

CASE FILE LIST

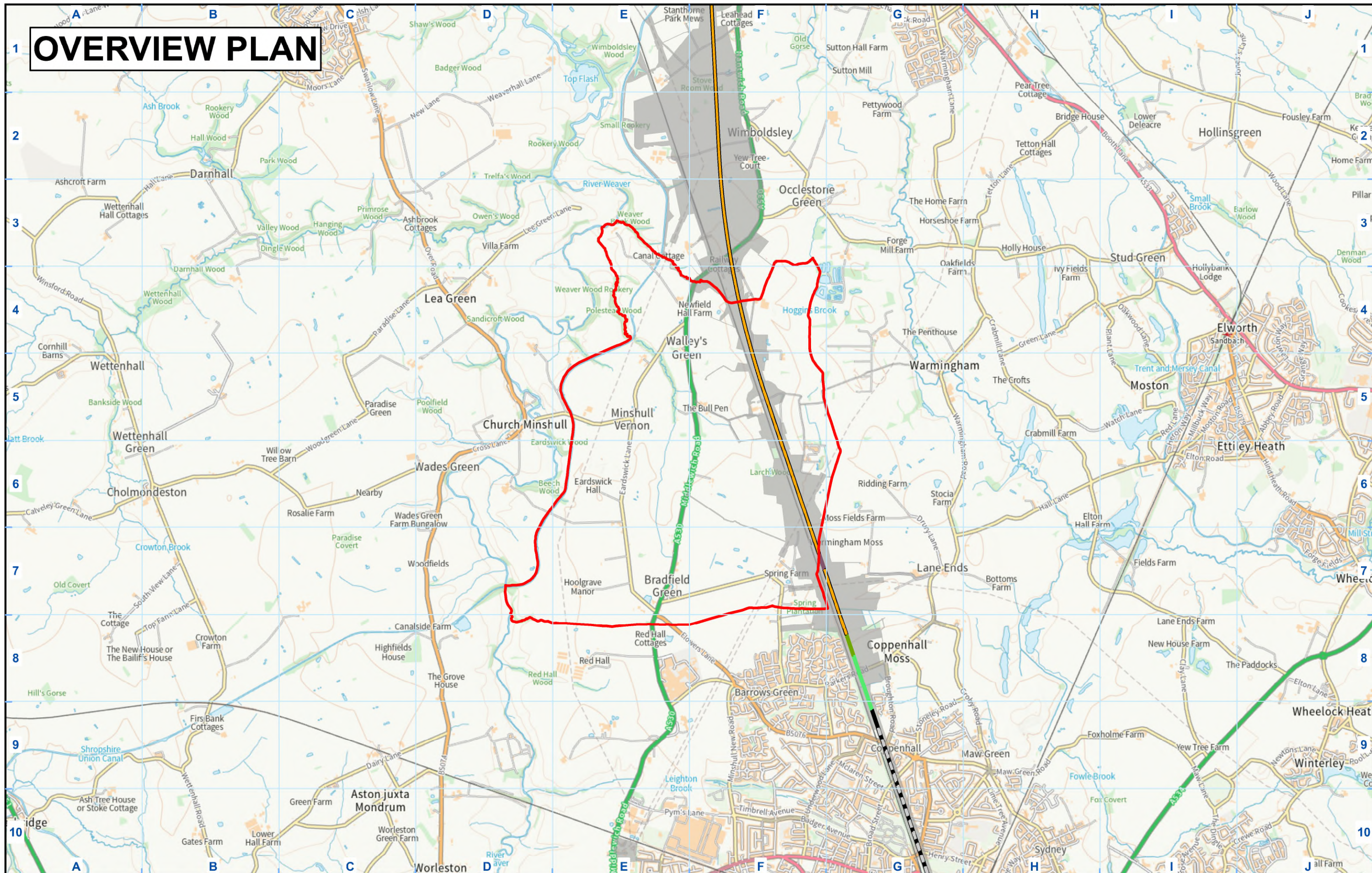
Case: HS2-025.

Title: HS2-025 Minshull Vernon and District Council - Promoter.

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OVERVIEW PLAN



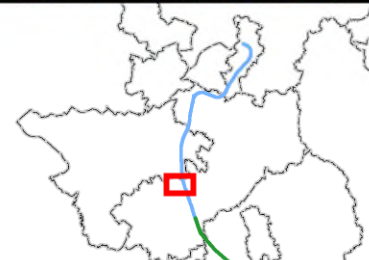
P196

Legend

Phase 2b Western Leg Bill alignment February 2022

- Box Structure
- Embankment
- Retaining Wall

- Indicative extent of petitioner(s) land interests
- hybrid Bill Limits



High Speed Two
Petitioner Location Plan
Reference Drawing

Petitioner
Minshull Vernon and District Parish Council

Petition number
P2B-HS2-025

HS2

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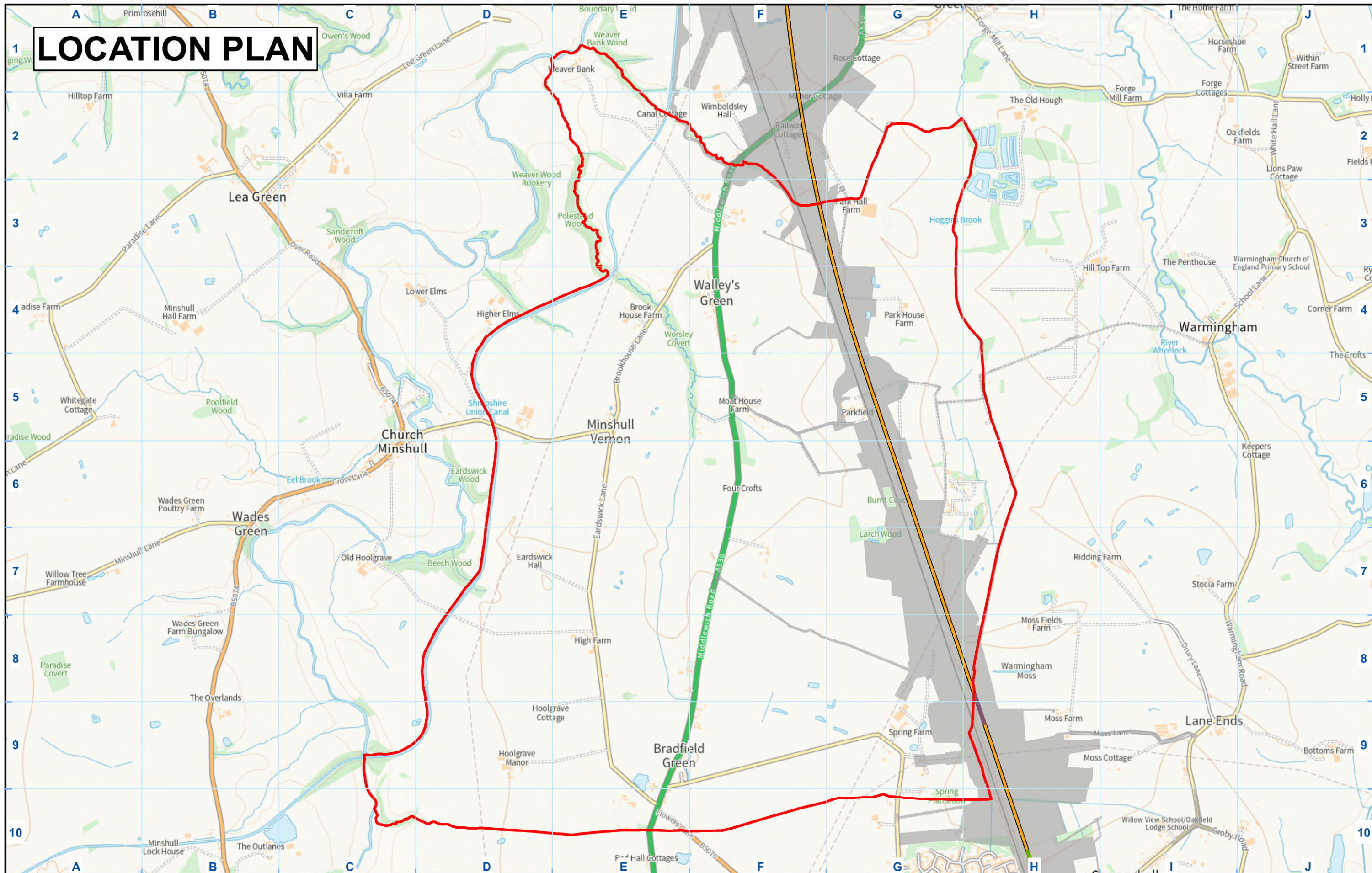
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Doc Number: P2B-HS2-HY-MAP-000-000040

Date: 03/03/23

LOCATION PLAN



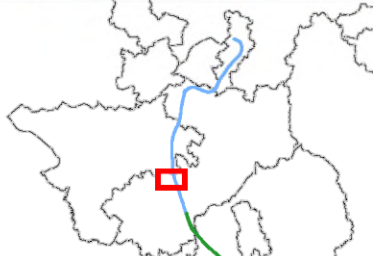
P197

Legend

Phase 2b Western Leg Bill alignment February 2022

- Box Structure
- Embankment
- Retaining Wall

- Indicative extent of petitioner(s) land interests
- hybrid Bill Limits



High Speed Two
Petitioner Location Plan
Reference Drawing

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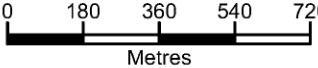
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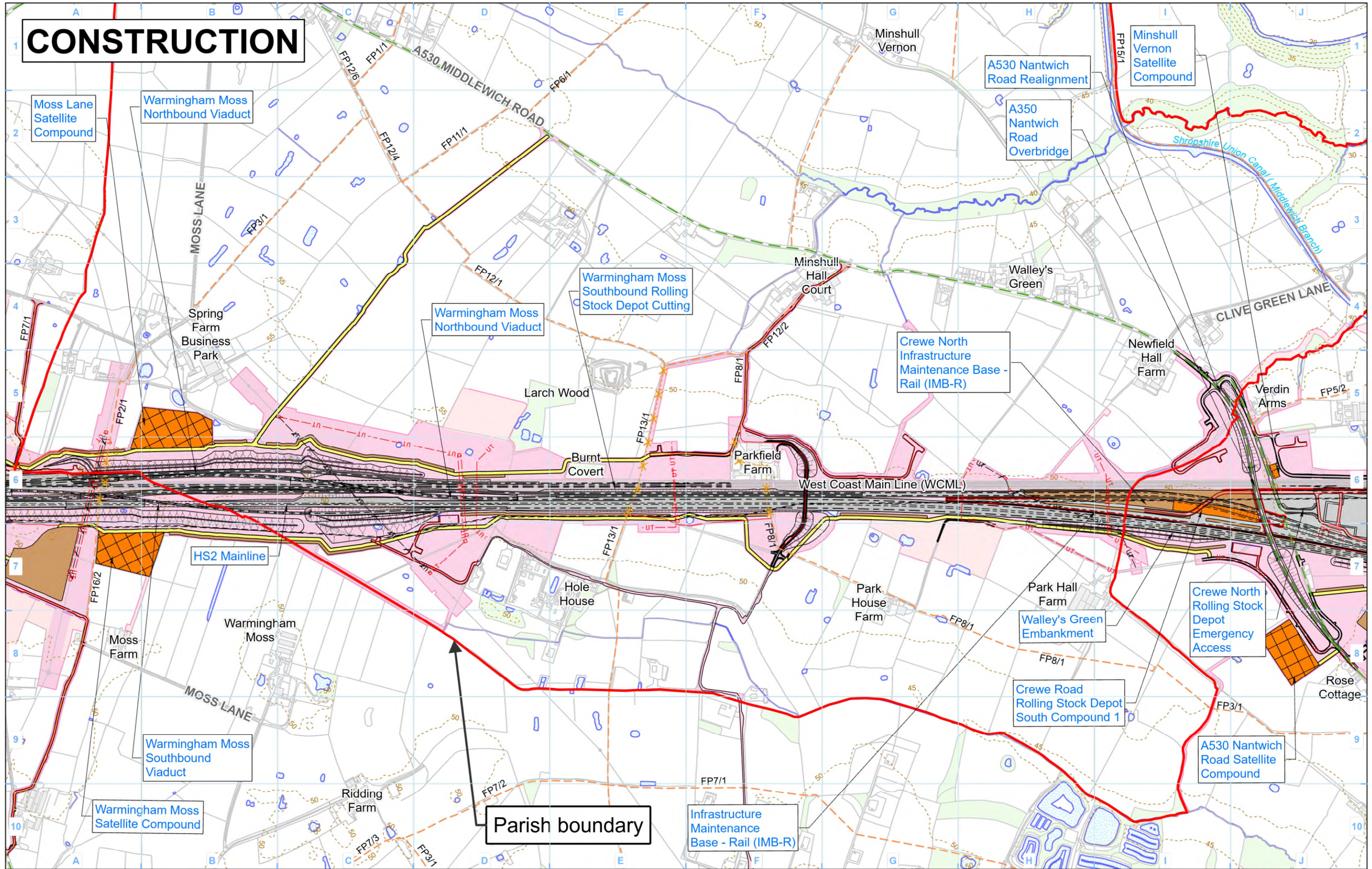


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Date: 14/09/22

CONSTRUCTION



Legend

Indicative extents of Petitioner(s) land interests	Land potentially required during construction	Existing public right of way	Engineering earthworks	Existing watercourse
Tunnel portal	Land potentially required for mitigation planting	Public right of way closure	Major utility works	HS2 access
Satellite construction compound	Rail alignment formation	Temporary public right of way diversion / realignment	Major utility works - Removed	Rail alignment
Railway systems compounds	Haul routes	New, diverted or realigned public right of way	Existing woodland	5m contours
Temporary material stockpile	Construction traffic route	Landscape earthworks	Existing buildings	
			Existing inland water	

Petitioner
Minshull Vernon and District Council

Petition number
HS2-025

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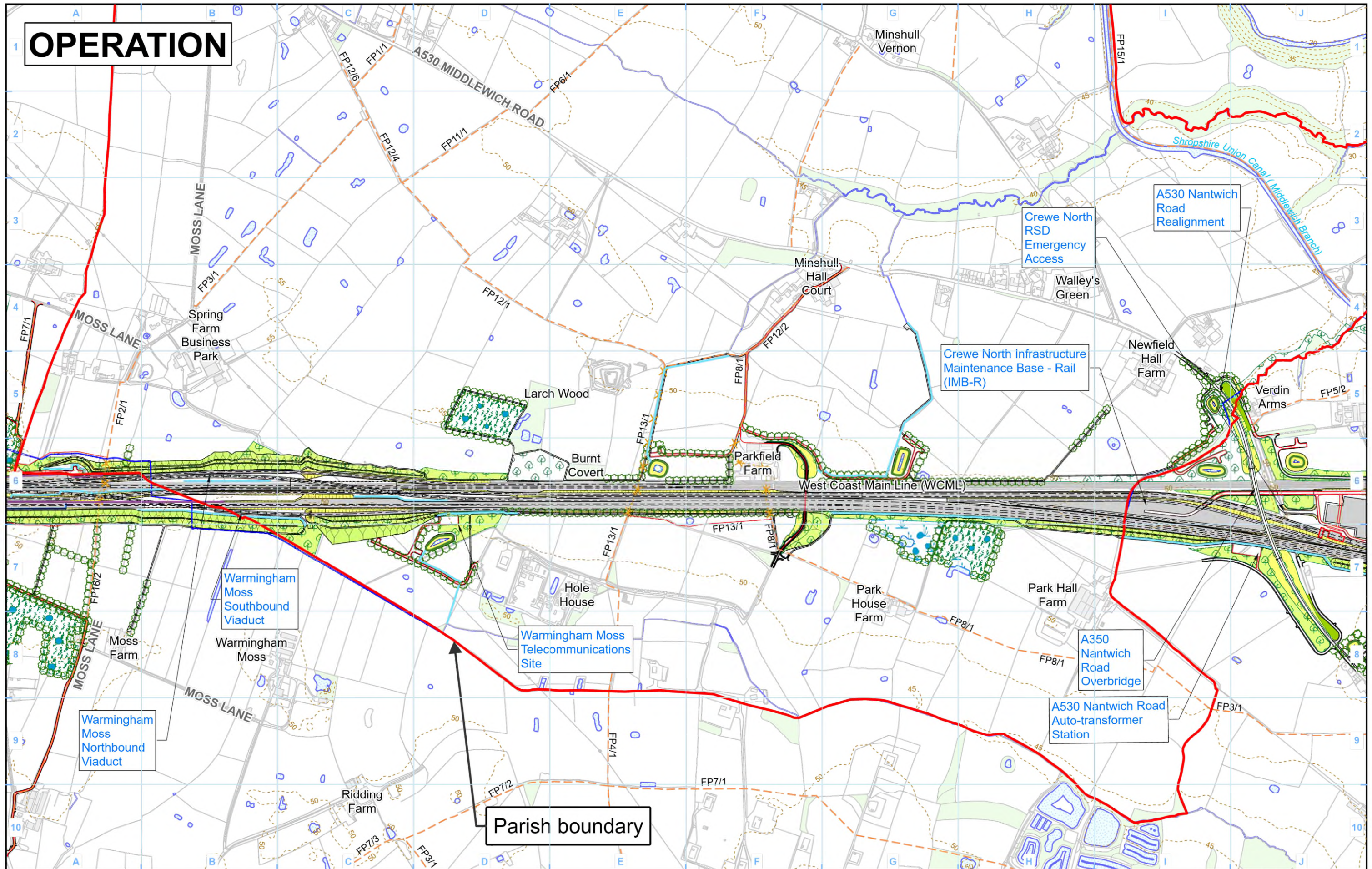
Doc Number: 2PT24-MWJ-PT-MAP-M000-002551-HS2-025

Date: 14/10/2022

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OPERATION



Legend				
Indicative extents of Petitioner(s) land interests	Replacement floodplain storage area	Grassed areas	Rail alignment formation	Existing inland water
Tunnel portal	Grassland habitat creation	Hedgerow	Existing public right of way	Existing watercourse
Railway Systems Site	Wetland habitat creation	New ditches	New, diverted or realigned public right of way	HS2 access
Ecological mitigation pond (Indicative only)	Woodland habitat creation	Watercourse diversion	Public right of way closure	Noise fence barrier
Lancing pond	Landscape mitigation planting (scrub / woodland)	Engineering earthworks	Existing woodland	Rail alignment
		Landscape earthworks	Existing buildings	5m contours

Petitioner	Minshull Vernon and District Council
Petition number	HS2-025

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Date: 14/10/2022

Councillor Neville Layhe
Minshull Vernon and District Parish Council
c/o 159 Broad Street
Crewe
Cheshire
CW1 3UD

Sent by email to: nevillelayhe@gmail.com

11 April 2023

Dear Councillor Layhe,

**HIGH SPEED RAIL (CREWE – MANCHESTER) BILL – HOUSE OF COMMONS SELECT
COMMITTEE: PETITION HS2-P2B-025 MINSHULL VERNON AND DISTRICT PARISH COUNCIL**

I am writing to you in my capacity as Director of Hybrid Bill Delivery at HS2 Ltd, which is acting on behalf of the Promoter of the High Speed Rail (Crewe-Manchester) Bill (the Bill) currently before Parliament.

I understand that you have concerns about the impact of HS2 Phase 2b (known as the Proposed Scheme) and have submitted a petition on that basis against the Bill and first Additional Provision to the Bill in the House of Commons.

I understand HS2 representatives met Parish Council representatives on 23 January 2023 to discuss your petition. A Promoter's Response Document setting out our position in relation to the issues you have raised in your petition was sent to you on 27 February 2023.

I understand that it is your intention to raise the following petition issues before the Select Committee and our final position is set out below.

Ground conditions

Further to the Promoter's response on ground conditions as set out in pages 4 to 6 of the Promoter's Response Document, a report was published on 3 March 2023 which provides a review of the ground conditions, the associated risks, and the mitigation measures for the Crewe-Manchester Proposed Scheme. This report titled "Crewe to Manchester - Understanding the Ground Risk across the Cheshire Plain" can be viewed from the following link:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1140192/Understanding_the_Ground_Risk_across_the_Cheshire_Plain.pdf

Section 4 of this report sets out how the Proposed Scheme will be constructed and operated to take account of ground conditions. Section 5 explains how information has been gathered, through ground investigations, consultation and engagement, to support the development of the Proposed Scheme.

The Select Committee have emphasised their desire that the Promoter and Petitioners seek to narrow down the issues between them as far as possible in advance of the hearing so that they can focus on issues which remain in dispute. Therefore, in order to assist with the efficient running of the Committee process, we would be grateful if you could clarify whether, in light of the March 2023 report, you have any outstanding issues concerning ground conditions and, if so, identify what those issues are. Please provide this clarification by return of email or letter to Rachna.Shah@hs2.org.uk by 17 April 2023.

Route alignment

The Promoter's response is set out on pages 7 to 13 of the Promoter's Response Document that was sent to you on 27 February 2023.

