelled using the default recommended parameters as outlined in the ADMS 5 model documentation, following the EPA guidance note AG4<sup>10</sup>.

NH<sub>3</sub> was modelled with the recommended deposition velocity for grasslands (0.020m/s) in the EPA guidance note AG4<sup>11</sup>. It was considered that the model domain was typical of short vegetation, represented by grassland deposition velocity, rather than taller vegetation represented by forest deposition velocity.

### 2.3.3 Meteorological data

To take account of variations in meteorological conditions and associated affects upon air quality concentrations, 5 years of meteorological data were used to establish worst case air quality concentrations, in line with EPA’s AG4 guidance<sup>12</sup>. Data held by the National Oceanic and Atmospheric Administration (NOAA) and Met Éireann (MÉ) were reviewed for suitability. Site selection was based upon the proximity to the study area and data availability for the 5-year period, using data which satisfies EPA’s meteorological data requirements.

It was determined that the most appropriate meteorological site in terms of proximity, representativeness, and data availability was the MÉ site Mullingar, although this site is not one of the seven MÉ sites with cloud cover data (an essential parameter for ADMS to calculate surface heat flux and compute dispersion). The EPA

<sup>9</sup> <https://www.epa.ie/publications/licensing--permitting/industrial/ied/Assessment-of-Impact-of--Ammonia-and-Nitrogen-on-Natura-sites-from-Intensive-Agriculture-Installations.pdf> Accessed August 2022.

<sup>10</sup> [https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-\(AG4\)-2020.pdf](https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-(AG4)-2020.pdf) Page 41, Accessed September 2022.

<sup>11</sup> [https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-\(AG4\)-2020.pdf](https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-(AG4)-2020.pdf) Page 66, Accessed September 2022.

<sup>12</sup> [https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-\(AG4\)-2020.pdf](https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-(AG4)-2020.pdf) Page 24, Accessed September 2022.

guidance states that when using a meteorological site with no cloud cover data, cloud cover data should be sourced from the most representative of the seven cloud cover stations<sup>13</sup>. The most appropriate site was determined to be the M<sup>E</sup> site Casement.

Data for both Mullingar (surface temperature, wind speed, wind direction, relative humidity and precipitation) and Casement (cloud cover) was sourced from M<sup>E</sup><sup>14</sup> for the years 2017 to 2021.

### 2.3.4 Habitat receptors

The following receptors were identified within a 15km radius of the source:

- Glen Lough SPA (6.2km)
- Mount Jessop Bog NHA and Mount Jessop Bog SAC (8.65km)
- Lough Garr NHA (11.8km)
- Lough Iron SPA (12.06km)
- Ardgullion Bog SAC (13.1km)
- Garriskil Bog SAC and Garriskil Bog SPA (13.5km)
- Lough Ree SAC and SPA (14.3km)
- Brown Bog SAC (14.8km)

Receptor points were digitised along the site boundaries of the ecological receptors in QGIS. A grid was used to estimate concentrations across the whole habitat. There are large differences between the areas of the ecological sites under consideration. As a result, varying resolutions have been used, as shown in Table 1. Where there were no ecological sites, a resolution of 250m by 250m grid was used.

It is worth noting that the modelling assessment only considered SPA and SAC sites, as Natura 2000 designated sites.]]

Table 1: Summary modelled habitat receptor resolution

Habitat	Distance from source (km)	Modelled receptor resolution
Glen Lough SPA	6.216	50m x 50m grid (plus 50m spaced points along boundary)
Mount Jessop Bog SAC	8.644	50m x 50m grid (plus 50m spaced points along boundary)
Lough Iron SPA	12.062	100m x 100m grid (plus 100m spaced points along boundary)
Ardgullion Bog SAC	13.124	50m x 50m grid (plus 50m spaced points along boundary)
Garriskil Bog SAC and SPA	13.499	50m x 50m grid (plus 50m spaced points along boundary)
Lough Ree SAC and SPA	14.311	100m x 100m grid (plus 100m spaced points along boundary)
Brown Bog SAC	14.847	50m x 50m grid (plus 50m spaced points along boundary)
All other areas		250 m x 250 m grid

### 2.3.5 Additional model inputs and assumptions

Emissions and sources were taken from the SCAIL screening inputs. One notable change is that ammonia emission rates were calculated from a combination of the different animal types and numbers in each building, rather than having to assume one animal type per building.

