

CLIENT:	Jones Homes (Yorkshire) Limited
PROJECT:	Land at Primrose Lane, Liversedge
SUBJECT:	Technical Response to Coal Authority Objection
JOB NO:	LD11032
DATE:	18 th September 2024
PREPARED BY:	Jonathan Currie (Wardell Armstrong, Associate Director)
CHECKED BY:	Abdul Rehman (Wardell Armstrong, Regional Director)

INTRODUCTION AND BACKGROUND

This Technical Note (TN) has been prepared by Wardell Armstrong (WA) to address the substantive concerns raised by the Coal Authority (CA) pursuant to Local Planning Authority number 2023/62/91116/E for the proposed development of 77 dwellings at land off Primrose Lane, Hightown, Liversedge (the Site).

It builds upon an initial meeting, dated 14th August 2024, that was held with the CA via their pre-application advice service (reference: PAS00266), during which WA presented an overview of the mining legacy issues at the Site and how these could be addressed.

The CA's objection, as detailed in their response dated 5th July 2023, primarily relates to concerns that the proposed development layout has not been sufficiently informed by the presence of the mine shafts and their potential zones of influence (ZOI). Other key issues that were raised included the potential for shallow, unrecorded coal mining activity beneath the Site, which may lead to voids, ground instability, and the risk of mine gas emissions.

It was advised that further intrusive investigations would be required to locate all the recorded mine entries within the Site, including establishing the adequacy of any past treatment works. The findings should then be used to revise the proposed development layout to ensure that the built development avoids the mine shafts and their associated ZOI's.

This TN expands on the presentation content provided within the preapplication meeting and aims to provide a comprehensive response, demonstrating that these concerns have been fully addressed, thereby allowing the CA to remove their objection to the application.

EXTENT OF GROUND INVESTIGATIONS AND REPORTING UNDERTAKEN TO DATE

Extensive Ground Investigations (GI) and reporting have been undertaken for the Site. These investigations have allowed for a comprehensive assessment of the subsurface conditions, particularly with regard to any potential mining legacy issues, and to accurately quantify the associated risks.

Extent of Reporting and Risk Assessments

The results of the GI's along with other desk based information have been documented in a series of detailed technical reports which include:

- Michael D Joyce Associates LLP (MDJA): “Phase 1 Geo-environmental and Geotechnical Assessment (Desk Study)” (report no. 4146), dated July 2021.
- MDJA: “Preliminary Phase 2 Ground Investigation” (report no. 4157), dated Sept. 2021.
- MDJA: “Primrose Lane, Liversedge – Ground Gas Risk Assessment” (ref: ADJ/DJM/11274), dated April 2022.
- WA: Coal Mining Risk Assessment (CMRA), Primrose Lane, Liversedge, dated July 2022.
- Terra Dat: Geophysical Survey to Map Potential Mineshafts – Primrose Lane, Liversedge (ref: Geophysical Survey Report 8085) – dated August 2022.
- WA: Shallow Coal Mining Investigation, Land at Primrose Lane, Liversedge, dated May 2023

The reports prepared by WA have been carried out in accordance with best practice and relevant industry standards and were informed by the previous third party reports. This integration ensured that the findings and subsequent assessments are robust and provide a comprehensive understanding of the Sites ground conditions and mining legacy issues.

Extent of Ground Investigations

The scope of the GI works carried out at the Site has been extensive and has included several stages of work that were undertaken between 2021 and 2023. Each stage of investigation has been built upon the previous stages and the overall extent of the works are summarised below:

- 6 No. rotary boreholes (BH) were drilled at strategically selected locations across the Site to depths up to 30.0m below ground level (bgl). These boreholes were logged in detail (where core was recovered) to establish the depths and nature of any shallow coal seams and/or workings beneath the Site, along with establishing the competency of the overlying strata.
- 37 No. trial pits (TP) were excavated to depths up to 4.5m bgl to establish the thickness, extent and characteristics of shallow Made Ground and shallow weathered bedrock and to provide direct observations of any shallow or outcropping coal seams.

- 5 No. trial trenches (TT) were excavated to depths up to 4.0m bgl to confirm the presence or absence of the shafts that had been identified within the developable area of the Site, and to establish the depth and width of the shafts at the level of competent rock head.
- 25 No. window sample (WS) boreholes were drilled to depths up to 5.45m bgl to obtain further information about the shallow ground conditions and establish the depth to competent rockhead.
- A comprehensive suite of geophysical surveys were conducted across the entire developable area to help identify potential anomalies associated with former mining activities, with a focus on being located unrecorded mine entries.
- 6 No. ground gas and groundwater monitoring visits were undertaken between 24th August 2021 and 08th November 2021 to enable ground gas risk assessment to be undertaken and to establish the groundwater regime beneath the Site.

All the exploratory hole positions undertaken at the Site are shown within Figure 1 below.

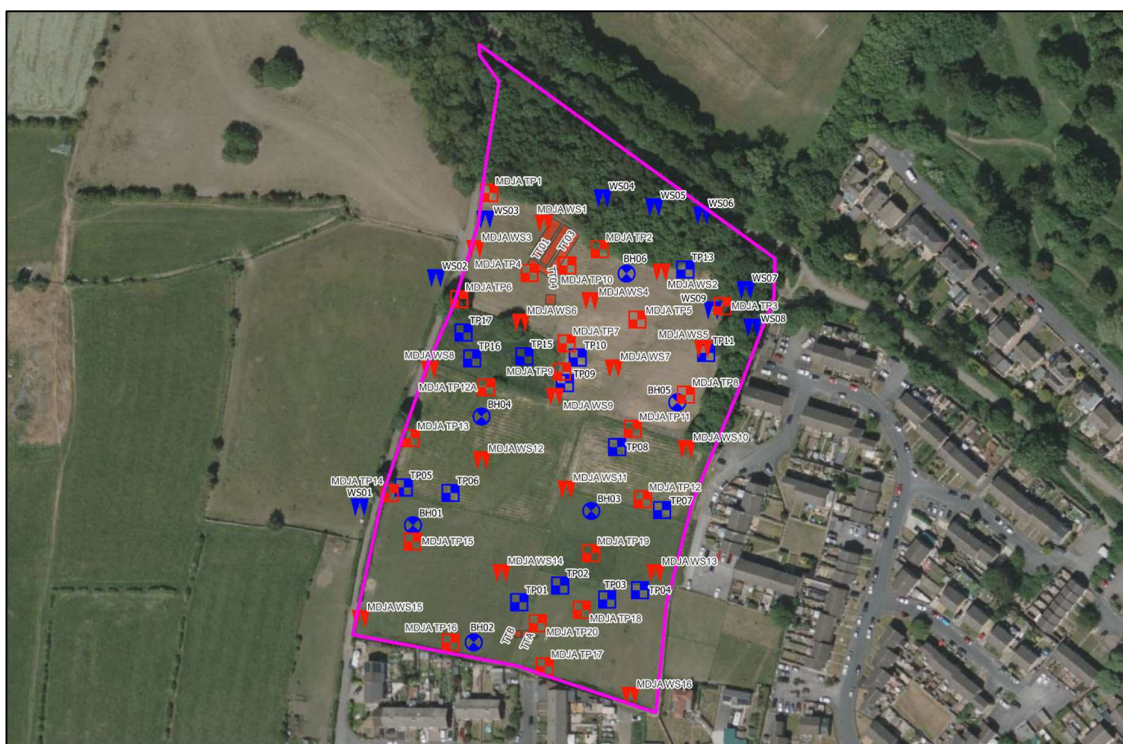


Figure 1: Aerial image showing exploratory hole locations and the extent of the previous investigations at the Site. Blue and red locations are WA and third party exploratory hole locations respectively.¹

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SUMMARY OF PAST LAND USE

The earliest available map from 1854 shows the Site as undeveloped. However, by 1892, the northern half of the Site is recorded to have become occupied by Stanley Colliery, which included two mine shafts and an air shaft, along with several buildings, a railway network, a small rectangular reservoir and a row of workers cottages, as shown in Figure 2 below.

