

## EXHIBIT LIST

Reference No: HOC/10006

Petitioner: Whitmore\_Madeley Tunnel

Published to Collaboration Area: Wednesday 18-Apr-2018

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# HS2

## Phase 2a – Whitmore Heath to Madeley: Proposed Scheme & the Twin Bored Single Tunnel

April 2018

# Proposed Scheme & the Twin Bored Single Tunnel Option – cost comparison

| Item   | Proposed Scheme<br>(£ million) | The Twin Bored Single Tunnel<br>(£ million) |
|--|--------------------------------|---|
| Tunnels  | 182.02                         | 369.38                                      |
| Civil engineering (excluding earthworks)                 | 144.52                         | 50.55                                       |
| Rail systems   | 69.66                          | 103.55                                      |
| Indirect costs   | 65.37                          | 84.92                                       |
| <b>Sub-total: Construction &amp; Indirect costs:</b>     | <b>461.57</b>                  | <b>608.39</b>                               |
| Sub-total difference:                                    |                                | 146.82                                      |
| Earthworks (reduction against Proposed Scheme)           |                                | -8.82                                       |
| Land & Property (reduction against Proposed Scheme)      |                                | -15.94                                      |
| Efficiency adjustment                                    |                                | 5.38  |
| Avoided design improvements required for Proposed Scheme |                                | -1.20                                       |
| <b>Total Difference:</b>                                 |                                | <b>126.24</b>                               |
| Contingency (40%)  |                                | 50.50                                       |
| <b>Total cost difference from Proposed Scheme:</b>       |                                | <b>176.74</b>                               |

# Proposed Scheme & the Twin Bored Single Tunnel – cost comparison notes

1. Tunnel costs include bored tunnels, cross passages, cut & cover tunnels, portals and shafts. The tunnel advancement rate assumed is 90 metres per week.
2. Civil engineering costs include bridges, viaducts & other structures, roads and utility diversions.
3. Indirect Costs include HS2 corporate costs, project management, design development & insurances. They are calculated on a % basis.
4. Earthworks costs represent the cost saving in adopting the single tunnel. The earthworks model considers re-use of excavated material, processing requirements, mass haul, disposal etc. These costs cannot be isolated for a specific section of route.
5. The cost shown for Land & Property illustrates the saving associated with avoided purchases from adopting the Single Tunnel Scheme.
6. The Efficiency Adjustment represents expected opportunity cost savings associated with rail systems and indirect costs and the loss of efficiency opportunity associated with the reduced civil engineering cost.
7. Contingency (40%) is consistent with the Proposed Scheme and is applied to the Total Difference.
8. All costs are stated at base date 1Q 2015.

# General Arrangements

|                                    | Proposed Scheme  | The Twin Bored Single Tunnel Option  |
|------------------------------------|--|--|
| <p><b>General Arrangements</b></p> | <ul style="list-style-type: none"> <li>Whitmore Heath Tunnel: 690m long twin bore tunnel/238m long cut and cover tunnel/150m long porous portals;</li> <li>Madeley Tunnel: 670m long twin bore tunnel/150m long porous portals;</li> <li>A retaining wall 495m long;</li> <li>Manor Road overbridge;</li> <li>785m River Lea Valley viaduct;</li> <li>Realignment of the A53 and A525;</li> <li>Stopping up of Snape Hall Road.</li> </ul> | <ul style="list-style-type: none"> <li>6,400m long twin bore tunnel/150m long porous portals;</li> <li>2 ventilation and intervention shafts and associated head houses and access roads.</li> </ul> |

# Construction Effects – slide 1 of 2

|   | Proposed Scheme  | The Twin Bored Single Tunnel Option  |
|---|--|--|
| <b>Method and Duration</b>                | <ul style="list-style-type: none"> <li>Whitmore Heath tunnel assumed to be bored by TBM from the Whitmore Heath southern portal. The TBM will break through at the north portal where it will be dismantled and returned to the southern end to drive the second bore;</li> <li>Madeley tunnel assumed to be bored by TBM from the Madeley Tunnel southern portal. The TBM will break through at the north portal where it will be dismantled and returned to the southern end to drive the second bore.</li> <li>Work assumed to commence in Q4 2020 and end Q1 2025, with a duration of 4 years and 6 months.</li> </ul> | <ul style="list-style-type: none"> <li>Twin bores of the single tunnel will be driven by 2 TBMs from the Whitmore Heath southern portal.</li> <li>Work assumed to commence in Q4 2020 and end Q1 2025, with a duration of 4 years and 6 months.</li> </ul> |
| <b>Construction Logistics - Worksites</b> |  |  |
| <b>Main Tunnel Drive</b>                  | 2  | 1  |
| <b>Vent Shafts</b>                        | 0  | 2  |

# Construction Effects – slide 2 of 2

|                            | Proposed Scheme  | The Twin Bored Single Tunnel Option                                       |
|----------------------------|--|---|
| <b>Utilities</b>           | <ul style="list-style-type: none"> <li>Local diversions of telecommunications assets.</li> </ul> | <ul style="list-style-type: none"> <li>No diversions required.</li> </ul> |
| <b>Excavated Materials</b> | 1,060,000m3  | 1,280,000m3   |
| <b>Surplus Material</b>    | 0  | 680,000m3   |

# Environmental Impacts Comparison

|   | Proposed Scheme | The Twin Bored Single Tunnel Option |
|---|-----------------|-------------------------------------|
| <b>Airborne noise/dwellings potentially eligible for noise insulation</b>       | 6               | 1                                   |
| <b>Ground-borne noise/dwellings potentially eligible for further mitigation</b> | 3               | 0                                   |
| <b>Loss of woodland Habitat/Ancient Woodland</b>                                | 33.2ha/6.7ha    | 13.6ha/0.3ha                        |
| <b>Listed buildings indirectly affected</b>                                     | 6               | 1                                   |
| <b>Public Rights of Way stopped up or diverted</b>                              | 11              | 5                                   |
| <b>Permanent loss of agricultural land</b>                                      | 190ha           | 46ha                                |
| <b>Farm holdings permanently affected</b>                                       | 19              | 10                                  |



# Construction Impacts Comparison

|  | Proposed Scheme   | The Twin Bored Single Tunnel Option   |
|--|---|---|
| <b>Dwellings potentially eligible for noise insulation</b> | 6   | 0   |
| <b>Temporary Loss of agricultural land</b>                 | 336ha   | 216ha   |
| <b>Traffic associated with construction</b>                | <ul style="list-style-type: none"> <li>• Temporary diversion of A53 Newcastle Road (and reinstatement), and permanent diversion of the A525 Bar Hill Road and Manor Road. Snape Hall Road permanently closed.</li> <li>• Peak construction HGV traffic on the A53 Newcastle Road (between A5182 Trentham Road and the Proposed Scheme) 706 HGV movements per day. Peak/busy period duration estimated at 10 months (where flows exceed 50% of the peak construction HGV flow).</li> <li>• Peak construction HGV traffic on the A525 Bar Hill Road 522 HGV movements per day. Peak/busy period duration estimated at 4 months (where flows exceed 50% of the peak construction HGV flow).</li> </ul> | <ul style="list-style-type: none"> <li>• No need for these diversions or closure.</li> <li>• Peak construction HGV traffic on the A53 Newcastle Road (between A5182 Trentham Road and the Proposed Scheme) 650 HGV movements per day. Peak/busy period duration estimated to increase to 18 months (where flows exceed 50% of the peak construction HGV flow).</li> <li>• Peak construction HGV traffic on the A525 Bar Hill Road 330 HGV movements per day. Peak/busy period duration estimated to increase to 13 months (where flows exceed 50% of the peak construction HGV flow)</li> <li>• The total HGV construction vehicles through the roadhead located on the A53 Newcastle Road increases by 16% and reduces through the roadhead located on the A525 Bar Hill Road by 30%.</li> </ul> |

# Southwards extension of Whitmore Heath Tunnel

Southwards extension of Whitmore Heath Tunnel would;

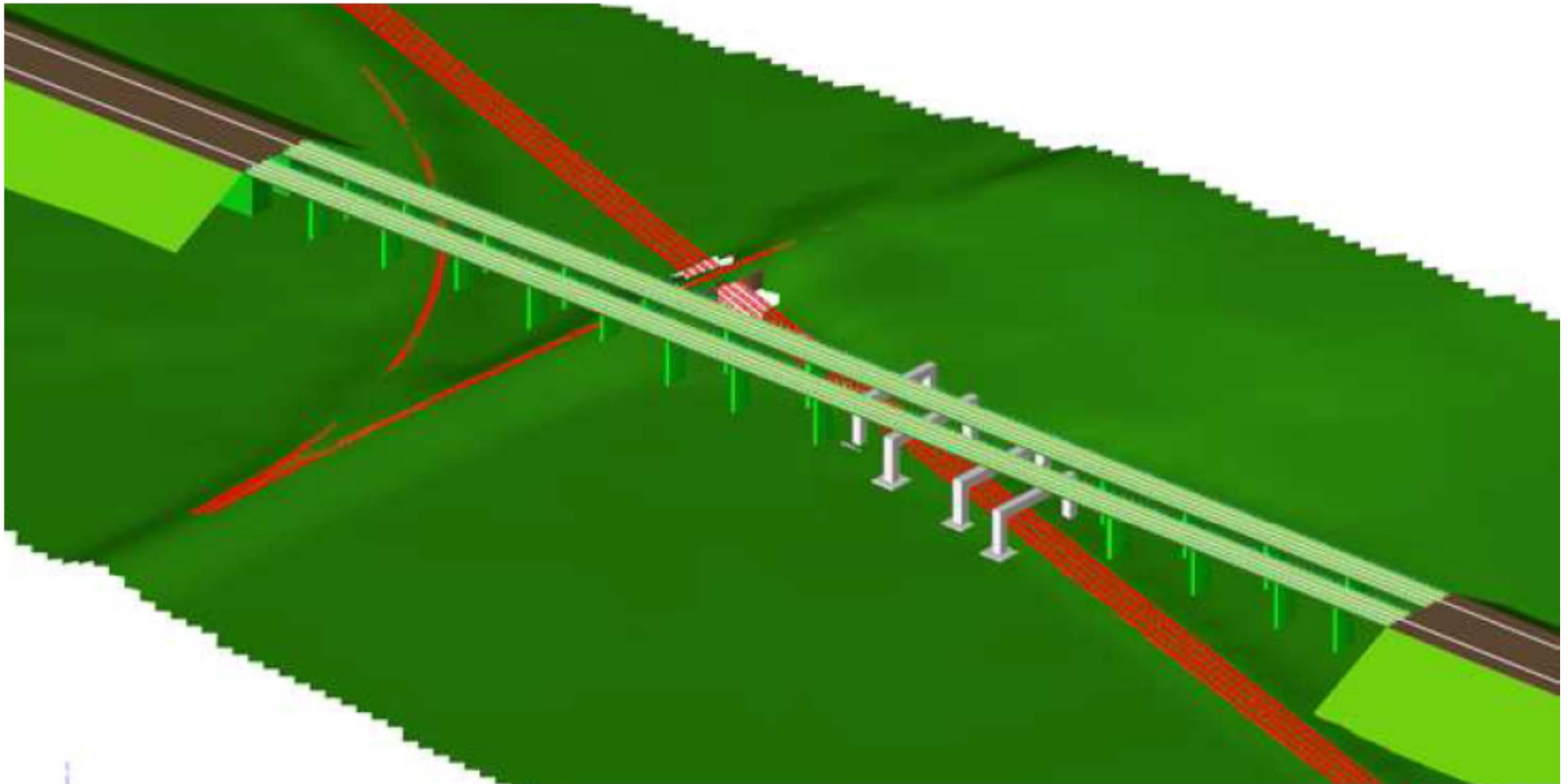
- Remove need for cut and cover section;
- Remove need for temporary diversion of A53 Newcastle Road;
- Avoid significant groundborne noise effects to 3 dwellings at Whitmore Heath;
- Reduce visual impact at Meece Brook Viaduct and Meece Embankment;
- Reduce impact on Whitmore Wood by 0.5ha;
- Simplify construction by removing need to reinstate A53 over tunnel portal;
- Reduce the cost of the Phase 2a project by approximately £12.8m.

# River Lea Viaduct

During detailed design, it would be possible to lower the River Lea viaduct by up to 3.4m, at its highest point, and by an average of 1.5m. This can be achieved without affecting the operation of the West Coast Mainline. This change could result in a potential cost saving of approximately £1 million.

Any further lowering of the River Lea viaduct (of up to 1.5m) would require works to the West Coast Mainline, involve additional disruption to services and involve significant additional cost of approximately £5.5m.

# River Lea Viaduct



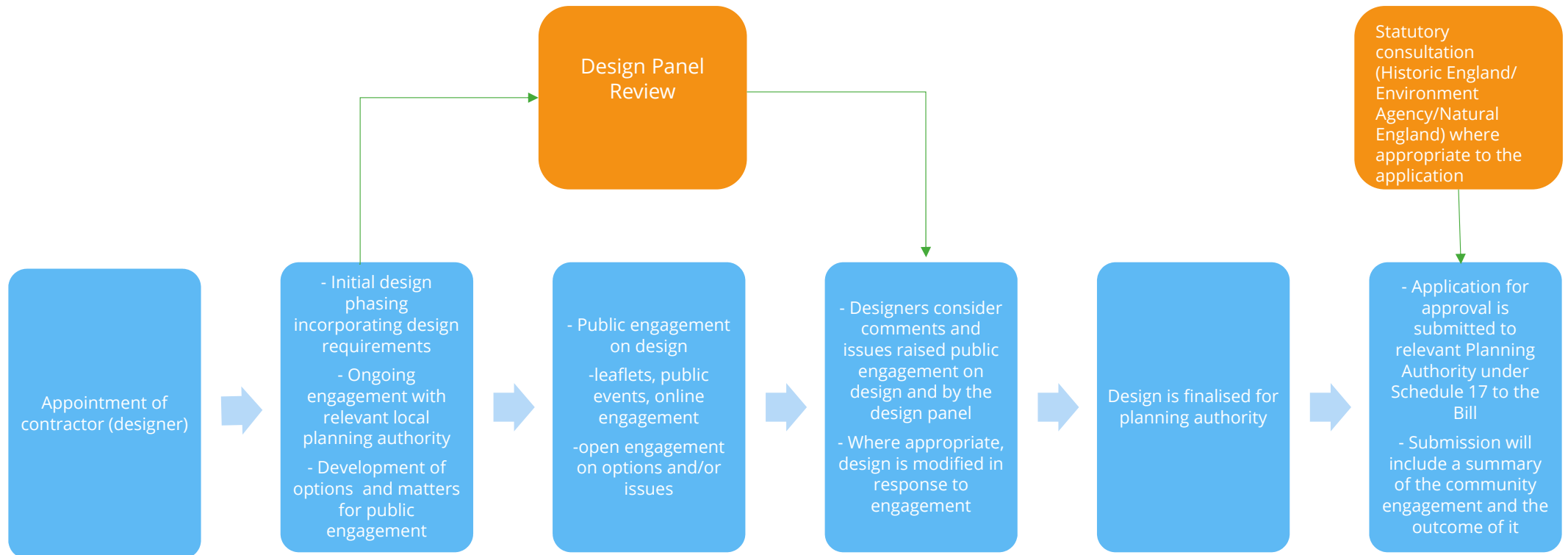
# Key Design Elements - engagement

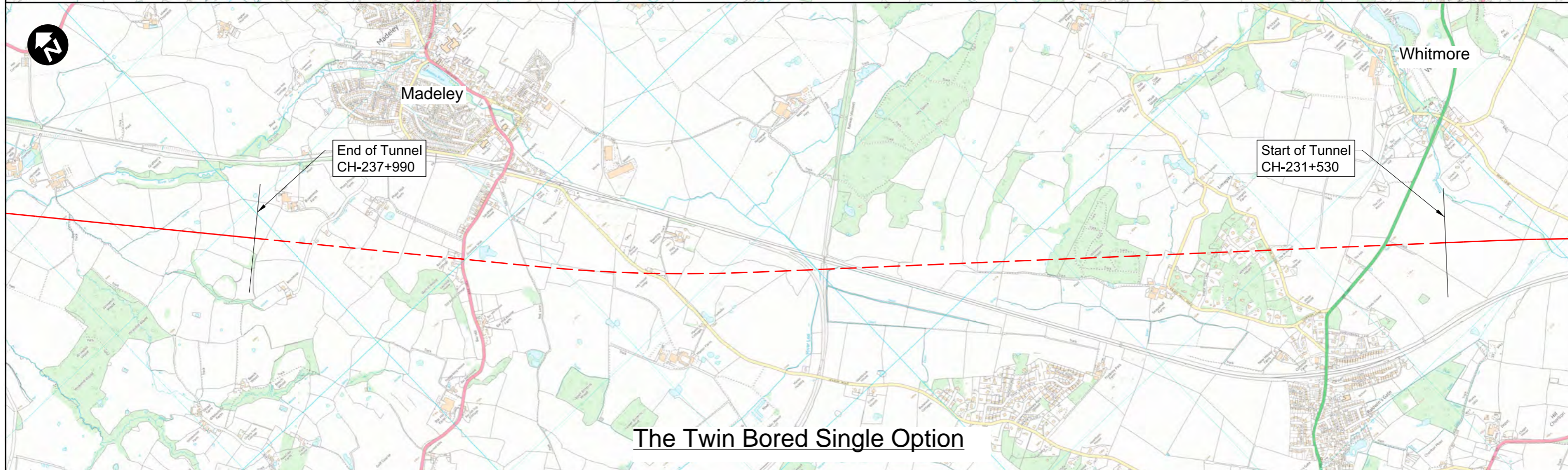
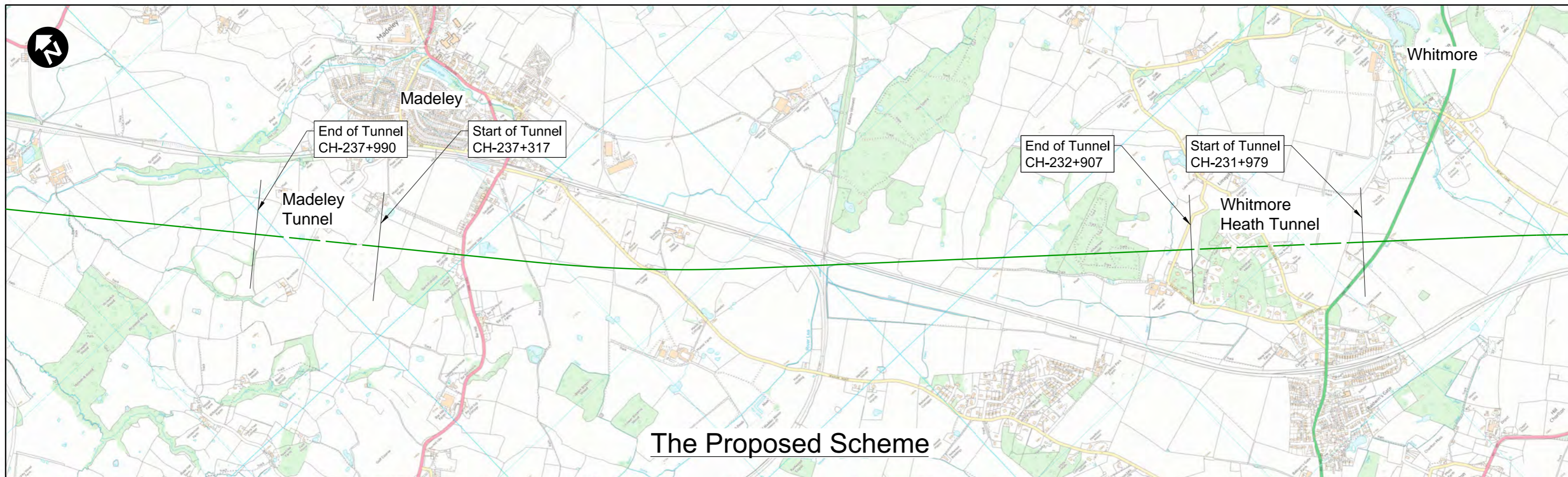
The nominated undertaker will carry out community engagement on the detailed design of key design elements. Such community engagement is likely to be directed at the members of the public in the area where each key design element is located. The exact scope and nature of public engagement will depend on the key design element in question.

The following are key design elements:

- Whitmore Heath Tunnel – South Portal;
- Whitmore Heath Tunnel – North Portal;
- River Lea Viaduct;
- Madeley Tunnel South Portal; and
- Madeley Tunnel North Portal.


