

A417

Missing Link

Technical Appraisal Report Appendices
February 2018

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Appendix A – Glossary

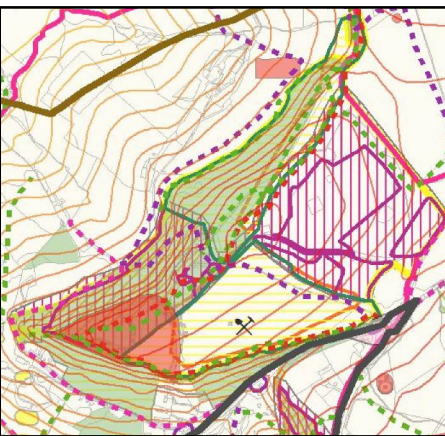
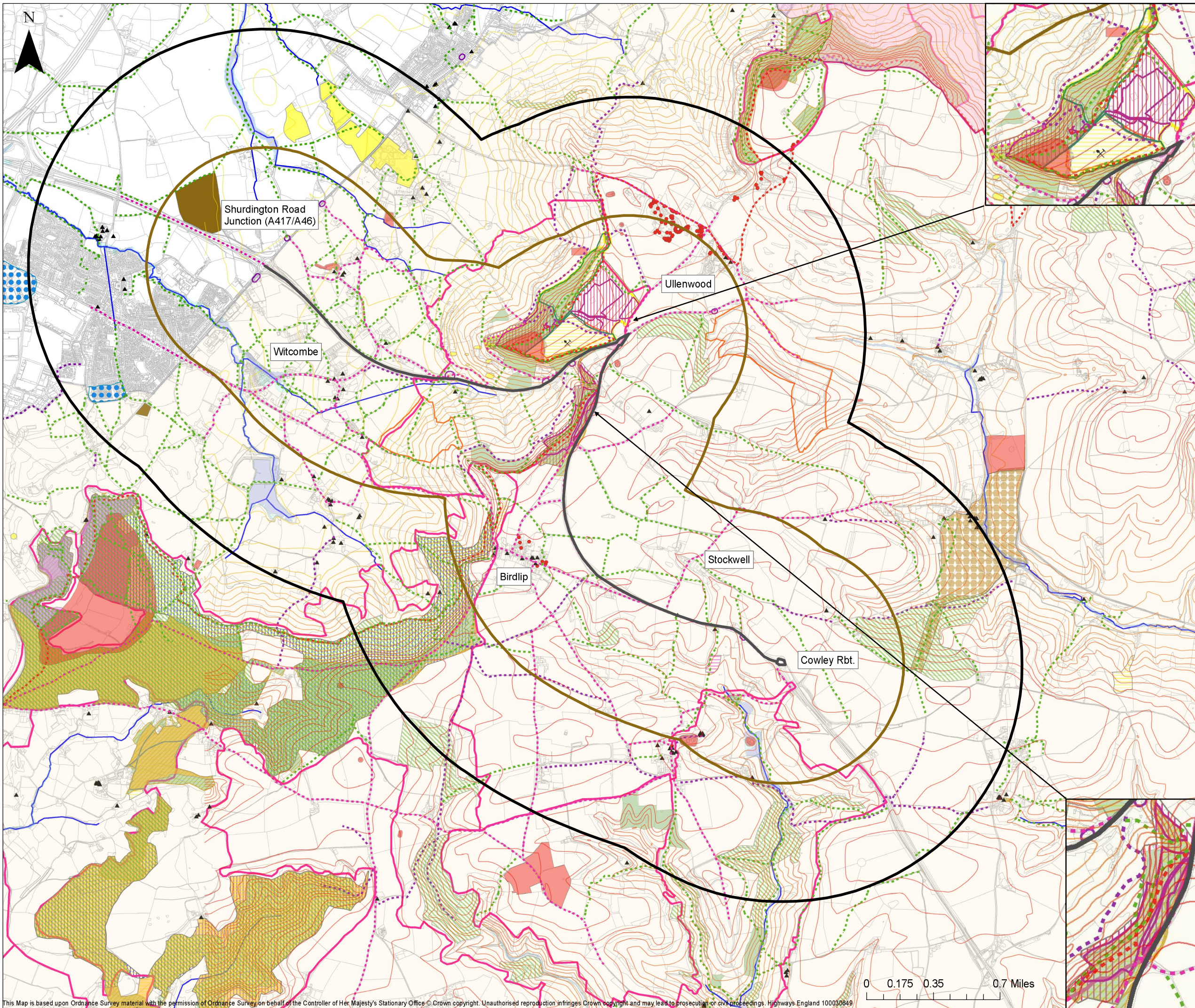
Abbreviation	Definition
AADT	Analysis of Annual Average Daily Traffic
AMBC	Analysis of Monetised Costs and Benefits
AOD	Above Ordinance Datum
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AQS	Air Quality Standards
AST	Appraisal Summary Table
ATC	Automatic Traffic Count
BCF	Benefit to Cost Ratio
BCR	Benefit Cost Ratio
BGS	British Geological Survey
BMV	Best and Most Versatile
CCB	Cotswolds Conservation Board
CDM	Construction (Design and Management)
CEMP	Construction Environment Management Plan
COBALT	Cost and Benefits of Accidents – Light Touch
CO ₂ e	Carbon dioxide equivalent
COSHH	Control of Substances Hazardous to Health Regulations 2002
CRF	Congestion Reference Flow
CRV	Conservation Road Verges
CRoW	Countryside and Rights of Way Act 2000
CSR	Client Scheme Requirements
D2AP	Dual 2 Lane All Purpose Carriageway
DBFO	Design, Build, Finance and Operate
DCO	Development Consent Order
DEFRA	Department for Environment Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DMRB	Design manual for Road and Bridges
DS	Do Something
EAST Plus system	Early Assessment and Sifting Tool Plus system

