Wressle Wellsite

Site Condition Report

Environmental Permitting (England and Wales) Regulations 2016

- Application to Vary Mining Waste Operation
- Application to Vary Water Discharge Activity
- Application to Vary Groundwater Activity
- Application for a New Installation for Gas Refining Activity

ISSUE No.	Description
240429	Draft for Client Review.
240501	First Issue for Permit Application

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1. Purpose and Context

This Site Condition Report forms part of an application to the Environment Agency to authorise the undertaking of specific 'permitted activities' at the Wressle Wellsite. In the context of onshore oil and gas operations, a number of activities are considered applicable to the environmental permitting regime.

The site within which the 'permitted activities' are undertaken is considered a 'regulated facility' under The Environmental Permitting (England and Wales) Regulations 2016, as amended (EPR2016) [Ref.1].

The purpose of the Site Condition Report is to set out the current condition of the Wressle Wellsite prior to the undertaking of the proposed operations by Egdon Resources U.K. Limited (herein referred to as the 'Operator').

An application to the Environment Agency is being made under EPR2016 to vary the current 'mining waste operation' 'water discharge activity' and 'groundwater activity' permits for Environmental Permit EPR/AB3609XX [Ref.2]. In addition a new 'installation activity' for the refining of natural gas in excess of 1,000 tonnes per year is being pursued.

The Wressle Wellsite has historically been the subject of a number of permit applications and variations. Table 1 provides a summary of the 'permitted activities' currently permitted at the wellsite.

Permitted Activities				
Permit	**Ref.**	**Description**	**Activity**	**EPR2016**
EPR/AB3609XX	A1	Loading, unloading, handling or storage of crude oil.	Installation	Schedule 1
	A2	Non-hazardous mining waste operation	Mining Waste	Schedule 20
	A3	Non-hazardous mining waste facility		
	A4	Groundwater activity for a single injection.	Groundwater	Schedule 22
	A5	Discharge of rainfall run off water to Ella Beck	Water Discharge	Schedule 21
	A6	Operate a Medium Combustion Plant.	MCP and SG	Schedule 25
EPR/HB3295DH	A1	Accumulation of radioactive waste on the premises.	Radioactive Substances	Schedule 23
	A2	Disposal of radioactive waste on or from the premises.		

Table 1: List of Activities Currently Permitted

As the development continues to progress, additional permitted activities have been identified as being necessary. As a result, the 'Operator' has prepared an application to vary the environmental permits with the purpose of gaining permission to undertake the following activities:

1.1 Proposed Activities

The 'Operator' is proposing to undertake 5 phases of development, which will include:

1. Phase 1 – Construction of the proposed Wellsite extension.
2. Phase 2 – Drilling of Wressle-2 and Wressle-3 Wells.
3. Phase 3 – Production testing of Wressle-2 and Wressle-3 Wells.
4. Phase 4 – Production.
5. Phase 5 – Well decommissioning and site restoration.

Phase 1

To facilitate the additional wells at the site the Wressle Wellsite will be extended from the southern boundary. As such, the 'regulated facility' will need to be increased and updated on any future permit.

Phase 2

The second phase of the development will include the drilling of two new boreholes from the existing/extended Wressle Wellsite. The second and third boreholes shall be known as the Wressle-2 Well and the Wressle-3 Well respectively and will be drilled with the intention of further evaluating the zones of interest identified by the 'Operator' during the drilling of the Wressle-1 Well.

It may be necessary to undertake a proppant squeeze, should it be deemed necessary to enhance production rates. The proppant squeeze has been designed such that it will be confined to the saturated formations, which contain hydrocarbons. The proppant squeeze is a 'groundwater activity', namely the injection of any substance into groundwater to increase the flow of fluids or gas to a well or borehole in connection with the extraction or use of any energy source.

Phase 3

The third phase of the development will include production testing of the Wressle-2 Well and the Wressle-3 Well.

Phase 4

If production testing of the Wressle-2 Well and/or the production testing of the Wressle-3 Well is successful, the wells will be put in to production. Natural gas will be exported via pipeline to the District Network Operator (DNO).

Phase 5

Following production operations, the wells will be decommissioned and the wellsite restored.

All figures included in this document, for example, volumes, tonnages, formation depth represent best estimates at the time of document production, and may change, as operations develop.

2. SCOPE

This Site Condition Report is applicable to the Wressle Wellsite, the 'Operator', its contractors and subcontractors and may be used in support of an application to the Environment Agency under EPR2016.

This Site Condition Report has been produced following the Environment Agency H5 guidance [Ref.3] and is broken down into three sections covering:

I. **Application Section** – Issued as part of an application for an environmental permit for the purpose of demonstrating that the condition of the land, groundwater and air prior to proposed development.

II. **Operational Section** – Maintained throughout the lifetime of the 'regulated facility' and includes details of the as built site (including embedded pollution mitigation) and environmental sampling and analysis data.

III. **Surrender Section** – Summarises the impact the 'regulated activity' has had on the environment by comparing the baseline and operational sampling and analysis report. It also provides details on any pollution incidents that may have occurred and the remediation taken.

As the purpose of this Site Condition Report is for an application to vary permit EPR/AB3609XX. Sections I and II have been included only. Section III will be completed and issued to the Environment Agency as part of an application to surrender environmental permit EPR/AB3609XX.

3. Abbreviations and Definitions

Active Area:	Regulated Facility area that is underlined by HDPE to provide tertiary containment
BAT:	Best Available Technique
BGS:	British Geological Survey
BREF:	BAT Reference Document
CIRIA:	Construction Industry Research and Information Association
DEFRA:	Department for Environment Food & Rural Affairs
DNO:	District Network Operator
EPR2010:	The Environmental Permitting (England and Wales) Regulations 2010
EPR2016:	The Environmental Permitting (England and Wales) Regulations 2016, as amended
GCL:	Geosynthetic Clay Liner
GEU:	Grid Entry Unit
Groundwater Activity:	Has the meaning given within Regulation 2 of EPR2016
HDPE:	High Density Polyethylene
Installation Activity:	Has the meaning given within Regulation 2 of EPR2016
km:	Kilometre
m:	Metre
mm:	Millimetre
MAGiC:	Multi-Agency Geographic Information for the Countryside
MCP:	Medium Combustion Plant
Mbgl:	Metres Below Ground Level
Medium Combustion Plant Activity:	Has the meaning given within Regulation 2 of EPR2016
mg/l	Milligram per Litre
Mining Waste Facility:	Has the meaning given within Regulation 2 of EPR2016
Mining Waste Operation:	Has the meaning given within Regulation 2 of EPR2016
NORM:	Naturally Occurring Radioactive Material

Operator:	Has the meaning given within Regulation 7 of EPR2016
Permitted Activities:	Any activity or operation defined within Schedule 1 to 29 of EPR2016
PWS:	Private Water Supplies
Radioactive Substances Activity:	Has the meaning given within Regulation 2 of EPR2016
Regulated Facility:	Has the meaning given within Regulation 8 of EPR2016
SG:	Specified Generator
Specified Generator:	Has the meaning given within Regulation 2 of EPR2016
TDS:	Total Dissolved Solids
TVD:	True Vertical Depth
TVDSS:	True Vertical Depth Subsea
TVT:	True Vertical Thickness
U.K.:	United Kingdom
Water Discharge Activity:	Has the meaning given within Regulation 2 of EPR2016

Table 2: Abbreviations and Definitions

SECTION I – CONDITION AT APPLICATION

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4. SITE DETAILS

4.1 Regulated Facility

The 'regulated facility' (Wressle Wellsite) is located in the countryside in the county of North Lincolnshire. It is centred on grid reference SE 96792 11107 and located at the following address.

