



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Remediation Strategy

Taylor Hall Lane

Mirfield

February 2024

On behalf of

Plantforce



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- Design/validation of ground gas remedial measures

This report has been prepared for the purpose of satisfying the requirements of the Local Planning Authority. Earth Environmental & Geotechnical Ltd reserves the right to amend this Remediation Strategy in the light of further information which may become available or future changes in contaminated land guidance, prior to site activities.

Sources of Information

The following reports have previously been prepared for the site by Earth Environmental & Geotechnical Ltd and should be read in conjunction with this Remediation Strategy:

- Earth Environmental & Geotechnical Ltd Phase I Geo Environmental Desk Study Report for Taylor Hall, Mirfield, by Earth Environmental & Geotechnical Ltd (Reference A4245/22/BDS, April 2022).
- Coal Mining Risk Assessment by Earth Environmental & Geotechnical Ltd (Referenced A4245/22/CMRA)
- Site Investigation Report, for Taylor Hall, Mirfield by Earth Environmental & Geotechnical Ltd (Reference A4245/23/SI, March 2023).
- Kirklees Council Condition Response, dated 5th February 2024, (Responding Reference: WK/202340560)

2.0 SITE LOCATION AND DESCRIPTION

The site is located to the north off of Taylor Hall Lane, Mirfield.

The site is approximately 1.6km to the north of Mirfield Centre.

The approximate National Grid Reference for the centre of the site is SE 19884 21422, (X: 419884, Y:421422) with the closest postcode being WF14 0LY.

The site is a square shaped parcel of land, the east of the site is overgrown with shrubbery.

To the north and east of site are open fields and to the south is Taylor Hall Lane and residential housing.

The maximum dimensions of the site are 34m east to west, and 33m north to south. The site occupies an area of approximately 0.04hectares.

The site is completely soft standing and there are no man-made obstacles on site.

A location plan is shown below as Figure 2.

Figure 2: Site Location Plan



3.0 PREVIOUS SITE INVESTIGATIONS

As mentioned in Section 1, three reports have been prepared for the site by EEG Ltd and are discussed below.

Phase 1 Geo Environmental Desk Study Report Taylor Hall, Mirfield by Earth Environmental & Geotechnical Ltd, (Referenced A4225/22/BDS), dated April 2022

The Report highlights that historically the site was part of a brickworks from 1888-1892. This remained until 1930-1931 when the site was a clay pit.

As of 2002 the site pit was filled in and a small building was erected directly on the site boundary. This remained until 2009 where the building was demolished, and the site became a vacant plot.

The report indicates that the site is underlain by an artificial deposit of infilled made ground.

The bedrock geology beneath the site is shown to be the Pennine Lower Coal Formation comprising of mudstone, siltstone, and sandstone (Secondary A Aquifer). The site is located with the specified search distance of a coal mining area and within a Development High Risk Area.

Previous onsite land use has included clay pits, brickworks, unspecified pits, and unspecified ground workings, dated 1892 to 1985. Other records in the vicinity refer to a clay pit, unspecified ground workings, unspecified pits, refuse heap, ponds, mill ponds, and old reservoirs.

Additionally, the report indicates that two historical landfill sites are within 500m of the site. The closest refer to Taylor Hall Landfill which is to the immediate northwest of the site with a unknown waste type. There are several potentially contaminative historical land uses within 500m of the site.

Additionally, the report identifies a previous intrusive investigation by GW Land Reclamation Limited (2006). Five boreholes were drilled across the site all of which encountered deep made ground of greater than 6m depth.

Contamination was identified on the site likely emanating from the surrounding tipped area by leachate migration and from historical tipping residue during the quarry/brick-making activities.

Gas Monitoring was installed during drilling however no elevated levels of methane with oxygen and carbon dioxide were detected.

The preliminary conceptual site model for the site outlined several pollutant linkages from potential soil, ground gas and groundwater contamination associated with the historic land use and asbestos-containing materials.

Therefore, the risk from soil contamination to construction workers was considered to be **MODERATE TO LOW**, with the risk to future end users considered to be **MODERATE TO LOW**.

The risk from ground gas to end users was considered to be **MODERATE** due to the potential for gas generation in the made ground deposits below the site and adjacent landfill site.