<sup>13</sup> [https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-\(AG4\)-2020.pdf](https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-(AG4)-2020.pdf) Page 25, Accessed September 2022.

<sup>14</sup> <https://www.met.ie/climate/available-data/historical-data> Accessed September 2022.

Building locations and dimensions were included in the ADMS model to incorporate building downwash into the modelling.

Surface roughness is one of the most influential dispersion parameters that can be entered within ADMS-5. It is a measure of the aerodynamic roughness of the surface and is related to the height of the roughness element<sup>15</sup>. An appropriate surface roughness value was identified by reviewing the study area in satellite imagery. The maximum value for agricultural land 0.3 was assumed for the model domain. This was considered to be a more representative choice for the surrounding area than the minimum value for agricultural land of 0.2.

Modelling terrain data was informed by a review of satellite imagery, a visual inspection of habitats shows that the study area is reasonably flat, and that terrain does not need to be represented in the model.

## 3. Results

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### 3.1 SCAIL Screening Results

Table 2 provides a summary of Process Contribution, Predicted Environmental Concentration/Deposition, Critical Load, and PC and a Percentage of the Critical Load for ammonia, nitrogen deposition and acid deposition at habitats within a 25km buffer of Brady Farm. Critical levels and loads for NH<sub>3</sub> and deposited nitrogen were provided by the EPA.

The SCAIL outputs show that the following can be concluded:

- The impact from DDS Brady Farm (PC) is above 0.3 kgN/ha/annum of nitrogen deposition at Glen Lough SPA and Mount Jessop Bog NHA and SAC habitats. The PC from DDS Brady Farm for nitrogen deposition is above 1% of the critical load (5 N/ha/annum) for all sites with sensitive habitats or species.
- The PC from DDS Brady Farm is above 4% of the critical level for ammonia at all habitats in the 17 km radius (ranging from 9% to 60% of the critical level).
- The PC from DDS Brady Farm is above 5% of the critical level for nitrogen deposition at all habitats in the 17 km radius where critical loads are applicable (ranging from 11% to 68% of the critical level).
- Additionally, one habitat (Glen Lough SPA) shows an exceedance of the critical level (3 µg/m<sup>3</sup>) for ammonia from the Predicted Environmental Concentration (process contribution plus estimated background concentration).

Following the EPA License Application Guidance: Assessment of the Impact of Ammonia and Nitrogen on Natura 2000 sites from Intensive Agriculture Installations<sup>9</sup>, an Appropriate Assessment (NIS) is required (Proceed to Step 3). The next stage involves re-running SCAIL in conservative mode including mitigation (and proceeding to detailed modelling and an NIS if the PC is still greater than 0.3 kgN/ha/annum of nitrogen deposition; greater than 4% of the critical level for ammonia, and greater than 5% of the critical load for nitrogen deposition), however this is not possible as the DDS Brady Limited is an existing site. Therefore, the assessment progressed to the next stage of detailed dispersion modelling.

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<sup>15</sup> [https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-\(AG4\)-2020.pdf](https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/EPA-Air-Dispersion-Modelling-Guidance-Note-(AG4)-2020.pdf) Page 27, Accessed October 2022.

Table 2: Summary of SCAIL outputs (PC = Process Contribution at receptor edge, PEC = Predicted Environmental Concentration, CL = Critical Load, PED = Predicted Environmental Deposition).

