



Hydrogeological Desk Study Appraisal

Application for the Development of Houghton Main Renewable Energy Centre (REC) comprising a Timber Resource Recovery Centre (TRRC) and Associated Infrastructure

Land located off Houghton Main Colliery Roundabout, Park Spring Road, Houghton Main, Barnsley

Peel Environmental Management (UK) Limited and Houghton Main Waste Limited

CRM.066.004



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For:	Peel Environmental Management (UK) Limited and Houghton Main Waste Limited
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1. Introduction

1.1 Background

- 1.1.1 Peel Environmental Management (UK) Limited proposes to develop and Timber Resource centre at Houghton Main. The aim of this study is to undertake a desk based hydrogeological review of the site based on available information.
- 1.1.2 The planning application and its supporting Environmental Impact Assessment present revised proposals for the development of a Timber Resource Recovery Centre, which will treat up to 150,000 tonnes per annum of waste wood and virgin timber through a gasification process which will generate over 20MW renewable electrical power.

1.2 Objectives

- 1.2.1 The objectives of this study are to;
- Review available geological and hydrogeological data for the site and complete a Desk Study. The desk study has been carried out on a larger area than the application site;
 - Assess the implications of any potential risk associated with groundwater (levels, flows and quality) and identify any development constraints associated with the site in relation to the future use of the site;
 - Provide a factual and interpretative report relating to the desk study, including recommendations in relation to groundwater risk;

1.3 Data Sources

- 1.3.1 This report makes reference to the following data sources:
- Phase 1 Environmental and Mining Report, Houghton Main, Barnsley (Enzygo, January 2015);
 - NPPF Flood Risk Assessment, Houghton Main, Barnsley (Enzygo, January 2015)
 - BGS Solid and Drift Geology map Sheet Map 087 – Barnsley, 1:50,000 Scale.
 - BGS Online viewers – Geology Maps and Borehole Records
 - Groundsure GeolInsight Report -EMS_245265_329171 (April, 2014)
 - Groundsure EnviroInsight Report - EMS-245265_329172 - 08/04/2014 (April, 2014)
 - Environment Agency Water Framework Directives Map viewer – Groundwater and Surface Water
 - The Coal Authority – Coal Mining Report (April, 2014)

1.4 Site setting and geology

Site Location and Description

- 1.4.1 The site's address Land off Houghton Main Colliery Roundabout, Park Spring Road, Barnsley, S71 5EX. The site is located at NGR 441799, 406582, with an approximate area of 2.915ha.
- 1.4.2 The site is described in detail in the Phase 1 Report, which also includes a detailed review of the site history, coal mining, expected ground conditions and potential sources of contamination. The sites current condition is described as follows
- The site currently comprises overgrown derelict land with shrub bushes and rough grassland.
 - A former railway embankment is shown on the north-western boundary of the site.
 - There are no public restrictions on the site and there are numerous dog walking paths traversing the site.
 - Park Spring Road marks the eastern boundary of the site. There are no buildings currently on site.
 - The site is accessed from Houghton Main Colliery roundabout to the south east of the site.
 - There are currently no drains on site.

Site Geology

- 1.4.3 **Artificial Ground-** The GroundSure GeoInsight report states that a large portion of the site and surrounding area consists of made ground. This made ground is the backfilled remains of an open cast coal mine which was present on site between 1997-2000. A proportion of the made ground may also be the remaining ballast from the two dismantled railway lines. No information about this made ground can be found on BGS sheet map 87 – Barnsley. For more information on past historic workings refer to the Enzygo Environmental and Mining Report, Section 4.13.
- 1.4.4 **Superficial Deposits-** Alluvial deposits are present on the sites south-western boundary. The BGS website states that these deposits mainly consist of fine clay and silt. Head Deposits are located approximately 300 meters North-west and 750 metres to the south-west of the site. The Head Deposits formed up to 3 million years ago in the Quaternary Period and comprise gravel, sand and clay depending on the upslope source.
- 1.4.5 **Bedrock Geology-** Beneath the site is the Pennine Middle Coal Measures Formation. The Pennine Middle Coal Measures Formation is interbedded with sandstones, mudstones and siltstones of the Middle Coal Measures Group beneath the site and within the surrounding area.

