

EXHIBIT LIST

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Wendover Bored Tunnel – Option Comparison

General Arrangement

	Hybrid Bill scheme	Bored Tunnel
General Arrangement	<ul style="list-style-type: none"> 1.28km green tunnel length, Ch53+780 to Ch55+060 Inclusive of porous portals 	<ul style="list-style-type: none"> 3.995km tunnel length, Ch51+050 to Ch55+005 inclusive of porous portals One intervention and ventilation shaft with associated construction compound. North portal location similar to Proposed Scheme South portal located at Wendover Dean Track centres significantly wider, therefore greater land requirement either side of tunnel.

Wendover Bored Tunnel – Option Comparison

Construction effects – Slide 1 of 2

	Hybrid Bill scheme	Bored Tunnel
Land & Property	<ul style="list-style-type: none"> Requires demolition of properties on Ellesborough Road within construction area Relocation required for Wendover Cricket Club 	<ul style="list-style-type: none"> Avoids demolition of properties on Ellesborough Road Avoids impact on Wendover Cricket Club
Highway diversions and temporary closures	<ul style="list-style-type: none"> Requires temporary diversion of Ellesborough Road and permanent diversion of Bacombe Lane Requires temporary closure of Small Dean Lane 	<ul style="list-style-type: none"> Avoids diversion of Ellesborough Road and Bacombe Lane Avoids temporary closure of Small Dean Lane
Tunnel infrastructure	<ul style="list-style-type: none"> Portal buildings at both ends of green tunnel 	<ul style="list-style-type: none"> Portal buildings required at both ends of tunnel, including new access road to southern portal from A413 Vent shaft and access road to vent shaft will be required

Wendover Bored Tunnel – Option Comparison

Construction effects – slide 2 of 2

	Hybrid Bill scheme	Bored Tunnel
Utilities	<ul style="list-style-type: none"> Requires diversion of overhead power lines at Wendover by north and south green tunnel portals 	<ul style="list-style-type: none"> Reduces extent of overhead power line diversion required at Wendover – only required at north portal. Increased power requirement for TBM during construction.
Spoil Management	<ul style="list-style-type: none"> Spoil managed as part of current mass-haul assumptions, utilising trace where possible 	<ul style="list-style-type: none"> Bored tunnel will increase surplus excavated material arising from the scheme at the tunnel north portal due to the longer tunnel length and due to reduced fill requirements between Small Dean and South Heath as a result of lowered vertical alignment
Programme		<ul style="list-style-type: none"> Construction programme extended compared to green tunnel due to longer tunnel required and associated rail systems fit-out

Wendover Bored Tunnel – Options Comparison

Operation and Maintenance

Hybrid Bill scheme	Bored Tunnel
<ul style="list-style-type: none">• Open section beyond north portal allows higher operating speed	<ul style="list-style-type: none">• Longer tunnel will restrict train speeds, marginally increasing journey times
<ul style="list-style-type: none">• No increase in power supply	<ul style="list-style-type: none">• Increased power requirement increases operating costs.
<ul style="list-style-type: none">• No increase in maintenance requirements	<ul style="list-style-type: none">• Increased equipment in tunnel leading to increased maintenance requirements.

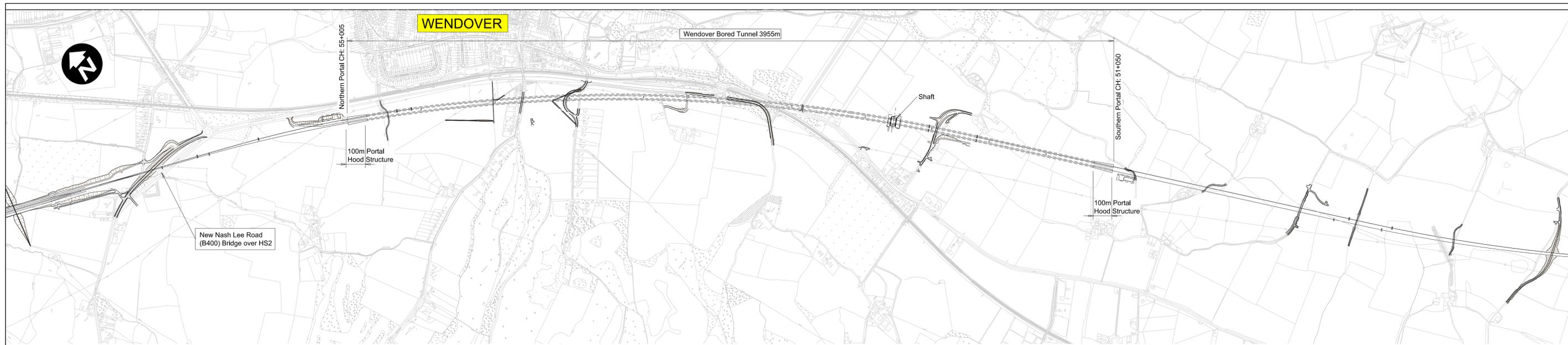
Wendover Bored Tunnel – Options Comparison Main environmental effects