Habitat	Distance from source (km)	NH <sub>3</sub>				Odour PC (O <sub>u</sub> m <sup>-3</sup> )	Nitrogen				Acid			
		PC (µg/m <sup>3</sup> )	PEC (µg/m <sup>3</sup> )	CL (µg/m <sup>3</sup> )	PC as a % of CL		PC (kg/ha/yr)	PED (kg/ha/yr)	CL (kg/ha/yr)	PC as a % of CL	PC ((kEqH <sup>+</sup> /ha/yr)	PED (kEqH <sup>+</sup> /ha/yr)	CL** (kEqH <sup>+</sup> /ha/yr)	PC as a % of CL
Glen Lough SPA (004045)	6.216	1.2	3.4	3	41%	1.2	5.8	18.4	*	*	0.4	2.5	*	*
Mount Jessop Bog NHA	8.644	0.6	3.0	1	60%	0.6	3.4	16.2	5	68%	0.2	2.4	0.4	64%
Mount Jessop Bog SAC (002202)	8.653	0.6	3.0	1	60%	0.6	3.4	16.2	*	*	0.2	2.4	*	*
Lough Garr NHA	11.836	0.4	2.7	3	12%	0.4	2.0	14.8	5	40%	0.1	2.3	0.4	31%
Lough Iron SPA (004046)	12.062	0.4	2.8	1	36%	0.4	1.9	15.1	*	*	0.1	2.4	*	*
Ardgullion Bog SAC (002341)	13.124	0.3	2.7	3	10%	0.3	1.7	14.8	5	34%	0.1	2.4	0.5	23%
Garriskil Bog SAC (000679)	13.499	0.3	2.6	3	9%	0.3	1.6	14.3	5	32%	0.1	2.2	0.5	24%
Garriskil Bog SPA (004102)	13.515	0.3	2.6	3	9%	0.3	1.6	14.3	*	*	0.1	2.2	*	*
Lough Ree SAC (000440)	14.311	0.3	2.3	1	25%	0.3	2.2	6.3	5	44%	0.2	1.0	1.0	16%
Lough Ree SPA (004064)	14.344	0.3	2.3	1	25%	0.3	1.5	12.3	*	*	0.1	2.0	*	*
Brown Bog SAC (002346)	14.847	0.2	2.4	1	24%	0.2	1.4	13.1	5	28%	0.1	2.2	0.5	19%
Ballymore Fen SAC (002313)	16.004	0.2	2.7	1	22%	0.2	1.2	14.5	10	12%	0.1	2.3	1.1	7%
Forthill Bog NHA	16.048	0.2	2.3	1	22%	0.2	1.2	12.2	5	24%	0.1	2.0	1.1	8%
Ballykenny-Fisherstown Bog SPA (004101)	16.563	0.2	2.3	1	21%	0.2	1.1	12.9	*	*	0.1	2.2	*	*
Lough Forbes Complex SAC (001818)	16.57	0.2	2.3	1	21%	0.2	1.1	12.9	5	22%	0.1	2.2	0.4	19%
Lough Owel SPA (004047)	16.69	0.2	2.7	1	21%	0.2	1.1	14.8	*	*	0.1	2.4	*	*
Lough Owel SAC (000688)	16.691	0.2	2.7	1	21%	0.2	1.1	14.8	10	11%	0.1	2.4	1.2	6%

\* Environmental Assessment Level or Critical Load / Level not applicable as this site does not have sensitive habitats or species.

\*\* Critical loads for Acid taken from SCAIL screening assessment outputs

### 3.2 Dispersion Modelling Results

Table 3 shows a summary of the ADMS maximum modelled concentrations of NH<sub>3</sub>, deposited Nitrogen and deposited Acid between 2017-2021 at the seven habitat receptors that were within a 15 km radius of Brady Farm. The critical loads and levels for each habitat are also presented in Table 3, as well as the maximum modelled process contribution displayed as a percentage of the critical levels and loads. Critical levels and loads for NH<sub>3</sub> and deposited nitrogen were provided by the EPA.

Step 4 in the EPA License Application Guidance<sup>9</sup> states that the process contribution percentage threshold is ≤1% of the critical level for ammonia, and ≤1% of the critical load for nitrogen deposition. The following conclusions were drawn from the results in Table 3:

1. For ammonia, the process contribution from DDS Brady Farm is within 1% of the critical levels at all habitat sites within a 15 km radius, with the maximum process contribution as a percentage of the critical level being 0.7% at Ardgullion Bog SAC.
2. For nitrogen deposition, the process contribution from DDS Brady Farm is within 1% of the critical load at both sites that have sensitive habitats or species within a 15 km radius, with the maximum process contribution as a percentage of the critical load being 0.97% at Glen Lough SPA.