1.4.6 A review of the BGS Borehole records has identified a number of prominent coal seams present beneath the site and surrounding area. These coal seams are part of the Pennine Middle Coal Measures Formation.

1.4.7 A brief summary of the geology expect on site follows -

- The site is underlain by a section of the Pennine Middle Coal Measures which contains a marine band and named coal seam.
- The marine band is named the Shafton Marine Band.
- The coal seam is named as the Shafton Coal Seam, one of the shallowest named seams in the Yorkshire Coalfields. The thickness of individual coal seams varies across the coalfield. Named coal seams were often at least half a meter thick, as thinner seams were often not economically viable; therefore they remained unnamed. It is the Shafton seam which was mined on site from 1997-2000 as part of an opencast coal mine.
- It can be assumed that any mine workings and backfilling would not have proceeded beyond the Shafton seam, as the next marked coal seam lies below the Mexborough Rock.
- The Mexborough Rock is a sandstone unit, formed in the Carboniferous Period 309 to 310 million years ago.
- The Mexborough Rock is part of the Sandstone and Grit Series of the Pennine Middle Coal Measures Group.
- A number of faults have been identified within the surrounding area of the site from the Geological Map, sheet 87. The closest fault to the site is located approximately 250m to the southwest of the site.
- The dip of the geological strata beneath the site is inferred to be towards the north-east and east. An extract of the Geological Map of the site is included in Figure 1.

1.5 Coal Mining History

1.5.1 Deep and shallow (opencast) coal mining has taken place at and beneath the site. Coal Mining is discussed in detail in the Phase 1 Report which also includes a Coal Authority Coal Mining Report.

1.5.2 The Coal Authority Coal Mining Report states that:

- The property is in the likely zone of influence from workings in 11 seams of coal at 300m to 850m depth, and last worked in 1991.
- Any ground movement from these coal workings should have stopped by now.

- In addition the property is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past.
- 1.5.3 The site was operated as an open cast coal mine from 1997 to 2000, and is understood to have been approximately 40m deep.
- 1.5.4 For a full overview of likely risk associated with coal mining please refer to the Coal Mining Report.