The overall risk to controlled waters was concluded to be **MODERATE TO LOW** based on the potential contamination at the site.

The report recommended intrusive investigation was recommended to establish geotechnical parameters for the design of foundations, floor slabs and pavement construction.

As part of the geotechnical investigation, it was recommended that samples are recovered for contamination testing of the soil and groundwater with gas and groundwater monitoring.

The full report can be viewed in Appendix 1.

Coal Mining Risk Assessment Taylor Hall, Mirfield by Earth Environmental & Geotechnical Ltd, (Referenced A4225/22/CMRA), dated April 2022

The report highlights that the site lies on the margin of a Coal Authority Development High Risk Area and the Coal Authority report indicates there are no probable shallow workings beneath the site.

The Coal Authority report shows two shafts on adjacent land. Both shafts would have been removed by opencast brickworks activities.

According to the Coal Authority report the 71cm thick Silkstone seam (alternative name Blocking Coal) was mined at a depth of 31m below the surface and last worked in 1945.

This working is outside the zone of influence of the surface.

A previous site investigation has confirmed that the site is on made ground to greater than 6m depth, from the Taylor Hall Lane Brickworks.

According to the Coal Authority report there are no reports of subsidence or mine gas in the area and previous gas testing on the site did not show any elevated levels of carbon dioxide or methane.

Based on the evidence presented within the report and summarised above, the reported proposed the following mitigation strategy.

Evidence from the data available suggests it is unlikely that there are any shallow workings beneath the site.

As a result, remedial activities such as infilled of abandoned mineworkings are not considered necessary.

The full report can be viewed in Appendix 2.

Site Investigation Report Taylor Hall, Mirfield by Earth Environmental & Geotechnical Ltd, (Referenced A4225/23/SI), dated March 2023

Scope of Works

The site investigation was conducted on the 30th of January 2023 and comprised:

- Five window sample boreholes (WS101 - WS105 inclusive) to depths of between 3.00 and 6.00m bgl.

- 50mm diameter standpipes were installed in all the window sample boreholes at depths between 3.00m - 6.00m below ground level.

Standard Penetration Tests (SPTs) were conducted in the window sampler boreholes, and soil samples were retrieved from the exploratory holes at regular intervals for geotechnical and chemical analysis. Soils were logged by an on-site engineer.

An exploratory hole location plan is presented as Figure 3, below.

Figure 3: Exploratory Hole Location Plan



Ground Conditions

The recorded ground conditions are summarised as follows:

Made Ground

Granular and cohesive made ground was encountered interbedded in all exploratory holes to depths of between 3.00 and 6.00 mbgl comprising

- Grass over brown clayey sandy gravelly TOPSOIL.
- Brown slightly clayey gravelly SAND. Gravel is red brick and sandstone.
- Dark brown slightly sandy gravelly CLAY. Gravel is red brick, siltstone, and sandstone.
- Dark brown gravelly SAND. Gravel is concrete, plastic, red brick, and clinker.
- Dark brown sandy slightly gravelly CLAY. Gravel is red brick, sandstone, and clinker.
- Dark brown gravelly SAND. Gravel is plastic, red brick, concrete, and plastic.
- Asphalt GRAVEL.
- Dark brown loamy organic SAND.
- Brown sandy GRAVEL. Gravel is red brick, clinker, MDF and sandstone.

The depths of the various materials encountered in the exploratory holes are summarised in Table 1, below.

Table 1: Summary of Ground Conditions Encountered

LOCATION	MADE GROUND	
	GRANULAR	COHESIVE
WS01	0.00 – 1.00, 2.00 – 4.40, 4.60 – 5.00	1.00 – 2.00, 4.40 – 4.60
WS02	0.00 – 0.70	0.70 – 3.00
WS03	0.00 – 1.00	1.00 – 3.80
WS04	0.00 – 1.00, 4.00 – 6.00	1.00 – 4.00
WS05	0.00 – 1.00	1.00 – 3.00

Soil Contamination Assessment

Five soil samples were retrieved from the boreholes for chemical analysis.

Samples were analysed for the following suite of contaminants: *Asbestos, Arsenic, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil Organic Matter and speciated Polyaromatic Hydrocarbons (PAH), Speciated Petroleum Hydrocarbons (TPH) and BTEX.*

The results of chemical testing were compared to screening criteria for Residential End Use with homegrown produce at a Soil Organic Matter Content of 1% and can be viewed in Table 2 overleaf.

