7 Land, Soil, Geology and Hydrogeology

7.1 Introduction

This chapter of the EIAR assesses the impacts with respect to land, soil, geology and hydrogeology arising from the proposed modifications to the West Offaly Power (WOP) Station and associated ash disposal facility (ADF) to facilitate the continued operation of these facilities and phased transition of that station to exclusive firing with biomass. As the existing development is subject to the condition that all existing activity ceases in December 2020 the potential impacts of the continued operation of WOP station and the ADF will also be assessed. This will subsequently be referred to as the 'proposed development'. .

The potential impacts on various groundwater and soil aspects such as groundwater quality, land changes and soil contamination from the proposed development, have been identified and assessed in relation to:

- Land, soil and groundwater quality impacts on receiving lands, soils, geology and groundwater from construction runoff (suspended solids and from accidental spillages (e.g. oil / chemical spillages);
- The continuation of operational impacts (post 2020) from the WOP station and ADF; and
- Indirect impacts associated with the peat and biomass supplies to the WOP station.

7.1.1 Legislative Context

The EU Water Framework Directive (WFD) (2000/60/EC) established a framework for the protection of both surface and groundwater. With regard to groundwater, the European Communities Environmental Objectives (Groundwater) Regulations 2010 S.I. 9 of 2010 (as amended), gives effect to the requirement of the WFD and the measures set out therein to protect groundwater. The Regulations lay down the criteria and environmental quality standards for classifying water status and impose an obligation on public authorities to take the necessary steps to achieve the objectives set out in river basin management plans. In addition they *require* licensing authorities to examine, and where necessary, review discharge licences where these are needed to achieve the water-quality objectives as set out in river basin management plans. The WOP station is licenced by the EPA under IE Licence P0611-02 which was reviewed and updated following the introduction of the regulation.

The key objectives of the WFD for groundwater are:

- To prevent deterioration of the status of groundwater

- To protect, enhance and restore all bodies of groundwater and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status (quantitative and chemical)
- To reverse any significant and sustained upward trends in the concentration of pollutants in groundwater

To implement the requirements of the WFD a cycle of River Basin Management Plans (RBMPs) were developed which are normally updated every six years. The first cycle RBMP of relevance to this assessment (the Shannon International RBMP 2009-2015) was adopted in 2009 and this included a programme of measures required to facilitate the achievement of the WFD objectives. This programme of measures included full implementation of existing legislation.

The second cycle of the river basin management planning is currently underway (this was delayed due to significant reform in the water sector in recent years) and the second consolidated RBMP which was published in April 2018 has merged the Eastern, South Eastern, South Western, Western and Shannon River Basin Districts to form one national River Basin District. There are 513 groundwater bodies identified in the Irish River Basin District (RBD).

Other relevant EU and national legislation pertaining to the hydrogeological environment and the proposed development include:

- S.I. 722 of 2003, European Communities (Water Policy) Regulations, as amended;
- S.I. 350 of 2014, European Union (Water Policy) Regulations 2014;
- The Industrial Emissions Directive 2010/75/EU; and
- Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013.

The Chapter also provides a high level assessment of the compliance of the proposed development with the Water Framework Directive (WFD). WFD classification for groundwater bodies consists of quantitative status and groundwater chemical status. Each is assigned as having either good or poor status.

7.2 Methodology

A desk study of the proposed development site and surrounding area was largely completed prior to the undertaking of the site survey and walkover assessment. The desk study involved collecting relevant geological, hydrological and hydrogeological and meteorological data for the area.

The following sources and publications were utilised in the preparation of this chapter:

- Environmental Protection Agency database (www.epa.ie);
- Environmental Protection Agency – “Envision” Map Viewer (www.epa.ie);

- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive "Water Maps" Map Viewer (www.wfdireland.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 12 (Geology of Longford and Roscommon). Geological Survey of Ireland (GSI, 2003); and
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

The desk study also included consultation with existing reports and documents including:

- West Offaly Power Generating Station IE License P0611-02 Annual Environmental Reports by ESB (2014-2017);
- "West Offaly Power Station and Ash Disposal Facility – Site Investigation: Factual Report" by Causeway Geotech (February 2017);
- "ESB West Offaly Power Risk Screening and Technical Assessment " completed by AECOM (May, 2015);
- "ESB Shannonbridge Exit Audit – Ash Ponds, Issue No. 3" completed by URS (November, 2010);
- "Shannonbridge New Peat Power Station Project Environmental Impact Statement" by ESBI International (February 2001);
- "Shannonbridge Generating Station, Environmental Site Characterisation Report, 1995" completed by ESB International 1995
- "New Shannonbridge Peat Station Site Investigation Report (Glovers International (Glovers Site Investigation Ltd. 2002)
- "Site Investigation at Lanesborough Generating Station" by Irish Geotechnical Services Ltd. (IGSL) (November 1995).
- West Offaly Power Station and the Ash Disposal Facility- Site Investigations: Factual Report, Report No. 16-1239,Causeway Geotech, May 2017

7.2.1 Site Investigation works

In 2017 Causeway Geotech undertook site investigation activities at WOP station and ADF (see **Appendix 7.1**). At WOP station a total of twelve boreholes were put down through soils and rock strata to their completion depths. Of these BH01 to BH06 were installed in the former ash disposal site adjacent to the station, BH07to BH10 were installed in the generating station itself where Storage Slab A and the pellet silo will be located and the remaining two (BH11 and BH 12) were installed at the location of Storage Slab B.

Six groundwater monitoring standpipes were installed and ground water monitoring undertaken at the site on 3 separate occasions.

Eighteen trial pits were excavated. Environmental samples were taken in each trial pit. Data from the site investigation was used to identify soil and subsoil layers at the station and borehole monitoring was used to identified groundwater quality.

7.3 Study Area

The study area comprises

- the WOP generating station footprint, land, soils, geology and hydrogeology beneath this footprint and extending out to the underlying groundwater bodies
- the ADF footprint, land, soils, geology and hydrogeology beneath this footprint and extending out to the underlying groundwater bodies
- the peat supply bog areas and the land, soils, geology and hydrogeology beneath this footprint and extending out to the underlying groundwater bodies

The assessment criteria used to assess potential impact on the receiving environment are those as set out in Chapter 1 as per the EPA Guidelines on environmental impact assessment.

7.4 Receiving Environment

This section provides a description of the receiving environment and also provides a summary of the proposed works to provide context for assessment of impacts and identification of appropriate mitigation.

The WOP station is an existing station commissioned in 2005. The existing baseline is industrial in nature having being used for electricity generation since the 1960's. The existing WOP station was constructed on a site previously used for electricity generation with generating stations located here been decommissioned and demolished as subsequent stations were constructed. Part of the original site which was decommissioned is in the ownership of a third party independent electricity generator. No development is proposed here and it is not included In the WOP station IE Licenced area. This area has not being developed to date. A large former ash landfill area exists to the north of the site, separated by the main WOP generating station entrance road. This area is also currently outside the WOP generating station IE Licence boundary. The proposed development will see the continued use of the existing WOP station with the addition of two biomass storage slabs, one pellet silo with pellet loading facilities and conveyor system.

There will be no change to the existing main generation station facilities but to facilitate biomass fuel use at the station biomass storage facilities in the form of concrete slabs and silos will be constructed. The established peat handling system

on the WOP site – namely the existing peat wagon tipplers, screens, conveyors and storage in the intermediate peat storage (IPS) will be maintained. There will be no change to the main boiler and emission control systems.

With regard to the ADF, the footprint of this will be increased to accommodate additional ash from future operation of the generating station. It will be constructed and operated strictly in accordance with the EPA IE Licence requirement and will be a lined and capped landfill facility.

The site (WOP station and ADF) will continue to operate in accordance with the EPA IE Licence requirements for the site.

Two purpose built concrete slabs for the short-term storage of biomass -such as wet woodchip and sawdust will be provided to facilitate the transition to biomass. One of the proposed concrete slabs is located immediately south of the existing Intermediate Peat Storage building and is referred to as the Biomass Storage Slab A. This area is located in the centre of an existing unused made ground area within the Bord na Móna controlled fuel handling area of the WOP site. The other slab is located adjacent to the eastern entrance to the station referred to as Biomass Storage Slab B. The proposed pellet storage silo will be located adjacent to the Biomass Storage Slab A. Biomass storage areas will be in the form of either piled or ground baring concrete slabs. The pellet silo will also be ground or piled foundation based. Surface water drainage from the slabs will be collected in a attenuation tank and directed via the surface water drainage system to the Shannon River, see Chapter 8. There will be no groundwater discharge from the slabs.

Site investigation undertaken by Causeway in 2017 (see **Appendix 7.1**) as part of the project indicates that the typical ground build-up was identified as mostly made-ground underlain by a peat layer overlaying a limestone bedding. The made-ground originated from the construction of the WOP station in 2004 when this area was levelled out and compacted.

The existing ADF is an engineered landfill currently comprising six cells and located on a former Bord na Móna peat harvesting area. Four of these are completed with 1-3 capped and cell 4 partially capped (cells 1- 4), cells 5 and 6 are under construction and cell 5 is in in operation. It is proposed to develop a further five cells (Cells 7, 8, 9, 10 and 11) and a new settlement lagoon to facilitate the continued operation of the station as it transitions to biomass. The cells will be lined with a geo-synthetic clay liner (GCL) at the base of each cell. The GCL consists of sodium bentonite clay, supported by geotextiles, which forms another hydraulic barrier, to prevent leachate migration to groundwater. The landfill is subdivided into cells which are filled sequentially. The GCL is overlain with a composite drainage layer (CDL), which collects any leachate generated. The CDL falls to a leachate collection drain at one end of each cell, which transfers leachate to a leachate monitoring manhole. Collected leachate in the leachate sump (in each cell) is either pumped over the ash as a means of dust suppression and compaction or pumped to the lined lagoon using an electrical submersible pump for temporary holding. The site has a licence to discharge leachate to a local surface waterbody.

As each cell reaches capacity, the cell is capped with a low permeability GCL. In turn the GCL is covered with a minimum thickness of local peaty soils. As a result of the cell capping, leachate production at the ADF will eventually cease.

7.4.1 WOP Station Site

According to Geological Survey of Ireland (GSI) mapping, the following are the site geological settings for the WOP generating station location.

7.4.1.1 Geology

Information from GSI indicates the underlying bedrock is Dinantian Upper Impure Limestone.

The original EIS for WOP, indicates that the site is underlain by Carboniferous Basinal limestones of Holkerian to Brigantian age, which are known in some localities as the Calp limestone. It predominantly consists of dark laminated argillaceous calcisiltites and calcareous shales, with some limestone turbidites. (Geological Survey of Ireland (GSI) Sheet No. 15, Bedrock Geological Map of Central Ireland). The Sheet indicates that the terminus of a north-east south-west trend fault lies approximately 1km to the north-east of the site. Boreholes installed in 1995 confirmed the presence of limestone.

Site investigations in 1994 indicated that the site on which WOP was developed comprised - deposits which overlie limestone and with areas of Made Ground and peat. The fluvioglacial deposits ranged in thickness from 1.6m to 5.1m. The fluvioglacial deposits may be categorised into three types, namely alluvium, granular deposits and boulder clays. Boulder clays at the site typically consist of sandy gravelly clay with cobbles with moderate permeability (4.9 x 10-5 and <3.9 x 10-5 m/s respectively). Made Ground, consisting of gravelly clay with cobbles and including some construction debris, is present in thicknesses of 1.4m to 3.2m with moderate to low permeability (2.3 x 10-5 to 4.7 x 10-6 m/s).

The peat represents the buried remnant of the bog that was present at some period prior to the construction of the existing station. Calculated permeability is 2.7 x 10-5, indicating it to be moderately permeable. Peat generally has a permeability of 10-6 m/s.

A summary of the ground types encountered at the WOP station in the exploratory in approximate stratigraphic order is as per **Table 7-1.**

Table 7-1: Summary of General Geology and Ground Types WOP Station Site

General Geology	Depth (meters below ground level)	Description
WOP Station Site		
Topsoil	0.0-0.5	Topsoil encountered in up to 0.50m thickness
Made Ground (sub base and fill)	1.0-2.0	Approximately 1.00m to 2.00m of aggregate fill over ash deposits in numerous boreholes with ash rich deposits varying in colour and stiffness, below this sub base layer
Recent Deposits	5.8-7.7*	Spongy peat deposits overlaying both tills derived from bedrock and more recent fluvioglacial deposits
Fluvioglacial Deposits	Varying depths	Typically medium dense sands and gravels with localised pockets of firm Sandy gravelly clays interspersed throughout.
Glacial Till		Sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth
Rock Head	3.7-11.3	Limestone

7.4.1.2 Bedrock

The Geological Survey of Ireland (GSI) mapping indicates the station to be underlain by the Lucan Formation, comprising dark limestone and shale (calp). The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar. The formation ranges from 300m to 800m in thickness.

The mapped bedrock geology (www.gsi.ie) is shown on

Figure 7-1 which depicts bedrock at both the WOP site and the associated ADF.

Site investigations carried out in 1995 found Rock encountered was moderately weathered to fresh dark grey fine grained argillaceous limestone with discontinuities present generally closely to medium spaced subhorizontal to subvertical and slightly rough. Rock head was encountered in borehole investigations at between 1.7m and 7.7m.

Site investigations carried out in 2017 indicated the bedrock to be medium to strong argillaceous limestone.

7.4.1.3 WOP Soils and Soil Chemistry

The Teagasc soils layers on the GSI website[1] indicate that the site is underlain to the west and northwest by mineral Alluvium soils and Made ground (at the site of the former Shannonbridge Power Station). Part of the site, in the location of the proposed Storage Slab A, sits on Peat Gleys Basic parent materials with the reminder of the site comprising Grey Brown Podzolics (at the location of Biomass Slab B) and surface water and Ground water Gleys derived chiefly from limestone.

The mapped soils (www.gsi.ie) are shown in **Figure 7-2** and depict the soils beneath the station and the ADF sites.

There are no known areas of soil contamination with the exception of the former ash landfill which is now closed and which is on the northern part of the site and the former ash lagoon and no development work is occurring in this area.