# Design - Engagement





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|  | Description | Drawn | Checked | Con App | HS2 App   |

|                |  |
|----------------|--|
| Legends/Notes: |  |
|                | The Twin Bored Single Tunnel - Surface Route   |
|                | The Twin Bored Single Tunnel - Proposed Tunnel |
|                | The Proposed Scheme - Surface Route            |
|                | The Proposed Scheme - Proposed Tunnel          |

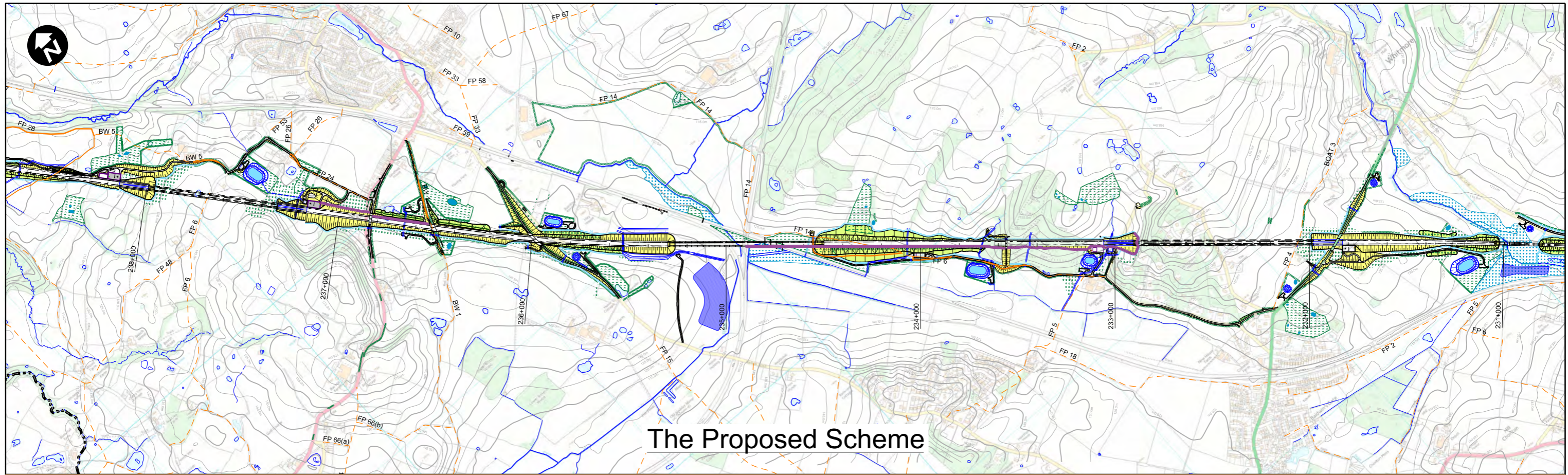


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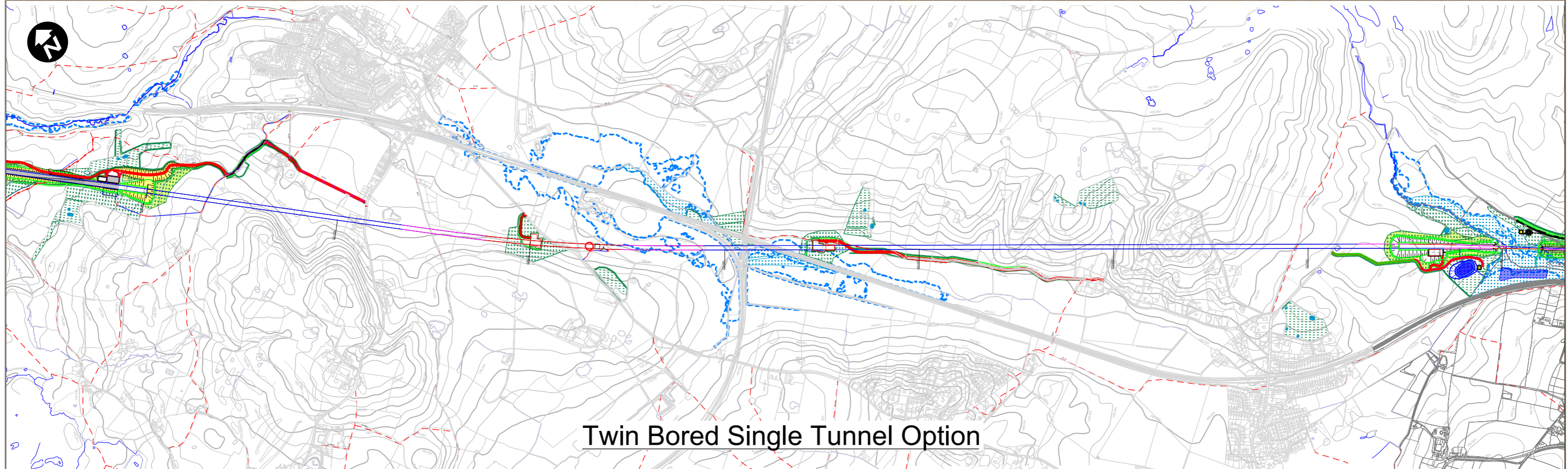
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|               |  |  |
|---------------|--|--|
| Zone          | Route Wide                                   |  |
| Design Stage  | DESIGN FOR PETITIONS                         |  |
| Drawing Title | Overview Plan<br>Whitmore to Madeley         |  |
|               | Proposed Scheme and Single Tunnel Alignments |  |

|  |         |          |
|--|---------|----------|
| Project/Contract                           |         |          |
| P2A Civils Design & Environmental Services |         |          |
| Discipline/Function                        |         |          |
| Tunnels                                    |         |          |
| Drawn                                      | Checked | Approved |
| DAS  | AC      | TN       |
| Date                                       | Scale   | Size     |
| 12/03/18                                   | NTS     | A3       |
| Drawing No.                                |         | Rev.     |
| C861-ARP-PT-DSK-000-100651                 |         | P01      |



The Proposed Scheme



Twin Bored Single Tunnel Option

|  |  |  |  |  |   |
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|                |
|----------------|
| Legends/Notes: |
|----------------|



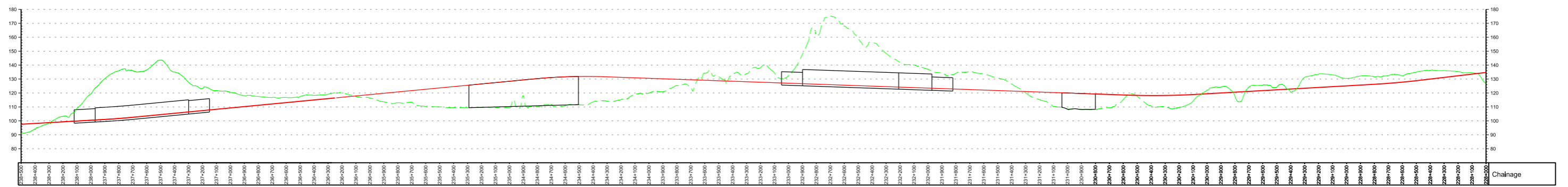
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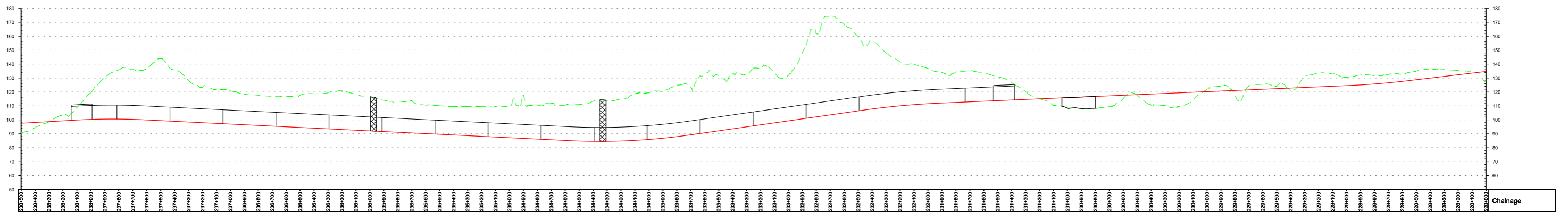
|               |  |
|---------------|--|
| Zone          | Route Wide   |
| Design Stage  | DESIGN FOR PETITIONS   |
| Drawing Title | Plans<br>Whitmore to Madeley<br>Proposed Scheme and<br>Twin Bored Single Tunnel Option |

|  |               |                |
|--|---------------|----------------|
| Project/Contract<br>P2A Civils Design & Environmental Services |               |                |
| Discipline/Function<br>Tunnels                                 |               |                |
| Drawn<br>DAS   | Checked<br>AC | Approved<br>TN |
| Date<br>17/04/18   | Scale<br>NTS  | Size<br>A3     |
| Drawing No.<br>C861-ARP-PT-DSK-000-100652                      |               | Rev.<br>P01    |





### The Proposed Scheme



### Twin Bored Single Tunnel Option

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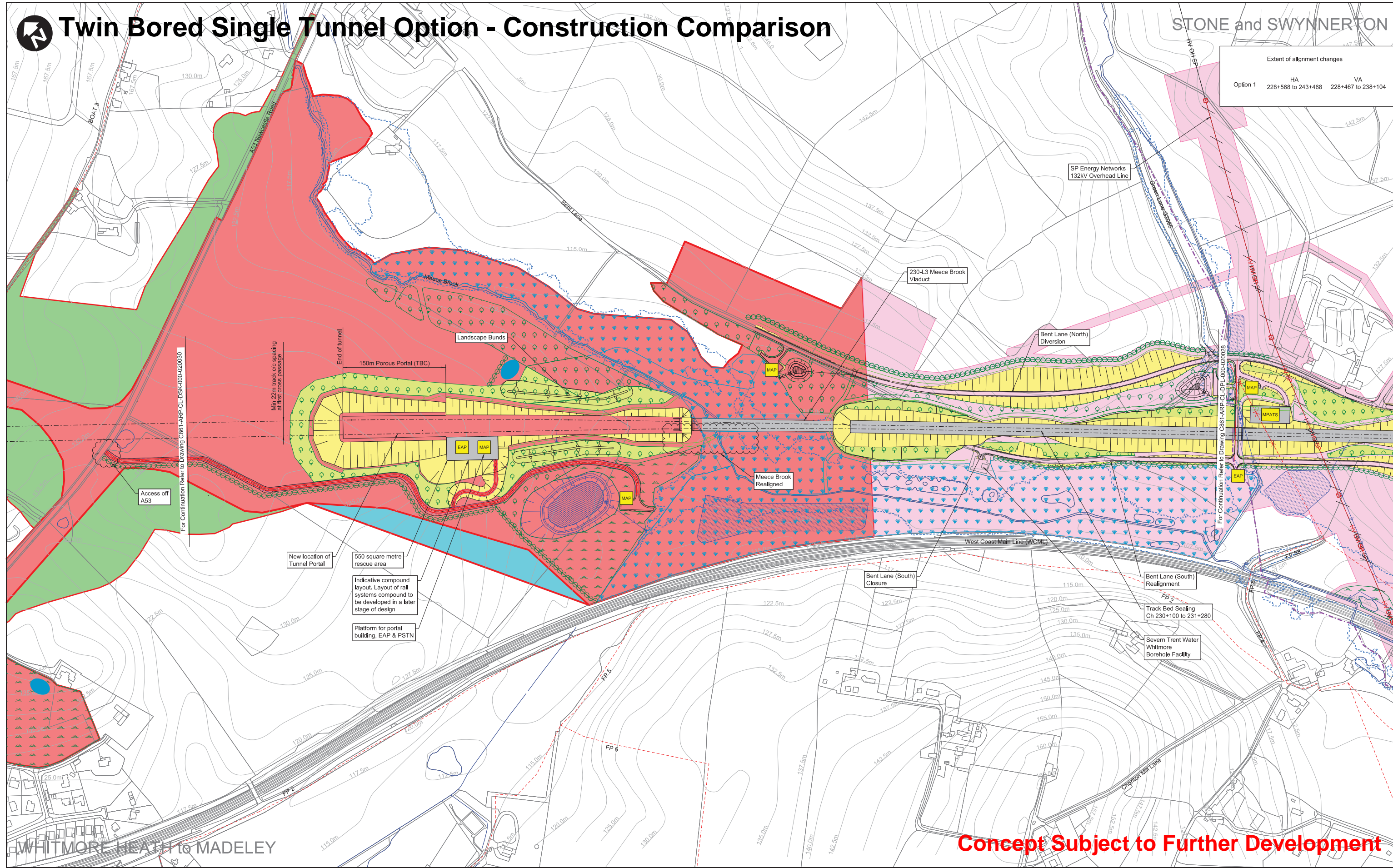
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|               |   |                            |  |         |
|---------------|---|----------------------------|--|---------|
| Zone          | Route Wide  |                            | Project/Contract                           |         |
| Design Stage  | DESIGN FOR PETITIONS  |                            | P2A Civils Design & Environmental Services |         |
| Drawing Title | Profiles<br>Whitmore to Madeley<br>Proposed Scheme and<br>Twin Bored Single Tunnel Option |                            | Discipline/Function                        | Tunnels |
|               |   |                            | Drawn                                      | Checked |
|               |   | DAS                        | AC   | TN      |
|               |   | Date                       | Scale                                      | Size    |
|               |   | 17/04/18                   | NTS  | A3      |
|               |   | Drawing No.                | Rev.                                       |         |
|               |   | C861-ARP-PT-DSK-000-100653 | P01  |         |

# Twin Bored Single Tunnel Option - Construction Comparison

STONE and SWYNNERTON

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option 1                    | HA                 | VA                 |
|                             | 228+568 to 243+468 | 228+467 to 238+104 |



| Revision | Description            | Drawn | Checked | Con App | HS2 App | Scale with caution as distortion can occur. |
|----------|------------------------|-------|---------|---------|---------|---|
| P03      | Minor Refinements      | DS    | TE      | TE      |         |   |
| P02      | Minor Refinements      | DS    | TE      | TE      |         |   |
| P01      | Key added, CCB refined | DS    | AG      | TE      |         |   |

Legends/Notes:

- Consolidated Construction Boundary (CCB) for Published Scheme based on Drawing C861-ARP-CL-DPL-000-021029 - P05
- CCB for Long Tunnel Concept Layout

Key:

- Land to be acquired / CCB unchanged from Published Scheme and not part of the Long Tunnel Option Study
- Land to be acquired / CCB unchanged from Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB additional to Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB contained in Published Scheme and no longer required for Long Tunnel Options (but note that access may still be required in order to monitor settlements or noise and vibration during construction)

Scale: 1:2500

METRES @ 1:2500

0 20 50 100 150 200 250

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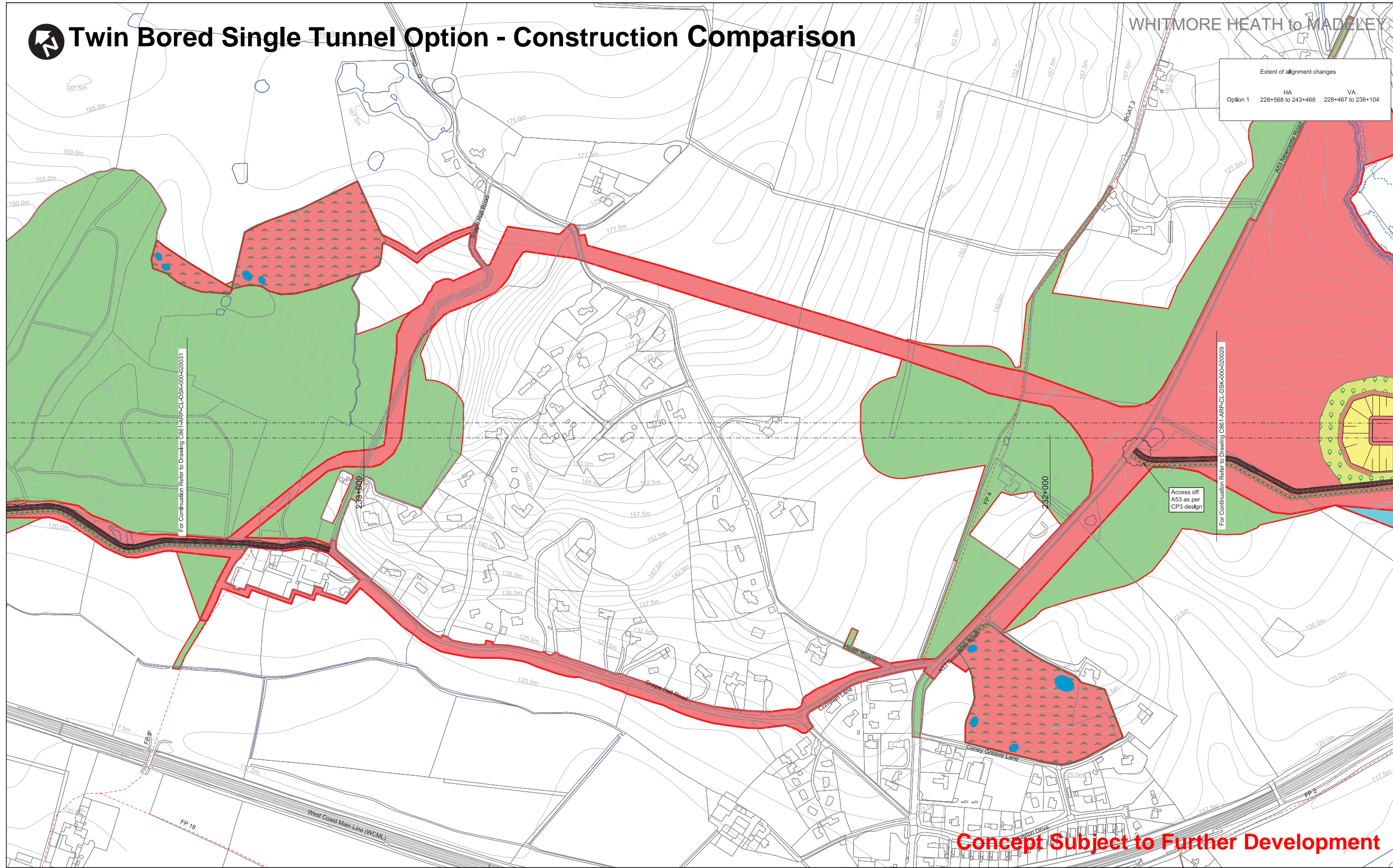
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| Zone          | Route Wide                      | Project/Contract                                  |
|---------------|---------------------------------|---|
| Design Stage  | Preliminary Concept Design      | P2A Civils Design & Environmental Services        |
| Drawing Title | Twin Bored Single Tunnel Option | Discipline/Function<br>Construction and Logistics |
|               | Preliminary Concept Revised CCB | Drawn: EW, Checked: AG, Approved: TE              |
|               | Sheet 29                        | Date: 21/07/2017, Scale: AS SHOWN, Size: A1       |
|               |                                 | Drawing No.: C861-ARP-CL-000-020029, Rev.: P03    |

# Twin Bored Single Tunnel Option - Construction Comparison

WHITMORE HEATH TO MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
|                             | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



For Continuation Refer to Drawing C861-ARP-CL-DSK-000-020031

For Continuation Refer to Drawing C861-ARP-CL-DSK-000-020029

**Concept Subject to Further Development**

| Item No | Description   | Drawn | Checked | Con App | HS2 App |
|---------|---|-------|---------|---------|---------|
| P03     | Minor Refinements   | DS    | TE      | TE      | TE      |
| P02     | Minor Refinements   | DS    | TE      | TE      | TE      |
| P01     | Updated post-sift selected engineering & mitigation details | DW    | TE      | TE      | TE      |

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- CCB for Long Tunnel Concept Layout

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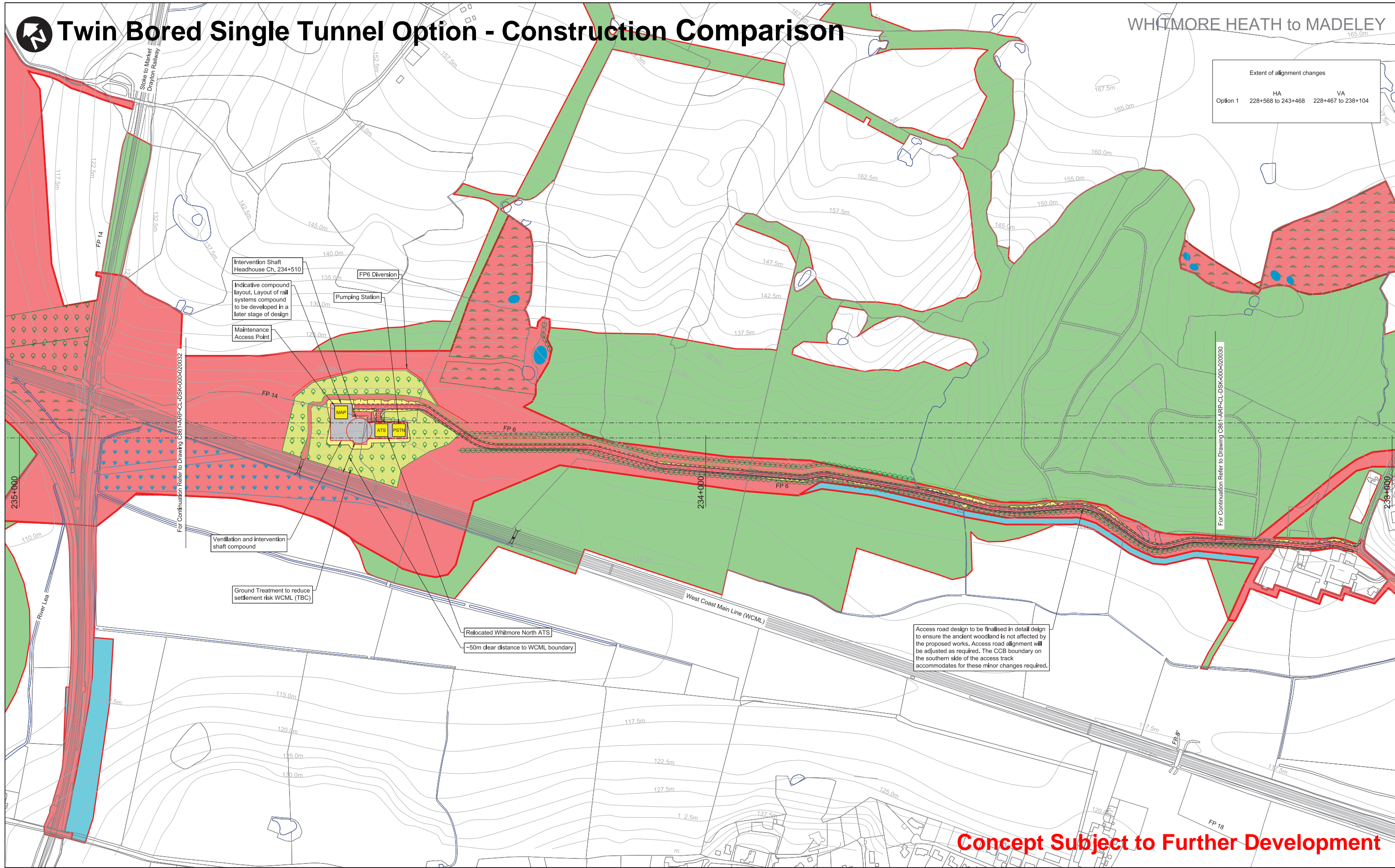
| Zone          | Route Wide   |
|---------------|--|
| Design Stage  | Preliminary Concept Design   |
| Drawing Title | Twin Bored Single Tunnel Option<br>Preliminary Concept Revised CCB |
|               | Sheet 30   |

| Project/Contract                           |          |          |
|--|----------|----------|
| P2A Civils Design & Environmental Services |          |          |
| Discipline/Function                        |          |          |
| Construction and Logistics                 |          |          |
| Drawn                                      | Checked  | Approved |
| PN   | AG       | TE       |
| Date                                       | Scale    | Size     |
| 06/09/2017                                 | AS SHOWN | A1       |
| Drawing No.                                |          | Rev.     |
| C861-ARP-CL-000-020030                     |          | P03      |