None of the soil samples were found to contain concentrations of contaminants in exceedance of assessment criteria values relevant to the Residential End Use with homegrown produce end use.

Asbestos fibres were not identified in any of the samples tested.

Table 2: Soil Results Comparison with C4SL/S4UL Values

Determinand	C4SL/S4UL Levels Resi w/ HP 1% SOM (mg/kg)	WS01 0.50m MG	WS02 0.40m MG	WS03 0.15m MG	WS04 0.80m MG	WS05 0.15m MG	No of Exceedances
Metals							
Arsenic	37	8	6	12	6	21	0
Boron	290	< 1	< 1	< 1	< 1	< 1	0
Cadmium	11	< 0.2	< 0.2	< 0.2	< 0.2	0.3	0
Chromium	910	25	14	15	26	24	0
Chromium VI	6	< 2	< 2	< 2	< 2	< 2	0
Copper	2400	24	18	27	22	54	0
Lead	200	20	27	54	19	127	0
Inorganic Mercury	40	< 1	< 1	< 1	< 1	< 1	0
Nickel	180	19	17	18	23	29	0
Selenium	250	< 2	< 2	< 2	< 2	< 2	0
Vanadium	410	27	21	22	28	28	0
Zinc	3700	55	64	107	59	136	0
Petroleum Hydrocarbons							
Benzene	0.087	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
Toluene	130	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0
Ethylbenzene	47	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
m-xylenes	59	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
p-xylenes	56	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
o-xylenes	60	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
Aliphatic EC >5-6	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aliphatic EC >6-8	100	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aliphatic EC >8-10	27	< 2	< 2	< 2	< 2	< 2	0
Aliphatic EC >10-12	130	< 2	< 2	< 2	< 2	< 2	0
Aliphatic EC >12-16	1100	< 3	< 3	< 3	< 3	< 3	0
Aliphatic EC >16-21	65000	< 3	< 3	< 3	< 3	< 3	0
Aliphatic EC >21-35	65000	< 10	< 10	< 10	< 10	< 10	0
Aromatic EC >5-7	70	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aromatic EC >7-8	130	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aromatic EC >8-10	34	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >10-12	74	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >12-16	140	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >16-21	260	< 3	< 3	< 3	< 3	< 3	0
Aromatic EC >21-35	1100	< 10	< 10	< 10	< 10	< 10	0
Polycyclic Aromatic Hydrocarbons							
Naphthalene	2.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0
Acenaphthylene	170	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0
Acenaphthene	210	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0
Fluorene	170	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0
Phenanthrene	95	< 0.1	0.16	0.62	< 0.1	0.28	0
Anthracene	2400	< 0.1	< 0.1	0.14	< 0.1	< 0.1	0
Fluoranthene	280	< 0.1	0.16	0.83	0.15	0.54	0
Pyrene	620	< 0.1	0.16	0.73	0.15	0.5	0
Benzo(a)anthracene	7.2	< 0.1	< 0.1	0.4	0.12	0.29	0
Chrysene	15	< 0.1	< 0.1	0.36	0.12	0.31	0
Benzo(b)fluoranthene	2.6	< 0.1	< 0.1	0.33	< 0.1	0.27	0
Benzo(k)fluoranthene	77	< 0.1	< 0.1	0.34	< 0.1	0.26	0
Benzo(a)pyrene	2.2	< 0.1	< 0.1	0.22	< 0.1	0.16	0
Indeno(1,2,3-cd)pyrene	27	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0
Dibenz(a,h)anthracene	0.24	< 0.1	< 0.1	0.18	< 0.1	0.15	0
Benzo(ghi)perylene	320	< 0.1	< 0.1	0.22	< 0.1	0.16	0
Phenols							
Phenol	120	< 2	< 2	< 2	< 2	< 2	0

Controlled Water Risk Assessment

During the monitoring period groundwater was not encountered within the monitoring wells, thus testing of groundwater samples was not undertaken.

The Phase 1 Desk Study report highlighted an absence of any surface-controlled waters within 250m of the site, with the nearest groundwater abstraction licence 1.6km west of the site.