Hybrid Bill scheme	Bored Tunnel
<ul style="list-style-type: none"> Substantial earthworks to integrate the scheme into the landscape 	<ul style="list-style-type: none"> Removes the earthwork requirements and viaducts and improves the overall integration into the landscape. Would require sensitive positioning of the vent shaft.
<ul style="list-style-type: none"> Potential noise impacts for residential and community receptors south of Wendover. 	<ul style="list-style-type: none"> Reduced probability of noise impacts for residential and community receptors south of Wendover.
<ul style="list-style-type: none"> Loss of land and severance 	<ul style="list-style-type: none"> Reduction in loss of land and severance.

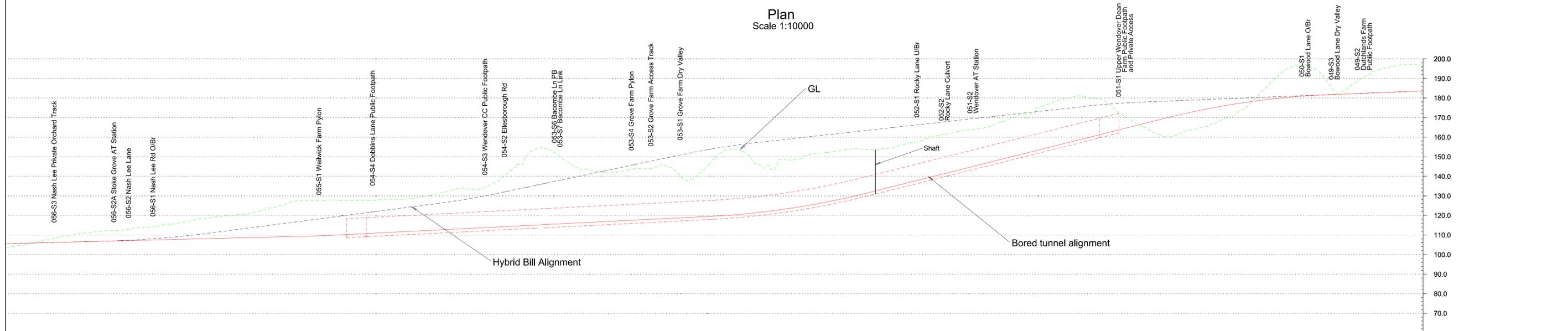
Wendover Bored Tunnel – Option Comparison

Construction Costs

Item	Bored Tunnel
Cost Comparison vs HS2 Proposed Scheme	+£292.79m



Plan
Scale 1:10000



Chainage	Route Element ID
56+700	055-L1 Wendoover North Cutting
56+600	
56+500	
56+400	
56+300	
56+200	
56+100	
56+000	
55+900	
55+800	
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50+400	
50+300	
50+200	
50+100	
50+000	
49+900	
49+800	
49+700	
49+600	
49+500	

Rev	Description	Drawn	Checked	Con App	HS2 App

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Scale with caution as distortion can occur.

- Legends/Notes:
- The bored tunnel option will consist of twin bore tunnels at centre-to-centre spacing of 19.4m.
 - Cross-passages will be required at 380m centres.
 - The maximum line speed within the tunnel will be 320kph.
 - A 100m long portal hood structure has been allowed at each end of the tunnel to mitigate micro-pressure wave burst
 - Vent shaft and headhouse building is required at approximate Ch 52+300.