# Twin Bored Single Tunnel Option - Construction Comparison

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| Revision | Description   | Drawn | Checked | Con App | HS2 App | Scale                                       |
|----------|---|-------|---------|---------|---------|---|
| P03      | Minor Refinements   | DS    | TE      | TE      |         | Scale with caution as distortion can occur. |
| P02      | Minor Refinements   | DS    | TE      | TE      |         |   |
| P01      | Updated post-sift selected engineering & mitigation details | DW    | TE      | TE      |         |   |

**Legends/Notes:**

- Consolidated Construction Boundary (CCB) for Published Scheme based on Drawing C861-ARP-CL-DPL-000-021031 - P05
- CCB for Long Tunnel Concept Layout

**Key:**

- Land to be acquired / CCB unchanged from Published Scheme and not part of the Long Tunnel Option Study
- Land to be acquired / CCB unchanged from Published Scheme and required for Long Tunnel Options
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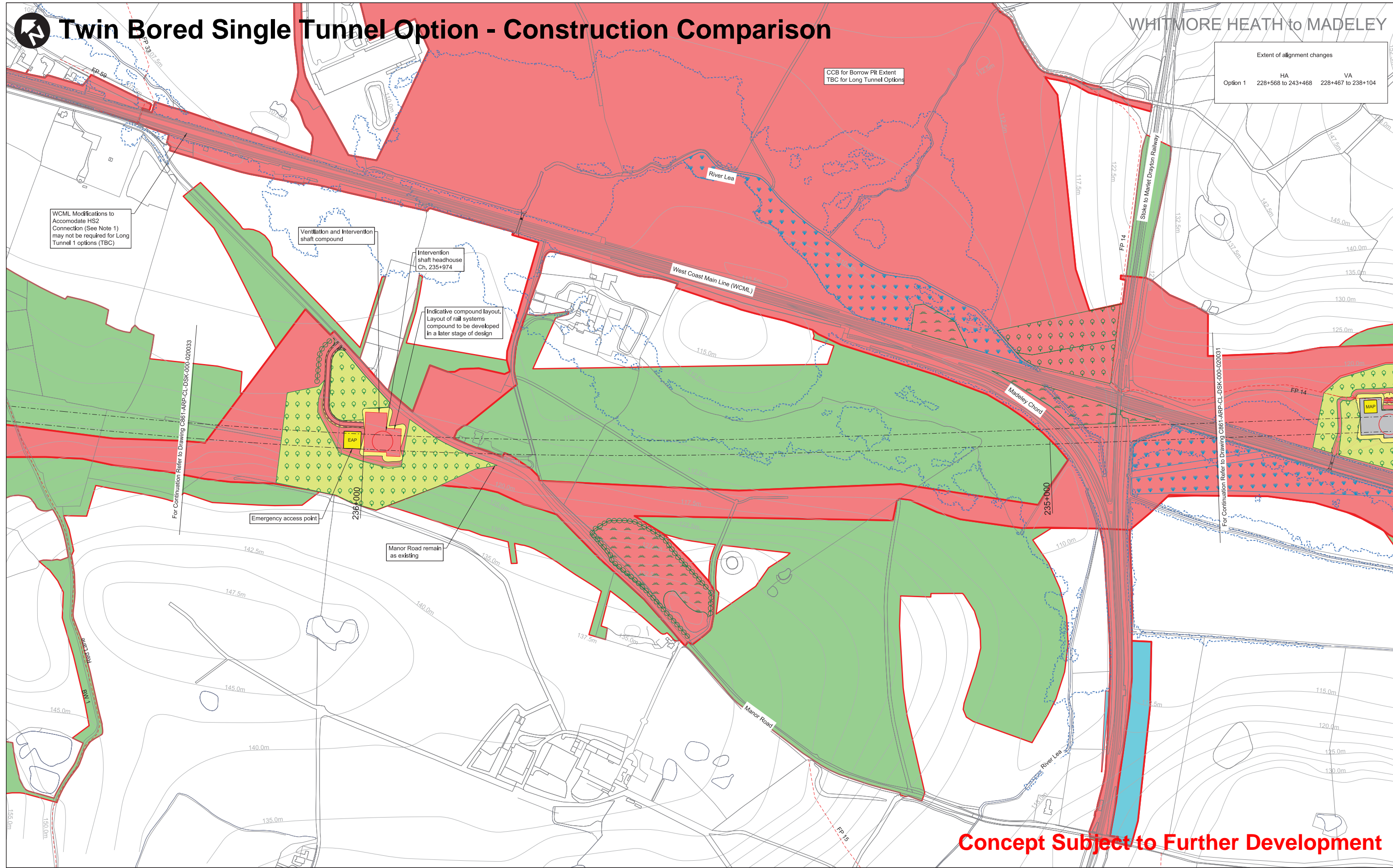
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|---------------|--|--|-------------------|----------------|
| Zone          | Route Wide   | Project/Contract<br>P2A Civils Design & Environmental Services |                   |                |
| Design Stage  | Preliminary Concept Design   | Discipline/Function<br>Construction and Logistics              |                   |                |
| Drawing Title | Twin Bored Single Tunnel Option<br>Preliminary Concept Revised CCB | Drawn<br>PN  | Checked<br>AG     | Approved<br>TE |
|               | Sheet 31   | Date<br>06/09/2017   | Scale<br>AS SHOWN | Size<br>A1     |
|               |  | Drawing No.<br>C861-ARP-CL-000-020031                          |                   | Rev.<br>P03    |

# Twin Bored Single Tunnel Option - Construction Comparison

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option 1                    | HA                 | VA                 |
|                             | 228+568 to 243+468 | 228+467 to 238+104 |



WCML Modifications to Accommodate HS2 Connection (See Note 1) may not be required for Long Tunnel 1 options (TBC)

Ventilation and Intervention shaft compound

Intervention shaft headhouse Ch. 235+974

Indicative compound layout. Layout of rail systems compound to be developed in a later stage of design

Emergency access point

Manor Road remain as existing

CCB for Borrow Pit Extent  
TBC for Long Tunnel Options

**Concept Subject to Further Development**

| P03 | Minor Refinements   | DS         | TE         | TE         | TE |
|-----|---|------------|------------|------------|----|
|     |   | 01/03/2018 | 01/03/2018 | 01/03/2018 |    |
| P02 | Minor Refinements   | DS         | TE         | TE         | TE |
|     |   | 28/02/2018 | 28/02/2018 | 28/02/2018 |    |
| P01 | Updated post-sift selected engineering & mitigation details | DW         | TE         | TE         | TE |
|     |   | 09/02/2018 | 07/02/2018 | 07/02/2018 |    |

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**Legends/Notes:**

- Consolidated Construction Boundary (CCB) for Published Scheme based on Drawing C861-ARP-CL-DPL-000-021032 - P05
- CCB for Long Tunnel Preliminary Concept

**Key:**

- Land to be acquired / CCB unchanged from Published Scheme and not part of the Long Tunnel Option Study
- Land to be acquired / CCB unchanged from Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB additional to Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB contained in Published Scheme and no longer required for Long Tunnel Options (but note that access may still be required in order to monitor settlements or noise and vibration during construction)

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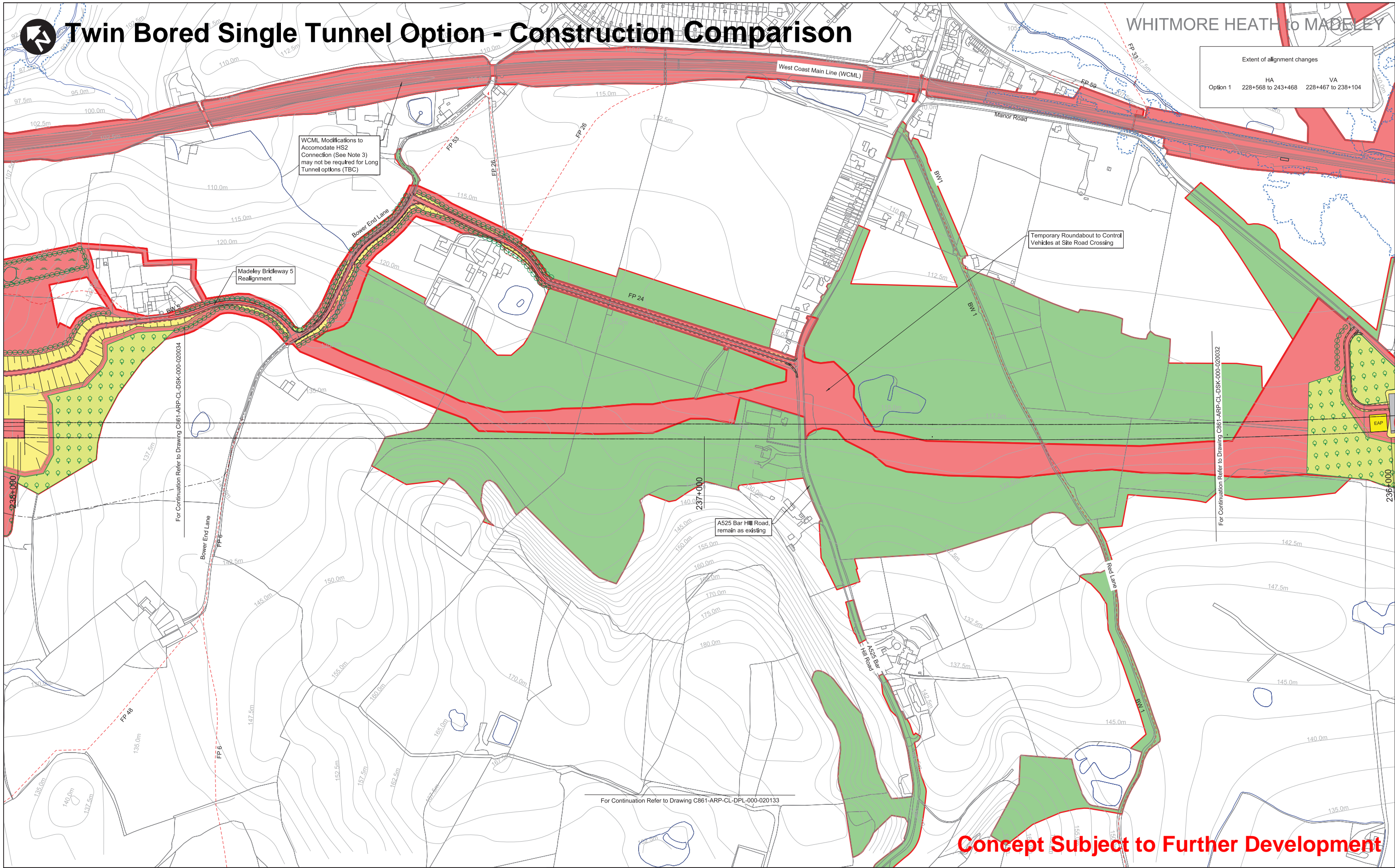
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|               |  |  |                   |                |
|---------------|--|--|-------------------|----------------|
| Zone          | Route Wide   | Project/Contract<br>P2A Civils Design & Environmental Services |                   |                |
| Design Stage  | Preliminary Concept Design   | Discipline/Function<br>Construction and Logistics              |                   |                |
| Drawing Title | Twin Bored Single Tunnel Option<br>Preliminary Concept Revised CCB | Drawn<br>PN  | Checked<br>AG     | Approved<br>TE |
|               | Sheet 32   | Date<br>05/09/2017   | Scale<br>AS SHOWN | Size<br>A1     |
|               |  | Drawing No.<br>C861-ARP-CL-000-020032                          |                   | Rev.<br>P03    |

# Twin Bored Single Tunnel Option - Construction Comparison

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



|     |                        |    |    |    |    |            |            |            |   |
|-----|------------------------|----|----|----|----|------------|------------|------------|---|
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| P01 | Key added, CCB refined | DS | AG | TE | TE | 09/02/2018 | 02/02/2018 | 07/02/2018 | © Crown Copyright material is reproduced with the permission of Land Registry under delegated authority from the Controller of HMSO. This material was last updated on 2017 and may not be copied, distributed, sold or published without the formal permission of Land Registry. Only an official copy of a title plan or register obtained from the Land Registry may be used for legal or other official purposes. |

For Continuation Refer to Drawing C861-ARP-CL-DSK-000-020094

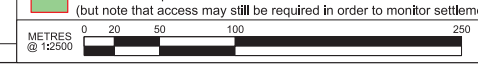
For Continuation Refer to Drawing C861-ARP-CL-DPL-000-020133

For Continuation Refer to Drawing C861-ARP-CL-DSK-000-020032

Legends/Notes:  
 1. Consolidated Construction Boundary (CCB) for Published Scheme based on Drawing C861-ARP-CL-DPL-000-021033 - P05  
 2. CCB for Long Tunnel Preliminary Concept

Key:

- Land to be acquired / CCB unchanged from Published Scheme and not part of the Long Tunnel Option Study
- Land to be acquired / CCB unchanged from Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB additional to Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB contained in Published Scheme and no longer required for Long Tunnel Options (but note that access may still be required in order to monitor settlements or noise and vibration during construction)



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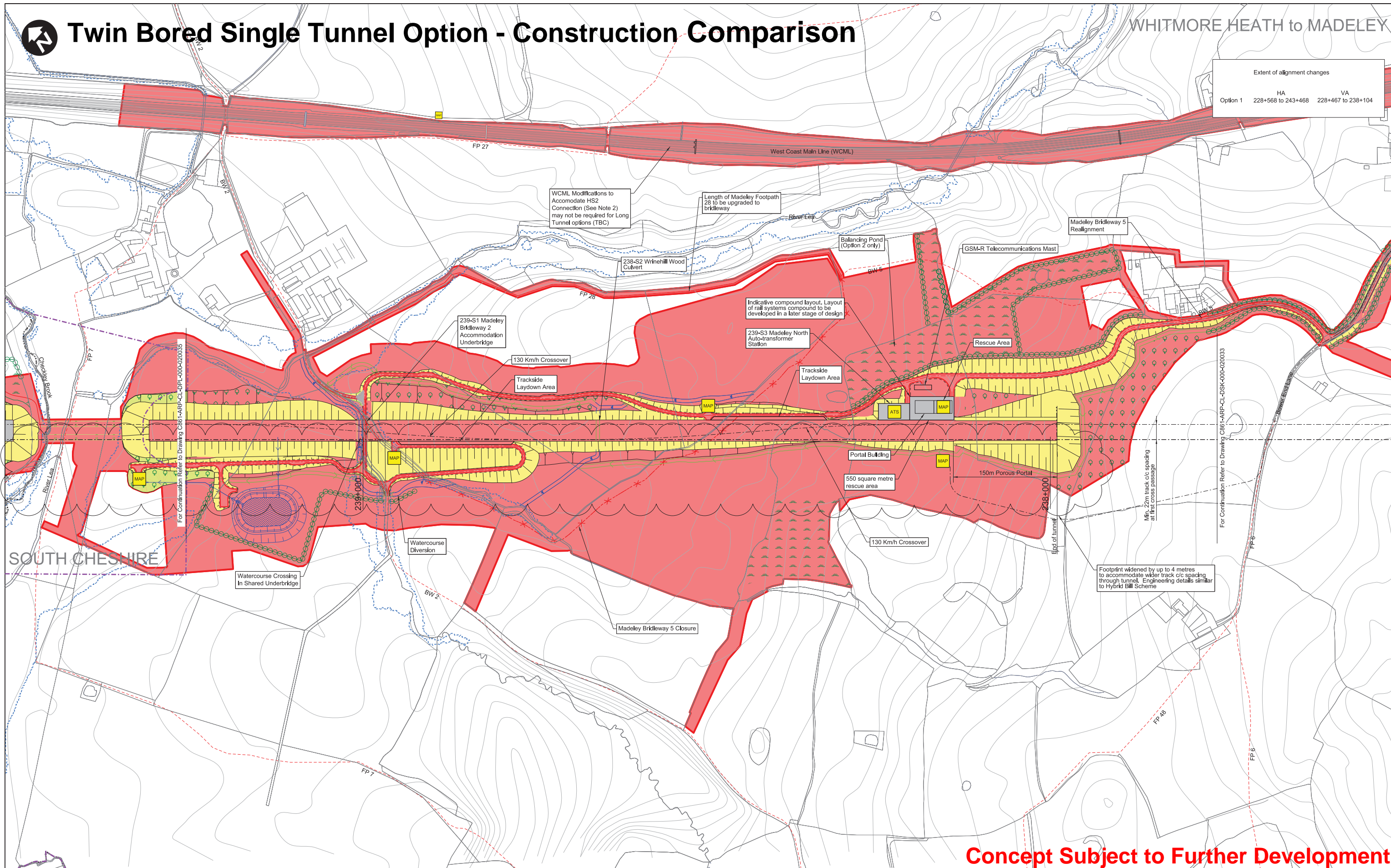
|               |  |                     |  |
|---------------|--|---------------------|--|
| Zone          | Route Wide   | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Preliminary Concept Design   | Discipline/Function | Construction and Logistics                 |
| Drawing Title | Twin Bored Single Tunnel Option<br>Preliminary Concept Revised CCB | Drawn               | EW   |
|               |  | Checked             | AG   |
|               |  | Approved            | TE   |
|               |  | Date                | 21/07/2017                                 |
|               |  | Scale               | AS SHOWN                                   |
|               |  | Size                | A1   |
|               |  | Drawing No.         | C861-ARP-CL-000-020033                     |
|               |  | Rev.                | P03  |

|          |  |
|----------|--|
| Sheet 33 |  |
|----------|--|

# Twin Bored Single Tunnel Option - Construction Comparison

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| P02 | Minor Refinements      | DS | TE | TE | TE | 28/02/2018 | 28/02/2018 | 28/02/2018 |
|-----|------------------------|----|----|----|----|------------|------------|------------|
| P01 | Key added, CCB refined | DS | AG | TE | TE | 09/02/2018 | 06/02/2018 | 07/02/2018 |

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**Legends/Notes:**

- Consolidated Construction Boundary (CCB) for Published Scheme based on Drawing C861-ARP-CL-DPL-000-021034 - P05
- CCB for Long Terminal Options proposed for Options S11 September 2017
- For Network Rail on-network works to WCML refer to drawings C862-PBR-RT-DPL-WS09-100000 to 100009

**Key:**

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- Land to be acquired / CCB unchanged from Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB additional to Published Scheme and required for Long Tunnel Options
- Land to be acquired / CCB contained in Published Scheme and no longer required for Long Tunnel Options (but note that access may still be required in order to monitor settlements or noise and vibration during construction)

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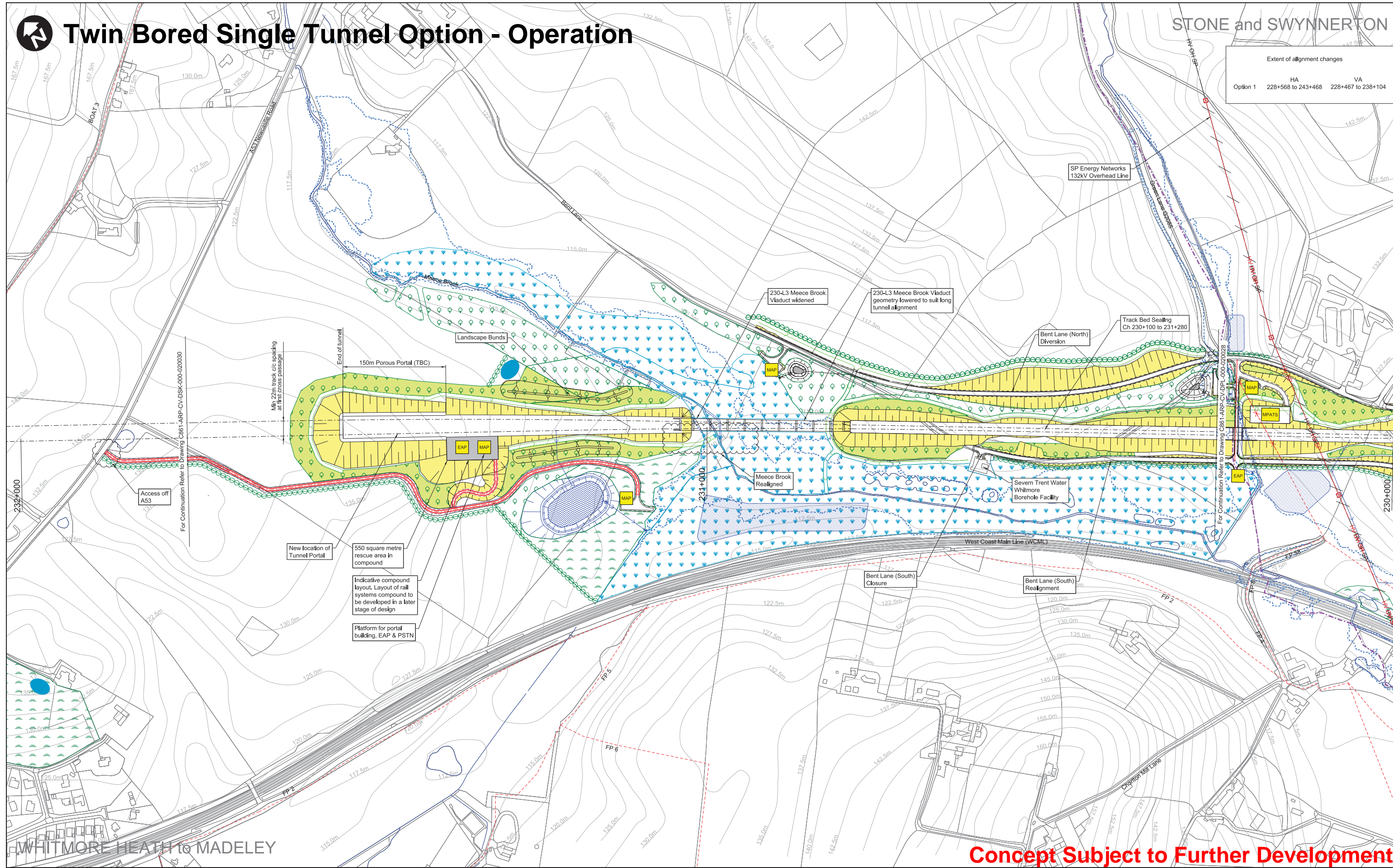
|               |  |                     |  |
|---------------|--|---------------------|--|
| Zone          | Route Wide                                     | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Hybrid Bill - Draft Initial Preliminary Design | Discipline/Function | Construction and Logistics                 |
| Drawing Title | Twin Bored Single Tunnel Option                | Drawn               | EW   |
|               | Revised CCB                                    | Checked             | AG   |
|               | Sheet 34                                       | Approved            | TE   |
| Date          | 21/07/2017                                     | Scale               | AS SHOWN                                   |
|               |  | Size                | A1   |
| Drawing No.   | C861-ARP-CL-000-020034                         | Rev.                | P02  |

|               |  |                     |  |
|---------------|--|---------------------|--|
| Zone          | Route Wide                                     | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Hybrid Bill - Draft Initial Preliminary Design | Discipline/Function | Construction and Logistics                 |
| Drawing Title | Twin Bored Single Tunnel Option                | Drawn               | EW   |
|               | Revised CCB                                    | Checked             | AG   |
|               | Sheet 34                                       | Approved            | TE   |
| Date          | 21/07/2017                                     | Scale               | AS SHOWN                                   |
|               |  | Size                | A1   |
| Drawing No.   | C861-ARP-CL-000-020034                         | Rev.                | P02  |