Ground Gas Assessment

Radon

The site is recorded to be located within an area where between 1-3% of properties are above the radon action level and therefore no radon protection measures were deemed necessary.

Ground gas monitoring wells were installed in all 5 window sample boreholes, details of the depth of plain and slotted pipe, response zone depth and targeted stratum are given below in Table 3.

Table 3: Window Sample Ground Gas Installation Summary

Location	Depth of Plain Pipe (m)	Depth of Slotted Pipe (m)	Response Zone (m)	Targeted Stratum
WS01	GL-1.00	1.00-5.00	1.0-5.00	Made Ground
WS02	GL-1.00	1.00-2.00	1.00-2.00	Made Ground
WS03	GL-0.80	0.80-3.80	0.80-3.80	Made Ground
WS04	GL-1.00	1.00-6.00	1.00-6.00	Made Ground
WS05	GL-1.00	1.00-3.00	1.00-3.00	Made Ground

Ground Gas Monitoring was carried out on four occasions between 8th March and 27th March 2023.

The results recorded methane (CH₄) levels of 0.1% to 0.8% (v/v) and carbon dioxide (CO₂) levels of 0.1% to 5.6% v/v. Gas flow rates were recorded between -0.1l/hr to 0.1l/hr and a maximum flow rate of 0.1l/hr has been adopted for the below calculations.

Atmospheric pressure was recorded to be between 978mb and 1005mb.

The Gas Screening Values (GSV) were obtained by multiplying the maximum concentration of gas by the steady flow rate of 0.1l/h adopted for assessment purposes.

- Carbon dioxide: steady flow rate = 0.1l/hr, max concentration = 5.6%
- Methane: steady flow rate = 0.1l/hr, max concentration = 0.8%.

Based on the above figures, the GSV is calculated as:

- **Carbon dioxide:** $GSV = 0.1 \times 5.6 / 100 = 0.0056 \text{ litres/hr}$
- **Methane:** $GSV = 0.1 \times 0.8 / 100 = 0.0008 \text{ litres/hr}$

The report suggests that the site can be give a Characteristic Situation 1, very low risk rating.

Conclusions, Recommendations and Commentary

Soil Contamination

Based on the results of the chemical testing, no exceedances of the assessment criteria relevant to a residential with homegrown produce end user use were identified in the tested samples.

It was therefore concluded that there was a low to moderate potential risk from soil contamination to construction workers and a low potential risk to future end users with no remedial measures required.

Ground Gas

The report concluded that the monitoring dataset indicated the site would fall in Characteristic Situation 1 (CS1) ('very low' gas risk).

The council have however suggested that as a precautionary measures, and given that the site was a former landfill, that ground gas mitigation measures are required.

As a result, Characteristic Situation 2 has been attributed to the local ground gas regime.

The full report can be viewed in Appendix 3.

4.0 LICENCES & APPROVALS

Various licences, permits and approvals are required at various stages before certain works can commence. Some activities can start before all such approvals are in place.

- (i) Approval of this Remediation Method Statement;
- (ii) All documentation in accordance with the CDM 2015 Regulations;
- (iii) Site Waste Management Plan;
- (iv) A signed declaration by qualified person of the Material Management Plan (MMP) in accordance with CL: AIRE Waste Code of Practice, Version 2, March 2011. This would allow for reuse of excavated soils after demonstration of suitability for use;
- (v) General condition survey of boundary features.

5.0 PROPOSED WORKS

Aims

The remediation aims are to resolve contamination issues to protect human and environmental receptors and render the site suitable for the proposed end use and satisfy the requirements of the Local Planning Authority and Insurance bodies (NHBC).

The remediation strategy for the site has been developed following review and assessment of the site investigation report previously prepared for the site by EEG Ltd.

Ground Gas

Although the site has been previously classified with a Characteristic Situation 1, “very low risk”, following concerns from Kirklees Borough Council and reassessment the data, the new proposed buildings on-site require CS2 level protection.

A scoring system is referred to within BS 8485:2015 +A1:2019, whereby each protection measure has an individual score, as summarised in Table 4 below.