Registered in England
Registration No. 06791686
Registered office:
One Canada Square,
London, E14 5AB

Creator/Organator
Atkins

Zone	Country South
Design Stage	DESIGN-FOR-PETITION
Drawing Title	Wendoover Bored Tunnel

Project/Contract		Country South Design	
Discipline/Function		Tunnels	
Drawn	Checked	Approved	
TB			
Date	Scale	Site	
08/07/2015	AS SHOWN		A3
Drawing No.			Rev.
C222-ATK-TN-DGA-020-000006-PET000000			P00.1

Wendover Green Tunnel – Hydrology

- Main ES identified potential effects to groundwater flows to Stoke Brook from green tunnel;
- Main ES proposed monitoring of groundwater and surface water flows to verify the extent of any effects;
- HS2 will carry out groundwater and surface water monitoring and surveys before , during and after construction;
- If the surveys identify different conditions one option would be to introduce a pumping station to remove water from around the green tunnel to re-charge the aquifer; and
- A cost estimate (2015 costs) to construct and operate a pumping station is :

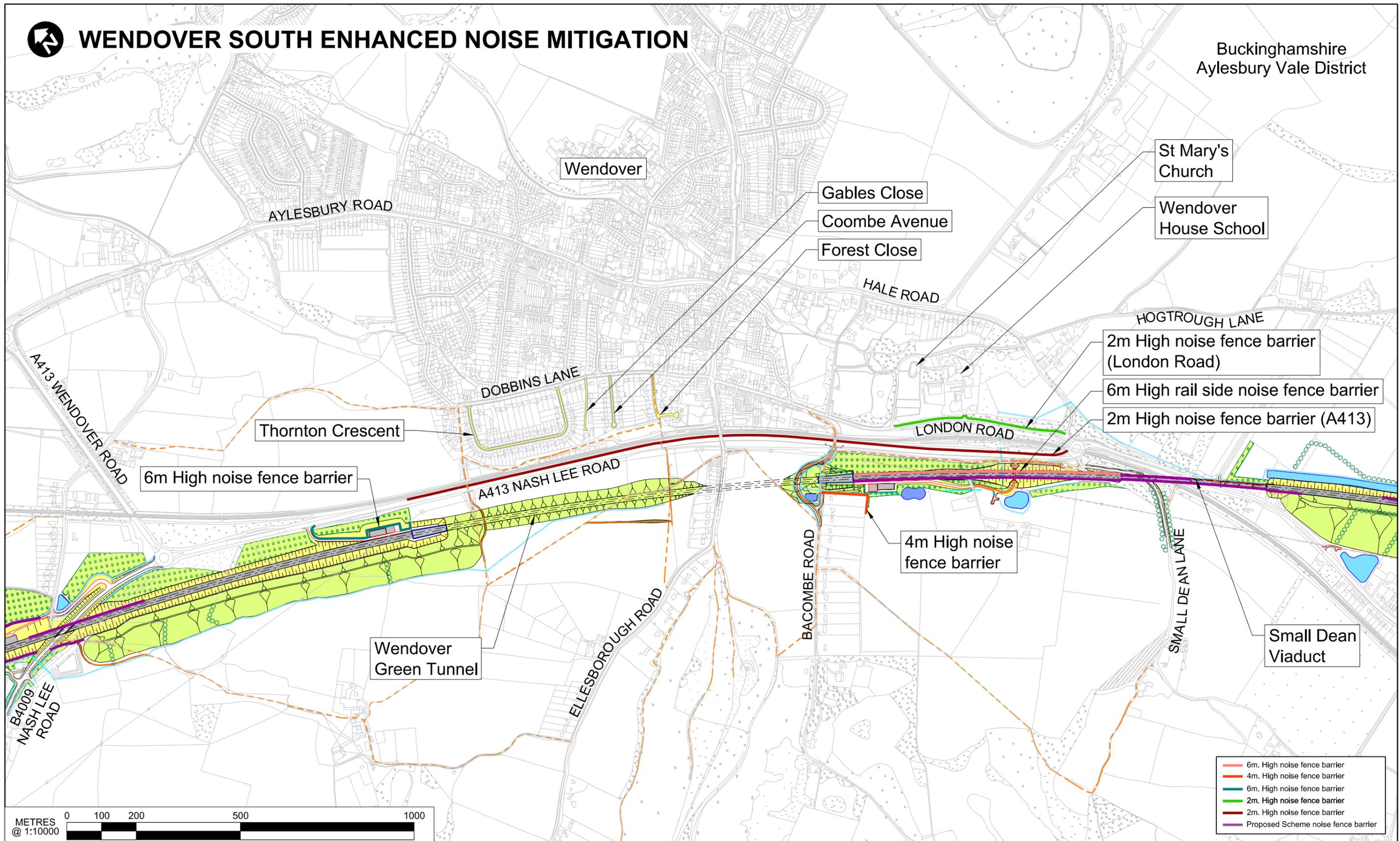
Construction £1.2m

Operation (electricity and maintenance) £16m



WENDOVER SOUTH ENHANCED NOISE MITIGATION

Buckinghamshire
Aylesbury Vale District



6m High noise fence barrier

Wendover Green Tunnel

4m High noise fence barrier

2m High noise fence barrier (London Road)