Wressle Wellsite
Lodge Farm
Clapp Gate
Broughton and Appleby
DN15 0DB
National Grid Ref: Easting: 496772
Northing: 411102

Figure 1: Pre-Development Wressle Wellsite (Source: Google Earth 11/04/2023)

4.2 Site Location Plan and Site Layout Plan

A number of site plans have been provided within 'Site Plans' and detail the extent of the 'regulated facility', including the site location, site layouts for the various phases of development, point source emissions and the extent of the Mining Waste Facility.

A copy of the following plans are provided within the Site Plans document (04 – Site Plans).

- Site Location Plan – 1:10,000 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-01].
- Site Location Plan – 1:2,500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-02].
- Site Layout Plan (Existing Site) – 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-03].
- Indicative Site Layout Plan (Construction Phase) – 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-04].
- Indicative Site Layout Plan (Drilling Phase) – 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-05].
- Indicative Site Layout Plan – Workover Phase 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-06].

- Indicative Site Layout Plan – Proppant Squeeze Phase 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-07].
- Indicative Site Layout Plan (Enhanced Production Phase) – 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-08].
- Indicative Site Layout Plan – Enhanced Production & Gas to Grid Phase 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-09].
- Indicative Point Source Emissions Plan 1:500 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-10].
- Extent of Mining Waste Facility Plan 1:10,000 Scale [Drawing Number ZG-ER-EPR-W2-SP-004-11].

5. CONDITION OF THE LAND AT PERMIT ISSUE

5.1 Environmental Setting

The Wressle Wellsite is located within countryside in the county of North Lincolnshire. The wellsite is located approximately 500 m east of Lodge Farm and is bound to the north by Ella Beck with agricultural land beyond and to the west with a wood approximately 70 m to the west. The village of Wressle is located 1.56 km south of the wellsite. Decoy Cottage is located approximately 480 m to the south of the wellsite.

A desktop study was undertaken to identify any designated sites which may be affected by the proposal. The results of the desktop survey using the MAGiC online search service [Ref.4]. The MAGiC online search identified two statutory designated sites within a 2 km radius of the site boundary. These are the Broughton Far Wood, and Broughton Alder Wood; these are both Sites of Special Scientific Interest. Broughton Far Wood is located approximately 600 m to the west of the site boundary, and Broughton Alder Wood is located approximately 1.2 km west of the site boundary.

The Lincolnshire Environmental Records Centre [Ref.5] identified twelve non-statutory sites within 2 km of the site boundary. These are summarised in Table 3.

Name	Designation	Direction from Wellsite	Distance from the Wellsite (km)
Broughton East Wood	Local Wildlife Site	South West	0.76
Broughton Far Wood	Local Wildlife Site	West	0.60
Broughton West Wood	Local Wildlife Site	South West	1.66
Clapgate Pit	Lincolnshire Wildlife Trust Reserve	West	0.70
Far Wood Farm Meadow	Local Wildlife Site	South West	1.16
Haverholme Common	Site of Nature Conservation Interest	North West	1.40
Heron Holt	No citation as yet	South West	1.26
Kebb Wood	Local Wildlife Site	North West	1.30
New River Ancholme	Local Wildlife Site	East	1.50
Rowland Plantation	Local Wildlife Site	North	0.27
Spring Wood	Site of Nature Conservation Interest	West	1.30
Weir Dyke	Local Wildlife Site	North East	1.60

Table 3: Non-Statutory Designated Sites

5.2 Geological Setting

The geological setting has been characterised using British Geological Survey (BGS) Map Sheet 89 (Brigg) [Ref.6]; records from the BGS' database of water wells and boreholes; and geological data obtained by the 'Operator' during the construction of the Wressle-1 Well.

The geological map suggests that superficial deposits at the wellsite consist of blown sands. Peat and alluvium deposits are present to the east of the wellsite. The total thickness of superficial deposits is expected to be approximately 5 m, as suggested by interpretation of BGS records for nearby water wells in the area.

The bedrock geology in the vicinity of the wellsite is characterised by Jurassic age strata. The wellsite is underlain by the Kellaways Formation (Ancholme Group) which is in turn underlain by the Cornbrash Formation and the Blisworth Clay, Blisworth Limestone & Rutland Formations of the Great Oolite Group. Beneath this, the Inferior Oolite Group is

present and consists of the Lincolnshire Limestone Formation, the Grantham Formation and the Northampton Sand Formation. The Inferior Oolite Group outcrops approximately 500 m west of the wellsite. The Northampton Sand Formation lies unconformably on mudstones of the Lias Group.

The Jurassic age strata are underlain by the Penarth and Mercia Mudstone Groups, and the Sherwood Sandstone Group of Triassic age, which are in turn underlain by Permian and Carboniferous age bedrock.

The geology at the wellsite is summarised in Table 4. The expected depth and thicknesses of the Jurassic formations have been estimated based on BGS 1:50,000 scale mapping, whilst the expected depth and thicknesses of the deeper strata is based on geological data obtained by the 'Operator' during the construction of the Wressle-1 well.