Table 4: Gas Protection Point Score Required (BS8485:2015+A1:2019)

Characteristic Situation	Minimum gas protection score (points)			
	High Sensitivity		Medium	Low
	Type A building (private housing)	Type B building (multiple occupancy private or commercial)	Type C building (single occupancy commercial)	Type D building (large industrial)
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4.0	3.0	2.5
4	6.5	5.5	4.5	3.5
5	-	6.0	5.5	4.5

The proposed development is for a private housing development, therefore would be classified as a Type A building (High Sensitivity). The combined score for such a development must equal or exceed a **gas protection score of 3.5 for a Characteristic Situation 2**.

The required 3.5 points must be achieved by installation of a suitable combination of measures from structural barrier, ventilation/dilution, and gas membrane. Reference should be made to BS8485:2019 for details, EEG recommends the following.

- Cast in-situ reinforced suspended floor slab with minimal penetrations- Structural barrier (Score -1)
- Passive sub floor dispersal layer of clear void or No fines gravel layer – Ventilation (Score-1.0)
- Ground Gas barrier membrane (Score-2)

The Cast in-situ reinforced suspended floor slab with minimal penetrations should be designed in accordance with BS EN 1992.

The Passive sub floor dispersal layer should be designed in accordance with BS EN 8484:2015+A1:2019 Annex B.

Details for the Gas Membrane are given below.

Visqueen Gas Barrier Membrane

- Minimum 0.5mm thick reinforced membrane meeting all the following criteria (**Gas Protection Score - 2**):
 - Sufficiently impervious to gases with a methane gas transmission rate $<40.0\text{ml/day/m}^2/\text{atm}$ (average) tested in accordance with BS ISO 15105-1, for sheet and joints;
 - Sufficiently durable to last for the anticipated life of the building and duration of gas emissions;
 - Sufficiently strong to withstand in-service stresses and installation process together with ongoing construction until covered.
 - All penetrations and joints sealed (taped or welded, not glued) to achieve complete integrity across entire building footprint.

After installation, the membrane should be capable of providing a complete barrier to gas entry.

Service entry locations and physical penetrations through the subfloor pose a potentially high risk to the continuity and integrity of any waterproofing and/or gas protection system. The reduction of service penetrations through a slab by relocation through the outer wall above ground level will reduce the detailing required if laying a membrane and therefore reduce the risk of failure.

The gas membrane should be installed correctly by a competent contractor. Appropriate specification, supervision and control will be needed during design and construction, including validation and verification of the construction accordance with CIRIA C735.

The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints.

For example, a minimum 0.5mm thickness (equivalent to 400g/m^2 for polyethylene) reinforced membrane (virgin polymer) will meet the performance criteria opposite.

If a membrane is installed that does not meet all the criteria above, then the “gas protection score” is zero.

An example of a suitable ground gas membrane is provided in Appendix 4.

Ground Gas Protection Measures –Verification & Validation

During the installation process, clear evidence that the recommended ground gas protection measures have been suitably installed in line with the above specification and appropriate guidance (CIRIA C735) will be provided.

Verification will be carried out by an appropriate independent person and a Verification Report will be prepared, which will provide the following:

- Description of the visual inspection regime
- Description of the elements of the ground gas protection system
- Dates of inspection, inspection staff present, weather conditions and surrounding site activities
- Specifics relating to the level of training, competency, and accuracy of the installation team
- Photographic record of gas protection system installed, including any observed defects and/or repairs
- Details of any areas unable to be inspected and the reasons explained.

It should be noted that no installation of gas protection measures should be carried out at the site without prior approval of this Remediation Strategy by the Local Planning Authority and any deviation to works away from the agreed Remediation Strategy should be agreed in writing with the Local Planning Authority prior to installation.

6.0 SITE WORKS

Outlined below are some of the main task and activities associated with the remediation works.

Site Organisation

Site works will be supervised throughout by a suitably qualified Engineer, who will report to a Project Manager. Supervision may be part-time for certain activities but will be full-time during the removal of any contaminated soil/fill and any placement of fill to an engineering specification.

Welfare Facilities/Security

Initial mobilisation works will include the establishment of appropriate office and welfare facilities. Such facilities may include but are not restricted to; office accommodation, canteen facilities, washroom/drying room, toilets, wheel wash, car parking, stores, and security unit.

The site should be secured by fencing to prevent unauthorised access onto the site during the enabling works.