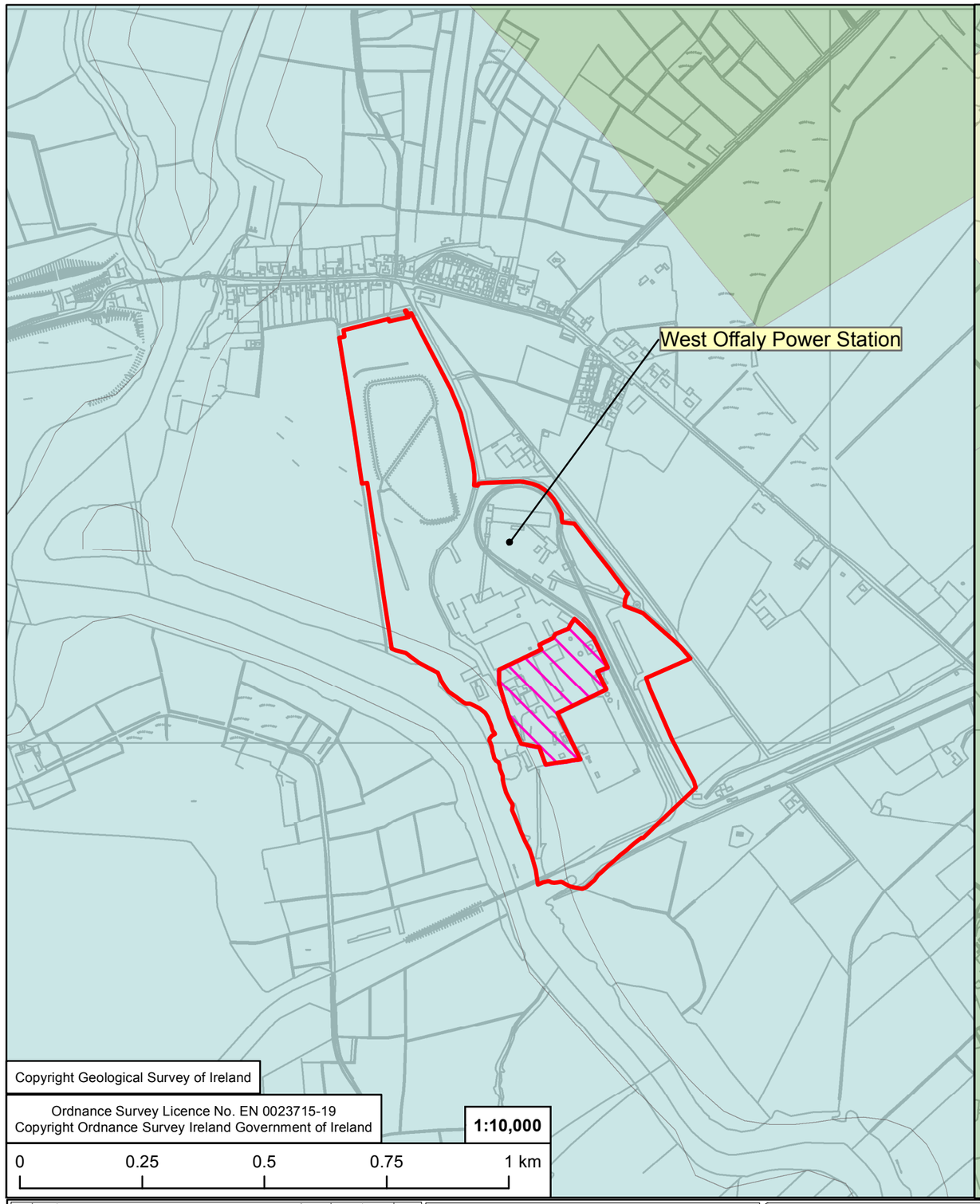
The WOP station site is subject to regulatory monitoring by the EPA under the conditions detailed in the IE License P0611-02 whereby the sites activities and impacts to the natural environment are monitored and controlled. As part of this monitoring, shallow groundwater quality was the subject of a review in 2014-2015. Specialist environmental consultants AECOM were commissioned to assess the source and nature of these elevated parameters. A final Risk Assessment Report was produced and submitted to the EPA in 2015, see **Appendix 7.2**.

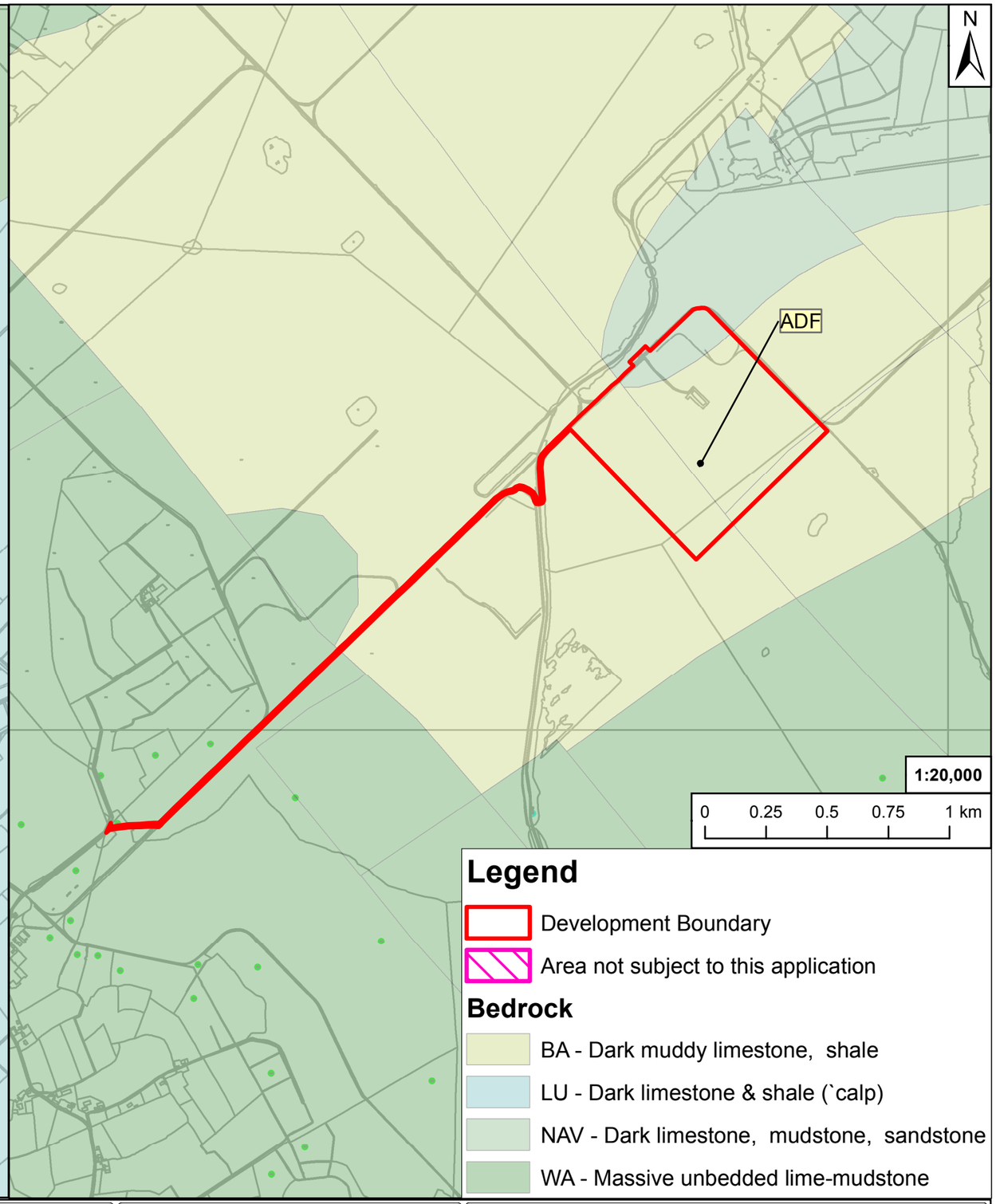
7.4.1.4 Subsoil

Subsoils beneath the site are depicted in **Figure 7-3.** The main WOP station site is indicated as being underlain by Alluvium undifferentiated gravelly subsoil to the west, with Basic esker sands and gravels to the east. The central area of the site comprises Made ground.

[1] Geological Survey of Ireland Spatial Resources

https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228





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0 0.25 0.5 0.75 1 km

Legend

- Development Boundary
- Area not subject to this application

Bedrock

- BA - Dark muddy limestone, shale
- LU - Dark limestone & shale (`calp)
- NAV - Dark limestone, mudstone, sandstone
- WA - Massive unbedded lime-mudstone

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PROJECT: West Offaly Power, Transition to Biomass

DRAWING TITLE: Figure 7.1 - Bedrock Geology

CONTRACT

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
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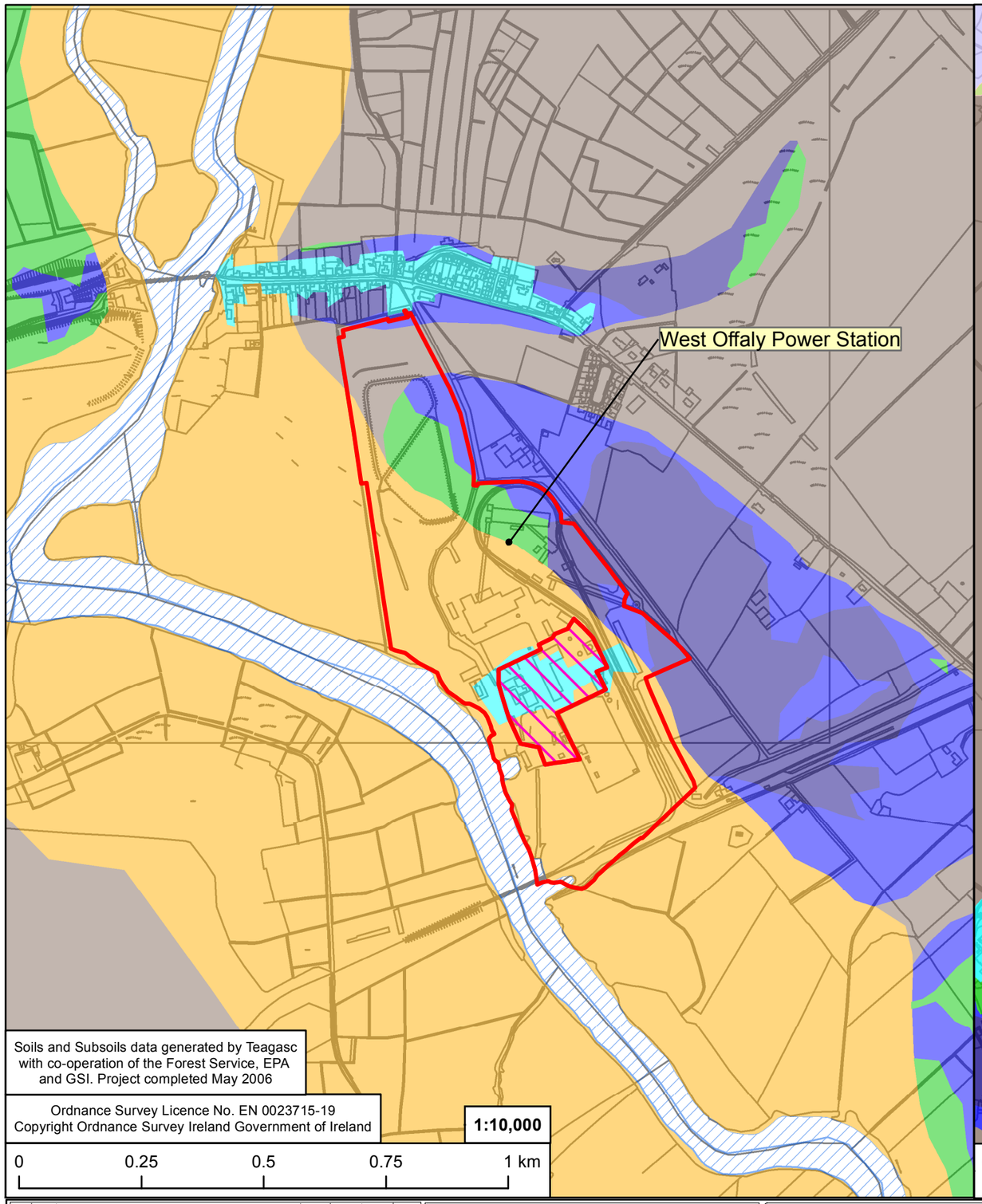
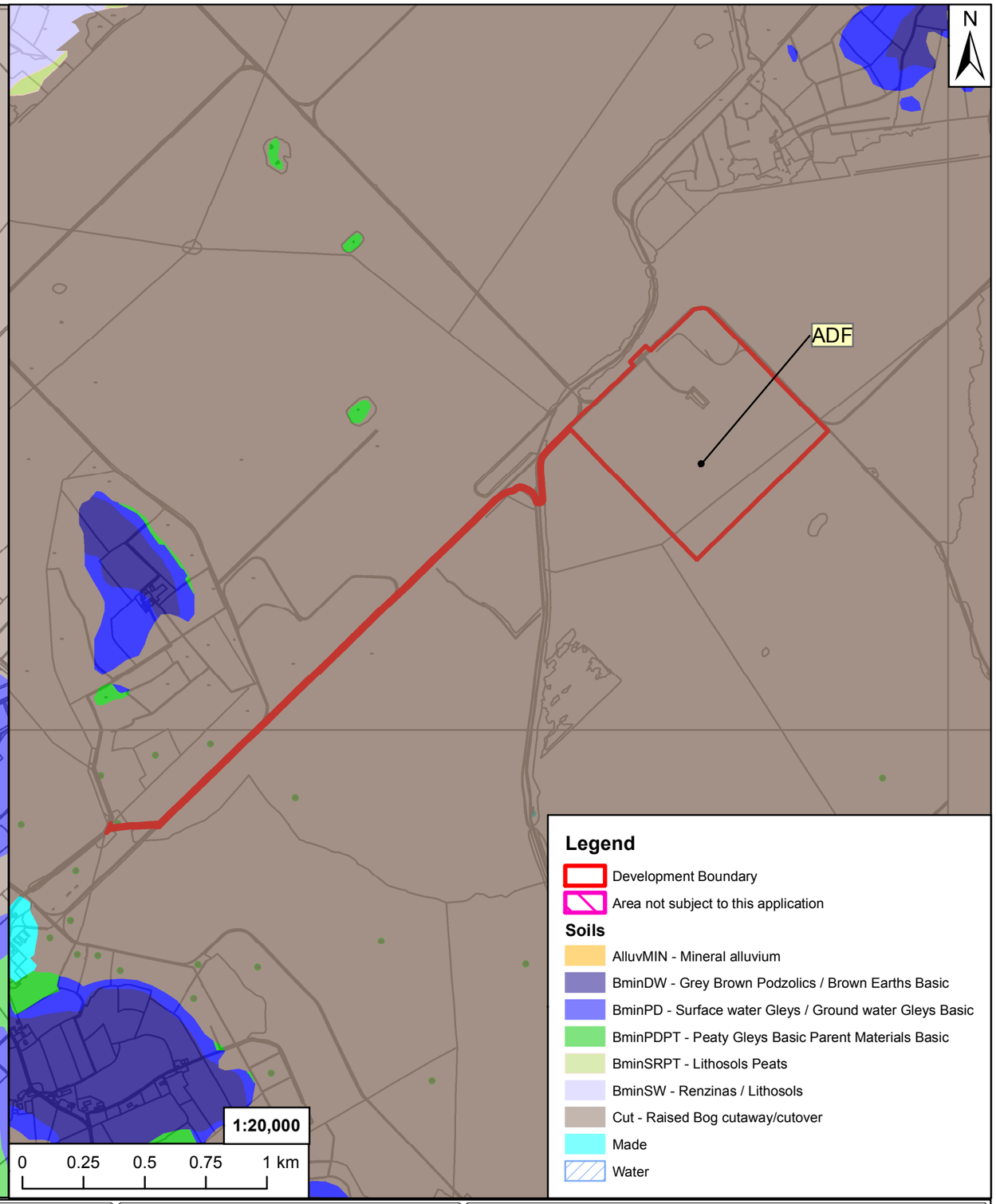
DRAWING NUMBER: QS-000206-01-D460-142





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DRAWING TITLE: Figure 7.2 - Soils

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E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