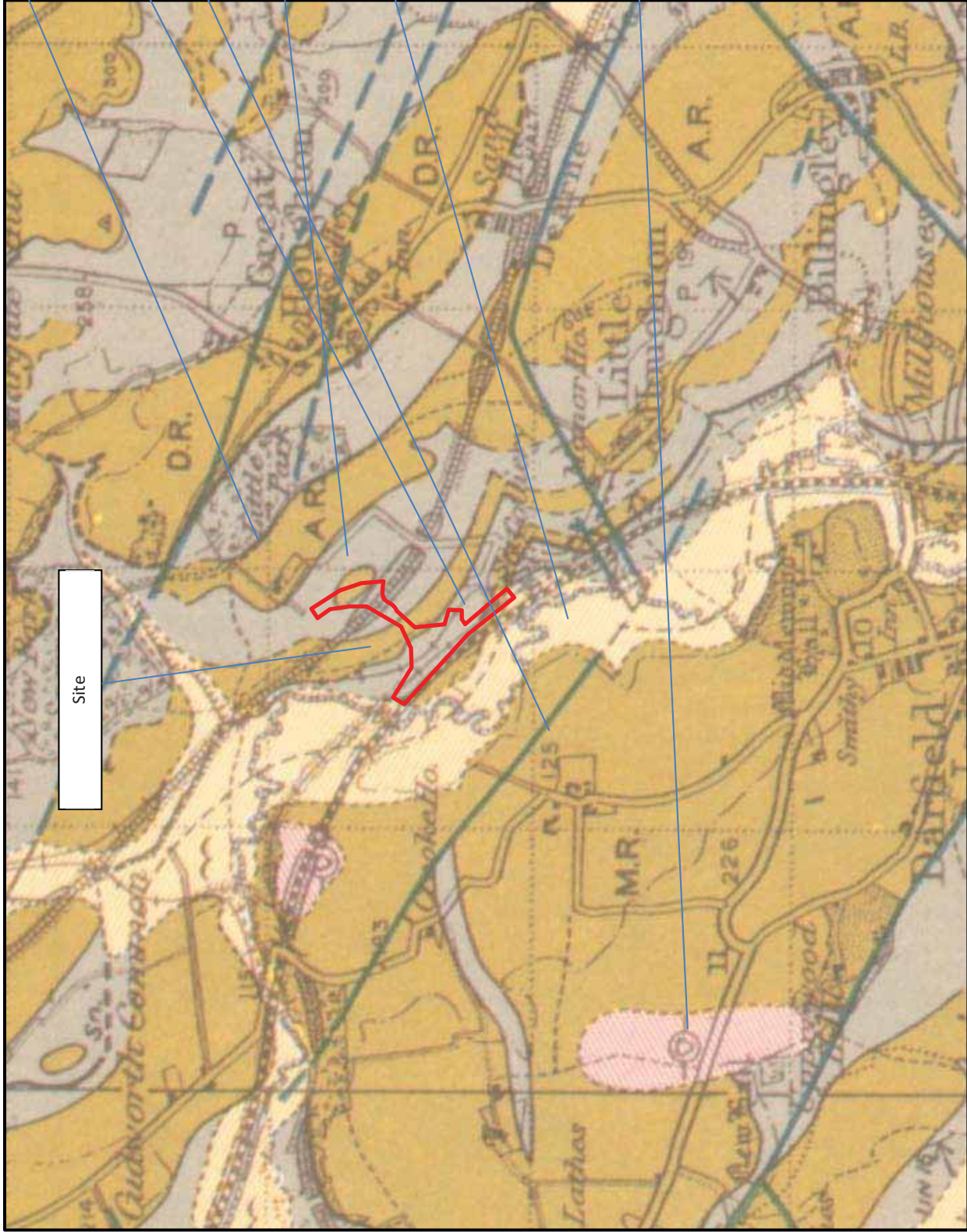
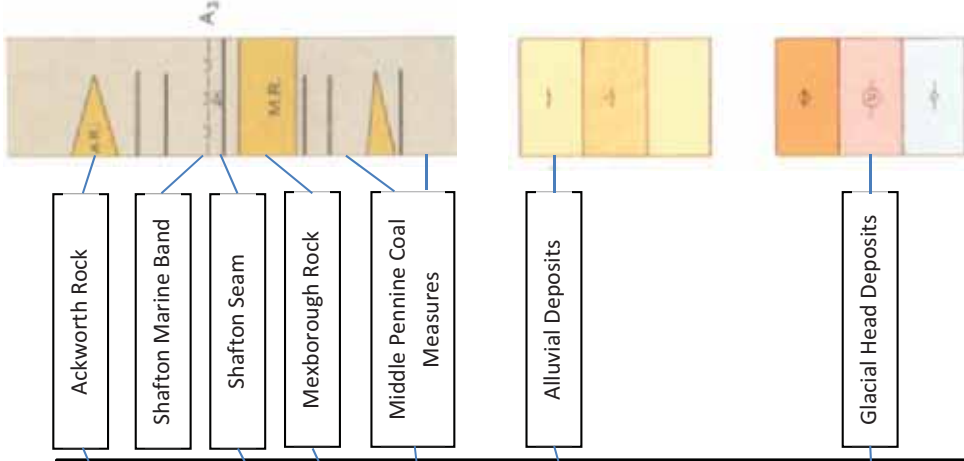