Health & Safety

All site personnel will undergo a site-specific health and safety induction prior to commencement of work on site.

The Engineer will be informed prior to any proposed entry of a confined space or deep excavation. Entry will be restricted to suitably qualified and equipped personnel.

Works will be carried out about current statutory requirements and guidance by the Health & Safety Executive "Protection of workers and the general public during the redevelopment of contaminated land." Protective clothing, footwear and gloves will be required with hand washing and boot-washing facilities made available. Smoking will be limited to designated areas.

Site Clearance

Any trees currently under a preservation order should be identified and agreed with relevant authorities prior to the commencement of the works. All trees subject to a Tree Preservation Order should be clearly identified and protected by chestnut paling with fluorescent tape.

The site should then be cleared of all residual debris, fly tipped materials, any vegetation, shrubs, bushes, and unprotected trees as instructed by the client.

Excavation of Subsurface Obstructions

During the site investigations, no significant obstructions were identified within the made ground, which could pose obstacles during excavations and construction.

Any material identified as potentially contaminated should be stockpiled on a non-permeable membrane, and tested for suitability for either re-use on site, or offsite disposal.

Should the material be removed from site, waste acceptance criteria testing should be undertaken, and the material disposed of in a suitably licensed facility. The development of a

Materials Management Plan (MMP) in line with the CL: AIRE Code of Practice may be required to remove or re-use soils.

Unexpected Contamination

If during site clearance works or other excavations, material with visual or olfactory evidence of previously unrecorded contamination is encountered, the principal contractor should contact Earth Environmental & Geotechnical.

These soils should be then sampled, and chemical analysis carried out. The environmental consultant shall decide upon the chemical suitability of the material, to either remain on site or if it is likely to present a risk to receptors.

If the soils present a risk, the materials should be removed from site or remediated as per the standard procedures.

Any excavated material identified as potentially contaminated should be stockpiled on a non-permeable membrane, and tested for suitability for either re-use on site, or disposed offsite.

If prolonged stockpiling is unavoidable, these soils should be covered with a non-permeable membrane at the end of each working day, to prevent the possibility of leachate migrating from the soils due to infiltration.

Should the material be removed from site, waste acceptance criteria testing should be undertaken, and the material disposed of in a suitably licensed facility. The development of a Materials Management Plan (MMP) in line with the CL:AIRE Code of Practice may be required to remove or re-use soils.

Backfill of Excavations

All excavations shall, prior to backfilling, be surveyed to ascertain their spatial extent and depth. Excavations (to remove relict structures, contamination etc) should be backfilled with suitable materials as agreed with the Engineer and subjected to nominal compaction.

However, where an excavation conflicts with the footprint of a proposed highway, compaction in general accordance with the Specification for Highway Works Table 6/1 will be required.

Control of Perched Groundwater

The regional groundwater table is unlikely to be encountered during remediation earthworks; however, discontinuous perched groundwater may be present within Made Ground. If encountered during the excavation works, this perched water will be recovered by pumping from open excavations. Dependant on volumes recovered, some form of temporary storage may also be required.

Provision should be made for pumping from sumps and appropriate excavation support for all excavations.

7.0 ENVIRONMENTAL MONITORING & CONTROLS

General

All works should be carried out in a manner that minimises impact on the environment and generates adequate and accurate records to demonstrate remediation works have been carried out to the required standard and in accordance with all applicable legislation. All such records should be collated on contract completion (or sooner as required) and included within the contract completion report. Appropriate progress reports should be provided in a format and at a frequency as agreed with the client and project manager including on-going monitoring/validation information.

Comprehensive records should be maintained throughout the project. These should be collated on contract completion into a completion and validation report, which should be submitted to the appropriate regulators for approval. It will be presented in an appropriate manner to allow interested third parties to fully understand the whole remediation process.

The records should include correspondence with the regulators & other third parties, environmental monitoring data, validation testing, comprehensive as-built drawings, photographs, collation of all site investigation reports, operational method statements & risk assessments, construction phase health & safety plan and confirmation of post remediation considerations especially in respect of interaction with initial construction (groundwork's).

Noise Control

Earthworks will only take place during normal working hours 8.00am – 6.00pm Monday to Friday and 8.00am to 13:00pm on Saturdays with no working on Sundays or Bank Holidays. The site manager shall assess noise and its impact upon neighbours through the working day and to ensure the following mitigation measures are being utilised:

All plant and machinery will be fitted with adequate silencers and will not be operated unless in good condition.