Crewe North Rolling Stock Depot

The Promoter's response is set out on pages 14 to 18 of the Promoter's Response Document that was sent to you on 27 February 2023. I understand this issue was also discussed during the meeting on 23 January 2023. At this meeting HS2 representatives explained why the Basford Hall railway yard site suggested by the Parish Council as an alternative location for a HS2 rolling stock depot site would not provide a viable alternative to the Crewe North site which is as set out in the Promoter's Response Document. Parish Council representatives also confirmed that they were aware that land adjacent to the existing Basford Hall railway yard is subject to residential and commercial development use, and that this land could be impacted by any rolling stock depot proposal.

I would also like to make you aware that the Promoter has offered the following assurance to Cheshire West and Chester Council in respect of engagement during the development of the Proposed Scheme within the area of Minshull Vernon Parish:

1. In this assurance:-

"Additional Provisions" means any amendment to the Bill requiring further or additional powers to be conferred and which are deposited after the introduction of the Bill in Parliament;

"the Bill" means the High Speed Rail (Crewe – Manchester) Bill as introduced into Parliament on 24 January 2022 and incorporating the Additional Provisions, and references to "the Bill" include any Act of Parliament enacting the Bill. References in these assurances to clauses and provisions of, and works authorised by, the Bill are

taken from the Bill as introduced in the House of Commons on 24 January 2022 but shall be modified as far as may be necessary to reflect changes in any Act of Parliament enacting the Bill;

“the Code of Construction Practice” means the draft Code of Construction Practice for the Proposed Scheme included in Volume 5 of the Environmental Statement deposited in January 2022 in connection with the Bill that is intended to control the construction of the works authorised by the Bill, the final version of which will be produced on Royal Assent;

“HS2 Community Engagement Framework” means the community engagement framework to be developed by the nominated undertaker in accordance with Section 5.1 of the Code of Construction Practice;

“the nominated undertaker” means the person who is, at the relevant time, the nominated undertaker under clause 42 of the Bill for the purposes of the works to which this assurance relates. The nominated undertaker may be HS2 Ltd, or it may be another body or bodies appointed to oversee the construction and operation of the Proposed Scheme or, in default of any such appointment, the Secretary of State;

“the Promoter” means the Secretary of State for Transport (or any successor Secretary of State or Minister holding the Transport portfolio) in his capacity as promoter of the Bill and includes, so far as relevant, any nominated undertaker exercising any powers or functions under the Bill once enacted;

“the Proposed Scheme” means Phase 2b (Crewe-Manchester) of High Speed 2 as defined in the Bill;

“Royal Assent” means the date upon which Royal Assent is given to the Bill; and

“the School” means Wimboldsley Community Primary School, Nantwich Road, Wimboldsley, Middlewich, Cheshire CW10 0LN.

2. **SPECIAL MANAGEMENT ZONE**

2.1 In accordance with the Code of Construction Practice, the Promoter will require the nominated undertaker to ensure that appropriately experienced community engagement personnel are appointed to manage stakeholder and community relationships during the development of the Proposed Scheme within the areas of Minshull Vernon and District Parish Council and Stanthorne & Wimboldsley Parish Meeting Council (**“the Designated Areas”**).

2.2 The community engagement team will include:-

2.2.1 A single point of contact for local authorities within the Designated Areas;

2.2.2 A single point of contact for the School;

- 2.2.3 Named individual points of contact for affected property owners within the Designated Areas; and
 - 2.2.4 A senior manager accountable for the effective implementation of the Code of Construction Practice within the Designated Areas.
- 2.3 The broad duties of the individuals specified in Paragraph 2.2 will include, but will not be limited to:-
- 2.3.1 Being the first point of contact for communities and local authorities along the line of route of the Proposed Scheme in the Designated Areas;
 - 2.3.2 Managing relationships with local communities, businesses, local authorities and other stakeholders within the Designated Areas;
 - 2.3.3 Raising issues from the community in the Designated Areas within HS2 Ltd for escalation, resolution or clarification;
 - 2.3.4 Monitoring the progress of each item raised and keeping stakeholders within the Designated Areas informed of progress;
 - 2.3.5 Ensuring the HS2 Community Engagement Framework is appropriately implemented within the Designated Areas;
 - 2.3.6 Attending regular meetings with the lead contractors, local authorities, local communities and other stakeholders within the Designated Areas to discuss construction issues and the forthcoming programme of works for the Proposed Scheme within the Designated Areas;
 - 2.3.7 Advising on the appropriate support mechanisms to be provided by the nominated undertaker which will be available to local businesses, property owners and voluntary and community organisations within the Designated Areas that may be affected by the construction of works for the Proposed Scheme; and
 - 2.3.8 Liaison with the School, Minshull Vernon and District Parish Council and Stanthorne & Wimboldsley Parish Meeting.

HS2 Construction traffic on A530

The Promoter's response is set out on pages 19 to 25 of the Promoter's Response Document that was sent to you on 27 February 2023. I understand that HS2 representatives explained the proposed HS2 construction traffic routes that are based on the Additional Provision 1 revised scheme.

It was also explained that HS2 are continuing to engage with relevant local highway authorities, such as Cheshire East Council and Cheshire West and Chester Council, to discuss

the impacts of the Proposed Scheme on their highway networks and the approach to mitigating these impacts, where it is considered appropriate.

Impacts on local traffic during construction would be managed in accordance with Route-wide Traffic Management Plans (RTMPs), Local Traffic Management Plans (LTMPs) and Route Management Improvement and Safety Plans (ROMIS), which will be developed with the relevant highway authority and other key stakeholders.

I hope that the information set out above and through our earlier correspondence and discussion with you gives the Parish Council the reassurance you were seeking in response to the issues raised in your petition.

For any further queries please don't hesitate to contact Rachna Shah, Senior Petition Manager, on 07881 792217 or Rachna.Shah@hs2.org.uk.

Yours sincerely



pp

Lucy Lagerweij

Director, Hybrid Bill Delivery
High Speed Two (HS2) Limited

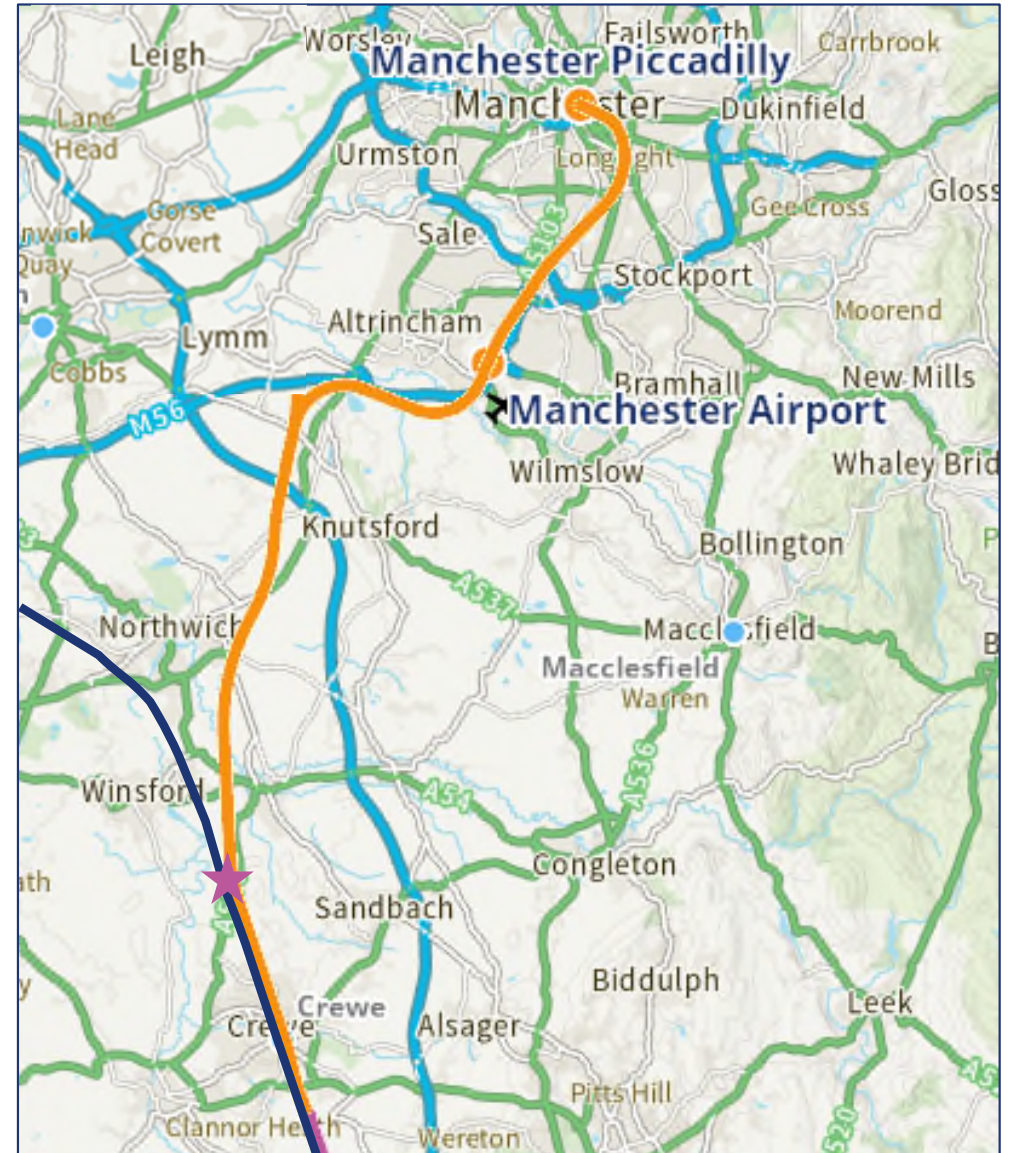
Phase 2b Crewe – Manchester Route Overview

— West Coast Mainline (WCML)

— High Speed Rail Crewe-Manchester Bill

★ Crewe North Rolling Stock Depot:

- 5 miles (8km) north of Crewe
- Located near Wimboldsley, Cheshire
- At point where Proposed Scheme and WCML diverge



Route Evolution 2013 - 2016

Phase 2b rolling stock depot locations review

In 2013 HS2 Ltd opened a consultation on Phase 2b scheme refinements. In the consultation, the decision to relocate the Western Leg Depot from the original Golborne site was considered.

Final locations considered as part of the review of the depot included:

- Alternative at Golborne (with alternative footprints and junction configurations);
- Location near Knutsford; and
- Location at Crewe (near Wimboldsley).

Considerations of options on the basis of:

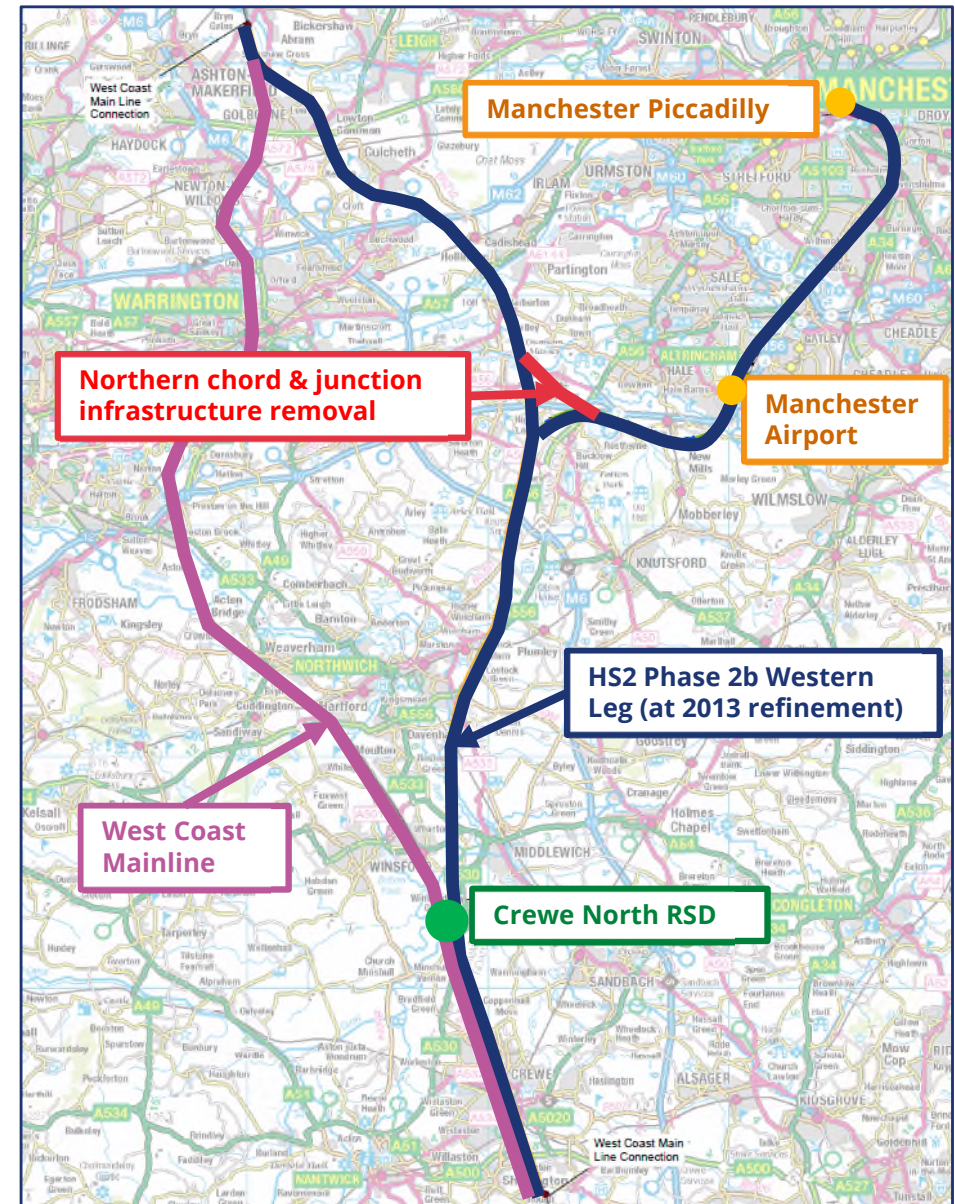
- Constructability;
- Environmental and sustainability impacts;
- Operational performance;
- Journey time;
- Comparative cost; and
- Demand/Business case.

Route Evolution 2013 - 2016

Relocation to Crewe North

In 2017, HS2 Ltd published 'Phase 2b Route Refinements advice to government', including the decision to locate the Western Leg depot to Crewe North.

- Crewe North was considered to be the best performing option, as a result of its central location, ideal for empty coaching stock movements to Manchester, Liverpool and Preston.
- Crewe North has easy access to both the WCML and HS2.
- Crewe North location means 4.5 mile long 'northern chord' and associated grade separated junction infrastructure can be removed, otherwise required to reach a location at Golborne from Manchester (significant cost saving and reduced receptor impacts).



Route Evolution 2013 - 2016

Other Rolling Stock Depot considerations

Crewe North is considered to have lower environmental impacts (listed buildings, landscape and visual) than Golborne and Knutsford options.

Environment Agency and Wildlife Trust preferred the Crewe North location against Golborne due to lower environmental impacts.

Complicated access and egress arrangements to the Knutsford option because of the M6 crossing and proximity to Hoo Green junction.

Knutsford option would require a back shunt move further complicating an M6 crossing (two track to five).

Knutsford option also has no direct connection to the classic network, increasing the length empty of stock movements.

Rolling Stock Depot

Requirements of a depot for Phase 2b:

- To have direct access to HS2 mainline into Manchester;
- Stabling and maintenance requirements to operate the Train Service Specification (TSS);
- Capability to receive wider gauge captive network trains; and
- Ability to stable up to 53 x 200m long train sets.

This is in addition to using spare stabling at Edge Hill (HS2 Liverpool services), Longsight (HS2 Macclesfield services) and Polmadie (HS2 Scotland services) where HS2 replaces existing WCML services.

Advantages of the Crewe North Rolling Stock Depot

Operationally optimal location as has access to WCML and HS2.

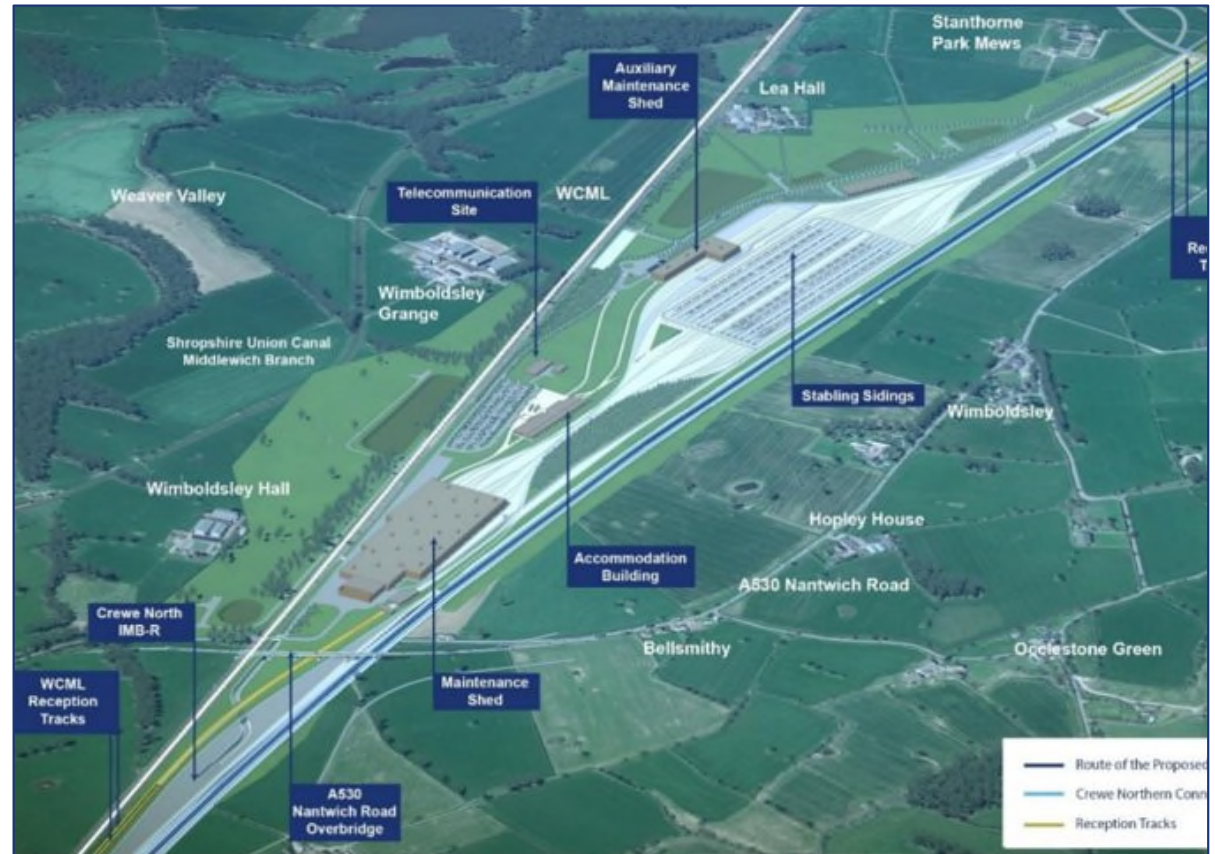
North facing access for services starting and finishing in Manchester and other locations in North West England.

Reduces empty stock movement lengths.

Reduces train path conflict risks.

Visual impact of the depot lessened due to location between WCML and the HS2 mainline.

Most of the land required for other construction works in the Proposed Scheme.



Basford Freight Yard (1)

Petitioner Alternative

Heavily utilised existing rail freight yard, critical to national freight operations.

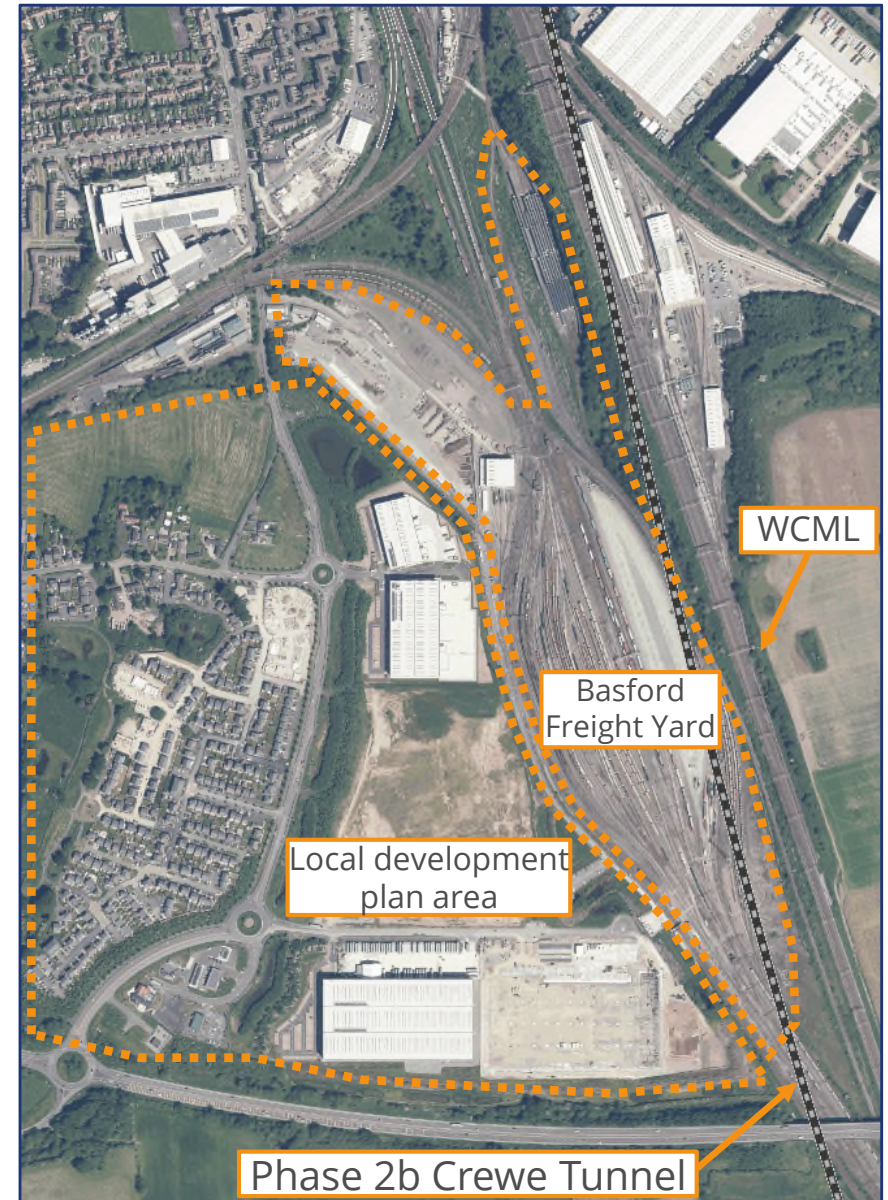
HS2 would be required to re-provide an equivalent freight yard elsewhere on the WCML.