Figure 1: Geological map of area surrounding the site. [C10/018] British Geological Survey.
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2. HYDROGEOLOGY

2.1 Regional Hydrogeology

- 2.1.1 The superficial clay and silt layers present on the southern edge of the site are designated as a Secondary A aquifer by the Environment Agency. This indicates that the aquifer is capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers, in this case the River Dearne. The superficial drift layers are present along the course of the River Dearne.
- 2.1.2 Made ground is present on site as part of the former open cast coal workings and railway workings. The permeability of the made ground is shown as very high to very low reflecting the mixed nature of the materials. For more detail please refer to the Enzygo Environmental and Mining Report section 4.1.
- 2.1.3 Approximately 250 meters west of the site a tributary stream of the River Dearne incises through superficial deposits of less permeable clay and silt, which are classed as a Secondary B Aquifer. Secondary B Aquifers consist of predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water bearing parts of former non-aquifers.
- 2.1.4 The Pennine Middle Coal Measures which make up the bedrock geology of the site are also classed as a Secondary A Aquifer by the Environment Agency. The Pennine Middle Coal Measures Formation comprises inter bedded grey mudstone, siltstone, pale grey sandstone and common coal seams, residual soils and ironstones.
- 2.1.5 Argillaceous strata predominate, acting as aquitards (low permeability strata), isolating the occasional thicker sandstone units, such as the Mexborough Rock and Oaks Rock, which are effectively separate aquifer units.
- 2.1.6 Coal Measures sandstones are generally fine grained, very well cemented, extremely hard and dense. In consequence, the sandstones possess very little primary porosity and intergranular permeability.
- 2.1.7 Groundwater storage and movement occurs primarily within and through fractures in the sandstone units which is a type of secondary porosity. Sandstone horizons in the Lower and Middle Coal Measures are generally thinner in comparison to the Upper Coal Measures, and generally yield less water.
- 2.1.8 Extensive faulting in the region has frequently split previously continuous sandstone horizons into disconnected isolated fault-bounded blocks, which limits recharge and groundwater flow. The Mexborough Rock underlies the site and is considered an important sandstone horizon of the Coal Measures Group in the South Yorkshire Coalfields. However, the sandstone units are commonly limited in lateral extent, which is the case for the Mexborough Rock in the South Yorkshire region, which can impact upon the potential yield.
- 2.1.9 The mining of numerous coal seams has been widespread over virtually the whole of the Lancashire, Yorkshire and East-Midlands coalfields. Widespread removal of coal has largely disrupted natural hydrogeological conditions of the Coal Measures Group by the

creation of open shafts and disused mine workings. Many mine drainage adits continue to drain the coal seams long after the cessation abandonment of mines. These features have created hydraulic continuity between layers which were previously isolated and, in some cases, between aquifer horizons and flooded disused workings. This modification of hydrogeological conditions led to the Coal Measures Group to be considered as an 'anthropogenically enhanced aquifer.'

- 2.1.10 Widespread development of coal mining, mine drainage pumping, associated contamination and industrial activity have meant that water supply wells and are not generally numerous. However, the Mexborough rock sandstone unit is present beneath the site and as one of the thicker sandstone units in the coal measures, may have some groundwater supply potential.

2.2 Groundwater Source Protection Zone

- 2.2.1 The site and surrounding area is not within any groundwater source protection zone (SPZ).

2.3 Licensed Abstractions

- 2.3.1 There are no licensed groundwater abstractions within 1km of the site. The closest groundwater abstraction licence is 1246 meters to the north at NGR 441600, 408000, and is held by Grimethorpe Colliery. The colliery is licenced to abstract up to 1600m³ a day for use in mineral washing. See section 5.3 of the Envirolnsight report for details of all abstractions within 2000 meters of the site.