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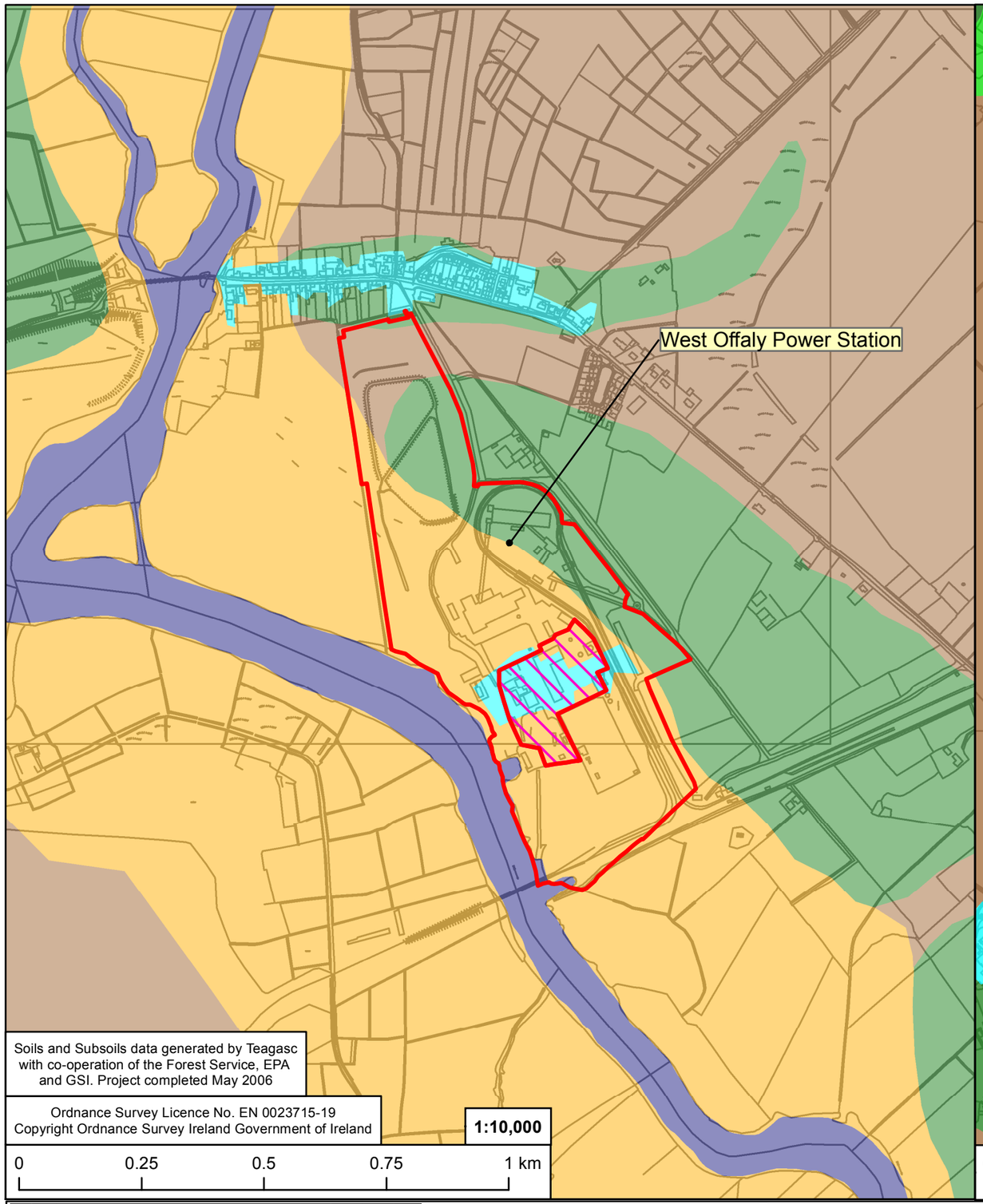

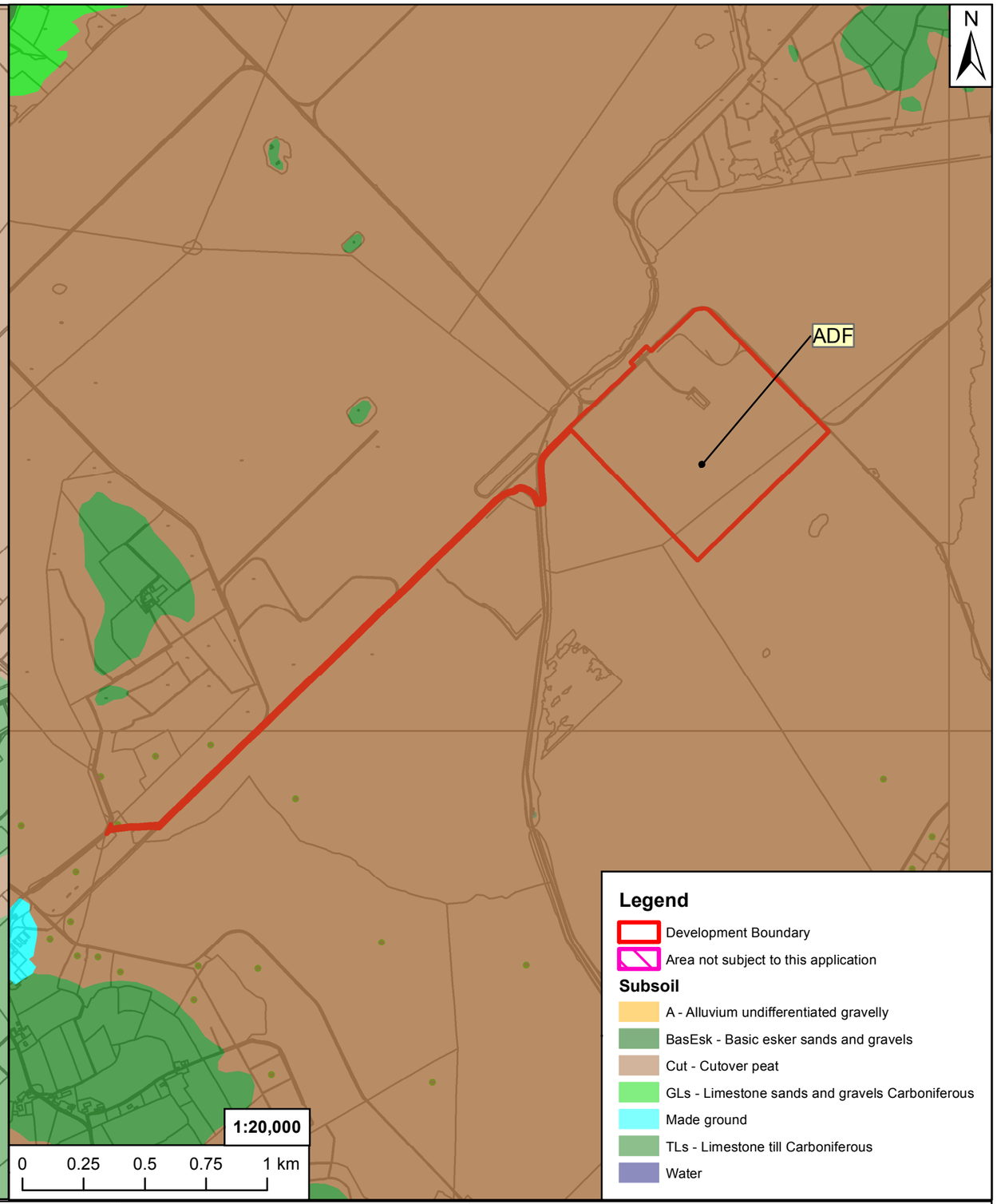

Soils and Subsoils data generated by Teagasc with co-operation of the Forest Service, EPA and GSI. Project completed May 2006

1:10,000

0 0.25 0.5 0.75 1 km

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0 0.25 0.5 0.75 1 km

Legend

- Development Boundary
- Area not subject to this application

Subsoil

- A - Alluvium undifferentiated gravelly
- BasEsk - Basic esker sands and gravels
- Cut - Cutover peat
- GLs - Limestone sands and gravels Carboniferous
- Made ground
- TLs - Limestone till Carboniferous
- Water

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DRAWING TITLE: Figure 7.3 - Subsoils

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E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

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7.4.1.5 Hydrogeology

Shallow groundwater is present in the soils above the bedrock. Due to the nature and extent of this groundwater, this water is not classified as an aquifer by the GSI. The bedrock aquifer beneath the site is classed as a locally important (Ll) which is moderately productive only in local zones. Overall, the flow direction is likely to be towards the Shannon River to the west and southwest of the site.

The mapped bedrock aquifers (www.gsi.ie) are shown in **Figure 7-4**.

7.4.1.6 Abstraction wells

A review of available information on groundwater abstraction wells, including the GSI database, was undertaken to identify any such wells within or in close proximity to the WOP Station.

GSI wells database did not identify any wells within 500 m of the WOP site. The GSI database indicates that the nearest two groundwater abstraction wells are located between 1 - 1.5 km to the north of the site (Raghra Townland adjacent to Shannonbridge). Both abstraction wells are installed in the limestone bedrock and are reported to be “Good” yielding with respective yields of 109 m^3/d) and 135.2 m^3/d.

An additional abstraction well is reported within the ESB property which is poor yielding with a yield of 10.9m^3/d. A summary of the GSI well data within 2km of the WOP Station site is provided in **Table 7-4** below.

Table 7-2: Summary of GSI Well Data within 2km and east of the Shannon River for the WOP Station Site

GSI Name	Type	Total Depth (m)	Depth to Bedrock (m)	Drill Date	Easting	Northing	Owner	Use
WOP Station Site								
1721NEW007	Borehole	38.4	3.1	1966	198,580	226,420	-	Domestic
1721NEW002	Borehole	15.5	-	1905	197,550	226,330	Offaly Board of Health	-
1721NEW003	Borehole	13.4	-	1962	197,550	225,950	Unknown	-
1721NEW004	Borehole	62.5	2.1	1962	197,600	224,850	ESB	Industrial
1721NEW005	Borehole	45.7	1.8	1962	197,600	224,750	ESB	Industrial

GSI Name	Type	Total Depth (m)	Depth to Bedrock (m)	Drill Date	Easting	Northing	Owner	Use
1721NEW006	Dug Well	3.7	3.7	1973	199,900	223,900	-	Domestic

There is no requirement to register abstraction wells with the GSI and consequently there may be other unregistered wells locally.

7.4.1.7 Groundwater vulnerability

The GSI defines groundwater aquifer vulnerability as the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Aquifer vulnerability maps produced by the GSI are based on the type and thicknesses of subsoil (glacial sands, gravels, tills or clays, peat and alluvial silts and clays), and the presence of karst features. It is considered that bedrock aquifers are most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes.

All land area is assigned one of the following groundwater vulnerability categories by the GSI: Rock near surface or karst (X), Extreme (E), High (H), Moderate (M) and Low (L). GSI groundwater vulnerability mapping is provided in **Figure 7-5.** The GSI mapping indicates that the station site is located on two main vulnerability classes, Moderate vulnerability to the west and High vulnerability to the east. One area, adjacent to the disused blending building, is classified as Extreme. Storage Slab A and the pellet silo will be located on an area of high groundwater vulnerability. Storage Slab B is also mainly on an area of high vulnerability but partly on the Extreme vulnerability area.

Site investigation in these areas has indicated that they are largely on made ground.

7.4.1.8 Geological Heritage Sites

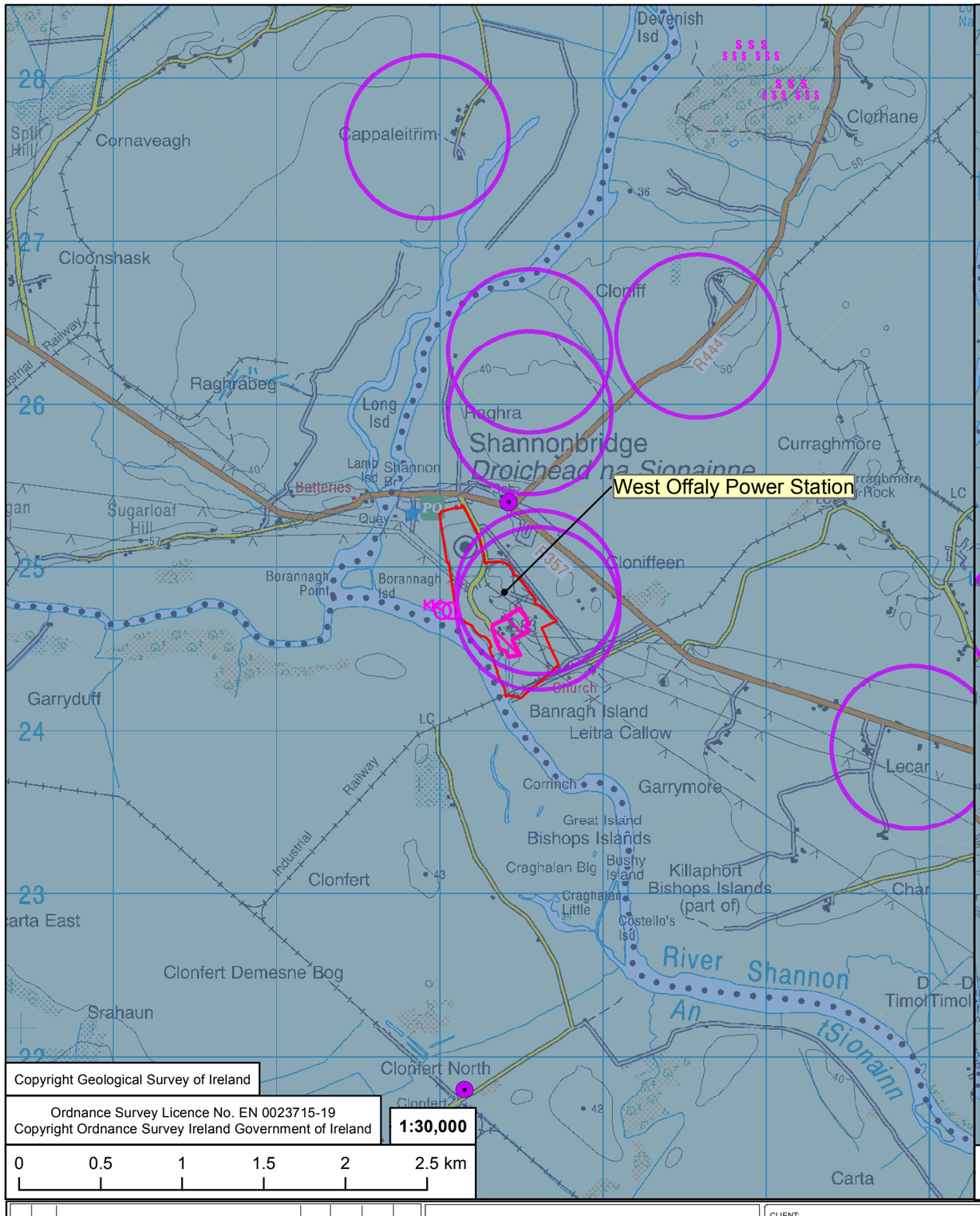
A review of the GSI mapping to identify sites of geological heritage within surrounding area indicated that the nearest site is the Shannon Callows (Site Code RO027) in County Roscommon. The Callows comprises a long, flat site which includes the Shannon River floodplain with areas of callow, or seasonally flooded, semi-natural, lowland wet grassland, along both sides of the river. It is located upriver of the WOP station site a distance of approximately 0.8 km.

7.4.1.9 Geo-Hazards

According to the GSI on-line database, the landslide susceptibility has been classified as low. There are no identified landslide records for the immediate area.

7.4.1.10 WOP Wastewater Treatment System

The WOP station is not connected to a public sewer system and all wastewater is collected on site to a foul sewer system which is directed to a proprietary wastewater treatment system (PureFlo) an engineering peat bed percolation area to ensure compliance with the stations IE licence. The waste water outlet is then fed to a drain for discharge to Shannon River via a licenced surface water discharge point. The treatment system is de-sludged as required. It is serviced under a regular maintenance contract.