# Twin Bored Single Tunnel Option - Operation

STONE and SWYNNERTON

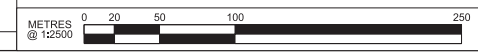
| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| Rev | Description   | Drawn | Checked | Con App | HS2 App | Scale with caution as distortion can occur. |
|-----|---|-------|---------|---------|---------|---|
| P03 | Minor Refinements   | DS    | TE      | TE      |         |   |
| P02 | Minor Refinements   | DS    | TE      | TE      |         |   |
| P01 | Updated post-sift selected engineering & mitigation details | DW    | TE      | TE      |         |   |

| Legends/Notes: |  |
|----------------|--|
| 1.             | For legend refer to drawing no HS2-HS2-IM-DSC-000-000001 |



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| Zone   | Project/Contract                           |            |          |
|--|--|------------|----------|
|  | P2A Civils Design & Environmental Services |            |          |
| Design Stage                                 | Discipline/Function                        |            |          |
| Preliminary Concept                          | Civil                                      |            |          |
| Drawing Title                                | Drawn                                      | Checked    | Approved |
| Twin Bored Single Tunnel Option              | MN   | TE         | TE       |
| Preliminary Concept General Arrangement Plan |  | Date       | Scale    |
|  |  | 13/07/2017 | AS SHOWN |
| Sheet 29                                     |  | Size       | Rev.     |
|  |  | A1         |          |
| Drawing No.                                  |  | Rev.       |          |
| C861-ARP-CV-000-020029                       |  | P03        |          |

**P37 (1)**

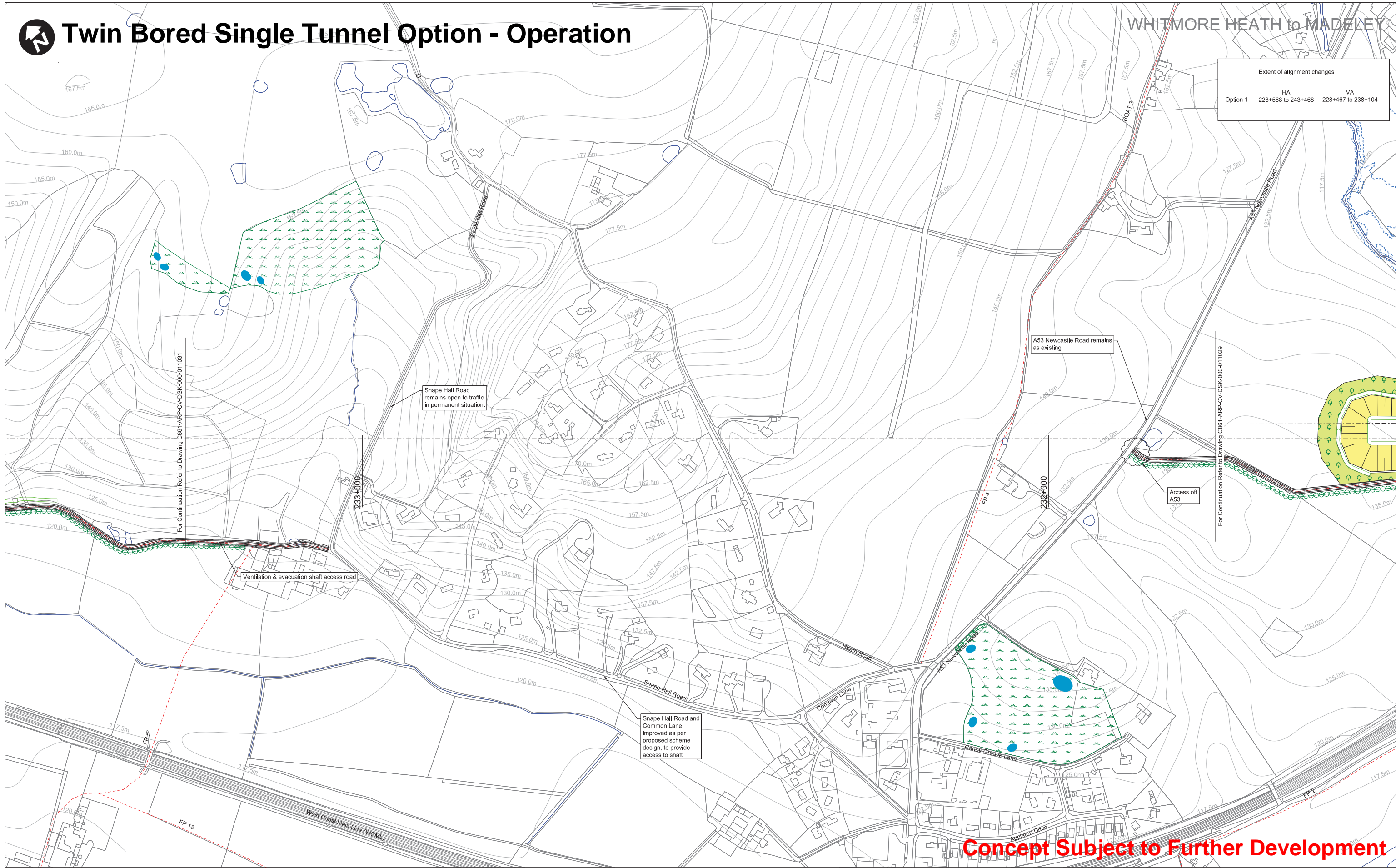
HOC/10006/0024



# Twin Bored Single Tunnel Option - Operation

WHITMORE HEATH TO MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
|                             | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



For Continuation Refer to Drawing C861-ARP-CV-DSC-000-011031

For Continuation Refer to Drawing C861-ARP-CV-DSC-000-011029

Ventilation & evacuation shaft access road

Snape Hall Road remains open to traffic in permanent situation.

A53 Newcastle Road remains as existing

Access off A53

Snape Hall Road and Common Lane improved as per proposed scheme design, to provide access to shaft

Concept Subject to Further Development

| Description   | Drawn      | Checked    | Con App    | HS2 App    | Scale with caution as distortion can occur. |
|---|------------|------------|------------|------------|---|
| P03 Minor Refinements   | DS         | TE         | TE         | TE         |   |
|   | 01/03/2018 | 01/03/2018 | 01/03/2018 | 01/03/2018 |   |
| P02 Minor Refinements   | DS         | TE         | TE         | TE         |   |
|   | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 |   |
| P01 Updated post-sift selected engineering & mitigation details | DW         | TE         | TE         | TE         |   |
|   | 09/02/2018 | 07/02/2018 | 07/02/2018 | 07/02/2018 |   |

Legends/Notes:  
1. For legend refer to drawing no HS2-HS2-IM-DSC-000-000001

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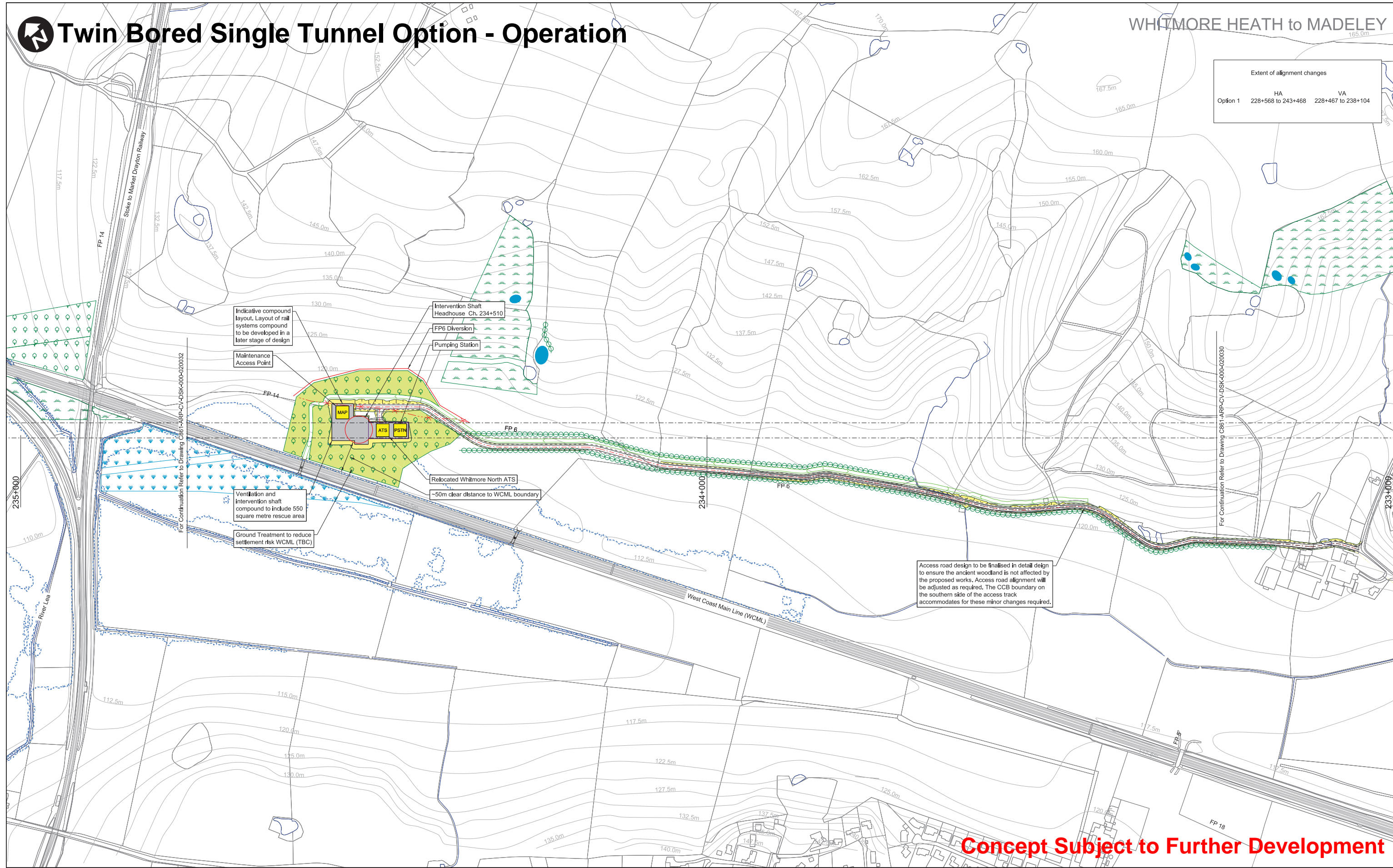
|               |                                 |                     |  |
|---------------|---------------------------------|---------------------|--|
| Zone          | Route Wide                      | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Preliminary Concept             | Discipline/Function | Civil                                      |
| Drawing Title | Twin Bored Single Tunnel Option | Drawn               | MN   |
|               |                                 | Checked             | TE   |
|               |                                 | Approved            | TE   |
|               |                                 | Date                | 13/07/2017                                 |
|               |                                 | Scale               | AS SHOWN                                   |
|               |                                 | Size                | A1   |
|               |                                 | Drawing No.         | C861-ARP-CV-DSC-000-020030                 |
|               |                                 | Rev.                | P03  |
|               |                                 | Sheet               | 30   |

|                     |  |
|---------------------|--|
| Project/Contract    | P2A Civils Design & Environmental Services |
| Discipline/Function | Civil                                      |
| Drawn               | MN   |
| Checked             | TE   |
| Approved            | TE   |
| Date                | 13/07/2017                                 |
| Scale               | AS SHOWN                                   |
| Size                | A1   |
| Drawing No.         | C861-ARP-CV-DSC-000-020030                 |
| Rev.                | P03  |
| Sheet               | 30   |

# Twin Bored Single Tunnel Option - Operation

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| Revision | Description   | Drawn | Checked | Con App | HS2 App | Scale                                       |
|----------|---|-------|---------|---------|---------|---|
| P03      | Minor Refinements   | DS    | TE      | TE      | TE      | Scale with caution as distortion can occur. |
| P02      | Minor Refinements   | DS    | TE      | TE      | TE      |   |
| P01      | Updated post-sift selected engineering & mitigation details | DW    | TE      | TE      | TE      |   |

**Legends/Notes:**  
 1. For legend refer to drawing no HS2-HS2-IM-DSC-000-000001  
 2. For Network Rail on-network works to WCML refer to drawings C862-PBR-RT-DPL-WS09-100000 to 100009.

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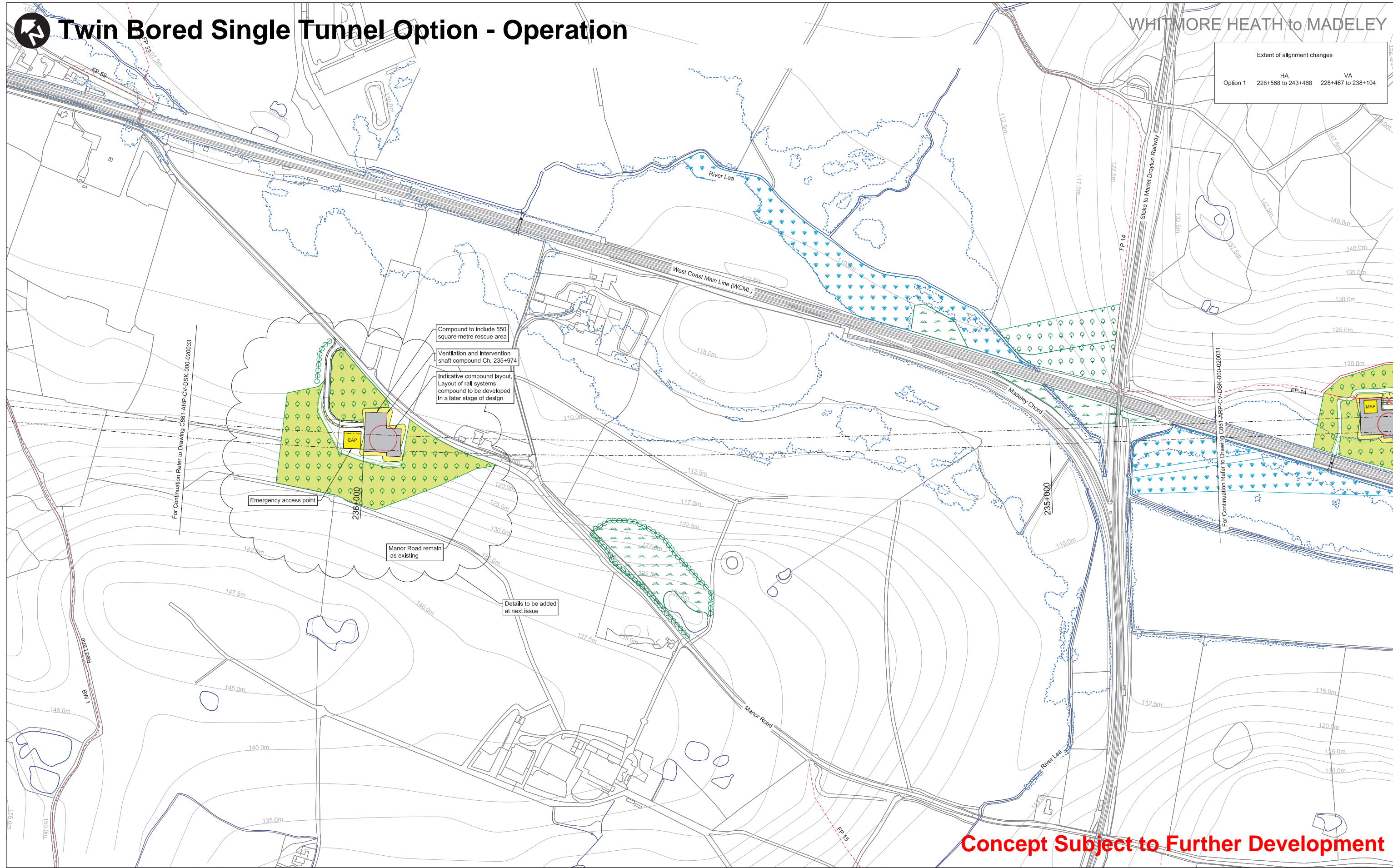
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|               |  |    |    |                     |  |          |  |
|---------------|--|----|----|---------------------|--|----------|--|
| Zone          | Route Wide                                   |    |    | Project/Contract    | P2A Civils Design & Environmental Services |          |  |
| Design Stage  | Preliminary Concept                          |    |    | Discipline/Function | Civil                                      |          |  |
| Drawing Title | Twin Bored Single Tunnel Option              |    |    | Drawn               | Checked                                    | Approved |  |
|               | MN   | TE | TE | Date                | Scale                                      | Size     |  |
|               |  |    |    | 13/07/2017          | AS SHOWN                                   | A1       |  |
|               | Preliminary Concept General Arrangement Plan |    |    | Drawing No.         | C861-ARP-CV-000-020031                     |          |  |
|               | Sheet 31                                     |    |    | Rev.                | P03  |          |  |

# Twin Bored Single Tunnel Option - Operation

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option 1                    | HA                 | VA                 |
|                             | 228+568 to 243+468 | 228+467 to 238+104 |



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| P01 | Updated post-sift selected engineering & mitigation details | DW         | TE         | TE         | © Crown Copyright material is reproduced with the permission of Land Registry under delegated authority from the Controller of HMSO. This material was last updated on 2017 and may not be copied, distributed, sold or published without the formal permission of Land Registry. Only an official copy of a title plan or register obtained from the Land Registry may be used for legal or other official purposes. |
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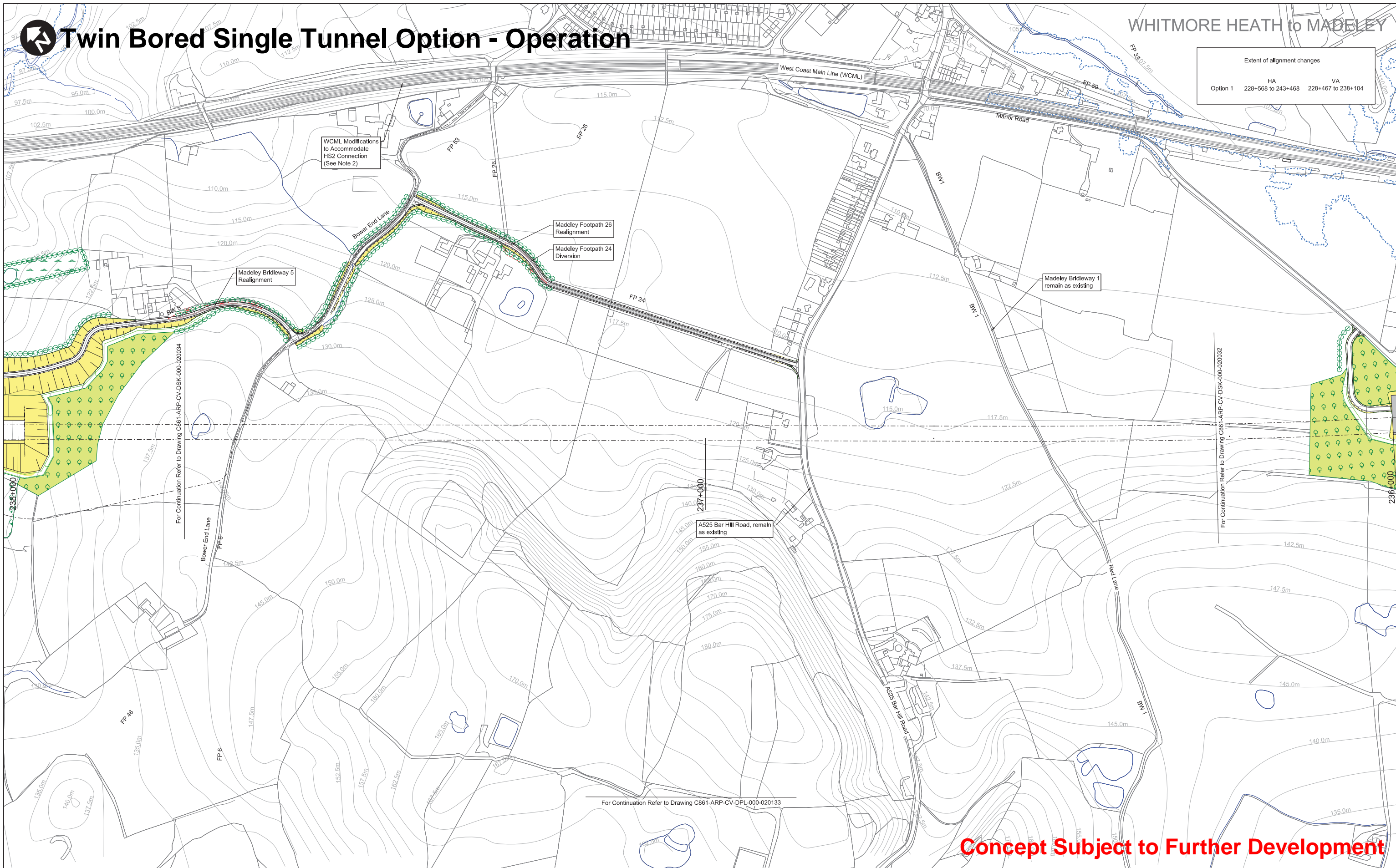
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|---------------|--|----|----|---------------------|--|----------|--|
| Zone          | Route Wide                                   |    |    | Project/Contract    | P2A Civils Design & Environmental Services |          |  |
| Design Stage  | Preliminary Concept                          |    |    | Discipline/Function | Civil                                      |          |  |
| Drawing Title | Twin Bored Single Tunnel Option              |    |    | Drawn               | Checked                                    | Approved |  |
|               | MN   | TE | TE | Date                | Scale                                      | Size     |  |
|               |  |    |    | 13/07/2017          | AS SHOWN                                   | A1       |  |
|               | Preliminary Concept General Arrangement Plan |    |    | Drawing No.         | C861-ARP-CV-000-020032                     |          |  |
|               | Sheet 32                                     |    |    | Rev.                | P03  |          |  |