- 2.3.2 There are no licensed surface water abstractions within 1km of the site. The closest licensed surface water abstraction is located 1730m to the west of the site at NGR 439770, 407050. The license grants permission to draw up to 5278m³ from the River Dearne for use in spray irrigation.

2.4 Private Abstractions

- 2.4.1 Barnsley Metropolitan council was contacted and asked to provide any information on any registered Private Water Supplies (abstractions of less than 20m³ a day). The council confirmed that they held no records of private water abstractions within 500m of the site. However, small scale unrecorded water abstraction could still take place in the local area.

2.5 Environmental Designations

- 2.5.1 The site is located within a Surface Water Nitrate Vulnerable Zone. This indicates that farmers must plan and record their application of fertilizers and manure to avoid eutrophication of surface waters.

2.6 Groundwater Levels and Flow Direction

- 2.6.1 The Carboniferous sedimentary strata are characterised by a low primary (intergranular) porosity. Groundwater flow is largely facilitated by bedding plane fractures, high angle joint-sets and faulting. Sandstone units demonstrate the most extensive fracturing and fissuring and constitute the main water bearing strata. The dependence of groundwater

flow on fractures and faulting often results in large discharges from flooded mine workings that intercept many fracture systems and provide a high permeability pathway for the transmission of groundwater.

- 2.6.2 Former underground workings and surface mine workings are present in the vicinity of the site so there is a high likelihood of high permeability pathways and high storage, enhanced by mine workings existing in these areas. High inflows to any excavations are likely where there are historic workings which have been subsequently flooded.
- 2.6.3 Dewatering of the mineworkings in the area is expected to have ceased, therefore groundwater levels are expected to have rebounded or may still be recovering.
- 2.6.4 Groundwater flow in a potential multi-layered fractured bedrock aquifer system is complex and flow paths are difficult to predict, particularly where old mine workings are present. The primary controls on groundwater flow within the bedrock aquifer in the vicinity of the site are considered to be:
- historic shallow and deep mine workings, shafts and adits;
 - local dip of the strata;
 - orientation and intensity of faulting;
 - hydraulic behavior of faults crossing the site (can act as barriers or conduits to flow);
 - the distribution and magnitude of aquifer recharge (limited by glacial till where this remains); and
 - the location of groundwater dependent receptors that receive groundwater discharge.
- 2.6.5 Shallow groundwater is expected to be presented in the open cast backfill beneath the site, which is expected to be in hydraulic continuity with groundwater in the uppermost undisturbed Coal measures sandstones (Mexborough Rock) and natural superficial deposits along the River Dearne. The majority of groundwater is expected to be discharging at the Dearne River located immediately to the west of the site.

2.7 Water Framework Directive Risk Categorization

2.7.1 The aim of the Water Framework Directive (WFD) is to ensure that all surface water and groundwater bodies are of good chemical and ecological status by 2015. Therefore, the most significant water bodies across England have been risk assessed within the Environment Agency's Classification Scheme as to the risk of not having 'good ecological status' by 2015. The results of the EA WFD assessments for the groundwater body directly beneath the site (Don & Rother Millstone grit & Coal Measures);

- CURRENT - Good quantitative quality; poor chemical quality;
- 2015 PREDICTED - Good quantitative quality; poor chemical quality.

2.8 Groundwater Quality

2.8.1 There is no groundwater quality data for the site. However the site history as former railway sidings and in particular open cast mining presents a potential for residual poor soil and groundwater quality.

2.8.2 One of the potential issues associated with open cast or surface coal mining activities is the potential for the replaced overburden to produce metaliferous acidic leachates that contain Hazardous and Non-hazardous contaminants. For backfill to give rise to poor quality water characterised by low pH, high sulphate and high metal concentrations, material with a high proportion of sulphide minerals must be present. Weathering of the sulphide minerals results in the reduction in pH and the leaching of metals from the backfill. Marine bands typically have a higher sulphide mineral content in comparison to non-marine deposits. It has been identified that the former open cast coal mine at the site will have exposed strata including the Shafton Marine Band, which is above the Shafton Coal Seam. It is therefore concluded that some backfill at the site has the potential to generate poor quality leachate which may have impacted groundwater quality at the site and the surrounding area.

