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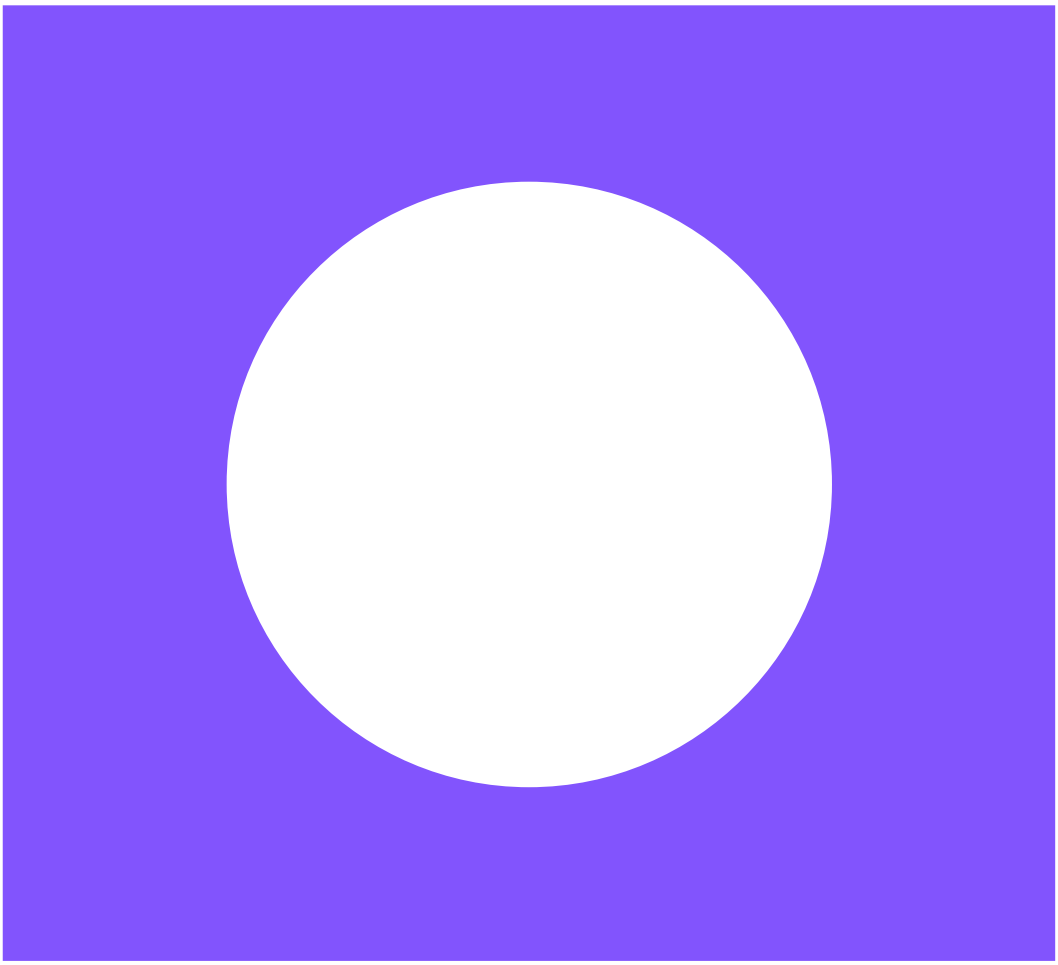

Eastern Green Link 4 - HVDC Converter Station

Coal Mining Risk Assessment

March 2025

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Coal Mining Risk Assessment

March 2025

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
01	Mar 2025	J. Carlyle	K. Wells	W. MacPherson	First Issue

Document reference: 113643-MMD-SPEN-XX-RP-GE-0685

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1 Application

1.1 Background

Mott MacDonald has been commissioned by Scottish Power Energy Networks (SPEN) to undertake a Coal Mining Risk Assessment (CMRA) in relation to the proposed construction of a new HVDC Converter Station at Westfield, near Ballingry, Fife, Scotland as part of the Eastern Green Link 4 project.

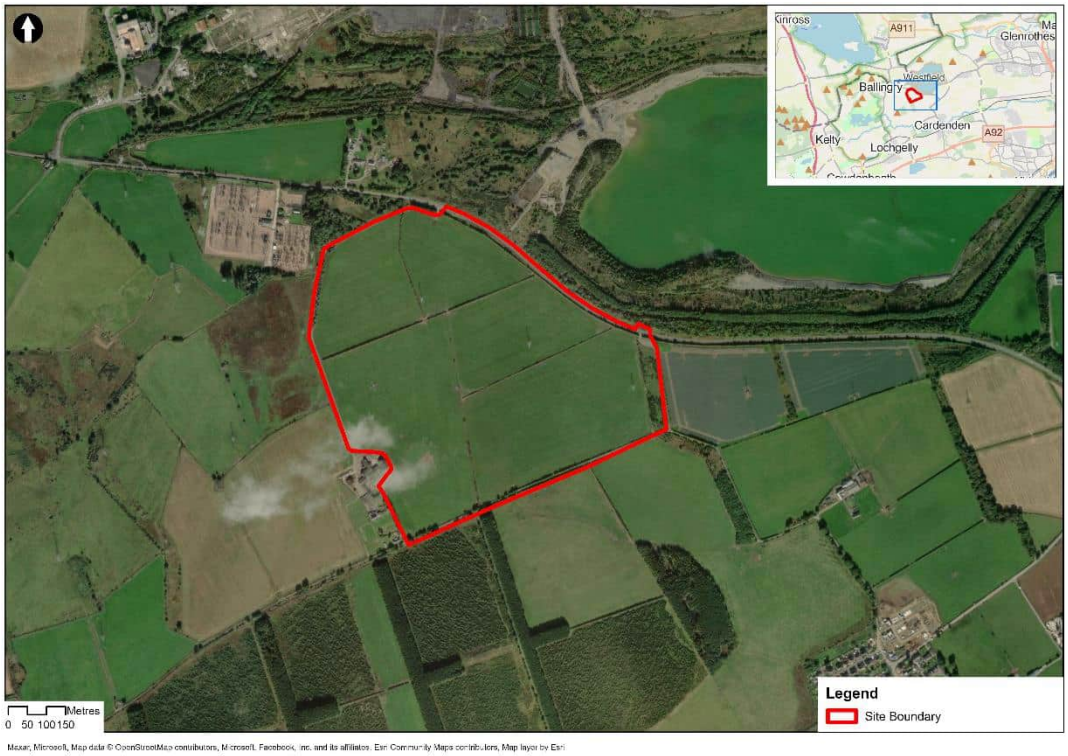
This report has been written in accordance with the Coal Authority's Guidance for Developers document [1] to assess the potential risks associated with historical coal mining to the proposed development.

1.2 Site Location

The proposed converter station is located approximately 9km northwest of Kirkcaldy, Fife, 1.5km east of Ballingry.

A site location plan is presented in Figure 1.1.

Figure 1.1: Site Location Plan



Source: Mott MacDonald, 2025

1.3 Site Description

The site comprises five agricultural fields separated by hedgerows. Overhead power lines as well as telephone poles cross the field in an approximate ESE to WNW direction leading to the existing Westfield substation immediately northwest of the site.

The topography across the site gently slopes down from south to north with a maximum elevation of approximately 110m OD in the southwest corner and a minimum elevation of approximately 85m OD in the northeast corner.

1.4 Proposed Development

The preliminary development proposals at the time of writing are shown in **Appendix A**. The proposed development comprises a converter station platform with associated buildings and site carpark connected by a primary access road from the B9097 for construction and operation. In addition, temporary construction compounds, car parking and access roads will be required for the construction phase of the project. Due to the existing topography onsite, the development will require cut and fill earthworks to create a level platforms for the permanent platform and the temporary compounds.

1.5 Scope of Coal Mining Risk Assessment

The purpose of this CMRA report is to:

- Present a desk-based review of available information on the coal mining issues which are relevant to the site.
- Use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues.
- Set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- Demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

1.6 Limitations and Responsibility for Information

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2 Sources of Information

The following principal sources of information were consulted in order to inform the assessment of coal mining risks to the proposed development. A summary of the key information relative to the site and proposed development derived from these sources is provided in the sections below.

2.1 Sources of Information

British Geological Survey

- British Geological Survey (BGS) GeoIndex Onshore Interactive Map Viewer [2]
- BGS, 1:10,000 Solid and Drift Geological Map Sheet NT 29 NW (Kinglassie), (1996) [3]
- BGS, 1:10,000 Bedrock Geology Map Sheet NT 29 NW (2 of 5) (1985) [4]
- BGS, 1:10,000 Drift Thickness Map Sheet NT 29 NW (3 of 5) (1985) [5]
- BGS, 1:10,000 Mining Information Map Sheet NT 29 NW (4 of 5) (1985) [6]
- BGS, 1:10,000 Shafts and Adits Map Sheet NT 29 NW (5 of 5) (1985) [7]
- BGS, 1:50,000 Solid Geological Map Sheet 40 Kinross (1971) [8]
- BGS, Six Inch to 1 Mile Solid and Drift Geological Map Sheet XXVII (Fife and Kinross-shire), (1933) [9]
- The Geology of central and western Fife and Kinross, being a description of sheet 40 and parts of sheet 32 and 48 of the geological map. (1900) [10]
- The economic geology of the Fife Coalfields, area 2: Cowdenbeath and central Fife including Fordell, Lochgelly, Cadham and Kirkcaldy (Second edition). (1961) [11]
- The Carboniferous strata at the Westfield opencast site, Fife, Scotland. (1980) [12]
- Geology of the Kirkcaldy district: a brief explanation of the geological map sheet 40E Kirkcaldy. (2000) [13]
- Geology of the Kirkcaldy district: a brief explanation of the geological map sheet 40E Kirkcaldy. (2003) [14]

Mining Remediation Authority

- The Mining Remediation Interactive Map Viewer [15]
- Coal Authority Consultants Coal Mining Report (**Appendix B**) [16]
- Mine Abandonment Plan S845 (Sheet 2 of 2) [17]
- Mine Abandonment Plan S610 (Sheet 3 of 5) [18]
- Mine Abandonment Plan S552 (Sheets 1 and 7 of 7) [19] [20]
- Mine Abandonment Plan S527 (Sheets 6 and 7 of 7) [21] [22]
- Mine Abandonment Plan S518 (Sheet 1 of 13) [23]
- Mine Abandonment Plan 8773 [24]
- Mine Abandonment Plan 2474 [25]

Mott MacDonald Documents

- Mott MacDonald document 113643-MMD-SPEN-XX-RP-GE-0571, "*Eastern Green Link 4 – HVDC Converter Station, Geotechnical Interpretative Report*" (February 2025) [26]
- Mott MacDonald document 113643-MMD-SPEN-XX-DR-CE-0584, "*Eastern Green Link 4 – Converter Station, Generic Quantitative Risk Assessment*" (February 2025) [27]

Other Sources

- Google Earth Imagery [28]
- National Library of Scotland Georeferenced Maps [29]

2.2 Mining History

2.2.1 Onsite

A review of historical maps of the area indicates that the site was primarily used as farmland from as early as 1856 until at least 1968. At some point between 1968 and 1984, the nearby Westfield opencast coal mine began to extend into the site boundaries, as shown in the 1984 map of the opencast extents from the National Coal Board and satellite imagery from 1985 [28]. Satellite imagery from 2006 appears to show the site in its current arrangement, restored from its use as opencast ground, and now used as agricultural fields again. Overhead power lines and telephone poles now cross the north of the site running east-southeast to west-northwest. No significant changes have occurred between 2006 and the present day.

2.2.2 Offsite

A review of historical maps of the surrounding area indicates that in 1856 the primary use of land was for agricultural use, with multiple farms within the local vicinity including North Pitkinny, South Bogside and North Bogside. However, the Capledrae Colliery is located approximately 700m northwest of the site. In 1896 three “old shafts” associated with the “Old Colliery” are located 150m northeast, 500m northeast and 600m east of the site boundary. Further collieries are recorded as being present in the surrounding area; Rosewell (1.1km west), Kirkness (660m north) and Kinninmonth upper and lower collieries (1.8km northeast). The Capledrae colliery is now disused.