Therefore would need to construct a new freight yard for Network Rail before decommissioning existing, both activities significantly increasing capital cost.

Freight yard relocation would reduce performance of existing freight operations and Basford is sub optimal location for planned HS2 operations.

Land to the west of the freight yard that would also be needed for the size of HS2 Rolling Stock Depot is allocated for other development in Cheshire East Council local development plan and has existing commercial development and residential properties.

Previously considered and discounted in Phase 2a for an alternative location of Stone IMB-R, due to additional impacts and sub optimal performance.



HS2 CREWE TO MANCHESTER

**A Note on Ground Risk across the
Cheshire Plain**

**A Report Prepared by GCG, led by
Professor Lord Robert Mair
CBE FREng FICE FRS**

5th April 2023

HS2

Crewe to Manchester

A Note on Ground Risk across the Cheshire Plain

5th April 2023

1. Introduction

1.1 This Note has been prepared by Professor Lord Robert Mair and Dr Chris Menkiti of Geotechnical Consulting Group (GCG). The purpose of the Note is to comment on the following documents:

- *Briefing Statement: HS2 2B route across the Cheshire Salt District North of Crewe*. Report by Dr Rosalind Todhunter, dated 6 July 2022 (hereinafter referred to as the ‘Todhunter report’)
- *Crewe to Manchester, Understanding the Ground Risk across the Cheshire Plain*. Report by HS2, dated 3rd March 2023 (hereinafter referred to as the ‘HS2 report’)

2. Background

- 2.1 The proposed HS2 line will cross the Cheshire Plain, an area of relatively flat topography, comprising mainly rural pasture and crop fields. The alignment of the Proposed Scheme crosses the Cheshire Plain in areas of former salt mining and other areas where salt mining is ongoing.
- 2.2 Throughout this Area of Interest, there are flashes and meres. Flashes are existing water bodies which have formed in depressions in the ground surface resulting from ground settlement, which has been induced by either historic mining collapse or salt dissolution processes. Meres are shallow lakes, likely to have originated at depressions formed from glacial scouring.
- 2.3 The HS2 Proposed Scheme will be on low embankments and, in some locations, on viaducts and bridge structures. There is a history of ground settlement in the area, arising from historic mining and from salt dissolution processes. The scheme is therefore likely to experience longer term ground settlements in its operational mode. This is addressed later in this Note.

3. Ground conditions and geotechnical risks

- 3.1 The HS2 report comprehensively describes the geology and ground conditions, including the hydrology (surface water) and hydrogeology (sub-surface groundwater). This information has been gained from detailed desk studies comprising reviews of published data sources, including borehole information held by the British Geological Survey (BGS), and consultations with mining companies operational within the area.
- 3.2 Geomorphological mapping (i.e. mapping the landforms and their development) has also been undertaken to identify higher priority locations in respect of potential salt dissolution hazard.

Advanced ground investigations, comprising boreholes and cone penetration tests (CPTs) have been undertaken at these targeted locations in 2020 and 2021. Currently, a time history of LiDAR¹ and InSAR² surveys are being studied by HS2 to identify locations of settlement within the alignment corridor.

- 3.3 LiDAR means Light Detection and Ranging and refers to a remote sensing technique that uses pulsed radar to survey a zone of ground.
- 3.4 InSAR stands for Interferometric Synthetic Aperture Radar. It is a satellite-based remote sensing method that can generate high-resolution images using radio and microwaves.
- 3.5 Appendix C of the HS2 report describes both LiDAR and InSAR techniques and associated data already gathered for the proposed alignment by HS2.

4. Further investigations

- 4.1 At this stage of a scheme, it is reasonable not to have undertaken fully comprehensive ground investigations in the form of many more boreholes and CPTs. HS2 is now planning for more ground investigations to further understand the ground conditions. Further supplementary investigations will be essential for the detailed design of the scheme; these will be at a later stage. However, there is sufficient geotechnical information at present on which to base the horizontal and vertical alignment of the Proposed Scheme.
- 4.2 Further investigations informing the detailed design development will also include collection and analysis of LiDAR and InSAR data to obtain information on surface depressions and settlements of the ground in the Area of Interest, as described above. Further comments on the value of LiDAR and InSAR are made in section 7.

5. Potential geotechnical risks

- 5.1 The Todhunter report identifies the complex geological issues in the Area of Interest, highlighting the influence of rock salt dissolution on potential future ground subsidence. Other concerns expressed in the report relate to artesian groundwater pressures in some superficial layers. However, this does not appear to be directly related to salt dissolution; it is a different and more common geotechnical problem associated with the impact of elevated porewater pressures in cohesionless deposits.

¹ From 1998 to present

² From 1995 to 2020

- 5.2 The HS2 report also addresses natural salt dissolution, controlled brine extraction and the potential effects at the ground surface. It notes that, with the cessation of wild brining more than four decades ago, ongoing dissolution along brine runs is expected to be at a slow rate. It also discusses the specific geological conditions leading to collapse at the ground surface, known as ‘sink holes’, noting that there have been no reported instances of sink hole formation arising from salt dissolution across the Area of Interest. This includes a review of data from the Cheshire Brine Compensation Board, for which HS2 report that “The Cheshire Brine Compensation Board stated that in the decade following 2006³ they had received [only] one notice of damage within 1km of the HS2 route” and for this “compensation [was] rejected as [it was] not attributable to salt dissolution”.
- 5.3 The Todhunter report also identifies the need for careful drainage design and this is recognised by HS2. We agree with this.
- 5.4 In summary, we agree with the broad mechanisms of potential salt dissolution hazards identified both in the Todhunter report and the HS2 report, and that there is likely to be future ground subsidence. This must be allowed for in the detailed design of the Proposed Scheme. The Todhunter report refers to “extensive ground instability” in several places. This is potentially misleading, implying that these mechanisms at depth will be manifested at the ground surface as extensive instability in terms of their interaction with the proposed embankments and structures. Whereas long-term surface ground movements that occur can be managed, as discussed in this Note.

6. Proposed scheme response

- 6.1 Although future ground subsidence is to be expected, the HS2 report outlines how this can be safely accommodated by the detailed design of the Proposed Scheme. Bridges and viaducts will be on piled foundations, with the piles taken down to adequate depths; the decks of these structures will be designed to have jacking facilities if there is a need to adjust them in the future.
- 6.2 The Proposed Scheme will be mainly on low embankments, which will probably incorporate geogrid reinforcement; these stiffer embankments will mitigate against effects of ground subsidence, but there may also be a need to adjust the rails to allow for ongoing settlement. The settlement development is likely to be slow and such adjustment is feasible.
- 6.3 A key to the approach outlined in the HS2 report is to mitigate the risk of ongoing settlement (including incipient sinkholes at the ground surface) by firstly adopting engineering solutions, such

³ after cessation of the last known brine operation - the New Cheshire Salt Works, situated in Wincham 2km from the route alignment, which ceased trading in June 2006

as those discussed in paragraphs 6.1 to 6.2 above, and then dealing with any further settlement by means of comprehensive monitoring and appropriate maintenance interventions.

- 6.4 The combination of further ground investigations, risk assessments, use of engineered solutions, detailed monitoring of movements of both the ground and the railway, and a detailed response plan for both anticipated and unexpected ground movement (termed ‘adaptive interventions’ in the HS2 report) will ensure that the Proposed Scheme can be operated safely.

7. Monitoring and surveillance technologies

- 7.1 The HS2 report refers to the use of LiDAR and InSAR for remote sensing of the settlement of the Proposed Scheme. We fully agree with this. Following the tragic train derailment near Carmont (west of Stonehaven), Scotland in August 2020 after a period of intense rainfall, Network Rail appointed Lord Mair to chair a Task Force Review of their management of earthworks (i.e., cuttings and embankments) across the whole Network Rail system. The Review focused on Network Rail’s capability and methodology for the management of railway cuttings and embankments, particularly in the light of climate change. The Task Force report, published in February 2021 (ref[1]), contained a total of 54 recommendations, including the need for significant investment in the updating of monitoring and surveillance methods.

- 7.2 Chapter 10 of the Task Force report focused on the importance of monitoring and surveillance technologies and drew attention to the considerable value of InSAR, using satellite technology. An application of InSAR for railways is shown in Figure 10.5 from the Task Force report (extract below) in which the technology was applied to the entire railway network of the Netherlands, more than 3000 km long, using hundreds of Radarsat-2 acquisitions between 2010 and 2015, leading to the first satellite-based nationwide railway monitoring system. The resulting deformation map for the Netherlands railways is shown in Figure 10.5 (a) of the Network Rail report, and a more detailed “flagging system” risk map is shown in Figure 10.5(b). The risk map, based on the satellite measurements combined with expert judgement, shows areas with < -10 mm/year (indicating a settlement rate exceeding 10mm/year), and those with $> +8$ mm/year (indicating a heave rate exceeding 8mm per year); these are highlighted by the red and blue flags, respectively.

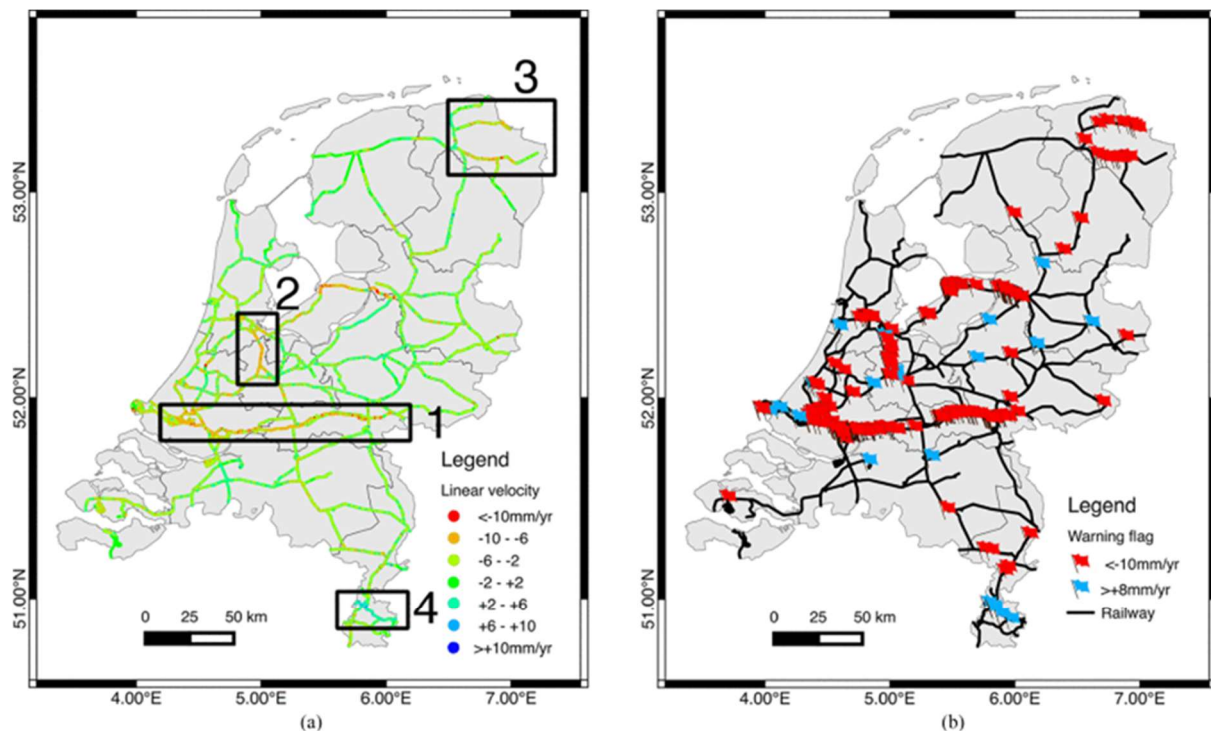


Figure 10.5: (a) Deformation map for Netherlands railway network derived from satellite observations. (b) Risk map, in which the coloured flags indicate the severity of the deformation (negative means settlement, positive means heave). Ling Chang et al (2018)

Extract from ref [1]

7.3 The recent experience for the Netherlands railway network illustrates the potential for InSAR to be used to monitor and control the performance of the HS2 Proposed Scheme. InSAR is clearly a promising technology which is developing rapidly, particularly with rapid developments in AI and machine learning.

7.4 InSAR is also capable of providing warning of impending instability. An example of its potential use for providing warning of bridge foundation scour is illustrated in Figure 10.4 from the Task Force report (see below). On 29th December 2015, following a period of intense rainfall and flooding, the masonry bridge at Tadcaster suffered a partial collapse into the River Wharfe due to scour of its foundations. Figure 10.4 shows subsequent analysis of InSAR data indicating settlement of the bridge being a precursor to failure; measurements several weeks before the failure indicate rapidly increasing settlement, almost certainly caused by earlier flooding and scour. This is a good example of the potential for InSAR technology for providing evidence of settlement as a precursor to subsequent instability and failure. It is highly relevant to providing warning of a possible, although unlikely, development of a sink hole beneath the HS2 Proposed Scheme.

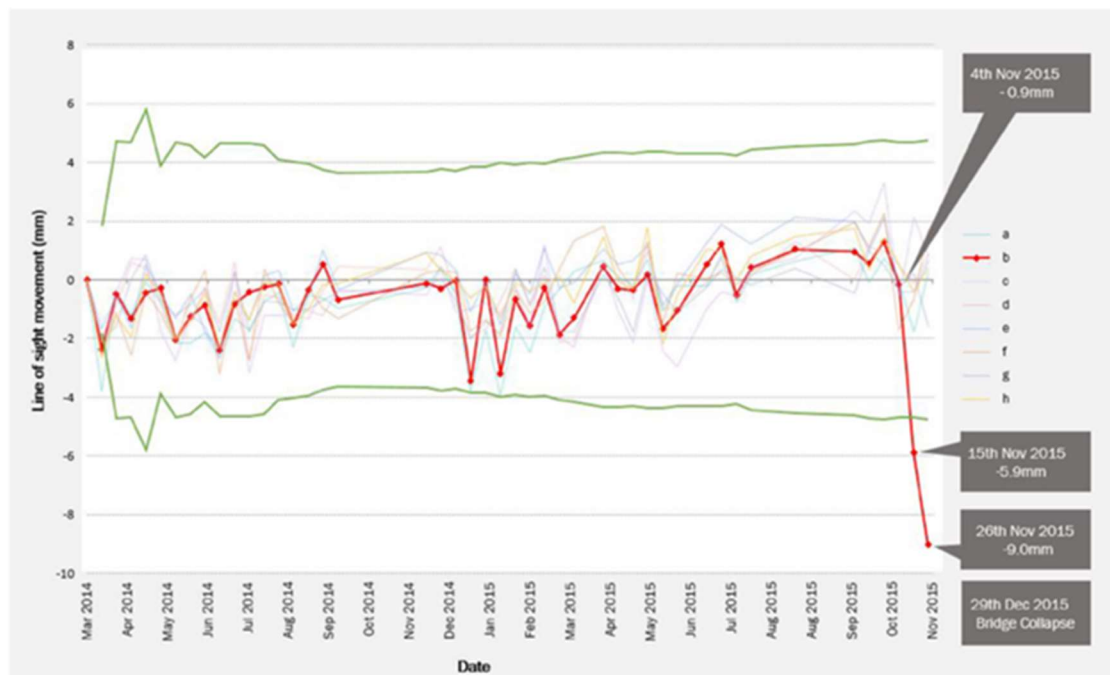


Figure 10.4: Vertical movements of masonry bridge at Tadcaster inferred from InSAR data, indicating rapidly increasing settlement several weeks before bridge failure occurred due to scour of its foundations during flooding of the River Wharfe (Selvakumaran, S et al, 2018)

Extract from ref [1]

7.5 Chapter 10 of the Task Force report also highlights a number of other new technologies for monitoring, including wireless tiltmeter systems recently trialled by Network Rail (see Figure 10.3 below, which has been extracted from the Task Force report). The tiltmeters transmit their measurements through a wireless communications network to a gateway, and thereby are loaded onto the internet. Readings can be taken every five minutes or at even higher frequencies, and alert levels set to give suitable warnings. These are an extremely promising application of innovative sensor development to the management of infrastructure such as the HS2 Proposed Scheme.

7.6 The roles of monitoring and mitigation are recognised in the Todhunter report⁴.

⁴ e.g., Section 4 paragraph 3



Figure 10.3: Wireless tiltmeters around a tunnel portal (Network Rail presentation, 9 October 2020)

Extract of ref [1]

7.7 Distributed fibre optic sensing (DFOS) provides a powerful technique for measurement of deformation and for advance warning of adverse ground movements. Controlled field experiments for early detection of sink hole development have recently been undertaken by HS2, Cambridge University and others (Xu et al, 2022). These were designed to assess the use of a newly developed geogrid for early warning of localised ground movement – see Fig.1 below. The geogrid is integrated with DFOS strain cables during the manufacturing process (referred to as a Sensorgrid). The trial results showed that the Sensorgrid configuration is highly sensitive to strain and can detect very small vertical displacement.

7.8 This innovative technology has considerable relevance to the HS2 Proposed Scheme, in which geogrids are likely to be incorporated in embankments in certain areas.

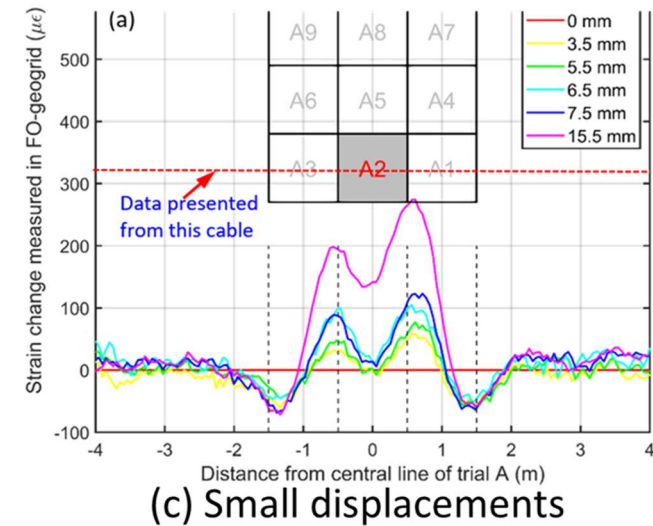
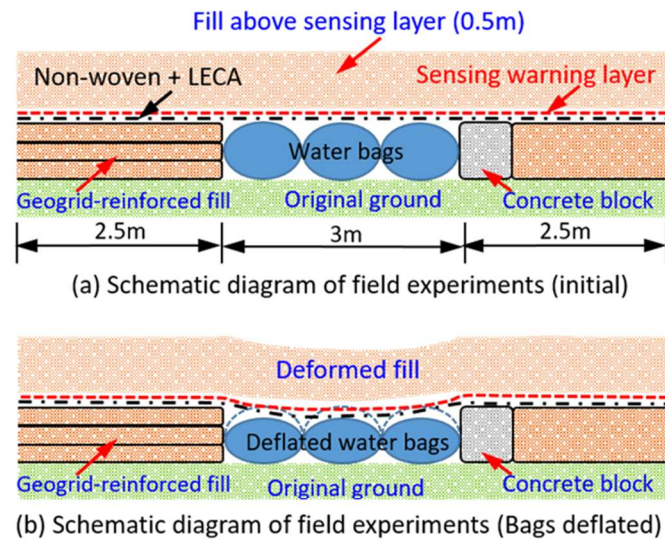


Fig.1 Field simulation of ground movement: (a) Schematic diagram of field experiments at the initial stage; (b) Schematic diagram of field experiments when bags deflated; (c) results for deflation of cell A2, small displacements results, (d) Construction of field experimental setup (after Xu et al, 2022)

8. Conclusions

- 8.1 Since the refined alignment was published in 2016 (ref [2]), additional surveys and studies have been undertaken by HS2 in the Cheshire Plain area, including desk studies of BGS boreholes, data harvesting from salt mine operators, geomorphological mapping and risk categorisation for salt solution landforms, new InSAR and LiDAR surveys, and new ground investigations comprising boreholes and CPTs.
- 8.2 Therefore, it appears, at this stage, that there is sufficient ground investigation information for HS2 to define the vertical and horizontal alignment in the Cheshire Plain area.
- 8.3 Nevertheless, further extensive ground investigation and surveys will be undertaken to fully develop the design and to inform construction planning.
- 8.4 Complex geological mechanisms apply in the Area of Interest, related to the influence of rock salt dissolution. These are well recognised in both the Todhunter report and the HS2 report and we agree that these potential geological hazards are important and applicable. These geological mechanisms will result in ongoing surface settlement that must be accommodated by the HS2 project, both during construction and in the operational life of the railway. The HS2 report discusses many engineering techniques for addressing such challenges.
- 8.5 It is common in infrastructure engineering for structures to be designed to tolerate ground movements. The techniques referenced in the HS2 report are well-established engineering methods that have been successfully used many times. We see no reason why they cannot be successfully used in the Cheshire Plain for the HS2 Proposed Scheme.
- 8.6 Indeed, for the efficient and safe operation of a high speed train, track maintenance with level corrections is a reality, regardless of any underlying time-dependent ground movements.
- 8.7 The ongoing settlements in the Cheshire Plain would be addressed by HS2 by risk categorisation and engineered solutions during design and construction, and in the operational life of the railway by monitoring, surveillance and appropriate maintenance interventions.
- 8.8 There have been significant advances in monitoring and surveillance technologies in recent years, e.g. LiDAR, InSAR, wireless tiltmeters and fibre optic sensing, most of which are being implemented by Network Rail. Adoption of such technologies will be of considerable benefit to the HS2 Proposed Scheme in ensuring safe construction and operation of the railway.
- 8.9 It is noteworthy that the West Coast Main Line railway and other railways have successfully operated in the same area for a long period.