3. HYDROLOGY

3.1 Surface Water Features

- 3.1.1 Detailed information on surface water/hydrology is included in the Enzygo Flood Risk Assessment and the Groundsure EnviroInsight Report
- 3.1.2 The closest and most prominent watercourse is the River Dearne. The River flows under a disused railway bridge at the northwest boundary of the site, then close to the sites western boundary and towards the south east. There are also several smaller secondary and tertiary watercourses in the surrounding area, including a small drain which flows a short distance from the sites southern tip to the River Dearne.

3.2 Surface Water Quality

- 3.2.1 There are chemical and biological water quality monitoring stations present along the River Dearne. The results are graded from A ('Very Good') to F ('Bad'). The chemical quality from the stations, taken from section 5.7.2 of the EnviroInsight report is summarized in the table below.

Location	NGR	River Name	Chemical Quality Grade				
			2005	2006	2007	2008	2009
On Site	441478, 406495	River Dearne, Cudworth Dike	E	E	E	D	D
On Site	441478, 406495	River Dearne, Billingley Dike	C	C	C	C	B
1129m NW	440378, 406959	River Dearne, Dike Midpoint	E	E	E	D	D

- 3.2.2 Biological Quality data describes water quality in terms of 83 groups of macroinvertebrates, some of which are pollution sensitive. The results are graded from A ('Very Good') to F ('Bad'). The biological quality from the stations, taken from section 5.7.1 of the EnviroInsight report is summarized in the table below.

Location	NGR	River Name	Biological Quality Grade				
			2005	2006	2007	2008	2009
On Site	441478, 406495	River Dearne, Cudworth Dike	D	D	D	D	D
On Site	441478, 406495	River Dearne, Billingley Dike	D	D	D	D	D

3.3 Water Framework Directive Risk Categorization

3.3.1 The aim of the Water Framework Directive (WFD) is to ensure that all surface water and groundwater bodies are of good chemical and ecological status by 2015. Therefore, the most significant water bodies across England have been risk assessed within the Environment Agency's Classification Scheme as to the risk of not having 'good ecological status' by 2015. The results of the EA WFD assessments for the River Dearne from Lundwood to River Dove are:

- CURRENT - Moderate Status for Ecological Quality; Does not require assessment for Chemical Quality
- 2015 PREDICTED - Moderate Status for Ecological Quality; Does not require assessment for Chemical Quality

4. CONCEPTUAL HYDROGEOLOGICAL MODEL

4.1 Introduction

4.1.1 To assess the potential impact of any contamination identified at the site on groundwater receptors, a risk assessment approach has been used. In order for a risk to be present at the site three components must exist:

- Contaminant(s) must be present at concentrations capable of causing adverse effects on groundwater (**Source**);
- A groundwater dependent receptor must be present, (**Receptor**); and
- There must be exposure migration pathway by which the receptor comes into contact with the contaminant (**Pollutant Linkage**).

4.1.2 The source-pathway-receptor scenario is a useful means to generate a conceptual model, which can be used to identify critical pathways that a more detailed quantitative analysis may be undertaken on if necessary. The first stage of the process was to determine the presence or absence of any contaminant(s) of concern (source) at the site, followed by the most likely pathways that these contaminants would take in the environment and finally the potential receptors of concern.

4.1.3 The key aspects with regards to hydrogeology for this project are considered to be:

- **Construction Effects:** potential impacts, from additional sources of contamination, mobilisation of existing contaminants, and the creation of rapid pathways, associated with the construction of the proposed development on groundwater dependent receptors; and
- **Operational Effects:** potential additional sources of soil or water contamination from materials stored or generated in the facility, on existing groundwater dependent receptors.