A map published in 1933 shows the large Minto and Bowhill Collieries approximately 2.2km and 1.8km southeast of the site respectively and the Eliza Colliery approximately 2km south. The Glencraig and Lochgelly Collieries are located approximately 2km southwest and 2.5km southwest respectively. The Westfield Opencast Coal Mine is indicated to have been present from 1955 on the site of the former Kirkness Colliery northwest of the site, with production commencing in 1956. The Old Colliery is now absent from the map with only the closest old shaft to the site remaining.

A map published in 1962 shows a significant expansion of the Westfield Opencast mine, with a large works compound and settling pond now present. A small works compound (now known to be Westfield Substation) is situated immediately outside the northwest corner of the site. At some point between 1968 and 1984 the Westfield Opencast mine expanded south into the site, however there is limited publicly available historical data to clarify the land use during these years, until 2006. Satellite imagery from 2006 indicates the Westfield opencast mine has ceased production and undergone restoration works and is partially infilled with water and made ground.

2.3 Published Geological Maps

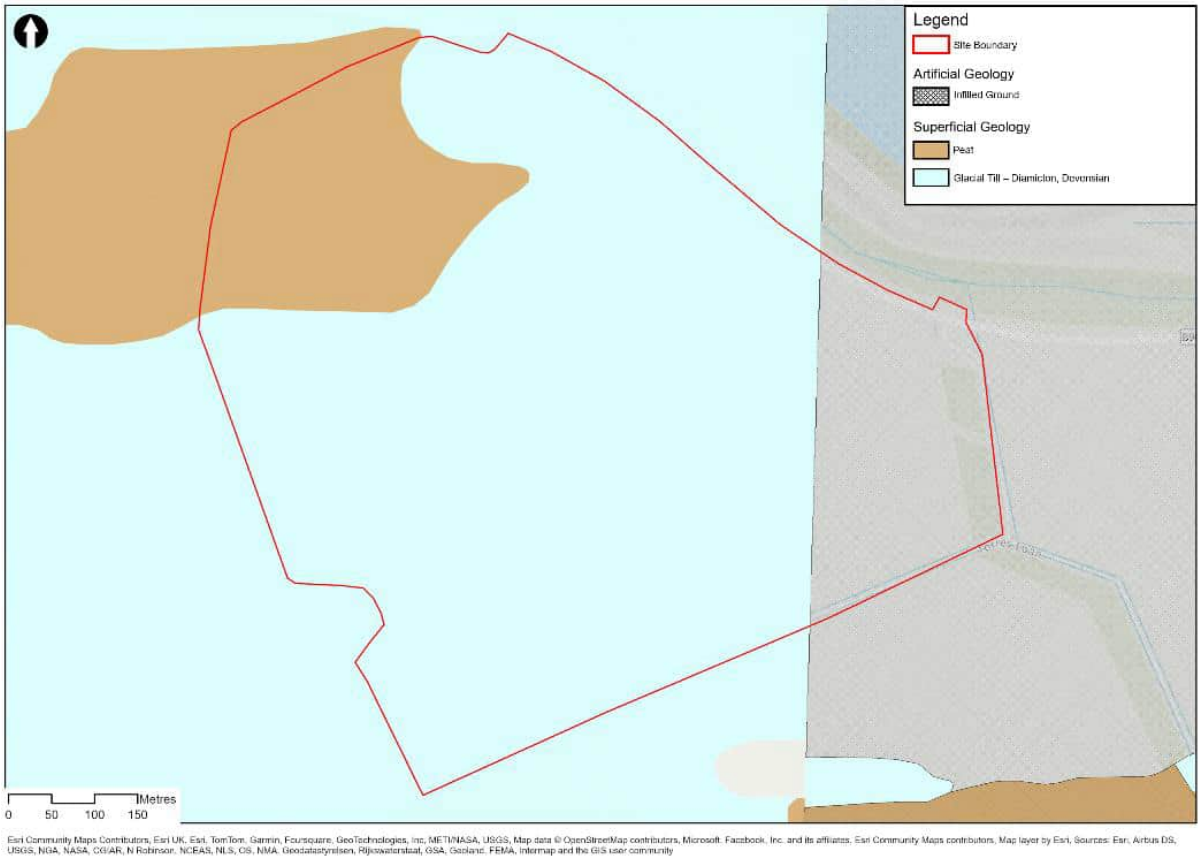
A summary of the BGS recorded geology on site is provided below.

2.3.1 Artificial Ground

Infilled Ground is indicated to be present in the southeast corner of the site as shown in Figure 2.1. It is noted that the western boundary of deposit coincides with the western boundary of geological map NT 29 NW [3], therefore it is considered that the boundary doesn’t accurately reflect the extent of boundary of the Infilled Ground on site. However, it is noted to be coincident

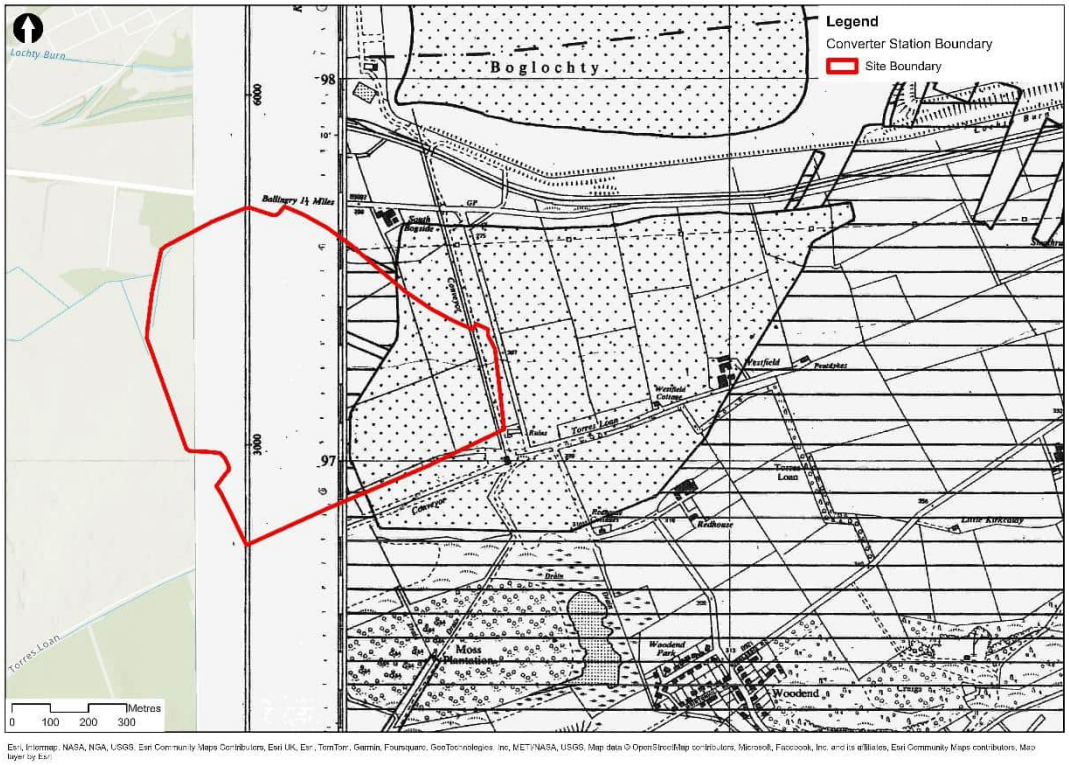
with the area recorded as a “Backfilled Opencast Coal Site and Rock Quarry” on NT29NW Map No.4 Mining Information [6] Shown in Figure 2.2.

Figure 2.1: Artificial and Superficial Geology onsite



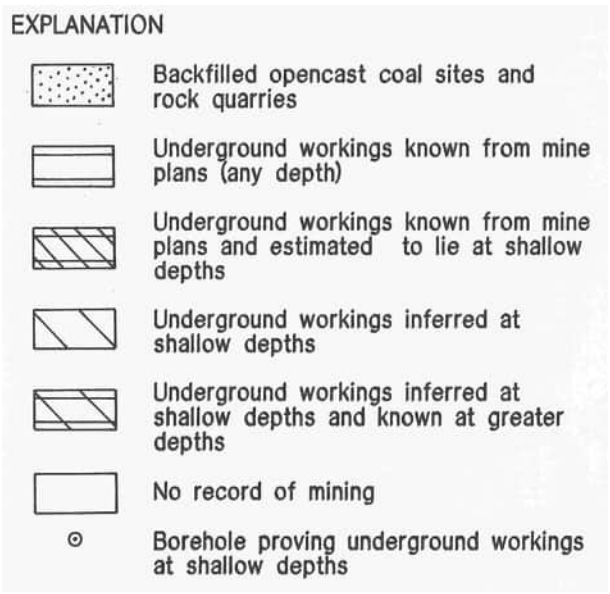
Source: Mott MacDonald, 2025. Contains BGS 1:50,000 Scale Superficial and Artificial deposits data (2025) [2]

Figure 2.2: Extract from NT29NW Sheet 4 – Mining Information



Source: Mott MacDonald, 2025. Contains BGS 1:10,000 Scale Mining Information NT29NW (Kinglassie) (1985) [6]

Figure 2.3: Key for NT29NW Sheet 4 – Mining Information



Source: Mott MacDonald, 2025. Contains BGS 1:10,000 Scale Mining Information NT29NW (Kinglassie) (1985) [6]

2.3.2 Superficial Geology

The majority of the site is indicated to be underlain by Glacial Till of Devensian Age. The till is locally absent in the east of the site where Infilled Ground is present (Figure 2.1).

The Till is overlain by Peat in the northwest of the site.

2.3.3 Bedrock Geology

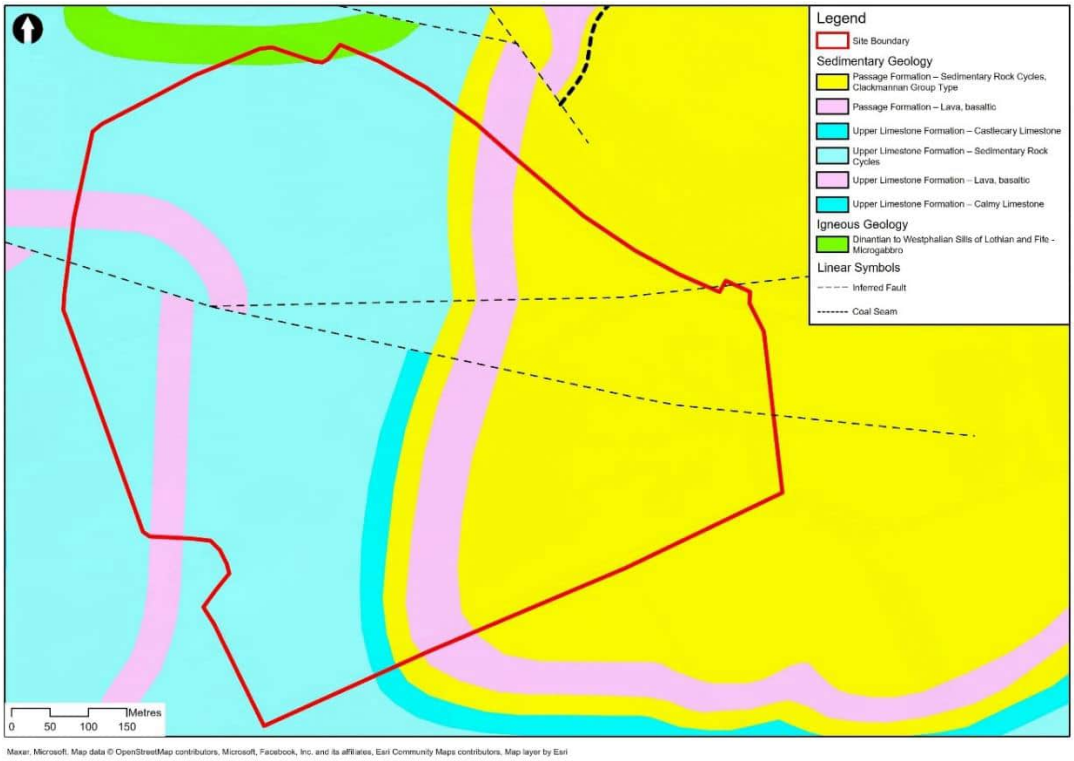
Current mapping (Figure 2.4) indicates that the bedrock geology beneath the site comprises the Upper Limestone Formation in the west and centre of the site, and the overlying Passage Formation in the east of the site, both members of the Clackmannan Group. A microgabbro sill of the Dinantian to Westphalian Sills of Lothians and Fife encroaches slightly in the northern boundary of the site.