8.10 Based on the information we have reviewed, we see no insurmountable obstacle to the successful construction and operation of the HS2 Proposed Scheme.

8.11 Climate change might promote faster salt solution mechanisms resulting in quicker rates of surface settlement. A climate change resilience assessment was undertaken by HS2 as part of its Environmental Impact Assessment. The result was that “All climate change related risks during operation have been assessed to be ‘low’ or ‘medium’ due to the range of mitigation measures”. We are satisfied that the proposed HS2 construction stage mitigations, as well as the monitoring and surveillance strategies for the operational stage jointly provide resilience to potential climate change impacts.

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- [2] High Speed Two Phase 2b, Crewe to Manchester West Midlands to Leeds, Route Refinement Consultation 2016 – Consultation document, November 2016.
- [3] Xiaomin Xu, Cedric Kechavarzi, David Wright, Graham Horgan, Hartmut Hangen, Nicholas De Battista, Dave Woods, Edgar Bertrand, Sarah Trinder, Nick Sartain (2022) “Fibre optic instrumented geogrid for ground movement detection”, 11th International Symposium on Field Monitoring in Geomechanics ,London, 4th – 8th September, 2022

Fibre optic instrumented geogrid for ground movement detection

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Abstract

The serviceability of transportation infrastructure, and other civil engineering assets, can be adversely affected by post-construction ground movements. Potential sources of these movements include loss of material from dissolution features, differential movements at earthwork/structure transitions and movements associated with mining legacy features. Post-construction ground movements are mitigated through engineering design, which may be supported through the inclusion of monitoring systems within the earthworks at locations of particular interest.

The number of available methods capable of monitoring sufficiently large areas and providing early warning of the onset/development of ground movement is limited. The incorporation of distributed fibre optic sensing (DFOS) systems into earthworks could provide important information on the commencement, location, origin and magnitude of ground movements in near real-time for critical infrastructure over areas at risk.

HS2 is the new high-speed railway connecting London, Birmingham and the north of England. This paper presents field monitoring trials on the HS2 Phase One route using a newly developed sensing solution consisting of a DFOS instrumented geogrid for ground movement detection. Controlled field tests were first performed on two simulated sinkholes using 3x3m pits in which water-filled bags were placed and covered with stabilised chalk and granular soils, respectively. By deflating the bags in varying sequences, the captured strain signature profiles from the instrumented geogrid were compared with displacement measurements from conventional instrumentation, to assess the instrumented geogrid's sensitivity to millimetre-scale settlements. Robustness and resilience were also evaluated through in-situ durability tests. Finally, as a result of these trials, this technology is being deployed over a 100 m-long, 10 m-wide stretch of the mainline alignment on the HS2 site at Tilehouse Lane Cutting to demonstrate its viability within a live construction environment. During the remaining construction period, continuous monitoring, near real-time data processing and visualisation will offer the opportunity to detect any incipient ground movement below the temporary haul road surface.

Keywords: Distributed fibre optic sensing, Ground movement, Geogrid, Sensorgrid, Early warning

1. Introduction

Nearly all of the UK's critical infrastructure is placed on, or situated in soil. Therefore, ground movement can have a significant social, economical and physical impact on infrastructure provision both at present and in future years. Such ground movements are commonly induced from shallow geohazards like sinkholes, subsidence, landslides, etc., often resulting in both long-term degradation and, ultimately, structural failure of particular assets. Climate change projections suggest that these geohazards, which are themselves often driven by antecedent weather conditions, are likely to increase in magnitude and frequency for certain areas of the UK through the 21st century. Implementing early warning systems by measuring and monitoring spatio-temporal movements may be used as part of a coordinated design and risk management approach to mitigate these increasing risks posed to critical infrastructure (Ast et al. 2001). This was also emphasised by the task force appointed by Network Rail to carry out a review of earthworks management following the fatal train derailment at Carmont, Scotland on 12th August 2020 (Network Rail, 2021).

The number of available methods that are capable of monitoring sufficiently large areas and providing early warning of the onset/development of ground movement, is limited. Conventional instrumentation, such as

borehole extensometers, are often constrained by discretely instrumented ‘measuring points’. Remote sensing technologies like interferometric synthetic aperture radar (InSAR) are commonly used to detect ground surface elevation changes and have proved effective in mapping large-scale ground motions. However, these do not allow for the capture of subsurface deformation, which is often a precursor and early warning of surface ground movement, and their effectiveness in highly vegetated infrastructure corridors is often limited. Distributed fibre optic sensing (DFOS) technology has emerged as a powerful tool for continuous, high temporal and spatial resolution mapping of subsurface ground movement. DFOS enables measurement of temperature, strain, and acoustic energy distributions along the entire length of a fibre optic sensing cable (Kechavarzi et al. 2016; Xu et al. 2021). The incorporation of DFOS cables into the ground could provide significantly improved information on the location and magnitude of subsurface ground movement and subsidence (Möller et al., 2022). To date, this technology has been trialled in some field monitoring campaigns, with DFOS cables embedded in trenches on the ground surface and back-filled by in-situ soil to monitor ground cracks, horizontal displacements and ground settlements. Many have reported that the quality of fibre optic sensing data is highly reliant on the mechanical coupling between fibre optic cables and their surrounding soils, which is dependent on both the cable construction and its installation (Iten et al., 2011; Klar et al. 2014; Zhang et al. 2016; Winters et al. 2020).

This paper reports on controlled field experiments designed to assess the use of a newly developed geogrid, integrated with DFOS strain cables during the manufacturing process (referred to as a Sensorgrid), for early warning of localised ground movement. This innovative Sensorgrid was developed in collaboration between Huesker, the Centre for Smart Infrastructure and Construction (CSIC) at the University of Cambridge and Epsimon Ltd. The performance and practical implications of the new sensing solution were explored through real-world trials simulating the type, scale and rate of ground movement that could be experienced by earthworks assets in areas of unmitigated ground movements.

2. Field-scale controlled experiments

2.1 Experimental setup

Two 3 x 3m voids constructed at the HS2 site at Tilehouse Lane Cutting (TLC) to simulate the ground movement from shallow geohazards and explore the behaviour and response of the Sensorgrid against two different types of overburden fills commonly found and used on the South Portal at TLC: stabilised chalk (trial A) and granular fill (trial B). As illustrated in Figure 1, nine heavy-duty water-filled bags were laid in the base of each, with a maximum inflation height of 0.5m. On one end of the pit, concrete modular blocks were used to form a hard edge, simulating the transition between earthwork and structure (e.g. bridge abutment). At the other end a soft edge was formed by using a geogrid and a non-woven wrap-around on compacted fill (Figures 1(a) and (c)). On one side of the pit, four modular blocks could be removed at the end of the trial to inspect the condition and profile of the Sensorgrid. When all the bags were fully inflated, a layer of non-woven geotextile was placed loosely on top of them to support a lightweight expanded clay aggregate (LECA) fill. This was then followed by the installation of the Sensorgrid, and a 500mm layer of overburden fill above the sensing layer.

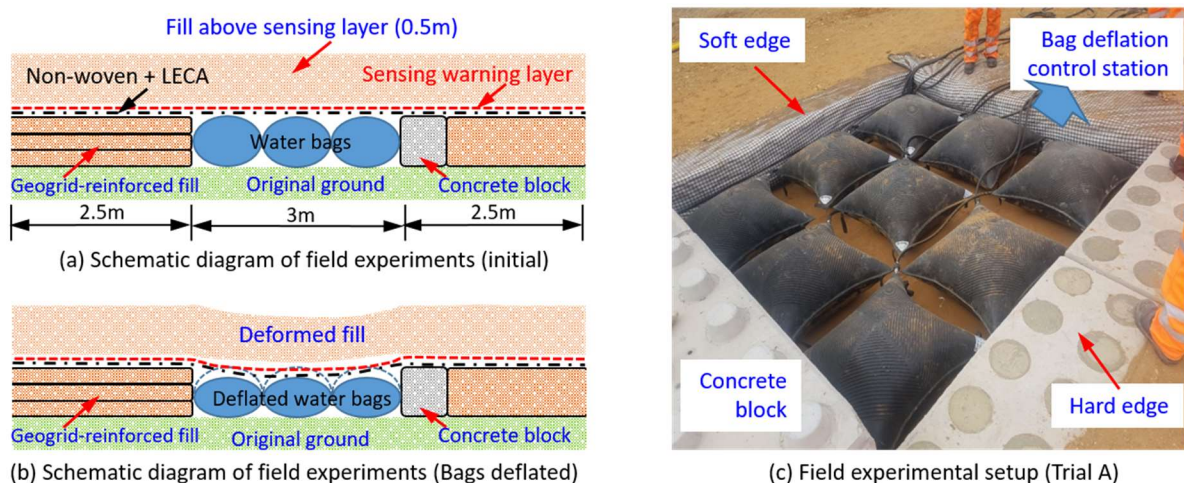


Figure 1: Field simulation of ground movement: (a) Schematic diagram of field experiments at the initial stage; (b) Schematic diagram of field experiments when bags deflated; (c) Field experimental setup (Trial A).

2.2 Field instrumentation

The strain fibre optic (FO) cable integrated into the Sensorgrid used in these two trials was 2.5 mm in diameter and consisted of single-mode optical fibre with a 0.9mm Hytrel coating embedded in an elastic 2.5 mm polyurethane outer sheath. It was knitted into a geogrid by Huesker by substituting it for yarns of similar size. The Sensorgrid used in these two trials was 0.5m wide and carried three individual FO cables, a central fibre, a redundant fibre positioned next to it and an offset fibre.

Prior to the trials, the performance of the Sensorgrid was evaluated through extensive testing at CSIC. In particular, the strain transfer function was evaluated using a bespoke universal testing machine to carry out tensile tests (Figure 2(a)). As illustrated by one of the test results presented in Figure 2(b), the strain transfer function of this very elastic cable showed good linearity, no hysteresis, good repeatability to high strains and high sensitivity (high strain coefficient or gauge factor, which is the slope of the linear relationships shown).

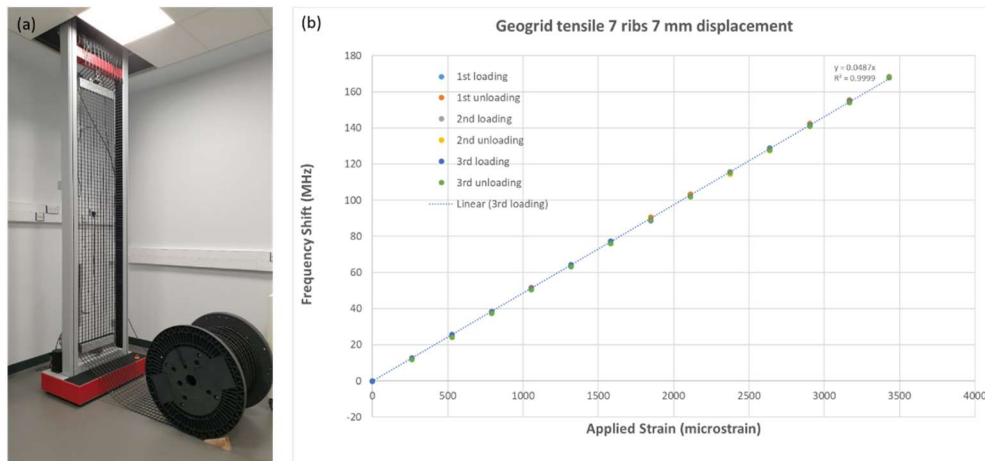


Figure 2: Laboratory tensile tests on the Sensorgrid: (a) Tensile test at CSIC; (b) Testing results.

Figure 3 shows an overview of the field instrumentation set-up. The grid was positioned on top of the bags in a way that the offset fibre was running over the middle of each bag, as illustrated in Figures 3(a) and (b). The anchored length of Sensorgrid was 2.5m on either sides of the pit.

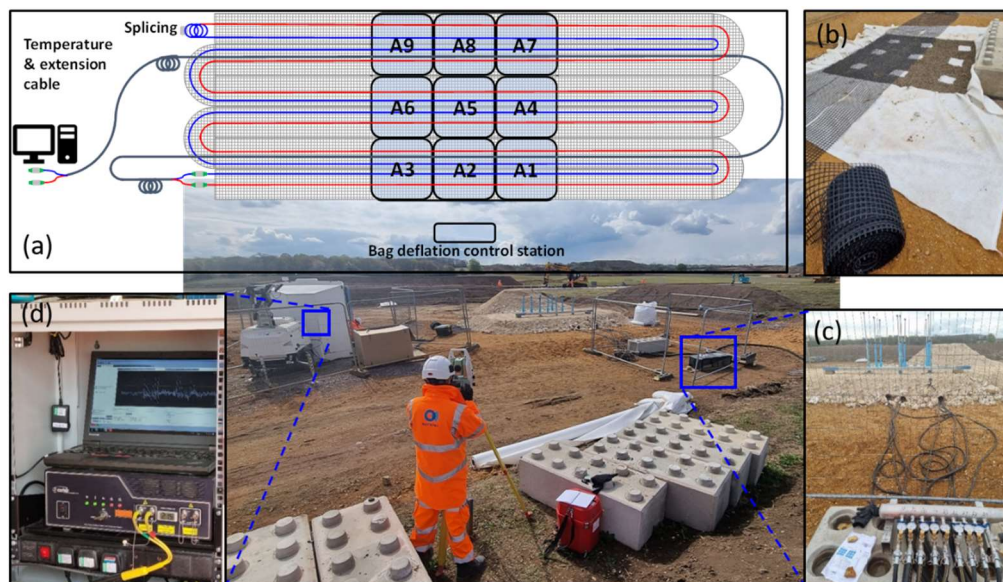


Figure 3: Field experimental setup at trial A: (a) Sensorgrid layout; (b) Sensorgrid installation; (c) Water bag control station; (d) Fibre optic sensing analyser operating in real-time.

A conventional total station monitoring system was employed to capture the displacement on the crown of each bag, created by deflation, as well as the resulting displacement experienced by the Sensorgrid. One circular metallic plate was sitting on the centre of each bag and a second plate was sitting on top of the Sensorgrid above the bags. These two plates were connected to rods and tubes that extended over the overburden fill. Prisms

were attached to the rods and tubes and monitored using a total station, as shown in Figure 3. This allowed the movement of the bags (void) and the geogrid to be recorded in real-time, with an accuracy of $\pm 1\text{mm}$.

To simulate ground movement, water was released from the bags through a control station (as pictured in Figure 2(c)), causing the fill above to move downwards and strain the mesh, which in turn caused a change in the characteristics of the spectrum of the back-scattered light pulsing through the FO sensing cable captured in real-time by a Brillouin Optical Time Domain Analysis (BOTDA) analyser (OZ Optics Ltd, Canada) (Figure 2(d)). After full completion of testing on trial A, the overburden fill, the monitoring tubes and the Sensorgrid were removed to recover the bags from the pit and reuse them for trial B.

3. Results and Observations

3.1 Early warning strain signatures

The strain signature profiles measured in the Sensorgrid at the very early stage of sinkhole formation are illustrated in Figure 4. These represent a change in strain with respect to a baseline measurement taken following the installation and prior to starting the tests. By convention, positive strain change corresponds to an increase in tension while negative strain change represents compression or loss of tension. The strain profiles shown are those obtained with the FO cable centred on the water bags in the row with red numbering, as indicated in the schematic inset in the figures. The grey shading illustrates the bags that have been (grey numbering) or are being (red numbering) deflated at the time of the measurement.

In both trials A and B, the Sensorgrid was sensitive to millimetre scale subsurface vertical settlement (not necessarily the ground surface settlement) over the relatively small spatial scale of 1m (deflated bag width). The strain generated was several times higher than the system's measurement resolution. At this early stage, the strain profile in Trial A exhibited a double-peak shape associated with the central dip across the A2 section and negative strain at the edge of the trial area. The strain profile is wider than that of the deflated water bag as the deformation across A2 generated axial strain in the grid. For Trial B, the strain profile displays a different pattern with a negative strain change in the centre line of the fibre optic trial pit B9, as shown in Figure 4 (b). This artefact is due to the different construction procedures used in Trial B where the soil over the water bags was compacted. This compaction forced the geogrid down in the dips in between the bags, creating tension in the FO cable over the centre of the curved bags. As the bags were deflated this tension was released, resulting in a negative strain change (loss of tension). This would not happen in a site installation when the geogrid is installed over a flat surface. Nevertheless, both trials demonstrate the sensitivity and effectiveness of the Sensorgrid system in detecting relatively small movements over a small spatial scale.

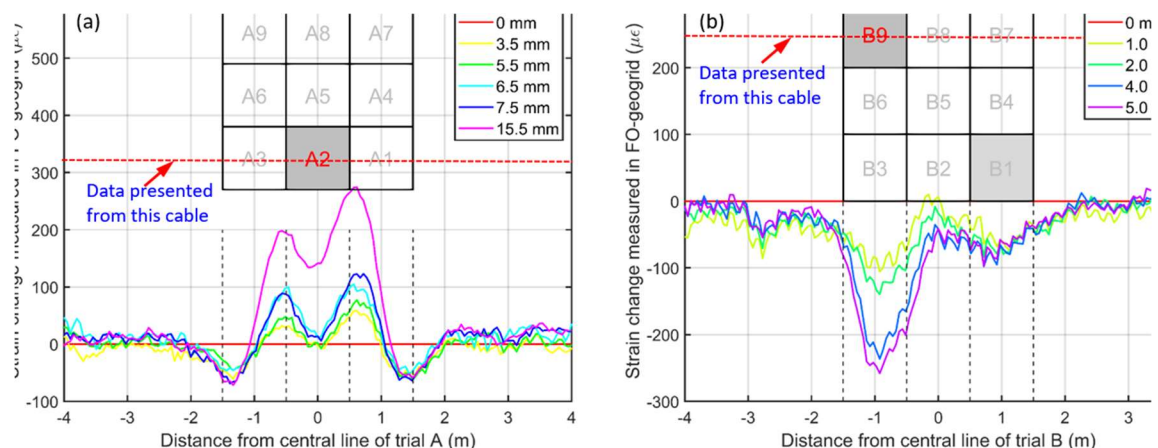


Figure 4: Early warning strain signature profiles: (a) Trial A - deflation of bag A2; (b) Trial B - deflation of bag B9 (following the deflation of B1).

3.2 Strain signatures at large ground deformations

The evolution of the measured strain profiles as sinkholes propagate was investigated by deflating bags in sequence. As displayed in Figure 5(a), the strain profile gradually became wider as the single bag A2 was deflated; i.e. the positive peaks remained around the edges of A2 but strain propagated up to about 1m into the anchorage length on both sides of the trial pit. Similar behaviour was observed in trial B, as shown in Figure 5(b). The

propagation of strain, as the bags were deflated, can also be visualised using contour plots, as highlighted in Figure 5(c) and (d). This type of two-dimensional plot on a larger scale installation is essential to allow for rapidly pinpointing the location of problem areas. Following completion of each trial, the lateral modular blocks were removed for inspection, as shown in Figure 6.