# Twin Bored Single Tunnel Option - Operation

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| Revision | Description   | Drawn | Checked | Con App | HS2 App | Scale with caution as distortion can occur. |
|----------|---|-------|---------|---------|---------|---|
| P03      | Minor Refinements   | DS    | TE      | TE      | TE      | 01/03/2018                                  |
| P02      | Minor Refinements   | DS    | TE      | TE      | TE      | 28/02/2018                                  |
| P01      | Updated post-sift selected engineering & mitigation details | DW    | TE      | TE      | TE      | 09/02/2018                                  |

**Legends/Notes:**

- For legend refer to drawing no HS2-HS2-IM-DSC-000-000001
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For Continuation Refer to Drawing C861-ARP-CV-DSK-000-020034

For Continuation Refer to Drawing C861-ARP-CV-DSK-000-020032

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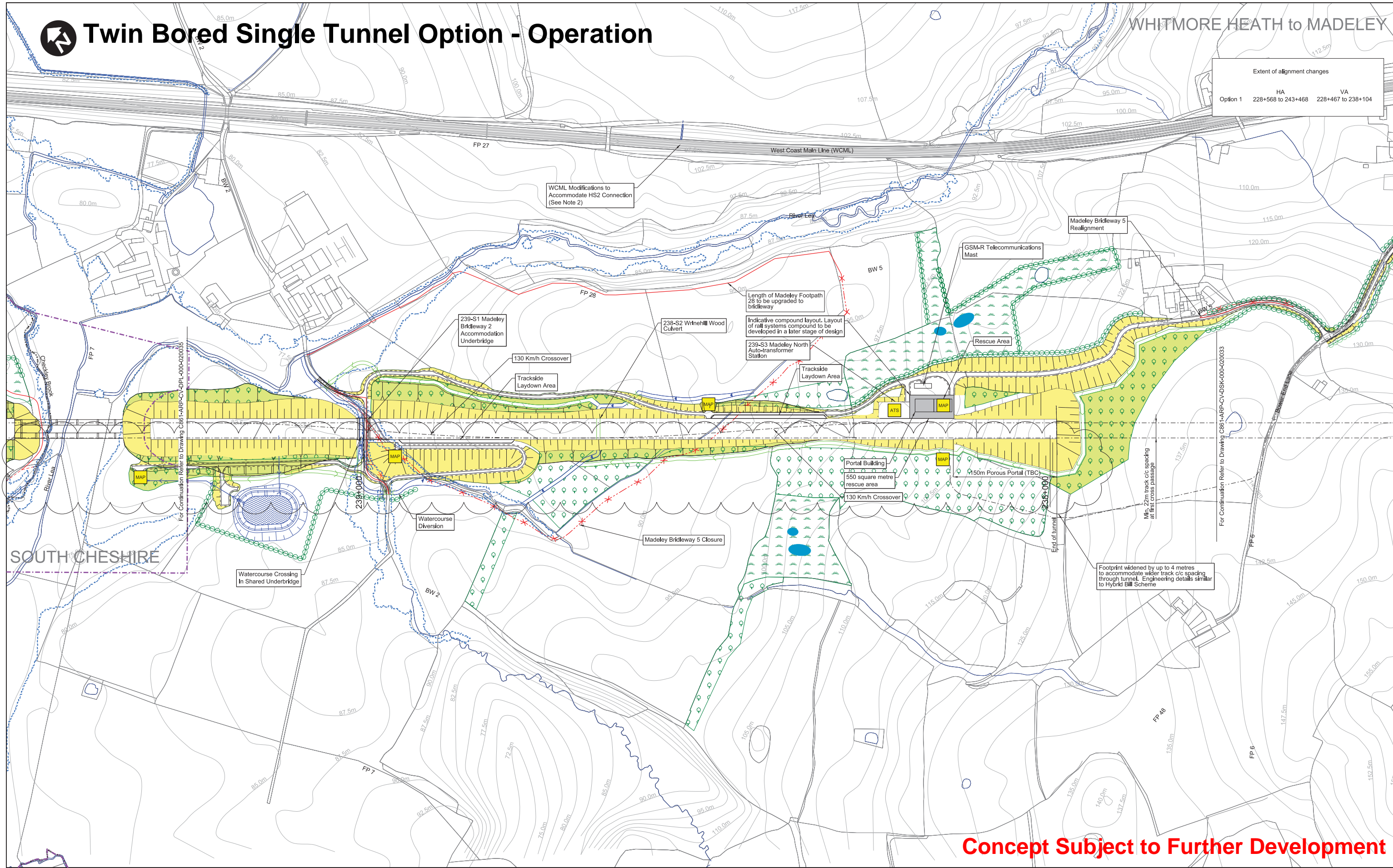
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|---------------|---|---------------------|--|
| Zone          | Route Wide  | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Preliminary Concept   | Discipline/Function | Civil                                      |
| Drawing Title | Twin Bored Single Tunnel Option<br>Preliminary Concept General Arrangement Plan | Drawn               | MN   |
|               |   | Checked             | TE   |
|               |   | Approved            | TE   |
| Date          | 13/07/2017  | Scale               | AS SHOWN                                   |
|               |   | Size                | A1   |
| Drawing No.   | C861-ARP-CV-000-020033  | Rev.                | P03  |
|               | Sheet 33  |                     |  |

|                     |  |
|---------------------|--|
| Project/Contract    | P2A Civils Design & Environmental Services |
| Discipline/Function | Civil                                      |
| Drawn               | MN   |
| Checked             | TE   |
| Approved            | TE   |
| Date                | 13/07/2017                                 |
| Scale               | AS SHOWN                                   |
| Size                | A1   |
| Drawing No.         | C861-ARP-CV-000-020033                     |
| Rev.                | P03  |

# Twin Bored Single Tunnel Option - Operation

WHITMORE HEATH to MADELEY

| Extent of alignment changes |                    |                    |
|-----------------------------|--------------------|--------------------|
| Option                      | HA                 | VA                 |
| Option 1                    | 228+568 to 243+468 | 228+467 to 238+104 |



**Concept Subject to Further Development**

| P03 | Minor Refinements   | DS | TE | TE | TE | 01/03/2018 | 01/03/2018 | 01/03/2018 |
|-----|---|----|----|----|----|------------|------------|------------|
| P02 | Minor Refinements   | DS | TE | TE | TE | 28/02/2018 | 28/02/2018 | 28/02/2018 |
| P01 | Updated post-sift selected engineering & mitigation details | DW | TE | TE | TE | 09/02/2018 | 07/02/2018 | 07/02/2018 |

Legends/Notes:  
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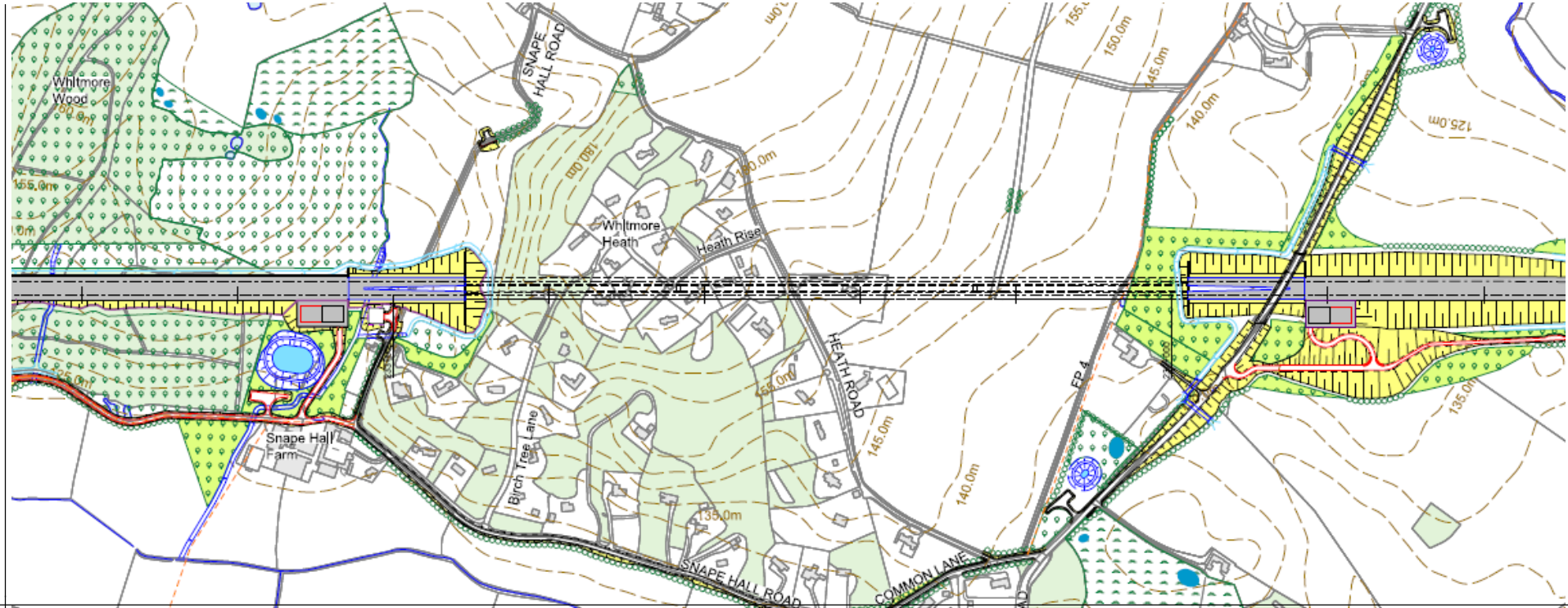
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|---------------|---------------------------------|---------------------|--|
| Zone          | Route Wide                      | Project/Contract    | P2A Civils Design & Environmental Services |
| Design Stage  | Preliminary Concept             | Discipline/Function | Civil                                      |
| Drawing Title | Twin Bored Single Tunnel Option | Drawn               | MN   |
|               |                                 | Checked             | TE   |
|               |                                 | Approved            | TE   |
|               |                                 | Date                | 13/07/2017                                 |
|               |                                 | Scale               | AS SHOWN                                   |
|               |                                 | Size                | A1   |
|               |                                 | Sheet               | 34   |
|               |                                 | Drawing No.         | C861-ARP-CV-000-020034                     |
|               |                                 | Rev.                | P03  |

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| Description | Drawn | Checked | Con App | HS2 App |
|-------------|-------|---------|---------|---------|

