

Pipe, Tank & Groundwater Assessment

Cooligboy Pig Farm, Cooligboy, Timoleague,
Co. Cork.



January 2022



Pipe, Tank & Groundwater Assessment

Client: Martin O Donovan

Location: Cooligboy Pig Farm, Cooligboy, Timoleague, Co. Cork

Date: 17th January 2022

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Appendix A. Site Layout Plan (From NREG, 2010)

1. Introduction

IE Consulting were appointed by NERGE Consulting, on behalf of Martin O Donovan, to assess the feasibility of using groundwater monitoring to assess Tank/Pipeline Integrity for Cooligboy Pig Farm, Cooligboy, Timoleague, Bandon, Co. Cork.

1.1. Background

A Tank and Pipeline inspection report was submitted to the EPA in 2010. IE Consulting understands that the integrity assessment for all the tanks and pipelines assessed passed.

The tank and pipeline assessment is due to be updated. As a result, the EPA has requested a tank and pipeline assessment to be completed on the site.

1.2. Site Location

Cooligboy Pig Farm is located in the townland of Cooligboy, c. 1.4 km west of Timoleague village, and 6.9 km North East of Clonakility. The site location is shown in Figure 1.

The site is located at an elevation of c. 100 mOD. The site is on the side of a rise which peaks to the north of the site at c. 144 mOD. To the south of the site is a valley.

The surrounding land is used primarily for agriculture (pasture).

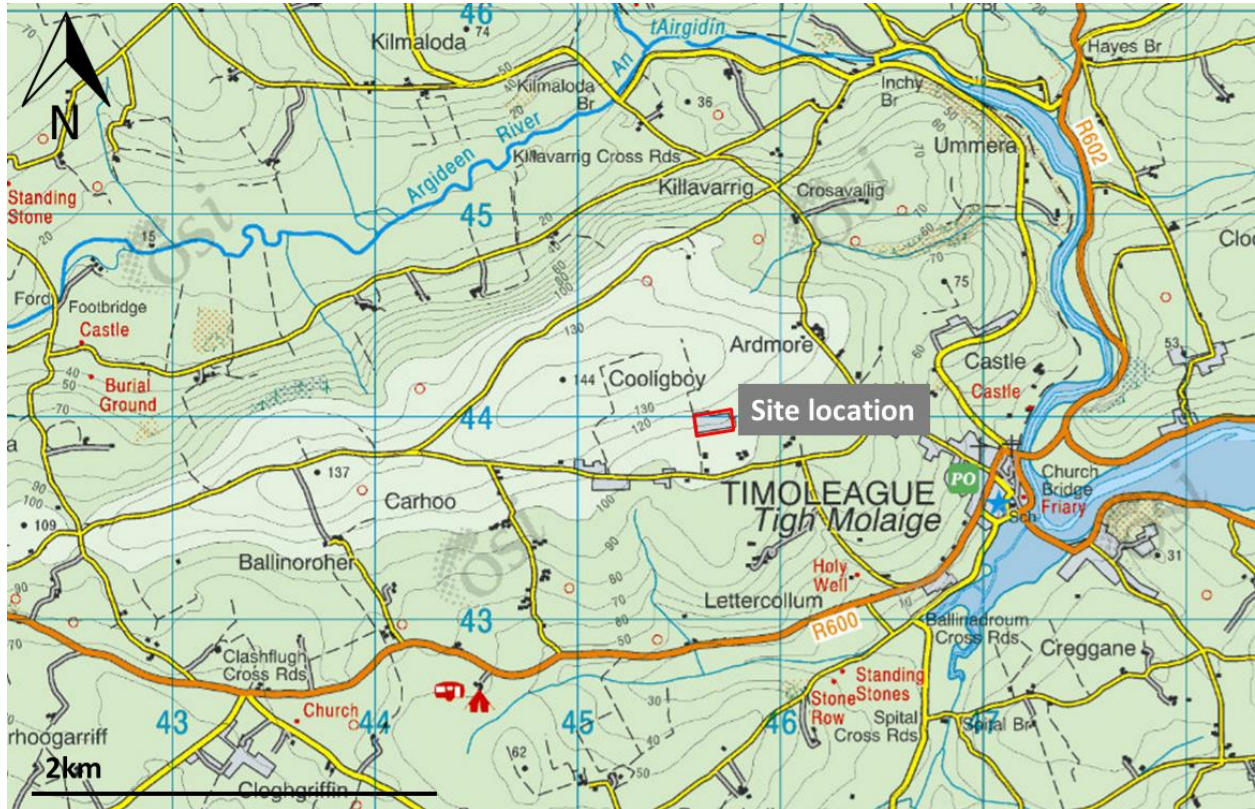


Figure 1: The site is located in the townland of Cooligboy (from OSI, 2021).

1.3. Site History

The Ordnance Survey Ireland (OSI) online historical map viewer (GeoHive) was consulted and a chronological review of key historical development stages and land uses locally from the 1840s to the present day is outlined in Table 1.

Table 1: Historical Map Review (OSI, 2020)

OS Map Date	Site Description	Surrounding Area Description
1837 – 1842 Historic Map 6 Inch B&W	Field boundaries noted	Field Boundaries noted. Some buildings in local area on side roads off the main road. Noted uncultivated Terrain on site.
1888 – 1913 Historic Map 25 Inch	Field boundaries noted	Some buildings along side roads appear to have been removed and a larger building made on the main road. Multiple small fields on site are amalgamated. More of the site is classed as uncultivated terrain.
1995 Aerial Imagery	Buildings noted on site.	Several farm building sites in the area, with additional roads linking them. New dwellings build south of the site and adjacent to the site.
2000 Aerial Imagery	Additional buildings added in the north-east of the site.	Piggery shelters built on site. Dwellings to south of site expand. Farmyards south of site also expand.
2005-2012 Aerial Imagery	Buildings in north-east of site extended.	Piggery expands and more shelters built on the site.
2019 Aerial Imagery	As before.	Piggery expands and more shelters are built on site. Farmyard expands. Dwelling just south of site also expands and receives multiple extensions.