Age	Group	Formation	Description	Thickness (m) (tvt)	Depth to Strata Base (mbgl) (tvd)	Depth to Base of Strata (tvdss) (m)
Quaternary	Sutton Sand Formation		Orange to brown, fine grained, Sand, well sorted, sub-rounded, quartzitic	6.5	6.5	-2.4
Middle Jurassic	Ancholme Group	Kellaways Formation	Light Greyish brown, Clay, with occasional angular calcareous rock fragments	1.4	7.9	-3.8
	Great Oolite Group	Cornbrash Formation	Light Grey Sandstone, highly calcareous with occasional shells	1.1	9	-4.9
		Blisworth Clay Formation	Medium Grey, Mudstone, calcareous with frequent shells with interbedded clays and sand	9.55	18.55	-14.45
		Blisworth Limestone Formation				
		Rutland Formation	Dark mottled brown, Mudstone, waxy with rare carbonaceous fragments	4.4	22.95	-18.18
	Inferior Oolite Group	Lincolnshire Limestone Formation	Dark grey, fossiliferous and oolitic limestones and sandy limestones interbedded with very fine and fine to medium sandstone	16.25	39.2	-35.1
		Northampton Sand Formation/Grantham Formation	Dark grey, fine grained, Sandstone highly calcareous with disturbed bedding and occasional peloids / pisoids. With interbedded mudstones.	4.9	44.1	-40
Lower Jurassic	Lias Group	Coleby/Whitby Mudstone Formation	Mudstone, sandy mudstone and argillaceous siltstone-sandstone	7.49	118.7	-114.6
		Scunthorpe Mudstone Formation Including Frodingham Ironstone	Calcareous and silty mudstone with thin beds of argillaceous limestone and calcareous siltstone	100.51	219.21	-215.11
Triassic	Penarth and Mercia Mudstone Groups		Mudstone with siltstone and evaporite	247.49	466.7	-462.6
	Sherwood Sandstone Group		Sandstone with occasional beds of mudstone and siltstone	337.81	804.51	-800.41
Permian	Zechstein Group		Mudstone and limestone with evaporite	321.77	1126.28	-1122.18
Carboniferous	Westphalian Group / Millstone Grit Group (Including Ashover Grit) / Carboniferous Limestone Group		Sandstone, mudstone, coal measures and Dinantian Limestone	683.93	1810.21	-1806.11

Table 4: Geological Sequence

5.3 Hydrogeological Setting

The aquifer potential at the wellsite has been assessed using literature published by the BGS in the Major and Minor Aquifer databases.

The superficial deposits in the vicinity of the wellsite are predominantly comprised of alluviums, blown sand or sand and gravel. These deposits may contain shallow groundwater and could be targeted to provide small yields for domestic use. A shallow superficial deposits groundwater system up to approximately 5 m is therefore expected to be present at the site.

The Kellaways Formation comprises low permeability mudstone and is considered essentially Unproductive. However, the Kellaways Sands (typically 2 to 4 m thick) at the base of the formation may contain small quantities of groundwater.

The underlying formations that make up the Great Oolite Group comprise mudstone, sandstone and limestone bedrock. The most productive layers are the Cornbrash Formation and the Blisworth Limestone Formation which are classified by the Environment Agency as Secondary aquifers. However, in this area the Cornbrash Formation is unlikely to contain significant quantities of groundwater due to its limited thickness and separation from the underlying Blisworth Limestone Formation by the Blisworth Clay Formation.

The underlying Lincolnshire Limestone Formation is classified by the Environment Agency as a Principal aquifer. The Lincolnshire Limestone can be divided into two sub-units, the Upper Lincolnshire Limestone and the Lower Lincolnshire Limestone. The Upper Lincolnshire Limestone has a variable thickness but is dominantly a coarse, shelly cross-bedded oolite. The Lower Lincolnshire Limestone is a mainly fine-grained, micritic and peloidal limestone.

The Lincolnshire Limestone Formation outcrops approximately 250 m west of the wellsite. The limestone dips to the east and thins from more than 30 m in thickness at outcrop to less than 20 m in thickness in the east where it is confined by the overlying mudstone and clays of the Upper Estuarine Series and becomes increasingly artesian in nature. An interpretation of data from the BGS water wells database by the 'Operators' hydrogeology consultant suggests groundwater heads in the Lincolnshire Limestone at the Wressle Wellsite will be close to or above ground level (artesian conditions). Where the Grantham Formation is thin, the Lincolnshire Limestone is often in hydraulic continuity with the underlying Northampton Sand Formation. There is also potential for a small amount of flow between the Lincolnshire Limestone and overlying Blisworth Limestone through the Rutland Formation.

Groundwater movement through the limestone is almost entirely by fracture flow along well developed bedding plane fractures and joints. Groundwater flow in the Lincolnshire Limestone is eastwards downdip from the outcrop to the confined area. The Brigg Fault is likely to restrict groundwater flow as it downthrows the Lincolnshire Limestone to the east by approximately 50 m. The main recharge to the limestone aquifer is via rainfall. Spring lines occur along the top and the base of the Lincolnshire Limestone. Seasonal variations in the rest water levels in the Lincolnshire Limestone are typically in order of 10 to 15 m due to the rapid response time of the aquifer to recharge. The groundwater is of good chemical quality, generally hard near the outcrop, softening in an easterly direction under cover of the permeable clay but the quality eventually deteriorates with increasing depths and distance to the outcrop.

Groundwater in the Northampton Sand Formation is a combination of matrix and fracture flow. The Northampton Sand Formation forms a reliable aquifer at shallow depths (less than 10 m) beneath the ground surface. Springs occur at the junction of the sands with the underlying Whitby Mudstone (e.g. near Far Wood Farm). Water from the Northampton Sand Formation is generally of good quality but hard.

The Marlstone Rock Formation, which outcrops approximately 2.8 km west of the wellsite, is the most important secondary aquifer in the Middle Lias with groundwater contained in, and transported through, a regionally developed fissure system. Both weathered and un-weathered Marlstone Rock are very fine grained with low matrix permeability; flow is therefore predominant along fissure with possibly small or non-existent matrix-flow. The Marlstone Rock is assumed to be in hydraulic continuity with the underlying Dyrham Formation siltstone. The water quality is generally good but hard and often ferruginous.

In the East Midlands Shelf, the permeable parts of the Scunthorpe Mudstone Formation are the thin limestone bands and calcareous sandy belt present towards the top. Yields are generally low. Groundwater quality is generally hard and often poor in the Scunthorpe Mudstone Formation; possibly saline or containing hydrogen sulphide from decomposing pyrite in the shales.

The Penarth Group is classed as Unproductive strata and the Mercia Mudstone Group Secondary aquifer will also act as Unproductive strata at this location due to its depth. The base of the Mercia Mudstone is located at approximately 450 m below ground level. It provides a hydraulic break between the groundwater systems that have a resource value and deeper water bearing systems in the deeper Triassic, Permian and Carboniferous strata that are likely to contain formation water with limited or no resource value. As documented by a geothermal investigation in the area, the Triassic Sherwood Sandstone at this location contains formation water with an elevated salinity (TDS estimated to be around 7,500 mg/L). Water bearing formations in the underlying Permian and Carboniferous bedrock are likely to contain saline water and hydrocarbons.

Within the deeper carboniferous strata, in particular the target formations, hydrogeology must be considered in the context of structural and petroleum geology.

5.4 Hydrology

Hydrological features have been provided within each subsection below.

5.4.1 Surface Water Feature

Surface water features within 2 km of the Wressle Wellsite have been identified from 1:25,000 Ordnance Survey mapping. The locations of the major surface water features are presented on Figure 2 and their details are summarised in Table 5.