Figure 5 displays the maximum ammonia process contribution from Brady Farm between 2017-2021 as a map. The green contour, that represent ≤1% of the critical levels of 1 µg/m<sup>3</sup> and 3 µg/m<sup>3</sup>, highlights that there are no habitat areas where maximum ammonia process contribution from Brady Farm between 2017-2021 exceeds the threshold for ammonia under the EPA License Application Guidance<sup>9</sup>.

The maximum ammonia concentrations are higher at locations closer to DDS Brady Farm, resulting in the closest habitat, Glen Lough SPA, having the highest maximum modelled concentration of ammonia, 0.019 µg/m<sup>3</sup>. The critical level for Glen Lough SPA is 3 µg/m<sup>3</sup> because lichens and bryophytes are not integral to the sensitive receptor or a qualifying interest for the site, resulting in 0.6% process contribution of the critical level. However, the maximum ammonia process contribution as a percentage of the critical level is 0.07% at Ardgullion Bog SAC. This is because lichens and bryophytes are integral to the sensitive receptor and a qualifying interest for the site, meaning that the critical level is 1 µg/m<sup>3</sup>.

**Table 3: Summary of ADMS maximum modelled concentrations of NH<sub>3</sub>, deposited Nitrogen and deposited Acid at habitat receptors between 2017-2021 (PC = maximum modelled Process Contribution, CL = Critical Load/Level).**

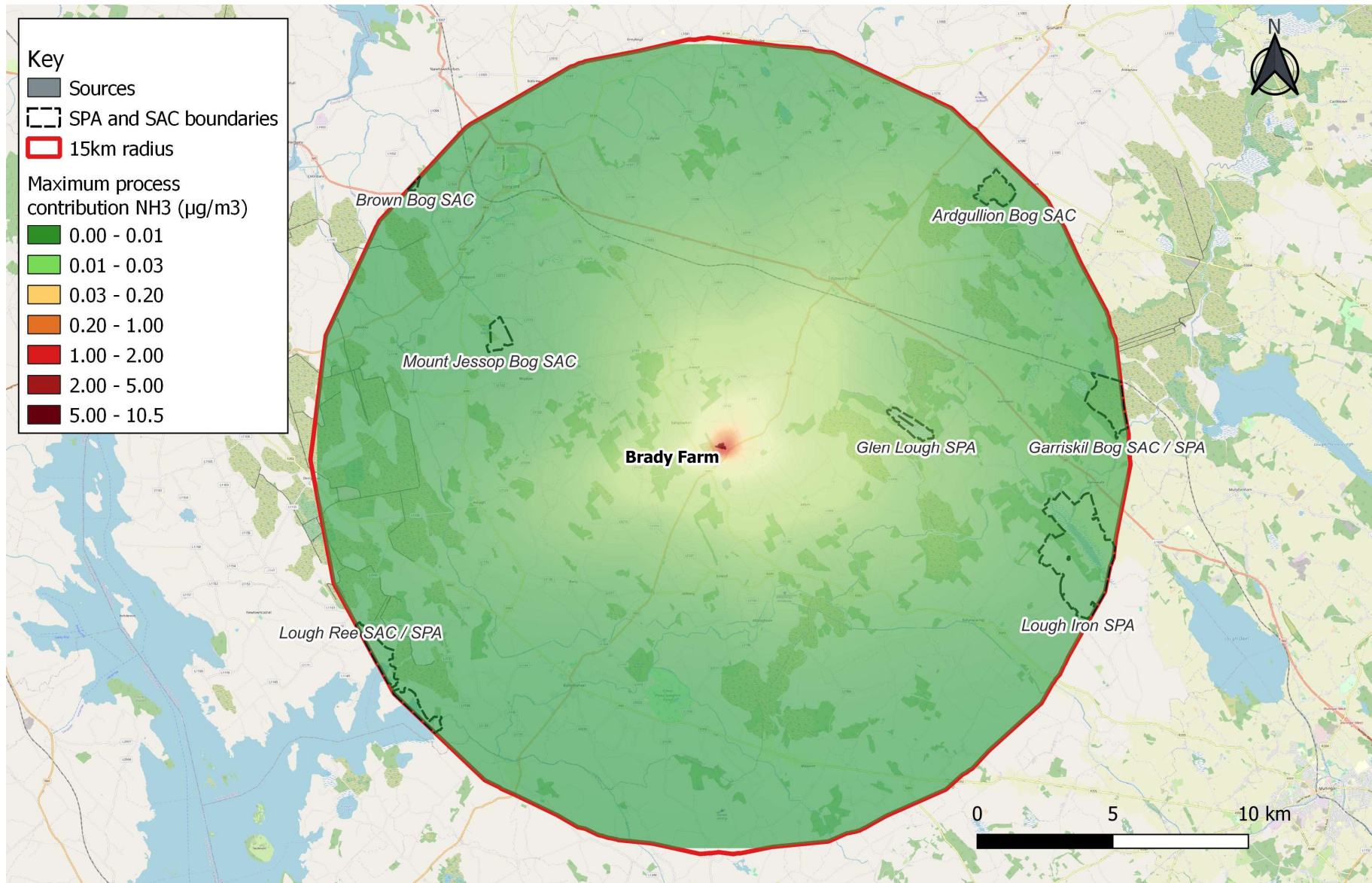
Habitat	Distance from source (km)	NH <sub>3</sub>			Nitrogen			Acid		
		PC (µg/m <sup>3</sup> )	CL	PC as a % of CL	PC (kg/ha/yr)	CL	PC as a % of CL	PC (kg/ha/yr)	CL* (kEqH <sup>+</sup> /ha/yr)	PC as a % of CL
Glen Lough SPA	6.216	0.019	3	0.6%	0.097	10	0.97%	0.007	N/A**	N/A**
Mount Jessop Bog SAC	8.653	0.003	1	0.3%	0.018	5	0.4%	0.001	N/A**	N/A**
Lough Iron SPA	12.062	0.006	3	0.2%	0.031	10	0.3%	0.002	N/A**	N/A**
Ardgullion Bog SAC	13.124	0.007	1	0.7%	0.034	5	0.7%	0.002	0.24	1.0%
Garriskil Bog SAC / SPA	13.499	0.005	1	0.5%	0.024	5	0.5%	0.002	0.23	0.7%
Lough Ree SAC	14.344	0.005	1	0.5%	0.024	3	0.5%	0.001	0.48	0%
Lough Ree SPA	14.344	0.002	3	0.2%	0.013	10	0.4%	0.001	N/A**	N/A**
Brown Bog SAC	14.847	0.002	1	0.1%	0.013	5	0.1%	0.001	0.25	0%