2. Desk Study Review

This section presents the findings of a desk study review of existing geological/hydrogeological information and water quality information.

2.1. Soils

The EPA/Teagasc soil mapping shows that the site is situated on AminDW, which is described a deep, acidic, well drained mineral, derived from mainly non-calcareous parent materials. AminSW lies to the north and in pockets around the site. This is defined as acidic, shallow, well drained mineral, derived from non-calcareous parent materials and can include some outcropping rock (EPA, 2021).

The regional soil mapping is shown in Figure 2.

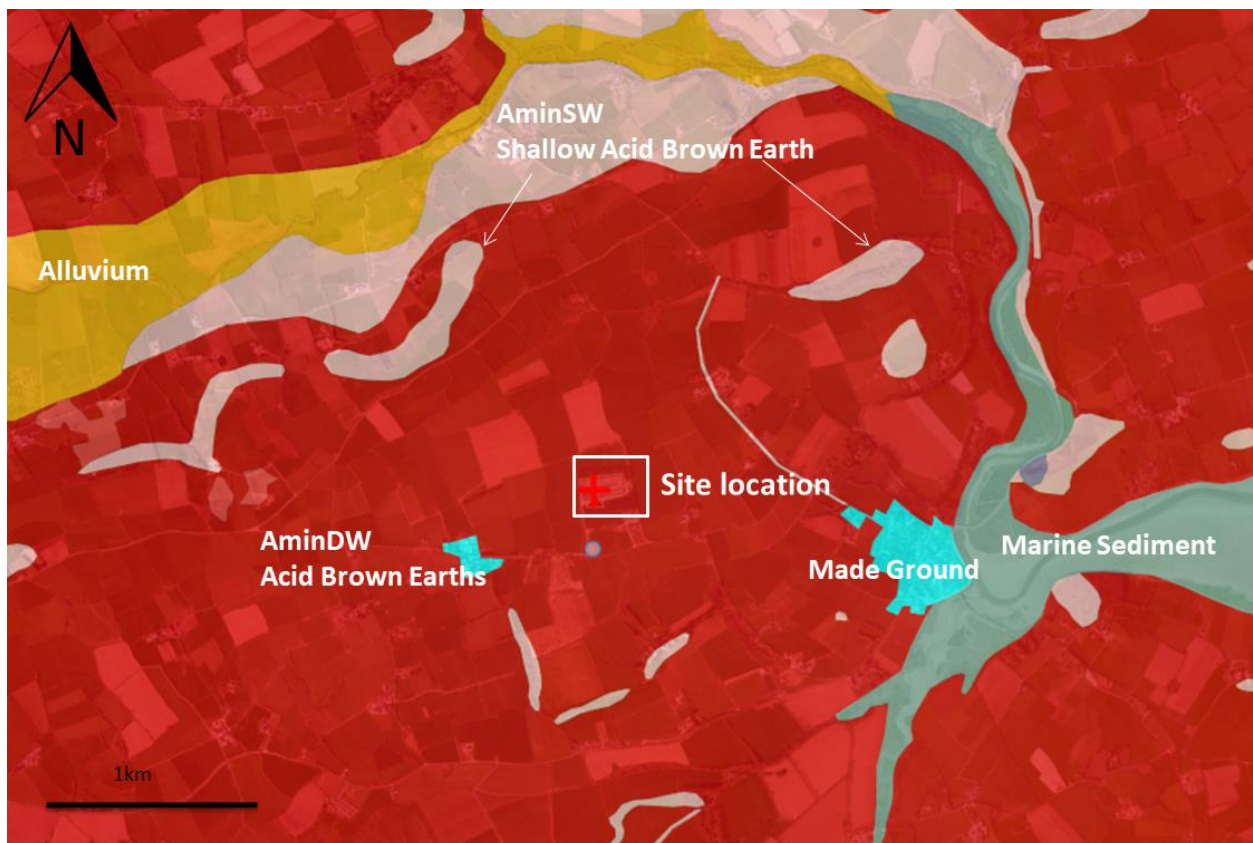


Figure 2: Regional Soil Mapping (EPA, 2021)

2.2. Subsoils

The GSI Subsoil Mapping shows that the site is underlain by **Till derived from Devonian and Carboniferous sandstones and shales**. There are also areas of **Sands and Gravels derived from Sandstone** to the north of the site. Some exposed rock is also seen in pockets around the site. Alluvium and Estuarine Sediments are associated with local water bodies.

The EPA map of subsoils is shown in Figure 3.