6m High rail side noise fence barrier

2m High noise fence barrier (A413)

Small Dean Viaduct



- 6m. High noise fence barrier
- 4m. High noise fence barrier
- 6m. High noise fence barrier
- 2m. High noise fence barrier
- 2m. High noise fence barrier
- Proposed Scheme noise fence barrier

P00.1					

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- Legends/Notes:
- Depot, station, headhouse or portal building
 - Tunnel portal
 - Balancing pond
 - Land drainage area
 - Replacement floodplain storage
 - Landscape mitigation planting (scrub / woodland)
 - Grassed areas
 - Engineering earthworks
 - Landscape earthworks
 - Rail alignment formation
 - Grassland habitat creation
 - Tunnels external extent
 - Rail alignment
 - Ditches - new
 - Hedgerow habitat creation
 - HS2 Access road
 - Existing public right of way (PRoW)
 - New, diverted or realigned PRoW
 - Stopped-up PRoW
 - UT - Main utility works
 - Likely significant beneficial effect

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Registered office:
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London, E14 5AB

Creator/Originator
Atkins

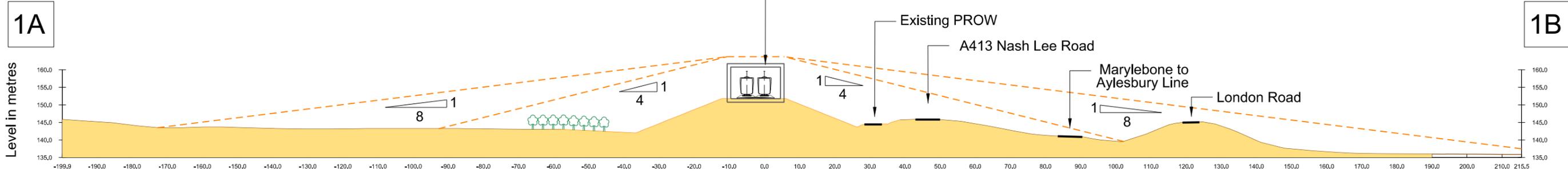
Zone	Country South
Design Stage	DESIGN-FOR-PETITION
Drawing Title	Wendover Parish Council Petition 1512
	Wendover South Enhanced Noise Mitigation

Project/Contract	Country South Design		
Discipline/Function	Environmental		
Drawn	IE	Checked	Approved
Date	14/08/2015	Scale	AS SHOWN
		Size	A1
Drawing No.	C222-ATK-EV-DPL-020-160915-PET001512		Rev.
			P00.1