\* Critical loads for Acid taken from SCAIL screening assessment outputs

\*\*Critical Load / Level not applicable as this site does not have sensitive habitats or species, according to SCAIL.



Figure 5: Map of maximum ammonia process contribution from Brady Farm between 2017-2021.



## 4. Conclusions

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Following the EPA License Application Guidance<sup>9</sup>, a screening assessment of air quality impacts from DDS Brady Limited pig farm on Natura 2000 ecological receptors was undertaken. This assessment has been based on licensed operations (P0408-01) at Brady farm and a desk-based study.

Based on screening results from the SCAIL Agriculture tool, detailed dispersion modelling was required to gain a more accurate understanding of the impact of NH<sub>3</sub> emissions from farm housing and slurry storage. Dispersion modelling was carried out using ADMS 5, which provides a more realistic representation of ammonia dispersion and nitrogen deposition. The maximum modelled outputs were summarised across a range of meteorological conditions between 2017-2021. The results showed that the DDS Brady Farms Limited process contribution does not exceed 1% of the critical levels for ambient NH<sub>3</sub> and nitrogen deposition critical loads across the full extent of the 15km buffer zone that was modelled.

This baseline review finds that ammonia emissions from currently licensed operations at DDS Brady Farms Ltd is unlikely to have a significant impact on Natura 2000 sites within 15 km of the licensed site.

# APPENDICES

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## Appendix 1 SCAIL inputs

Table A1: Numerical inputs to SCAIL agriculture model, as taken from the SCAIL Agriculture results/outputs file (inputs removed from table as identical across all sources: Source relates to = Pig; New or Existing Source = Existing).