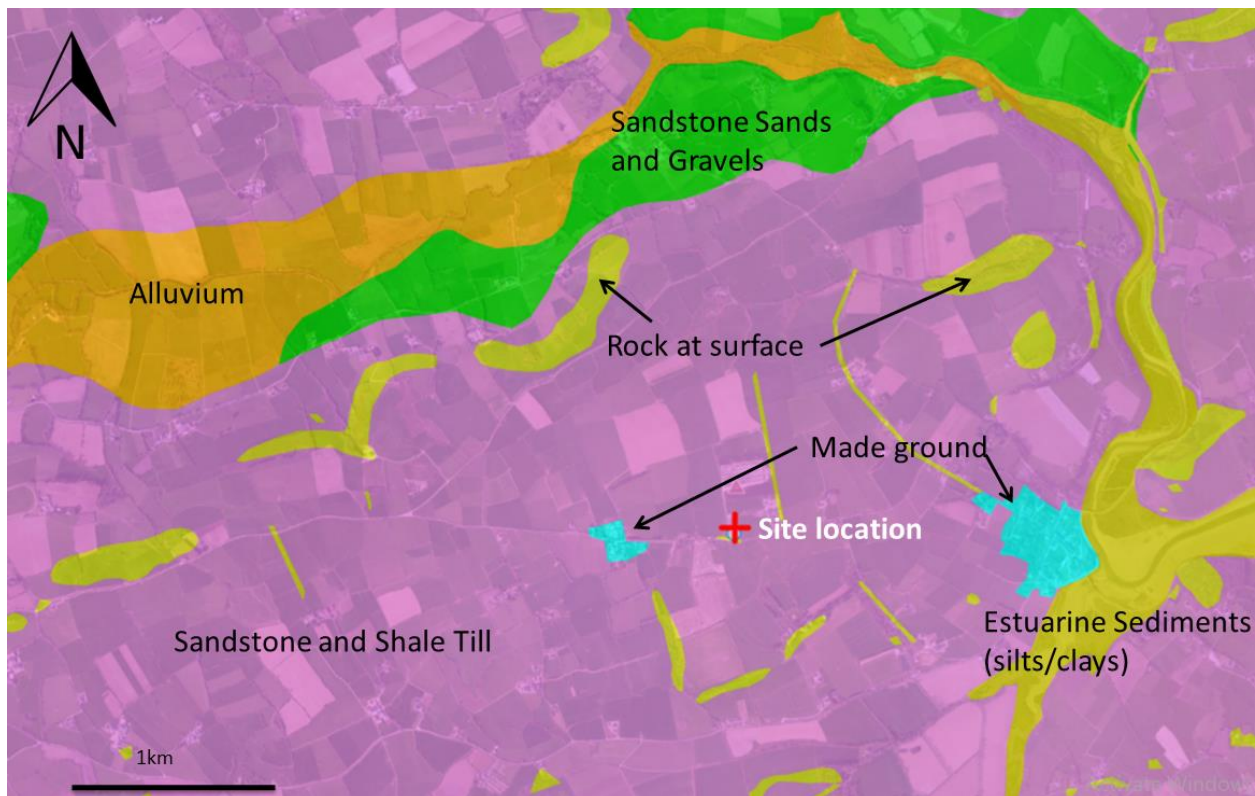


Figure 3: Subsoils (EPA, 2021)

2.3. Bedrock Geology

The GSI Bedrock Mapping indicates that the site is underlain by the Old Head Sandstone Formation. This is described as a Devonian-age formation dominated by heterolithic facies of fine grained sandstones and mudstones. Just north of the area is the Kinsale Formation which is described as a grey mudstone with heterolithic lithology (GSI, 2021).

Regionally, there is large-scale deformation observed in the geology of this area. The area is heavily folded with folds orientated north-east to south-west, causing repetition of formations. There are also north-south orientated faults in the region causing discontinuous units.

Figure 4 shows the geological distribution around the site.

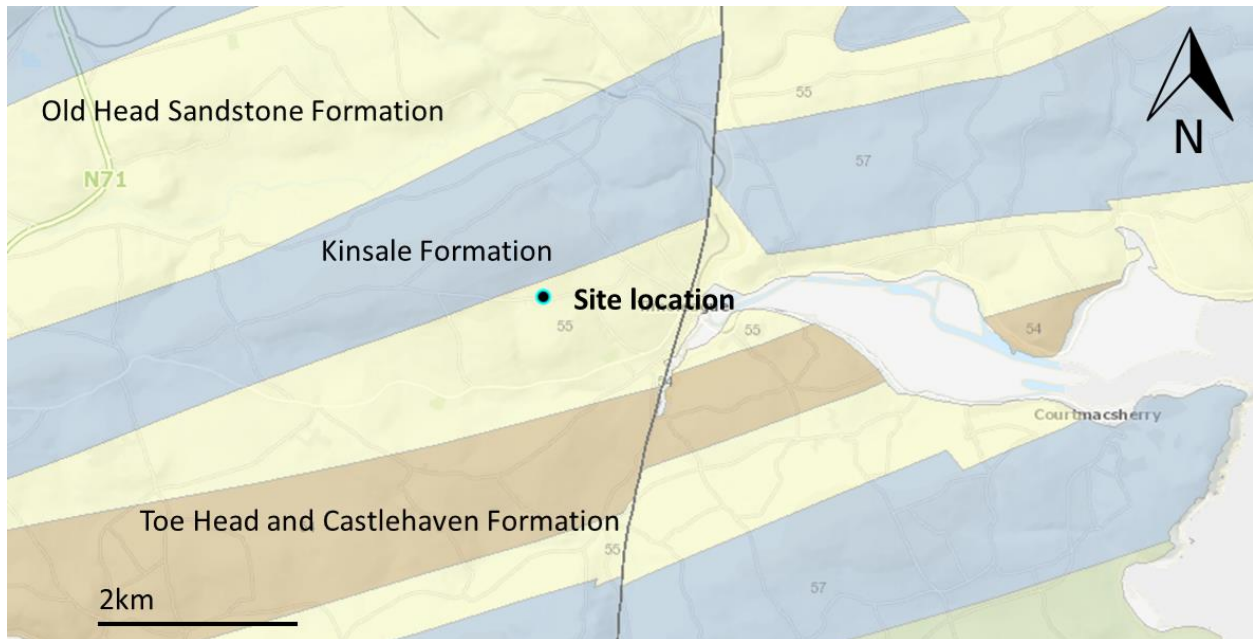


Figure 4: Bedrock Geology (GSI, 2020)

2.4. Hydrogeology

2.4.1. Regional Hydrogeology

The piggery site is underlain by a **Locally Important Aquifer, bedrock which is moderately productive only in Local Zones**. This is an aquifer which is poorly connected and overall low permeability, though some localized zones of shallow permeability may exist. Aquifer storage is low and it has a low recharge acceptance.