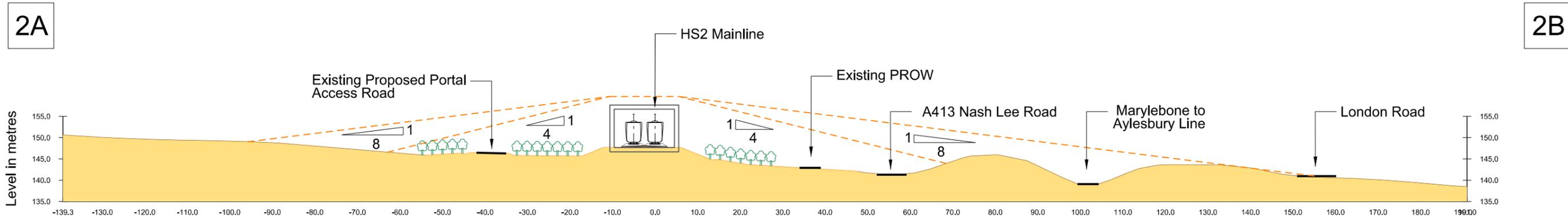
Wendover – Noise mitigation package

Noise mitigation option	Benefit
Option 1: 6m high trackside noise fence barrier on the Wendover side of the alignment from the southern portal to the Small Dean viaduct	<ul style="list-style-type: none"> Removes the likely significant noise effect at St Mary's Church as a music performance venue
Option 2: 2m high and 1.7km long noise fence barrier on the Wendover side of the A413	<ul style="list-style-type: none"> Improves the acoustic character of Wendover in general by reducing the continuous ambient traffic noise that affects it
Option 3: 2m high and 500m long noise fence barrier on the Wendover side of the London Road in the vicinity of the Church and School	<ul style="list-style-type: none"> Reduces the likelihood of incidents at the school, including its grounds, caused by noisy vehicle pass-bys on the nearby London Road which children there are especially sensitive to
Option 4: 6m high noise fence barrier at track level running 300m northwards of the northern portal on the Wendover side	<ul style="list-style-type: none"> Reduces maximum noise levels at properties in northern Wendover to below the lowest adverse effect threshold
Option 5: 4m high 200m long additional noise fence barrier on the western side of the alignment and at the rear of the Bacombe Lane properties	<ul style="list-style-type: none"> Significant community effect at Bacombe Lane would be removed Reduce airborne sound levels such that the operational airborne noise impacts at dwellings on Bacombe Lane become 4 minor impacts.

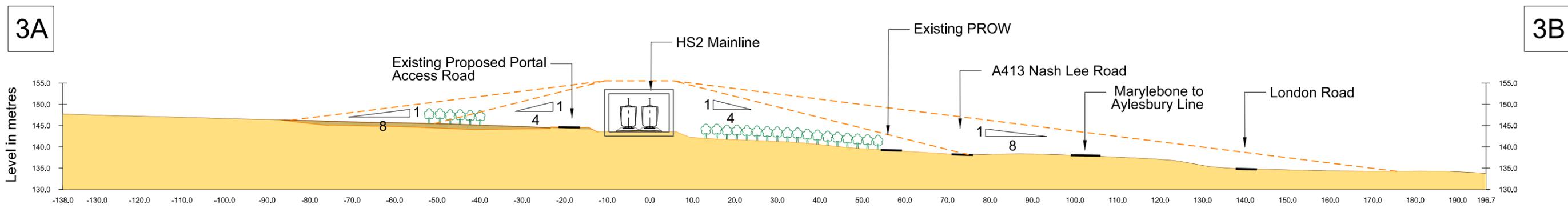
In addition, HS2 Ltd will also continue to work with the Church and School to agree suitable noise attenuation at these receptors.



Section 1A-1B (Year 15)
Scale as shown



Section 2A-2B (Year 15)
Scale as shown



Section 3A-3B (Year 15)
Scale as shown

For Location Of Sections Refer To Drawing No. C222-ATK-EV-DPL-020-560920-PET001512

P00.1					HS2 accepts no responsibility for any circumstances which arise from the reproduction of this document after alteration, amendment or abbreviation or if it is issued in part or issued incompletely in any way.	Legends/Notes: Proposed mitigation tree planting Existing trees Existing hedgerow Existing ground Proposed hedgerow planting Proposed HS2 embankment/landscape earthworks Indicative landform required to cover the extended tunnel at a 1:4 and 1:8 slope	 Registered in England Registration No. 06791686 Registered office: One Canada Square, London, E14 5AB Creator/Originator Atkins	Zone	Country South	Project/Contract	Country South Design	
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					Scale with caution as distortion can occur.			Date	05/01/2015	Scale	AS SHOWN	Size
P8168	Description	Drawn	Checked	Con App	HS2 App			Drawing No.	C222-ATK-EV-DSE-020-560920-PET001512		Rev.	P00.1

Current baseline (2015)



Operation Year 15 (2041) - Summer verifiable photomontage



Technical Information

Location: Viewpoint WGT-01: View north-east from PRoW near Coxgrove Wood.

Date taken: 06/08/15
Time taken: 11:59
Focal length: 57.296mm

The verifiable photomontage provides an illustration of how the Wendover green tunnel extension may look in 2041 (15 years after opening). Where new planting is proposed, it has been shown as semi-mature trees which have put on 15 years of growth to illustrate how the Wendover green tunnel extension will further integrate into the landscape over time.