The site falls within the Westfield Basin or the Bowhill syncline structure that trends northeast-southwest. The southeast of the site is indicated to be located in the base of the syncline whilst the rest of the site falls within the northwestern limb of the syncline. The bedrock geology on site dips down towards the base of syncline. A dip of 7º to the southeast is recorded on the 1:50,000 scale map [8], however the dip is considered to steepen towards the northwest on the limb of the syncline.

The Upper Limestone Formation is recorded to consist of sequences of mudstone, siltstone, sandstone, and limestone with a thick bed of basaltic lava present in the west of the site. The Microgabbro sill of the Dinantian to Westphalian Sills of Lothians and Fife intrudes into this unit in the north of the site.

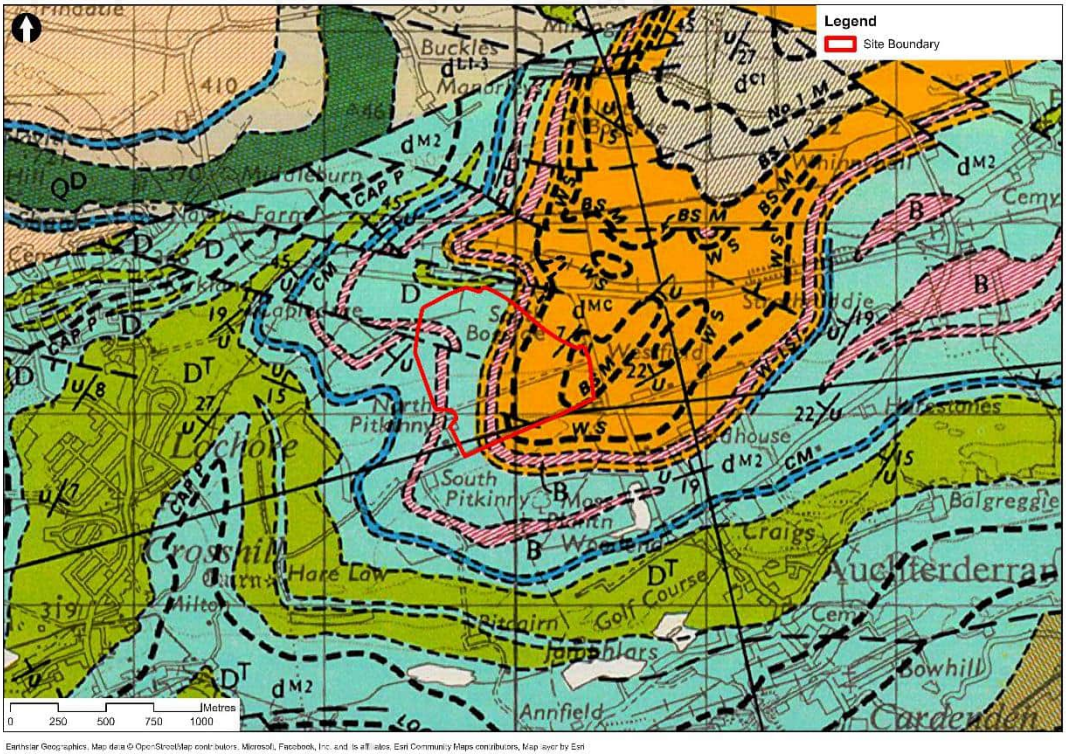
The Passage Formation typically comprises cyclic sequences of sandstones, mudstones, coal seams, marine beds and seatearths with a basaltic lava bed mapped close to the base of the formation.

Figure 2.4: Solid Geology on site – 2025 Online Mapping



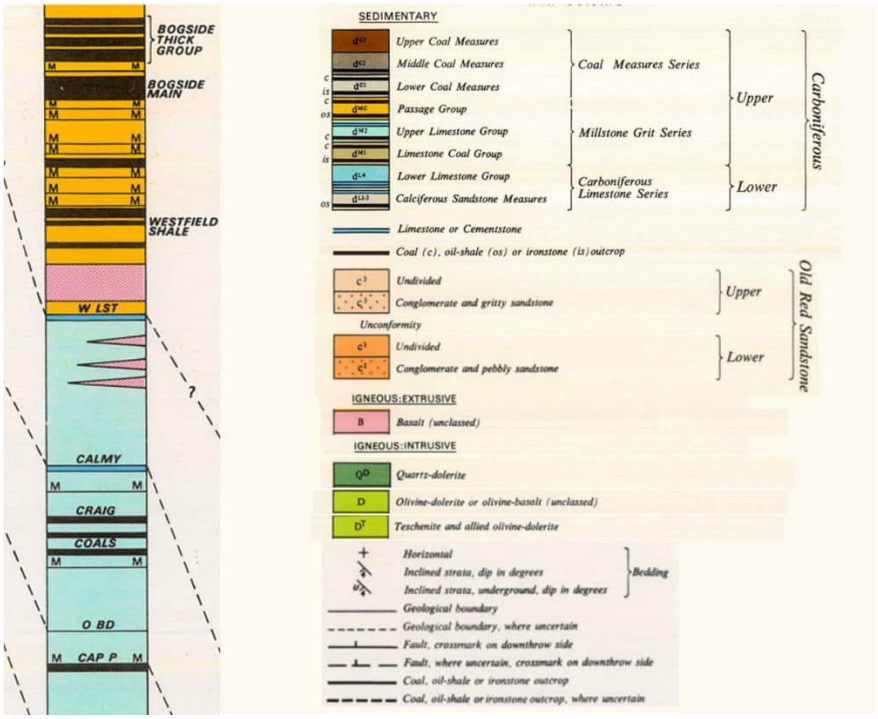
Source: Mott MacDonald, 2025. Contains BGS 1:50,000 Scale Solid Geology Data (2025) [2]

Figure 2.5: Extract of 1:50,000 Scale Map



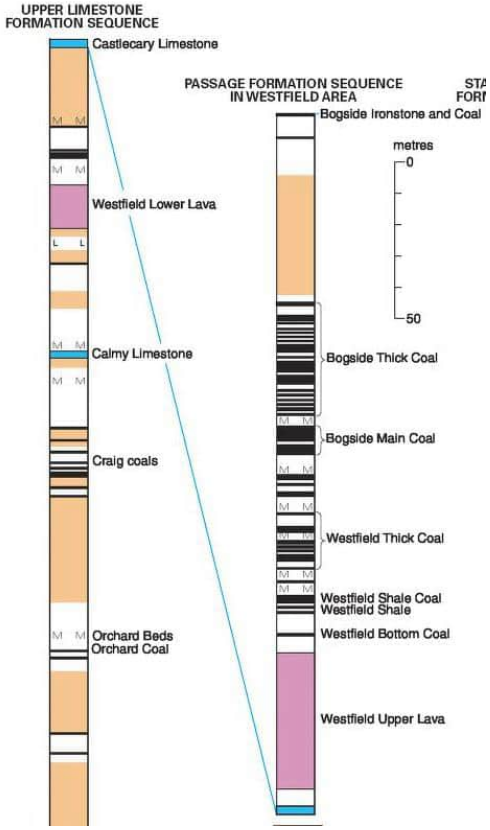
Source: Mott MacDonald, 2025. Annotated extract of 1:50,000 Scale Map (1971) [8]

Figure 2.6: Stratigraphic Column and Lithology Key for 1:50,000 Scale Map



Source: Mott MacDonald, 2025. Adapted from 1:50,000 Scale Solid Geology Map (1971) [8]

Figure 2.7: Upper Limestone and Passage Formation



Source: Mott MacDonald, 2025. Extract of Figure 8 of Geology of the Kirkcaldy district: sheet description of the British Geological Survey 1:50000 series sheet 40E Kirkcaldy (Scotland) [13]

2.3.3.1 Coal

The BGS Geoindex Viewer [2] indicates that no coal seams subcrop on the site. The closest mapped coal seam subcrop is the Westfield Shale seam indicated to be present 100m to the northeast of the site as shown in Figure 2.2.

However, the historical 6 inch to 1 mile geological map from 1933 [9] and the 1:50,000 scale geological map from 1971 [8] indicates that the Westfield Shale Coal Seam subcrops beneath the site, trending northeast to southwest as Figure 2.5. In addition, the 1:50,000 scale geological map [8] also indicates that the Bogside Main Coal Seam is present in the southeast corner of the site also trending northeast to southwest. The location of these seams is coincident with the mapped area of opencast workings and as such the seams may have been extracted beneath the site which is why they are not shown as present on the recent geological maps.

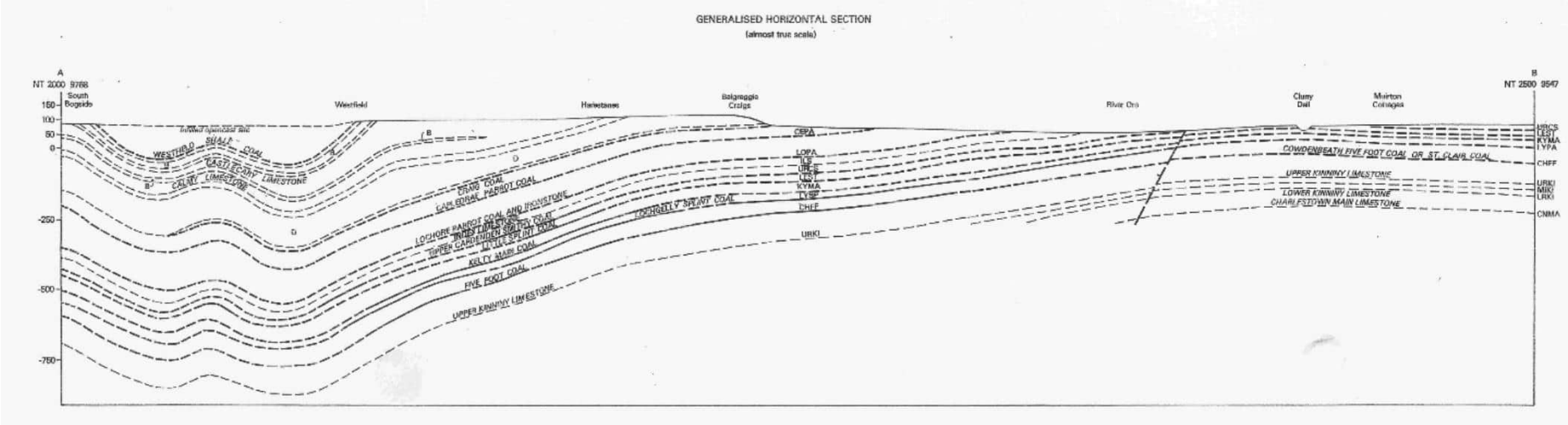
The Westfield Shale Coal Seam and the Bogside Main coal seam form part of the Boglochty Beds, a thick sequence of coal seams within the Passage Formation as shown in the stratigraphic column in Figure 2.6 and Figure 2.7. Although not mapped, the stratigraphic columns indicate that several coal seams lie between the Westfield Shale and the Bogside Main Coal seams that include the Westfield Thick Coal. In addition, the Westfield Shale is indicated to be present immediately beneath the Westfield Shale Coal, and the Westfield Bottom Coal [29] is indicated to present between the Westfield Shale and basal basaltic lava bed of the Passage Formation.

The Bogside Thick group of coals, located up sequence of the Bogside Main coal, are indicated to subcrop 525m northeast of the site [8] and generally dip to the northeast, away from the site, following the regional trend of the Westfield Basin syncline.

The closest mapped coal seam subcrop down geological sequence from the site is the Capledrae Parrot Coal that is located approximately 1km northwest of the site in the Upper Limestone Formation. This dips to the southeast-east down the limb of the syncline and is expected to present around 240m below the site. In addition, the available stratigraphic columns indicate that the Craig Coal Seams are present within the Upper Limestone Formation at approximately 180m beneath the site.

No coal seams are indicated to be present between the Craig Coals and those in the Passage Formation beneath the site as shown in the 1:50,000 scale geological map (Figure 2.6) and the generalised horizontal section from the 1:10,000 Bedrock Geology Map Sheet Map [4] replicated below in Figure 2.8.