This aquifer forms part of the Skibbereen-Clonakilty Groundwater Body, which is understood to have formerly been part of the Bandon Groundwater Body. No GWB Description is available from the GSI regarding the Skibbereen-Clonakilty GWB, but the Bandon Groundwater Body has the following characteristics as described by the GSI (GSI, 2004):

- The Devonian Old Red Sandstone units in this GWB form sequences which can be several kilometres thick (Sleeman & Pracht, 1994).
- These rocks have no intergranular permeability; groundwater flow occurs in fractures and faults.
- The permeability of individual fractures and the degree of interconnection will be generally low, with fracturing confined to local zones. Permeability is highest in the upper few metres, but generally decreases rapidly with depth.
- Most groundwater flow in this groundwater body is expected to occur within the top 15m of the aquifer, in the layer that comprises a weathered zone of a few metres and a connected fracture zone below this.

- In general the Devonian ORS aquifer transmissivities will be in the range 2-20m²/day. However, “Excellent” yielding wells (>400m³/day) are known in some of the units – these yields are usually associated with boreholes being situated on fault zones.
- Groundwater flow paths are expected to be relatively short, typically 30-300m, with groundwater discharging to small springs, or to the streams and rivers that traverse the aquifer. Groundwater will also discharge at the coast.
- Aquifer storativity will be low in all rocks.
- The water table can vary between a few metres up to more than 10m below ground surface, depending on topography. Groundwater gradients are likely to be in the range 0.01 to 0.04.
- Subsoil is generally <10m thick within the GW with large areas of <3m subsoil.
- Diffuse recharge will occur via rain percolating through the subsoil or areas of outcropping rock.
- Flow directions are expected to approximately follow the local surface water catchments.
- Groundwater is generally unconfined in this aquifer.

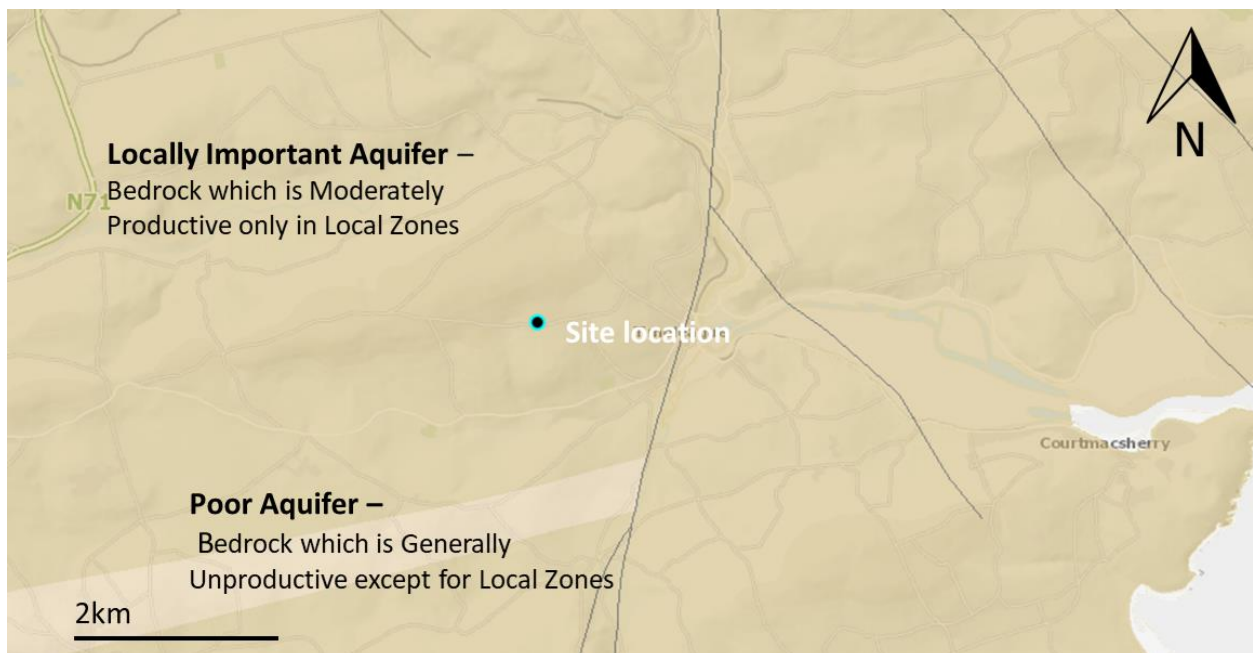


Figure 5: Regional Aquifer Mapping (GSI, 2021)

2.4.2. Site Specific Hydrogeology

The site has four groundwater production wells, which are discussed further in Section 2.6.

There was no current information available on the groundwater levels across the site. However, the groundwater flow direction has been inferred from OSI topographical mapping. The groundwater flow direction is understood to be towards the south-southeast at the site, towards the Argrideen River. The

previous tank and pipeline assessment (June 2010), used water level monitoring in wells AGW1 and AGW4 which confirmed this flow direction.