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1:40,000

0 0.5 1 1.5 2 2.5 km

Legend

- Development Boundary
- Area not subject to this application
- Wells (10m to 50m accuracy)
- Wells (500m radius)
- BOREHOLE
- SUPERFICIAL SOLUTION FEATURES
- LI -Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

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DRAWING TITLE: Figure 7.4 - Groundwater Resource – Aquifer Type, Karst Features & GSI Groundwater Wells and Springs

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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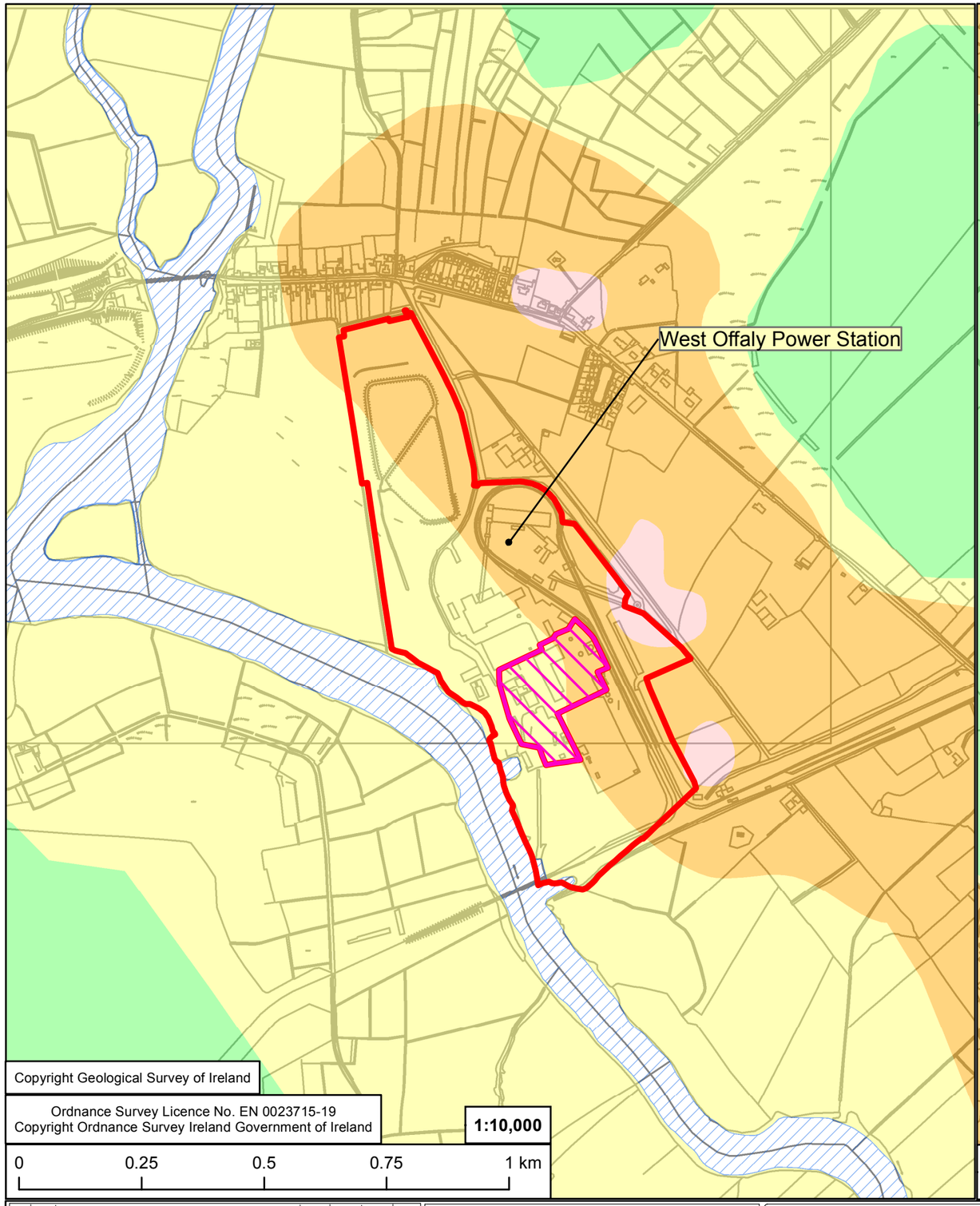

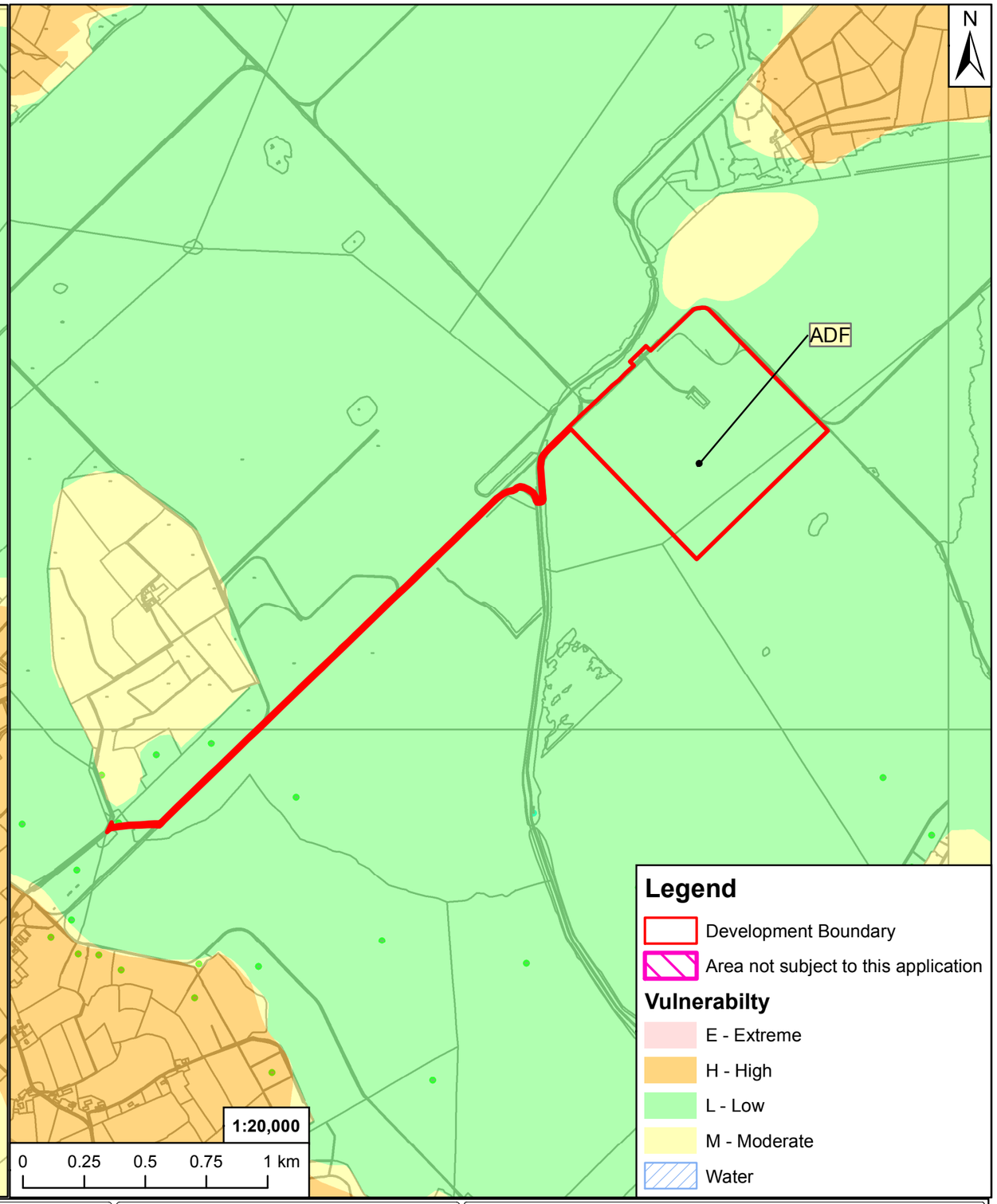

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CLIENT: ESB

PRODUCTION UNIT: Civil & Environmental Engineering

PROJECT: West Offaly Power, Transition to Biomass

DRAWING TITLE: Figure 7.5 - Aquifer Vulnerability

CONTRACT

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	As Shown

DRAWING NUMBER: QS-000206-01-D460-146

7.4.2 ADF Site

7.4.2.1 Bedrock Geology

The GSI website indicates the site is underlain partially to the northwest by the Navan Beds (Diantian Courcetyan dark Limestone, Mudstone and Sandstone) and mainly to the southwest by the Ballystein Formation comprising Dark Muddy limestones and Shale, see **Figure 7-1**.

The site investigations fieldwork undertaken for the EIS in 2001 comprised the putting down of eight boreholes by cable percussive techniques with rotary open holing follow-on in four of them and the recovery of soil samples during the cable percussive boring. The SI indicated that the ADF site is underlain by Carboniferous Argillaceous Bioclastic limestones (ABL) of Courceyan age (GSI Sheet No. 15.) The ABL consists of dark grey fossiliferous, argillaceous calcarenites interbedded with thin calcareous shales. The Sheet indicates the presence of a north-east-south-west trending fault approximately 1km to the north of the site.

The 2017 Causeway Report (see **Appendix 7.1**) summarises the ground types encountered at the WOP ADF in the exploratory boreholes in approximate stratigraphic order is as follows:

- **Recent deposits**: spongy peat deposits overlaying both tills derived from bedrock and more recent fluvioglacial deposits
- **Glacial Till**: sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.

Table 7-3: Summary of General Geology and Ground Types WOP ADF Site

General Geology	Depth (meters below ground level)	Description
WOP ADF Site		
Recent deposits	0.0 – 4.0	Spongy peat deposits overlaying both tills derived from bedrock and more recent fluvioglacial deposits
Glacial Till	0.4 -11.60	Sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth.

* Peat was not encountered in all boreholes

7.4.2.2 Soils and Soil Chemistry

The ADF is located on Cut-raised Bog cutaway/cutover soils, see **Figure 7-2** above. The proposed extension to the ADF site will occur on this soil type also.

There are no known areas of soil contamination (with the exception of ash landfill cells, four of which are closed and capped, two are in development and operation). The ADF site is subject to regulatory monitoring by the EPA under the conditions detailed in the IE License P0611-02 whereby the sites activities and impacts to the natural environment are monitored and controlled. As part of this monitoring, shallow groundwater quality was the subject of a

review in 2014-2015. Specialist environmental consultants AECOM were commissioned to assess the source and nature of these elevated parameters. A final Risk Assessment Report was produced and submitted to the EPA in 2015.

7.4.2.3 Subsoil

Subsoils beneath the ADF site are depicted in **Figure 7-3** above. The subsoil type is described as Cutover peat.

7.4.2.4 Hydrogeology

Shallow groundwater is present in the soils above the bedrock. Due to the nature and extent of this groundwater, this water is not classified as an aquifer by the GSI.

The bedrock aquifer beneath the site is classed as a locally important (Ll) by the GSI which is moderately productive only in local zones, see **Figure 7-4** above.

Diffuse recharge occurs over this entire GWB via rainfall soaking through the subsoil. Overall, the flow direction is likely to be towards the River Shannon in the southwest of the GWB

7.4.2.5 Abstraction wells

The GSI database indicates that there are no abstraction wells within 2 km of the area and there- are no drinking water protected areas, see **Figure 7-4** above.

7.4.2.6 Groundwater vulnerability

The GSI indicates that the ADF site is located on a Low vulnerability aquifer area, see **Figure 7-5** above.

7.4.2.7 Geological Heritage Sites

A review of the GSI mapping to identify sites of geological heritage within surrounding area indicated that there are no sites within 500m of the ADF. The nearest site, the Clonmacnoise Esker (Site Code OY008, is located to the northwest about 3.8km distance. The esker is the traditional route defined as the ‘Eiscir Riada’ in ancient Irish Folklore and is the longest esker system in the country. It is a superb example of relict subglacial conduit.

7.4.2.8 Geo-Hazards

According to the GSI on-line database, the landslide susceptibility has been classified as low. There are no identified landslide records for the immediate area.

7.4.2.9 Wastewater Treatment at the ADF

A proprietary wastewater Puraflo system and percolation area has been provided at the ADF, which is regularly serviced.

7.4.3 Groundwater quality

7.4.3.1 Historical groundwater quality

An Environmental Impact Statement (ESB, 2001) for the WOP station reported that the previous Shannonbridge station that existed on the site and which was demolished prior to

the construction of the current site and the ADF which serviced the station had little significant impact on groundwater or soil quality. The data collected indicates that ammoniacal nitrogen, nitrite and zinc were the only inorganic EU list II substances present at elevated concentrations at the site prior to the existence of the current WOP site.

The 2001 EIS detailed that:

"*Ammoniacal nitrogen was found to exceed the EU Drinking Water Limit for ammonia of 0.3 mg/l in all eight groundwater samples. Concentrations were between 3.5 mg/l and 11.4 mg/l. Ammoniacal nitrogen may be naturally present in groundwater as it is formed by the microbial reduction of other nitrogen compounds. However, it can also be sourced from foul and industrial wastes that may be released to the groundwater by septic tanks, agricultural slurry pits, etc. The widespread occurrence and relative close range of concentrations would suggest that the ammoniacal nitrogen levels in the groundwater at the site represent the background concentration range.*

Elevated concentrations were recorded for nitrite (0.05 mg/l, 0.12 mg/l and 0.14 mg/l, which exceed the EU Drinking Water Limit of 0.03 mg/l), chemical oxygen demand (44 mg/l to 241mg/l, which exceed the EU Surface Water (A3) Limit of 40 mg/l,), faecal coliforms (between 1 cfu/100 ml and 23 cfu/100 ml) and total coliforms (all >180 cfu/100 ml). These determinands, in a similar manner to ammoniacal nitrogen, may be associated with foul water discharges.

However, foul water discharge seems unlikely as a source of groundwater contamination given the location of the site. The elevated chemical oxygen demand may be due to the presence of significant levels of organic carbon in the water. The organic material in the water would provide a substrate for bacterial metabolism and this may expand the presence of the coliforms. Where elevated levels of these four determinants were recorded, they are considered to be representative of the higher end of the natural background range.

A zinc concentration of 2,810 µg/l, exceeding the EU Drinking Water Limit (1,000 µg/l), was reported in one groundwater sample. This concentration is well above the other groundwater samples where the highest concentration was 136 µg/l.

Calcium and iron were found to exceed their respective EU Drinking Water Limits in two samples. Potassium exceeded the EU Drinking Water Limit (12 mg/l) in two samples with concentrations of 29 mg/l and 33 mg/l. Elevated concentrations of calcium, iron and potassium are thought to be associated with the overburden and bedrock chemistry and are thus representative of the higher end of the natural background range. Five of the seven groundwater samples had manganese concentrations above the EU Drinking Water Limit (50 µg/l) with concentrations ranging from 81 µg/l in to 699µg/l. Elevated manganese concentrations are also thought to relate to bedrock and groundwater geochemistry and are considered to represent natural background concentrations.

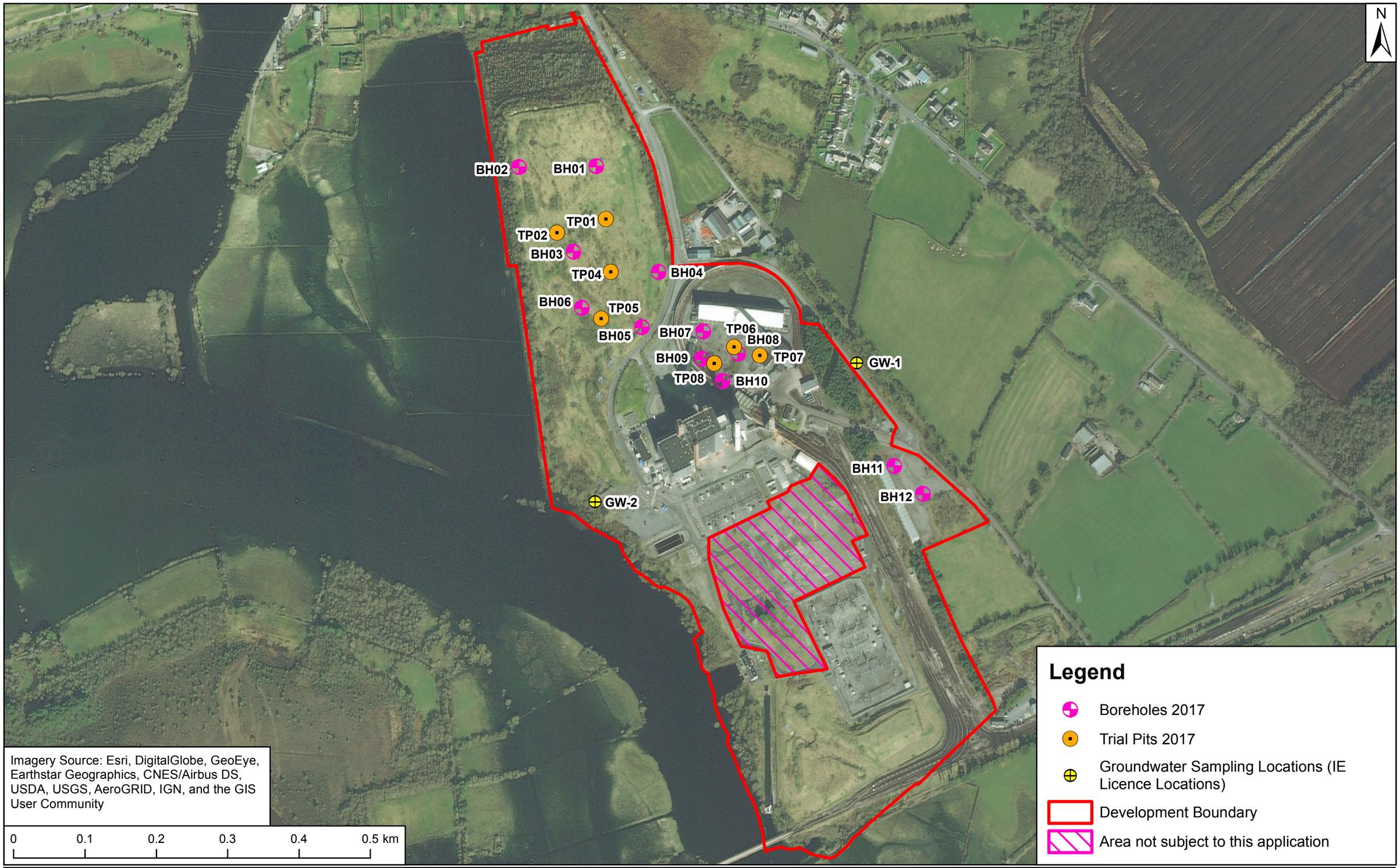
Elevated concentrations of DRO, mineral oil, total phenol and total PAH were reported in one to two groundwater samples. These elevated hydrocarbon concentrations are generally not significantly above the concentrations encountered in the other groundwater samples and may be due to the introduction of hydrocarbons during fieldwork. It is also possible that the hydrocarbons encountered are related to the natural levels and are at the upper end of the natural range.