Figure 2.8: Generalised Horizontal Section from NT29NW Sheet 2 – Bedrock Geology



Source: Mott MacDonald, 2025. Extract from NT29NW Sheet 2 – Bedrock Geology [4]

Coal seams are indicated to be present between the Craig Coals and the Passage Formation in the east of the region, as shown on the stratigraphic logs from the 1:10,000 scale map NT29NW and from the geological memoirs (Figure 2.7), however these are considered to be present beneath the site.

A summary of the expected coal seams beneath the site is provided in Table 2.1.

Table 2.1: Coal Seams Inferred beneath site

Seam	Seam Thickness (m) [3]	Remarks
Bogside Main Coal	0.0 – 10.0	Boglochtly Beds. Seams formerly inferred to subcrop on site from mapping or from stratigraphic columns. No longer expected to be present due to being worked out by opencast working.
Unnamed Coal	0.0 – 6.0	
Westfield Thick Coal	0.0 – 13.0	
Westfield Shale and Westfield Shale Coal (WS)	0.0 – 7.5	
Westfield Bottom Coal	0.0 – 5.0	Basal coal of Boglochtly Beds, inferred from stratigraphic log only.
Craig Coals	0.0 – 2.5	Not mapped but inferred to be present at depth from stratigraphic logs. Indicated to be around 180m below the Westfield Coal Seam. Possibly pinches out beneath the site. Where present comprises 4 leaves.
Capledrae Parrot Coal	0.0 – 0.65	Subcrop indicated to be approximately 1km northwest of site. Indicated to be around 240m below the Westfield Coal Seam.

2.3.4 Structural Geology

An inferred fault which forks into two faults cuts across the site WNW-ESE as shown in Figure 2.4.

2.4 BGS Geological Memoirs

A summary of the key points relating to coal mining within or in close proximity to the site from review of the available geological memoirs is provided below.

2.4.1 Passage Formation - Boglochty Coal Field

The 1961 Economic Memoir for the area [11] records that the coal measures of the Boglochty Coalfield are preserved in a small basin of which the major axis runs in an east-northeast direction. The Boglochty Beds, defined as a series of coals with interbedded mudstones, are proven at Westfield to vary in thickness between 30m to 150m of which one third is coal [12].

The northern limit of the coalfield is formed by the Ochil fault located approximately 950m north of site. The western and eastern boundaries for the coalfield are formed by the faulted subcrop of the Westfield Shale that can be traced southward from the fault through the site to Torres Loan. The memoir reports that the Westfield Shale forms the base of the coalfield. The main syncline is recorded to be divided by a narrow fold along its centre which brings the lower beds to the surface within the area of the site.

The coals are typically of poor quality across the coalfield, but substantial thicknesses of bright coal have been encountered within the thicker seams.

The Westfield Shale seam is described in the 1961 memoir [11] as succeeding a thick bed of greenish, faky fireclay containing a variable coaly layer. The shale varies in thickness from 2ft 4in to 3ft 9in (0.71m to 1.14m), underlies a thick coal and has been identified over all the southern and western part of the coalfield. The Westfield Shale is recorded to have been

worked for oil-making in the 1860s and 1880s with a yield of crude oil varying from 18.5 to 30 gallons per ton. The seam lies 20 fathoms (36.5m) from the surface at the “Pitkinny Pit”.

The strata in the 25 fathoms (45.7m) above the Westfield Shale is noted to contain coaly material throughout, including a brown coal 5ft to 6ft (1.6m to 1.8m) thick found 20ft to 30ft (6m to 9.1m) above the Westfield Shale and a thick mass of coal and fireclay in variable beds found 3 to 5 fathoms (5.5m to 9.1m) above the brown coal. The northwestern part of the basin is noted to contain coaly material which is of poor quality but more concentrated in more definitive seams.

The Bogside Main Coal seam is noted to occur in leaves and total a thickness of greater than 20ft (6m). The seam is recorded to have been worked in the 1890s from the Bogside Pit, where a narrow strip was taken out near the outcrop and in the Kinninmonth Colliery as late as 1908. Along the west of the coalfield it is noted that the majority of the 15 fathoms (36.5m) of strata overlying the Bogside Main Coal is composed of coal with thin partings of faky fireclay and blaes. The 30 seams of coal included within these overlying strata comprise a total coal thickness of 65ft (19.8m).

Extensive coal mining, in addition to ironstone and oil shale extraction, has been undertaken within the Boglochty Coalfield throughout the during the 19th Century [12]. In the 1960s the seams were worked by opencast methods at the Westfield Opencast site. These workings were excavated to depths of over 200m to extract the economic resources from the Boglochty Beds. Coal extraction continued onsite until at least 1984, however it is uncertain the exact time that coal extraction ceased.

2.4.2 Upper Limestone Formation

The 1900 memoir for the region [10] records that the Capledrae Coalfield, located to the east of the site, is the only notably worked coalfield within the Upper Limestone Formation at this time. The worked seams are detailed to include the Craig Coals, Capledrae Parrot Coal, the Lochore Parrot Coal and the Bowesbank Coal. However, the memoir notes that workings within the coalfield, such as in the Capledrae Coal and the Craig Coal, have been stunted by the presence of extensive faulting and igneous intrusions which have damaged/reduced the quality of the coal.

The 1961 memoir [11] records that the Craig Coal Seam of the Upper Limestone Formation is recorded to lie 10 to 15 fathoms (18.3m to 27.4m) below the Calmy Limestone in the stratigraphic sequence. It is recorded to have been worked at surface >1km southwest of the site, and in several leaves between 23 fathoms (42m) and 40 fathoms (73.15m) below ground level within the North Pitkinny (located approximately 470m west of the site).

The Westfield opencast memoir [12] notes a thick coal seam (approx. 1.7m) encountered in a borehole drilled by IGS approximately 550m northeast of the site with numerous thin partings recorded between the Castlecary Limestone and the Westfield Lower Lava. However, it is noted that the Castlecary Limestone has not been proven to be present within the Bowhill syncline and as such suggests the higher beds of the Upper Limestone Formation and this coal is likely absent [11].

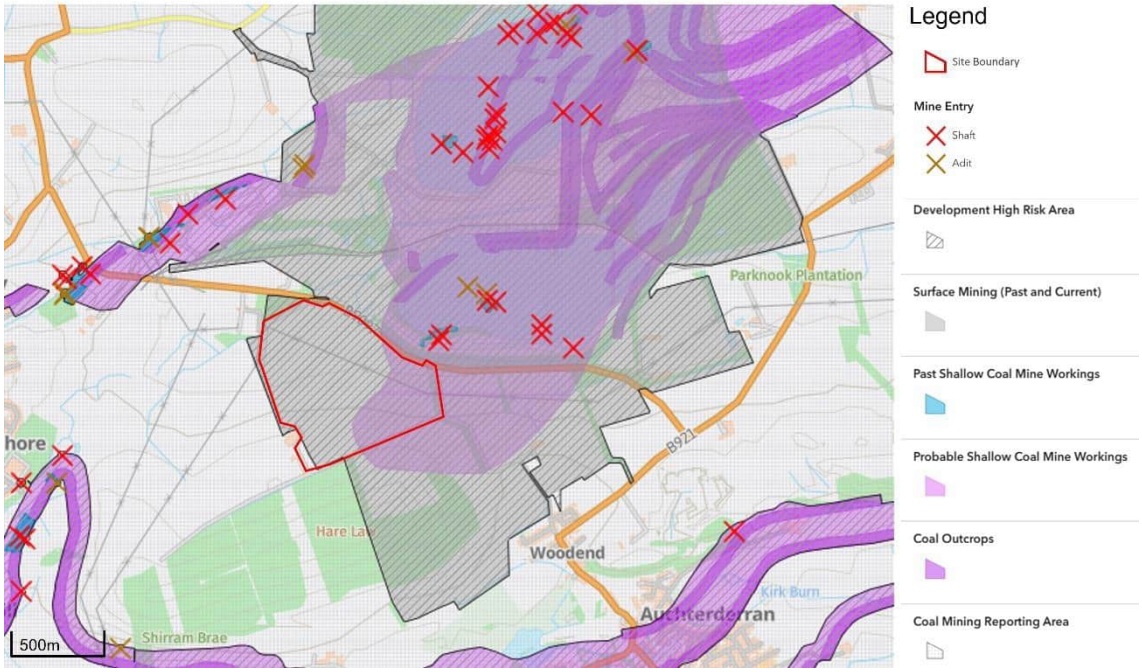
2.5 Mining Remediation Authority Information

2.5.1 Mining Remediation Authority Interactive Map Viewer

A review of the Mining Remediation Authority Interactive Map Viewer [15] has identified the following coal related features on or within close proximity to the site. Key features are presented in Figure 2.9.

- The entire site falls within a Coal Mining Reporting Area.
- The entire site falls within the Development High Risk Area, due to the presence of probable shallow workings and surface mining.
- No coal subcrops lie beneath the site. The closest coal subcrop is located 190m northwest of the site and is indicated to be the Westfield Shale Coal.
- No shallow workings are recorded beneath the site. The closest recorded shallow workings are located approximately 70m northeast of the site boundary. These are indicated to workings within the Westfield Shale and Westfield Shale Coal.
- Southeastern half of site falls within area of probable shallow coal mine workings as shown in Figure 2.9.
- Underground workings are present beneath the site, notably beneath the southeastern half at levels between -518m OD and -720m OD (630m bgl to 820m bgl).
- The nearest mine entry is located approximately 150m northeast of the site boundary as shown in Figure 2.9.
- No fissures or breaklines are present within the site or surrounding area.
- The entire site falls within the Past Surface Mining area.
- Several mine abandonment plans are recorded as being available beneath the site. Relevant plans have been purchased and are discussed within Section 2.6.

Figure 2.9: Mining Remediation Authority data

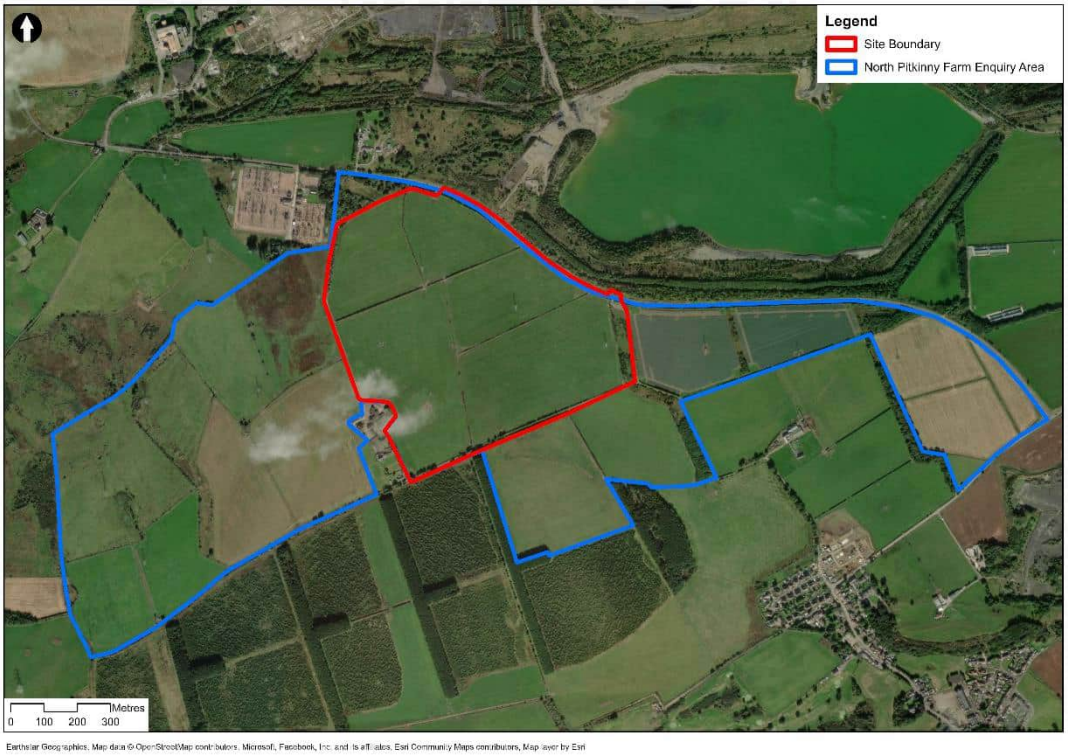


Source: Mott MacDonald, 2025. Contains OS data © Crown Copyright and database right 2023. Contains data from OS Zoomstack. Esri Maps.