4.1.4 The assessment process identifies the different environmental setting criteria that may affect the potential impact of a location on controlled waters arising by any contaminants both historical or brought to the site during its construction or operational phases. It includes an assessment of any existing, created or modified pathways for contaminant transport to any groundwater dependent receptors at or near the site. The conceptual model ideally needs to incorporate the following key site specific data: -

- The character, size and extent of any likely sources of contamination existing in soil and groundwater at the site. (**Current Source**)
- The potential sources of contamination which could be derived from the construction or operation of the site (**Potential Source**);

- The thickness of the unsaturated zone/depth to water table **(Pathway)**
- The leaching potential of the soils and their ability to attenuate potential pollutants **(Pathway)**
- The location of any groundwater abstractions and Source Protection Zones **(Receptors)**
- The location of any nearby surface watercourses or other groundwater dependent water features **(Receptors)**

4.2 Sources

- 4.2.1 **Existing Sources:** Soil and groundwater at the site has not been investigated to date. The potential sources inside the site boundary include the former railway sidings within the site and the former open cast coal mining backfill and operations. Additional potential sources may exist associated with activities at the land directly to the east of the site, namely the historic activity of the Houghton Main Colliery.
- 4.2.2 **Potential Sources During Site Construction:** The accidental spillage of fuels/oils and chemicals stored and used on site during construction activities could result in the contamination of groundwater. Proper housekeeping of the plant and machinery used during construction including routine maintenance would minimise the risk of fuel or oil spillage. Spillage and Emergency Procedures will be followed in the event of a pollution incident, and will be developed in consultation with the Environment Agency. The plan will include the provision of appropriate emergency response equipment on-site and staff training in emergency procedures.
- 4.2.3 Fuels and chemicals will be stored and handled in accordance with best practice and appropriate guidelines, and should be stored in the least sensitive areas of the site, at the furthest practical point from potable water supplies.
- 4.2.4 **Potential Sources During Site Operation:** The accidental spillage of fuels/oils and chemicals stored and used on site during site operation activities could result in the contamination of groundwater. The generation, storage and treatment of any liquids/leachates at the facility could also present a potential risk to groundwater quality. By following best practise and appropriate guidelines for the handling and storage of hazardous and non-hazardous materials and liquids on site and the development of a suitable EMS, the potential for accidental contamination of groundwater will be minimised.
- 4.2.5 Spillage and Emergency Procedures will be followed in the event of a pollution incident, and will be developed in consultation with the Environment Agency. The plan will include the provision of appropriate emergency response equipment on-site and staff training in emergency procedures.

4.3 Pathways

- 4.3.1 Made ground is present across the site as a remnant of the dismantled railways and open cast backfill. Site plans show the intention to build a surface water storage lagoon and

bunds to divert and store surface water runoff. Any infiltration of contaminants into shallow groundwater within the made ground/backfill could migrate into the adjacent alluvial deposits or underlying sandstone units.

- 4.3.2 In natural undisturbed bedrock (Middle Pennine Coal Measures) groundwater movement would be along 'secondary' permeability pathways comprising fractures, fissures (primarily in sandstone units) and faults.
- 4.3.3 The groundwater flow direction on site is expected to be towards the south west towards the River Dearne and will provide baseflow to this watercourse.
- 4.3.4 Below ground excavations foundations and service corridors in the proposed development could also potentially provide pathways and conduits for the migration of contamination across the site.

4.4 Receptors

- 4.4.1 The main groundwater dependent receptor for the site is the River Dearne which is expected to receive baseflow from groundwater flowing beneath the site.