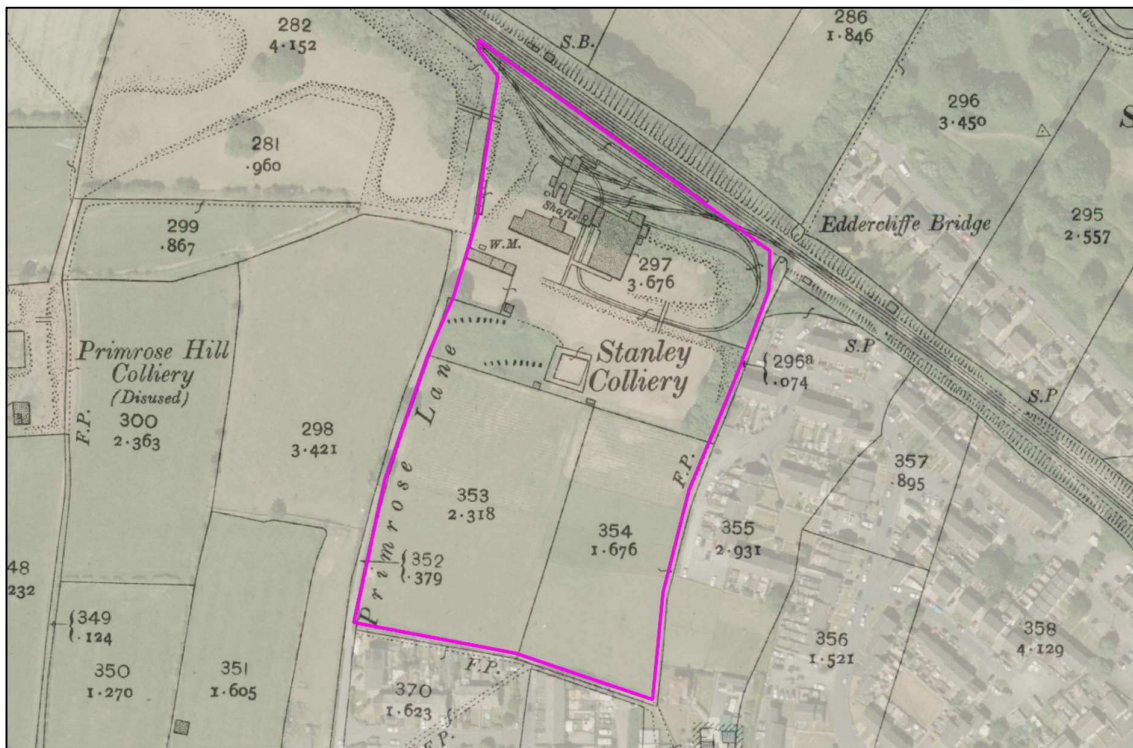


Figure 2: Overlay of historical mapping dated c. 1922 showing the former Stanley Colliery with associated buildings and shafts.²

By 1933, the colliery is indicated to have ceased operations and by 1938 most structures are indicated to have been demolished and the shafts no longer recorded. By 1969, the only remaining features are the outline of former spoil heaps.

Notably, the southern half of the Site appears to have remained undeveloped. Following the demolition of the colliery, the northern section of the Site also appears to have remained undeveloped to the present day, although it is understood to have been used for grazing by the current landowner.

² Image is for illustrative purposes only. Historical imagery reproduced with the permission of the National Library of Scotland under Creative Commons Attribution (CC-BY) licence. BING imagery reproduced under license and for illustrative purposes only. Boundaries are indicative. Aerial imagery shown for context purposes only. Drawing uses third-party data. No reliance can be provided for this data and WA cannot be held responsible for any errors within this data.

SUMMARY OF GROUND CONDITIONS

The ground and groundwater conditions encountered at the Site are summarised in the sections below. For detailed descriptions please refer to the specific GI reports listed in the previous sections.

Geological Overview

British Geological Survey (BGS) mapping indicates that the Site is characterised by an absence of drift deposits and is underlain by solid geology of the Pennine Lower Coal Measures Formation, which has a shallow rock dip to the northeast.

As shown in Figure 3 below, the Top Lousey and Trub coal seams are conjectured to outcrop across the southern and central sections of the Site respectively, although the outcrop locations are noted to differ between the various sources that have been reviewed. No faults are indicated to be present at the Site.



Figure 3: Extract from BGS 1:50,000 scale geological map showing the Lower Pennine Coal Measures Formation with prominent sandstone outcrops in green and typical coal measures strata in grey. The diagonal hatched area depicts an area of Made Ground. Conjectured coal seam outcrops are shown by the dashed black lines.³

³ This drawing is for illustrative purposes only. BGS Geology 50k: Contains British Geological Survey materials © UKRI [2024] and provided under the Open Government License v3. BING imagery reproduced under license. Aerial imagery shown for context purposes. Drawing uses third-party data. No reliance can be provided for this data and WA cannot be held responsible for any errors within this data.

Ground Conditions Summary

Previous GI's at the Site indicate that ground conditions vary significantly between the northern and southern sections. Typical ground conditions are as follows:

- The northern part of the Site predominantly consists of granular Made Ground that mainly comprises colliery spoil with some demolition and infill materials related to the former colliery. This Made Ground extends to depths of between 1.2m and in excess of 4.5m bgl. In localised areas, particularly around the former reservoir, more cohesive materials were also encountered.
- Across the remainder of the Site, and beneath the Made Ground in the north, residually weathered coal measures strata were encountered. The thickness of this stratum ranges from 0.3m to 6.2m, with the thickness increasing towards the north. It typically comprises a soft to stiff clay with lithorelicts of mudstone, though it occasionally occurs as an angular gravel of extremely weak mudstone or sandstone.
- The superficial strata and weathered bedrock strata are underlain by the Lower Pennine Coal Measures Formation, which typically comprised sequences of extremely weak to medium strong mudstone, very weak to weak sandstone, and weak ferruginous siltstone.
- Intact coal was encountered within 7 No. exploratory hole locations at depths of between 2.0m and 18.2m bgl. These coals were recorded as being between 0.2m and 0.8m thick and are believed to correspond to the Top Lousey and Trub Coal seams that are conjectured to outcrop at the Site.

Groundwater was generally absent and where water strikes were encountered these were primarily associated with land drains and other relict man-made features. However, perched groundwater was encountered in shallow monitoring wells at depths ranging from 1.3m to 3.4m bgl.

Significant obstructions related to the former colliery buildings were encountered in the northern section of the Site and this included brick walls, concrete footings, floor slabs, drains, and other oversized materials.

MINE ENTRY FINDINGS AND PROPOSED STRATEGY

There are 5 No. recorded mine entries within the Site, each with specific details that have been outlined below. Further detailed research has provided new information, allowing for the locations of these mine entries to be determined with increased accuracy and for details of past treatment to be quantified.

This updated information has been used to refine the potential ZOI's for each mine entry and the proposed development layout has been amended accordingly to avoid buildings being located over these areas. The proposed strategy for managing and mitigating the residual risks associated with these mine entries and any unrecorded mine entries is also discussed, to demonstrate how the proposed development can proceed safely without significantly compromising the developable area and number of building plots that are required.

Mine Entry Details

WA have obtained the Mine Entry Plans and Datasheets from the CA but have also reviewed the CA Surface Hazard Record of Investigation and Treatment Health and Safety File along with the National Coal Board (NCB) Shaft Register slips for these mine shafts. These documents are enclosed.

5 No. mine entries are recorded at the Site as shown in Figure 4 below, each with varying levels of detail regarding their locations, construction, and treatment. Unrecorded mine entries may also be present.



Figure 4: Image showing the updated mine entry locations based on CA data and recent investigations.⁴

⁴ This drawing is for illustrative purposes only. Contains data from the Coal Authority WMS, this information has been extracted from the national coal mining database, held and maintained by the Coal Authority © Crown copyright 2024 and provided under the Open

Mine Entries 419424-004, 419424-005, 419424-006:

For mine entries 419424-004, 419424-005, and 419424-006, their locations have been confirmed through intrusive investigations conducted by the CA between 2004 and 2005. The shafts were found to be 2.5m in diameter, capped with concrete, and in places reinforced with 5mm thick steel plates that were secured to the caps with M12 100mm parabolts. The caps were noted to rest on brick shaft linings that were recorded as being 0.25m thick; with minimal overlap. Water levels were recorded at 17m depth in all three shafts, and the total depths to water was noted as c. 90m. While no details about the condition of the caps has been provided, historical records from the NCB Shaft Register (1948) note the shafts as concreted over and in good condition.

Mine shafts 419424-004 and 006 are recorded as being 105.8m deep, both targeting the Black Bed coal seam. Mine shaft 004 is listed as an air shaft on historical maps but is also recorded as the upcast shaft in the NCB records. Mine shaft 006 is recorded as the pumping shaft. Mine shaft 419424-005 is recorded as being 147.2m deep and targets the Better Bed coal seam. It is assumed to have been used for downcast or upcast operations for men and materials.