Hydrocarbons can be derived from the natural breakdown of larger naturally occurring organic molecules and the soil samples may, therefore, be more organic rich than the other samples tested.

In general, while some analytes were at the higher end of their naturally occurring ranges, the groundwater did not show significant contamination."

7.4.3.2 Existing Groundwater quality

Groundwater monitoring is undertaken on an annual basis at the WOP station site and WOP ADF as part of the IE Licence requirement and reported to the EPA in the Annual Environmental Report. In addition, as part of the proposed project development groundwater monitoring was undertaken at 6 boreholes installed in 2017 at the WOP site and at three boreholes at the ADF site. The groundwater monitoring locations are listed in **Table 7-4** and **Table 7-5**. Locations GW-01, GW-02, GW-03, GW-04, GW-05 and GW-06 are monitored as part of the stations IE compliance and are shown on **Figure 7-6** and **Figure 7-7.**



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PROJECT: West Offaly Power, Transition to Biomass

CONTRACT

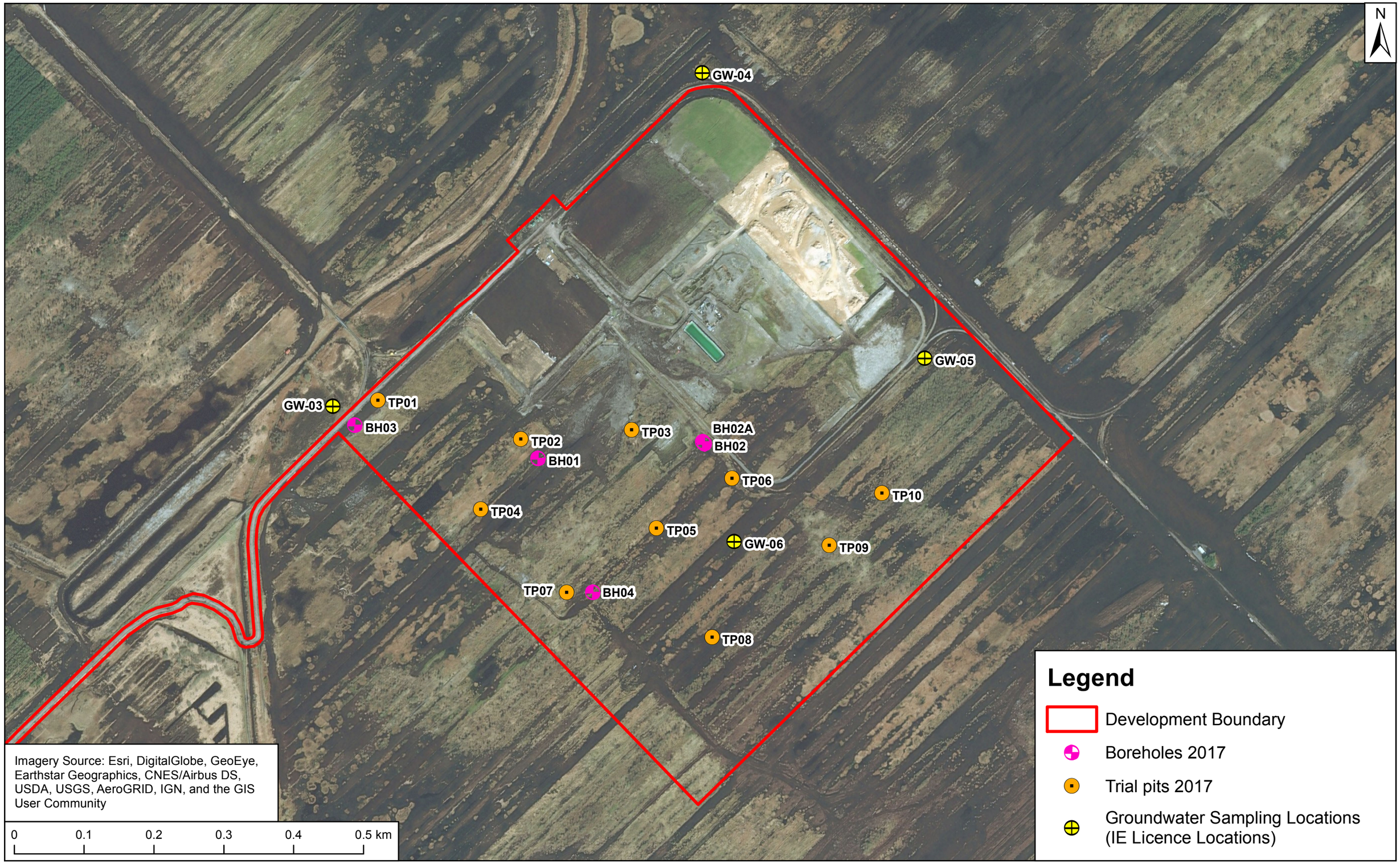
PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Figure 7.6- Boreholes, Trial Pit and Groundwater Monitoring Locations at WOP Station

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:5,000

DRAWING NUMBER: QS-000206-01-D460-147



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PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Figure 7.7- Boreholes, Trial Pit and Groundwater Monitoring Locations at the ADF

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
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DRAWING NUMBER: QS-000206-01-D460-148

The results of groundwater analysis on samples taken during the site investigation activities in 2017 are provided in **Appendix 7.3**.

Table 7-4: Groundwater Wells Monitored AT WOP

Borehole Excavation Year	IE Compliance Licence Monitoring well ID	2017 Water Monitoring wells
2005	GW-01	
2005	GW-02	
2017		WOP BH01/17
2017		WOP BH02/17
2017		WOP BH04/17
2017		WOP BH05/17
2017		WOP BH06/17
2017		WOP BH09/17

Table 7-5: Groundwater Wells Monitored WOP ADF Site

Borehole Excavation Year	IE Compliance Licence Monitoring well ID ADF Site	2017 Water Monitoring wells
2000	GW-03	
2000	GW-04	
2000	GW-05	
2000	GW-06	
2017		WOA BH01/17
2017		WOA BH02A/17
2017		WOA BH03/17

As part of the 2017 site investigation works groundwater analysis was undertaken for a number of parameters as per Table 7-6:

Table 7-6: Groundwater parameters monitored

- **pH**
- **Conductivity**
- **Level**
- **Metals:**
  - **Aluminium**
  - **Arsenic**
  - **Boron**
  - **Cadmium**
  - **Calcium**
  - **Chromium**
  - **Copper**
  - **Iron**
  - **Lead**
  - **Magnesium**
  - **Manganese**
  - **Mercury**
  - **Molybdenum**
  - **Sodium**
  - **Nickel**
  - **Potassium**
  - **Selenium**
  - **Zinc**
- **PAHs**
- **Pesticides**
- **TPH**
- **Phenols**
- **Sulphate as SO_4 Chloride**
- **Nitrate as NO_3 Nitrite as NO_2**
- **Ortho Phosphate as P**
- **Ammoniacal Nitrogen as N and NH_3**
- **Sulphide**
- **Total Coliforms**
- **COD**
- **VOC sand SVOCs**

Table 7-7 below details the parameters analysed for each borehole sampled, borehole location are shown in **Figure 7-6.** It is noted that WOP BH01, BH02, BH04, BH05, BH06 lie outside the boundary of the WOP station and that BH09 lies within the WOP station boundary. Originally focus was on the area of the closed ash fields to the north of the station as the main biomass storage area but this was subsequently discounted. However, the spread of groundwater monitoring locations provides a good overview of the groundwater aquifer within the area and provide sufficient data to undertake a robust groundwater assessment of the baseline groundwater quality.

An analysis of the groundwater monitoring data at WOP station compared to the Groundwater Threshold Values (GTVs) in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, (S.I. No. 9 of 2010) where available indicates the following:

- Exceedance of metal concentration limits when compared to the Groundwater Regulations GTV values with the exception of Aluminium at BH02, BH05 and BH06 with values ranging between 29 and 1,083 ug/l and Sodium at BH01 and BH06 with values ranging between 160.8 and 193.6 ug/l
- No exceedance of PAH limit values were detected
- No exceedance of pesticide limit values were detected

- No exceedance of Aliphatics limit values were detected
- No exceedance of Aromatics limit values were detected
- With respect to other physico-chemical parameters elevated levels of Sulphate were detected in BH04 and BH05 located in the former ash storage area with values ranging between 191-310.9 mg/l as SO4. The GTV limit value for SO4 is 187.5 mg/l
- Ammoniacal nitrogen was also found to be elevated in BH02, BH04, BH05, BH06, BH09 and WOP-PS-GW-02 with values ranging from 1.78 – 21.29 mg/l as N. The GTV limit value for ammonia in groundwater is l nitrogen as NH3 is 0.175 mg/l should be noted that GW2 is located in the old Shannonbridge Generating station ash pond which is outside the current IE Licenced area.
- No exceedance in other chemical parameters were observed.

An analysis of groundwater monitoring data for the WOP ADF indicates the following:

- Arsenic levels exceeded the threshold values at the ADF boreholes Bh01, and BH 02 with similar exceedances recorded in GW5 and GW6 (the IE Licence monitoring points). Recorded high values ranged from 14.1 to 49.5 ug/l which are above the GTV of 7.5ug/l for Arsenic. The IE Licence Trigger Level Value whereby action is required by the station is 162 ug/l and all samples were below this value.
- Nickel concentration exceeded the GTV in GW5, a value of 20 ug/l was recorded;
- No exceedance of PAH limit values were detected
- No exceedance of pesticide limit values were detected
- No exceedance of Aliphatics limit values were detected
- No exceedance of Aromatics limit values were detected
- Ammoniacal nitrogen was also found to be elevated in the ADF BH01, BH02, BH03, GW3, GW4, GW5 and GW6 with values ranging from 1.78 – 21.29 mg/l as N. However, these are similar to historical values recorded prior to the generating stations construction in 2005 as stated in the EIS prepare dfor the existing WOP development , see7.3.3.1 above
- No exceedance in other chemical parameters were observed.

A Risk Screening and Technical Assessment Report, prepared by AECOM Ltd, in 2015 and based on the stations groundwater monitoring identified elevated concentration of Sulphate of between 260-290 ug/l) in the period 2013 and 2014 at GW2 which is located within a former closed ash pond area on the station site. Subsequent monitoring reported in the AER 2016 and AER 2017 indicate consistently similar levels of Sulphate with values ranging from 205 – 230 mg/l in 2016 and 161-240 mg/l in 2017. The risk assessment concluded that the source of the elevated concentrations of sulphate at PS-GW2 is considered likely to be the former ash landfill located in this area.

The elevated concentrations of Aluminium in boreholes BH02, BH05 and BH06 and marginally elevated concentrations of sodium all occur in the former ash disposal area also and are likely associated with this landfill.

The risk screening report also indicates an ammonia level of 6.3 mg/l at PS-GW2 in 2014 at the station. Ammonia levels of 4.83 mg/l and 6.28 were recorded in this groundwater monitoring location in 2016 and in 2017 as part of the stations monitoring compliance with a value of 9.81 mg/l recorded during the site investigation works for the project at this location. Analysis to date indicates that the groundwater at WOP shows consistently elevated levels of ammoniacal nitrogen. There are a number of possible sources for ammonia in groundwater at this location. It could generate from leachate from the soil and subsoil in the area of the station, soil ammonia analyses indicates levels of 10.6 mg/kg in the soil sample taken at WOP. Ammonia can also occur at elevated levels in the general groundwater in the area arising from natural seepage levels from peaty bog water down into the overburden deposits below the bog and to the shallow groundwater. This would also account for the observed elevated ammonia levels at the WOP ADF which is remote from the station. This was also observed at Lough Ree Power located at Lanesborough further up the catchment, where groundwater monitoring indicated similar elevated ammonia levels and where seepage of ammonia from peatland to groundwater was identified as a likely cause. A third possibility relates to potential leaching of contaminated water from the stations proprietary wastewater treatment system and percolation area. The station will continue to monitor ammonia on a quarterly basis as per the requirements of their IE Licence to determine whether any obvious trend becomes apparent.

With regard to Arsenic, elevated levels have been reported in the Stations Annual Environmental Reports for 2016 and 2017 in the ADF monitoring wells GW3, GW5 and GW6 with high levels ranging from 1.28 to 36.02 (GW5 in 2016). These are below the EPA IE Licence agreed value of 162 ug/l. The Risk Screening and Technical Assessment Report indicated that the source of the elevated arsenic concentration is unclear but it may be associated with elevated background concentrations often associated with the regional geology in the area (impure limestones); or the ash landfilled at the site. Again, the station will continue to monitor Arsenic as per the requirements of their IE Licence to determine whether any apparent trend becomes obvious.

7.4.3.3 Water Framework Directive Groundwater Status

The WOP station site and the WOP ADF site are located on the Clara groundwater body (IE_SH_G_240) with Good status assigned by the EPA, see https://gis.epa.ie/EPAMaps/.

Table 7-7: Parameters analysed at WOP station monitoring boreholes

Location	Borehole	Level	pH	Conductivity	Metals	PAHs	Pesticides	TPH	Phenols	Sulphate	Nitrate / Nitrite	Phosphate	Ammonia	Sulphide	Coliforms	COD	SVOC	VOC
Station Site	GW-01**		X	X	X	X		X	X	X	X	X	X	X			X	X
	GW-02**		X	X	X	X		X	X	X	X	X	X	X			X	X
	WOP BH01	X	X	X	X	X		X	X	X	X	X	X	X				
	WOP BH02	X	X	X	X	X		X	X	X	X	X	X	X				
	WOP BH04	X	X	X	X	X		X	X	X	X	X	X	X				
	WOP BH05	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	WOP BH06	X	X	X	X	X		X	X	X	X	X	X	X				
	WOP BH09*	X	X	X	X	X		X	X	X	X	X	X	X				
ADF Site	GW-03**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	GW-04**	X	X	X	X	X		X	X	X	X	X	X	X				
	GW-05**		X	X	X	X		X	X	X	X	X	X	X				

Location	Borehole	Level	pH	Conductivity	Metals	PAHs	Pesticides	TPH	Phenols	Sulphate	Nitrate / Nitrite	Phosphate	Ammonia	Sulphide	Coliforms	COD	SVOC	VOC
	GW-06**	X	X	X	X	X		X	X	X	X	X	X	X				
	WOA BH01	X	X	X	X	X		X	X	X	X	X	X	X				
	WOA BH02A	X	X	X	X	X		X	X	X	X	X	X	X				
	WOA BH03	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

* Located within the boundary of the WOP Station Site

** Monitored under the IEL

7.4.4 Peat Supply Bogs

There are a number of groundwater bodies associated with these existing supply bog as shown in **Figure 7-8** and detailed in **Appendix 7.4**. **Figure 7-9** indicates the groundwater vulnerability of the Bord na Móna peat supply bogs based on the GSI groundwater vulnerability mapping. The GSI data and mapping indicates that groundwater beneath the peat supply bogs are largely classed as having low vulnerability with some moderate areas of vulnerability in some supply bog area (Boughill bog, Drinagh Boora, Clongawny More and Mountlucas for example) and with minor areas of high vulnerability within Drinagh Boora and Mount Lucas bogs

Risk assessments carried out by the EPA indicate that only one groundwater body has been identified as being in the at risk category of failing status with respect to abstraction or chemical water quality with the majority not at risk or under review. In terms of environmental pressure on groundwater from peat extraction only one groundwater body has been identified as being at risk from such extractive activities in the Irish River Basin Management Plan 2018-2021[2]. The groundwater body (IE-Sh_G-039) at risk from the extractive industry has been identified (source https://www.catchments.ie/maps/) as being associated the Clara Bog SAC which is a groundwater dependent terrestrial ecosystem. The location of this with respect to the peat supply bogs serving WOP is shown on **Figure 7-10**. None of the WOP peat supply bogs are located on this groundwater body and therefore do not contribute to the identified extractive industry pressure acting on it.