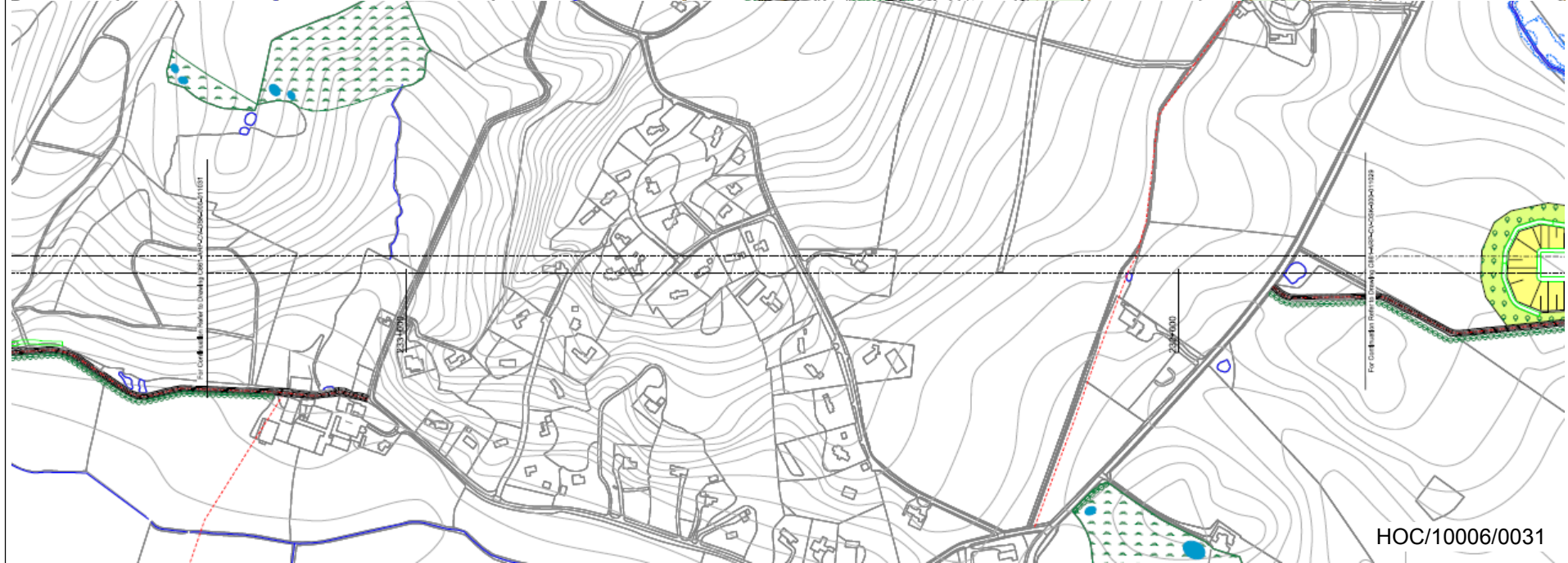


# Map CT-06-230

The Proposed Scheme

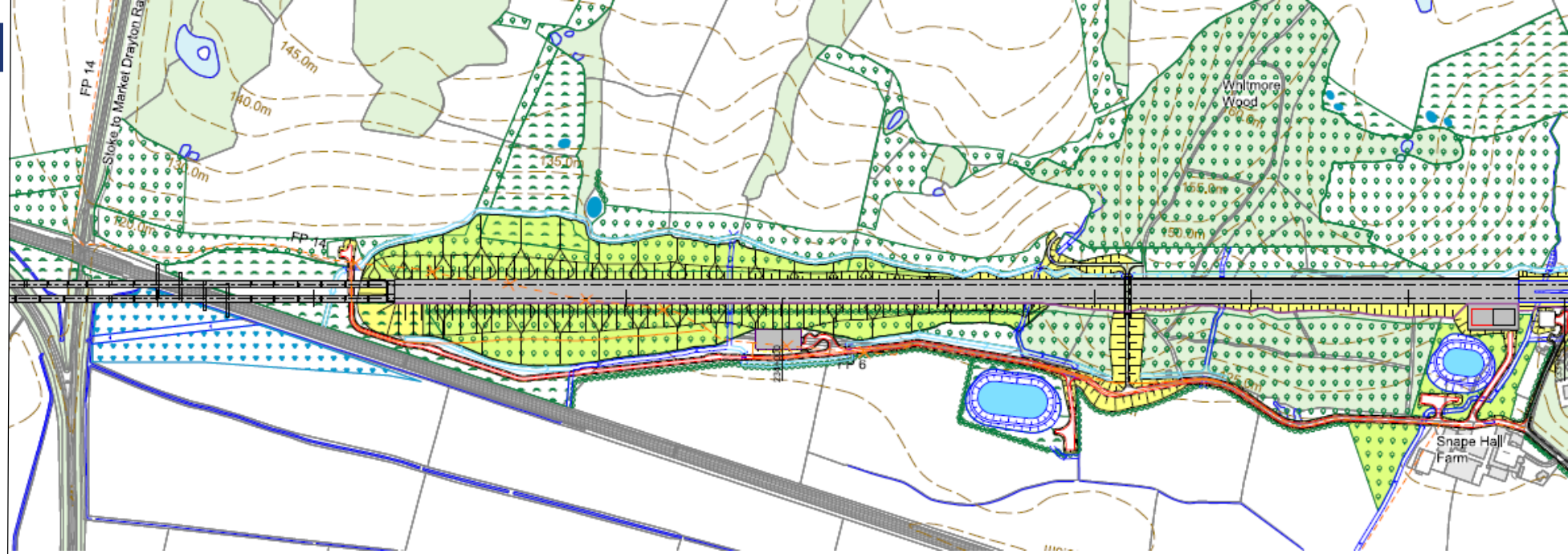


Twin Bored Single Tunnel Option

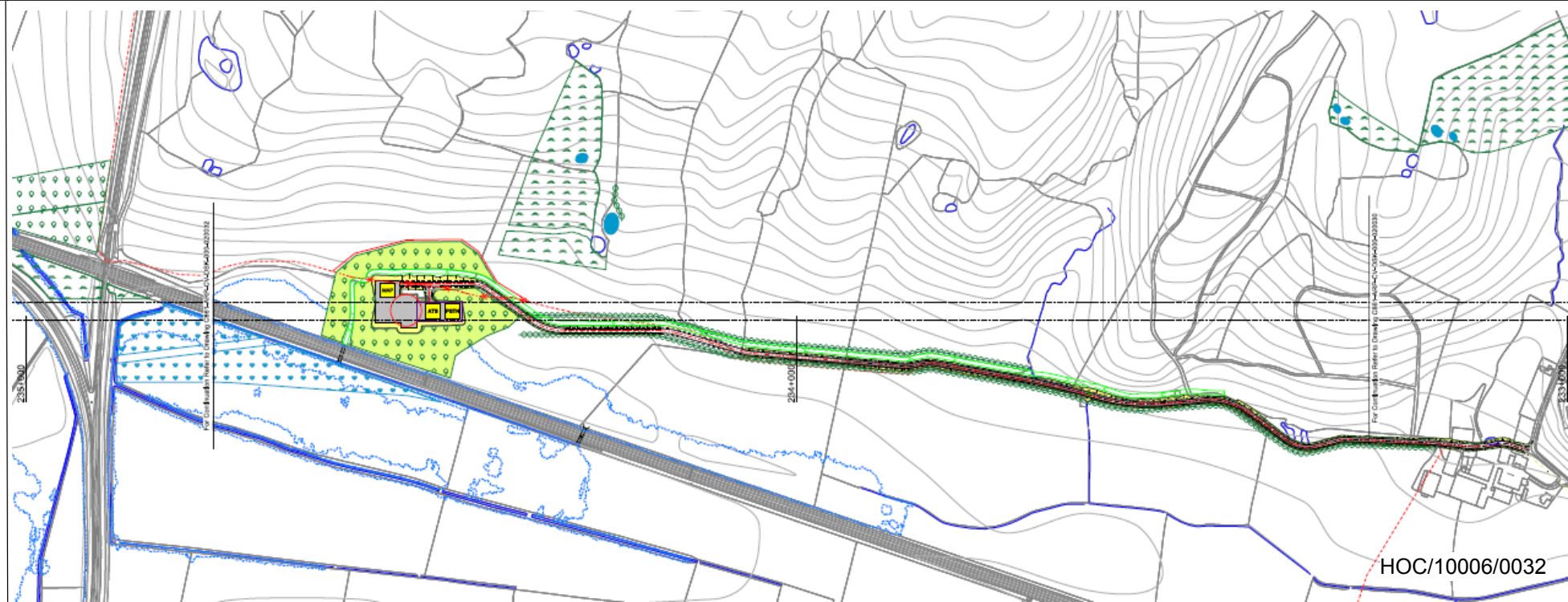


# Map CT-06-231

The Proposed Scheme



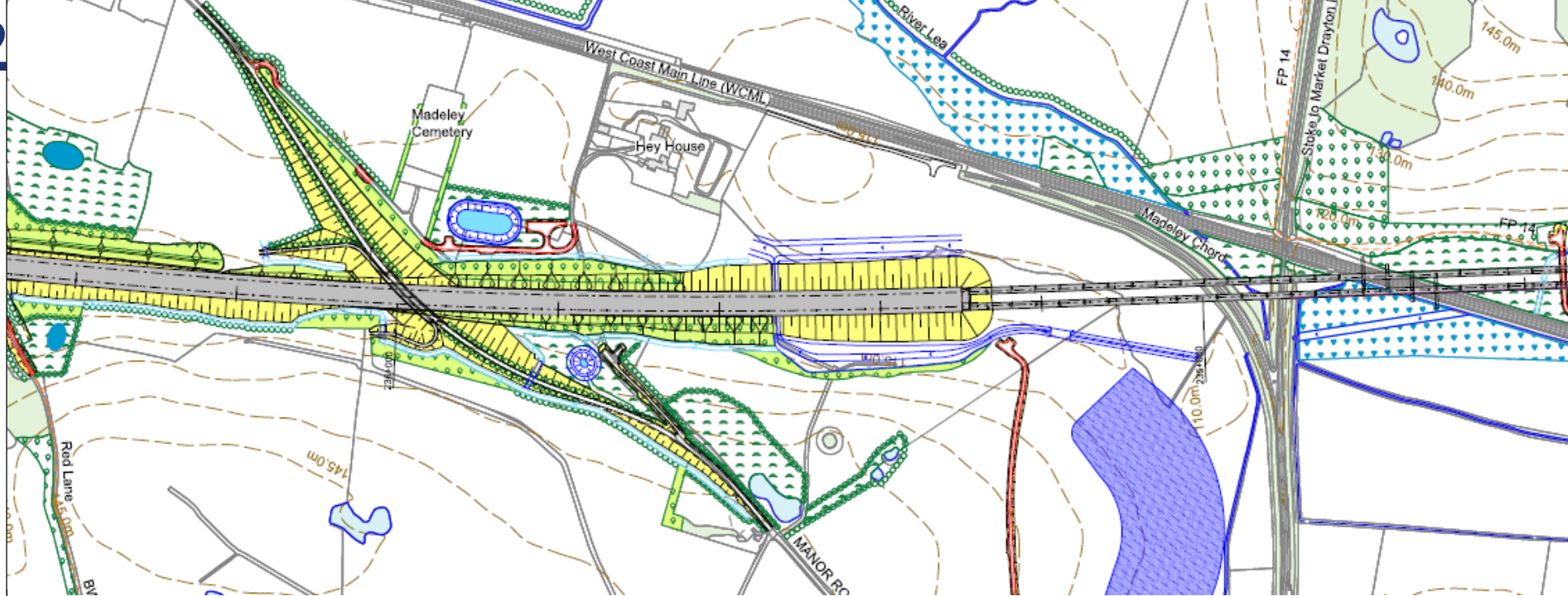
Twin Bored Single Tunnel Option



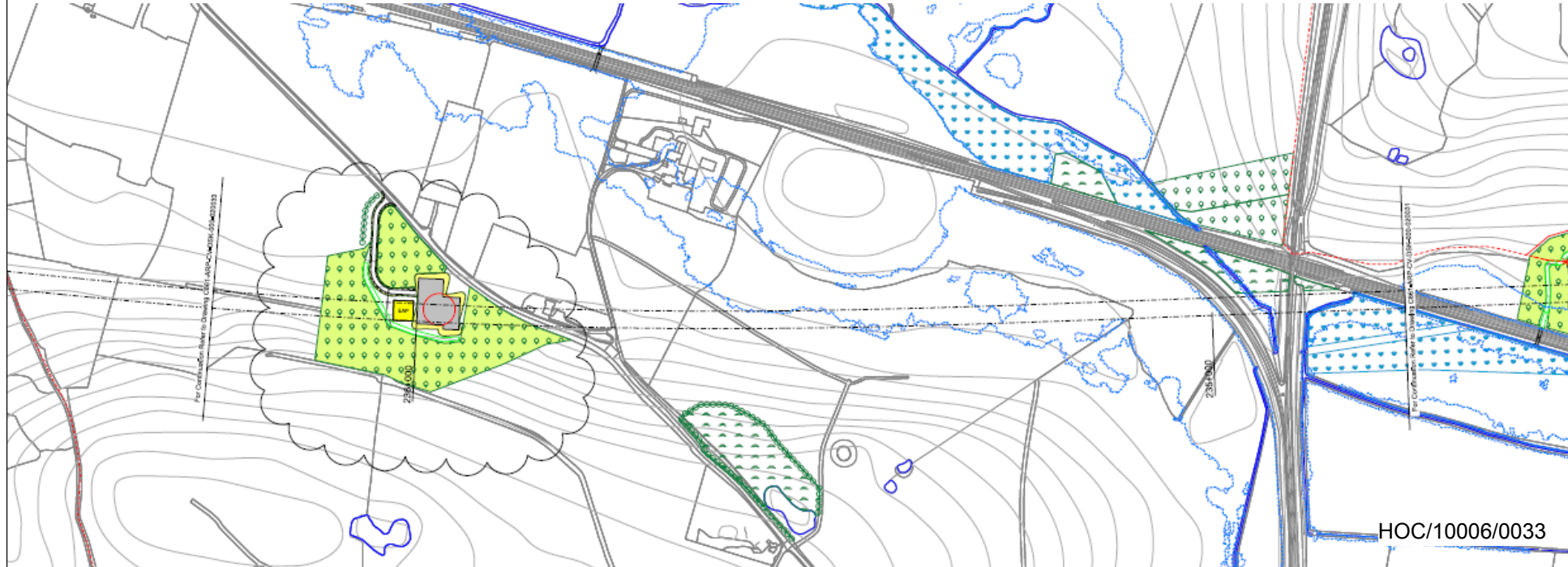


# Map CT-06-232

The Proposed Scheme

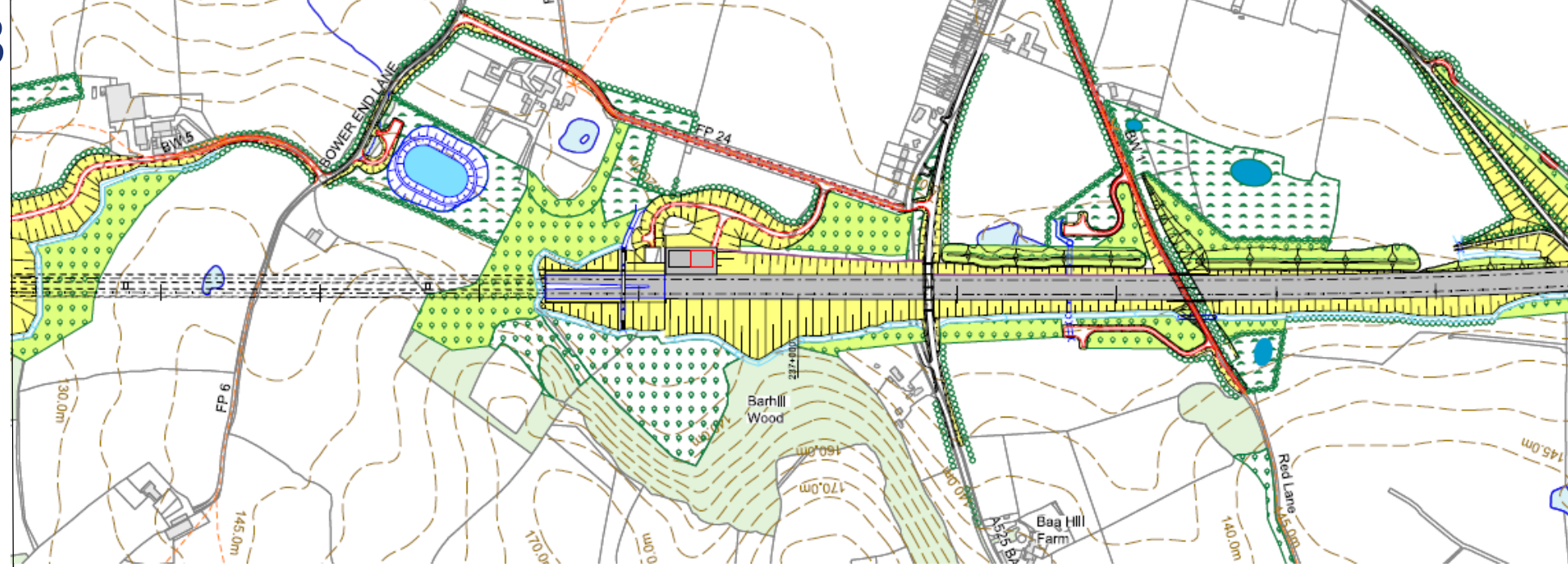


Twin Bored Single Tunnel Option

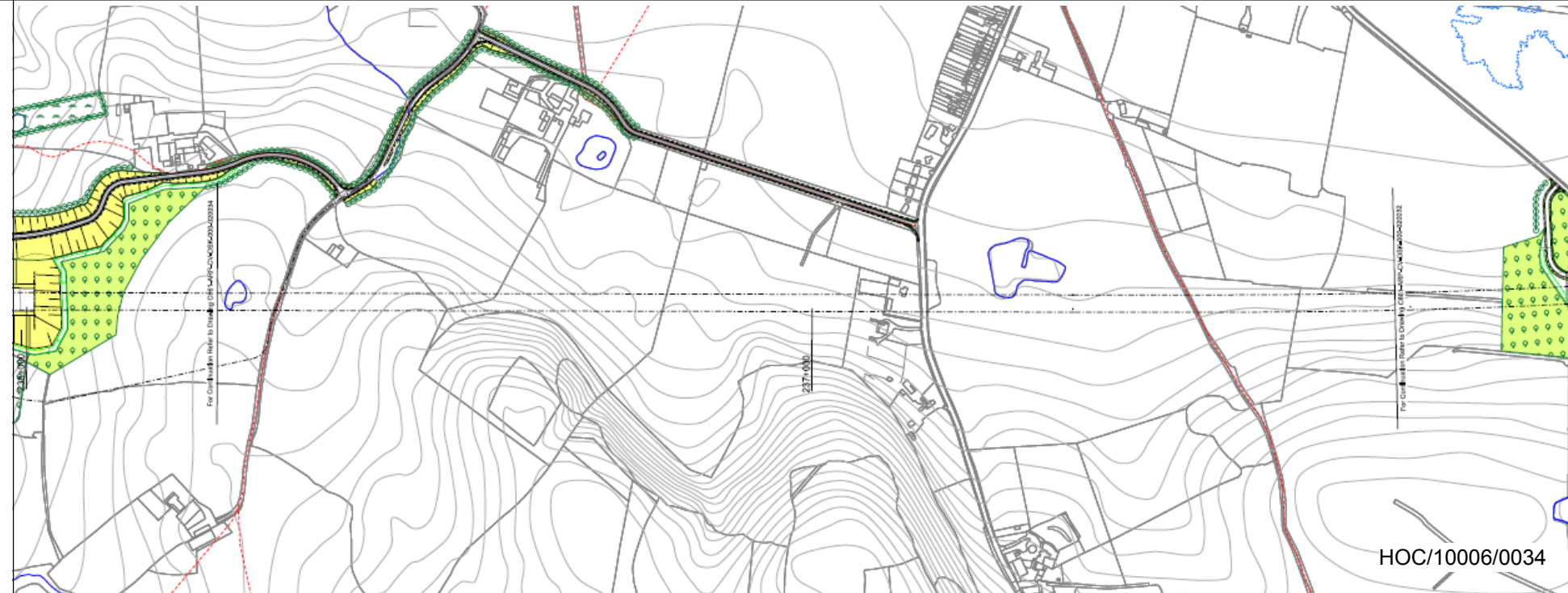


# Map CT-06-233

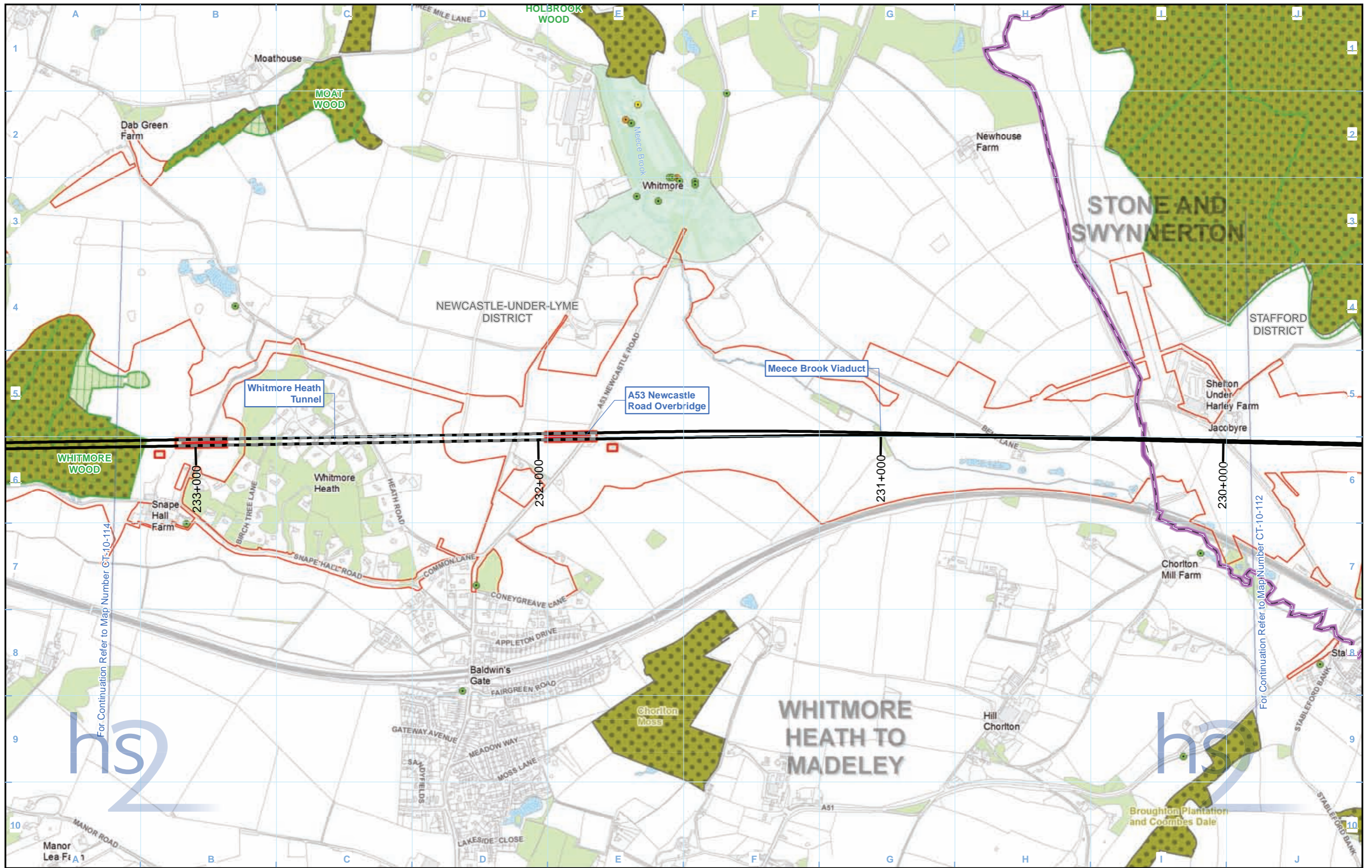
The Proposed Scheme



Twin Bored Single Tunnel Option







**Legend**

- Route in tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Land potentially required during construction
- Community area boundary
- County boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Conservation areas
- Scheduled monument
- Listed building grade I
- Listed building grade II\*
- Listed building grade II
- Registered park or garden
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Local Wildlife Site (LWS)
- Ancient Woodland Inventory Sites (AWIS)
- Ramsar Site - Wetland of International Importance

For Continuation Refer to Map Number CT-10-114

233+000

232+000

231+000

230+000

Whitmore Heath Tunnel

A53 Newcastle Road Overbridge

Meece Brook Viaduct

Whitmore Heath

Chorlton Moss

Whitmore

NEWCASTLE-UNDER-LYME DISTRICT

STAFFORD DISTRICT

Manor Lea Farm

Snape Hall Farm

Chorlton Mill Farm

Hill Chorlton

Broughton Plantation and Coombes Dale

Map Number CT-10-113b

Map Name Environmental Baseline

Community Area 4: Whitmore Heath to Madeley

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0 100 200 300 400 Metres

For Continuation Refer to Map Number CT-10-112

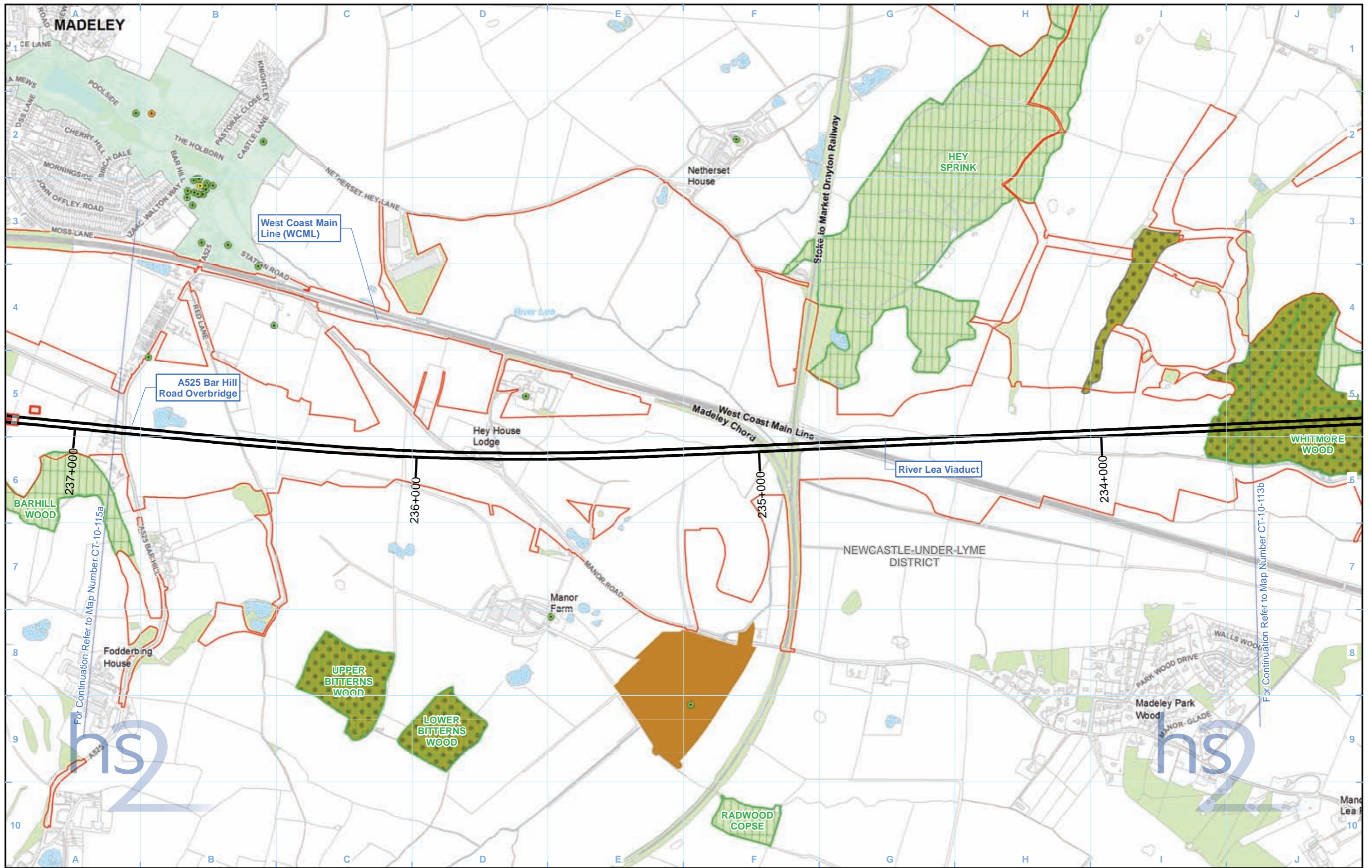
Sta 8

STABLEFORD BANK

STABLEFORD BANK

Scale at A3: 1:10,000

HOC/10006/0036



| Legend |  |  |  |
|--------|--|--|--|
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|        |  |  |  |

|            |  |
|------------|--|
| Map Number | CT-10-114                                      |
| Map Name   | Environmental Baseline                         |
|            | Community Area 4:<br>Whitmore Heath to Madeley |

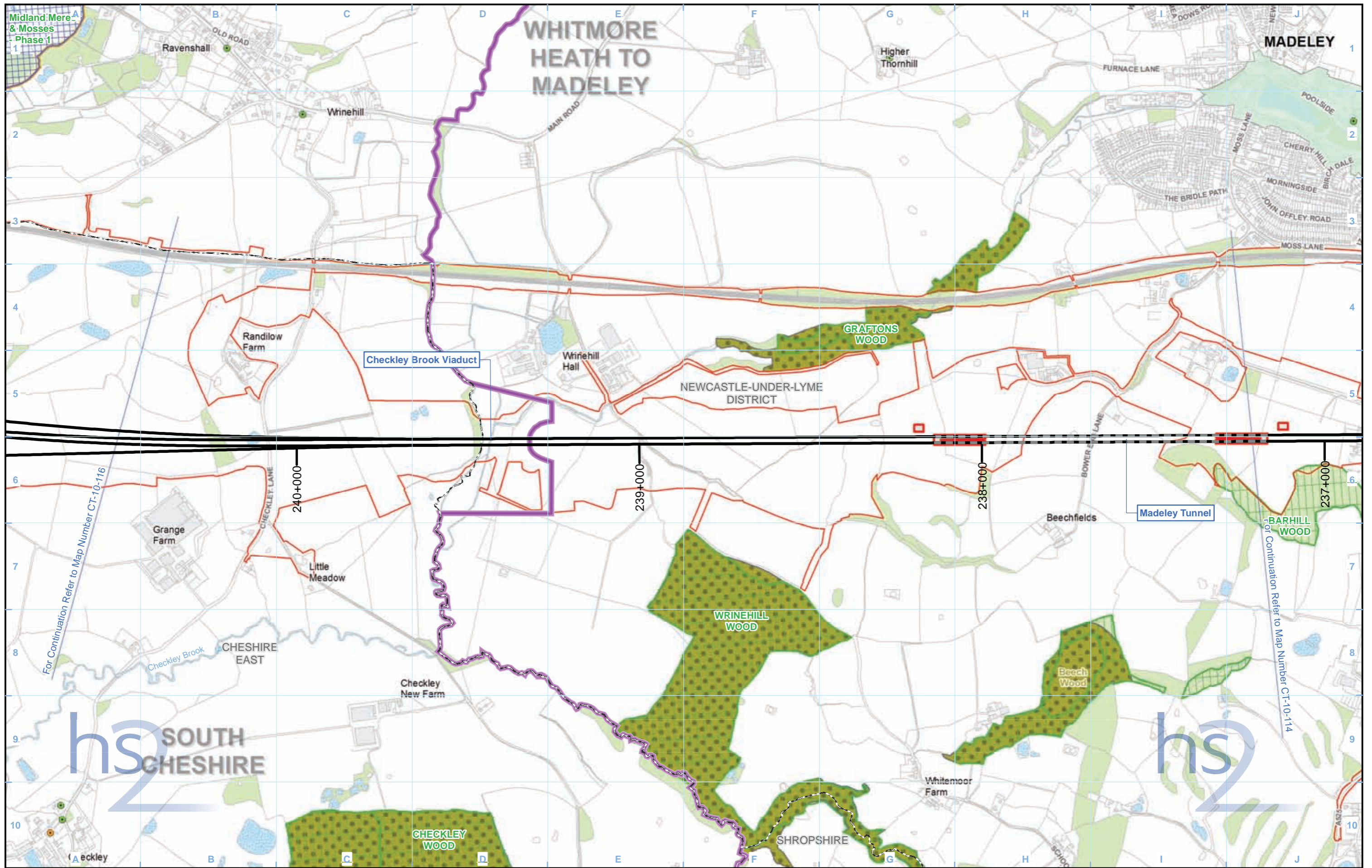
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Doc Number: C861-ARP-EV-MAP-000-060114-P03



| Legend |   |  |   |
|--------|---|--|---|
|        | Route in tunnel                               |  | Watercourse                                       |
|        | Route on surface                              |  | Water body  |
|        | Depot, station, headhouse or portal building  |  | Conservation areas                                |
|        | Land potentially required during construction |  | Scheduled monument                                |
|        | Community area boundary                       |  | Listed building grade I                           |
|        | County boundary                               |  | Listed building grade II*                         |
|        | District/Borough boundary                     |  | Listed building grade II                          |
|        |   |  | Registered park or garden                         |
|        |   |  | Site of Special Scientific Interest (SSSI)        |
|        |   |  | Local Nature Reserve (LNR)                        |
|        |   |  | Local Wildlife Site (LWS)                         |
|        |   |  | Ancient Woodland Inventory Sites (AWIS)           |
|        |   |  | Ramsar Site - Wetland of International Importance |

|            |  |
|------------|--|
| Map Number | CT-10-115a                                     |
| Map Name   | Environmental Baseline                         |
|            | Community Area 4:<br>Whitmore Heath to Madeley |