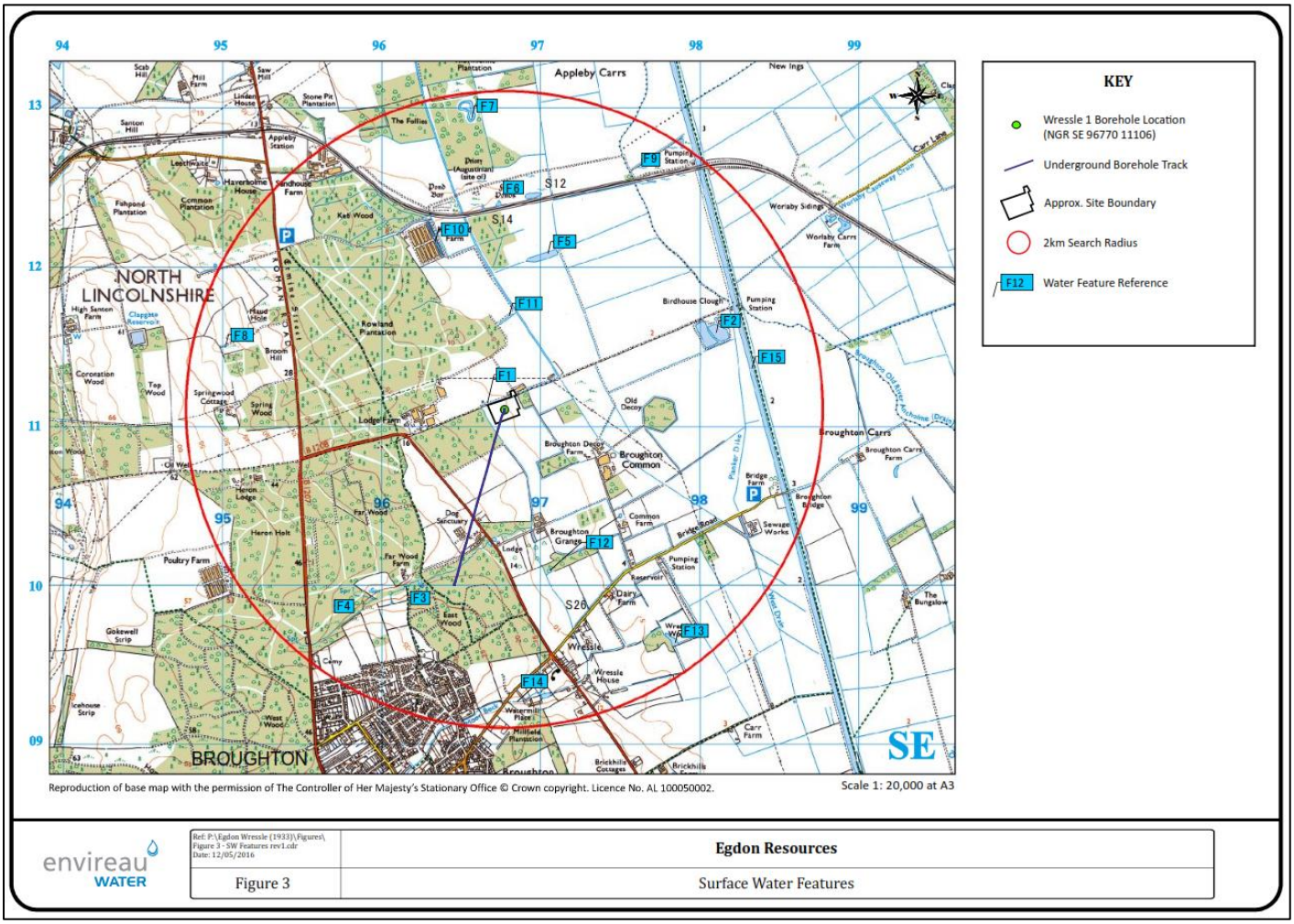

Figure 2: Surface Water Features

Reference Figure 2	Feature	Description	Approx. Distance from Wellsite (km)
F1	Ella Beck + West Drain	"Main River". Circumventing the site, running southwards on the western side and eastwards on the northern side and then northwards into River Humber.	0.06
F2	Large Pond	Large Pond at near Birdhouse Clough	1.32
F3	Small Pond	Stream and ponds system south of Far Wood Farm	1.28
F4	Springs	Springs west of Far Wood Farm	1.47
F5	Large Pond	Large Pond	0.97
F6	Small Pond	Small Fish Ponds at the Priory	1.42
F7	Large Pond	Large Pond at The Follies	1.91
F8	Small Pond	Small Pond at Broom Hill	1.84
F9	Small Pond	Small Ponds at Appleby Carrs Pumping Station	2.00
F10	Small Pond	Small Pond at Kebwood Farm	1.04
F11	Small Pond	Small Pond east of Rowland Plantation	0.59
F12	Small Pond	Small Ponds near Broughton Grange and Common Farm	1.00
F13	Small Pond	Small Pond at Wressle Wood	1.80
F14	Moor Beck	Running eastward and joining Ella Beck, associated pond near Watermill Place	1.91
F15	New River Ancholme	Bunded river, running northward to River Humber	1.58
N/A	Field Drains	Various field drains and dykes within the 2km radius	N/A

Table 5: Surface Water Features

5.4.2 Protected Water Rights

Protected water rights within of 2 km the Wressle Wellsite have been identified and are presented as Figure 3.