The WFD status for the waterbodies within close proximity to peat production bogs (50m buffer zone) are tabulated in **Appendix 7.4** also. All of the groundwater bodies in the vicinity of the bogs that supply WOP are at Good status, see **Appendix 7.4** (Table 7.4) and **Figure 7-11**.

The Bord na Móna supply bogs are licenced by the EPA and there are a number of conditions stipulated under each licence in order to provide for the protection of the environment by way of control, limitation, treatment and monitoring of emissions, see extract of Condition 6 and 9 in **Appendix 7.5.** With respect to groundwater, Condition 9 specifically addresses groundwater protection relating to the Bord na Móna workshop areas where potential for groundwater contamination exists.

Over the period of 2012 to 2013 the IPC Licences for peat bogs that supply the WOP generating station were reviewed by the EPA in accordance with the requirements of the European Communities Environmental Objectives (Groundwater) Regulations 2010 and as amended. Resulting from this a number of modifications to the relevant conditions of the Bord na Móna licences were subsequently made through a technical amendment to the licence (see **Appendix 7.5** of this EIAR).

[2] River Basin Management Plan for Ireland 2018 – 2021, page 41.

An examination of the IPC Licences for the peat supply bogs indicates that there is no groundwater monitoring requirement in the IPC Licences covering the peat supply bogs to WOP generating station.

The RBMP relates environmental impacts to suspended solids, ammonia and hydro-morphological alterations (DHPLG, 2018) principally to surface waters and this issue is addressed in Chapter 8. There are a number of principle actions proposed in the published RBMP to address these pressures at a strategic scale as follows:

"

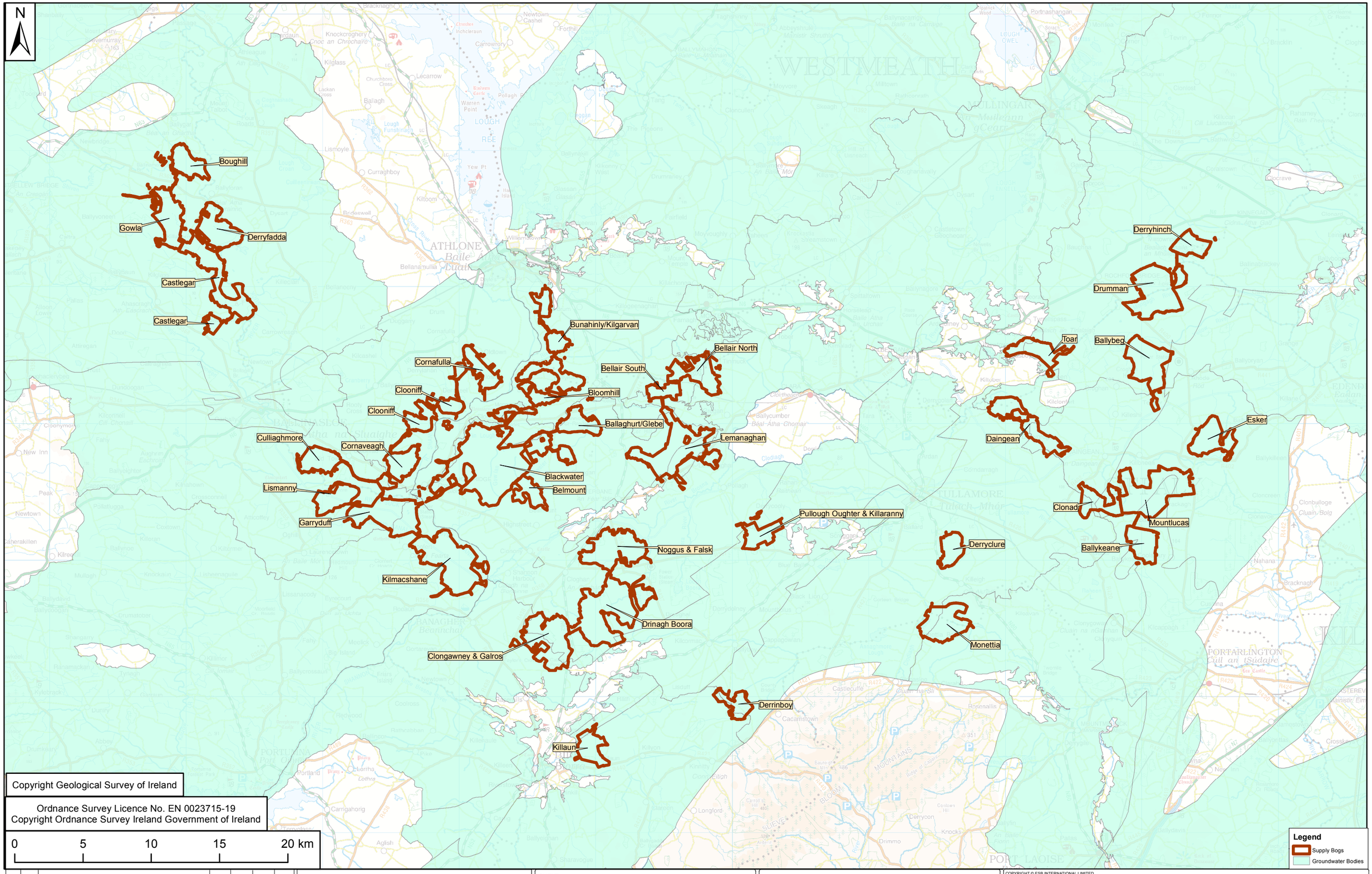
1. *The Minister for Housing, Planning, Community and Local Government intends to make regulations in 2017 as soon as possible that will require the EPA to carry out EIA for all existing and new large-scale peat extraction (> 30ha) as part of its examination of IPC license applications for the activity. When these regulations are made, proposals will be developed for public consultation relating to a new regulatory regime that will bring smaller-scale commercial peat extraction (≤ 30ha) under a new local authority licensing system incorporating EIA and AA, as necessary, and enforcement powers.*
2. *The DCHG[3], together with the Peatlands Strategy Implementation Group, will oversee the implementation of the National Peatland Strategy and the first national management plan for Ireland's raised-bog Special Areas of Conservation (SACs) network.*
3. *The Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs will oversee the implementation of the Peatland strategy the principal aim of which is to provide a framework for determining and ensuring the most appropriate future use of cutover and cutaway bogs.*
4. *Bord na Móna will implement its Sustainability 2030 Strategy and Biodiversity Action Plan 2016-2021 which addresses the long-term rehabilitation of its cutaway bogs.*
5. *By 2021, Bord Na Móna will rehabilitate an additional 25 peatlands covering approximately 9,000ha. This is subject to several assumptions, including the availability of cutaway bogs for rehabilitation.*
6. *The EPA has identified this priority issue as the subject of a research proposal for inclusion in its 2018 research call. The proposal involves evaluating mitigation strategies for improving water quality from drained peatlands. The project proposal, if selected, is intended to integrate with the ongoing mitigation trials being undertaken by Bord Na Móna."*

As part of the above Bord na Móna, in conjunction with the EPA, are assessing whether peat harvesting gives rise to ammonia release and measures to mitigate the generation and impact of ammonia from their cutaway peatlands if these are required. In addition Bord Na Móna commenced work in 2017 on preparing

[3] Department of Culture, Heritage and the Gaeltacht.

Environmental Impact Assessments on all of its peatlands including AA, where necessary, in anticipation of the new streamlined licensing system for large-scale peat extraction (> 30ha) that will be operated by the EPA.

The Strategic Environmental Assessment (SEA) undertaken for the RBMP has determined that the above proposed measures will have broadly positive effect on the water environment.



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CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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Registered Office: as above
Registered in Ireland No. 155249

CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

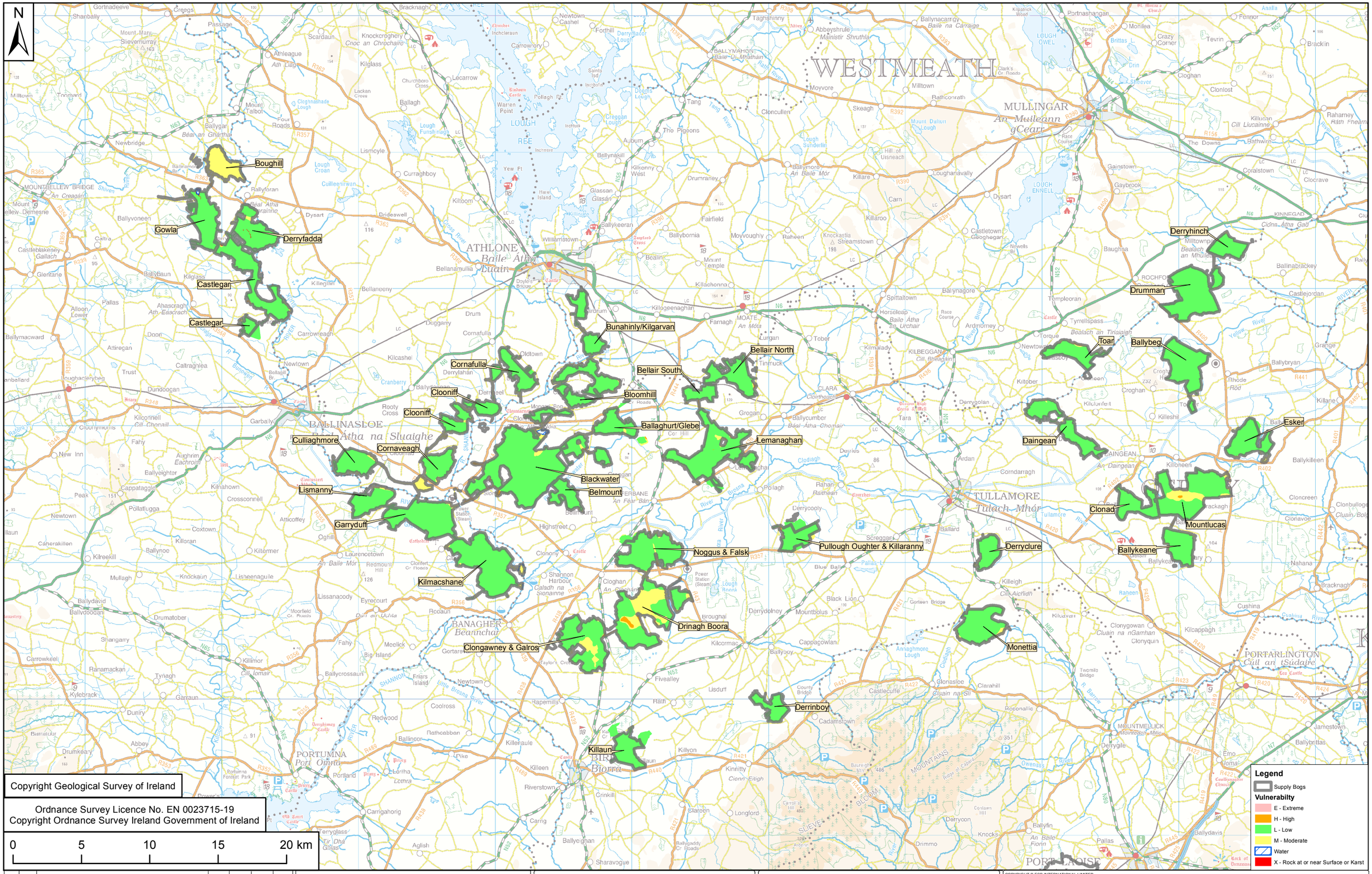
PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 7.8- Supply Bogs and Groundwater Bodies**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	1/1	A3	1:250,000

DRAWING NUMBER **QS-000206-01-D460-149**



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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

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PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE:

Figure 7.9- Supply Bogs and Groundwater Vulnerability

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
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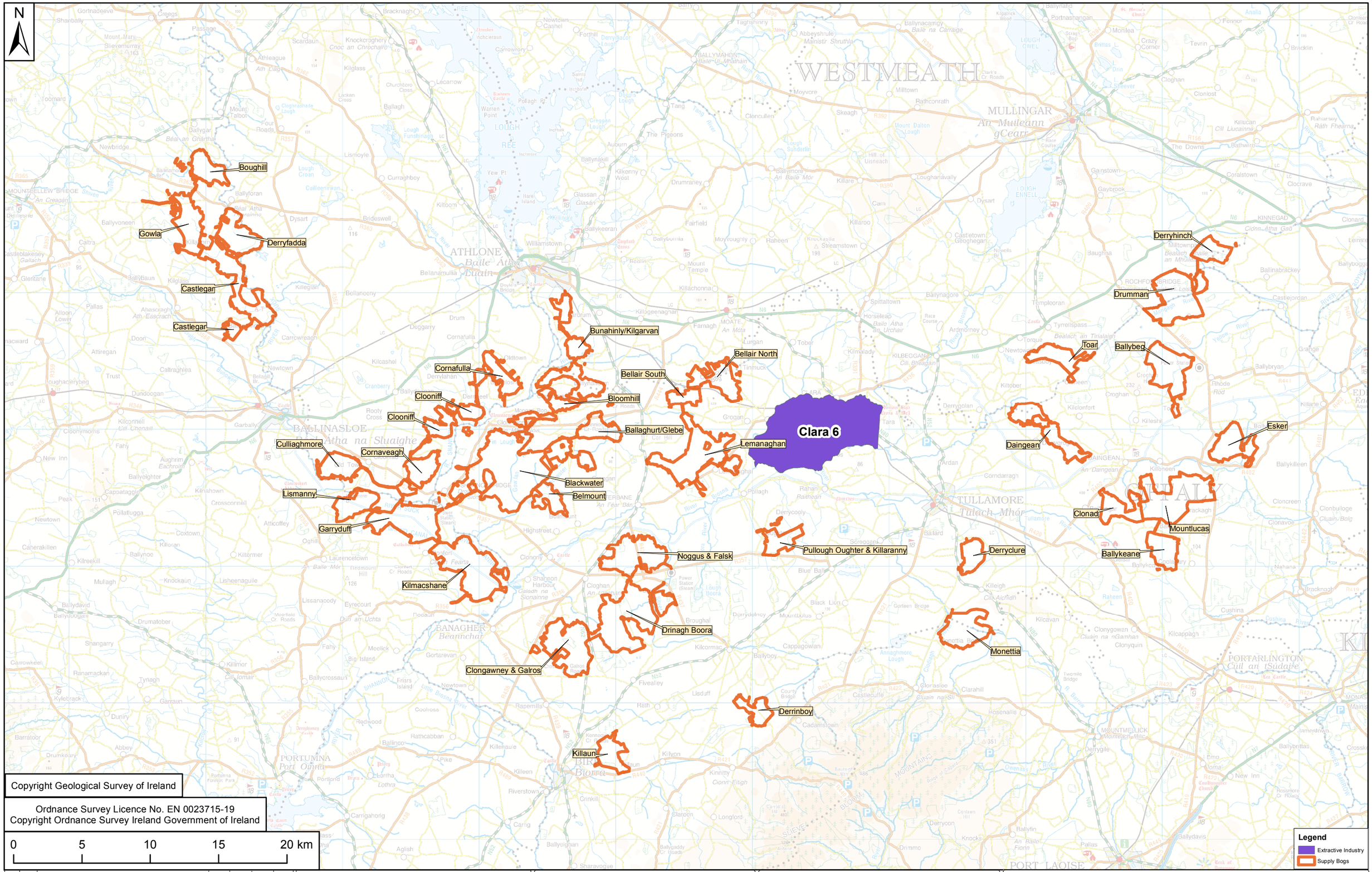
DRAWING NUMBER **QS-000206-01-D460-150**