While it is not stated within the completion report, the shafts are believed to have been capped at rockhead, as the report notes that the brick arch roof of a fan drift was encountered at a depth of 1.0m bgl but that it was proven to be 3.0m high. This suggests that excavations extended to at least 4.0m bgl and this corresponds with the depth to natural strata that has been proven during previous investigations immediately to the south of these shafts.

Mine Entry 419424-014

Mine entry 419424-014 was successfully located during previous WA investigations and excavated to a depth of 2.2m bgl. This mine shaft was rectangular and had a maximum aperture of 2.7m and appeared to have been backfilled with dark greyish-brown sandy Gravel comprising clinker, sandstone, and ceramics. No slumping of the backfill was observed, but as the full depth of the shaft (recorded as 12.8m bgl) was not proven, it is uncertain if the shaft has been fully backfilled. No shaft lining or water ingress was identified at the depths investigated, but the shaft appeared to have been excavated directly into the rock as shown in Figure 5 below.



Figure 5: Image showing the aperture of mine entry 419424-014 at a depth of 2.2m bgl and surrounded by sandstone bedrock.

Mine Entry 419424-020

Shaft 419424-020 presents uncertainty. WA's investigations and extensive trial trenching at the recorded location of this mine shaft, which covered an area of c. 250m² to a maximum depth of c. 4.0m bgl, were unable to locate this shaft. This shaft does not appear on historical maps, and its presence beneath one of the colliery buildings is questionable. It is also not mentioned within the CA Surface Hazard Record of Investigation and Treatment Health and Safety File, nor was it investigated by the CA at the time of the other three shafts associated with Stanley Colliery between 2004 and 2005.

The authenticity of this mine shaft has been queried with the CA Mining Information Team and an attempt was made to locate the original source plan. Unfortunately this plan is not in the possession of the CA, but this exercise did lead to the discovery of a confidential plan that does show the shaft's position near an alternative conjectured outcrop of the Lousey Coal within the northern section of the Site. This suggests that it may have predated Stanley Colliery and could have been an early shallow working and was likely destroyed as part of the colliery's construction.

However, it is listed on the NCB Shaft Register dated 1948 and the abandonment plan for the Top Beeston seam does show a diversion of the main roadway from the other shafts that appears to intersect this shaft, lending some credibility to its existence. Due to the uncertainty, georeferencing techniques were used to refine the shaft's location based on the confidential plan. The updated findings were shared with the CA, and as per their procedure for mine entry review, it is understood that the location information for this mine shaft has been updated.

Unrecorded Mine Entries

Given the Site's geological characteristics—including the absence of superficial drift, shallow rockhead across much of the Site, its location on the side of a valley, and the recorded outcrop of conjectured coal seams—there is a potential risk of early, unrecorded mine entries. This risk is further heightened by the presence of shallow intact coal seams identified during previous investigations, and the existence of an adit driven into one of these seams c. 400m west of the Site.

However, extensive previous intrusive investigations and comprehensive Site-wide geophysical surveys have provided limited evidence for unrecorded mine entries. It is also assumed that no such features were encountered during the installation of the existing water main that runs through the Site, as no records of mine entries or remedial works from that time exist. It is possible that the water main and other on-site features could be masking potential geophysical anomalies that could be mine entries.

Zone of Influence Calculations

This detailed assessment of the mine entries has allowed for an accurate determination of the ZOI's, which have been used to inform the layout and design of the proposed development.

Development over or within the ZOI of a mine entry should be avoided, where possible, even when optimum treatment is undertaken. The ZOI is typically regarded to be within an angle of 45-degree angle, drawn from the edge of an untreated mine entry position at competent rockhead and projected to the surface.

ZOI calculations are generally calculated as being the sum of the departure distance, plus the depth to competent rockhead, plus the entry radius of an untreated shaft from the plotted co-ordinates of the mine entries.

In this instance, with the exception of mine entry 419424-020, the mine entry locations are known with confidence, as they have been located during previous intrusive investigations,

so a departure distances of 0m is justifiable for use within the calculation. However, for mine entries 419424-004, 005 and 006 a departure of 1m has still been applied to account for any inaccuracies that could result from the use of older GPS systems at the time of the CA investigations.

WA have undertaken highly conservative Site specific ZOI calculations for the treated shafts based on the recorded ground conditions information and the nearest exploratory hole to the shaft that provides depth to competent rockhead (defined by SPT N Values >50 and/or based on rotary drillers logs). For mine entries 419424-004, 005, 006 and 020 a conservative depth to competent rockhead of 6.2m bgl has been assumed and for mine entry 419424-014 the depth to competent rockhead was proved at 2.2m bgl.

The results of the zone of influence calculations and the various parameters used are shown in the Table below and the ZOI's for each mine shaft in relation to the proposed development are illustrated within Drawing LD11032-001:

ZOI Calculations						
Mine Entry Reference	Borehole Reference (m)	Depth to Rockhead (m)	Maximum Diameter of Shaft (m)	Departure (m)	Angle of Draw (m)	Calculated ZOI
419424-004	BH06	6.20	2.50	1 ²	45	8.45m
419424-005	BH06	6.20	2.50	1 ²	45	8.45m
419424-006	BH06	6.20	2.50	1 ²	45	8.45m
419424-014	TP014B	2.20 ¹	2.70	0	45	3.55m
419424-020	BH06	6.20	2.50	8	45	15.45m
Notes: ¹ This is the depth that the mine shaft aperture was identified within rockhead rather than the depth at which the feature was encountered which was at c. 0.40m bgl. As such, the calculated ZOI is highly conservative. ² Despite these mine entries being located, a departure of 1m has been applied to account for any inaccuracies that could result from the use of older GPS systems.						

It should be noted that WA are adopting a worst case ZOI calculation for mine entries 419424-004, 005, 006 and 020 as depth to competent rockhead may be shallower than that indicated by BH06.

Relationship of Mine Entries to Development Layout and Proposed Mitigation

The relationship between the recorded mine entries and the proposed development layout, along with the proposed mitigation strategy, have been discussed below. Careful

consideration has been given to ensure that no buildings are directly located over the mine shafts and the proposed strategy aims to achieve a balance of risk mitigation with optimisation of the layout to accommodate the development needs.

Mine Entries 419424-004, 005, 006

Drawing LD11032-001 shows that the mine entries 419424-004, 005, 006 and their ZOI are located outside of the built development area. Furthermore the Yorkshire Water Main Diversion has been rerouted to avoid these mine entries. Given that the shafts are now located within an undeveloped area, the area is to remain woodland and that the shafts are capped and treated, these mine entries pose a very low risk to the proposed development.

Given that an intrusive investigation has already been conducted by the CA and records are available that prove the location of the mines shafts and their treatment, we believe that no further investigation of these mine shafts is necessary at this stage. This also aligns with the ecological and access consideration for this area. Since the trees are to be retained, it's important to avoid any potential damage to them and any other ecological receptors.

Given the very low risk to the proposed development, it is proposed that isolation of the mine entries and their ZOI to within the woodland area is prudent. It is recommended that this be achieved by securing the area with suitable fencing and appropriate signage with regular inspections being undertaken by the landowner to maintain security.

While the ZOI of mine entry 419424-004 is located close to Plot 08 it should be noted that a precautionary 1m departure has been included within the ZOI calculation, even when the use of a 0m departure would have been justifiable. Furthermore, due to the deep Made Ground that is present within this area, it is understood that piled foundations to competent rockhead and suspended floor slabs would be required. In the unlikely event that the shaft were to collapse, the most likely mode of failure would be at the intersection where the shaft meets rockhead, with the collapse primarily occurring in the overlying fill material. The impact of such a collapse on a structure with the above structural precautions would be significantly reduced.

Mine Entry 419424-014

Drawing LD11032-001 shows that this mine entry and its ZOI are no longer located beneath a building and are now restricted to the garden areas of Plots 54 and 55. While the mine entry and its ZOI are still located close to residential dwellings, several factors significantly reduce the likelihood of any major instability.

Previous investigations have shown that the mine entry is located within an area of shallow rockhead, with a limited depth and diameter, and it appears to have been backfilled with no evidence of slumping. The depth to rockhead used for the ZOI calculation (2.2m bgl) also corresponds to the depth where the shaft aperture was identified within competent rockhead. However, the shaft was encountered at 0.4m bgl, with the fill materials enclosed by a mixture of weathered and more competent rockhead strata.