2.5.2 Mining Remediation Authority Consultants Mining Report

A Consultants Coal Mining Report produced by the Mining Remediation Authority (formerly the Coal Authority at the time of production) was supplied by the client (SPEN) in 2023 for the wider North Pitkinny Farm site, which encompasses the site area considered in this CMRA, as shown in Figure 2.10.

Figure 2.10: Site within Consultants Mining Report enquiry area



Source: Mott MacDonald, 2025.

The report states that the that the North Pitkinny Farm site is at risk from probably unrecorded shallow workings; however no known workings or associated spine roadways were recorded within a depth of 30m below the site.

The shallowest workings recorded are located to the north of the site and are associated with the Westfield Shale. These are recorded at a depth of 57m bgl with an extraction thickness of 0.91m and dip at 3.4 degrees to the north. Numerous other workings are noted beneath or within the vicinity of the North Pitkinny Farm enquiry area at depths ranging between 144m to 897m bgl.

The site is not located within an area known to be at risk of mine-related subsidence. Past opencast mining is recorded to have taken place beneath the entirety of the Converter Station site area.

No remediated sites are recorded within 50m of the site and no mine water treatment schemes or evidence of mine related gas issues are recorded within 500m of the site.

The report is presented in Appendix B.

2.6 Mine Abandonment Plans

A summary of the available mine abandonment plans beneath the site is presented in Table 2.2 below. It is noted that nearly all of the underground workings are either no longer present beneath the site and/or are only present at significant depths. Mine plan S845 is a plan of the former opencast workings on the site.

Table 2.2: Mine Abandonment Plan Summary

Mine Plan No.	Workings beneath Site?	Seam Name	Seam Level (shallowest recorded)	Seam Depth (m bgl)	Extraction Thickness from Plan (m)	Dip (°)	Dip Direction (°)
S845	Yes	Bogside Thick Bogside Main Westfield Thick Westfield Shale	Opencast workings	-	-	-	-
8773	No	Westfield Shale	No levels recorded on plan. Inferred to be ~57m OD from Consultants Coal Mining Report.	30	2.97	3.4 to 11.9	146 to 338
2474	No	Gas Coal/Capeldrae Parrot Coal	-124m OD	214	1.6	17.8 to 39.8	039 to 158
S518 - 1 of 13	No	Upper Cardenden Smithy	-430m OD	547	0.91	22.6 (online) 15.9 (on plan)	349 (online)
S610 - 3 of 5	Yes	Upper Jersey	-518m OD	629	0.91	11.9 to 15.9	003 to 075
S552 - 7 of 7	Yes	Lochgelly Splint	-566m OD	677	2.59	15.8	357
S552 - 1 of 7	Yes	Little Splint	-579m OD	672	1.06	12.6 to 15.0	072 to 286
S527 - 6 of 7	Yes	Five Foot	-632m OD	743	0.89-1.02	12.3 to 18.9	015 to 324
S527 - 7 of 7	No	Dunfermline Splint	-640m OD	754	**East Side** 2.51 **West Side** 1.14	48.5	126

All Dip and Dip directions are taken from Mining Remediation Authority Interactive Viewer unless stated otherwise.

Mine Abandonment Plan 8773 located off-site is dated between 1885 and 1886. It is understood these workings were fully worked by the opencast in 1980's and therefore no longer exist in this state.

Mine Abandonment Plan S845 is an opencast mine plan for the "Westfield Extension" which details the depth and extent of the workings in September 1984. The plan indicates the workings extend into the southeast of the site as shown in Figure 2.2.

The workings are recorded to have been undertaken within the Westfield Shale, Westfield Thick, Bogside Main and Bogside Thick Coals. The plan indicates that the opencast workings within the site boundary had a maximum depth of approximately 60m.

2.7 Historical Ground Investigations

A summary of the available ground investigation records for the site are provided below. The available borehole records and the information summarised above have been used to create geological sections through the site which are provided in **Appendix D**.

2.7.1 BGS Boreholes

The BGS hold available records for 11 boreholes located within the site boundaries, as shown in grey in Figure 2.11, that were drilled between 1925 and 1975, prior to the opencast workings on the site as coal exploration wells.

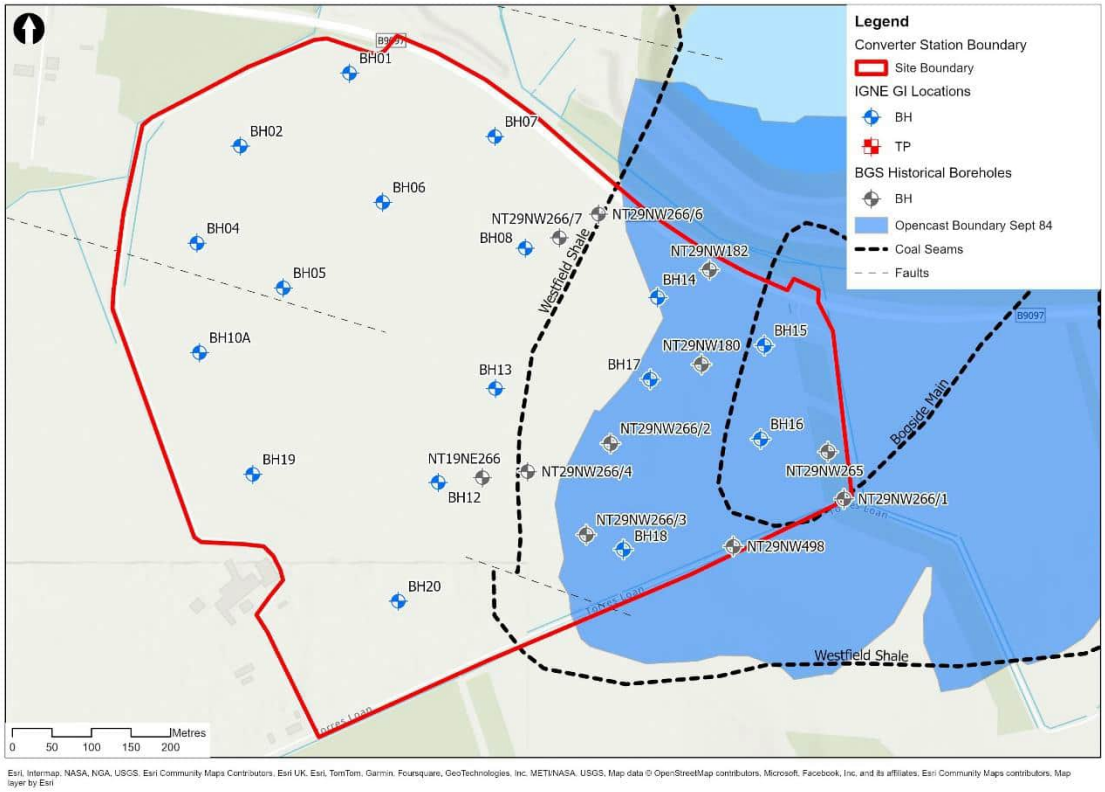
The borehole logs record high number of coal seams in the southeast of the site only that are considered to be associated with the Boglochtly Beds. It is noted that the boreholes furthest to the west terminate on basalt (basal lava unit of Passage Formation) at shallow depths whilst those to the east prove frequent coal seams to >30m bgl depths. However, it is considered that all the coal seams have since been removed by subsequent opencast working as illustrated on the geological sections provided in **Appendix C**.

The borehole logs are provided in **Appendix D**.

2.7.2 IGNE Ground Investigation

Raeburn Drilling and Geotechnical Limited (trading as IGNE) undertook a ground investigation on the site in July and August 2024 that comprised 46 trial pits and 23 boreholes as detailed in the IGNE Factual Report [13] and the Mott MacDonald GIR [1]. The locations of the boreholes are shown in Figure 2.11, with the relevant logs provided in **Appendix E** (Note – Trial pits and boreholes terminating in superficial deposits are not presented as they do not extend into rock).

Figure 2.11: Historical Borehole Locations



Source: Mott MacDonald, 2025. Contains coal seams inferred from 1:50,000 Scale Sheet 40 (Kinross) [8]

Ground conditions were typically found to comprise cohesive and granular Made Ground that varied between 0.2m and 4.8m thick in the west and centre of the site, increasing to >40m in thickness in the southeast corner of the site, however it is locally absent in the in the southwest corner of the site.

Underneath the Made Ground the natural superficial deposits were encountered as Glacial Till of Devensian Age. This typically comprised a 0.4m to 2.8m thick layer of cohesive Glacial Till with localised granular units and was complete absent in the southeast corner of the site. Although mapped as being present (Figure 2.1) Peat was not encountered during the recent and historical investigations however Organic Clay (0.2m to 2.2m thick) was locally encountered in the north of the site beneath the Made Ground Deposits.

The thickest deposits of the Made Ground correlate with the area of mapped Infilled Ground as shown in Figure 2.1 and is considered to be located within the area of the site that was opencast in the c.1980s as shown on Figure 2.11

Bedrock was typically encountered at depths of between 0.9m and 7.3m m bgl in the west and centre of the site increasing to 11.7m up to >43.2m bgl in the southeast of the site. The bedrock was found to typically comprise extremely weak to moderately weak mudstone, siltstone, sandstone, limestone, basalt and dolerite.

Coal was only identified in two boreholes (BH15 and BH18), both in the southeast of the site, beneath the area of opencast.

The coal in BH15 is encountered at the base of the Made Ground material at 31.1m depth as a 0.1m thick layer of “weathered coal recovered as stiff friable black slightly gravelly sandy clay”. As such, it is considered likely that this may comprise waste material from the base of the opencast and not comprise an actual coal seam.

In BH18 the first coal is encountered at the base of the Made Ground material at 23.5m depth as a 0.2m thick layer of “very black vitreous coal”. As above considering the location of the coal at the base of the Made Ground it is considered unlikely to comprise an in-situ coal seam as any coal within the opencast workings will have been excavated. The second coal encountered in this borehole was encountered at 26m depth as a 0.35m thick layer of “very weak thickly layered black dull and muddy coal with thin layers of dark grey mudstone”. This is overlain by 0.8m of mudstone and underlain by 1.05m of siltstone/fireclay with evidence of plant remains. It is considered likely that this layer likely comprises the faky fireclay containing a variable coaly layer that is discussed as being present beneath the Westfield Shale in the memoirs above [11].

The relevant borehole logs are shown in the geological sections presented in **Appendix C**.

3 Identification and Assessment of Site Specific Coal Mining

Throughout this section ‘shallow’ is understood to refer to coal seams or mine workings within 30m of current ground surface levels, as per the Mining Remediation Authority guidance. Consideration of coal seams or mine workings at or greater than 30m below current ground level are referred to as ‘deep’.

3.1 Coal Mining Risks

An identification and assessment of the risks posed to the proposed converter station development is presented below.

Table 3.1: Coal Mining Risk Assessment

Coal Mining Issue	Yes	No	Risk Assessment
Underground coal mining (recorded as shallow depths)		✓	No recorded shallow workings beneath the site. See Section 3.2.1.
Underground coal mining (probable at shallow depths)		✓	Shallow coal seams are no longer found within the site area due to past surface mining within the area, therefore no probable shallow underground mine workings anticipated. See Section 3.2.2.
Mine entries (shafts and adits)		✓	No mine entries are recorded within the site. See Section 3.3.
Coal mining geology (fissures)		✓	None recorded.
Recorded past mine gas emissions of potential		✓	None recorded. See Section 3.4.
Recorded coal mining surface hazard		✓	No recorded coal mining surface hazards (e.g. subsidence, collapse etc.) known within the area.
Surface mining (opencast workings)	✓		Surface mining took place within the east of the site. See Section 3.5.

3.2 Underground Coal Mining

3.2.1 Shallow Record Coal Mining

There are no recorded shallow workings beneath the site. The closest shallow recorded workings are located 70m northeast of the site in the Westfield Shale and are likely to have been removed by the Westfield opencast working operations.

3.2.2 Unrecorded (probable) Shallow Coal Mining

3.2.2.1 Upper Limestone Formation

No shallow coal seams are indicated to be present within the Upper Limestone Formation in the centre and northwest of the site. Therefore, no unrecorded shallow workings are expected.