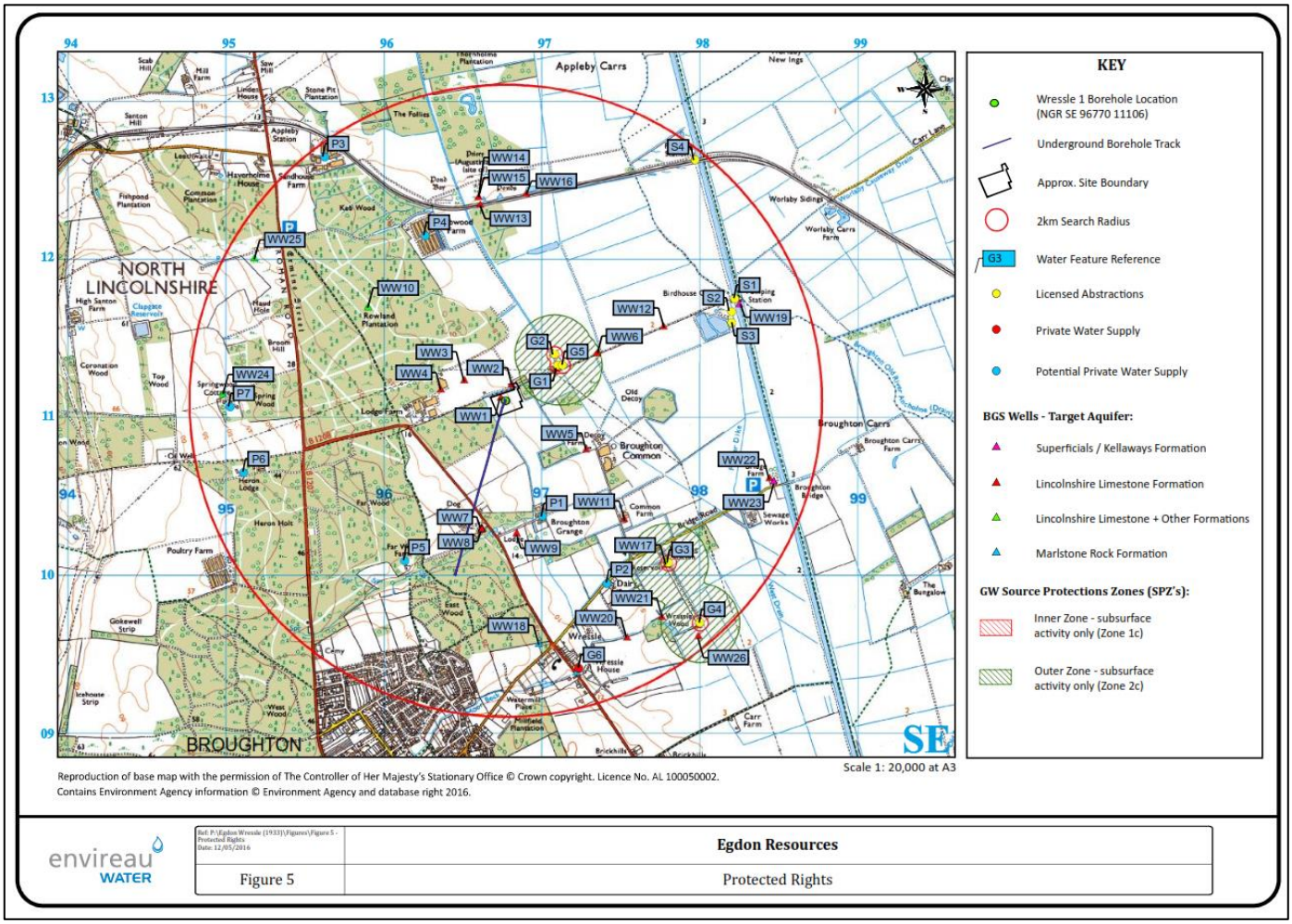

Figure 3: Protected Water Rights within a 2km Radius of the Wellsite

5.4.3 Licence and Other Abstractions

Based on a search of the Environment Agency abstraction licence database, there is one licensed groundwater abstraction and three licensed surface water abstractions within the 2 km radius. The location of the licensed abstractions are shown within Figure 3 and the licence details are summarised in Table 6. Some of the licences cover multiple sources of abstraction. The licensed groundwater abstraction includes three sources (the Clapgate and Birdhouse Clough sources) all located 0.4 km east of the wellsite; and two sources (the Bridge Road sources) located 1.5 km and 1.9 km southeast of the wellsite respectively.

Source No. Figure 3	Location	Source	Licence #	Easting	Northing	Distance (km)
G1	Clapgate	Groundwater	4/29/07/*G/0020	497100	411330	0.4
G2	North of Birdhouse Clough Pumping Station	Groundwater		497080	411400	0.4
G3	Near Bridge Road Pumping Station	Groundwater		497800	410080	1.5
G4	South of Bridge Road Pumping Station	Groundwater		498000	409700	1.9
G5	Near Birdhouse Clough Pumping Station	Groundwater		497130	411330	0.4
S1	River Ancholme, Appleby	River	4/29/05/*S/0020	498220	411750	1.6

Source No. Figure 3	Location	Source	Licence #	Easting	Northing	Distance (km)
S2	Planker Dyke	River	4/29/07/*S/0037	498200	411670	1.5
S3	Planker Dyke	River		498200	411600	1.5
S4	New River Ancholme LB Worlaby	River	4/29/05/*S/0010	497970	412630	1.9

Table 6: Licensed Abstractions

5.4.4 BGS Boreholes and Wells

A search of the BGS water wells online database has been undertaken, which has identified 32 water well records within the 2 km search radius. However, the BGS data is indicative of water wells that have been historically present but may not necessarily be present or accessible now.

The majority of the records relate to water wells targeting the Lincolnshire Limestone Formation or the Marlstone Rock Formation. A few shallow wells target the Kellaways Formation. The closest water well record (WW1) is located on the wellsite close to the Ella Beck and targets the Lincolnshire Limestone Formation, however this well was not located during the construction of the wellsite. The deepest water well (WW10) is 122 m deep and is located some 1.1 km northwest of the wellsite at Rowlands Plantation and targets a number of formations including the Lincolnshire Limestone Formation and the Marlstone Rock Formation.

5.4.5 Private Water Supplies

A search of North Lincolnshire Council's register of Private Water Supplies (PWS) has been undertaken. The Council has confirmed that they have one PWS recorded within the 2 km search radius. The location of the registered PWS is presented within Figure 3 and summarised in Table 7.

Source No. Figure 3	Location	Likely Target Aquifer	Easting	Northing	Distance (km)
G6	Stone Cottages, Brigg Road, Wressle, Brigg DN20 0BT	Marlstone Rock Formation	497232	409412	1.7

Table 7: Registered Private Water Supplies

It is recognised that the local authority's PWS register may be incomplete and that unrecorded supplies may exist at outlying properties. Based on the local geology, any unrecorded supplies in the vicinity of the wellsite would be most likely to target the Superficial Deposits or the Lincolnshire Limestone Formation.

The BGS water wells identified all have the potential to be used as PWS. In addition, a review of the 1:25,000 scale Ordnance Survey mapping data has identified seven other properties within the 2 km radius where PWS could potentially be present. The location of the potential PWS are presented on Figure 3 and Table 8 respectively.

Ref No. Figure 3	Location	Easting	Northing	Distance (km)
P1	Broughton Grange	49700	41038	0.8
P2	Dairy Farm	49743	40997	1.3
P3	Sandhouse Farm	49563	41263	1.9
P4	Kebwood Farm	49626	41214	1.2
P5	Far Wood Farm	49614	41006	1.2
P6	Heron Lodge	49522	41067	1.6
P7	Springwood Cottage	49503	41109	1.7

Table 8: Potential Private Water Supplies

5.5 Pollution History

5.5.1 Pollution Incidents Affecting the Land

One pollution incident to controlled water was recorded within 1 km of the wellsite. An unnamed operator discharged an unspecified pollutant into a river/stream 650 m east of the wellsite. The incident was designated Category 3 – Minor Incident.

There are no records suggesting pollution incidents have taken place at the development location.

5.5.2 Historic Land Use and Associated Contamination

Historical maps dated back as far as 1886 consistently identify the land as being an area of undeveloped land, considered likely to be of agricultural use given the presence of farm buildings in close proximity to the land most notably Sadler's Lodge Farm which was present on all historical maps. Prior to the development the land was generally undeveloped. Agricultural land was located to the north, south and east of the site, whilst woodland comprised areas of land to west. Other potentially significant historic land uses within 1 km of the site include a pumping station located 350 m east of the site.