Therefore, the ZOI that has been adopted is highly conservative and could realistically be reduced to account for the shaft aperture alone, as the stabilising effect of the surrounding rock would justify the use of a significantly reduced angle of draw. In this scenario it is less likely that any direct structural loads from the buildings would be transmitted to the shaft, meaning that the risk of collapse, notwithstanding treatment, is significantly reduced.

To further refine the mitigation strategy and ascertain the most pragmatic and economical approach, additional investigations will be conducted to confirm key details of the shaft, such as its full depth, the nature of the backfill, the presence of voids or obstructions, and any groundwater. Depending on the findings, potential treatment options could include drilling and grouting the shaft to enhance stability and/or installing a reinforced concrete cap. The nature of the treatment would be confirmed and agreed with the CA once these investigations have been completed and designs have progressed.

CIRIA C758⁵ states that in situations with a suitably filled shaft and/or fully designed and structurally adequate cap, the risk of failure is insignificant, and that the respective area can be included within the proposed build envelope. There are several factors that need to be considered, but in this instance there is sufficient information to warrant the inclusion of the built development within the mine shafts theoretical and limited ZOI.

It is recognised that some residual risk will always remain, as mine shafts may degrade over time, either due to construction activities that could impact upon its integrity, changes in ground conditions or backfill conditions. However, the residual risks in this case are minimal, as any potential collapse would likely be restricted to the shaft column due to the surrounding rockhead. To further manage these risks, bridging techniques could be employed within the garden areas, and building foundations extended into competent rock and below the intersection of the mine entry with competent rockhead.

⁵ Abandoned Mine Workings Manual, 2019

Mine Entry 419424-020:

Drawing LD11032-001 shows that the mine entry is located within garden area of Plot 07 and the proposed development has been amended so that the majority of the ZOI is now restricted to the garden areas of Plots 06 – 10. While Plots 06 and 07 are still located within the wider ZOI, the proposed development has been carefully amended to ensure that they are not located within this mine entries departure radius.

Given the uncertainties surrounding the precise location of this mine entry, further intrusive investigations are required to accurately identify its position and refine the ZOI. Until this information is obtained, it would be premature to further adjust the proposed development layout. Any required changes can be made once additional data is available to ensure the layout adequately addresses the risks and better reflects the Sites conditions. At present, no buildings are located directly over the anticipated mine entry location or its departure radius, and by applying the same rationale and mitigation strategy used for mine entry 419424-014, it is hoped that the CA's objection can be removed.

We recognise that, in a worst-case scenario, the mine entry could be discovered outside of its departure radius and beneath one of the proposed building plots. Should this occur, then any built development located over the mine entry would be removed from the consent, to ensure that no buildings are constructed over the mine entry. This approach provides the CA with a clear mechanism to withdraw their objection while maintaining flexibility should a mine entry be located beneath one of the buildings.

If the mine shaft cannot be definitively located, it is envisaged that the ZOI can still be reduced by proving where the shaft is not, thereby reducing or eliminating the departure radius. If the shaft is located, the departure can be removed entirely. In either scenario, the ZOI would be reduced, meaning that the likely worst case scenario is being reflected within the current ZOI. Following the reduction of the ZOI, the strategy and rationale used for mine entry 419424-014 would apply.

While some structures may still be located within the ZOI, additional structural precautions in the form of suspended floor slabs and piled foundations are understood to be required for these building plots due to the presence of deep Made Ground in this area of the Site. In the unlikely event that the mine shaft collapses, following its anticipated treatment, the most probable failure would occur at the intersection between the shaft and rockhead, primarily involving the overlying fill material. The structural precautions proposed (piled foundations and suspended slabs) would significantly mitigate the impact of such a collapse to these buildings. Additionally, bridging techniques could be implemented in the garden areas,

allowing any collapse to become evident before it reaches a critical stage, enabling pre-emptive remedial actions to be undertaken.

Once the additional investigations are completed, the most pragmatic and cost-effective mitigation strategy will be identified. The final treatment approach will be agreed with the CA as the design progresses and further details become available.

Unrecorded Mine Entries and Shallow Coal:

Given the possibility of unrecorded mine entries, the following precautionary measures are proposed:

- A site strip would be undertaken as part of the earthworks that would be required for the Site, and during this exercise a careful watching brief will be maintained to monitor for any features that could indicate the presence of unrecorded mine entries. Should any such features be encountered, specialist advice will be sought to determine if further investigation or remedial works would be required and the appropriate permits sought for such activities.
- An identical procedure to the above would apply during the cut and fill earthworks operations and any service trench or foundation excavations that would be required for the Site.
- It is intended to excavate any shallow coal from the outcrop to at least the anticipated foundation and service trench depths, or deeper if Site constraints allow. This approach will increase the likelihood of locating unrecorded features, which are most likely to be found near the outcrop. Prior to this activity, an incidental coal agreement would be secured.
- Naturally all construction works would proceed with caution, keeping in mind the potential for unrecorded mine entries. Should any unexpected or unusual ground conditions arise during excavations, then all work within the vicinity would halt, and further investigation will be conducted to assess the situation.

By adopting these measures, the risks associated with unrecorded mine entries can be carefully managed, minimising their potential impact and ensuring that the proposed development can be made safe and stable.

COAL MINING FINDINGS AND PROPOSED STRATEGY

This section outlines the key findings related to the potential presence of unrecorded shallow coal mine workings, recorded and potential unrecorded deeper coal workings, and the strategy for mitigating these risks as part of the proposed development.

Potential Shallow Coal Mine Workings

The Site's geological characteristics, with shallow rockhead and multiple coal seams at or near the surface, suggest an increased likelihood of early, unrecorded shallow coal mine workings being present. While the previous investigations indicate that there is limited direct evidence of shallow workings beneath the Site, coal seams have been encountered at shallow depth and are of workable thickness. The Top Lousey Coal is recorded as being up to 0.8m thick and there is an adit driven into this coal seam c. 400m west of the Site that suggests it may have been historically worked near its outcrop.

Despite evidence of natural 'washouts' of the coal seams and the intact coal being of variable quality, unrecorded shallow coal mine workings, especially within the Top Lousey Coal, cannot be discounted. The highest risk of such workings are at the recorded outcrop positions of the coal seams and at depths up to 10-12m bgl, which aligns with the typical maximum depth of early mining techniques like bell pits. Beyond this depth, the likelihood of unrecorded workings decreases, although early shallow mine shafts with headings for pillar and stall type workings, could still pose a risk.

Regarding stability of the Site, shallow workings would only be deemed safe when at least 10 times the coal seam thickness, or the height of a major roadway (assumed as 1.5m), is overlain by competent rock. In the worst-case scenario involving a major roadway, those parts of the Site that are located down-dip of the Top Lousey coal seam outcrop could be at risk of ground instability. However, the likelihood of major roadways from early pillar and stall working methods or bell pits being present is low, suggesting that most of the Site would be stable once sufficient rock cover for the maximum recorded coal seam thicknesses has been obtained.

In summary, while the risk of unrecorded shallow workings remains, particularly near the Top Lousey Coal outcrop, the available evidence suggests that once adequate rock cover is achieved, the stability risk from early coal mining activities is significantly reduced.

Recorded and Potential Unrecorded Deep Coal Mine Workings

Deep coal mine workings are recorded at the Site within the Top Beeston, Black Bed, and Better Bed coal seams. Investigations and calculated coal seam contours indicate that the

shallowest of these seams, the Top Beeston, lies at depths of approximately 35m to 46m bgl beneath the developable areas of the Site as shown in Figure 6 below. While there is potential indirect evidence of workings within this seam that have migrated upward to between 16.5m and 23.5m bgl, there is significant competent rock cover above these workings and any associated potential 1.5m high roadways.