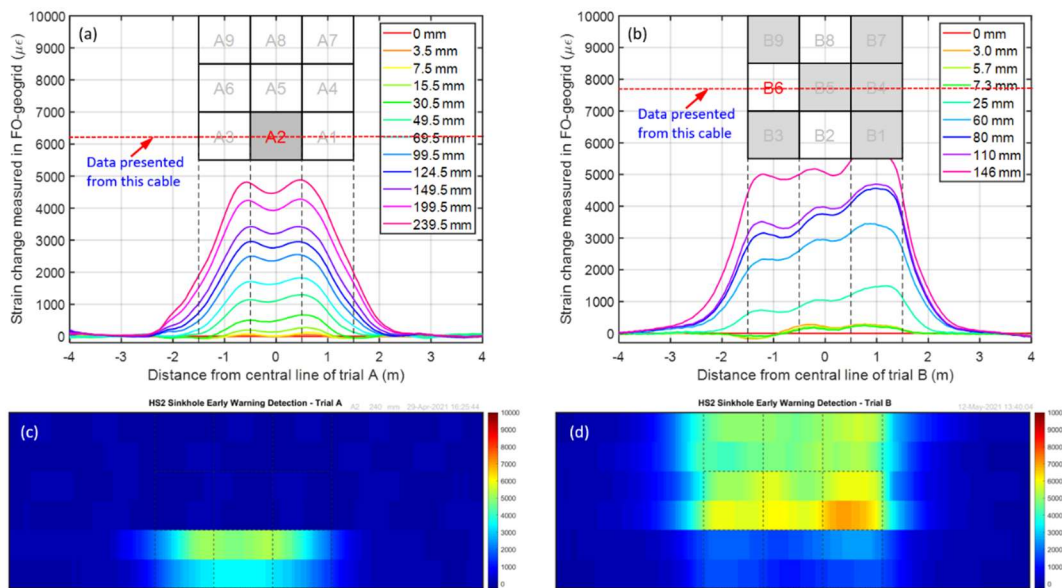


Figure 5: Strain profiles at large ground deformations: (a) Trial A – deflation of bag A2; (b) Trial B - deflation of bag B6 (following the deflation of B1, B9, B3, B7, B5, B4 and B6 in sequence); (c) Strain contour at trial A deflating A2 to 239.5mm; (d) Strain contour at trial B deflating B6 to 146mm.

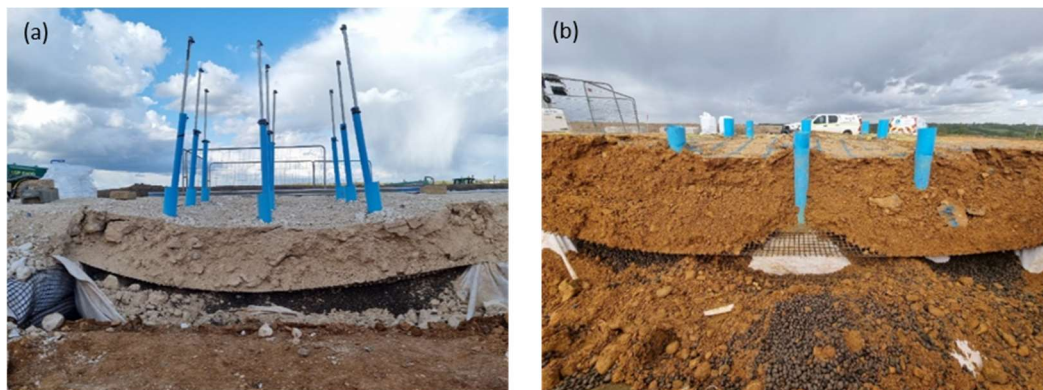


Figure 6: Deformed profiles of Sensorgrid after all bags were fully deflated: (a) Trial A; (b) Trial B.

During the trials, a FO temperature cable was installed above the Sensorgrid to assess potential temperature effects. The largest temperature changes occurred on 29 April 2021 due to sun exposure, with rapid changes and an increase of almost 25°C, which was picked up by part of the cable located outside of the soil. However, in the cable covered by the soil in the trial pit, the changes were not significant and in the order of the precision of the analyser (i.e. ± 1 °C).

4. In-situ durability assessment

Separate tests were conducted in order to assess the robustness of the Sensorgrid used in these preliminary trials, where no significant problems had occurred, under more realistic field conditions representative of the temporary haul road and final pavement construction process at TLC. Two separate Sensorgrid circuits were laid on the ground in a single loop over a length of approximately 50m in order to apply four different treatments: (1) T1 with one protection layer of non-woven geotextile (NW20) above and below the Sensorgrid, (2) T2 with two layers of NW20 above and below the Sensorgrid, (3) T3 with three layers of NW20 above and below the Sensorgrid; (4) T4 with three layers of NW20 above and two layers of NW20 below the Sensorgrid; The non-woven geotextile (NW20) used here had a weight of 235 grams/m², and was the same product used to cover the

water bags in the trial areas. After placing the Sensorgrid and NW20 protections, a series of construction activities were carried out, including placement and levelling of a stabilised chalk fill over the Sensorgrid, and compaction of that fill with eight passes of a 20-tonne vibratory roller. For all treatments, both strain and optical power were measured with a Neubrex NBX-5000 Brillouin Optical Time Domain Reflectometry (BOTDR) analyser all along the FO cables integrated in the Sensorgrid. The data showed that, whereas acceptable localised losses were generated during soil placement, soil levelling and soil compaction resulted in significant losses at several locations along the optical fibres. These were likely due to excessive localised bending in the fibres generated by sharp aggregates, but as the losses are cumulative they eventually exceeded the optical budget available (dynamic range of the analyser), leading to erroneous strain data.

Since the manufacturing of the Sensorgrid by Huesker is realised through a knitting process, different grid designs can be achieved by using FO strain cables of different sizes and stiffness and therefore robustness. As such, a stiffer Sensorgrid (Fortrac® R 220/100-30 GSGTA) was produced with a much more robust cable for the larger scale ground movement monitoring scheme deployed at TLC, as described below.

5. Large-scale trial of ground movement monitoring at Tilehouse Lane Cutting

TLC is approximately 710m long in total and up to 11m deep, and it connects the North Approach Embankment and Colne Valley Viaduct to the south-east with the West Hyde embankment and the 10.6 mile-long twin-bore Chiltern Tunnel passing under the M25 to the north-west, as indicated in Figure 7. The ground investigation (48 CPTs) and cutting excavation has revealed dissolution features ranging from 0.5 to 2m in diameter to be present along the cutting (Figure 7(a)). The condition of the infill material varies, and voids are occasionally present. Engineered mitigation has been constructed at these locations and a geogrid-reinforced mattress will also be installed over the area. This has provided the opportunity to prove the viability of the technology in a live construction environment and 5m-wide Sensorgrid with FO strain sensing cables at a 0.5m spacing is being deployed to monitor potential ground movement beneath a 100m-long, 10m-wide stretch of the mainline alignment on the HS2 site at TLC.

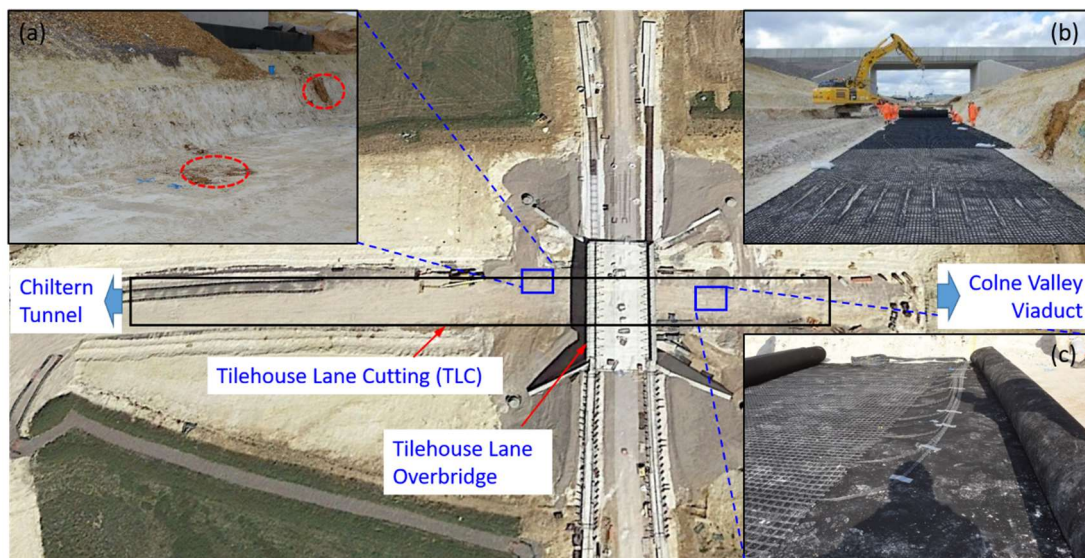


Figure 7: Large-scale monitoring of ground movement at Tilehouse Lane Cutting (TLC): (a) Solution features at TLC (as circled); (b) Field deployment of Sensorgrid; (c) Sensorgrid in-situ.

To protect against construction damage, the Sensorgrid is sandwiched between layers of Non-woven geotextile (HPS14) (Figure 7 (b) and (c)). Above this is a layer of geogrid Fortrac 600 MDT forming the base of the reinforced mattress, overlain by chalk mixed with 2% cement. Strain will be monitored continuously along the Sensorgrid for two years during the construction of HS2. This represents 10,000 monitoring points over 1000m². Temperature cables are also being embedded with the Sensorgrid to assess any (unexpected) temperature effect. The data acquired from the FO cables will be automatically processed and displayed in real-time on a web-based visualisation dashboard developed by Epsimon Ltd. This will enable the project engineers to detect any incipient ground movement, enabling them to take timely preventative action if necessary.

6. Conclusions

Controlled field experiments were performed to explore the performance of a newly developed DFOS instrumented geogrid (Sensorgrid) for ground movement detection. Water-filled bags were placed in the ground and deflated in a pre-determined sequences to replicate vertical ground movements which demonstrated the sensitivity and effectiveness of the Sensorgrid system as an early warning detection solution for local ground movements beneath earthworks. The Sensorgrid sensing system is sensitive to millimetre scale vertical settlement at depth. It is also sensitive to settlement at the sub-metre spatial scale. For large ground movements, the Sensorgrid is likely to experience large strains but, in the trials, these did not exceed the capacity of the system (both in terms of tensile strength and measurement range/limit).

As shown by the trial results, the current Sensorgrid configuration is highly sensitive to strain and can detect very small vertical displacement. Its low stiffness is likely to lead to good strain transfer in soils, which also makes it ideal for application where horizontal movement and axial strain occurs, such as for slope movements and embankment retaining walls. For applications in harsh construction environments, the Sensorgrid design is highly configurable and it can be integrated with more robust strain cables as required.

Developing a capability for early detection of ground movement which leads to appropriate preventative or precautionary measures could prove a valuable tool for the maintenance of infrastructure earthworks. These technologies may become more valuable in future because of the increasing frequency of extreme weather events and their potentially adverse impact on ground conditions and earthwork assets.

Acknowledgements

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6 April 2023

Dear Emyr,

HIGH SPEED RAIL (CREWE – MANCHESTER) BILL – HOUSE OF COMMONS SELECT COMMITTEE: PETITION HS2-P2B-HOC-110 & HS2-P2B-AP1-116 CHESHIRE WEST AND CHESTER COUNCIL

I am writing to you in my capacity as the Director of Hybrid Bill Delivery at HS2 Ltd, which is acting on behalf of the Promoter of the High Speed Rail (Crewe - Manchester) Bill ('the Bill') currently before Parliament. I understand that your client has a number of concerns about the impact of Phase 2b of HS2 (known as 'the Proposed Scheme') and have submitted petitions on that basis against the Bill and Additional Provision 1 in the House of Commons.

I am writing to you, on behalf of the Secretary of State for Transport, to offer Cheshire West and Chester Council the following assurances to address some of those concerns which have also been raised by Minshull Vernon and District Parish Council and Stanthorne and Wimboldsley Parish Meeting in their respective petitions against the Bill.

Part A - Wimboldsley Primary School

1. In these assurances:-

"Additional Provisions" means any amendment to the Bill requiring further or additional powers to be conferred and which are deposited after the introduction of the Bill in Parliament;

"the Act limits" has the same meaning as given by clause 63(2) to the Bill;

"the Authorised Works" means the works authorised by the Bill;

“the Bill” means the High Speed Rail (Crewe – Manchester) Bill as introduced into Parliament on 24 January 2022 and incorporating the Additional Provisions, and references to “the Bill” include any Act of Parliament enacting the Bill. References in these assurances to clauses and provisions of, and works authorised by, the Bill are taken from the Bill as introduced in the House of Commons on 24 January 2022 but shall be modified as far as may be necessary to reflect changes in any Act of Parliament enacting the Bill;

“the Borrow Pit” means the borrow pit identified as MA02-Borrow Pit B on sheet CT-05-05-309 in the Environmental Statement, Volume 2 (Community Area Map Book) MA02: Wimboldsley to Lostock Gralam;

“the Code of Construction Practice” means the draft Code of Construction Practice for the Proposed Scheme included in Volume 5 of the Environmental Statement deposited in January 2022 in connection with the Bill that is intended to control the construction of the works authorised by the Bill, the final version of which will be produced on Royal Assent;

“the Construction Period” means the period from commencement of any works for construction and delivery of the Proposed Scheme until completion of those works;

“the Deposited Plans” has the meaning given by clause 54 to the Bill;

“the Environmental Statement” means the environmental statement deposited in Parliament in connection with the Bill and includes any additional environmental statement deposited in Parliament in connection with an Additional Provision to the Bill or supplementary environmental statement deposited in connection with the Bill;

“Large Goods Vehicles” has the same meaning as in Part 4 of the Road Traffic Act 1988;

“the nominated undertaker” means the person who is, at the relevant time, the nominated undertaker under clause 42 of the Bill for the purposes of the works to which this assurance relates. The nominated undertaker may be HS2 Ltd, or it may be another body or bodies appointed to oversee the construction and operation of the Proposed Scheme or, in default of any such appointment, the Secretary of State;

“the Petitioner” means Cheshire West & Chester Council of 58 Nicholas Street, Chester, Cheshire CH1 2NP;

“the Promoter” means the Secretary of State for Transport (or any successor Secretary of State or Minister holding the Transport portfolio) in his capacity as promoter of the Bill and includes, so far as relevant, any nominated undertaker exercising any powers or functions under the Bill once enacted;

“the Proposed Scheme” means Phase 2b (Crewe-Manchester) of High Speed 2 as defined in the Bill;

“Royal Assent” means the date upon which Royal Assent is given to the Bill; and

“the School” means Wimboldsley Community Primary School, Nantwich Road, Wimboldsley, Middlewich, Cheshire CW10 0LN.

2. **CONSTRUCTION AIR QUALITY MONITORING**

- 2.1 The Promoter will require the nominated undertaker to treat the construction worksites for the Authorised Works that are situated within the administrative area of the Petitioner as "medium risk" as set out in best practice methodology, currently the Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction 2014 ("IAQM, 2014"), as revised from time to time, for the purposes of worksite boundary construction dust monitoring unless and until it is demonstrated by the nominated undertaker's appointed contractor that such construction worksites for the Authorised Works do not meet the criteria to be classed as medium risk under that best practice methodology.
- 2.2 For those construction worksite(s) for the Authorised Works located in the immediate vicinity of the School, worksite boundary automatic continuous construction dust monitoring as set out in Section 7.3 of the draft Code of Construction Practice will be undertaken for any period that such construction worksite(s) are treated as medium risk under paragraph 2.1, and the results will be reported back to the Petitioner in the manner described in Section 7.3 of the draft Code of Construction Practice.

3. **BORROW PIT SCREENING**

- 3.1 The Promoter will, subject to the conditions in paragraph 3.2, require the nominated undertaker where reasonably practicable to create a reasonable and proportionate landscape screening bund to mitigate the visual impact on the School of works to excavate the Borrow Pit (**“the Screening Works”**) subject to the approval of the Screening Works by the relevant local planning authority under Schedule 17 of the Bill.
- 3.2 The conditions referred to in Paragraph 3.1 are that:-
- 3.2.1 the Screening Works can be provided within the existing powers of the Bill and within the Act limits without the need for any additional land from that identified on the Deposited Plans;
 - 3.2.2 the provision of the Screening Works will not create any new or different environmental effects than those assessed in the Environmental Statement; and
 - 3.2.3 the provision of the Screening Works will not prejudice the safe, timely and economic delivery of the Proposed Scheme.

4. **SCHOOL LANE CONSTRUCTION TRAFFIC**

- 4.1 The Promoter will require the Nominated Undertaker to restrict HS2 Large Goods Vehicles from using School Lane between its junction with Nantwich Road (A530) and Chapel Lane / Forge Mil Lane during the Construction Period, except:-
- 4.1.1 in circumstances where the Authorised Works can only be accessed by Large Goods Vehicles via School Lane;
 - 4.1.2 in circumstances where the Nominated Undertaker is required to use School Lane by the relevant local planning authority under powers conferred on it by paragraph 6 of Schedule 17 to the Bill;
 - 4.1.3 in the case of emergency or if the nominated undertaker is directed to do so by the police or emergency services; or
 - 4.1.4 where not using School Lane for access by Large Goods Vehicles would prejudice the safe, timely and economic delivery of the Proposed Scheme.

Part B - Engagement

1. In this assurance:-

“Additional Provisions” means any amendment to the Bill requiring further or additional powers to be conferred and which are deposited after the introduction of the Bill in Parliament;

“the Bill” means the High Speed Rail (Crewe – Manchester) Bill as introduced into Parliament on 24 January 2022 and incorporating the Additional Provisions, and references to “the Bill” include any Act of Parliament enacting the Bill. References in these assurances to clauses and provisions of, and works authorised by, the Bill are taken from the Bill as introduced in the House of Commons on 24 January 2022 but shall be modified as far as may be necessary to reflect changes in any Act of Parliament enacting the Bill;

“the Code of Construction Practice” means the draft Code of Construction Practice for the Proposed Scheme included in Volume 5 of the Environmental Statement deposited in January 2022 in connection with the Bill that is intended to control the construction of the works authorised by the Bill, the final version of which will be produced on Royal Assent;

“HS2 Community Engagement Framework” means the community engagement framework to be developed by the nominated undertaker in accordance with Section 5.1 of the Code of Construction Practice;

“the nominated undertaker” means the person who is, at the relevant time, the nominated undertaker under clause 42 of the Bill for the purposes of the works to which this assurance relates. The nominated undertaker may be HS2 Ltd, or it may be another body or bodies appointed to oversee the construction and operation of the Proposed Scheme or, in default of any such appointment, the Secretary of State;

“the Promoter” means the Secretary of State for Transport (or any successor Secretary of State or Minister holding the Transport portfolio) in his capacity as promoter of the Bill and includes, so far as relevant, any nominated undertaker exercising any powers or functions under the Bill once enacted;

“the Proposed Scheme” means Phase 2b (Crewe-Manchester) of High Speed 2 as defined in the Bill;

“Royal Assent” means the date upon which Royal Assent is given to the Bill; and

“the School” means Wimboldsley Community Primary School, Nantwich Road, Wimboldsley, Middlewich, Cheshire CW10 0LN.

2. **SPECIAL MANAGEMENT ZONE**

- 2.1 In accordance with the Code of Construction Practice, the Promoter will require the nominated undertaker to ensure that appropriately experienced community engagement personnel are appointed to manage stakeholder and community relationships during the development of the Proposed Scheme within the areas of Minshull Vernon and District Parish Council and Stanthorne & Wimboldsley Parish Meeting Council (**“the Designated Areas”**).
- 2.2 The community engagement team will include:-
 - 2.2.1 A single point of contact for local authorities within the Designated Areas;
 - 2.2.2 A single point of contact for the School;
 - 2.2.3 Named individual points of contact for affected property owners within the Designated Areas; and
 - 2.2.4 A senior manager accountable for the effective implementation of the Code of Construction Practice within the Designated Areas.
- 2.3 The broad duties of the individuals specified in Paragraph 2.2 will include, but will not be limited to:-
 - 2.3.1 Being the first point of contact for communities and local authorities along the line of route of the Proposed Scheme in the Designated Areas;
 - 2.3.2 Managing relationships with local communities, businesses, local authorities and other stakeholders within the Designated Areas;
 - 2.3.3 Raising issues from the community in the Designated Areas within HS2 Ltd for escalation, resolution or clarification;
 - 2.3.4 Monitoring the progress of each item raised and keeping stakeholders within the Designated Areas informed of progress;

- 2.3.5 Ensuring the HS2 Community Engagement Framework is appropriately implemented within the Designated Areas;
- 2.3.6 Attending regular meetings with the lead contractors, local authorities, local communities and other stakeholders within the Designated Areas to discuss construction issues and the forthcoming programme of works for the Proposed Scheme within the Designated Areas;
- 2.3.7 Advising on the appropriate support mechanisms to be provided by the nominated undertaker which will be available to local businesses, property owners and voluntary and community organisations within the Designated Areas that may be affected by the construction of works for the Proposed Scheme; and
- 2.3.8 Liaison with the School, Minshull Vernon and District Parish Council and Stanthorne & Wimboldsley Parish Meeting.