Noise levels will be as per normal for a project of this nature. Pneumatic breakers will be used but location and hours of use controlled whenever possible.

Should residents make any complaints regarding noise associated with the works, the site manager shall investigate. Such investigation may include the use of portable monitoring equipment to record noise levels at the location of the complainant. The nature of the complaint and findings of the investigation shall be discussed with the local EHO. If the complaint is upheld appropriate remedial action shall be taken. Such action may include the adjustment of working hours or the alteration of site practices and working methods.

Odour Control

Works may produce odours, but good site practice and associated mitigation measures should ensure fugitive odours are kept to an absolute minimum. Such controls may include:

- Additional covers will be applied to stockpiles if they are contributing to fugitive odours.
- Areas of excavation i.e., area of exposed contaminated soils, will be kept to a minimum and covered/re-instated as soon as is practicably possible.

- Odour suppressing equipment shall be utilised at appropriate locations at appropriate times.

If a complaint is made regarding odours from nearby residents, the site manager shall respond by attending the complainant's property to assess the nature and level of odour nuisance including monitoring where appropriate. Appropriate mitigation measures as described herein shall then be enforced including, if necessary, suspension of excavation works until the prevailing weather conditions become more favourable.

Dust Control

Earthworks may produce dust during prolonged periods of dry weather. The site manager shall assess dust and its impact upon neighbours through the working day and ensure the following mitigation measures are being utilised to control dust:

- The use and maintenance of good quality site roads;
- Enforcing speed limits of site plant and;
- Dust suppression via water applied by towed bowser, particularly in the vicinity of locations where trace asbestos fibres have been detected in soils.

8.0 VALIDATION REPORT

A Validation Report should be developed for installation of the ground gas protection measures.

The validation of the ground gas membrane will be by Earth Environmental & Geotechnical prior to the laying of the screed horizon. The installation will be validated in accordance with a gas protection validation record template.

Ground Gas Mitigation

The ground gas element of validation report should include:

- 🌍 A description of any measures installed – this could be presented in textual form, as photographic records or by as-built construction drawings (any variations to the pre-construction design should be fully detailed and justification(s) presented);
- 🌍 Details of who installed the measures;
- 🌍 Details of who inspected or verified the installation/s and a description of how this took place, together with any constraints (i.e., areas that could not be inspected or tested) or other issues of uncertainty;
- 🌍 Verification test results, outcome of inspections and compliance data should be provided, either within the main text or as an Annex to the report; and
- 🌍 Any defects identified, together with corrective actions and subsequent verification checks. Where appropriate, the report content should also include:
- 🌍 Copies of regulatory correspondence/sign off;
- 🌍 Manufacturers' specifications, warranties and/or guarantees;
- 🌍 Personnel details (such as relevant qualifications); and
- 🌍 Maintenance requirements and/or limitations of the system.

The report would provide a concluding comment about the suitability (or otherwise) of installed gas measures and include the name of the author, company details and date of issue.

A detailed installation plan including the chosen membrane specification, manufacturers documentation together with proposed cross sections showing how the system will be installed, sealed, and jointed in relation to the proposed foundations/slab design.

The plan will include how the gas protection system meets the required score for the building type as listed in BS8485.

APPENDIX 1

PHASE 1 GEO ENVIRONMENTAL DESK STUDY REPORT, TAYLOR HALL, MIRFIELD BY EEG LTD, (REFERENCED A4225/22/BDS), DATED APRIL 2022

APPENDIX 2

COAL MINING RISK ASSESSMENT, TAYLOR HALL BY EEG (REFERENCED A4225/22/CMRA), DATED APRIL 2022

APPENDIX 3

**SITE INVESTIGATION REPORT, TAYLOR HALL BY EEG (REFERENCED A4224/23/SI),
DATED MARCH 2023.**

APPENDIX 4

EXAMPLE OF APPROPRIATE GAS MEMBRANE SPECIFICATION

APPENDIX 5

REPORT LIMITATIONS

LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd based on a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2024 and should be read considering any subsequent changes in legislation, statutory requirements, and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full of those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.