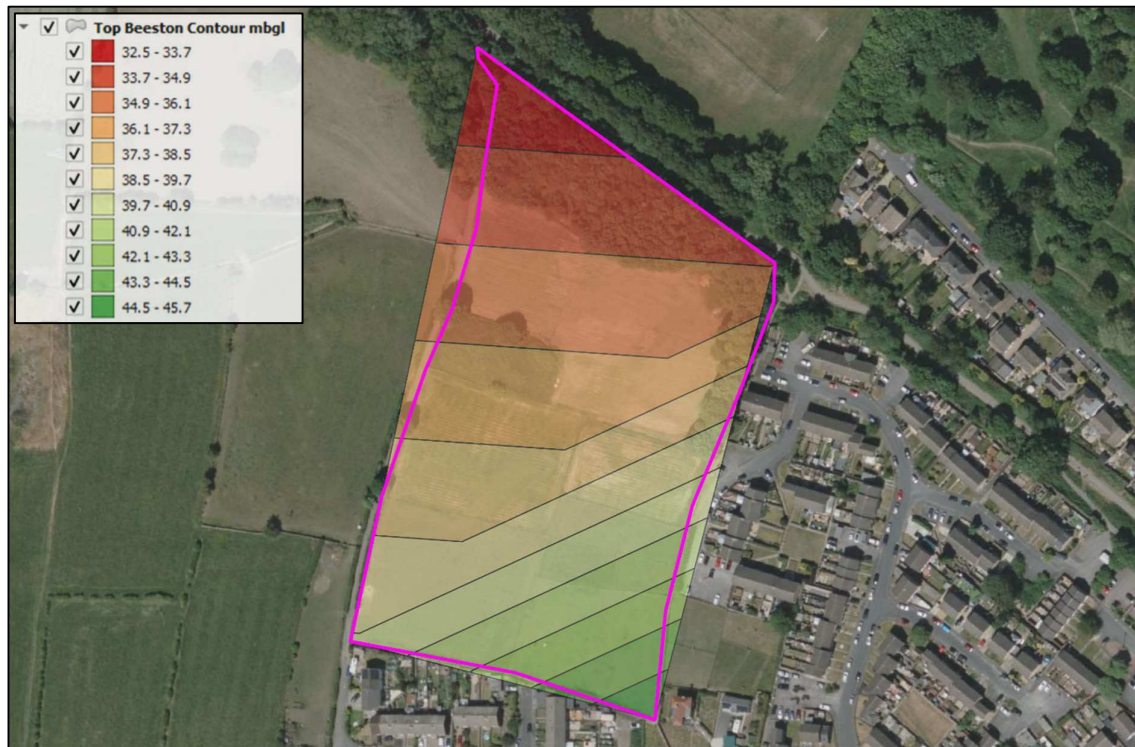


Figure 6: Image showing the interpolated coal seam contours for the Top Beeston coal seam.⁶

For the deeper coal seams, including the recorded workings within the Black Bed and Better Bed seams, these are found at depths of between c. 57m bgl and c. 146m bgl beneath the Site, and as such it is highly unlikely that any workings would pose a risk to surface stability or impact the proposed development. Additionally, many of the intervening seams between the Top Beeston and Better Bed coals are not of workable thickness, and due to the thickness of the intervening strata and the presence of competent sandstone strata, the risk of instability from multiple seam extraction can effectively be discounted.

In conclusion, the available evidence suggests that the recorded deep workings would not present a significant risk to the proposed development, as multiple lines of evidence approach

⁶ This drawing is for illustrative purposes only. The contour is an estimate based on preliminary calculations and assumes that the information included on the CA Abandonment Plan for this coal seam are correct. BING imagery reproduced under license and for illustrative purposes only. Boundaries are indicative. Aerial imagery shown for context purposes only. Drawing uses third-party data. No reliance can be provided for this data and WA cannot be held responsible for any errors within this data.

suggests that sufficient competent rock cover is present and, as such, the likelihood of ground instability due to deep coal mining activities is very low.

Proposed Mitigation

For any very shallow unrecorded coal workings, we propose to address them in the same manner as any unrecorded mine entries. Upon completing additional investigations and Site preparation works, we will utilise all available data to accurately map outcrop locations and derive coal seam contours to constrain those areas of the Site where less than 10 times the seam thickness of competent rock cover is present and/or derive site specific criteria (which may or may not be based upon a 1.5m high roadway).

The resulting hazard zones derived from the above would then guide the decision on whether further remedial works are necessary for specific buildings. If shallow workings are identified, possible remedial measures could include localised ground improvement and/or drilling and grouting to ensure surface stability.

Regarding the deeper coal workings, given the significant depth of these seams and the extensive competent rock cover, a multiple lines-of-evidence approach suggests that further investigations or remedial works are unlikely to be necessary. The highest risk is concentrated in the northernmost section of the Site, which is to remain undeveloped. Across the remainder of the Site, the rapidly increasing depth of the coal seams, due to the natural dip of the coal and the rising elevation, substantially reduces the risk of ground instability from deeper workings.

In summary, for shallow workings, much of the risk would be reduced during site preparation (i.e. topsoil strip and excavations) and hazard zoning will drive any necessary remedial actions for the remainder of the Site. The risk from deeper workings is considered minimal based on current data and Site conditions.

MINE GAS

While the recent third-party ground gas risk assessment suggests that ground gas protection measures are unlikely to be required, this conclusion appears overly optimistic given the Sites coal mining legacy, which would typically necessitate the inclusion of ground gas protection measures as a precautionary approach. Additionally, the ground gas regime could change due to subsidence or collapse of any coal mine workings or following remedial works and site development—especially if new pathways for gas migration are inadvertently created.

To mitigate these risks, it would be prudent to conduct further ground gas monitoring particularly in the vicinity of the recorded mine shafts, as these shafts can serve as preferential

pathways for mine gas to migrate to the surface. A comprehensive mine gas risk assessment should follow, validating the conclusions of the third-party report and determining whether additional protective measures are required.

If any further unrecorded mine entries, shallow coal workings, or anomalous ground conditions are discovered as site works progress, additional ground gas monitoring wells would need to be installed to accurately assess the risks and ensure appropriate mitigation is in place.

CONCLUSIONS AND PROPOSED ACTIONS

The primary objective of this TN is to address and remove the objection raised by the CA, specifically by ensuring that no buildings are located over recorded mine entries. The proposed development layout has been amended accordingly, ensuring it is informed by the known mining legacy features.

The strategies outlined within this TN provide a pragmatic approach to managing the residual risks associated with historical coal mining features while allowing the development to proceed safely. It is hoped that these strategies can be conditioned as part of the planning process, rather than being used to uphold the current objection.

Granting planning permission is essential for the development to move forward, allowing Jones Homes to purchase the Site and undertake the required remedial actions.

An outline of the proposed strategy for addressing each of the mining legacy issues that have been identified for the Site are outlined below:

- **Mine Entries in Woodland:** Given that the shafts are located within an undeveloped area, the area is to remain woodland and that the shafts have been located and capped, isolation of the mine entries is therefore proposed. The area would be secured with suitable fencing and appropriate signage with regular inspections being undertaken by the landowner.
- **Southernmost Mine Shaft:** The proposed development layout has been amended so that this shaft and its ZOI are restricted to the garden areas of Plots 54 and 55. The treatment approach for this mine entry will be determined following further investigations to confirm its condition and precise location.
- **Fourth Shaft:** The proposed development layout has been amended to remove certain building plots from the mine entries ZOI and to ensure that no buildings are located over this mine entry or within its departure radius. Given the uncertainties surrounding the

precise location of this mine entry, further intrusive investigations are required to accurately identify its position and refine the ZOI. Until this information is obtained, it would be premature to further adjust the proposed development layout and should this be required this can instead be addressed through a reserved matters application. By applying the same rationale and mitigation strategy used for the southernmost shaft, it is expected that the CA's objection can be removed.

- **Unrecorded Mine Entries and Shallow Coal:** To mitigate the risk it is proposed that watching briefs are employed during site preparation (e.g. site strip and during earthworks) and during construction (e.g. excavation of service trenches and foundations) as this would expose and address any unrecorded features. Additionally, it is proposed to excavate shallow coal from outcrop locations as this would further reduce the risks. For any unrecorded shallow coal mine workings, zoning will be undertaken following the completion of the additional investigations and site preparation activities, to assess the need for further remedial works on certain plots, ensuring that any residual risks are effectively managed.
- **Deeper Recorded and Potential Coal Mine Workings:** Given the significant depth of these seams and the extensive competent rock cover, a multiple lines-of-evidence approach suggests that further investigations or remedial works are unlikely to be necessary.
- **Mine Gas:** Conduct further ground gas monitoring and undertake a mine gas risk assessment.

By implementing these strategies and continuing with the investigative and remedial processes, we are confident that the residual risks posed by the Site's mining legacy will be effectively mitigated, allowing the development to proceed safely and sustainably.