Following a review of the historical maps it has been considered that there is a low likelihood that the soil and/or groundwater may have been affected by contamination. However, the possibility does exist that the soil and groundwater may have been affected by fertiliser and farm chemical usage both onsite and in the immediate vicinity.

5.5.3 Visual and Olfactory Evidence or Historic Contamination

There is no visual or olfactory evidence to suggest existing or historic contamination at the location.

5.5.4 Evidence of Damage to Pollution Prevention Measures

No evidence of damage to any pollution prevention measures have been identified at the time of this report being produced.

6. PERMITTED ACTIVITIES

6.1 Permitted Activities

The Wressle Wellsite has historically been the subject of a number of permit applications and variations. Table 9 provides a summary of the 'permitted activities' currently permitted at the wellsite.

Permitted Activities				
Permit	Ref.	Description	Activity	EPR2016
EPR/AB3609XX	A1	Loading, unloading, handling or storage of crude oil.	Installation	Schedule 1
	A2	Non-hazardous mining waste operation	Mining Waste	Schedule 20
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EPR/HB3295DH	A1	Accumulation of radioactive waste on the premises.	Radioactive Substances	Schedule 23
	A2	Disposal of radioactive waste on or from the premises.		

Table 9: List of Activities Currently Permitted

6.1.1 Current Operational Status

The Wressle Wellsite is currently producing oil and gas from a single well. The wellsite is in its infancy with regards to production and as such, activity A6 has yet to commence.

The site is currently producing and storing crude oil in accordance with Activity A1 of permit EPR/AB3609XX, whereby the volume of oil is less than 500 tonnes. This activity is considered an 'installation activity'.

As the Wressle Wellsite is in a phase of production, it is currently operating as a 'mining waste operation' (Activity A2 of EPR/AB3609XX), due to the production (or potential production) of extractive waste. Such extractive waste may include formation water, spent acid and proppant throughout the lifetime of the development. The wellsite also holds the necessary permission to operate a 'mining waste facility' (Activity A3) which for clarity is not located at the wellsite itself but within the target formation where proppant fluid remains following previous proppant squeeze operations.

As previously stated, a proppant squeeze operation was undertaken at the wellsite. The 'groundwater activity' permit was obtained to enable the discharge of a pollutant in circumstances that might lead to an indirect input of that pollutant to groundwater. The residual proppant fluid and proppant remains in the formation from which hydrocarbons are produced.

Due to the wellsite incorporating an impermeable membrane to capture any potential spills or leaks, the site regularly collects rainwater. To negate the need for a road tanker to remove the water from site a 'water discharge activity' was permitted at the site to enable the discharge of clean rainwater to the adjacent Ella Beck surface watercourse via an oil-water separator. During low risk operations i.e. production and suspension operations the outlet remains open. Where workovers and similar operations are being undertaken, the outlet shall be closed.

Due to the production of associated gas at the wellsite, a 'medium combustion plant activity' (which is also considered a specified generator) was obtained as a means to harness the gas, produce electricity for site use, and potentially export. This activity has yet to commence at the wellsite due to no suitable gas engines being identified for the small volume of electricity needed for the site. Only when exportation is available, or the site power requirements increase significantly can a suitable gas engine be installed. The waste natural gas is currently harnessed as much as possible via micro-turbines to meet the sites electrical supply with remaining gas being incinerated in a flare unit, consented

under the 'mining waste operation' as the volumes of incineration are below 10 tonnes per day. For clarity, the use of the micro-turbines do not fall under EPR2016 due to the aggregated thermal input parameters not meeting the threshold limit detailed within the Medium Combustion Plant Directive [Ref.7] and is therefore not considered a 'permitted activity'.

Production of hydrocarbons together with associated water and natural gas has the potential to produce naturally occurring radioactive material (NORM). At the time of this application, produced water is materialising and initial analysis indicates that NORM is evident. A Radioactive Substances Permit (EPR/HB3295DH) [Ref.8] is in place for the accumulation and disposal of radioactive waste from NORM resulting from the production of oil and gas. This is considered a 'radioactive substances activity'.

Table 10 outlines the operations that are permitted to be undertaken currently in line with the current environmental permitting consents.

Permitted Operations derived from Permitted Activity.		
Permit		**Description**
EPR/AB3609XX	A1	Allows for the storage and handling of crude oil that arise from oil production activities.
	A2	Allows for the management of extractive wastes from side-track drilling, radial drilling and near well-bore treatments (acid-squeeze, hot oil wash, solvent treatment, nitrogen injection) and hydraulic fracturing for conventional oil which will be done only once. An enclosed ground flare will be used to incinerate less than 10 tonnes of waste gas per day.
	A3	Allows for a mining waste facility for the disposal and management of non-hazardous extractive waste and permanent deposit in-situ of fracturing fluids.
	A4	Allows for the discharge (injection) of fracturing fluid into the target formation that might lead to an indirect input of a pollutant to groundwater.
	A5	Allows for the discharge of rainfall runoff treated site surface water to the Ella Beck.
	A6	A medium combustion plant comprising of a natural gas fired engine.
EPR/HB3295DH	A1	Accumulation of radioactive waste including both aqueous and solid material containing NORM on the premises
	A2	Disposal of radioactive waste on or from the premises to an EA permitted facility for treatment and onward disposal.

Table 10: Permitted Operations Derived from the Permitted Activities

6.2 Non-Permitted Activities

Additional activities associated with the development, but not regulated under EPR2016 as a 'permitted activity' includes, but is not limited to:

- Car parking for staff vehicles;
- Provision of welfare facilities for site staff;
- Well and wellsite maintenance; and
- Storage and disposal of non-hazardous and hazardous wastes not directly associated with the permitted activities.

7. CHANGES TO THE ACTIVITY

7.1 Changes to the Activity Boundary

To date, neither the land under the control of the 'Operator' or the 'regulated facility' sat within the site have been extended or reduced.

It is proposed that both the Wressle Wellsite area and the 'regulated facility' area will increase as part of a variation to the existing permit. The extent of the additional land take can be viewed in Figures 4 and 5.

A copy of the Site Location Plan and Proposed Site Layout Plan are provided within the Site Plans document (04 – Site Plans).

Figure 4: Wressle Wellsite – Current (Source: Google Earth 11/04/2023)

Figure 5: Wressle Wellsite – Proposed (Source: Google Earth 11/04/2023)

7.2 Changes to the Permitted Activities

To date, there have been no changes to the permitted activities from those stated in Section 3. However, it is proposed to vary a number of 'permitted activities' whilst also adding a further 'installation activity'.