Subsoil mapping indicates that the aquifer is unconfined, but this has not been confirmed by borehole logs.

A groundwater flow map is shown in Figure 6.



Figure 6: Groundwater Flow Map (OSI, 2021)

2.4.3. Groundwater Quality

Both the Bandon and the Skibbereen-Clonakilty Groundwater Bodies were assigned a ‘good’ overall groundwater status for the 2013-2018 monitoring period under the Water Framework Directive (WFD). The Skibbereen-Clonakilty GWB is deemed to be ‘not at risk’ of not achieving good status again in the next monitoring period, and the Bandon GWB is classified as ‘under review’ (EPA, 2021).

Water quality data is available from all four groundwater wells on the piggery site. This data is presented in Tables 2 – 5.

The water quality data was compared to the following regulations:

- S.I. No. 366/2016 – European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016.

- S.I. No. 122/2014 – European Union (Drinking Water) Regulations 2014.
- Environmental Protection Agency (EPA) Interim Guideline Values (IGV) (2003).

The locations of the wells (AGW1 – 4) and storm water monitoring points (SW) are shown in Figure 7.



Figure 7: Site Wells (OSI, 2021)

AGW4 is located up-gradient of the piggery site, and can be considered to be representative of background water quality.

AGW1 & 3 are located down-gradient of the site at 218m and 152m respectively to the south of the main pig houses, and are located adjacent to Martin O Donovan's family dwelling, and they are in constant use for farm and domestic supplies. These could detect contamination originating from the piggery operations within the zone of contribution of the well.

AGW2 is the main production well for the site and located along the site's hydraulic mid-gradient, and can detect leaks or spills from tanks on-site because of a developed ZOC.

Ammonia and Nitrate are considered key indicator parameters, given the prevalence of nitrogen in pig slurry.

Overall, the groundwater quality beneath the site can be considered to be good. The data ranges from 2008-2021 for GW1, GW2, and GW3; and from 2010-2021 for GW4 – with some gaps. Measurements were taken annually until 2014, when they began to be taken biannually. Samples were sent to ALS laboratories. The groundwater samples are tested for Nitrate, Total Ammonia, Faecal Coliforms, and E Coli. Sampling and delivery to Lab was undertaken by NERGE Ltd. This data is shown below in Tables 2-5.

Ammonia has occasionally exceeded the groundwater threshold values in all wells, but this has not happened since 2016. The S.I. 366/2016 Groundwater Threshold Value for total ammonia is 0.065-0.175 mg/l. In the 18 years recorded, GW1 exceeded this threshold in 2011, 2014, and 2016; GW2 exceeded it in 2009, 2011, and 2016; GW3 exceeded it in 2009 and 2021. GW4 was found to be exceeding the threshold in 2011 and 2016 only. It is important to note that there are some years that samples were not taken during this period. **In 2011 and 2016 when most wells exceed the threshold value – ammonia concentrations were highest in GW4 which implies an offsite source of contamination. The spike in 2014 is highest in the down gradient boreholes (GW1 and GW3) which may imply a once off event.**

Faecal coliforms and E-coli were only found to exceed the threshold values in GW1, GW2, and GW3 in 2008 all at 9 CFU/100ml. The S.I. 366/2016 Groundwater Threshold Value for these is 0 CFU/100ml. GW1 also exceeds the thresholds one other time in 2017 at greater than 150 CFU/100ml. **This is a downgradient borehole and may indicate a one off event.**

A summary table of the groundwater quality analysis data is contained in Table 2-5.

Table 2: Groundwater Quality Data from GW1.

GW1 - Ground water Quality Data					
	Nitrate mg/l NO ₃	Total Ammonia N mg/l	Enterococci number/100ml	Faecal coliforms CFU/100ml	E Coli CFU/100ml
S.I. 366/2016	37.5	0.065-0.175	-	-	-
S.I. 122/2014	37.5	0.3	0	0	0
EPA IGV 2003	25	0.12	-	0	0
2008	1.32	0.02	-	9	-
2009	10.5	0.05	-	0	-
2010	10.9	0	0	0	-
2011	11.1	1	0	0	-
2012	7.3	0.04	0	0	0
2013	-	-	-	-	-
2014	3.3	0.51	0	0	0
2015	0.9	0.06	0	0	0
2016	20.6	0.07	0	0	0
2017 - 1	14.63	0.04	out of spec	154	>150
2017 - 2	1	<0.02	-	0	0
2018 - 1	<1.0	0.02	-	0	0
2018 - 2	10.7	0.03	-	0	0
2019 - 1	1.8	0.03	0	0	0
2019 - 2	3.8	<0.02	0	0	0
2020 - 1	1.5	<0.02	0	0	0
2020 - 2	1.6	<0.02	0	0	0
2021 - 1	1.3	0.03	0	0	0

Table 3: Groundwater Quality Data from GW2.

GW2 - Groundwater Quality Data					
	Nitrate mg/l NO ₃	Total Ammonia N mg/l	Enterococci number/100ml	Faecal coliforms CFU/100ml	E Coli CFU/100ml
S.I. 366/2016	37.5	0.065-0.175	-	-	-
S.I. 122/2014	37.5	0.3	0	0	0
EPA IGV 2003	25	0.12	-	0	0
2008	1.32	<0.01	-	9	-
2009	10.8	0.46	-	0	-
2010	10.9	0	0	0	-
2011	11.6	0.1	0	0	-
2012	-	-	-	-	-
2013	10.8	0.04	0	0	0
2014	3.5	0.04	0	0	0
2015	9	0.03	0	0	0
2016	20.2	0.1	0	0	0
2017 - 1	9.86	0.02	-	0	0
2017 - 2	3.2	0.02	-	0	0
2018 - 1	<1.0	<0.02	-	0	0
2018 - 2	5.5	<0.02	-	0	0
2019 - 1	1.1	0.02	0	0	0
2019 - 2	3.9	<0.02	0	0	0
2020 - 1	1.6	<0.02	0	0	0
2020 - 2	2.7	<0.02	0	0	0
2021 - 1	3.5	0.03	0	0	0

Table 4: Groundwater Quality Data from GW3.