In conclusion, this technical note outlines a comprehensive and pragmatic approach to addressing the coal mining legacy issues associated with the Site. The proposed development layout has and will be informed by thorough investigations and careful consideration of recorded and unrecorded mine entries, shallow and deep coal workings, and ground gas risks. By adopting the strategies outlined above, the residual risks can be effectively managed.

We are confident that with these strategies in place, the objection from the CA can be resolved, allowing the development to proceed safely and enabling the Site to be granted planning permission. Continued collaboration with all stakeholders will ensure that any emerging issues are addressed promptly, and that the development can move forward with full consideration of the Site's historical mining features.

Encs.

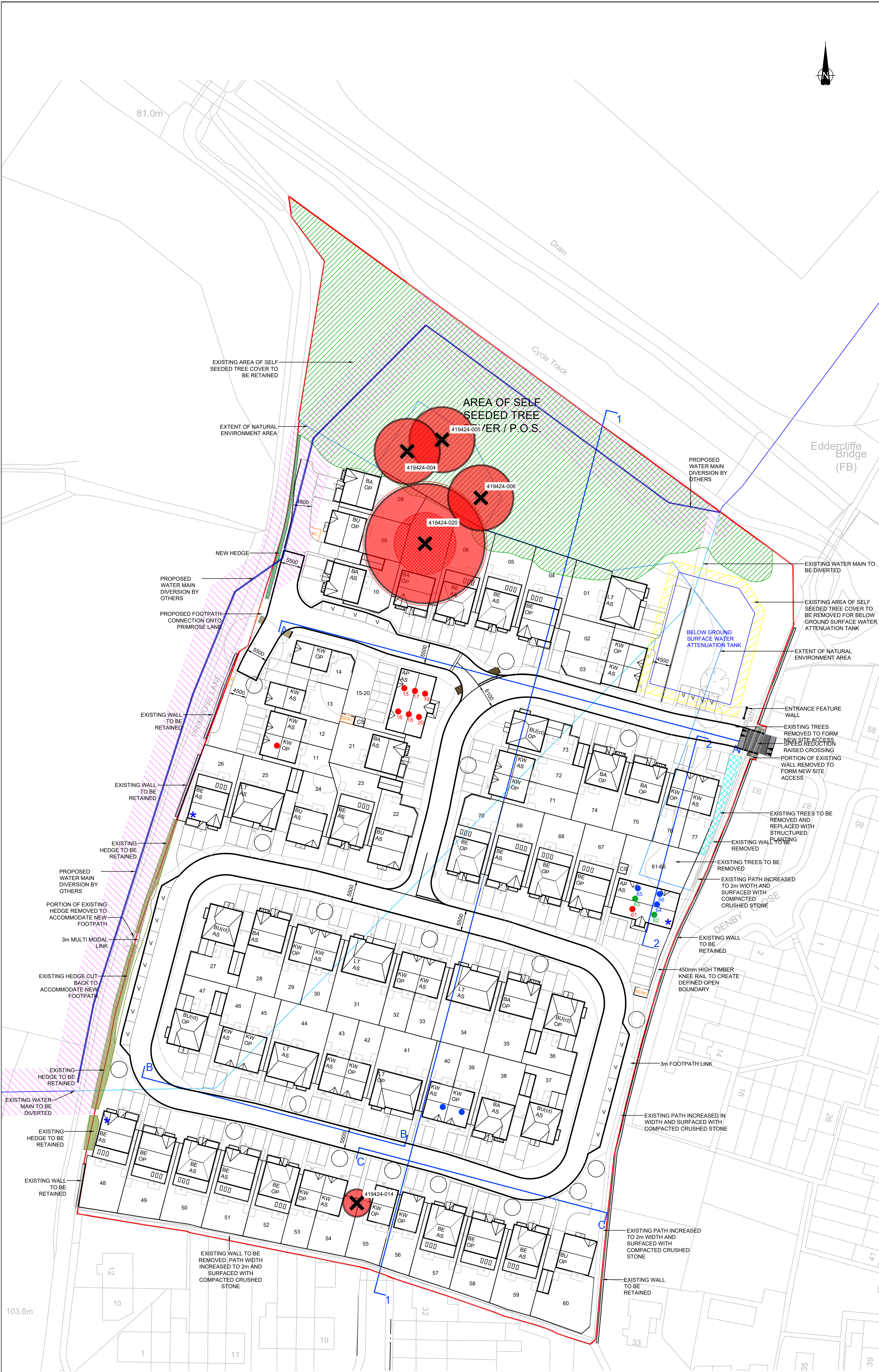
Appendix A – Drawing LD11032-001 Mine Shaft Zone of Influence Drawing

Appendix B – Coal Authority Mine Entry Plans and Datasheets

Appendix C – CA Surface Hazard Record of Investigation and Treatment Health and Safety File

Appendix D – National Coal Board Shaft Register

APPENDIX A



DO NOT SCALE FROM THIS DRAWING

LEGEND:

- SF10 - 1800mm HIGH TIMBER SCREEN FENCE
- SF1 - BRICK WALL & TIMBER SCREEN FENCE
- SF12 - 450mm HIGH TIMBER KNEE RAIL
- EXISTING HEDGE TO BE RETAINED
- EXISTING HEDGE REMOVED FOR NEW FOOTPATHS
- PROPOSED HEDGE
- PROPOSED TREE
- EXISTING TREES TO BE RETAINED
- EXISTING TREES TO BE REMOVED
- EXTENT OF NATURAL ENVIRONMENT AREA
- V VISITOR PARKING
- RC REFUSE COLLECTION POINT
- BCRC COMBINED BIN STORAGE & REFUSE COLLECTION POINT
- STRUCTURED TREE PLANTING
- PROPOSED WATER MAIN DIVERSION & EASEMENT
- EXISTING YORKSHIRE WATER MAINS
- CS CYCLE STORAGE
- ★ SIDE WINDOW / GABLE FEATURE - REFER TO HOUSE TYPE DRAWINGS
- AFFORDABLE RENT UNIT
- FIRST HOME
- INTERMEDIATE UNIT
- DEPARTURE RADIUS

AREA OF SELF SEEDING TREE COVER / P.O.S.

NATURAL / SEMI NATURAL P.O.S. - 4387.33m²
AMENITY GREENSPACE - 1312.83m²

✕ MINE ENTRY LOCATION (ALLOCATED ZONE OF INFLUENCE)

NOTE:
ZONE OF INFLUENCE CALCULATED AS THE SUM OF DEPARTURE VALUE PLUS LOCAL DEPTH TO ROCKHEAD PLUS MINE ENTRY RADIUS. DEPARTURE DISTANCE AND MINE ENTRY RADIUS HAVE BEEN OBTAINED FROM AND AGREED WITH THE COAL AUTHORITY.

BH06 AND TP014B USED FOR LOCAL DEPTH TO ROCKHEAD INFORMATION.

ANGLE OF DRAW USED FOR THESE PRELIMINARY ZONE OF INFLUENCE CALCULATIONS IS 45 DEGREES.

DRAWING USES THIRD PARTY DATA. NO RELIANCE CAN BE PROVIDED FOR THIS DATA AND WA CANNOT BE RESPONSIBLE FOR ANY ERRORS WITHIN THIS DATA.

DRAWING IS FOR ILLUSTRATIVE PURPOSE ONLY.

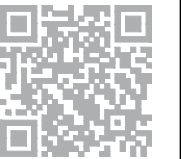
P02	UPDATED PROPOSED LAYOUT	17.09.24	MC	JC
P01	ISSUE FOR COMMENTS	22.07.24	MC	JC
REVISION	DETAILS	DATE	ISSUED	APPROVED
CLIENT				

JONES HOMES (YORKSHIRE) LIMITED

PROJECT	LAND OFF PRIMROSE LANE, LIVERSEDEGE			
DRAWING TITLE	MINE SHAFT ZONE OF INFLUENCE DRAWING			

DRG No.	LD11032-001	REV	P02	SUIT. CODE
DRG SIZE	A1	SCALE	1:500	DATE
DRAWN BY	MC	CHECKED BY	JC	APPROVED BY

wardell armstrong



APPENDIX B

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848

JONATHAN CURRIE
36 PARK ROW
LEEDS
LS1 5JL

Our reference:	51003437456001
Your reference:	LD4240
Date of your enquiry:	16 July 2024
Date we received your enquiry:	16 July 2024
Date of issue:	19 July 2024

This report is for the property described in the address below and the attached plan.

Shaft Plan and Data Sheets

LAND OFF PRIMROSE LANE, LIVERSEDGE, WEST YORKSHIRE, WF15 6PA

I refer to the enquiry dated 16 July 2024, received 16 July 2024, in connection with the above.