Part C - Footpath Winsford 3/1

1. In this assurance:-

“Additional Provisions” means any amendment to the Bill requiring further or additional powers to be conferred and which are deposited after the introduction of the Bill in Parliament;

“the Act limits” has the same meaning as given by clause 63(2) to the Bill;

“the Bill” means the High Speed Rail (Crewe – Manchester) Bill as introduced into Parliament on 24 January 2022 and incorporating the Additional Provisions, and references to “the Bill” include any Act of Parliament enacting the Bill. References in these assurances to clauses and provisions of, and works authorised by, the Bill are taken from the Bill as introduced in the House of Commons on 24 January 2022 but shall be modified as far as may be necessary to reflect changes in any Act of Parliament enacting the Bill;

“the Footpath” means that part of the existing footpath known as Footpath Winsford 3/1 within the Act limits;

“the nominated undertaker” means the person who is, at the relevant time, the nominated undertaker under clause 42 of the Bill for the purposes of the works to which this assurance relates. The Nominated Undertaker may be HS2 Ltd, or it may be another body or bodies appointed to oversee the construction and operation of the Proposed Scheme or, in default of any such appointment, the Secretary of State;

“the Promoter” means the Secretary of State for Transport (or any successor Secretary of State or Minister holding the Transport portfolio) in his capacity as promoter of the Bill and includes, so far as relevant, any nominated undertaker exercising any powers or functions under the Bill once enacted;

“the Proposed Scheme” means Phase 2b (Crewe-Manchester) of High Speed 2 as defined in the Bill; and

“the Relevant Authority” has the same meaning as given by paragraph 8(14) of Schedule 5 to the Bill.

2. **TEMPORARY STOPPING UP OF FOOTPATH WINSFORD 3/1**

- 2.1 The Promoter will require the nominated undertaker during the construction of the Proposed Scheme to use reasonable endeavours in exercising the powers conferred by paragraph 8 of Schedule 5 of the Bill to temporarily stop up the Footpath to limit the duration of any period of temporary stopping up of the Footpath to a duration for each period of not more than four (4) weeks.
- 2.2 The Promoter will require the nominated undertaker to use reasonable endeavours to provide the Relevant Authority with notice of each proposed period of temporary stopping up of the Footpath under the Bill powers in advance of the nominated undertaker commencing the consultation with that Relevant Authority that is required by paragraph 8(4) of Schedule 5 to the Bill to be undertaken before the nominated undertaker exercises the Bill powers to temporarily stop up the Footpath.

If accepted, these assurances will be included in the Register of Undertakings and Assurances, which is held by the Department for Transport. Drafts of the Register will be published regularly during the passage of the Bill and it will be finalised after Royal Assent. A nominated undertaker will be contractually obliged to comply with all relevant undertakings and assurances set out in the Register. The assurance process is set out in Annex A.

If you have any further queries please don't hesitate to contact Alan Phelan, Petition Manager, on **07780 227796** or alan.phelan@hs2.org.uk.

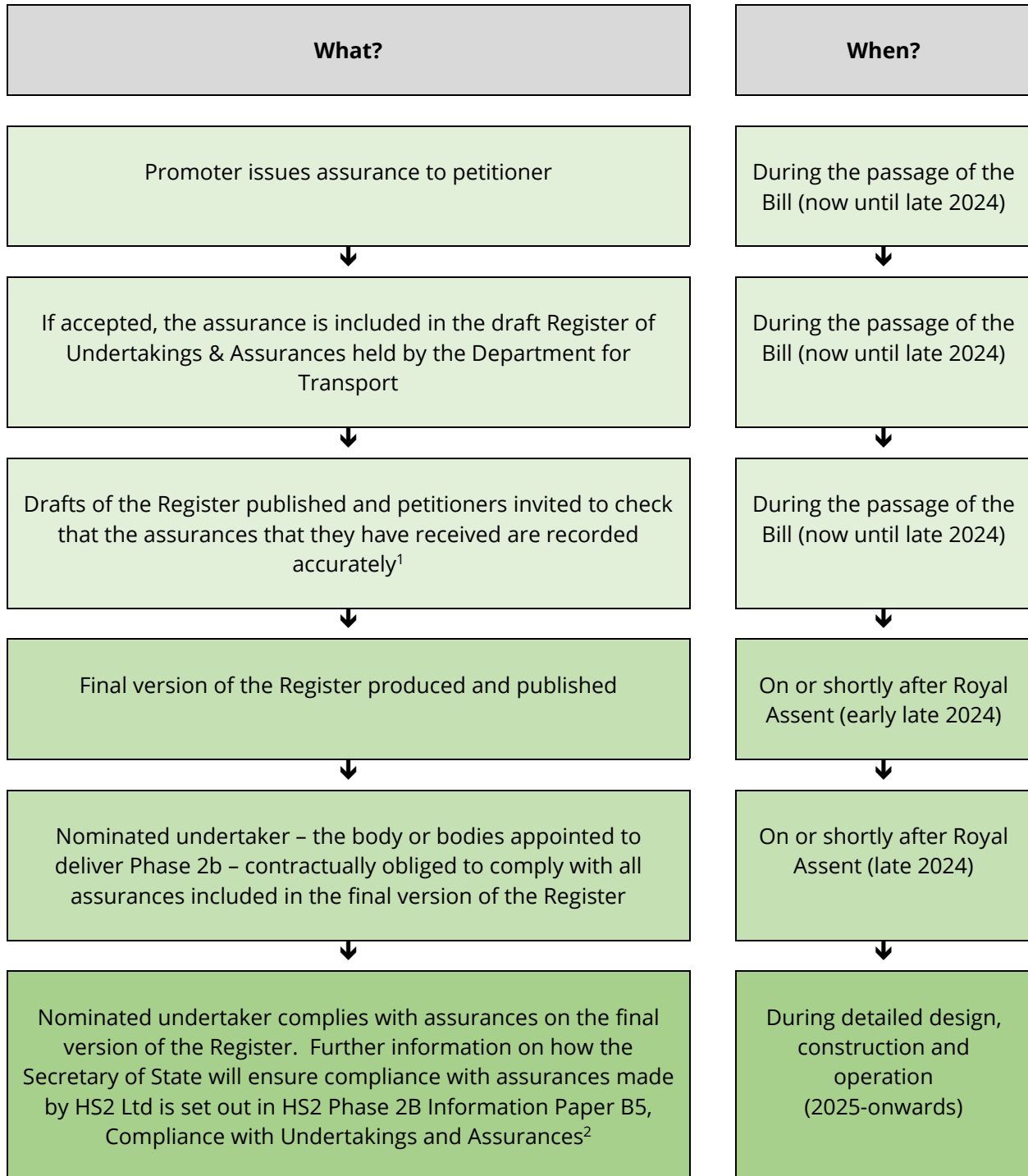
Yours sincerely



Lucy Lagerweij
Director, Hybrid Bill Delivery
High Speed Two (HS2) Limited

Annex A

ASSURANCES: STEPS AND TIMING



¹ The latest draft of the Register can be found at <https://www.gov.uk/government/publications/hs2-phase-2b-crewe-manchester-register-of-undertakings-and-assurances>

² A copy can be found at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1048801/B5_Compliance_with_undertakings_and_assurances_v1.pdf

Ground conditions

Promoter's response

On 3rd March 2023 the Promoter published a report entitled "Crewe to Manchester - Understanding the Ground Risk across the Cheshire Plain".

The March Report can be viewed at the following link: [HS2 Phase 2b Select Committee: Crewe to Manchester - Understanding the Ground Risk across the Cheshire Plain - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/114444/HS2_Phase_2b_Select_Committee_Crewe_to_Manchester_-_Understanding_the_Ground_Risk_across_the_Cheshire_Plain.pdf)

The March Report provides a review of the ground conditions, the associated risks, and the mitigation measures for the Crewe to Manchester Proposed Scheme.

HS2

Crewe to Manchester

Understanding the Ground Risk across the Cheshire Plain

3rd March 2023

Overview of the March Report

Ground conditions

The alignment of the Proposed Scheme passes across the Cheshire Plain in areas of former salt mining and other areas where salt mining is ongoing. The March Report addresses geological concerns in this area and sets out:

- HS2 Ltd's understanding and interpretation of the existing ground conditions;
- How the route alignment and developed design has taken account of those ground conditions; and
- How HS2 Ltd plans to gather further information, develop the design, construct, and operate the Proposed Scheme.

Based on interpretation of information obtained to date and the derived engineering approach, HS2 Ltd, in conjunction with its designers and technical advisors, considers that the route alignment is appropriate for the intended purpose, and that geological challenges can be both managed and mitigated during detailed design and construction so as to provide a safe operational railway.

Conclusion of the March Report

Ground conditions

The scale of the ground related challenges and their solutions are commensurate with the purpose of the Proposed Scheme as key national infrastructure, and comparable to the scale of other ground related challenges that can be encountered in the operation of other high-speed railways.

The Proposed Scheme has been designed with sufficient inbuilt resilience, along with practical measures for routine maintenance and adaptive design, which can be put in place in achievable timeframes, to mitigate against climate change during operation.

Route Alignment

Ground conditions

The Proposed Scheme was selected to minimise the risks posed by ground conditions in the Cheshire plain. In particular, the route selected:

- Avoids major areas of former high subsidence as marked by flashes, with the one exception of Billinge Flash;
- Avoids a line of Meres that broadly align southeast of Rostherne Mere;
- Avoids areas of ground subsidence such as those which the Cheshire Brine Compensation Board defines as requiring statutory consultation in relation to any new development;
- Does not pass within 2 km of any known former locations of historical wild brine well pumping sites, with one possible exception, a suspected brine well in the vicinity of Clive Green Lane;
- Avoids clusters of subsidence features as historically mapped by BGS;
- Avoids historical and controlled salt mines, whether remediated or not, with the exception of Winsford Rock Salt mine; and
- Avoids existing brining extraction and gas storage caverns, passing just west and northwest of Warmingham and Holford brinefields respectively.

It is not possible to select a route which avoids entirely all possible sources of risk posed by the ground conditions.

Design response

General risk mitigation by design

The Proposed Scheme has been designed to account for the risks posed by ground conditions in the Cheshire plain as outlined below.

Adapted precautionary mitigation measures are proposed against the risk of subsidence, which are typical for the construction of infrastructure in these types of ground condition, or for high-speed rail systems in general including:

- The viaducts will be supported by piers on piled foundations because of the potentially relatively low strength of the near-surface soils. The piles can be lengthened into more stable ground.
- Surface rainwater run-off from embankments, and viaducts to be collected by lined drainage systems and held temporarily in lined balancing ponds, before discharge to river courses. Rainwater not concentrated and not percolating through the ground to give rise to the risk of salt dissolution.
- The track forms can have built in design features to allow for corrections of vertical rail geometry in operation.
- Differential settlements arising from the ground can be addressed through the design and routine maintenance aspects of the track form.

Design response

General risk mitigation by design of vertical horizontal and vertical alignment

The selection of structural infrastructure including viaducts and bridges is driven by the need to cross over existing natural features such as rivers and existing major infrastructure. The viaducts are sufficiently high so as to provide necessary headroom. This infrastructure will be designed to account for the risks posed by ground conditions.

Where the Proposed Scheme continues north and has passed beyond the area of wet rockhead, long cuttings can be incorporated without risk of salt dissolution. At Hoo Green Lane and Rostherne the design has lowered the alignment to pass under the A556 and M56.

Design response

Site Specific Risk Mitigation Design

Solutions are proposed at Clive Green Lane and Billinge Flash. The final choice of mitigation solution will be based on interpretation of further ground investigation.

Winsford Rock Salt mine - viaduct structures and embankment are proposed. The piles of the viaduct structures will not reach the wet rockhead level, nor any of the salt layers. The mine is not materially impacted by the Proposed Scheme.

Construction Stage Response

The draft CoCP references measures to be implemented which include undertaking ground investigation, risk assessments, monitoring of ground movement, groundwater and ground gas.

Ground movement will be monitored using a master network of positional and level datums which would be tied into national level bedrock datums. INSAR and LiDAR surveys would be used during the construction stage to monitor ground movements in direct response to construction stage activities.

Operational Stage Response

Risk mitigating measures by adaptive interventions

Operation and maintenance of the railway will make use of digital information and monitoring techniques to detect:

- ground movements from the legacy effects of former salt brining activity
- salt dissolution from climate change impacts.

Due to the transient nature of ground surface settlements, the operational safety of the railway will need solutions which are able to make corrections for settlements which are outside of expectation.

Adaptive measures can include provisions for track raising, OCS raising, bridge deck raising, and interventions to the foundations, and future 'new technology' that will occur during the 120 year lifetime of the railway.

The monitoring data will allow early decisions on the application of the adaptive design elements accommodated for, or built into the infrastructure, and hence avoid unnecessary interruptions to operations.

Ground investigation works

Ground conditions

Under the process of desktop study, a significant amount of data gathering has been undertaken to inform the Proposed Scheme design with specific reference to the geology, hydrogeology and ground conditions.

HS2 Ltd has carried out detailed reviews of published data sources and a series of consultations with mining companies operational within the area so as to establish the ground conditions in the area.

Subsequently, advanced ground investigations were undertaken at targeted locations in 2020 and 2021. The data from these investigations has been used to reinforce the understanding from the desktop study, refine risk assessments, and will contribute to informing the detailed design development.

Further ground investigations will be carried out as the Proposed Scheme is taken forward.

Alternative alignment following the M6

Ground conditions

The proposed route via Crewe with a connection with the WCML near Crewe provides greater strategic benefit including connectivity to northwest England (including Chester, Liverpool and Warrington) and north Wales. This route also performs more favourably from a sustainability perspective compared with the other alternative routes including the M6 corridor, as it will require fewer demolitions and will be further away from a number of settlements across the Cheshire plain.

Routes following the M6 corridor would have similar impacts and geological challenges associated with passing over the Cheshire plain but would require a less favourable location for the junction of the HS2 WCML connection and the HS2 Manchester spur.

The decision to serve Crewe was confirmed by the Secretary of State in 2015. Neither of the alternative corridors (via the M6 or Airport) would serve Crewe.

House of Commons

High Speed Rail (Crewe - Manchester) Bill

1. Petitioner information

In the box below, give the name and address of each individual, business or organisation submitting the petition.

Minshull Vernon and District Parish Council

In the box below, give a description of the petitioners. For example, "We are the owners/tenants of the addresses above"; "My company has offices at the address above"; "Our organisation represents the interests of..."; "We are the parish council of...".

We are the parish Council of Minshull Vernon and District located in east Cheshire

2. Objections to the Bill

In the box below, write your objections to the Bill and why your property or other interests are **directly and specially affected**. Please number each paragraph.

Only objections outlined in this petition can be presented when giving evidence to the Committee. You will not be entitled to be heard by the Committee on new matters not included in your written petition.

Dangerous geological conditions under the route of Phase 2b

1. Minshull Vernon and District Parish Council objects to the proposals to route the HS2 line and associated infrastructure across the Cheshire Salt District which includes the brine field and salt mines and covers approximately 17km of the Phase 2b route commencing near Minshull Vernon and ending close to the village of Pickmere.
2. This section of the route has been in use for mining of salt and brine extraction since Roman times and remains a key feedstock producer for the chemical and, water purification industries. This area is highly prone to subsidence, sinkholes and ongoing brine run activity, all of which have the potential to destabilise pillars of salt within the mine workings and caverns beneath and adjacent to the proposed route. Over the life of the HS2 scheme (120 years) there will be huge costs involved in preventing surface flooding and stopping fresh water from reaching the soluble rock below.
3. The proposal to put much of the route from Crewe to Manchester on embankments will significantly add to the burden on the ground and add to the risk from ground instability from the underlying geological conditions,
4. The proposed Phase 2b route also crosses former salt workings that are used, or proposed for gas and hydrogen storage. It will therefore sterilise such usage and represents a threat to the UK's energy security

5. Given the above underlying extremely adverse geological conditions, the successful delivery of Phase 2b is at considerable risk. It also has the potential to pose a serious threat to land, the environment and the population that live adjacent to the proposed works.

Crewe North Rolling Stock Depot (RSD)

6. Minshull Vernon and District Parish Council object to the location of the Crewe RSD on greenfield land within the parish and the adjoining parish of Stanthorne and Wimboldsley..
7. In its own document '*Phase 2b Western Leg Information Paper - F3: Rolling stock stabling facilities*', HS2 Ltd cited five criteria for selecting the best location for the depot.
Crewe North RSD fails to achieve three of these:
 - Use of a brownfield rather than a greenfield site
 - Be located as close as feasible to where HS2 services will terminate or begin to minimise empty train movements
 - Be accessible to workforce and the local transport network
8. This massive industrial facility is also totally out of keeping with the rural nature of the area and is sited on land which has also been used for salt extraction leading to the same risks as listed in 3.1-3.5 above. .
9. Minshull Vernon and District Parish Council considers that there is no justification for this facility to be constructed approximately half-way along the western leg of HS2.

Use of local roads for HS2 construction traffic and operation of the RSD

10. Minshull Vernon and District Parish Council objects to the volume of HS2 construction traffic on the local road network through the parish and specifically the use of the A530 and several unclassified lanes that are unsuitable to be used by construction HGVs. Already classed as one of the most dangerous roads in Cheshire the **major** increase in HGV traffic on the A530 through the village of Minshull Vernon will pose a serious risk of accidents.
11. The proposal to create c.500 car parking spaces at the RSD will again result in a permanent increase in traffic commuting to this industrial facility. The workforce will need to travel considerable distances by car to reach the facility.

3.What do you want to be done in response?

In the box below, tell us what you think should be done in response to your objections to the Bill. You do not have to complete this box if you do not want to.

You can include this information in your response to section 3 'Objections to the Bill' if you prefer. Please number each paragraph.

Extremely adverse geological conditions under the route of Phase 2b

1. HS2 Ltd has selected the route of Phase 2b without investigating or considering the underlying geological conditions. Numerous warnings have been raised by experienced geologists with extensive knowledge of the underlying geological and

ground condition constraints in Cheshire but these have been ignored. Only following the passage of the HS2 Phase 2b bill through Parliament has a contract been advertised at an estimated cost of c.£225m - £300m for the geological investigation of the route.

2. Minshull Vernon and District Parish Council requires that a detailed independent and impartial examination be given to the risks posed to the route of Phase 2b and the construction of the HS2 railway and the associated infrastructure, with specific focus on where it bisects the Cheshire Salt District.
3. Such an investigation should be carried out prior to the Phase 2b Select Committee hearings and should consider all engineering options to appropriately mitigate the construction and operational health and safety, environmental and economic risks.
4. The options considered should include the following:
 - Re-routing the Phase 2b railway to minimise, or entirely avoid, interaction with the Cheshire Salt District. **This was the approach adopted by the engineers who designed the route of the M6 through Cheshire.**
 - The relocation of associated infrastructure, such as the Crewe RSD, that does not need to be constructed within the Cheshire Salt District.
 - Detailed evaluation and costing of engineering mitigation measures to reduce or remove the risks posed by the underlying geology.
 - The abandonment of Phase 2b altogether in favour of using the Manchester to Crewe line and the WCML Manchester Branch via Stoke-on-Trent.

Crewe North Rolling Stock Depot

5. Minshull Vernon and District Parish Council considers that it is essential that greenbelt land is not used for this scheme.
6. Specifically, Minshull Vernon and District Parish Council considers that overnight stabling and servicing of trains could be more efficiently provided from existing facilities located on the existing rail network (such as Longsight in Manchester, and Edge Hill in Liverpool) and that the use of these facilities should be prioritised over the construction of new facilities on greenfield land at the Crewe RSD.
7. Minshull Vernon and District Parish Council understands that an alternative brownfield site suitable for the RSD exists at Basford near Crewe **which is already owned by Network Rail who wish to retain it for development.** Using this site would provide Crewe with approximately 500 much needed jobs for the local population with lower carbon footprint travel needs. The proposed rural site is not served by public transport 24/7. Heavy maintenance requirements of HS2 trains should be carried out at the Washwood Heath RSD, near Birmingham, instead of the Crewe North RSD.

Use of local roads for HS2 construction traffic and operation of the RSD

8. Minshull Vernon and District Parish Council notes that nine HS2 satellite compounds would be supplied from the A530, with three of these located at the Crewe North RSD.
9. The main means of accessing the A530 would be from the south via the A500 and A51 from Nantwich, although it is likely that HGVs would travel from the north via the A54 and Middlewich.
10. The number of HGV movements proposed by HS2 Ltd is unacceptable and could be greatly reduced by moving the RSD to Basford near Crewe and by using the WCML slow lines to move materials.
11. The numbers of HGV movements should be limited and restricted to times which minimise disruption and harm to residents living on the routes.

February 2023

**HIGH SPEED RAIL (CREWE -
MANCHESTER) BILL**

**HOUSE OF COMMONS
SELECT COMMITTEE**

**Petition No. HS2-P2B-025:
Minshull Vernon and District Parish
Council**

Promoter's Response Document

INTRODUCTION

This Promoter's Response Document (PRD) forms the Promoter's response to Petition No. HS2-P2B-025, from Minshull Vernon and District Parish Council.

In this PRD, 'the Promoter' means the Secretary of State and HS2 Ltd acting on their behalf.

The purpose of the PRD is to advise you and the Select Committee of the Promoter's position in relation to the petitioning points raised. It is intended that the PRD will alleviate many of the concerns raised in the petition.