**hs2**

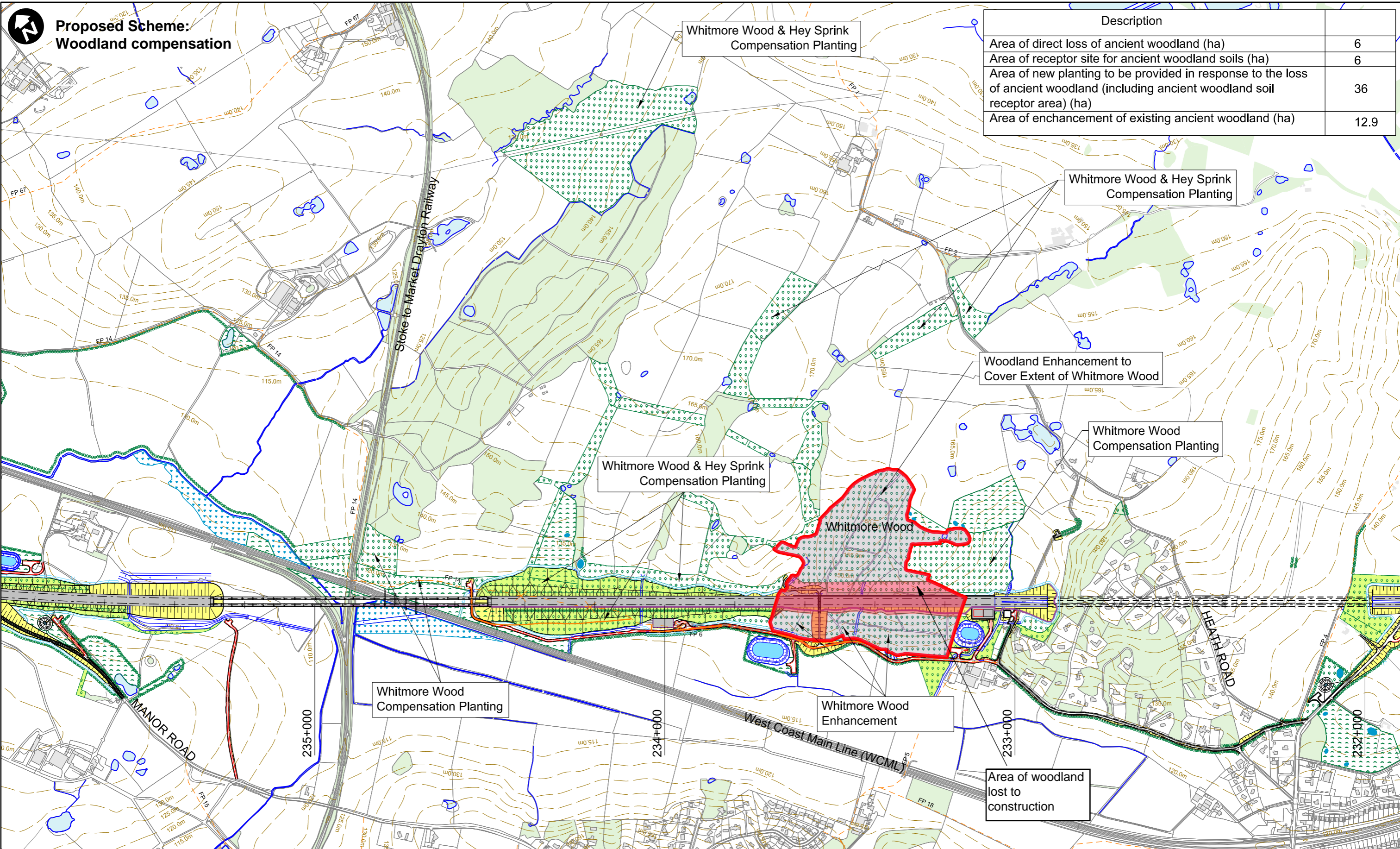
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Doc Number: C861-ARP-EV-MAP-000-060215-P03



| Description  |      |
|--|------|
| Area of direct loss of ancient woodland (ha)   | 6    |
| Area of receptor site for ancient woodland soils (ha)  | 6    |
| Area of new planting to be provided in response to the loss of ancient woodland (including ancient woodland soil receptor area) (ha) | 36   |
| Area of enhancement of existing ancient woodland (ha)  | 12.9 |

|     |             |       |         |         |   |   |
|-----|-------------|-------|---------|---------|---|---|
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|     | Description | Drawn | Checked | Con App | HS2 App   | Scale with caution as distortion can occur. |

| Legends/Notes: |  |
|----------------|--|
|                | Balancing pond                                   |
|                | Grassland habitat creation                       |
|                | Landscape mitigation planting (scrub / woodland) |
|                | Grassed areas                                    |
|                | Engineering earthworks                           |
|                | Landscape earthworks                             |
|                | Rail alignment                                   |
|                | Rail alignment formation                         |
|                | Ditches - new                                    |
|                | Hedgerow habitat creation                        |
|                | Existing public right of way                     |
|                | Rail alignment                                   |
|                | HS2 Access road                                  |
|                | Ancient Woodland                                 |

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 Birmingham, B4 6GA

Creator/Originator  
 Ove Arup & Partners International Ltd

|  |                            |
|--|----------------------------|
| Zone                                   | CA4                        |
| Design Stage                           | Designs for Petition       |
| Drawing Title                          | Whitmore Wood Exhibit Pack |
| Proposed Scheme: Woodland compensation |                            |

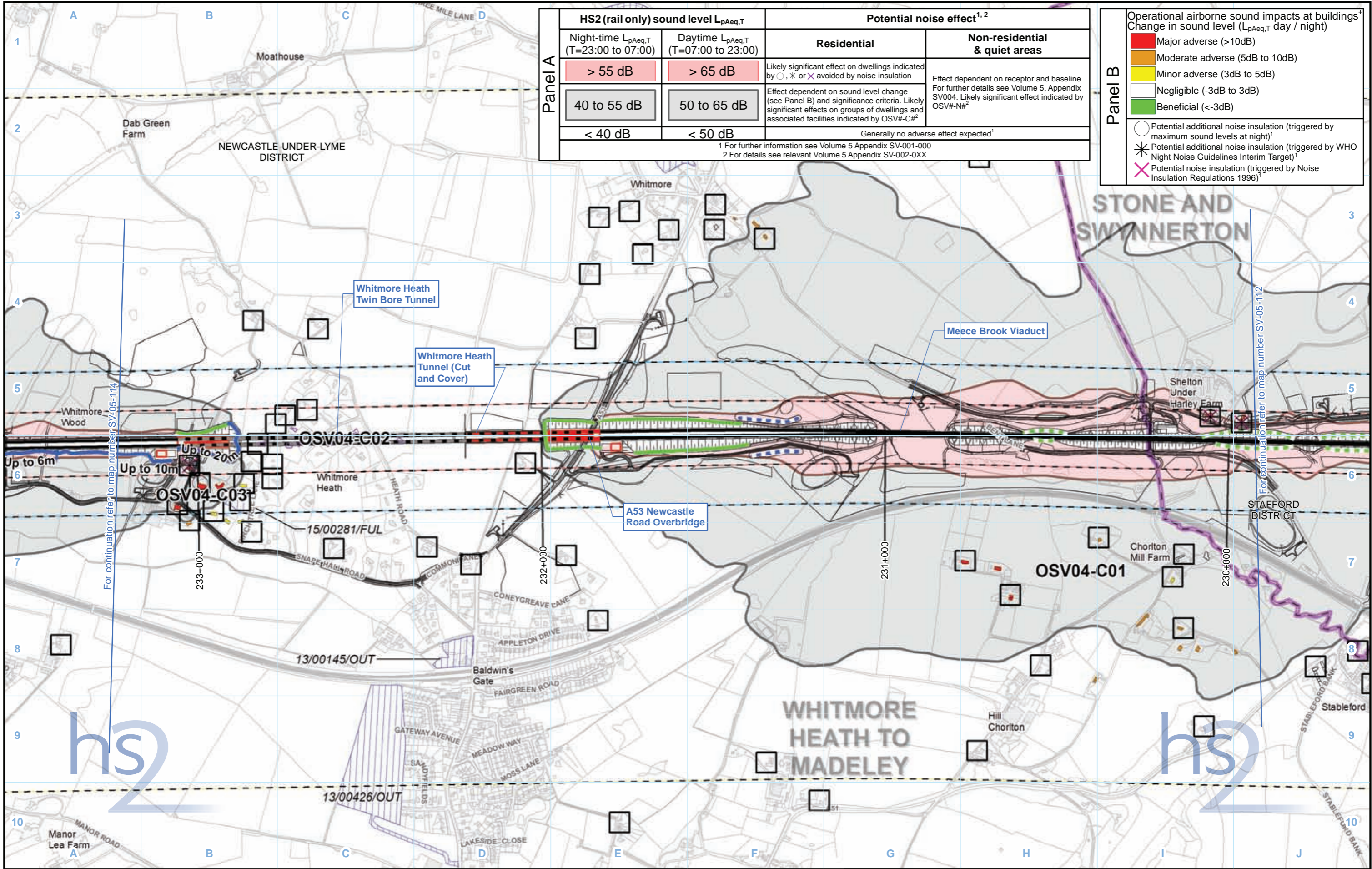
|                     |         |          |  |         |       |
|---------------------|---------|----------|--|---------|-------|
| Project/Contract    |         |          | P2A Civils Design & Environmental Services |         |       |
| Discipline/Function |         |          | Engineering                                |         |       |
| Drawn               | Checked | Approved | DW   | AC      | TE    |
| Date                | Scale   | Size     | 15/04/2018                                 | 1:10000 | A3    |
| Drawing No.         |         | Rev.     | C861-ARP-EV-DSK-000-000120                 |         | P00.1 |

# Whitmore Wood Local Wildlife Site

- Whitmore Wood Local Wildlife Site covers an area of approximately 16.6ha, all of which plus an additional 1.3ha of woodland is listed as an Ancient Woodland Inventory Site.
- The Local Wildlife Site is designated for deciduous and ancient woodland:

*The canopy is dominated by downy birch with occasional rowan and hazel. The middle and the south-west corner sections of the woodland are dominated by coniferous plantations, such as larch and western red cedar. Eleven vascular plant species indicative of ancient woodland are also present, including yellow archangel and bluebell.*
- The area affected by construction of the Proposed Scheme (approximately 6ha in total) is mainly plantation on ancient woodland site (consisting of planted mature larch), but some areas of deciduous woodland are also affected.
- Species including badgers, bats and fallow deer are present in the local area and could potentially utilise the wood for foraging and breeding purposes.





| Panel A | HS2 (rail only) sound level $L_{pAeq,T}$      |  | Potential noise effect <sup>1,2</sup>   |  |
|---------|---|--|---|--|
|         | Night-time $L_{pAeq,T}$<br>(T=23:00 to 07:00) | Daytime $L_{pAeq,T}$<br>(T=07:00 to 23:00) | Residential   | Non-residential<br>& quiet areas   |
|         | > 55 dB                                       | > 65 dB                                    | Likely significant effect on dwellings indicated by ○, * or X avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
|         | 40 to 55 dB                                   | 50 to 65 dB                                | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> | Generally no adverse effect expected <sup>1</sup>  |
| < 40 dB | < 50 dB                                       |  |   |  |

1 For further information see Volume 5 Appendix SV-001-000  
2 For details see relevant Volume 5 Appendix SV-002-0XX

| Panel B | Operational airborne sound impacts at buildings <sup>1</sup><br>Change in sound level ( $L_{pAeq,T}$ day / night) |
|---------|---|
| Red     | Major adverse (>10dB)   |
| Orange  | Moderate adverse (5dB to 10dB)  |
| Yellow  | Minor adverse (3dB to 5dB)  |
| White   | Negligible (-3dB to 3dB)  |
| Green   | Beneficial (<-3dB)  |

○ Potential additional noise insulation (triggered by maximum sound levels at night)<sup>1</sup>  
\* Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target)<sup>1</sup>  
X Potential noise insulation (triggered by Noise Insulation Regulations 1996)<sup>1</sup>

**Legend - General features**

- Route in bored tunnel
- Route in cut and cover tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Community area boundary
- County boundary
- District/Borough boundary

**Legend - Sound related features**

Engineering earthworks:

- Embankment
- Cutting

Non engineering earthworks:

- Embankment
- Cutting

Committed developments - SV Only

Envisaged mitigation to avoid / reduce significant noise effects:

- Landscaping and/or fence barriers\*
- Engineering e.g. cuttings (green tunnels separately marked)

Envisaged measures further reducing noise effects:

- Other environmental e.g. landscaping
- Engineering e.g. cuttings

\* Residential buildings only  
\* Labelled with total barrier height above rail level  
\*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

- 1km Airborne sound study area
- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Ground-borne noise or vibration impact\*
- $L_{pAFmax}$  exceeds 60dB façade\*\*

Map Number: SV-05-113b

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects

Community Area 4: Whitmore Heath to Madeley

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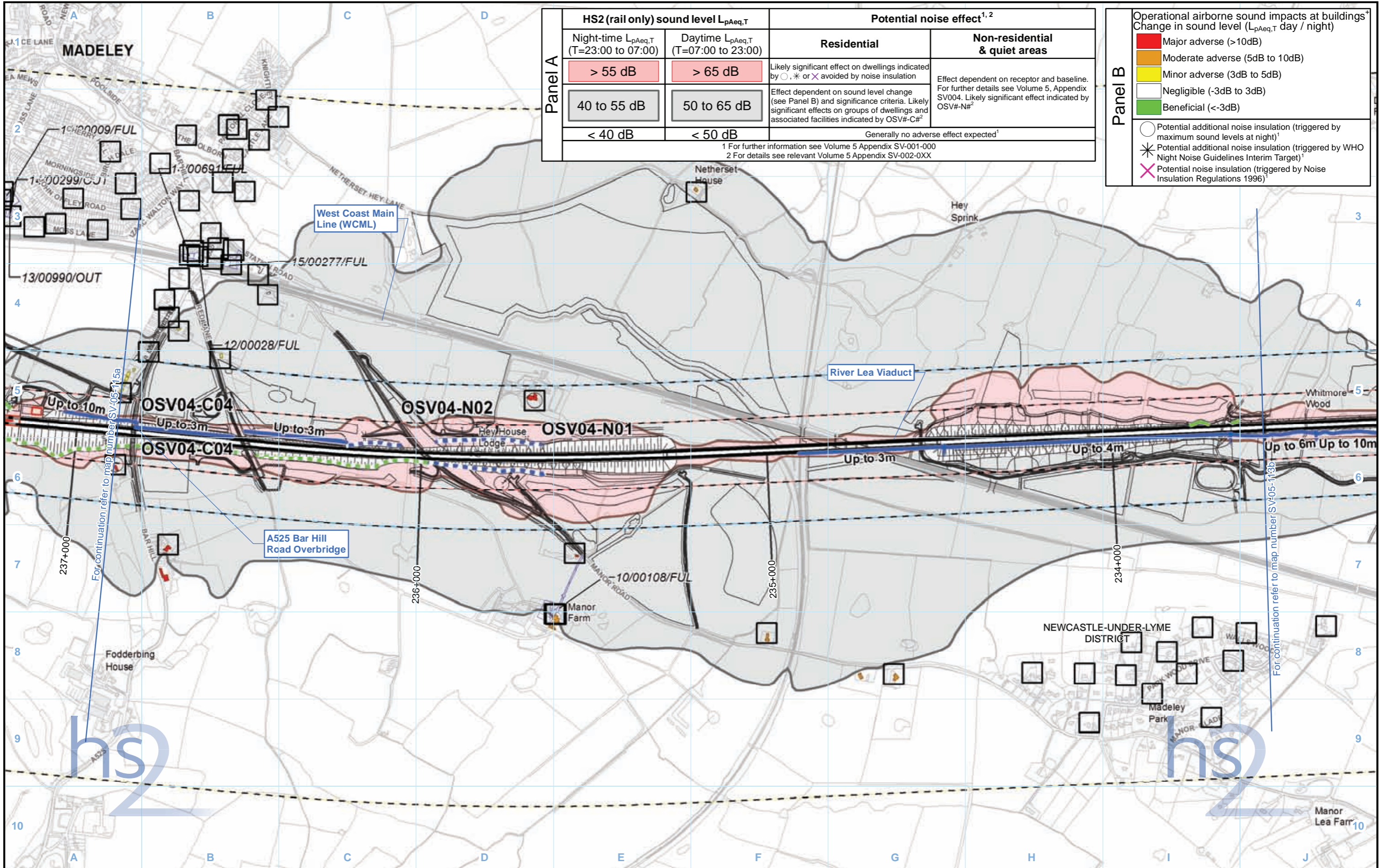
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Doc Number: C861-ARP-EV-MAP-000-135213-P03

THOC/10006/0041



| HS2 (rail only) sound level $L_{pAeq,T}$      |  | Potential noise effect <sup>1,2</sup>   |  |
|---|--|---|--|
| Night-time $L_{pAeq,T}$<br>(T=23:00 to 07:00) | Daytime $L_{pAeq,T}$<br>(T=07:00 to 23:00) | Residential   | Non-residential<br>& quiet areas   |
| > 55 dB                                       | > 65 dB                                    | Likely significant effect on dwellings indicated by ○, * or X avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
| 40 to 55 dB                                   | 50 to 65 dB                                | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> | Generally no adverse effect expected <sup>1</sup>  |
| < 40 dB                                       | < 50 dB                                    |   |  |

1 For further information see Volume 5 Appendix SV-001-000  
2 For details see relevant Volume 5 Appendix SV-002-0XX

| Operational airborne sound impacts at buildings <sup>1</sup><br>Change in sound level ( $L_{pAeq,T}$ day / night) |   |
|---|---|
| Major adverse (>10dB)   | Potential additional noise insulation (triggered by maximum sound levels at night) <sup>1</sup>             |
| Moderate adverse (5dB to 10dB)  | Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target) <sup>1</sup> |
| Minor adverse (3dB to 5dB)  | Potential noise insulation (triggered by Noise Insulation Regulations 1996) <sup>1</sup>                    |
| Negligible (-3dB to 3dB)  |   |
| Beneficial (<-3dB)  |   |

**Legend - General features**

- Route in bored tunnel
- Route in cut and cover tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Community area boundary
- County boundary
- District/Borough boundary

**Legend - Sound related features**

Engineering earthworks:

- Embankment
- Cutting

Non engineering earthworks:

- Embankment
- Cutting

Committed developments - SV Only

Envisaged mitigation to avoid / reduce significant noise effects:

- Landscaping and/or fence barriers\*
- Engineering e.g. cuttings (green tunnels separately marked)

Envisaged measures further reducing noise effects:

- Other environmental e.g. landscaping
- Engineering e.g. cuttings

\* Residential buildings only  
\* Labelled with total barrier height above rail level  
\*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

- 1km Airborne sound study area
- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Ground-borne noise or vibration impact\*
- $L_{pAFmax}$  exceeds 60dB façade\*\*

Map Number: SV-05-114

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects

Community Area 4: Whitmore Heath to Madeley

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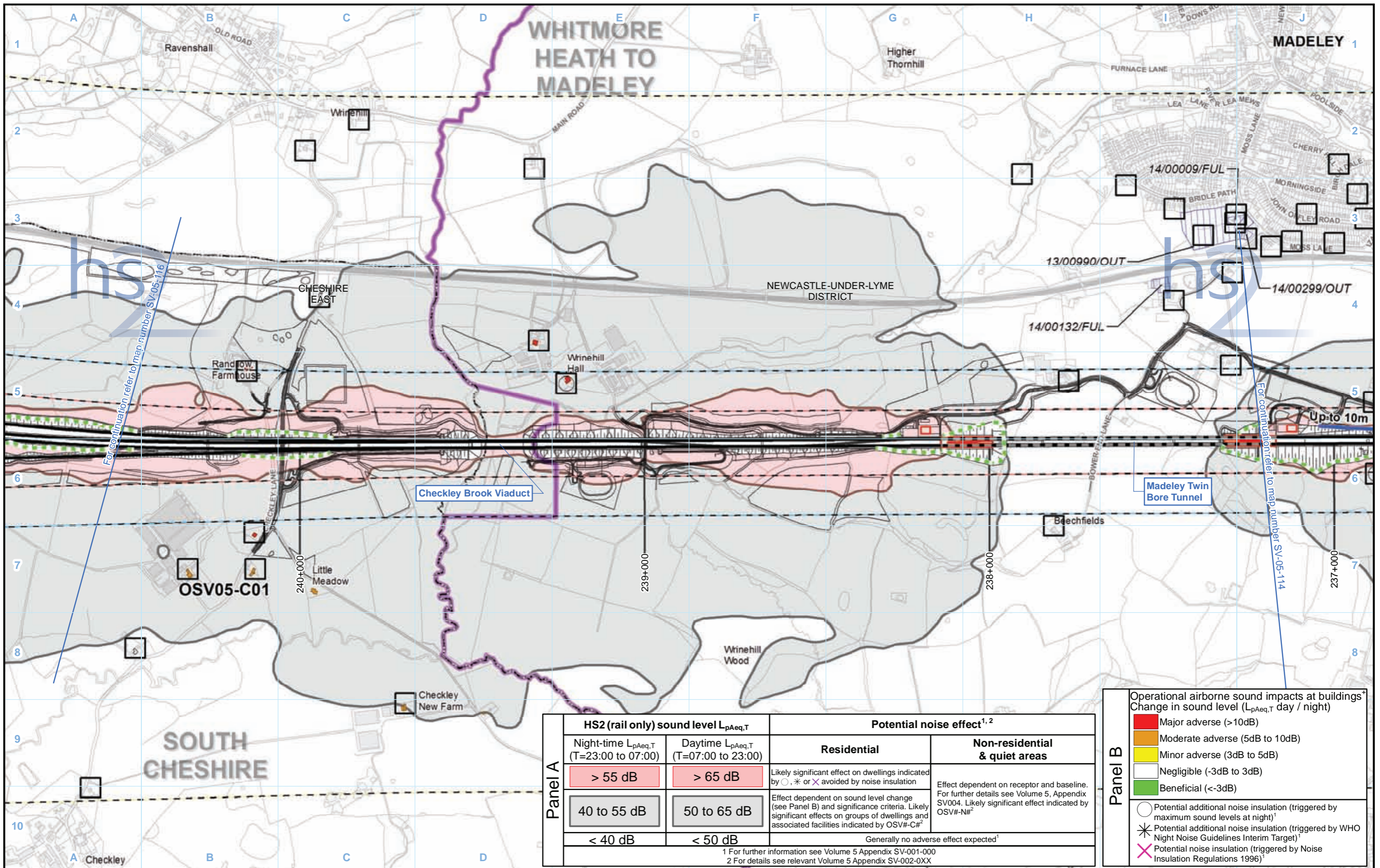
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THOC/10006/0042



| Panel A | HS2 (rail only) sound level $L_{pAeq,T}$      |   | Potential noise effect <sup>1, 2</sup>  |  |
|---------|---|---|---|--|
|         | Night-time $L_{pAeq,T}$<br>(T=23:00 to 07:00) | Daytime $L_{pAeq,T}$<br>(T=07:00 to 23:00)        | Residential   | Non-residential & quiet areas  |
|         | > 55 dB                                       | > 65 dB   | Likely significant effect on dwellings indicated by ○, * or ✕ avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
|         | 40 to 55 dB                                   | 50 to 65 dB                                       | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> |  |
| < 40 dB | < 50 dB                                       | Generally no adverse effect expected <sup>1</sup> |   |  |