As requested I enclose the mine entry data sheet(s) held for the mine entry/entries referred to.

Mine Entry Data

Shaft/adit:	Shaft
Reference:	419424-020
Source:	Former British Coal Records
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	Unknown
Diameter of shaft (m):	Unknown
Probable adit azimuth:	Not Applicable
Treatment details:	This mine entry was searched for by limited trial trenching in March 2023 and was not found
Conveyance:	Not Applicable
Easting:	419699
Northing:	424197
Other information:	None

Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	419424-014
Source:	1st Ed. Geological. Located on site
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	2.2
Depth of shaft (m):	12.8
Diameter of shaft (m):	2.7
Probable adit azimuth:	Not Applicable
Treatment details:	Unknown
Conveyance:	Not Applicable
Easting:	419682
Northing:	424025
Other information:	None

Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	419424-006
Source:	H4773, OS 1:2500 Yorkshire 232/9 (1922, 1907, 1894) Ab plans 6087 9069/2 8708. 9069/1 1264/4/5/6
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	105.8
Diameter of shaft (m):	2.5
Probable adit azimuth:	Not Applicable
Treatment details:	is capped and is within a fenced compound
Conveyance:	Not Applicable
Easting:	419714
Northing:	424207
Other information:	None

Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	419424-005
Source:	H4773, OS 1:2500 Yorkshire 232/9 (1922, 1907, 1894) Ab plans 6087 9069/2 8708 9069/1 12674/3/4/5/6
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	147.2
Diameter of shaft (m):	2.5
Probable adit azimuth:	Not Applicable
Treatment details:	is capped and is within a fenced compound
Conveyance:	Not Applicable
Easting:	419704
Northing:	424222
Other information:	None

Mine Entry Data (continued)

Shaft/adit:	Shaft
Reference:	419424-004
Source:	H4773, OS 1:2500 Yorkshire 232/9 (1922, 1907, 1894) Ab plans 6087 9069/2 8708 9069/1 12674/4/5/6
Colliery name:	Unknown
Entry name:	Unknown
Date abandoned:	Unknown
Depth of superficial deposits (m):	Unknown
Depth of shaft (m):	105.8
Diameter of shaft (m):	2.5
Probable adit azimuth:	Not Applicable
Treatment details:	is capped and is within a fenced compound
Conveyance:	Not Applicable
Easting:	419695
Northing:	424219
Other information:	None

Location map

Approximate position of enquiry



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This plan shows the approximate location of the disused mine entry / entries referred to in the attached mining report. For reasons of clarity, mine entry symbols may not be drawn to the same scale as the plan.

Property owners have the benefit of statutory protection (under the Coal Mining Subsidence Act 1991). This contains provision for the making good, to the reasonable satisfaction of the owner, of physical damage from disused coal mine workings including disused coal mine entries. A leaflet setting out the rights and obligations of either the Coal Authority or other responsible persons under the 1991 Act can be obtained by visiting www.groundstability.com.

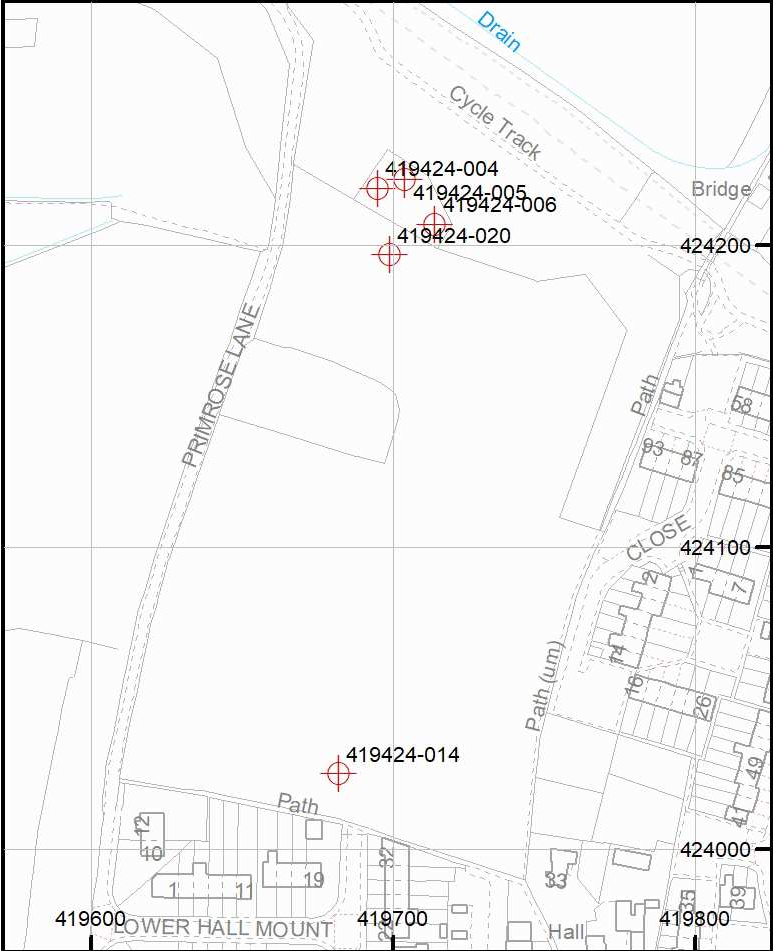
If you wish to discuss the relevance of any of the information contained in this report, you should seek the advice of a qualified mining engineer or surveyor. If you or your advisor wish to examine the source plans from which the information has been taken, these are available to view, free of charge, at our Head Office in Mansfield. To book an appointment please ring 01623 637225. Should you or your advisor wish to carry out a physical investigation that may enter, disturb or interfere with any disused mine entry, prior permission of the owner must be sought. For coal mine entries, the owner will normally be the Coal Authority.

The Coal Authority, regardless of responsibility and in conjunction with other public bodies, provide an emergency call out facility in coalfield areas to assess the public safety implications of mining features (including disused mine entries).

Our emergency telephone number is 0800 288 4242.

Key

Disused Adit or Mineshaft



APPENDIX C

SURFACE HAZARD RECORD OF INVESTIGATION AND TREATMENT
HEALTH & SAFETY FILE

Hazard Ref: H4773	Date reported 04/04/2005
Address/Location of Hazard Primrose Lane Hightown Liversedge Nr Dewsbury / Kirklees / WF15 6LN	
Coordinates 419573 E 424270 N	Mining Report Ref: 00008928-05
Hazard reported as: Shaft fencing inspection - Formerly H3802. The site perimeter fencing is currently secure, but there are open shafts within the site. These shafts will be investigated further tomorrow and individually fenced off if necessary.	
Hazard Type	Shafts
Shaft / Adit Ref No: (if applicable)	419424-004, 05, 06, 18,19.
Coal Authority Desktop Investigation: MRSDS indicates shaft was 105.8 m deep. Capped. No further details. Also within compound, two other shafts: Ref 419424-005. 147.2 m deep capped 419704E 424222N Ref 419424-006. 105.8 m deep capped 419714E 424207N Ref 419424-004. 105.8 m deep capped 419695E 424219N Ref 419424-018. unknown depth 419573E 424274N Ref 419424-019. unknown depth 419581E 424274N	
Description of Investigation Works Enclosure 1 - Re H3802 H4773/01 - Feature 1 – Shaft Ref 419424-019, 419581mE 424274mN H4773/02 - Feature 2 – Shaft Ref 419424-018, 419573mE 424274mN Summary No further works were undertaken to the shafts. The area was re-fenced with stock proof fencing. Enclosure 2 H4773/03 - Feature 3 – Shaft Ref 419424-005, 419705mE 424222mN H4773/04 - Feature 4 – Shaft Ref 419424-004, 419695mE 424219mN H4773/05 - Feature 5 – Shaft Ref 419424-006, 419714mE 424208mN Summary A trial pit was excavated adjacent to the shafts. Water was dipped at the shafts at a depth of 17m, with a total depth of approximately 90m. A fan drift was also identified 3m high, with brick arch roof of drift at about 1 m below existing ground level. Shaft caps appear to be founded on the brick shaft lining (0.25 wide) - there being minimal overlap. Estimate of shaft external diameter 2.5m. A void next to shaft and the hole punctured through the roof of the drift were both covered with cast steel plate and backfilled as a means to temporarily secure the area. Water sample were taken for analysis. The three shafts were cored to determine the integrity of the cap. Due to the very wet weather during the summer months it was not possible to access the site with vehicles, so in order to carry out the work it was decided to cap off the boreholes through the caps with 3No galvanized ,5mm thick steel plates bolted to the concrete caps with M12 100mm long parabolts. 1No 1.2m x 1.2m plate covers 2No boreholes and 2No 0.5m x 0.5m plates cover 1No borehole each. About 30m of wooden perimeter fencing was also reinstated adjacent to the field with each upright post being provided with a strut support on the shaft site side (see photographs). A routine visit on 26/09/2007 revealed that one of the 0.5m x 0.5m plates had been removed despite spoiling the nuts. This was replaced by RPM on 18/10/2007.	