The Table of Contents overleaf lists the page number, petitioning points in the order they appear in the petition, and a summary statement of the issue(s) contained in the petition for quick reference. Other supporting material (e.g., reports, drawings, and photographs) referred to in the response are attached where applicable.

Copies of the HS2 Phase 2b Information Papers referred to in the response can be found at

[HS2 Phase 2b \(Crewe – Manchester\) Information Papers - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/614442/HS2_Phase_2b_Crewe_-_Manchester_Information_Papers.pdf).

Department for Transport
High Speed Two (HS2) Limited

BACKGROUND

Minshull Vernon and District Parish Council represents the residents of Minshull Vernon in the administrative area of Cheshire East.

PETITION NO. HS2-P2B-025

MINSHULL VERNON AND DISTRICT PARISH COUNCIL

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HOUSE OF COMMONS SELECT COMMITTEE

HIGH SPEED RAIL (CREWE - MANCHESTER) BILL

PROMOTER'S RESPONSE TO PETITION OF: Minshull Vernon and District Parish Council

PETITION NO: HS2-P2B-025

PARAGRAPH NO: 2.1 - 2.3, 3.1 - 3.3

ISSUE RAISED: Ground conditions

PETITION PARAGRAPH: 2.1 Minshull Vernon and District Parish Council objects to the proposals to route the HS2 line and associated infrastructure across the Cheshire Salt District which includes the brine field and salt mines and covers approximately 17km of the Phase 2b route commencing near Minshull Vernon and ending close to the village of Pickmere.

2.2 This section of the route has been in use for mining of salt and brine extraction since Roman times and remains a key feedstock producer for the chemical and, water purification industries. This area is highly prone to subsidence, sinkholes and ongoing brine run activity, all of which have the potential to destabilise pillars of salt within the mine workings and caverns beneath and adjacent to the proposed route. Over the life of the HS2 scheme (120 years) there will be huge costs involved in preventing surface flooding and stopping fresh water from reaching the soluble rock below.

2.3 The proposal to put much of the route from Crewe to Manchester on embankments will significantly add to the burden on the ground and add to the risk from ground instability from the underlying geological conditions,

Request

3.1 HS2 Ltd has selected the route of Phase 2b without investigating or considering the underlying geological conditions. Numerous warnings have been raised by experienced geologists with extensive knowledge of the underlying geological and ground condition constraints in Cheshire but these have been ignored. Only following the passage of the HS2 Phase 2b bill through Parliament has a

contract been advertised at an estimated cost of c.£225m - £300m for the geological investigation of the route.

3.2 Minshull Vernon and District Parish Council requires that a detailed independent and impartial examination be given to the risks posed to the route of Phase 2b and the construction of the HS2 railway and the associated infrastructure, with specific focus on where it bisects the Cheshire Salt District.

3.3 Such an investigation should be carried out prior to the Phase 2b Select Committee hearings and should consider all engineering options to appropriately mitigate the construction and operational health and safety, environmental and economic risks.

PROMOTER'S RESPONSE:

Ground conditions

1. HS2 is in consultation with the operators of the Salt Industry infrastructure and discussions are ongoing with the business owners/operators to ensure public safety and their safe continued business operations during the construction and operation of the Proposed Scheme.
2. HS2 has undertaken a significant amount of data gathering to inform the design with specific reference to the geology and ground conditions. HS2 has held discussions with relevant agencies that have significant knowledge and information on existing infrastructure assets within the area and captured data on the interaction between their activities and the ground conditions. These agencies include Network Rail, The Canal and Rivers Trust, the relevant Salt Industry companies and the Cheshire Brine Subsidence Compensation Board. In addition, HS2 has listened to local communities who have knowledge of the local geology and taken note of their observations and opinions.
3. A comprehensive desk study has been compiled for the Phase 2B Western Leg route. Following a review of desk study information, two phases of ground investigations have already been carried out.
4. It is industry practice to undertake Ground Investigation in a phased manner, with each phase building on the next. HS2 has planned a route wide Ground Investigation activity which is proposed to start in 2023. This proposed route wide Ground Investigation would involve closely spaced exploratory sampling points along the full route from Crewe to Manchester, with more frequent and site-specific exploration at specific locations, where the ground risk may be greater due to the local geological conditions. Future contractors would normally also deploy additional ground investigations in the later stages of design and the early stages of construction to

finalise design elements that could be sensitive to ground conditions along the HS2 corridor. This ensures the engineering solutions proposed are verified and the safety of the Proposed Scheme is validated and assured.

5. The Promoter has previously given commitments on the design of the Proposed Scheme in HS2 Phase 2b Western Leg Information Paper D1: Design, in particular the Promoter would highlight Sections 3.1 of this publication, which states:

“The Promoter and the nominated undertaker will seek to ensure that:

- the design is safe, efficient, and meets with the requirements of whole life operation and maintenance alongside initial buildability and will integrate with the local setting;
- the design is developed through engagement to seek peoples' views and including integration with setting design of the visible buildings and permanent structures”

6. HS2 continues to work with its design partners to optimise the Proposed Scheme with respect to engineering design and cost as more information relating to the ground conditions emerges.

HOUSE OF COMMONS SELECT COMMITTEE

HIGH SPEED RAIL (CREWE - MANCHESTER) BILL

PROMOTER'S RESPONSE TO PETITION OF:	Minshull Vernon and District Parish Council
PETITION NO:	HS2-P2B-025
PARAGRAPH NO:	2.4, 3.4
ISSUE RAISED:	Route alignment
PETITION PARAGRAPH:	2.4 The proposed Phase 2b route also crosses former salt workings that are used, or proposed for gas and hydrogen storage. It will therefore sterilise such usage and represents a threat to the UK's energy security Request 3.4 The options considered should include the following: - Re-routing the Phase 2b railway to minimise, or entirely avoid, interaction with the Cheshire Salt District. This was the approach adopted by the engineers who designed the route of the M6 through Cheshire. - The relocation of associated infrastructure, such as the Crewe RSD, that does not need to be constructed within the Cheshire Salt District. - Detailed evaluation and costing of engineering mitigation measures to reduce or remove the risks posed by the underlying geology. - The abandonment of Phase 2b altogether in favour of using the Manchester to Crewe line and the WCML Manchester Branch via Stoke-on-Trent.

PROMOTER'S RESPONSE:

Development of the Crewe – Manchester Proposed Scheme

1. The Promoter has carried out extensive stakeholder and public consultation in advance of the submission of the Bill. HS2 Phase 2b Western Leg Information Paper G1: Consultation and Engagement provides the details of the consultation and engagement carried out during the development of both the strategy for high speed rail in the UK and the route between London and the West Midlands of HS2 (Phase One).

2. The Crewe – Manchester Environmental Statement published in January 2022 (main ES) in section 3.2, Volume 1 and table 3 provide key engagement and consultation to date for the Phase 2b Proposed Scheme.

3. Consultation and engagement has been carried out in compliance with relevant guidance and legislation, including:

- the second provision of the Aarhus Convention (June 1998);
- Cabinet Office guidance on Consultation, published in July 2012;
- prior to July 2012, the Cabinet Office's Code of Practice on Consultation issued in July 2008; and
- the Gunning Principles, which are a set of criteria for assessing the fairness of a public consultation.

4. Consultation has been a major influence on the development of the Proposed Scheme, particularly in helping to identify and mitigate local impacts. Initial consultation on High Speed Rail was undertaken from February 2011 to July 2011, and the subsequent announcement of the decision to pursue the Y network in two phases was announced in January 2012.

5. In January 2013 the initial preferred route for Phase Two was announced which allowed an early opportunity to engage with key stakeholders on potential key issues and concerns about the route and its impacts ahead of consultation. This included the publication of background material used to inform the initial preferred route, including an Appraisal of Sustainability (AoS) options report setting out the environmental performance of alternative route options. Consultation on the Phase Two route between July 2013 and January 2016 sought comments on the proposed route and the approach to the environmental appraisal carried out by the Promoter.

6. On 11 October 2018, HS2 Ltd launched two parallel consultations on the working draft Environmental Statement (ES) and the working draft Equality Impact Assessment (EQIA) Report for the full Phase 2b scheme (including both Eastern Leg and Western Leg).

7. On 6 June 2019, the Government launched a national consultation on 11 proposed design refinements to the full Phase 2b scheme. These refinements included proposed infrastructure for HS2 to accommodate future potential Northern Powerhouse Rail (NPR) services.

8. In August 2019, the Government announced that Douglas Oakervee would chair an independent review of HS2, referred to as the 'Oakervee Review'. The review was asked to assemble and test all the existing evidence in order to allow the Government to make properly informed decisions on the future of all phases of the HS2 project.

9. The Oakervee Review, published on 11 February 2020, concluded that the HS2 project should proceed, based on a number of recommendations. These included the

need for Phase 2b to be considered as part of an Integrated Rail Plan (IRP) for the North and Midlands and for the full Phase 2b scheme to be split into smaller sections.

10. In February 2020 the Government recommitted to providing better rail connectivity between London, the Midlands and the North, ensuring all parts of the country benefit from opportunities for economic development and prosperity. The Government committed to preparing an IRP (including consideration of the Eastern and Western Legs), informed by a 'Rail Needs Assessment' undertaken by the National Infrastructure Commission (NIC).

11. At that time the Government also announced its decision to proceed with the legislation to allow for the development of the Phase 2b Western Leg (the Proposed Scheme) separately and that, subject to the IRP, the full Phase 2b scheme could be legislated for in two or more hybrid Bills. This ensured work on the HS2 project continued whilst the IRP was being developed, to minimise delay.

12. On 7 October 2020, the Government provided a Western Leg route-wide update and launched a national consultation on four further proposed design refinements that were relevant to the Phase 2b Western Leg. This included changes to allow the HS2 route to be used by future NPR trains to link cities across the North of England.

13. The NIC published the Rail Needs Assessment for the Midlands and the North in December 2020. The NIC developed a menu of options for a programme of rail investments in the Midlands and the North, using three different illustrative budget options: focussing on upgrades (baseline budget only); prioritising regional rail links; and prioritising long distance links. The Proposed Scheme was included in the scope of all options.

14. The IRP was published in late 2021. In terms of the Proposed Scheme, the IRP confirmed that the HS2 Crewe – Manchester hybrid Bill should proceed to deposit in Parliament. The outcomes of the IRP are being taken into account in the on-going development of the Proposed Scheme.

15. The Proposed Scheme, as deposited in Parliament in January 2022, comprised:

- the HS2 Western Leg from Crewe to Manchester, including:
 - new stations at Manchester Airport and Manchester Piccadilly;
 - a depot north of Crewe;
 - maintenance facilities north of Crewe and at Ashley; and
 - a connection onto the WCML near Bamfurlong;
- the Crewe Northern Connection, connecting the route of the Proposed Scheme with the WCML and enabling future NPR services to connect with HS2;
- provision for the NPR London to Liverpool, Manchester to Liverpool, and Manchester to Leeds junctions, to enable these future NPR routes to connect with HS2; and
- a number of works at locations beyond the Western Leg route corridor, referred to as 'off-route works' which include:

- works to enable HS2 trains to call at existing stations further north on the WCML; and
- construction of depots to provide overnight stabling for HS2 trains serving the north of England and Scotland.

Route corridor alternatives

16. The route corridor of the Proposed Scheme has developed through a refinement process referred to as sifting. The sifting process consisted of a sequentially more detailed appraisal of route options. At the end of each appraisal stage or sift sustainability performance was considered alongside cost, operational and engineering considerations. Preferred options were identified to progress to the next level of sift for a more detailed appraisal.

17. The following environmental factors were considered as part of the appraisal of sustainability performance: climatic factors and adaptability; greenhouse gases; landscape; townscape and cultural heritage; biodiversity and geodiversity; water resources; flood risk; air quality; noise and vibration; community integrity; accessibility; health and well-being; security and safety; economic prosperity; economic welfare; soil and land resources; waste generation; and resource use.

18. The sequence of sifts were aimed at considering a progressively smaller number of options at increasing levels of detail (e.g., by avoiding centres of population and/or key environmental features). In the later sifts, the predicted impacts of the remaining options were further mitigated by refining the vertical and/or horizontal alignments and by introducing certain structures such as viaducts or cuttings with retained walls, where appropriate. In this way, the route development process has ensured that mitigation, so far as reasonably practicable, is inherent within the design from the outset.

The benefits of the Proposed Scheme

19. The WCML is one of the busiest mixed-use railways in Europe, with passenger and freight, fast and slow services sharing the same lines, slowing all traffic and causing congestion. Constructing new lines to remove fast services allows for more frequent, faster and reliable services on dedicated lines. This simultaneously releases capacity on existing lines for commuter, semi-fast services and freight. Constructing new lines can unlock demand and boost growth through new and faster connectivity. The combination of new and released capacity also provides the opportunity to deliver growth through the provision of new and/or different local services.

20. The Proposed Scheme offers the potential for more commuter services to run on some of the key routes into and out of Manchester. The combination of new HS2 services alongside changes to conventional rail services has the potential to more than double evening peak seats on conventional rail services from Manchester Piccadilly on the Stoke and Crewe corridors.

21. The Proposed Scheme improves access to Manchester Airport, the important South Manchester and North Cheshire markets, and creates major regeneration opportunities through Manchester Airport High Speed station.

22. The Proposed Scheme would also significantly improve opportunities for rail connectivity between London and Scotland and provides a necessary segment of the proposed NPR scheme for the Liverpool – Manchester corridor via Manchester Airport which would improve connectivity across the North.

23. Greater Manchester and the North have seen significant rail passenger growth in recent years; Office of Road and Rail (ORR) data shows that daily passenger journeys within the Northwest have quadrupled from just over 25,000 in 1995/96 to over 100,000 in 2019/20, leading to poor performance and crowding. Physical capacity to run more trains on the network is constrained in the Northwest and particularly on the approaches to Manchester, with a bottleneck in the Stockport area. This creates reliability issues and means that many local stations in the South Manchester and Cheshire East area have a poor frequency of service due to lack of capacity on this corridor.

24. Alternatives considered failed to fully meet the Government's strategic objectives. They provided limited flexibility for additional rail services and significantly lower performance and reliability. This is especially true for the WCML into Manchester Piccadilly where the alternatives provide no capacity release and would do little to address long standing performance issues given the complexity of the network via Stockport.

The environmental effects of the Proposed Scheme

25. The purpose of the Environmental Statement and subsequent Supplementary Environmental Statements (SES) that accompanies the High Speed 2 (Crewe to Manchester) Bill and Additional Provisions (APs), is to identify the likely significant effects of a proposed development on people and the environment. It does this by identifying the current baseline conditions, anticipating how these may change in the future when the development is assumed to begin construction, and predicting the potential impacts of constructing and operating the development across a range of environmental topics. Where the assessment has identified the likely significant effects, the main ES sets out measures proposed to mitigate adverse effects, and the likely significant residual effects (including agriculture, biodiversity, air quality and sound noise and vibration).

26. The environmental assessment within the ES and SES takes account of a broad evidence base. This includes existing data obtained, for example, from local biological record centres and local experts and aerial photography, as well as surveys and professional judgement. An appropriate baseline was therefore developed to enable assessment to a sufficient level in the ES. As such, the main ES and SES1 and AP1 ES are compliant with the requirements of the Environmental Impact Assessment and Parliamentary Standing Order 27A.

27. As explained in paragraph 9.2 of the main ES, Volume 5, Scope and Methodology Report (SMR) - Addendum report, in order to ensure that all likely significant effects of the Proposed Scheme were identified, a precautionary approach of assuming a 'reasonable worst-case' valuation has been adopted where baseline information was incomplete. This approach was utilised to assign precautionary values to both known receptors and potential receptors based on the best available information.

28. The environmental effects have been assessed on the basis of the Proposed Scheme deposited in Parliament in January 2022. Where an Environmental Impact Assessment is legally required, works would not take place unless they have been assessed already as part of the ES or are subject to a further EIA and consent process. Any nominated undertaker would be contractually bound to comply with the controls set out in the Bill and the Environmental Minimum Requirements, as described in HS2 Phase 2b Western Leg Information Paper E1: Control of environmental impacts and as may be developed during the passage of the Bill through Parliament.

Route alignment

29. Following the period of public consultation on the 2013 scheme, route refinement work was undertaken. One area covered was approximately 26km of the route from the tunnel portal south of Crewe to the M6 crossing north of Pickmere. The refinement considered the risks associated with the large expanse of salt fields and salt mining north of Crewe and gas storage in the area. Further information on route alternatives can be found in the Volume 5: Appendix CT-003-00000 (Alternatives report) of the Environmental Statement (main ES) published alongside the Bill in January 2022.

30. As reported in paragraph 5.2.17 of the Alternatives Report, a further review of alternative route corridors from Crewe heading north-east towards Manchester Airport via Mobberley was undertaken.

31. As reported in paragraph 5.2.20 of the Alternatives Report the following three options were taken forward to a full sift appraisal:

Option 00: the route refinement baseline (RRB) would run in a bored tunnel under Crewe, surfacing to the north near Coppenhall alongside the WCML. It would continue northwards in a mix of shallow cutting and at ground level, moving away from the WCML near Wimboldsley and would continue north between Winsford and Middlewich. The route would cross the River Dane and the Trent and Mersey Canal on an approximately 10m high viaduct, before rising onto embankment. The route would turn north-east towards Lostock Gralam, passing to the east of Lostock Green and continue to the west of Pickmere Telescope before entering cutting and then onto embankment approaching the M6;

Option 03: would be in bored tunnel under Crewe before surfacing near Coppenhall, after which the route section would continue at a minimum height of 1m above ground level. North of Crewe, the route would initially follow a similar route to Option 00 and would head north to the west of Wimboldsley on

embankment between Middlewich and Winsford. The route would then continue north and would cross the river Dane on an approximately 26m high viaduct, with three crossings of the Trent and Mersey Canal. Approaching Rudheath, the route would start to head north-east alongside the A556 to the west of Lostock Green and would continue north to the east of Lostock Gralam and Pickmere Telescope. It would continue on embankment over the M6; and

Option 08: would follow a similar route to Option 00 but upon surfacing north of Crewe would be elevated throughout the length of this section to a minimum height of 1m above ground level. The route would head north of Crewe on low embankment, before on an approximately 26m high viaduct crossing of the river Dane and would continue on a mix of embankment and viaduct towards Lostock Gralam. This route would include an approximately 60m shift eastwards (compared to the RRB) and would pass Lostock Green and continue north towards and across the M6 on embankment.

32. Options 03 and 08 were taken forward as viable alternatives, pending further investigation into the salt/brine and gas storage risks. Option 03 was subsequently confirmed as the preferred option due to the lower geological risk associated with avoiding salt mining and gas storage areas.

Crewe North Rolling Stock Depot

33. The Promoter has provided a response in relation to the location of the Crewe North Rolling Stock Depot in response to paragraphs 2.5, 2.6, 2.7, 2.8, 2.9, 3.5, 3.6, 3.7 of the petition in the next section of this document.

Alternative to the Proposed Scheme

34. The Promoter considers that the Petitioners' proposal for the 'abandonment of Phase 2b altogether in favour of using the Manchester to Crewe line and the WCML Manchester Branch via Stoke-on-Trent' is not within the broad route alignment of the Proposed Scheme as set out on the Parliamentary Plans deposited in January 2022 with the Bill. The Promoter considers this issue raised by the Petitioner to be against the principle of the Bill established at Second Reading and the Promoter retains the right to argue that the issue is outside the remit of the Select Committee should the Petitioner seek to raise this issue before the Select Committee.

35. The principle of the Bill was voted on during Seconding Reading of the Bill in the House of Commons in June 2022. The Bill passed its Second Reading by 205 votes to 6.

HOUSE OF COMMONS SELECT COMMITTEE

HIGH SPEED RAIL (CREWE - MANCHESTER) BILL

PROMOTER'S RESPONSE TO PETITION OF: Minshull Vernon and District Parish Council

PETITION NO: HS2-P2B-025

PARAGRAPH NO: 2.5 - 2.9, 3.5 - 3.7

ISSUE RAISED: Crewe North Rolling Stock Depot

PETITION PARAGRAPH: 2.5 Given the above underlying extremely adverse geological conditions, the successful delivery of Phase 2b is at considerable risk. It also has the potential to pose a serious threat to land, the environment and the population that live adjacent to the proposed works. Crewe North Rolling Stock Depot (RSD)

2.6 Minshull Vernon and District Parish Council object to the location of the Crewe RSD on greenfield land within the parish and the adjoining parish of Stanthorne and Wimboldsley.

2.7 In its own document 'Phase 2b Western Leg Information Paper - F3: Rolling stock stabling facilities', HS2 Ltd cited five criteria for selecting the best location for the depot. Crewe North RSD fails to achieve three of these:

- Use of a brownfield rather than a greenfield site
- Be located as close as feasible to where HS2 services will terminate or begin to minimise empty train movements
- Be accessible to workforce and the local transport network

2.8 This massive industrial facility is also totally out of keeping with the rural nature of the area and is sited on land which has also been used for salt extraction leading to the same risks as listed in 3.1-3.5 above.

2.9 Minshull Vernon and District Parish Council considers that there is no justification for this facility to be constructed approximately half-way along the western leg of HS2.

Requests

3.5 Minshull Vernon and District Parish Council considers that it is essential that greenbelt land is not used for this scheme.