1 For further information see Volume 5 Appendix SV-001-000  
2 For details see relevant Volume 5 Appendix SV-002-0XX

**Operational airborne sound impacts at buildings\***  
Change in sound level ( $L_{pAeq,T}$  day / night)

- Major adverse (>10dB)
- Moderate adverse (5dB to 10dB)
- Minor adverse (3dB to 5dB)
- Negligible (-3dB to 3dB)
- Beneficial (<-3dB)

**Panel B**

- Potential additional noise insulation (triggered by maximum sound levels at night)<sup>1</sup>
- \* Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target)<sup>1</sup>
- ✕ Potential noise insulation (triggered by Noise Insulation Regulations 1996)<sup>1</sup>

**Legend - General features**

- Route in bored tunnel
- Route in cut and cover tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Community area boundary
- County boundary
- District/Borough boundary

**Legend - Sound related features**

Engineering earthworks:

- Embankment
- Cutting

Non engineering earthworks:

- Embankment
- Cutting

Committed developments - SV Only

- Landscaping and/or fence barriers\*
- Engineering e.g. cuttings (green tunnels separately marked)
- Other environmental e.g. landscaping
- Engineering e.g. cuttings

\* Residential buildings only  
\* Labelled with total barrier height above rail level  
\*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

**Legend - Sound related features**

- 1km Airborne sound study area
- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Ground-borne noise or vibration impact\*
- $L_{pAFmax}$  exceeds 60dB façade\*\*

Map Number: SV-05-115a

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects

Community Area 4: Whitmore Heath to Madeley

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THOC/10006/0043

**Panel B**

Operational airborne sound impacts at buildings  
Change in sound level ( $L_{pAeq,T}$  day / night)

|                                |
|--------------------------------|
| Major adverse (>10dB)          |
| Moderate adverse (5dB to 10dB) |
| Minor adverse (3dB to 5dB)     |
| Negligible (-3dB to 3dB)       |
| Beneficial (<-3dB)             |

○ Potential additional noise insulation (triggered by maximum sound levels at night)<sup>1</sup>

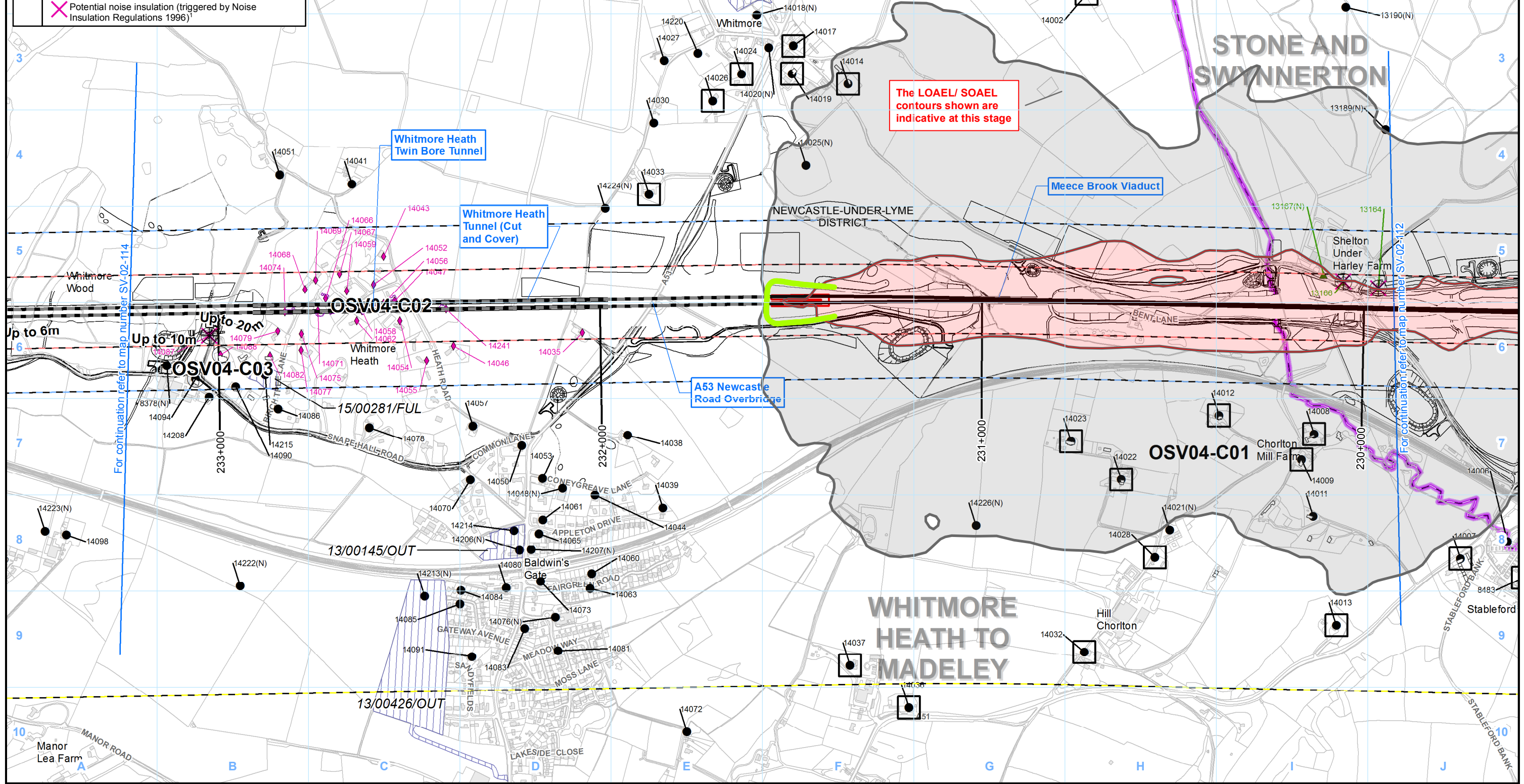
\* Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target)<sup>1</sup>

✕ Potential noise insulation (triggered by Noise Insulation Regulations 1996)<sup>1</sup>

**Panel A**

| HS2 (rail only) sound level $L_{pAeq,T}$      |  | Potential noise effect <sup>1,2</sup>   |  |
|---|--|---|--|
| Night-time $L_{pAeq,T}$<br>(T=23:00 to 07:00) | Daytime $L_{pAeq,T}$<br>(T=07:00 to 23:00) | Residential   | Non-residential & quiet areas  |
| > 55 dB                                       | > 65 dB                                    | Likely significant effect on dwellings indicated by ○, * or ✕ avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
| 40 to 55 dB                                   | 50 to 65 dB                                | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> |  |
| < 40 dB                                       | < 50 dB                                    | Generally no adverse effect expected <sup>1</sup>   |  |

<sup>1</sup> For further information see Volume 5 Appendix SV-001-000  
<sup>2</sup> For details see relevant Volume 5 Appendix SV-002-0XX



**Legend - General features**

- Route in bored tunnel
- Route in cut and cover tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Community area boundary
- County boundary
- District/Borough boundary

**Engineering earthworks:**

- Embankment
- Cutting
- $L_{pAFmax}$  exceeds 60dB façade\*\*

**Non engineering earthworks:**

- Embankment
- Cutting

\* Residential buildings only  
\* Labelled with total barrier height above rail level  
\*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

**Legend - Sound related features**

- Committed developments - SV Only
- Envisaged mitigation to avoid / reduce significant noise effects:
  - Landscaping and/or fence barriers\*
  - Engineering e.g. cuttings (green tunnels separately marked)
  - Envisaged measures further reducing noise effects:
    - Other environmental e.g. landscaping
    - Engineering e.g. cuttings
    - 1km Airborne sound study area

- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Airborne sound assessment location
- Airborne sound and vibration assessment location
- Ground-borne sound and/or vibration assessment location
- Airborne sound, ground-borne sound and vibration assessment location
- Ground-borne noise or vibration impact\*

Map Number: SV-02-113a

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects (with Assessment Locations) SES and AP ES

Community Area 3: Stone and Swynnerton

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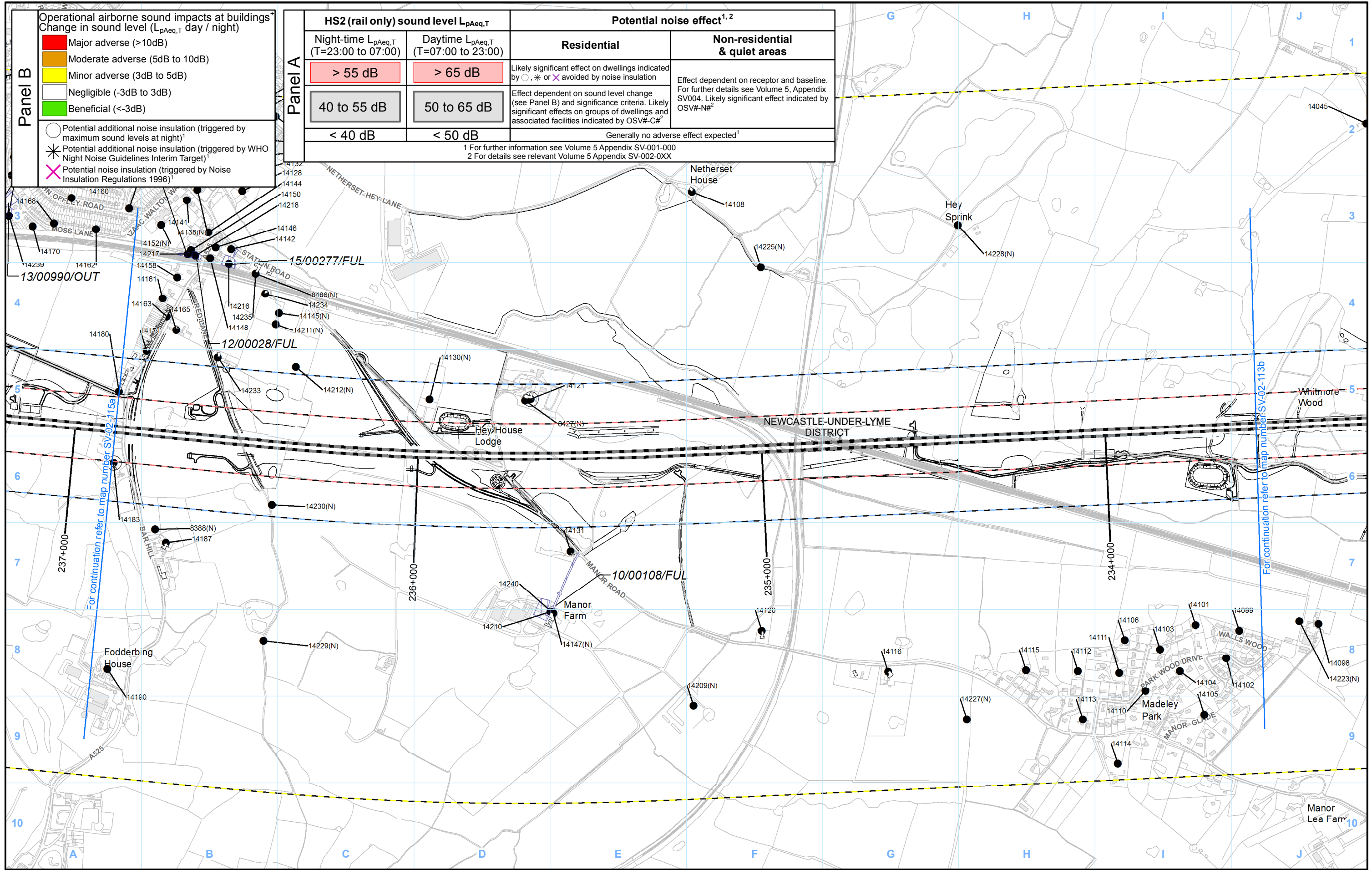
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HOC/10006/0044



**Operational airborne sound impacts at buildings**  
Change in sound level ( $L_{pAeq,T}$  day / night)

|                                |
|--------------------------------|
| Major adverse (>10dB)          |
| Moderate adverse (5dB to 10dB) |
| Minor adverse (3dB to 5dB)     |
| Negligible (-3dB to 3dB)       |
| Beneficial (<-3dB)             |

○ Potential additional noise insulation (triggered by maximum sound levels at night)<sup>1</sup>  
 ✱ Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target)<sup>1</sup>  
 ✕ Potential noise insulation (triggered by Noise Insulation Regulations 1996)<sup>2</sup>

**Panel A**

| HS2 (rail only) sound level $L_{pAeq,T}$   |   | Potential noise effect <sup>1,2</sup>   |  |
|--|---|---|--|
| Night-time $L_{pAeq,T}$ (T=23:00 to 07:00) | Daytime $L_{pAeq,T}$ (T=07:00 to 23:00) | Residential   | Non-residential & quiet areas  |
| > 55 dB                                    | > 65 dB                                 | Likely significant effect on dwellings indicated by ○, ✱ or ✕ avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
| 40 to 55 dB                                | 50 to 65 dB                             | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> |  |
| < 40 dB                                    | < 50 dB                                 | Generally no adverse effect expected <sup>1</sup>   |  |

<sup>1</sup> For further information see Volume 5 Appendix SV-001-000  
<sup>2</sup> For details see relevant Volume 5 Appendix SV-002-0XX

**Legend - General features**

- Route in bored tunnel
- Route in cut and cover tunnel
- Route on surface
- Depot, station, headhouse or portal building
- Community area boundary
- County boundary
- District/Borough boundary

**Engineering earthworks:**

- Embankment
- Cutting
- $L_{pAFmax}$  exceeds 60dB façade\*\*

**Non engineering earthworks:**

- Embankment
- Cutting

\* Residential buildings only  
 \*\* Labelled with total barrier height above rail level  
 \*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

**Legend - Sound related features**

- Committed developments - SV Only
- Envisaged mitigation to avoid / reduce significant noise effects:
  - Landscaping and/or fence barriers\*
  - Engineering e.g. cuttings (green tunnels separately marked)
  - Envisaged measures further reducing noise effects:
    - Other environmental e.g. landscaping
    - Engineering e.g. cuttings
    - 1km Airborne sound study area

- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Airborne sound assessment location
- Airborne sound and vibration assessment location
- Ground-borne sound and/or vibration assessment location
- Airborne sound, ground-borne sound and vibration assessment location
- Ground-borne noise or vibration impact\*

Map Number: SV-02-114

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects (with Assessment Locations) SES and AP ES

Community Area 4: Whitmore Heath to Madeley

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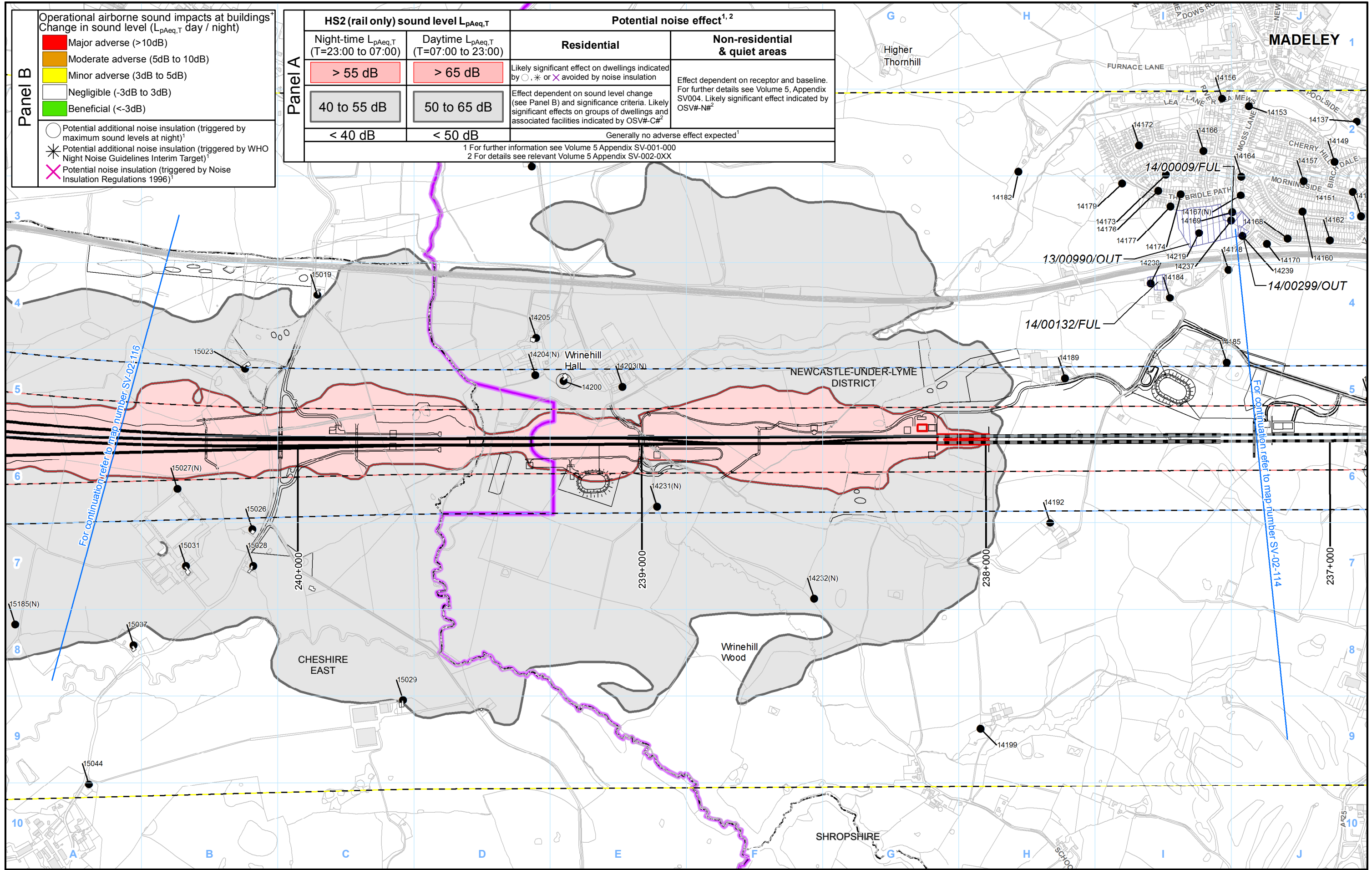
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**Panel B**

Operational airborne sound impacts at buildings  
Change in sound level ( $L_{pAeq,T}$  day / night)

|                                |
|--------------------------------|
| Major adverse (>10dB)          |
| Moderate adverse (5dB to 10dB) |
| Minor adverse (3dB to 5dB)     |
| Negligible (-3dB to 3dB)       |
| Beneficial (<-3dB)             |

○ Potential additional noise insulation (triggered by maximum sound levels at night)<sup>1</sup>

\* Potential additional noise insulation (triggered by WHO Night Noise Guidelines Interim Target)<sup>1</sup>

✕ Potential noise insulation (triggered by Noise Insulation Regulations 1996)<sup>1</sup>

**Panel A**

| HS2 (rail only) sound level $L_{pAeq,T}$      |  | Potential noise effect <sup>1,2</sup>   |  |
|---|--|---|--|
| Night-time $L_{pAeq,T}$<br>(T=23:00 to 07:00) | Daytime $L_{pAeq,T}$<br>(T=07:00 to 23:00) | Residential   | Non-residential & quiet areas  |
| > 55 dB                                       | > 65 dB                                    | Likely significant effect on dwellings indicated by ○, * or ✕ avoided by noise insulation   | Effect dependent on receptor and baseline. For further details see Volume 5, Appendix SV004. Likely significant effect indicated by OSV#-N# <sup>2</sup> |
| 40 to 55 dB                                   | 50 to 65 dB                                | Effect dependent on sound level change (see Panel B) and significance criteria. Likely significant effects on groups of dwellings and associated facilities indicated by OSV#-C# <sup>2</sup> |  |
| < 40 dB                                       | < 50 dB                                    | Generally no adverse effect expected <sup>1</sup>   |  |

<sup>1</sup> For further information see Volume 5 Appendix SV-001-000  
<sup>2</sup> For details see relevant Volume 5 Appendix SV-002-0XX

**Legend - General features**

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**Non engineering earthworks:**

- Embankment
- Cutting

\* Residential buildings only  
\* Labelled with total barrier height above rail level  
\*\* HS2 train only  $L_{pAFmax} + 2.5dB$  façade correction

**Legend - Sound related features**

- Committed developments - SV Only
- Envisaged mitigation to avoid / reduce significant noise effects:
  - Landscaping and/or fence barriers\*
  - Engineering e.g. cuttings (green tunnels separately marked)
- Envisaged measures further reducing noise effects:
  - Other environmental e.g. landscaping
  - Engineering e.g. cuttings
  - 1km Airborne sound study area

- Ground-borne sound & vibration study area (residential and non-residential)
- Ground-borne sound & vibration study area (highly sensitive non-residential)
- Airborne sound assessment location
- Airborne sound and vibration assessment location
- Ground-borne sound and/or vibration assessment location
- Airborne sound, ground-borne sound and vibration assessment location
- Ground-borne noise or vibration impact\*

Map Number: SV-02-115a

Map Name: Operational Noise and Vibration Impacts and Likely Significant Effects (with Assessment Locations) SES and AP ES

Community Area 4: Whitmore Heath to Madeley

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