Site Works Started	04/04/2005	Site Works Complete	07/04/2005
Description of Treatment Works			
Treatment Works Started	10/09/2007	Treatment Works Complete	14/09/2007
Coal Authority Liability		Yes	
Other Comments The two compound areas have been placed on the secured site inspection programme.			
Signed		Date	18/03/09

Copies to: Mining Reports

APPENDIX D

NORTH YORKSHIRE AREA

STANLEY COLLIERY. S H A F T

Upcast

SHAFT DIA.

SURFACE LEVEL

DEPTH 347 ft. Black bed.

Cords check with 1/250 o/s 1894 edition @ plan
N° 6087.

Date Capped _____

Plan Ref. No's.

E. 419696 } Ab. Plan 12674
N. 424217 } G.M. Kane 8.11.84

INSPECTION DETAILS

SEE FILE PB. 178

[illegible]



NORTH YORKSHIRE AREA

STANLEY COLLIERY SHAFT

Pumping.

SHAFT DIA. _____

SURFACE LEVEL

DEPTH 347 ft Black bed

E. 419, 712 } From 1/2500 o/s 1894 + plan N° 608
N 424, 204 }

Date Capped _____

Plan Ref. No's.

E. 419713 } From Ab. Plan. 12674
N. 424205 } G.M. Kaye 8.11.84

INSPECTION DETAILS

SEE FILE PB 178

[illegible]

NATIONAL COAL BOARD

NORTH YORKSHIRE AREA

SHAF T

NAT. GRID CO ORDINATES

State how obtained

By. | Date

NCB Ref. No 232 SW 52

E. 419730 N. 424195

1.4.5 Field Ship - C Bromhead

G.B. 18/2/84

6" $\frac{1}{4}$ Sheet SE 12 SE

E N

E. N.

Surface Level

F N

[illegible]

Date Filled _____

Details

Depth

Date Capped

Details

Date	Depth to Water	Depth to Fill	Remarks	Inspected by
			Denoted by pencil circle on field slip G.B. See Old Sheet	

2848
2.88

3546
2.49

4445
18.39

6147
1.81

The Princess Mary Playing Fields

4541
1.74

6039
2.76

6841
82

3636
1.96

117

Primrose Hill Farm

4632
2.76

7535
5.70

Primrose Lane Bridge

5828
5.05

132

8329
1.90

131

8325
2.20

8625
85

8931
44

9126
69

3423
3.65

4321
3.55

10

159

51 52
133 7218 3.69

232 SW 52

Eddercliffe Bridge

8817
1.32

9218
52

9216
37

53

161

142

168

12

5013
2.98

6607
2.31

6401
1.35

2808
1.67

3300
1.81

3800
3.0

4200
2.6

4500
2.94

5000
63

5500
95

5900
2.93

7200
1.61

7501
2.02

7700
2.36

8200
1.76

NORTH YORKSHIRE AREA

S H A F T

N.G. CO-ORDINATES E. 419700 N. 424195

SHAFT DIA.

SURFACE LEVEL

DEPTH

Date Capped

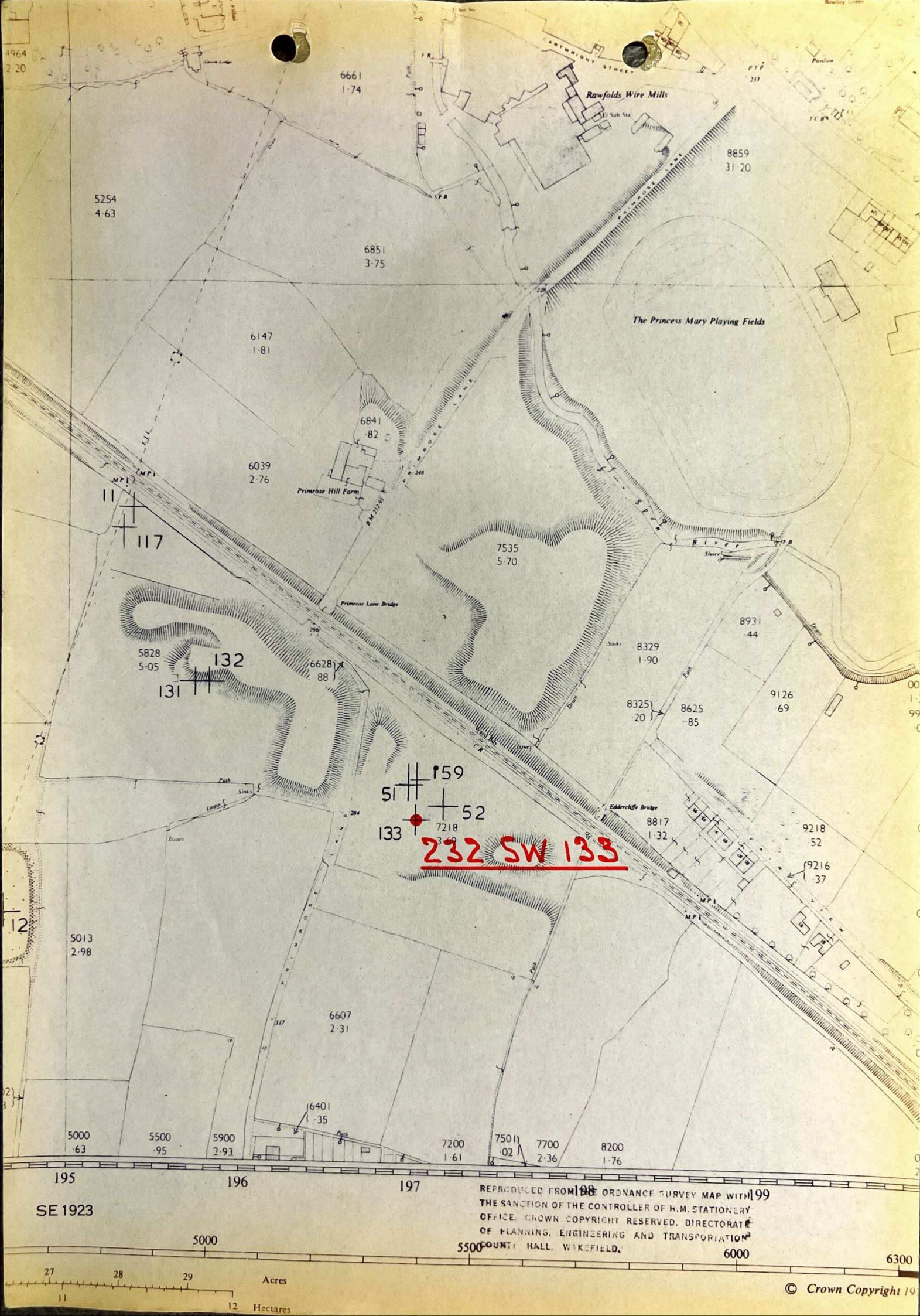
Plan Ref. No's.

* Three shafts are shown on 1:2500 O.S. Plan in file PB 178. Four shafts shown on 6" Top Ruster beam plans.

INSPECTION DETAILS

See File PB. 178

[illegible]



SE 1923

REPRODUCED FROM 1908 ORDNANCE SURVEY MAP WITH 199
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COUNTY HALL, WAKEFIELD.

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N O R T H Y O R K S H I R E A R E A

STANLEY CONNERY. SHAFT

SHAFT DIA. _____

SURFACE LEVEL

DEPTH 473 feet to Better Bed.

E. 419,7002 } 4 from 1/2500 o/s 1894 & plan 6087.
N. 424,218 }

E. 419703 } Ab. Plan 12674
N. 424220 } G.M. Kaye 8.11.84

Plan Ref. No's.

INSPECTION DETAILS

SEE FILE PB.78

[illegible]



SE 1923

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