GW3 - Groundwater Quality Data					
	Nitrate mg/l NO ₃	Total Ammonia N mg/l	Enterococci number/100ml	Faecal coliforms CFU/100ml	E Coli CFU/100ml
S.I. 366/2016	37.5	0.065-0.175	-	-	-
S.I. 122/2014	37.5	0.3	0	0	0
EPA IGV 2003	25	0.12	-	0	0
2008	<1	0.01	-	9	-
2009	11	0.88	-	0	-
2010	9.2	0	0	0	-
2011	5.7	0.04	0	0	-
2012	10.6	0.03	0	0	0
2013	-	-	-	-	-
2014	21.2	0.3	0	0	0
2015	13.8	0.06	0	0	0
2016	7.3	0.03	0	0	0
2017 - 1	11.69	<0.02	-	0	0
2017 - 2	3.4	<0.02	-	0	0
2018 - 1	<1.0	0.2	-	0	0
2018 - 2	5.5	<0.02	-	0	0
2019 - 1	1	0.03	0	0	0
2019 - 2	4	<0.02	0	0	0
2020 - 1	1.6	<0.02	0	0	0
2020 - 2	4.4	<0.02	0	0	0
2021 - 1	3.1	0.16	0	0	0

Table 5: Groundwater Quality Data from GW4.

GW4					
	Nitrate mg/l NO ₃	Total Ammonia N mg/l	Enterococci number/100ml	Faecal coliforms CFU/100ml	E Coli CFU/100ml
S.I. 366/2016	37.5	0.065-0.175	-	-	-
S.I. 122/2014	37.5	0.3	0	0	0
EPA IGV 2003	25	0.12	-	0	0
2008	-	-	-	-	-
2009	-	-	-	-	-
2010	2.8	0	0	0	-
2011	5.1	2.8	0	0	-
2012	-	-	-	-	-
2013	-	-	-	-	-
2014	-	-	-	-	-
2015	-	-	-	-	-
2016	16.8	0.09	0	0	0
2017 - 1	14.06	<0.02	-	0	0
2017 - 2	1.2	<0.02	-	0	0
2018 - 1	<1.0	<0.02	-	0	0
2018 - 2	5.4	<0.02	-	0	0
2019 - 1	1.7	0.02	0	0	0
2019 - 2	4.2	<0.02	0	0	0
2020 - 1	1.6	<0.02	0	0	0
2020 - 2	4.5	<0.02	0	0	0
2021 - 1	3	0.03	0	0	0

2.5. Groundwater Vulnerability

Aquifer or groundwater vulnerability is a relative measure of the ease with which the groundwater could be contaminated by human activity and depends on the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability of any overlying deposits. For example, bedrock with a thick, low permeability, clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, gravelly overburden.

The GSI uses five groundwater vulnerability categories – Extreme rock at or near surface or karst (X), Extreme (E), High (H), Moderate (M) and Low (L) for mapping purposes and in the assessment of risk to groundwater. The classifications are based on the thickness and permeability of the sub-soils overlying the aquifer. The GSI groundwater vulnerability classification scheme is outlined in Table 6.

Table 6: Groundwater Vulnerability Classification Scheme

Depth to Rock	Hydrogeological Requirements for Groundwater Vulnerability				
	Diffuse Recharge			Recharge Point	Unsaturated Zone
	High Permeability (sand/gravel)	Moderate Permeability (sandy subsoil)	Low Permeability (clayey subsoil, clay, peat)	(swallow holes, loosing streams)	(sand & gravel aquifers <u>only</u>)
0-3 m	Extreme	Extreme	Extreme	Extreme (30 m radius)	Extreme
3 – 5 m	High	High	High	N/A	High
5 – 10 m	High	High	Moderate	N/A	High
>10 m	High	Moderate	Low	N/A	High
<p>i. N/A = not applicable. ii. Release point of contaminants is assumed to be 1 – 2 m below ground surface. iii. Permeability classifications relate to the engineering behaviour as described by BS5930. iv. Outcrop and shallow subsoil (i.e. generally <1.0 m) areas are shown as sub-category of extreme vulnerability.</p> <p style="text-align: right;"><i>(amended from Deakin and Daly (1999) and DELG/EPA/GSI (1999))</i></p>					

The GSI Groundwater Vulnerability Mapping was reviewed. The piggery site sits within an area of **Extreme Vulnerability** (GSI, 2021).

These classifications typically indicate that the depth to bedrock is at within 0-3 m of the surface. Logs for the wells onsite indicate that the true depth to bedrock is between 4.6 m - 3.7m (Table 7).

The groundwater vulnerability mapping is shown in Figure 8.



Figure 8: Groundwater Vulnerability Mapping (GSI, 2021)

2.6. Abstractions

The piggery site has four wells, the locations of which are shown in Figure 7.

The details of the wells are outlined in Table 7.