Source no.	Source name	Location (x,y)	Type	Height (m)	Fan location	No. of fans	Fan diameter (m)	Fan Flow rate (m <sup>3</sup> /s)	Type (2)	Details	Livestock number	Tonnes Fresh Manure (t)	Housing floor area (m <sup>2</sup> )/ Area of manure storage (m <sup>2</sup> )	NH <sub>3</sub> source emissions (kg)	PM <sub>10</sub> source emissions (kg)	Odour emissions (million Ou per second)
1	A1	221198, 265671	Housing	4.15	Roof	9	0.5	0.0029	Weaners	Fully Slatted Floor (FSF)	1938	NA	820	562	41	244,000
2	A2-A3-A5	221231, 265641	Housing	4.15	Roof	5	0.5	0.02	Sows	Fully Slatted Floor (FSF)	1394	NA	2805	4196	47	1,140,000
3	A4-A6	221293, 265640	Housing	4.15	Naturally ventilated	NA	NA	NA	Sows	Fully Slatted Floor (FSF)	1160	NA	948	3492	39	951,000
4	A7	221300, 265654	Housing	4.15	Roof	5	0.5	0.0029	Weaners	Fully Slatted Floor (FSF)	1228	NA	805	356	26	155,000
5	A8	221257, 265669	Housing	4.15	Side Of Building				Weaners	Fully Slatted Floor (FSF)	689		NA	200	14	86,900
6	A9	221314, 265666	Housing	4.15	Roof	13	0.5	0.02	Farrowers	Fully Slatted Floor (FSF)	140	NA	835	818	20	115,000
7	A11	221245, 265671	Housing	4.15	Roof	4	0.5	0.02	Sows	Fully Slatted Floor (FSF)	541	NA	630	1628	18	444,000
8	A12-A13	221174, 265748	Housing	4.15	Roof	9	0.5	0.02	Farrowers	Fully Slatted Floor (FSF)	2270	NA	1660	13257	320	1,860,000
9	Slurry4	221395, 265670	Litter / Manure storage		NA	NA	NA	NA	Slurry - lagoon	No cover	NA	122	1100	1540	0	694,000
10	B1	221305, 265709	Housing	4.15	Roof	14	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	2689	NA	2900	11132	379	2,200,000
11	B2	221310, 265737	Housing	4.15	Side Of Building				Finishers	Fully Slatted Floor (FSF)	486		NA	2012	69	398,000
12	B3	221318, 265747	Housing	4.15	Roof	11	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	1233	NA	1055	5105	174	1,010,000
13	B4	221322, 265764	Housing	4.15	Roof	12	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	1438	NA	1240	5953	203	1,180,000
14	B5	221328, 265782	Housing	4.15	Roof	11	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	1370	NA	1240	5672	193	1,120,000
15	B6	221333, 265800	Housing	4.15	Roof	11	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	1370	NA	1240	5672	193	1,120,000
16	B7	221331, 265820	Housing	4.15	Roof	8	0.5	0.01	Finishers	Fully Slatted Floor (FSF)	913	NA	885	3780	129	749,000
17	C1	221382, 265622	Housing	4.15	Naturally ventilated	NA	NA	NA	Finishers	Fully Slatted Floor (FSF)	311	NA	805	1288	44	255,000

Source no.	Source name	Location (x,y)	Type	Height (m)	Fan location	No. of fans	Fan diameter (m)	Fan Flow rate (m³/s)	Type (2)	Details	Livestock number	Tonnes Fresh Manure (t)	Housing floor area (m²)/ Area of manure storage (m²)	NH <sub>3</sub> source emissions (kg)	PM <sub>10</sub> source emissions (kg)	Odour emissions (million Ou per second)
18	C2	221413, 265612	Housing	4.15	Naturally ventilated	NA	NA	NA	Sows	Fully Slatted Floor (FSF)	339	NA	1175	1020	12	278,000
19	Slurry1	221270, 265799	Litter / Manure storage		NA	NA	NA	NA	NA	No cover	NA	300	250	350	0	158,000
20	Slurry2	221276, 265777	Litter / Manure storage		NA	NA	NA	NA	Slurry - circular store	No cover	NA	300	250	350	0	158,000
21	Slurry3	221265, 265742	Litter / Manure storage		NA	NA	NA	NA	Slurry - circular store	No cover	NA	300	250	350	0	158,000





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