4.5 Source – Pathway Receptor Linkages

- 4.5.1 The site is in a low to moderately sensitive groundwater environment, the main risk associated with the proximity to the River Dearne and shallow groundwater.
- 4.5.2 There are potential former sources of groundwater contamination at the site (railway sidings and opencast backfill) which will need to be characterised prior to development. This will enable the design and construction of the facility including the foundations to take into account any poor quality groundwater. The building and foundations can therefore be designed to be resistant to the groundwater chemistry (high sulphate for example) and also to minimise the potential for mobilising contaminants or enhancing pathways.
- 4.5.3 The facility can be designed and operated to protect groundwater dependent receptors from the potential contaminant sources associated with the operation.
- 4.5.4 A Preliminary Conceptual Site Model (CSM) is presented overleaf:

Source	Location	Exposure Pathway	Potential Receptor	Probability of Exposure	Details
Groundwater					
Hydrocarbon and metals.	Railway Sidings	Vertical Migration.	Groundwater.	Low/Negligible.	Secondary A Aquifer but no nearby extraction and groundwater quality likely to be impacted by open cast activities around the site as well as on it. Therefore groundwater is of limited resource value. Remediation if gross contamination is encountered leading to environmental betterment.
	Opencast Backfill				
Hydrocarbon and metals.	Railway Sidings	Foundations creating new pathway		Low/Negligible	Piling risk assessment recommended and use of piling technique to minimise risk where appropriate.
	Opencast Backfill				
Fuels and oils	Construction plant	Vertical Migration.		Low	Addressed through good site management practices.
Surface Water					
Hydrocarbon and metals.	Railway Sidings	Horizontal Migration.	River Dearne	Low/Negligible.	Secondary A Aquifer acts as pathway. Remediation if gross contamination is encountered leading to environmental betterment.
	Opencast Backfill				
Hydrocarbon and metals.	Railway Sidings	Services creating new pathway		Low/Negligible.	Remediation measures such as clay stanks if necessary to address risk.
	Opencast Backfill				
Fuels and oils	Construction plant	Horizontal Migration.		Low	Addressed through good site management practices.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 Summary


5.1.1 The findings of the desk based hydrogeological study are as follows;

- The site geology comprises made ground and open cast backfill overlying Middle Coal measures strata;
- Shallow groundwater is expected to be present in the made ground/backfill which may be in hydraulic continuity with the alluvial deposits to the west and also deeper groundwater in the Mexborough Rock Sandstone (Middle Coal Measures);
- The former land use at the site may have impacted on groundwater quality beneath the site, primarily due to leachate from the open cast backfill which appears to have included a Marine Band in the geological sequence mined;
- The site is in a low to moderately sensitive groundwater environment; the River Dearne is the main groundwater dependent receptor and is expected to receive groundwater baseflow from beneath the site.

5.2 Recommendations

- 5.2.1 There are potential former sources of groundwater contamination at the site (railway sidings and opencast backfill) which will need to be characterised prior to development during a site investigation and groundwater monitoring programme.
- 5.2.2 The findings of the site investigation and groundwater monitoring will enable the design and construction of the facility, including the foundations, to take into account any poor quality groundwater. The buildings, foundations and subsurface structures can therefore be designed to be resistant to the groundwater chemistry (high sulphate for example) and also to minimise the potential for mobilising contaminants or enhancing pathways.
- 5.2.3 Development of the site with the use of hardstanding should reduce infiltration and provide some environmental enhancement.
- 5.2.4 Should gross contamination be encountered during the ground investigation or site development this should be remediated either through source removal or treatment giving overall environmental enhancement.
- 5.2.5 A piling risk assessment may be required if this foundation solution is used.
- 5.2.6 The facility can be designed and operated to protect groundwater dependent receptors from the potential contaminant sources associated with the operation.
- 5.2.7 Best practice during construction and operation of the site should be undertaken to minimise potential impacts upon the groundwater discharging from the site as baseflow to the River Dearne.

- 5.2.8 Use of a 'discovery strategy' during the construction phase will allow any areas of unforeseen gross contamination to be assessed and remediated.



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