Table 7: Wells Details

Well ID	Hydraulic Location	Depth [m]	Depth to Bedrock (m)
GW1	Downgradient	74.67	3.7
GW2	Midgradient	48.8	4.3
GW3	Downgradient	54.9	4.6
GW4	Upgradient	60.1	3.7

The GSI Well & Spring Database was consulted. Registration of abstractions with the GSI is not mandatory and therefore the database may not represent all of the abstractions within the vicinity of the proposed development. The abstractions in the surrounding areas are presented in Table 8.

Table 8: Abstractions (GSI, 2021)

GSI ID	Townland	Distance from Site [km]	Type	Depth of Hole [m]	Yield [m ³ /d]	Use
1403NWW103	Timoleague	0.25 SE	Borehole	48.7	-	Agricultural and Domestic
1403NWW116	Castle Upper	0.77 NW	Dug well	54.8	54.5	Agricultural and Domestic
1403NWW108	Lettercollum	0.95 S	Borehole	15.2	76.4	Agricultural and domestic use
1403NWW107	Carhoo	1.44 SW	Borehole	21.9	-	Agricultural and domestic use
1403NWW104	Castle Upper	1.53 NE	Borehole	39	54.5	Agricultural and Domestic use

There are no group water schemes or ground water zones near the site.

2.7. Karst

The GSI Karst Database was consulted. There are no karst features mapped on the piggery site (GSI, 2020). However, the GSI's karst database is not comprehensive and other karst features that are not mapped may be present in the vicinity of the site.

2.8. Hydrology

The piggery site is located in the Bandon-ilen Catchment, which is designated as Hydrometric Area No. 20. The piggery is situated within the East Cruary Sub-catchment No. 010.

The Argideen River is the main drainage feature in the area surrounding the piggery site, and is located 1.61 km north and then curves around to be 1.44 km to the east of the site. Several smaller tributaries to the river are closer to the site, including the East Cruary tributaries. The Argideen River flows towards the west and south and widens towards the sea to the south.

Surface water is monitored on site at two storm water monitoring points (SW1 and SW2). Their locations are shown in Figure 7 above. SW1 and SW2 have been in place since 2006 and 2013 and measure chemical oxygen demand (COD) quarterly.

The characteristics of the principal drainage features are outlined in Table 9.

The location of the piggery in relation to the surface water features is shown on Figure 10.

Table 9: Hydrological Features (EPA, 2021)

Name	Water Feature	Water Body Code	Sub-Catchment	Distance from Site	WFD Status 2013-2018	WFD Risk (December 2020)
Argideen_040	River	IE_SW_20A020200	20-12	1.61 km N	good	Not at risk
East Cruary_010	River	IE_SW_20E050970	20_1	740 km N	Unassigned	Under Review



Figure 9: Hydrological features around the site (EPA, 2021).

2.9. Designated Sites

The closest Special Area of Conservation (SAC) is the Courtmacsherry Estuary SAC, which is located c. 1.5km east of the piggery site (EPA, 2021). The closest Special Protection Area (SPA) is Courtmacsherry Bay SPA.

3. Groundwater Monitoring Tank & Pipeline Assessment

3.1. Groundwater Monitoring

The existing groundwater wells across the site are suitably positioned to act as monitoring points for tank integrity and risk to groundwater as follows:

- GW1 – Down-gradient on the site
- GW2 – Midgradient on the site
- GW3 – Down-gradient of the site
- GW4 – Up-gradient of the site

Pumping of these wells will form a zone of contribution which will draw water from the surrounding aquifer which underlies the site. These wells are suitable to act as monitoring points for groundwater quality as the water will be abstracted from beneath the piggery site.

3.2. Tank & Pipeline Assessment

As of October 2021, there is 13,200 m³ storage available for pig manure on site.

The pig slurry produced at this farm is primarily (90%) delivered to an Anaerobic Digester located nearby which is operated by Timoleague AgriGen Ltd, under EPA Licence Reg No P0986-01. The remaining 10% is used as a fertilizer for agricultural crops displacing chemical fertilizers.

The site is mapped by the GSI as located in an area of extreme groundwater vulnerability, which the GSI estimates as indicating 0-3 m of subsoil present to offer protection to the underlying bedrock aquifer. Borehole logs show that there is between 4.6 m and 3.7 m to bedrock across the site, which is more than anticipated (Table 7).

The groundwater quality has been monitored consistently for the past 16 years (annually 2008-2016 and biannually 2017-2021), and is considered good for ammonia and nitrate, which are key contamination indicator parameters from piggery sites. This indicates that there is no leakage from pipes or tanks.

The zone of contribution of the production wells' will underlie the piggery site and is considered satisfactory to detect any leaks from tanks or pipelines.

Continued monitoring at these points is proposed in order to enable rapid identification and remediation of any leaks. Given the good water quality data from the past 10 years, biannual monitoring is deemed satisfactory. In this case, no further integrity testing is considered necessary.

4. Conclusions

The following conclusions can be drawn from this assessment of Cooligboy Pig Farm, Cooligboy, Timaleague, Co. Cork:

1. The piggery is located in an area classified as extreme groundwater vulnerability.
2. The site is situated over Locally Important Bedrock Aquifer, which is described as moderately productive only in local zones.
3. The groundwater flow is interpreted as being towards the southeast, where it discharges to the regionally to the sea to the southeast, and locally towards a tributary of the Argideen located to the south.
4. The water quality underlying the site is considered to be good for both ammonia and nitrate – which are key contamination indicator parameters for piggery sites.
5. The existing production wells onsite have formed a zone of contribution which extends beneath the piggery site. The zone of contribution will draw water from beneath the piggery's tanks/pipelines and water quality analysis of the production wells will act as a suitable monitoring regime to detect any leaks from underground tanks/pipelines. Therefore, further pipeline and tank integrity testing is not warranted at this stage.