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

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CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

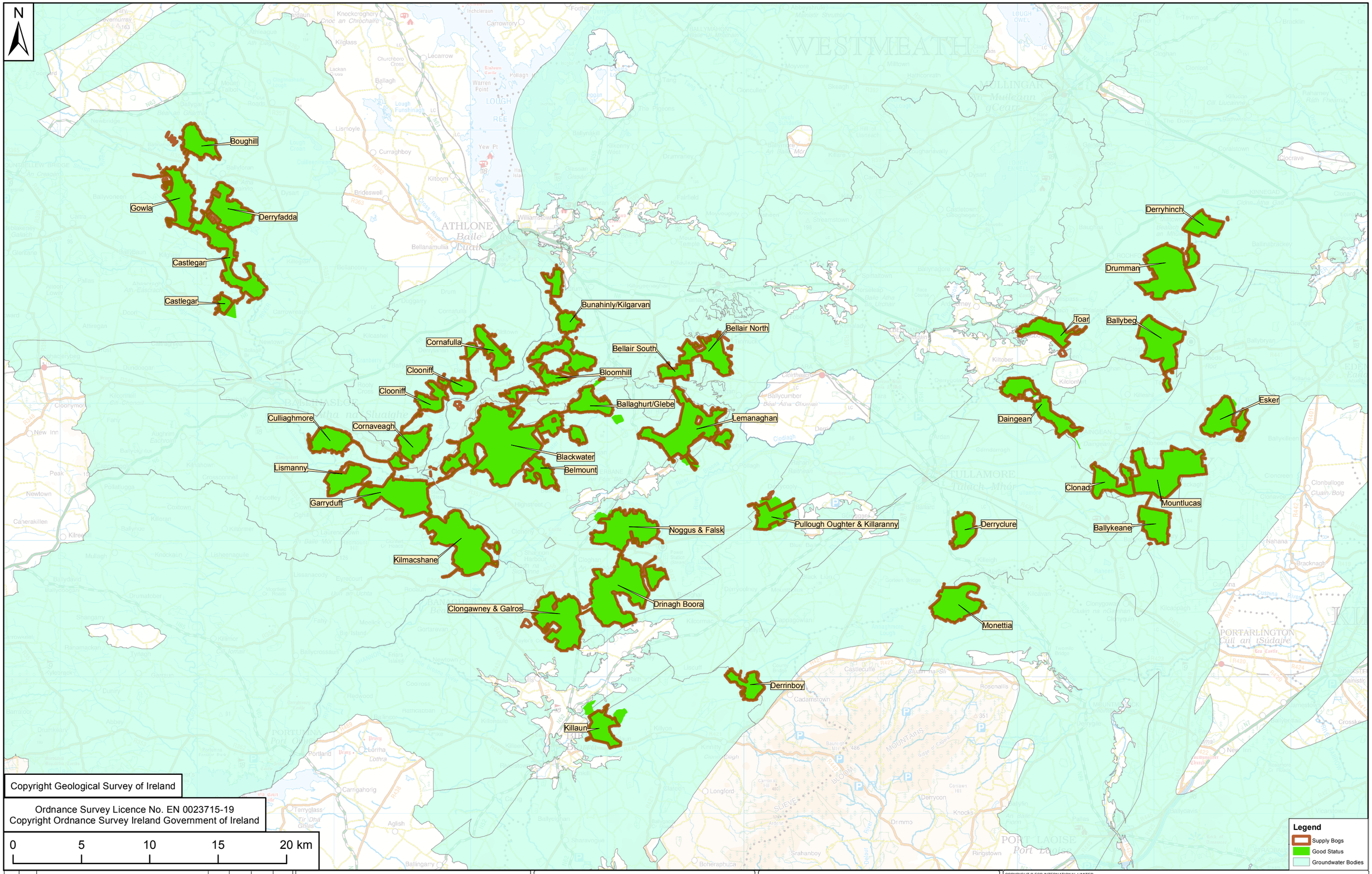
DRAWING TITLE:

Figure 7.10- Supply Bogs and Extractive Industry Pressures

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	1/1	A3	1:250,000

DRAWING NUMBER **QS-000206-01-D460-151**



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 7.11- Supply Bogs and Groundwater Status**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	O.Duffy	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	1/1	A3	1:250,000

DRAWING NUMBER **QS-000206-01-D460-152**

7.4.5 Biomass Supply

The principle source of indigenous fuel are identified in **Chapter 4** of the EIAR. The exact location of biomass source within Ireland has not been yet been identified but will be a combination of state and privately owned forest estates and agricultural lands generally within a 100km radius from the WOP generating station as described in Chapter 4.

Under the Forestry Regulations 2017 (S.I. No. 191 of 2017) the prior written approval from the Minister for Agriculture, Food and the Marine is required for all applications for licences for afforestation, forest road construction projects and harvesting whether grant-aided or not, and for aerial fertilisation and tree felling operations, require. The activities are as follows

- **Tree felling (harvesting)** – the uprooting or cutting down of any tree (subject to certain exemptions);
- **Aerial fertilisation** – aircraft application of fertiliser to a forest;
- **Afforestation** – the establishment of a forest or stand of trees in an area where there was no previous tree cover where the area involved is greater than 0.10 hectares (approximately 0.25 acres);
- **Forest road construction** –construction of a forest road.

Before the Minister can grant approval for any of the above activities, they must first determine if the project is likely to have a significant environmental effect.

In addition to the above licencing requirements the Forests and Water Quality Guidelines were developed by the Forest Service and apply to all grant-aided projects and to all activities associated with a Felling Licence. These guideline make provisions for the following:

- SAC, SPAs and pNHAs/NHAs;
- Areas sensitive to acidification;
- Areas sensitive to erosion;
- Buffer Zones;
- Ground preparation and drainage works;
- Fertiliser application and storage;
- Chemicals, fuel and machine oils;
- Roads, bridges, culverts and fords; and
- Harvesting.

In relation to the development of energy crops within the agriculture sector (such as Short Rotation Coppice (SRC) of willow), environmental protection is facilitated through the implementation of cross-compliance and agri-environmental schemes (e.g. GLAS) under the Common Agricultural Policy, the application of measures under the Nitrates Action Programme (as required under the EU Nitrates Directive (91/676/EEC)) and the ongoing

employment of the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011 (as amended).

The second River Basin Management Plan also acknowledges that the Forest Service[4] is aware of the negative impacts inappropriately sited forests and poorly managed forest operations can give rise to. In addition the RBMP acknowledges agriculture as a significant pressure in approximately 53% of At Risk water bodies due to excess nutrients; chemicals, including those used in pesticides; and sediment loss due to poor land management have all been identified as likely pressures in certain water bodies (DHPLG,2018). The principle actions that have been proposed in the RBMP to address these pressures at a strategic level relate primarily to surface water quality protection and are set out in Chapter 8

Biomass will be sourced from demonstrably sustainable sources only which will be audited and certified, see Chapter 4.

7.5 Impacts of the Development

This assessment considers the likely significant effects on the environment arising in relation to groundwater, including the secondary, cumulative, transboundary, short term, medium term and long term permanent and temporary, positive and negative effects of the proposed development.

In the “Do Nothing” scenario the generating station would close with full decommissioning under its IE Licence requirements and also would be demolished within two years as required by the planning permission for the station. The proposed development would allow the station to continue in operation with all existing potential impacts arising from such operation continuing. Additionally, there would be potential; impacts from the construction of biomass storage and handling facilities and from operation of the generating station on biomass. These are discussed below.

7.5.1 WOP Station

This section sets out the potential impacts that could arise during the construction, operation and decommissioning phases of the project

7.5.1.1 Construction Phase

The continued use of the existing station will not require any additional construction other than the proposed storage slabs and pellet storage facilities for biomass use.

For the biomass storage areas additional site investigations will be carried out prior to detailed design to confirm the soil properties.

The following impacts are therefore predicted for the biomass storage slab construction:

[4] Part of the Department of Agriculture, Food and Marine (DAFM)

Land, Soils and Geology

Potential impacts can arise from construction within the WOP station of the biomass storage slabs and pellet silo. These will be will either be ground baring slabs excavated to a depth of less than one metre or piled foundations to bedrock. This is confined to the excavation of mainly made ground. There will be no impact on karst features, no impact on geological heritage as there are none in the study area and although impact on soils will occur, this is mainly on made ground and will not be significant.

The main impacts that could potentially arise from piled foundations are similar to those of the ground bearing foundations. Where confirmatory site investigation works indicate that a piled foundation design is required there will be less potential for impact on soils as the depth of excavation of the slabs will be less and again **no significant impact** will occur.

Impact on soils occur in an industrial site setting and will be negative but with a slight effect, localized in extent and long term in nature.

Hydrogeology

Potential Impacts are as follows and arise from typical engineering practices as follows:

- The excavation of soil reduces the natural protection of groundwater to contaminants at or near the ground surface and makes the groundwater more vulnerable to any losses of hydrocarbons, effluents and surface water run-off during construction.
- General surface water run-off from the site may contain high levels of particulate matter associated with soil disturbance which could gain access to the groundwater if a flowpath was available.
- Hydrocarbons may be lost to the ground and subsequently the groundwater during fuelling of plant and vehicles during construction.
- Where piling is required this could potentially allow mobilisation of contaminants into the groundwater through creation of preferential flow paths. Impact to groundwater would be localised given the low productivity of the groundwater.
- The development will require the construction of concrete structures and foundations, which may give rise to high alkalinity waters and slurries that could reduce receiving water quality.
- Wastewater effluents will be generated by site facilities, such as toilets, given the scale of the project it is expected that the construction phase will require the provision of foul water holding tanks at the contractor's compound areas. These will be emptied regularly and routinely disposed of in a licensed facility.
- No groundwater wells will be affected by the construction of the biomass storage facilities at WOP station.

The aquifer beneath the site is described as Ll being moderately productive in localised areas only. Given the lower productivity of the groundwater resource beneath the site and the protection provided to it by overlying soils, the development of the project is considered to represent a **not significant risk to groundwater resources** and risks associated with groundwater abstraction and quality are not considered further in this respect.

It is unlikely that contaminated runoff will access the groundwater in this location due to the impermeable nature of the soil/subsoil and the scale of the development proposed. The impact is predicted to be **negative, localised in extent, slight in effect, temporary in nature and of low probability**.

Waste

In a worst case scenario where excavated material cannot be reused on site the following quantities would require disposal off-site to a licensed waste landfill:

Biomass storage slabs: 3,169 m3 of made ground material, 4,300m^3 of peaty gley material

Pellet storage: 520m^3 of made ground

Impact on waste will be **negative but with a slight effect, localized in extent and long term in nature.**

7.5.1.2 Operational Phase

Existing generating station activities

During the operational phase the existing activities at WOP station will continue as previously.

There are no direct discharges from these activities to groundwater but potential impacts could arise from equipment malfunctions giving rise to spillages or leaks of hydrocarbons which could potentially impact the groundwater or from leakage arising from storage of chemical materials.

Should these impacts materialise, they would be negative, significant, effect the groundwater body and would be temporary to short term in duration. The likelihood of such an impact occurring is low however as the station operates in accordance with its IE Licence requirements which requires all hydrocarbon and chemicals storage to be fully bunded and management procedures to be implemented in accordance with the stations Environmental Management System (EMS)

Biomass operations

Storage of biomass on the concrete storage slabs will not give rise to direct discharges to groundwater from these areas. Surface water runoff from the storage areas will be collected to the site drainage and attenuation system before discharge to the River Shannon, see **Chapter 8**.

However, potential for impacts on groundwater will still exist with the possibility of oil and fuel spills from equipment and heavy goods vehicles operating on site. Any impact from such an occurrence would be localised temporary and slight in nature as there will be a limited number of vehicles and equipment items in use.

The station will operate in accordance with its IE Licence and will also implement a delivery management system for all fuel deliveries to minimise site congestion and ensure minimum risk of accident occurring on site.

Decommissioning Phase

During decommissioning potential for impact would arise similar in nature to the construction activities on site but the scale would be much larger as the station would be decommissioned to render it environmentally safe and then subsequently demolished in accordance with the requirements of any planning permission granted. The decommission process would be strictly in accordance with the EPA approved Decommissioning Management Plan. The impacts would be slight, temporary in nature and short term in duration.

7.5.2 WOP Ash Disposal Facility

7.5.2.1 Construction Phase

The WOP ash disposal facility is an existing facility with ongoing operations. Were the generating station to close as in the "Do Nothing" Scenario the existing ADF would also be closed and capped in accordance with the requirements of its IE Licence. The proposed development will continue to see the ADF in operation to accommodate additional ash deposition from the generating station. There will be no change in the construction methodology or operational methodology as compared to the existing situation and as approved by the EPA. The proposed development will involve the increased deposition of ash into the existing active ADF to accommodate the continued disposal of peat ash from WOP Station.

The impact is predicted to be negative**, localised in extent, slight in effect, permanent in nature and of high probability**.

Land, Soils and Geology

Construction of the WOP ADF will require the excavation of material to establish base layer of the landfill on a cell by cell basis. This depth is generally the base depth of the excavation at which the ADF liner is placed. This will involve the excavation of circa 2 m in peat and subsoil to facilitate. However, if rock or cobbles are encountered it will be necessary to remove these to provide a suitable surface for the liner. In this case, these areas will be backfilled with suitable material sourced on site. Also there will be localised excavation underneath the cell to lay a pipe for under-cell drainage. This development will result in a permanent removal of peat in the area of excavation. The majority of excavated peat and subsoil will, however, be side casted and landscaped in the immediate area or subsequently used to cap closed cells. Additional capping material will be excavated from within the ADF footprint and used as capping material to finally close the landfill site.

The impact is predicted to be negative**, localised in extent, slight in effect, permanent in nature and of high probability**.

Hydrogeology

The potential for direct impacts to the environment is typically highest during the construction stage due to the increased number of personnel and construction stage vehicles working at the site with potential for. As a result of the increase in site activity and presence of

potentially polluting substances (foul water, fuel oils etc.), there is a potential for accidental leaks or spills to impact on the groundwater.

However, the impact is expected to be **negative, local, temporary and slight to moderate** in nature.

7.5.2.2 Operational Phase

Land, soils and geology

During the operational stage ash from WOP will be deposited into the active cells within the landfill. In general as one cell is in the active phase the next cell will enter construction. Suitable excavated peat, is generally used to cover the geo-synthetic capping layer and composite drainage layer on previously constructed cells that are filled with ash and capped. The excavated subsoil is generally used to construct the cell embankments of future cells or temporarily stockpiled in a suitable location to be used in future embankment construction.

Land use will change from excavated peatland to landfill cells which will be a permanent effect as the footprint of the landfill will grow as cells are brought into operation. Soil type will change from peat to deposited ash comprising made ground.

The impact is expected to be **negative, local, permanent and slight to moderate** in nature.

Hydrogeology

During the course of the operational stage, the ash is tipped from the train wagons and is placed in the cells using low bearing pressure tracked earthmoving plant. The ash is placed semi-dry and is wetted to control potential dust emissions. A tractor drawn spray tanker or fixed spray system is used in wetting the ash to aid compaction and further prevent dust nuisance. This machinery is the same as is currently used on the active ADF and there is no evidence of a significant impact. Similar to the construction stage, control measures will be implemented which mitigate the impact such as fuel storage bunds, spill kits etc. to prevent contamination of groundwater.

Leachate from the ash deposited will be generated during the operational stage. This will settle at the base of each cell. Although each cell is lined, there is the potential for leachate to leak from the engineered leachate containment system and impact the underlying soil, shallow groundwater in the overburden and bedrock aquifer.

Once each cell is full, the cell will be capped, preventing rain ingress. This in turn prevents the generation of leachate.