3.6 Specifically, Minshull Vernon and District Parish Council considers that overnight stabling and servicing of trains could be more efficiently provided from existing facilities located on the existing rail network (such as Longsight in Manchester, and Edge Hill in Liverpool) and that the use of these facilities should be prioritised over the construction of new facilities on greenfield land at the Crewe RSD.

3.7 Minshull Vernon and District Parish Council understands that an alternative brownfield site suitable for the RSD exists at Basford near Crewe which is already owned by Network Rail who wish to retain it for development. Using this site would provide Crewe with approximately 500 much needed jobs for the local population with lower carbon footprint travel needs. The proposed rural site is not served by public transport 24/7. Heavy maintenance requirements of HS2 trains should be carried out at the Washwood Heath RSD, near Birmingham, instead of the Crewe North RSD. Use of local roads for HS2 construction traffic and operation of the RSD.

PROMOTER'S RESPONSE:

1. The Proposed Scheme includes the Crewe North infrastructure maintenance base – rail (IMB-R), located on 4ha of land between the route of the Proposed Scheme and the WCML, north-east of Walley's Green. The Crewe North IMB-R would be a maintenance facility and storage area for the Proposed Scheme. It would support the main maintenance base at Stone, which is part of the Phase 2a scheme. Crewe North Rolling Stock Depot (RSD) would be located just to the north of the IMB-R and would serve as an operational and maintenance hub for HS2 rolling stock.

2. Section 2.2 of the Environmental Statement (ES) Volume 2, Community Area report: Wimboldsley to Lostock Gralam (MA02), sets out details of the Crewe North Rolling Stock Depot ("RSD"). Paragraphs 2.2.33 to 2.2.36 of that section set out the purpose and use of the Crewe North RSD. It also covers the length of the facility along with the extent of land that would be occupied, its height in comparison with the existing landscape, road and rail connections, and lighting arrangements (including the heights of the lighting columns).

3. Figure 5 of that document shows a visualisation of the RSD, and paragraphs 2.2.39 - 2.2.43 goes on to list the area and (where relevant) the maximum heights of the key features of the depot along with other information, such as the lengths of the trains that can be accommodated in each siding. Also included in these paragraphs are details of the landscape mitigation planting and the works to accommodate the site.

4. Finally, paragraphs 2.2.44-2.2.50 provide details of the reception tracks serving the RSD, including information on their operation, and the lengths, depths and heights of the relevant associated engineering features. The design of the Proposed Scheme to date provides the level of detail necessary for the purposes of the Phase 2b Bill and the requirements of the Standing Orders of Parliament. Once the detailed design of the Proposed Scheme is complete the nominated undertaker would need to apply to local authorities along the route for approval of the detailed design of a range of elements of the Proposed Scheme in accordance with the planning regime established under Schedule 17 to the Bill.

Rolling stock stabling and depot – operational requirements

5. HS2 Ltd define rolling stock stabling and depot requirements using an agreed Train Service Specification (TSS) and maintenance frequency needs of the fleet. Rolling stock depots and stabling must be viewed as part of an operational system, to consider the need to stable trains at night, starting and finishing points for services, as well as cleaning and maintenance requirements.

6. The operational requirements for the Phases One and 2a are met through the provision of Washwood Heath Rolling Stock Depot in Birmingham, as well as stabling at existing sites, Edge Hill in Liverpool, Longsight in Manchester, and Polmadie in Glasgow. Washwood Heath Depot in Birmingham also has some additional capacity designed in for Phase 2b services that circulate back to Birmingham.

7. The Phase 2b TSS requires further stabling facilities in addition to those identified for Phase One and Phase 2a so that the increased number of services can operate.

8. HS2 Ltd plans to continue stabling some trains at existing Network Rail (NR) facilities at Edge Hill, Longsight and Polmadie where HS2 rolling stock is planned to replace current West Coast Main Line (WCML) services. However, the additional stabling required for Phase 2b operations far exceeds the limited spare and/or released capacity at NR depots. Additionally, Longsight at Manchester cannot be accessed from the new HS2 Station at Manchester, so is only expected to be used by HS2 Macclesfield trains, and the released capacity used for other conventional rolling stock.

9. The TSS also specifies that HS2 Ltd is required to make accommodation for the operation of HS2 captive network trains between Birmingham, Manchester and Euston. This rolling stock is wider than the existing British rolling stock gauge, similar to European high speed trains and with different maintenance needs. These captive trains therefore, could not stable at existing NR facilities, without substantial modification works to those facilities, or be able to access them using the existing network. In any event, as well as having to make significant modification for regauging existing NR depots, the existing conventional rail network would also require expensive and very disruptive gauge widening in order for such trains to be able to reach the existing depots, which in some areas may not be practicable.

10. Additional rolling stock required once Phase 2b is in operation, would be for providing two new Birmingham to Manchester services per hour.

11. Services between London Euston and Manchester from Phases One and 2a would also be made longer through the provision of two 200m rolling stock sets operating together to form 400m trains. There would also be passive provision for an additional London Euston to Manchester train per hour in the future. It would not be possible for these trains to access the existing NR Longsight depot.

Crewe North Rolling Stock Depot - location

12. A new Rolling Stock Depot (RSD) is required to run the planned train services (to meet the TSS requirements for Phase 2b). The RSD size is identified from the requirement to stable up to 53 units in addition to the stabling at Washwood Heath Depot and at existing NR depots.

13. Depot locations were assessed and reviewed against multiple criteria with public consultations. No brownfield sites were available that met the requirements of the RSD on the current line of route. Crewe North site was deemed optimal due primarily to having direct access to both the WCML and HS2 route with least overall environmental impact. The WCML access is needed for services to Liverpool, the Northwest and Scotland, whereas the HS2 access is needed for services to Manchester.

14. While the RSD site is not a brownfield site prior to construction, the land would become more difficult to access and farm, due to being situated between the WCML and the proposed HS2 mainline. There are still significant construction activities that would require land in this area irrespective of the RSD. The presence of these two pieces of infrastructure would also largely screen the RSD from public viewpoints on either side. Alternatives assessed at locations along the Phase 2b route require additional infrastructure to be built, with additional environmental impacts, land take and cost to the scheme while possibly reducing the operational efficiency of the proposed Phase 2b service provision.

Phase 2b Western Leg Rolling Stock Depot – alternative sites considered

15. Section 5.2.113 to 5.2.128 of the main Environmental Statement Volume 5: Appendix CT-003-00000 Alternatives report sets out the alternative rolling stock depot locations between Crewe, Manchester and the WCML connection near Golborne.

16. For further information on the alternatives that were tested for the Crewe North RSD, please see the High Speed Two Phase 2b Crewe to Manchester West Midlands to Leeds Route refinements - HS2 Ltd's advice to Government report (July 2017).

Petitioners' proposal to relocate Crewe North Rolling Stock Depot to site at Basford

17. The Government's response to the HS2 Phase 2b Western Leg Design Refinement Consultation (January 2022) set out that Basford Hall Rail Yard had previously been

considered as a location for the Crewe North Rolling Stock Depot and had been discounted as being unsuitable. This is because of their location, size, or lack of connections to the existing rail network. The site at Basford Hall Rail Yard is currently an operational freight yard. Locating an HS2 depot at Basford Hall Rail Yard would mean moving the existing freight operation elsewhere and therefore would not remove the issue of land take. Basford Hall Rail Yard is further away from the line of route than the site at Crewe. Using this site would lead to increased empty train movements with sound, noise, and vibration impacts. It would affect existing railway operations and affect planned development in the area.

18. In addition to the existing freight depot, the land adjacent to the existing Basford depot is currently under development. Notwithstanding, due to the location of Phase 2a, the Proposed Scheme and the associated connections with the WCML, a depot in a location to the south of Crewe would be operationally challenging to meet the requirements of the TSS and would perform worse than the proposed location of the Crewe North RSD.

19. The HS2 Phase 2b Western Leg Design Refinement Consultation Response document can be viewed here:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1049091/dft-hs2-phase-2b-western-leg-design-refinement-consultation-web-version.pdf#page=22&zoom=100,0,0

HOUSE OF COMMONS SELECT COMMITTEE

HIGH SPEED RAIL (CREWE - MANCHESTER) BILL

PROMOTER'S RESPONSE TO PETITION OF: Minshull Vernon and District Parish Council

PETITION NO: HS2-P2B-025

PARAGRAPH NO: 2.10 – 2.11, 3.8 – 3.11

ISSUE RAISED: HS2 Construction traffic on A530

PETITION PARAGRAPH: 2.10 Minshull Vernon and District Parish Council objects to the volume of HS2 construction traffic on the local road network through the parish and specifically the use of the A530 and several unclassified lanes that are unsuitable to be used by construction HGVs. Already classed as one of the most dangerous roads in Cheshire the major increase in HGV traffic on the A530 through the village of Minshull Vernon will pose a serious risk of accidents.

2.11. The proposal to create c.500 car parking spaces at the RSD will again result in a permanent increase in traffic commuting to this industrial facility. The workforce will need to travel considerable distances by car to reach the facility.

Request

3.8 Minshull Vernon and District Parish Council notes that nine HS2 satellite compounds would be supplied from the A530, with three of these located at the Crewe North RSD.

3.9 The main means of accessing the A530 would be from the south via the A500 and A51 from Nantwich, although it is likely that HGVs would travel from the north via the A54 and Middlewich.

3.10 The number of HGV movements proposed by HS2 Ltd is unacceptable and could be greatly reduced by moving the RSD to Basford near Crewe and by using the WCML slow lines to move materials.

3.11 The numbers of HGV movements should be limited and restricted to times which minimise disruption and harm to residents living on the routes.

PROMOTER'S RESPONSE:

Management of construction traffic - general

1. The Bill provides for a process to approve lorry routes and the draft Code of Construction Practice (CoCP) and the Route-wide and Local Traffic Management Plans would include the necessary detailed controls for lorry routes and traffic management. Paragraphs 5.1-5.3 of HS2 Phase 2b Western Leg Information Paper E3: Management of Traffic During Construction explains the mechanisms in Schedules 4 and 16 to the Bill and in the draft Environmental Minimum Requirements (EMRs) for ensuring that construction traffic is controlled:

“Under the planning regime established under Schedule 17 to the Bill the nominated undertaker would be required to seek approval from the relevant qualifying authority for the use of any routes to and from a working or storage site, a site where material will be re-used, or a waste disposal site by large goods vehicles where movements would exceed 24 per day. Approval is only required for the part of the route between the site and any motorway or trunk road.”

2. The draft CoCP requires the nominated undertaker to prepare a Route-wide Traffic Management Plan and Local Traffic Management Plans in liaison with highway and traffic authorities and the emergency services.

3. The planning of the works would take into consideration the affected residential, commercial, industrial and farming premises, and specifically their requirements for access and servicing (including delivery, collection and maintenance). Access and servicing would be maintained as far as reasonably practicable, within the constraints of the works and the need to ensure the safety of the public; this may involve diversions, temporary traffic controls and the use of temporary carriageways and footways. However, the Bill includes a general requirement to maintain reasonable pedestrian access to premises.

HS2 construction traffic on local road network

4. The Promoter notes the Petitioner's comments in relation to HS2 construction traffic on the local road network through the Parish. The only designated route for HS2 HGV construction traffic through the Minshull Vernon and District Parish Council area is the A530 Middlewich Road, which extends on a south to north alignment and is located in Community Area MA01. The Promoter notes the Petitioner's concerns regarding the use of unclassified lanes in the Parish by HS2 HGV construction traffic. However, there are no unclassified roads that are designated as HS2 HGV construction routes within the Parish boundary.

5. The A530 Middlewich Road through the Minshull Vernon and District Parish Council area is designated as a HS2 construction route. Table 13-5 in the Transport Assessment Part 3 for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the SES1 and AP1 ES summarises the peak daily construction traffic flows associated with the AP1 revised scheme. This indicates that the section of A530 Middlewich Road between Eardswick Lane and Brookhouse Lane would carry a peak daily two-way combined flow of 1216 HGVs over an assumed 10-hour working day, which equates to approximately two HGV's every minute on average. The busy period is expected to be of 18 months duration.

6. In 2030, there was forecast to be a moderate adverse effect on traffic-related severance for non-motorised users due to changes in daily all vehicle movements and a major adverse effect on traffic-related severance due to changes in changes in daily HGV movements on the section of A530 Middlewich Road between Eardswick Lane and Brookhouse Lane during construction, as set out in Tables 52 and 53 in Volume 2, Community Area report: Hough to Walley's Green (MA01) of the main ES.

7. The assessment of the A530 Middlewich Road between Eardswick Lane and Brookhouse Lane in 2030 has been updated for the AP1 revised scheme. The moderate adverse effect on traffic-related severance for non-motorised users due to changes in daily vehicle movements as reported in the main ES has been removed in the SES1 and AP1 ES. The major adverse effect on traffic-related severance due to changes in HGV movements during construction as reported in the main ES has become an increased major adverse effect in the SES1 and AP1 ES.

8. The changes in traffic between the 2030 future baseline and the construction of the AP1 revised scheme are reported in Table 13-7 and Table 13-8 in the Transport Assessment Part 3 Addendum for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the SES1 and AP1 ES.

9. This indicates that this section of road will carry 812 vehicles per hour in the AM peak hour and 861 vehicles per hour in the PM peak hour during the 2030 future baseline.

10. During construction of the Proposed Scheme, traffic flows on the section of A530 Middlewich Road between Eardswick Lane and Brookhouse Lane are forecast to increase to a maximum of 867 vehicles per hour in the AM peak hour, an increase of 55 vehicles (7%) compared with the 2030 future baseline. In the PM peak hour, traffic flows would increase to a maximum of 930 vehicles per hour, an increase of 69 vehicles (8%) compared with the 2030 future baseline.

11. Flowers Lane through the Minshull Vernon and District Parish Council area is designated as a HS2 construction route. Table 13-5 in the Transport Assessment Part 3 for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the SES1 and AP1 ES summarises the peak daily construction traffic flows associated with the AP1 revised scheme. This indicates that the section of Flowers Lane between A530 Middlewich Road and B5076 Bradfield Road would carry a peak daily two-way

combined flow of 170 HGVs over an assumed 10-hour working day, which equates to approximately an HGV every three minutes on average. The busy period is expected to be of 53 months duration.

12. In 2030, there was forecast to be a major adverse effect on traffic-related severance due to changes in daily HGV movements on the section of Flowers Lane between A530 Middlewich Road and B5076 Bradfield Road during construction, as set out in Table 53 in Volume 2, Community Area report: Hough to Walley's Green (MA01) of the main ES.

13. The assessment of Flowers Lane between A530 Middlewich Road and B5076 Bradfield Road in 2030 has been updated for the AP1 revised scheme. The major adverse effect on traffic-related severance during construction as reported in the main ES has become moderate adverse effect in the SES1 and AP1 ES.

14. Tables 13-7 and Table 13-8 in the Transport Assessment Part 3 Addendum for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the SES1 and AP1 ES indicate that Flowers Lane would carry 1513 vehicles per hour in the AM peak hour and 1415 vehicles per hour in the PM peak hour during the 2030 future baseline.

15. During construction of the Proposed Scheme, the traffic flows on Flowers Lane are forecast to increase to a maximum of 1561 vehicles per hour in the AM peak hour, an increase of 48 vehicles (3%) compared with the 2030 future baseline. In the PM peak hour, traffic flows will increase to a maximum of 1551 vehicles per hour, an increase of 136 vehicles (10%) compared with the 2030 future baseline.

16. The forecast traffic flows on A530 Middlewich Road and Flowers Lane during construction are within the generally accepted capacity of a single carriageway rural road. As such, the Promoter does not consider that the additional construction traffic associated with the Proposed Scheme would materially impact the operation of A530 Middlewich Road within the Parish boundary.

17. The Promoter recognises that the impact of construction traffic on local roads is likely to be a particular concern for residents who live or work near the line of route. A draft Code of Construction Practice (CoCP) has been produced for the Crewe – Manchester Proposed Scheme with the aim of ensuring that the likely significant, adverse effects of impacts reported in the ES are reduced, as far as reasonably practicable.

Accidents and safety

18. The Promoter notes the Petitioner's comments in relation to accidents and safety on the local road network. As set out in paragraph 13.3.177 in the Transport Assessment Part 3 for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the main ES, there are no identified locations with existing safety concerns within Community Area MA01 that are likely to experience substantial increases in traffic during construction and, consequently, no unacceptable impacts on accident and safety risks are expected.

Car parking spaces at Crewe North Rolling Stock Depot

19. The Promoter does not recognise the figure quoted by the Petitioner in relation to traffic generated by c500 space car park at the proposed Crewe North rolling stock depot.

20. As set out in paragraph 13.5.3 in the Transport Assessment Part 3 for Hough to Walley's Green (MA01) in Volume 5, Appendix: TR-003-00001 of the main ES, the proposed Crewe North RSD and the Crewe North IMB-R would generate some additional vehicle movements due to staff, servicing and operational traffic. The Crewe North RSD is expected to generate fewer than 25 vehicle trips passing through the MA01 area in the weekday peak hours. Consequently, it is not expected to generate any significant traffic and transport impacts in the MA01 area. Furthermore, the adjacent Crewe North infrastructure maintenance base (IMB-R) is expected to generate infrequent traffic movements and would not result in any significant traffic and transport impacts in the MA01 area.

21. The staff employed at the RSD would be employed in shift patterns and therefore traffic movements to/from the car park would be spread throughout the day. The car park is however required to accommodate shift change-overs when employees are arriving and leaving the car park at similar times.

HGV time restrictions

22. The Promoter notes the Petitioner's comments in relation to restricting the time of HGV movements to minimise disruption to residents. As set out in paragraph 14.4.5 in Volume 2, Community Area report: Hough to Walley's Green (MA01) of the main ES, the core site operating hours will be 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour. Activities such as major concrete pours may involve extended working hours for reasons of engineering practicability. Tunnelling and directly associated activities may be carried out on a 24-hour, seven days a week basis, with very few workers travelling within the peak traffic hours.

23. By restricting HGV movements to condensed working hours this would potentially result in higher levels of traffic flow during those restricted hours than would otherwise be expected. In addition, restricting HGV movements to specific hours could also result in a prolonged construction programme.

Location of construction compounds

24. Construction compounds would be required at various locations along the route and would generally be sited alongside or adjacent to the relevant proposed works. The siting of construction compounds has been influenced by a number of factors as set out in Para 4.1 in the HS2 Phase 2b Western Leg Information Paper, D2: Construction Compounds. These factors include amongst others:

- Proximity to major road network;

- Proximity to local A and rail/bus routes;
- Easy accessibility for the local workforces;
- suitable existing topography with minimal requirement for site preparation works;
- adequate space; and
- the existing use of the site.

25. Section 14 of the draft CoCP includes measures that aim to reduce the adverse impacts and effects on local communities and maintain public access. This includes the impacts of deliveries of construction materials and equipment.

26. The measures in the draft CoCP include controls on vehicle types, hours of site operation and routes for HGVs to reduce the impact of road-based construction traffic. In order to achieve this, general and site-specific traffic management measures would be implemented during the construction of the Proposed Scheme on or adjacent to public roads and public rights of way (PRoW) affected by the Proposed Scheme.

27. The draft CoCP includes the requirement to develop local traffic management plans in consultation with the highway and traffic authorities and the emergency services. These would consider the local traffic management strategy including consideration of sensitive receptors, such that adverse impacts would be reduced, insofar as reasonably practicable.

28. Specific measures include core site operating hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays with site staff and workers generally arriving before the morning peak hour and departing after the evening peak hour. Activities such as major concrete pours may involve extended working hours for reasons of engineering practicability. Tunnelling and directly associated activities may be carried out on a 24-hour, seven days a week basis, with very few workers travelling within the peak traffic hours.

29. The number of private car trips to and from the construction compounds (both workforce and visitors) would be reduced by encouraging alternative sustainable modes of transport or vehicle sharing. This would be supported by an overarching framework travel plan that requires construction workforce travel plans to be produced that include a range of potential measures to mitigate the impacts of workers' traffic and transport movements associated with construction of the Proposed Scheme. The travel plans would promote the use of sustainable transport modes as appropriate to the location and types of trips. They would include measures such as: provision of information on and promotion of public transport services; provision of good cycle and pedestrian facilities; liaison with public transport operators; promotion of car sharing; and the appointment of a travel plan coordinator to ensure suitable measures are in place and are effective.

30. The draft Environmental Minimum Requirements (EMRs) and the draft CoCP, together with the various controls set out in the Bill, are intended to ensure that the impacts of the Proposed Scheme, including those relating to construction traffic,

would not exceed those assessed in the ES, unless certain circumstances apply. As part of these controls, the nominated undertaker would require contractors to seek to reduce the impacts on local communities from construction traffic, and ensure that public vehicle access is maintained, where reasonably practicable.

31. Prior to the start of the works, the draft CoCP requires the nominated undertaker to develop a Route-wide Traffic Management Plan and Local Traffic Management Plans in consultation with the highway and traffic authorities and the emergency services. Provisions would be made for construction routes to be made suitable for the proposed level of HGV movements in advance of construction.

Crewe North Rolling Stock Depot

32. The Promoter has provided a response in relation to the location of the Crewe North Rolling Stock Depot in response to paragraphs 2.5, 2.6, 2.7, 2.8, 2.9, 3.5, 3.6, 3.7 of the petition in the previous section of this document.