3.2.2.2 Passage Formation

Coal seams of the Boglochty Beds were formerly present at shallow depths within the Passage Formation in the southeast of the site. However, all the seams up from the Westfield Shale, considered as the base of the Boglochty Coalfield, are indicated to have been removed by the Westfield Opencast Workings.

A 0.35m thick, muddy coal with thin layers of mudstone has been encountered locally in BH18 in the 2024 ground investigation beneath the base of the opencast. However, this is considered to comprise to discontinuous and uneconomical to work.

Therefore, no unrecorded (probable) shallow coal workings are expected to be present beneath the site.

3.2.3 Deep Coal Mining

The shallowest recorded workings beneath the site are recorded within the Upper Jersey seam at -518m OD (approximately 630m bgl). The seam thickness of the Upper Jersey workings at this level is recorded as 0.91m thick and was last worked 29th September 1967.

Considering thickness and date of workings, and their depth from surface, it is considered that these do not present a risk of mining instability to the surface.

3.3 Mine Entries (Shafts and Adits)

No mine entries are recorded by the Mining Remediation Authority within the site boundaries.

The nearest recorded mine entry to the site is located approximately 150m northeast of the site boundaries, associated with the Westfield Shale workings and is considered likely to have been removed by the Westfield Opencast mining operations.

3.4 Mine Gases

Abandoned mine workings can contain pockets of gas that can be forced to the surface along conduits such as broken ground associated with geological faults or collapsed mine workings at shallow depth, or along mine shafts.

No mine gas has been recorded within 500m of the Consultants Coal Mining Report enquiry boundary and no shallow underground workings which can accumulate mine gas are anticipated to be beneath the site indicate a low risk of mine gases.

3.5 Surface Mining

The Westfield Opencast Coal Mine was an extensive surface mine area recorded to have been worked within the site boundaries. The mine progressed in phases which targeted thick coal beds of the Passage Formation within the Bowhill Syncline, with the Extension phase of the opencast encroaching into the site boundaries to cover the eastern third of the site.

The Mine Abandonment Plan S845 indicates the coal seams targeted within the Extension phase consist of the Westfield Shale, Westfield Thick, Bogside Main and Bogside Thick Coals

within the site boundaries. BH14 to BH18 of the recent IGNE ground investigation were drilled within the footprint of the opencast mine and recorded Made Ground deposits as deep as 43.2m bgl within BH16 in the southeast corner. Thinner Made Ground deposits are found across the north and west of the site, anticipated to be associated with the excavated material spread across site.

As there is a thick sequence of made ground in this former opencast site, there is a risk of settlement if loaded, and a risk of differential settlement for any structures constructed over the boundary of the opencast site with the unworked area.

4 Mitigation Strategy Proposed

As outlined in Section 3 it is considered that there is a low risk from coal mining related activities to the proposed development with the largest risks being posed by the consolidation / settlement of the backfill material with the area of former opencast mining.

The permanent platform for the proposed substation development has been designed to be located outside of the footprint of the former opencast site to mitigate the risks associated with settlement.

No further ground investigation is proposed to investigation coal mining features beneath the site and no remediation measures are recommended.

5 Conclusions

Mott MacDonald has been commissioned by Scottish Power Energy Networks (SPEN) to undertake a Coal Mining Risk Assessment (CMRA) in relation to the proposed construction of a new HVDC Converter Station at Westfield, near Ballingry, Fife, Scotland as part of the Eastern Green Link 4 project.

Based on a review of all the available sources of information in relation to coal and coal mining in the area of the site, as detailed in Section 2, it is considered that the risk of surface stability to the proposed development from coal related features is low. The remaining risk is posed by consolidation of backfill to surface mining (opencast workings).

The former Westfield Opencast mine extents intrude into the southeast of the site as shown in Figure 2.2, where extensive infilled ground deposits have been identified. The thick layers of potentially compressible backfill material may present a risk of settlement if loaded by new developments.

To mitigate this potential risk the proposed permanent converter station platform has been designed to be located outside of the footprint of the former opencast site.

6 References

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[13] M. A. E. Browne and D. G. Woodhall, “Geology of the Kirkcaldy district: sheet description of the British Geological Survey 1:50000 series sheet 40E Kirkcaldy (Scotland).,” 2000.

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[17] Mining Remediation Authority, “Mine Abandonment Plan S845 Sheet 2 of 2 - Westfield Extension,” 1984.

[18] Mining Remediation Authority, “Mine Abandonment Plan S610 Sheet 3 of 5 - Minto Colliery - Upper Jersey Workings,” 1967.

[19] Mining Remediation Authority, “Mine Abandonment Plan S552 Sheet 1 of 7 - Bowhill Colliery - Little Splint Workings,” 1966.

[20] Mining Remediation Authority, “Mine Abandonment Plan S552 Sheet 7 of 7 - Bowhill Colliery - Lochgelly Splint Workings,” 1966.

[21] Mining Remediation Authority, “Mine Abandonment Plan S527 Sheet 6 of 7 - Minto Colliery - Five Foot Workings,” 1962.

[22] Mining Remediation Authority, “Mine Abandonment Plan S527 Sheet 7 of 7 - Minto Colliery - Dunfermline Splint Workings,” 1963.

[23] Mining Remediation Authority, “Mine Abandonment Plan S518 Sheet 1 of 13 - Bowhill Colliery - Upper Cardenden Smithy Workings, West Side,” 1965.

[24] Mining Remediation Authority, “Mine Abandonment Plan 8773 - Plan of Westfield Shale Workings,” 1883.

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[27] Mott MacDonald, “Eastern Green Link 4 - HVDC Converter Station - Generic Quantitative Risk Assessment,” 2025.

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[34] Scottish Power Energy Networks (SPEN), *Eastern Green Link 4 - HVDC Converter Station. Ground Investigation Technical Specification. I-P2K-12-B Issue No. 1,* 2023.

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Appendices

A. Proposed Development Layout

WATERCOURSE

CATTLE GRID
TO ALLOW SHALLOW
OUTFALL THROUGH
TRACK

CONCRETE CHANNEL TO
PASS OVER CABLES

OUTLET 1
IL: 82 mAOD

OUTLET OPEN CHANNEL
LENGTH = 105m
DEPTH = 0.5m
SLOPE = 1:3
BASE WIDTH = 0.5m

SW 1.07
HW 16
SW 1.06 (Hydrobrake)
HW 3 Attenuation Basin Outlet
PIPE 1.10
PIPE 1.09
PIPE 1.08

ATTENUATION BASIN
VOLUME: 8000 m3
BASE LEVEL: 85mAOD
200 YR WATER DEPTH: 1 m
FREEBOARD: 0.3m

HW 8
PIPE 1.13
SW 1.16
PIPE 1.14
HW 9
SW 1.02
HW 1
PIPE 1.02
PIPE 1.01
PIPE 1.04
HW 2
SW 1.04
PIPE 1.05
SW 1.05
PIPE 1.06
HW 5
SW 1.01
DEPTH: 2.7 m
PIPE 1.03
SW 1.03
DEPTH: 2.23 m

CONVERTER STATION
PLATFORM
SFL: 88.6mAOD

PERMANENT SWALE 3
LENGTH = 110m
DEPTH = 0.5m
SLOPE = 1:4
BASE WIDTH = 2m
25m CHECK DAMS

HW 6
PIPE 1.07
HW 7

PERMANENT SWALE 2
LENGTH = 20m
DEPTH = 0.5m
SLOPE = 1:4
BASE WIDTH = 2m
25m CHECK DAMS

TEMPORARY SWALE 6
LENGTH = 230m
DEPTH = 0.75m
SLOPE = 1:4
BASE WIDTH = 2m
40m CHECK DAMS

REINFORCED PIPE TO
PASS UNDER HAUL ROAD

TEMPORARY SWALE 5
LENGTH = 40m
DEPTH = 0.5m
SLOPE = 1:4
BASE WIDTH = 2m
40m CHECK DAMS

HW 15
SW 1.15
HW 10
PIPE 1.15
PIPE 1.16
SW 1.14
PIPE 1.18
HW 11
HW 12
REINFORCED PIPE TO
PASS UNDER HAUL ROAD
HW 13
PIPE 1.19
SW 1.13
PIPE 1.21
SW 1.11
SW 1.25
PIPE 1.24
SW 1.17
PIPE 1.23
HW 14
PIPE 1.20
PIPE 1.22
SW 1.12
SW 1.10
15m CABLE BUFFER ZONE

CONVERTER COMPOUND
AREA: 15500m2
1:100 FALL
SFL:
MAX: 93.70 mAOD
MIN: 92.48 mAOD

CABLE COMPOUND
AREA: 14000 m2
1:100 FALL
SFL:
MAX: 94 mAOD
MIN: 92.13 mAOD

CAR PARK
AREA: 7500 m2
1:100 FALL
SFL:
MAX: 94.00 mAOD
MIN: 92.47 mAOD

OUTLET 2
IL: 83 mAOD

PIPE 1.12
SW 1.09
PIPE 1.11
HW 4

PERMANENT SWALE 1
LENGTH = 380m
DEPTH = 1m
SLOPE = 1:3
BASE WIDTH = 2m
50m CHECK DAMS

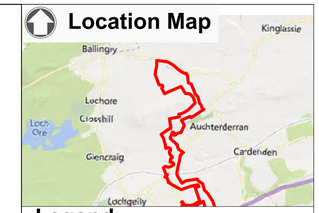
TEMPORARY SWALE 4
LENGTH = 370m
DEPTH = 0.5m
SLOPE = 1:4
BASE WIDTH = 2m
25m CHECK DAMS

TEMPORARY SWALE 7
LENGTH = 200m
DEPTH = 0.5m
SLOPE = 1:4
BASE WIDTH = 1m
25m CHECK DAMS

0 50m 125m
1:1250

PLAN VIEW
SCALE: H 1:1250

Location Map



Legend

- Proposed Red Line Boundary
- Proposed Converter Station
- Temporary Compound
- Temporary Car Parking
- Attenuation Basin
- Swale
- Haul Road
- Concrete Surround to Protect Shallow Pipe
- HVDC/ HVAC Cable Route
- Cable Corridor
- Cattle Grid
- Watercourse
- Surface Water Pipe
- Headwall

Notes

1. Do not scale from this drawing.
2. All dimensions are in metres unless otherwise stated.
3. This drawing is to be read in conjunction with all relevant documents and drawings.
4. No unauthorised disclosure, storage or copying.
5. All spatial coordinates relate to the Ordnance Survey, British National Grid (OSGB36).
6. All levels are in metres and relate to AOD (Ordnance Survey, Newlyn).
7. Bellmouth and haul roads may be wider than 7m to facilitate abnormal load vehicles or turning.
8. Outfalls from platform drainage have been assumed and form part of a separate design package.
9. Topsoil strip depth has been assumed at 400mm.
10. The assumed thickness of pavement is 775mm for the Converter Station, and 150mm for the Temporary Compounds.
11. Bulk factor applied to topsoil: 1
12. Compression factor applied to imported fill: 1.20
13. Bulk factor applied to unusable cut and stored excess volume: 1
14. Subgrade is not considered suitable to be used as fill.
15. Cut slopes: 1V:3H, fill slopes 1V:3H. These values are to be verified by the Contractor during Stage 2 Detailed Design.
16. Contours shown within the available data from existing LIDAR survey carried out by Cyberhawk.
17. Utility data presented is duplicated from the Utility Search Map Report dated 23/02/2024. Data is shown for information only and must not be used for locating services. Locations must be confirmed with the relevant service owner prior to undertaking work. See reference drawings for further details. Protection to utilities to be confirmed following liaison with statutory undertakers at detailed design. Contractor is to confirm depth and alignment of all existing utilities on site prior to beginning work
18. Berms are to be provided in temporary settlement lagoon to allow for settlement of sediment and may be refined permanent use.