Figure Number	LV-01-297
Figure Name	Wendover green tunnel extension Verifiable Photomontage Operation Year 15 (2041) - Summer Viewpoint WGT-01
	Community Forum Area CFA10: Dunsmore, Wendover and Halton



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Current baseline (2013)



Operation Year 1 (2026) - Winter verifiable photomontage



Technical Information

Location: Viewpoint 104-3-002: View south-west from PRow (Bridleway WEN/14) on Bacombe Lane, Wendover.

Date taken: 28/02/13
Time taken: 10:48
Focal length: 57.296mm

This verifiable photomontage provides an illustration of how the Wendover green tunnel extension may look in 2025 (the opening year). Where new planting is proposed, it has been shown as immature plants which would mature over time to further integrate the Wendover green tunnel extension into the landscape.

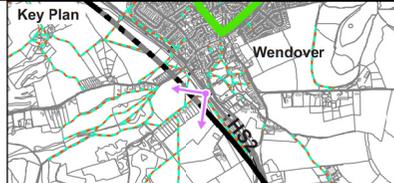


Figure Number	LV-01-298
Figure Name	Wendover green tunnel extension Verifiable Photomontage Operation Year 15 (2041) - Summer Viewpoint 104-3-002
Community Forum Area CFA10:	Dunsmore, Wendover and Halton

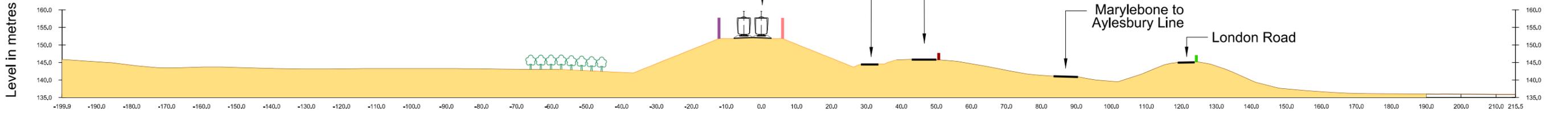


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1A

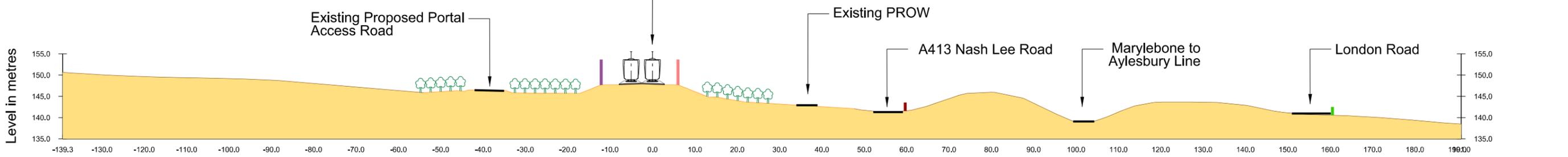
1B



Section 1A-1B (Year 15)
Scale as shown

2A

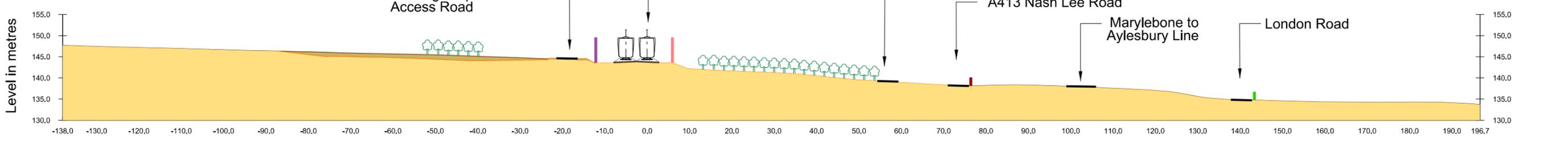
2B



Section 2A-2B (Year 15)
Scale as shown

3A

3B



Section 3A-3B (Year 15)
Scale as shown

- 6m. High noise fence barrier
- 4m. High noise fence barrier
- 6m. High noise fence barrier
- 2m. High noise fence barrier
- 2m. High noise fence barrier
- Proposed Scheme noise fence barrier

For Location Of Sections Refer To Drawing No. C222-ATK-EV-DPL-020-560925-PET001512

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	Scale with caution as distortion can occur.						Cross Sections - Proposed Noise Fence Barriers		Date 05/01/2015	Scale AS SHOWN	Size A3
Description		Drawn	Checked	Con App	HS2 App	Creator/Originator Atkins	Drawing No. C222-ATK-EV-DSE-020-560925-PET001512		Rev. P00.1		

P8171

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