The next phase of the development will include the drilling of up to two new boreholes from an extended Wressle Wellsite. The second and third boreholes shall be known as the Wressle-2 Well and the Wressle-3 Well respectively and will be drilled with the intention of further evaluating the zones of interest identified by the 'Operator' during the drilling of the Wressle-1 Well.

To facilitate the additional wells at the site the Wressle Wellsite will be extended from the southern boundary. As such, the 'regulated facility' will need to be increased and updated on any future permit.

7.2.1 Mining Waste Operation including a Mining Waste Facility

In order to drill, test and undertake well treatments from the proposed Wressle-2 Well and Wressle-3 Well it is necessary to apply for a variation to the mining waste operation (which includes a flare, mining waste facility and a fracture operation). It is necessary to vary the 'mining waste operation' to include the additional extractive waste volumes and streams created as a result of both the drilling process and any subsequent testing, production and well treatment operations. In addition, the 'Operator' is proposing to undertake a proppant squeeze, which will also require a variation to the 'mining waste facility' which permits the permanent storage of waste at the wellsite, which in the case of the proposed development is the permanent disposal of proppant carrier fluid into the target formation.

7.2.2 Incineration of Natural Gas

Schedule 1, Part 2 of EPR2016 transposes the requirements of the Industrial Emissions Directive, which requires an environmental permit to authorise an installation operation for the incineration and coincineration of waste, as detailed within Section 5.1.

Part A(1)

(a) The incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day;

The proposed short-term production testing phase may involve the incineration of natural gas exceeding 10 tonnes per day and therefore Environmental Permit EPR/AB3609XX is being varied to include the Well Clean up (WCU) and Extended Well Test (EWT) activities.

7.2.3 Groundwater Activity

An activity that could involve the discharge of pollutants into groundwater must be notified to the Environment Agency, together with the nature of these pollutants, under EPR2016. The Environment Agency will then determine whether the groundwater activity needs to be permitted.

During the life of the wells, as with the current Wressle-1 Well, it may be necessary to undertake near wellbore treatments, including an acid squeeze and solvent treatment, all of which fall within the definition of a 'groundwater activity' under Schedule 22 of EPR2016.

Schedule 22 3 (3) of EPR2016 provides that the '*The regulator may determine that a discharge, or an activity that might lead to a discharge, is not a groundwater activity if the input of the pollutant…*

(b) is or would be of a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater.

To assist the regulator in determining whether the proposed activities are/are not considered groundwater activities a description of the operations, together with a technical justification as to why the 'Operator' believes these can be excluded under Schedule 22 paragraph 3 (3) of EPR2016, is included within the Waste Management Plan.

It may be necessary to undertake a proppant squeeze, should it be deemed necessary to enhance production rates. This activity falls within the definition of a 'groundwater activity under Schedule 22 of EPR2016. The proppant squeeze has been designed such that will be confined to the saturated formations, which contain hydrocarbons. The proppant squeeze is a 'groundwater activity', namely the injection of any substance into groundwater to increase the flow of fluids or gas to a well or borehole in connection with the extraction or use of any energy source.

7.2.4 Water Discharge Activity

To enable the drilling of up to two additional wells it is necessary to increase the area of the 'regulated facility'. As such, the containment system (HDPE Impermeable membrane) will also need to be extended to cover the additional site area. The containment ditches on the East and West side of the Wressle Wellsite will be extended further South, with a new southern perimeter ditch also being installed of the same design. The current southern containment ditch will either remain and connect to the eastern and western ditches via a T-Piece connection or be removed and infilled depending on the final configuration of the site design.

The rate of discharge will not alter from the existing permit boundary, nor will the maximum volume of daily discharge. The discharge conditions shall also remain the same and the surface water will be the subject of the same monitoring regime, with surface water only being discharged during production operations or during periods of site inactivity where the likelihood of contamination is far lower. The interceptor and surface water outlet will be locked off during any well operations or wellsite construction operations.

7.2.5 Installation Activity - Refining of Natural Gas

The 'Operator' is proposing to add an additional 'installation activity' to its existing permit (EPR/AB3609XX) to permit the refining of natural gas. The refining of natural gas is considered under the IED [Ref.9] and transposed into domestic legislation under EPR2016. The specific 'installation activity' to be applied for under EPR2016 is Schedule 1, Part 2, Chapter 1, Section 1.2 Part A(1)(a) which states:

"Refining gas where this is likely to involve the use of 1,000 or more tonnes of gas in any 12-month period."

In the absence of a specific definition for "refining" under EPR2016, BREF for the Refining of Mineral Oil and Gas [Ref.10] States: "*the purpose of refining is to convert natural raw materials such as crude oil and natural gas into useful saleable products*". In this instance, the dehydration of the natural gas would be considered an installation activity.

The purpose of refining the gas is to ensure that it complies with both the requirements of the Gas Safety (Management) Regulations 1996 [Ref.11] and the entry requirements of the District Network Operator (DNO). It is proposed by the 'Operator' to refine the gas within the existing boundary of the 'regulated facility' before being exported.

It is the view of the 'Operator' that the pipeline shall be considered a Directly Associated Activity to the 'installation activity'. Where the pipeline leaves the boundary of the 'regulated facility' it will be formally adopted by the DNO.

In the context of the export of gas to the DNO a Grid Entry Unit (GEU) is required to enrich (where required), analyse, meter and odorise natural gas entering the grid. Odorants are added to natural gas for reasons of public safety to alert members of the public to leaks of gas within the system. The current odorant employed by DNOs in the UK for natural gas is Odorant NB, a blend of t-butyl mercaptan and dimethyl sulphide.

Whilst the addition of an odorant to the natural gas is a permitted activity under ERP2016, the activity would not be undertaken by the 'Operator' should the gas be exported to the DNO. The GEU (which also includes a remotely operable valve and a remote telemetry unit) will be adopted by the DNO for monitoring, controlling and odourising the flow to its network. This activity will be undertaken and operated by the DNO and not the 'Operator'.

7.3 Dangerous Substances

Dangerous substances associated with both the current and future operations are limited to:

- Crude Oil;
- Natural Gas;
- Propane;
- Engine Fuels and Oils; and
- Hydraulic Oil.

These substances are considered dangerous under Schedule 1 of the Control of Major Accident Hazards 2015 [Ref.12] as they are either categories of dangerous substances or named dangerous substances. For clarity, the Wressle

Wellsite is considered a lower tier establishment under the Control of Major Accident Hazards (COMAH) Regulations 2015 [Ref.12].

8. MEASURES TAKEN TO PROTECT THE LAND

8.1 Impermeable Liner and Containment Systems

The construction of the Wressle Wellsite commenced in 2014 with the excavation of topsoil and relocating it to the northern and western boundary of the wellsite. The topsoil which is stored onsite for subsequent wellsite restoration, forms part of the bund, which provides partial screening of the wellsite. The subsoil was then 'cut to fill', a method of removing subsoil from higher areas of the wellsite and relocating it within the lower areas of the wellsite to create a level plateau.