Reference Documents

113643-MMD-SPEN-XX-DR-CE-0631 - Standard Details Sheet 1
113643-MMD-SPEN-XX-DR-CE-0636 - Permanent Site Overview
113643-MMD-SPEN-XX-DR-CE-0637 - EGL4 -SPEN - Drainage – Permanent Attenuation basin GA
113643-MMD-SPEN-XX-DR-CE-0638 - Permanent Manhole Schedule
113643-MMD-SPEN-XX-DR-CE-0639 - Permanent Long sections
113643-MMD-SPEN-XX-DR-CE-0641 - Temporary Attenuation basin GA
113643-MMD-SPEN-XX-DR-CE-0642 - Temporary Manhole Schedule
113643-MMD-SPEN-XX-DR-CE-0643 - Temporary Long sections Sheet 1
113643-MMD-SPEN-XX-DR-CE-0644 - EGL4 -SPEN - Drainage – Temporary Long sections Sheet 2
6113643-MMD-00-XX-M3-CE-0005 - PLATFROM POSITIONS

Sheet X Centroid Coordinate: Sheet Y Centroid Coordinate:

Issue	Date	Remarks	Drawn	Checked	Approved
P01	26/02/2025	Draft	KH		

Title

Eastern Green Link 4
Convertor Station Compound
Temporary Site overview

nationalgrid

Application Number
-

National Grid Drawing Reference
113643-MMD-SPEN-XX-DR-CE-0640

Scale	Sheet Size	Sheet	Issue
1:1250	A1	SHEET 1	P01

B. Coal Authority Consultants Coal Mining Report

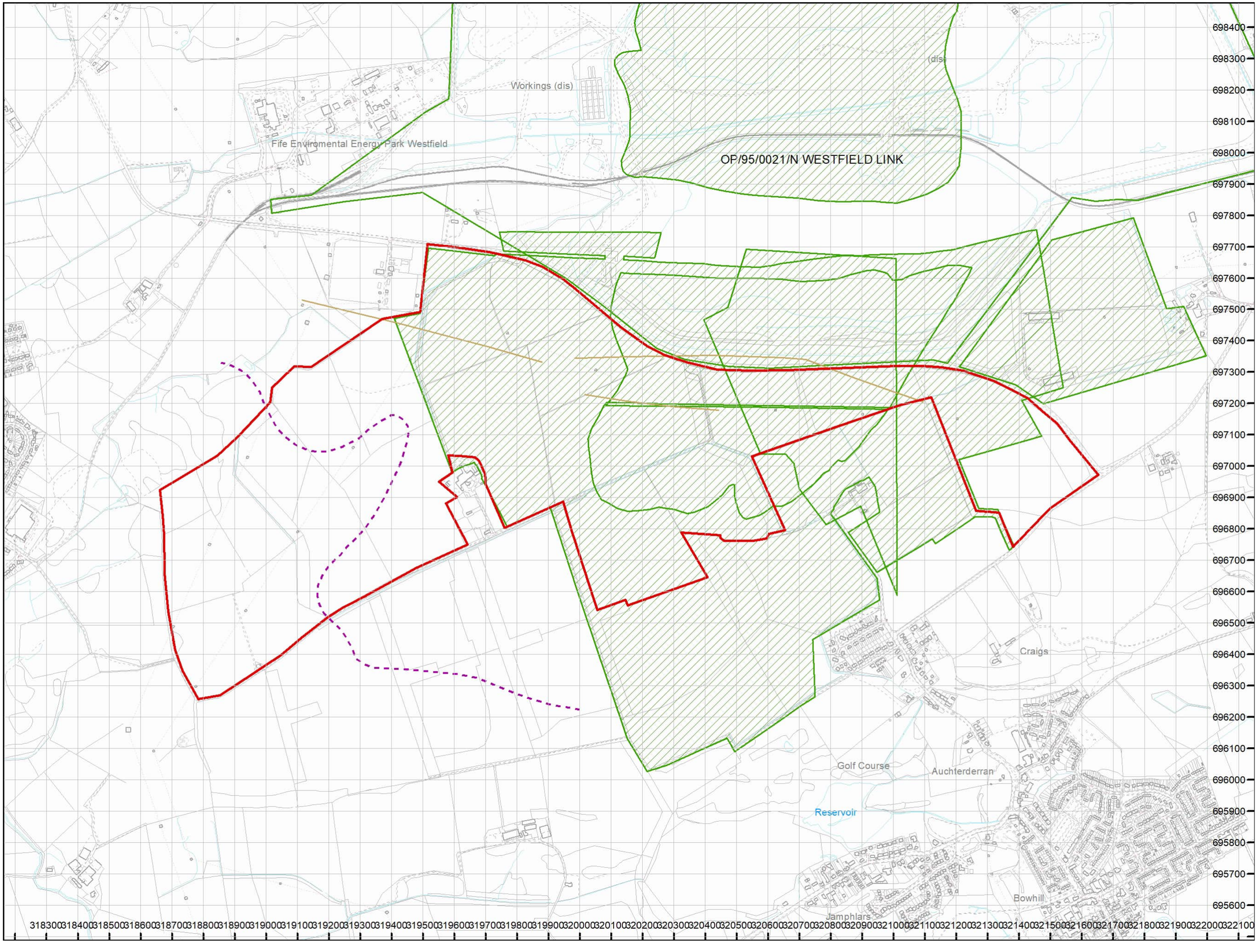
The Coal Authority

Summary of findings

The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

- Approximate position of the enquiry boundary shown
- Outcrop (Conjectured)
- Geological faults
- Opencast mine licence area
- Unlicensed opencast site



How to contact us
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www.groundstability.com

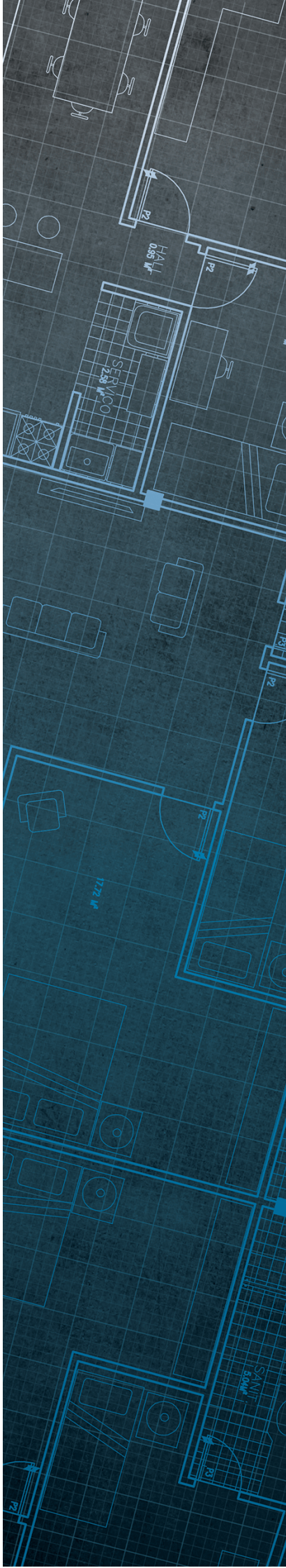
The Coal Authority

Consultants

Coal Mining Report

North Pitkinny Farm, B9097 From
Fife Boundary To B921, Westfield,
Cardenden
Fife
KY5 0HG

Date of enquiry:	**18 September 2023**
Date enquiry received:	**18 September 2023**
Issue date:	**18 September 2023**
Our reference:	**51003378685001**
Your reference:	**GS-AXU-TMW-5WR-2UX**



Consultants
Coal Mining Report

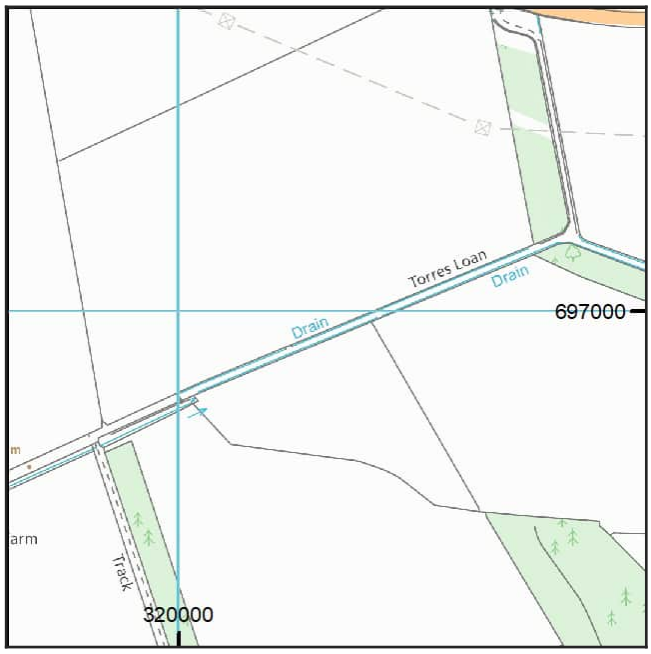
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

GROUNDSURE LIMITED

Enquiry address

North Pitkinny Farm, B9097 From Fife Boundary To B921, Westfield, Cardenden
Fife
KY5 0HG



Approximate position of property

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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	WESTFIELD SHALE	Coal	6OWZ	57	North	3.4	North	91	1886
CAPEL HALL	CAPLEDRAE PARROT	Coal	73J6	144	North-West	28.7	North	66	1885
CAPLEDRAE	CAPLEDRAE PARROT	Coal	6OXL	146	Beneath Property	13.7	North-East	94	1900
CAPEL HALL	CAPLEDRAE PARROT	Coal	6OX3	207	Beneath Property	17.8	North-East	94	1887
BOW HILL	UPP CARDENDEN SMITHY	Coal	73S7	299	South-East	16.9	North-West	102	1929
BOW HILL	LITTLE SPLINT	Coal	73SO	300	South-East	15.8	North-West	100	1932
GLANCRAIG	BLAIRHALL MAIN	Coal	73JP	302	South	9.7	North	89	1959
GLANCRAIG	UPP CARDENDEN SMITHY	Ironstone	73JM	310	Beneath Property	15.9	East	112	1958
GLANCRAIG	BLAIRHALL MAIN	Coal	73JQ	316	South-West	5.0	East	91	1940
GLANCRAIG	BLAIRHALL MAIN	Coal	6OXM	321	South	18.0	North	89	1959
GLANCRAIG	UPP CARDENDEN SMITHY	Ironstone	73JN	332	South	14.3	North	112	1958
GLANCRAIG	LITTLE SPLINT	Coal	73LH	342	West	14.6	East	107	1947
GLANCRAIG	SEVEN FOOT	Coal	73K5	349	South-West	16.1	East	94	1943
GLANCRAIG	LITTLE SPLINT	Coal	73LI	354	South	9.6	North-East	107	1947
BOW HILL	UPP CARDENDEN SMITHY	Coal	73S5	355	Beneath Property	16.9	North-West	102	1961
GLANCRAIG	UPP CARDENDEN SMITHY	Ironstone	6OXS	363	South	14.4	North	107	1957
GLANCRAIG	KELTY MAIN	Coal	73LV	363	South-West	20.3	East	152	1936
MARY	UPPER JERSEY	Coal	B0GI	368	South-West			132	1911
BOW HILL	LITTLE SPLINT	Coal	73SI	387	Beneath Property	15.8	North-West	91	1964
BOW HILL	UPP CARDENDEN SMITHY	Ironstone	73RC	390	North-East	14.8	North-West	76	1952

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
GLANCRAIG	KELTY MAIN UPPER	Coal	73KD	390	West	15.9	North	104	1938
GLANCRAIG	KELTY MAIN UPPER	Coal	73KE	398	West	15.8	North	104	1939
GLENCRAIG	UPPER JERSEY	Coal	B0GJ	399	West			132	1935
BOW HILL	UPP CARDENDEN SMITHY	Ironstone	6OXP	403	Beneath Property	13.0	North	112	1946
GLANCRAIG	KELTY MAIN	Coal	73LU	411	South-West	28.7	East	152	1932
BOW HILL	GLASSEE	Coal	73T8	412	South-East	11.6	North-West	100	1946
BOW HILL	LOCHGELLY SPLINT	Coal	73SW	416	North-East	8.2	North-West	127	1910
GLANCRAIG	KELTY MAIN	Coal	73LY	418	West	19.7	East	152	1936
BOW HILL	LITTLE SPLINT	Coal	6OXU	419	South	14.3	North	102	1944
MINTO	SWALLOWDRUM	Coal	6OYI	422	South-East	17.5	North	122	1958
GLENCRAIG	UPPER JERSEY	Coal	B0GL	422	South-West			132	1935
GLANCRAIG	SWALLOWDRUM	Coal	73M9	422	South	16.2	North	260	1931
GLANCRAIG	KELTY MAIN	Coal	73LZ	423	West	19.4	East	152	1936
BOW HILL	LITTLE SPLINT	Coal	73SJ	427	Beneath Property	15.8	North-West	91	1953
BOW HILL	UPPER JERSEY	Coal	73SS	427	Beneath Property	15.7	North-West	178	1939
GLANCRAIG	SWALLOWDRUM	Coal	73MA	428	South-West	13.8	East	260	1931
GLENCRAIG	UPPER JERSEY	Coal	B0GN	429	West			132	1939
GLANCRAIG	SWALLOWDRUM	Coal	73MC	429	West	13.8	East	260	1931
GLANCRAIG	KELTY MAIN	Coal	73LX	429	West	19.6	East	152	1926
GLENCRAIG	UPPER JERSEY	Coal	A0JW	430	West			132	1939
MINTO	UPPER JERSEY	Coal	6OYA	434	Beneath Property	3.7	North	203	1962
GLANCRAIG	SWALLOWDRUM	Coal	73MB	436	Beneath Property	13.7	East	260	1963
BOW HILL	LITTLE SPLINT	Coal	6OXW	438	South-West	14.1	North-West	97	1944
MINTO	UPPER JERSEY	Coal	6OY9	439	South	18.1	North	178	1963
MINTO	SWALLOWDRUM	Coal	6OYK	446	Beneath Property	15.6	East	122	1964