A comprehensive review completed in 2018 of available groundwater monitoring data, did not identify any significant impacts to shallow groundwater or bedrock aquifer as a result of the existing ADF. This together with the operational monitoring and long term monitoring after closure means that it is unlikely that the proposed development will have a significant impact.

There is no evidence of a significant or adverse impact on the groundwater quality as a result of the continued use of the existing ADF. The type of impact is considered “do nothing”

whereby the development will not affect the future hydrogeological environment in the short to long term.

It therefore likely that the proposed development will result in a **not significant** impact.

However in the “worst case scenario”, where leachate leaks into the shallow groundwater and migrates to the underlying bedrock aquifer, this would be considered a **negative impact** of **moderate adverse significance** given the low importance of the underlying aquifer

There will also be no increase in frequency in the train runs bringing waste ash from the station and the ADF as the operation of the station will remain the same. There is no evidence of impact to groundwater from the train wagons and it is not considered that the train runs associated with the proposed development will result in a significant impact.

There is no evidence of a significant or adverse impact on the groundwater quality as a result of fuel oil or chemical storage from the continued use of the existing ADF.

The type of impact is considered “do nothing”, whereby the proposed development will not affect the future hydrogeological environment. However in the “worst case” scenario, where fuel oil leaks into the shallow groundwater and migrates to the underlying bedrock aquifer, this would be considered a **negative impact of imperceptible significance and temporary in duration**.

7.5.2.3 Decommissioning Phase

The closure and long term aftercare management of the ADF is controlled under the EPA license which includes a Decommissioning Management Plan (DMP) and a Closure, Restoration and Aftercare Management Plan (CRAMP) for the ADF (QS-000139-01-R105-009 dated 12th October 2016) and subject to annual review by the EPA.

As part of the CRAMP, EPA monitoring requirements, impacts to the environment including impacts to soil, underlying shallow groundwater and bedrock aquifer are monitored for a period of 10 years following closure.

Once capped and closed there will be no further potential for impact on soils, geology and hydrogeology. Rehabilitation of the landfill will occur over a period of time with natural regeneration of vegetative cover leaving a vegetated mound. The impact of this will be **positive, permanent in nature and slight** in effect.

7.5.3 Peat Supply to WOP Station

Bord na Móna has been commercially harvesting peat in Ireland since its foundation by the Irish Government in the 1930’s. Bord na Móna currently supplies approximately 3.8 million tonnes of milled peat per annum to three peat-fired power plants, including WOP Station (approximately 1.2 million tonnes per annum). The bogs that will supply peat fuel to WOP Station to 2027 are currently, or have recently been, in production. As such, the upper acrotelm layer (which includes living plants) has been completely removed. The remaining, deeper peat layer (which contains dead plant material) is harvested by Bord na Móna and supplies peat fuel to WOP Station.

Refer to Chapter 4, which presents details on the bogs which supply peat to WOP Station, their size and the associated EPA Licence governing the environmental monitoring and management requirement for each bog.

It is noted that there will be no requirement for the development of any new raised bog areas within the supply bog estate to provide peat to WOP but the ongoing peat supply to the generating station is associated to the continued operation of the Bord na Móna peat supply bogs identified in Section 7.3.4.

The primary emissions to water associated with peat harvesting are discharges arising from the bog surface water drainage channels.

The IPC Licences identify the Bord na Móna workshop areas and depots as the main area of concern with respect to groundwater contamination where potential for contamination from fuels, oils and chemicals arising from leachates and accidental spillages could occur. Condition 9 of the IPC Licences (see **Appendix 7.5**) relates to protection groundwater protection from these locations. The conditions relevant to groundwater are typically as follows:

- No potentially polluting substance or matter shall be permitted to discharge to off-site surface waters, off site storm drains or groundwater.
- Within twelve months of the date of grant of licence, all tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded, either locally or remotely, to a volume not less than the greater of the following;
    - 110% of the capacity of the largest tank or drum within the bunded area
    - 25% of the total volume of substance which could be stored within the bunded area.
- Drainage from bunded areas shall be diverted for collection and safe disposal.
- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter. A report on such tests shall be included in the AER.
- The loading and unloading of fuel oils shall be carried out in designated areas protected against spillage and leachate run-off. While awaiting disposal, all materials shall be collected and stored in designated areas protected against spillage and leachate run-off.
- A maintenance/cleaning log for all oil interceptors and septic tanks shall be maintained. This log shall also record the observations made during weekly inspections of all oil interceptors and bi-annual inspections of septic tanks.
- An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly.

- Provision of a catchment system to collect any leaks from flanges and valves of all over ground pipes used to transport material other than water shall be examined.
- A programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines are tested at least every three years. A report on the first testing shall be submitted to the Agency within twelve months of the date of grant of licence and as part of the AER thereafter.
- An adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage to be provided
- Removal and safe disposal of waste oil and oil contaminated soil.
- Recording and logging of bi-annual inspections of all rail and tractor transported fuelling units. These inspections as a minimum should record any damage or leaks or flaws in rolling stock that could result in accidental spillage.

A review of the AERs and the EPA Inspection Report for the period 2015-2017 was undertaken for the purpose of this assessment. The majority of sites reported no breaches of the conditions. In addition sites related to peat supply for WOP have been subject to EPA inspection over the last two years with correction actions identified by the EPA as required.

Impacts on water resources related to the supply bogs from the continued operation of the WOP generating station are considered to be **indirect, long term, negative, and negligible** with the implementation of existing control measures required under the IPC Licence and ongoing enforcement of the IPC Licence conditions by the EPA

7.5.3.1 Geology and Hydrogeology

These bogs are all within the counties of Offaly, Galway, Westmeath, Meath and Roscommon and share a number of general environmental characteristics as described below.

Appendix 7.4 presents the general, aquifer productivity, groundwater vulnerability, geology, groundwater status and assigned groundwater risk for each bog.

Groundwater status for groundwater bodies on which supply bogs are located is stated as Good by the EPA, see **Table 7.4 in Appendix 7.4.**

7.5.4 Biomass Supply to WOP Station

The primary emissions to water associated with biomass production are discharges arising from forestry operations, agricultural activities and management activities such as fertilisers and these are principally to surface waters and not to groundwater.

There are a number of legislative requirement in existence in relation to the forestry sector as detailed in Section 7.3.5.

In relation to the biomass supplies ESB will ensure that only biomass which has received sustainability certification is used, see Chapter 4.

Impacts on water resources related to the biomass supply from the continued operation of the WOP generating station are considered to be indirect, long term, negative, and negligible with existing control measures as detailed in Section 7.4.1.1 and if sustainability certification in place.

7.5.5 Do Nothing' Scenario

Under the 'Do Nothing' scenario, the WOP Station and ADF will close at the end of 2020. This will require decommissioning and demolition of the station under the IE Licence Decommissioning Management Plan and Planning conditions relating to closure and implementation of the Closure, Restoration and Aftercare Management Plan for the ash disposal area.

Should closure of the ADF and decommissioning of the power station occur, the impacts in relation to Groundwater would entail the cessation of development of disposal cells; there would be no additional impact to groundwater. An associated overall reduction in peat harvesting from the surrounding Bord na Móna supply bogs would also occur.

7.6 Mitigation

7.6.1 WOP Station

The station is managed under EPA IE licence P0611-02 which enforces control measures to mitigate against potential risk to groundwater. During the construction phase additional mitigation measures, other than compliance with the limits regulated by the EPA, are considered necessary in terms of groundwater. To avoid potential impacts the following guidelines will be implemented as appropriate

- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA, 2001).
- Inland Fisheries Board Guidance Document (formerly developed by Eastern Fisheries Board) "Requirements for the protection of fisheries habitat during Construction and development works at river Sites";
- UK Environment Agency:
    - GPP5 Guidance for Pollution Prevention Works and Maintenance in or near Water;
    - GPP21 Pollution Incident Response Planning;
    - GPP22 Dealing with Spills; and
    - PPG26 Pollution Prevention Guidelines Drums and Intermediate Bulk Containers
- In the event that confirmatory site investigations at construction locations identifies contaminated soil this will be removed by a licenced waste contractor as appropriate and safety requirements for all construction workers will be ensured. In line with good engineering practice the following UK Guidance will be implemented

- Environment Agency (England and Wales) (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

In addition the following current mitigation measures as developed in compliance with the IE Licence for the Site will be maintained during construction, operation and decommissioning, see **Table 7-8**.

Table 7-8: WOP Station Current Mitigation Measures

Potential Impact Type	Mitigation Measure
Groundwater Quality	All tank, container and drum storage areas shall be rendered impervious to the materials stored therein.
	Bunds shall be designed having regard to Agency guidelines 'Storage and Transfer of Materials for Scheduled Activities' (2004).
	All tank and drum storage areas shall, as a minimum, be bunded.
	All drainage from bunded areas shall be treated as contaminated unless it can be demonstrated to be otherwise.
	All drainage from bunded areas shall be diverted for collection and safe disposal unless it can be deemed uncontaminated.
	All inlets, outlets, vent pipes, valves and gauges must be within a bunded area.
	All tanks, containers and drums shall be labelled to clearly indicate their contents.
	The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage at the installation. Once used, the absorbent material shall be disposed of at an appropriate facility.
	The licensee shall maintain oil separators at the installation:
	All pump sumps, storage tanks, lagoons or other treatment plant chambers from which spillage of environmentally significant materials might occur in such quantities as are likely to breach containment or separators, shall be fitted with high liquid level alarms or oil detectors as appropriate.
	The provision of a catchment system to collect any leaks from flanges and valves of all over ground pipes used to transport material other than water shall be examined.

7.6.2 WOP ADF

The main mitigation measure will be the full implementation and compliance with the limits of the IE Licence as regulated by the EPA and which are considered necessary in terms of groundwater. The proposed ash cells will be constructed with the same drainage system as the current cells. The landfill will be engineered and constructed in accordance with the EPA approved Landfill Operational Plan as required by the Stations IE Licence.

The following

Table 7-9 details mitigation measures which will be implemented to minimise the impact to the groundwater.

Table 7-9: WOP ADF Mitigation Measures

Stage	Potential Impact	Mitigation Measure
Construction	Chemical and fuel oil spills/leaks	All temporary tank and drum storage areas shall be bunded. Adequate supply of containment booms and suitable absorbent material to contain and absorb any spillage or leak maintained at the ADF. Once used, the absorbent material shall be disposed of at an appropriate facility. Designated vehicle refuelling points will be implemented where vehicles can be refuelled in a controlled environment.
Operational	Leachate leak from the engineered leachate containment system	Impermeable liner and good modern design in accordance with landfill directive (Council Directive 1999/31/EC) requirements which includes a leachate alarm and pumping facility. Capping of each cell within two years of completion to minimise the volume of leachate generated as per the current IE Licence requirement. Monthly, quarterly and annual groundwater monitoring and reporting to EPA as directed by the EPA License monitoring requirements.
Decommissioning	Leachate overtopping the cell liner through excessive infiltration of surface water.	Monitor groundwater for capping failure and in accordance with the closure and aftercare management plan (CRAMP) for a period of 10 years following closure. As agreed with the EPA.

7.6.2.1 Peat Supply to the WOP Station

The Bord na Móna bog groups which supply WOP Station are regulated by the EPA under IPC Licences Registration No's. 500, 501, 502, 503 and 507 respectively. No additional mitigation measures, other than compliance with the control measures regulated by the EPA, are considered necessary in terms of hydrogeology. **Table 7-10** details the control measures conditioned under the IPC licencing regime, as regulated by the EPA protective of groundwater.

Table 7-10: Control Measures Applicable to Bord na Móna Bogs

Potential Impact Type	Control Measure
Groundwater Quality	Effective spill/leak management of mobile fuelling units.
	Replacement (and remediation where necessary) of all underground fuel tanks.
	There shall be no other emissions to water of environmental significance.
	All tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded,
	Drainage from bunded areas shall be diverted for collection and safe disposal.
	The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter.
	The loading and unloading of fuel oils shall be carried out in designated areas protected against spillage and leachate run-off. While awaiting disposal, all materials shall be collected and stored in designated areas protected against spillage and leachate run-off.
	With the exception of roof water, all surface water discharges from workshop areas shall, be fitted with oil interceptors.
	An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly.
	The licensee shall undertake a programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines are tested at least every three years.
	The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

Potential Impact Type	Control Measure
	The licensee shall maintain a log of bi-annual inspections of all rail and tractor transported fuelling units. These inspections as a minimum should record any damage or leaks or flaws in rolling stock that could result in accidental spillage.
	The licensee shall ensure that a documented Emergency Response Procedure is in place which shall address any emergency situation which may originate on-site. This Procedure shall include provision for minimising the effects of any emergency on the environment
	A maintenance/cleaning log for all oil interceptors and septic tanks shall be maintained. This log shall also record the observations made during weekly inspections of all oil interceptors and bi-annual inspections of septic tanks.

7.7 Difficulties Encountered in Compiling Information

No difficulties were encountered during the assessment.

7.8 Residual Impacts

With the implementation of the requirements of the IE Licence for the WOP Station construction methodology and control measures and continued good engineering practice on the site, it is expected that there will be no significant residual cumulative impacts to the groundwater body beneath the power station site.

Similarly, with the implementation of the of the IE Licence for the WOP Station and in particular the EPA approved Landfill Operational Plan, construction methodology and control measures, it is expected that there will be no significant residual impacts on the groundwater or soils in the ADF area as is the case currently.

7.9 Cumulative Impacts

The potential for cumulative impact between station and identified other major projects has been assessed.

Potential cumulative impacts between WOP station itself and the ADF could occur as WOP station is partly located on the same groundwater body, (Cara) as the ADF and construction related activity could give rise to cumulative groundwater contamination. However, WOP is located approximately 5.5km from the ADF and no cumulative impact is predicted.

Lumcloon Energy Limited is a Lithium ion battery energy storage development located adjacent to the WOP station site and has the potential for cumulative impact on land, soils,

geology and groundwater. There will be physical loss of agricultural land associated with this development with excavation of foundation base and construction of an industrial building to house the battery storage units. Mitigation measures have been proposed to address potential impacts during construction of the proposed development. There will be no potential for operational cumulative issues.

The Lough Ree Power (LRP) Station and ADF will also be subject to a planning application in relation to the transition of the station from peat to biomass. However, the LRP site and ADF site are located circa 50km from the WOP station on different groundwater bodies and therefore no cumulative impacts are anticipated.

Similarly the Bord na Móna Edenderry Power Limited (EPL) generating station and the ADF are located to the east of WOP a distance of circa 60 km and also on different groundwater bodies. Again there will be no cumulative impacts from this development.

Several of the peat supply bogs which supply WOP station also supply the other ESB-owned midland power station at Lanesborough (LRP) station), which also receives peat exclusively from a number of other supply bogs in the region. The Bord na Móna-owned EPL power station is also supplied by Bord na Móna bogs, predominantly in the east midlands. Bord na Móna also harvests peat for other end uses (e.g. horticulture) on a suite of sites around the midlands, within the same groundwater catchments as the WOP supply bogs. These other bogs are also subject to IPC licencing and associated conditioned groundwater quality protection measures. Therefore no cumulative impacts are anticipated.

No significant cumulative impacts associated with the proposed development and any identified plans or projects, are anticipated.

7.10 Water Framework Directive Compliance

The EU WFD has introduced environmental targets with specific objectives including:

- To prevent deterioration of the status of groundwater
- To protect, enhance and restore all bodies of groundwater and ensure a balance of abstraction and recharge, with the aim of achieving good groundwater status (quantitative and chemical)
- To reverse any significant and sustained upward trends in the concentration of pollutants in groundwater

The proposed development will not cause the deterioration of groundwater quality within the groundwater bodies adjacent to the proposed development either during construction (with implementation of appropriate mitigation measures) or during the subsequent operational phase with established mitigation and design. Therefore it can be concluded that the proposed development will not compromise the ability of groundwater bodies to maintain the “Good” status assigned by the EPA, see https://gis.epa.ie/EPAMaps/.

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7.11 References

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- GPP21 Pollution Incident Response Planning;
- GPP22 Dealing with Spills; and
- PPG26 Pollution Prevention Guidelines Drums and Intermediate Bulk Containers