Once the wellsite was level a ditch was excavated around the perimeter of the 'active area' of the wellsite. The perimeter ditch forms part of the wellsite containment, collecting and storing surface run-off water. Following excavation of the perimeter ditch, the 'active area' of the wellsite was overlaid with a geotextile membrane and covered with 50 mm sand with a Bentomat membrane which is a geosynthetic clay liner (GCL) specifically designed for landfill, surface water impoundments and secondary containment. The membrane is self-sealing if punctured, with high climatic and chemical resistance. Additional sand and geomembrane were then placed over the GCL with a layer of 300 mm Type 3 stone completing the wellsite active area surface.

Following grant of Planning Permission on Appeal, the site was reconfigured through the installation of a High Density Polyethylene (HDPE) impermeable membrane, installed on top of the GCL and with upper and lower protective geotextiles. The HDPE liner, supported by the underlying GCL (though the GCL is not to be relied upon) is the tertiary mitigation measure for the protection to land. Primary and secondary containment measures are storage tanks and pipelines (primary) and purpose-built bund areas (secondary). The tertiary containment system is the mechanism by which pollution is prevented in the unlikely event of both primary and secondary containment failures. A Validation Report [Ref.13] was independently prepared to confirm the construction quality assurance standards carried out and contains the certification of the HDPE liner.

As stated in Section 4.1 the site boundary and 'regulated facility' boundary will be extended to facilitate the drilling and subsequent production operations. To this end, it is proposed to extend the HDPE liner also. The same quality assurance standards shall be adopted to ensure that the liner maintains its integrity on both the existing site and the proposed extended area with both areas being heat welded together and vacuum tested to confirm strong seals.

8.2 Well Cellar Integrity Testing

The well cellar was constructed within the centre of the 'active area' of the wellsite and forms a containment area from which the well(s) have/would be drilled, whilst also housing the wellhead(s). A concrete drilling pad was constructed at surface, immediately surrounding the well cellar.

Once the cellar was completed an integrity test was carried out to confirm its integrity. The test consisted of filling the cellar with water and monitoring water loss over a period of 24 hours. The water level was marked on the side wall of the cellar using marker dye to provide a reference point. The cellar was then covered to avoid both water fill (precipitation) and water loss through evaporation.

No water loss within the drilling cellar was observed and the well cellar was considered integral. This test will be repeated in line with the 'Operators' procedures. The test will also be undertaken upon completion of each new well cellar, which will also be the subject of the same procedures.

8.3 Materials and Storage

Dedicated CIRIA C736 [Ref.14] compliant bunds have also been installed to act as secondary containment for the storage and handling of substances, in particular crude oil and when present, produced water.

Spill kits are available on site and close to identified pollution sources (e.g. fuel storage areas).

All oil containers, secondary containers and vehicles are visually inspected on a daily basis to check for signs of damage, corrosion, bulging, leaks or unauthorised use.

No refuelling of plant and equipment takes place without the use of a drip tray and where practicable undertaken in close proximity to spill kits.

Emergency response plans for the site are also established and consider plans to manage spills.

9. POLLUTION INCIDENTS TO LAND

No pollution incidents have been recorded at the Wressle Wellsite in its lifetime.

Following the successful drilling and testing of the first well, the Wressle Wellsite was expected to remain for the longer duration as part of the production phase i.e. in excess of 20 years. As a result of planning requirements, and following the Environment Agency's indicative 'BAT' for 'mining waste operations', the decision was made to reline the entire site using a HDPE liner, as previously detailed.

During the installation of the HDPE liner, no contamination was observed to either the site stone, or to the underlying GCL, and so it is assumed that at the point of entering the production phase, no pollution incidents or subsequent offsite contamination had occurred to land.

10. Environmental Monitoring

As part of the development a suite of environmental monitoring continues to take place assessing the impact the 'permitted activities' are having on the environment. The monitoring regime can be broken down into five areas as specified within each sub section.

10.1 Air Quality

Air Quality monitoring was undertaken at the Wressle Wellsite in 2014 and 2015 as part of both the drilling and well testing operations, given the significant amount of engines onsite at the time of drilling and subsequent flaring of natural gas.

The report has been provided within Appendix 1 and concludes that whilst the average Nitrogen Dioxide concentration during the baseline sampling period was slightly higher than the DEFRA backgrounds but when standard deviation of the monitoring data is considered the DEFRA background is within this range and therefore the DEFRA background is representative of the background at the Wressle Wellsite during both baseline and flaring periods.

An Air Quality Impact Assessment (LSW231043) has been undertaken by Egdon's Air Quality Consultant for the proposed activities to be undertaken. A copy of the Air Quality Impact Assessment (LSW231043) is provided within the application documentation.

10.2 Groundwater

Four groundwater monitoring boreholes were constructed to enable the sampling of the shallow groundwater bodies underlying the Wressle Wellsite. Three of the boreholes were drilled and completed to target an Unconsolidated Sands Aquifer, with the last borehole targeting the Lincolnshire Limestone.

To date the sampling has not indicated any impacts to groundwater as a result of the 'permitted activities'. A summary of the results have been provided as Appendix 2.

10.3 Surface Water

Surface water is being monitored at Ella Beck, a watercourse immediately present to the north of the wellsite. The monitoring arrangement includes the analysis of an upstream, downstream and adjacent to the midpoint of the site boundary riparian to the watercourse.

To date the sampling has not indicated any impacts to surface water as a result of the 'permitted activities'. A summary of the results have been provided as Appendix 2.

10.4 Soil Analysis

In 2018 a Ground Investigation Report [Ref.15] was undertaken prior to further site construction works. Given no previous baseline soil analysis was undertaken prior to the original site construction. This ground investigation report provides a good reference point as to the condition of the land underneath the site, which should be the target condition upon eventual site restoration.

The Ground Investigation Report has been provided as Appendix 3.

10.5 Radiological Baseline Survey

A Radiological Baseline Survey Report [Ref.16] was undertaken in 2015 with the purpose to determine whether there was significant radiological contamination arising from NORM on the site's surface and immediate sub-surface material, and local area surrounding the site, and to produce a radiological baseline against which future sampling and monitoring could be compared.

The samples taken for the radiological baseline survey showed no significant presence of NORM and when the results were assessed against the out-of-scope limits present in EPR2016 (superseded EPR2010), all six samples were below the limit. Similarly, the areas that were monitored for dose-rate and surface contamination showed no significant presence of NORM.

The Radiological Baseline Survey has been provided as Appendix 4.

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APPENDIX 1 – AIR QUALITY BASELINE REPORT

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APPENDIX 2 – GROUNDWATER AND SURFACE WATER MONITORING RESULTS SUMMARY

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APPENDIX 3 – GROUND INVESTIGATION REPORT

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APPENDIX 4 – RADIOLOGICAL BASELINE SURVEY

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