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
GLANCRAIG	KELTY MAIN	Coal	73LW	448	Beneath Property	20.1	East	152	1961
BOW HILL	LOCHGELLY SPLINT	Coal	73SU	450	Beneath Property	14.6	North-West	127	1905
MINTO	KELTY MAIN UPPER	Coal	6OY3	457	South-East	18.1	North-West	76	1939
BOW HILL	DUNFERMLINE SPLINT	Coal	73TF	459	South-East	11.0	North-West	122	1927
BOW HILL	FIVE FOOT	Coal	73S3	468	North-East	10.8	North-West	107	1923
BOW HILL	LOW LOCHGELLY SPLINT	Coal	73T3	470	South	0.0	East	64	1940
BOW HILL	UPPER JERSEY	Coal	73RH	471	North-East	15.9	North-West	168	1939
BOW HILL	UPPER JERSEY	Coal	6OY4	473	Beneath Property	16.5	North	203	1960
MINTO	UPPER JERSEY	Coal	6OY7	480	Beneath Property	14.8	North	203	1940
BOW HILL	SWALLOWDRUM	Coal	6OYC	486	South-East	22.9	North	122	1939
MINTO	LOCHGELLY SPLINT	Coal	6OYV	492	Beneath Property	15.1	North-East	137	1956
MINTO	LOCHGELLY SPLINT	Coal	73L1	492	Beneath Property	7.4	North-East	157	1956
BOW HILL	UPPER JERSEY	Coal	73RG	496	Beneath Property	15.8	North-West	168	1941
MINTO	LOCHGELLY SPLINT	Coal	6OYU	497	South-East	15.8	North	137	1951
BOW HILL	LOCHGELLY SPLINT	Coal	6OYL	500	Beneath Property	17.9	North	132	1950
BOW HILL	LOCHGELLY SPLINT	Coal	73RL	500	Beneath Property	58.1	West	137	1943
GLANCRAIG	GLASSEE	Coal	73KS	505	West	12.1	East	147	1936
BOW HILL	FIVE FOOT	Coal	73TB	510	Beneath Property	13.8	North-West	122	1923
BOW HILL	UPP CARDENDEN SMITHY	Coal	6OXQ	512	Beneath Property	22.6	North	102	1959
GLANCRAIG	SWALLOWDRUM	Coal	73M8	517	West	27.5	North-West	260	1909
GLANCRAIG	MYNHEER	Coal	73NJ	527	South-West	12.0	North-East	140	1921
MINTO	SWALLOWDRUM	Coal	6OYG	530	South-East	17.5	North	122	1943
BOW HILL	UPPER JERSEY	Coal	73RF	532	Beneath Property	23.1	West	168	1947
MINTO	MYNHEER	Coal	6OZ4	532	South-East	29.1	North	76	1929
BOW HILL	FIVE FOOT	Coal	73S2	534	Beneath Property	18.4	North-West	107	1941

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
MINTO	SWALLOWDRUM	Coal	5OYJ	541	South-East	17.5	North	122	1943
GLANCRAIG	DUNFERMLINE SPLINT	Coal	74O6	541	South	7.4	North-East	122	1930
BOW HILL	LOCHGELLY SPLINT	Coal	73RK	542	Beneath Property	58.1	West	137	1943
GLANCRAIG	GLASSEE	Coal	73KT	546	South	15.3	North	147	1935
MARY	UPPER JERSEY	Coal	B0GB	549	West			132	1955
MINTO	DUNFERMLINE SPLINT	Coal	6OZR	549	South-East	14.0	North	94	1934
BOW HILL	GLASSEE	Coal	6OZ0	550	South-West	21.3	North-West	117	1930
BOW HILL	DUNFERMLINE SPLINT	Coal	6OZK	556	South-East	16.9	North	127	1929
BOW HILL	FIVE FOOT	Coal	6OZ7	557	South-West	13.9	North-West	135	1919
BOW HILL	FIVE FOOT	Coal	6OZ9	561	Beneath Property	15.6	North-West	135	1919
MARY	LITTLE SPLINT	Coal	73LB	564	West	8.7	South-East	155	1961
GLANCRAIG	FIVE FOOT	Coal	73NV	565	West	11.8	North-East	114	1910
BOW HILL	LOW LOCHGELLY SPLINT	Coal	6OYX	565	South	0.0	East	102	1923
MINTO	LOCHGELLY SPLINT	Coal	6OYP	566	South-West	15.8	North	132	1948
MINTO	LOCHGELLY SPLINT	Coal	6OYN	567	South	17.9	North	132	1944
BOW HILL	UPPER JERSEY	Coal	6OY5	570	South	14.8	North	203	1940
MINTO	FIVE FOOT	Coal	6OZI	575	Beneath Property	16.7	East	112	1933
BOW HILL	DUNFERMLINE SPLINT	Coal	6OZN	575	South-West	15.6	North-West	127	1930
BOW HILL	UPPER JERSEY	Coal	6OXA	576	Beneath Property	25.9	North-West	188	1961
BOW HILL	DUNFERMLINE SPLINT	Coal	6OZL	589	South-East	16.9	North-West	127	1931
MINTO	FIVE FOOT	Coal	73NW	590	South	11.7	North-East	114	1929
MINTO	FIVE FOOT	Coal	73NX	596	Beneath Property	11.8	North-East	114	1933
BOW HILL	MYNHEER	Coal	6OZ6	597	South-East	17.7	North-West	61	1935
BOW HILL	UPPER JERSEY	Coal	6OY6	600	Beneath Property	14.8	North	203	1958
MINTO	DUNFERMLINE SPLINT	Coal	6OZW	603	Beneath Property	16.8	East	102	1936

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
BOW HILL	LOCHGELLY SPLINT	Coal	6OXB	605	Beneath Property	26.4	North-West	127	1961
BOW HILL	FIVE FOOT	Coal	6OZ8	611	Beneath Property	13.9	North-West	135	1938
MINTO	DUNFERMLINE SPLINT	Coal	74O7	613	Beneath Property	2.7	North-West	102	1934
MINTO	FIVE FOOT	Coal	6OZF	614	South-East	18.4	North	127	1932
BOW HILL	GLASSEE	Coal	6OZ1	633	South-East	18.9	North-West	142	1946
MINTO	LOCHGELLY SPLINT	Coal	6OYQ	644	Beneath Property	15.8	North	132	1964
BOW HILL	LITTLE SPLINT	Coal	6OX6	647	Beneath Property	15.0	West	122	1966
MINTO	FIVE FOOT	Coal	6OZB	651	Beneath Property	12.3	North	127	1942
BOW HILL	FIVE FOOT	Coal	6OZA	652	Beneath Property	27.8	North-West	135	1923
MARY	KELTY MAIN	Coal	73LT	653	West	13.0	South-East	312	1937
BOW HILL	LITTLE SPLINT	Coal	6OX5	655	Beneath Property	20.6	South-East	122	1966
MARY	SWALLOWDRUM	Coal	73M7	656	West	15.3	South-East	300	1961
MARY	UPPER JERSEY	Coal	B0Gf	656	West			132	1961
MINTO	DUNFERMLINE SPLINT	Coal	6OZV	657	Beneath Property	33.9	North-West	102	1942
BOW HILL	FIVE FOOT	Coal	6OXD	659	Beneath Property	26.2	North-West	109	1940
MINTO	DUNFERMLINE SPLINT	Coal	6OZQ	668	South-East	13.9	North	94	1939
MINTO	DUNFERMLINE SPLINT	Coal	6OZS	670	South-East	20.6	North	102	1939
BOW HILL	DUNFERMLINE SPLINT	Coal	6OZM	671	Beneath Property	16.9	North-West	127	1940
BOW HILL	UPPER JERSEY	Coal	6OX9	675	Beneath Property	15.9	East	188	1961
BOW HILL	LITTLE SPLINT	Coal	6OX7	678	Beneath Property	12.6	East	122	1965
MINTO	DUNFERMLINE SPLINT	Coal	6OZU	678	Beneath Property	48.5	South-East	102	1940
unnamed	UPPER JERSEY	Coal	6OWO	686	North-West	28.1	South-East	183	1945
unnamed	LOCHGELLY SPLINT	Coal	60WQ	689	North-West	42.3	North-East	304	1939
MINTO	DUNFERMLINE SPLINT	Coal	6OZT	694	Beneath Property	23.9	East	102	1940
BOW HILL	LITTLE SPLINT	Coal	6OXX	695	Beneath Property	23.6	North	116	1944
MINTO	FIVE FOOT	Coal	6OZG	696	Beneath Property	18.9	North-West	127	1940

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	UPPER JERSEY	Coal	6OWP	700	North-West	11.5	North-West	157	1941
BOW HILL	LITTLE SPLINT	Coal	6OX4	709	Beneath Property	8.9	North	122	1966
MINTO	LOCHGELLY SPLINT	Coal	6OYM	711	Beneath Property	17.9	North	132	1963
MINTO	LOCHGELLY SPLINT	Coal	6OYR	712	Beneath Property	15.8	North	132	1965
BOW HILL	UPPER JERSEY	Coal	6OX8	719	Beneath Property	11.9	North-East	188	1961
GLANCRAIG	LOCHGELLY SPLINT	Coal	73L6	719	North-West	21.0	East	165	1940
GLANCRAIG	FIVE FOOT	Coal	73NT	738	West	36.5	North-West	203	1945
BOW HILL	LOCHGELLY SPLINT	Coal	6OXC	742	Beneath Property	15.1	North-East	188	1961
MARY	FIVE FOOT	Coal	73NR	745	West	25.7	East	183	1933
MINTO	FIVE FOOT	Coal	6OZH	822	Beneath Property	46.2	South-East	127	1936
BOW HILL	FIVE FOOT	Coal	6OXE	852	Beneath Property	0.0	East	137	1921
GLANCRAIG	FIVE FOOT	Coal	73NP	897	West	18.3	South-East	203	1943

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

S552	S4389	S4362
S4716	S610	3850
S4424	S579	S4379

Our records show we have more plans than those shown above which could affect the enquiry boundary.

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
CALMY LIMESTONE	Limestone	Yes	Within	N/A	156
CALMY LIMESTONE	Limestone	Yes	26.6	North-West	160
CALMY LIMESTONE	Limestone	Yes	Within	N/A	315
CALMY LIMESTONE	Limestone	Yes	Within	N/A	337

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property recorded.

Opencast mines

Please refer to the “Summary of findings” map (on separate sheet) for details of any opencast areas within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations
None recorded within 50 metres of the enquiry boundary.

Remediated sites
None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence
The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas
None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes
None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing

Status	Licence type	Distance (m)	Direction
Past	Opencast	6.0	North

See Section 4 for further information.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is in an area where notices to withdraw support were given in 1945 and 1946.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Coal mining licensing

The report has highlighted that the site is close to a Coal Authority license area for coal mining operations. Please contact us if you require further information.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines
Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips
Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations
Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites
Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence
Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas
Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

Mine water treatment schemes
Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining
Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing
Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders
Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices
Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices
Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land
Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.