5. Recommendations

The groundwater wells GW1, GW2, GW3 and GW4 are recommended to be monitored biannually for the following list of parameters:

- Nitrate as NO_3
- Nitrite as NO_2
- Ammonium as NH_4
- Chloride
- Potassium
- Orthophosphate
- Sodium
- Electrical Conductivity
- Total Coliforms
- Faecal Coliforms

The samples should be collected by a suitably qualified person (engineer/scientist) and analysed in an INAB accredited laboratory. The limits of detection should be sufficient to enable comparison to the latest groundwater regulations.

Reason: To monitor for leaks from underground tanks/pipelines and to monitor for any negative impacts from site operations on groundwater to protect the underlying aquifers. The proposed wells are strategically located to detect contamination from the site.

In addition, it is recommended that static groundwater levels be monitored where possible (i.e. if the well is not in use).

Reason: To better determine the groundwater flow direction and verify that the groundwater monitoring network is satisfactory to identify any possible leaks.

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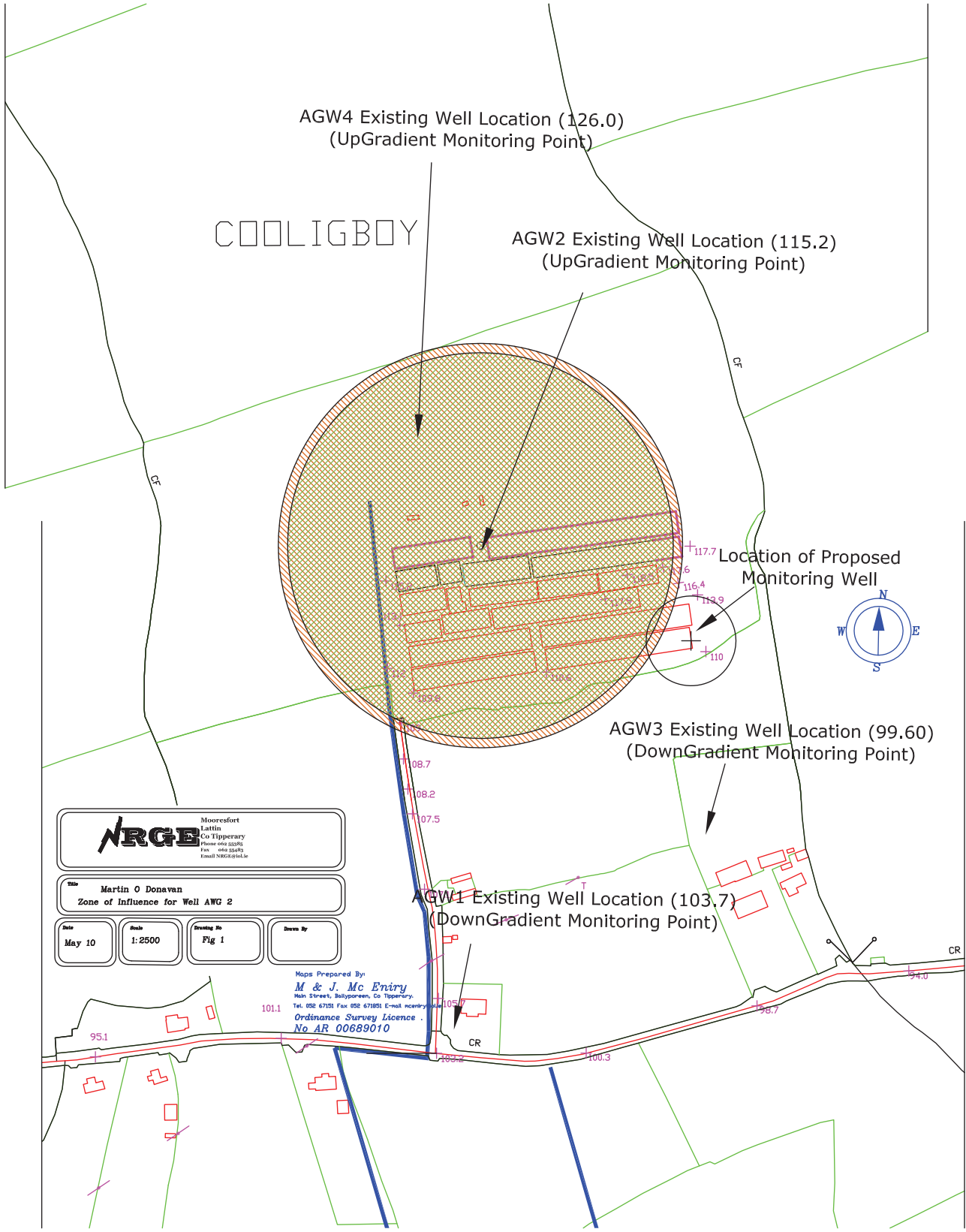
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Appendix A

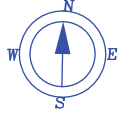


AGW4 Existing Well Location (126.0)
(UpGradient Monitoring Point)

COOLIGBOY

AGW2 Existing Well Location (115.2)
(UpGradient Monitoring Point)

Location of Proposed
Monitoring Well



AGW3 Existing Well Location (99.60)
(DownGradient Monitoring Point)

AGW1 Existing Well Location (103.7)
(DownGradient Monitoring Point)

NRGE Moneesfort
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Title: Martin O Donovan
Zone of Influence for Well AWG 2

Date	Scale	Drawing No.	Drawn By
May 10	1:2500	Fig 1	

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