Abbreviation	Definition
EC	European Commission
ECI	Early Contractor Involvement
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPA	Environment Protection Agency
EU	European Union
FRA	Flood Risk Assessment
GCC	Gloucestershire County Council
GEH	GEH is a form of Chi-squared statistic that incorporates both relative and absolute errors and issued to compare modelled traffic data against observed data.
GHG	Green House Gases
GIS	Geographical Information System
GLNP	Gloucestershire Local Nature Partnership
GWT	Gloucestershire Wildlife Trust
HADDMS	Highways Agency Drainage Data Management System
HAGDMS	Highways Agency Geotechnical Data Management
HDV	Heavy duty vehicle
IAN	Interim Advice Note
IDC	Investment Decision Committee
JCS	Joint Core Strategy
KPI	Key Performance Indicators
KSI	Killed or seriously injured
LEP	Local Enterprise Partnership
LNR	Local Nature Reserves
LWS	Local Wildlife Site
MCTC	Manual Classified Turning Counts
MHCW	Manual of Contract Documents for Highways Works
MMSJV	Mott MacDonald Sweco Joint Venture
MoL	Monetisation of Landscape
NCA	National Character Area
NDD directorate	Network Delivery and Development directorate
NERC	Natural Environment and Rural Communities
N/A	Not/Applicable

Abbreviation	Definition
NIA	Noise Important Areas
NMU	Non-motorised user(s)
NNNPS	National networks National Policy Statement
NO	Nitrogen Oxides
NO2	Nitrogen dioxide
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NPSNN	National Policy Statement for National Networks
NPV	Net Present Value
NRSA	New Roads and Street Works Act
NSIP	Nationally Significant Infrastructure Project
NTEM	National trip End Model
OD	Operations Directorate
OE	Option Estimate
OP	Off Peak
PCF	Project control framework
PCM	Pollution Climate Mapping
PIA	Personal Injury Accidents
PIC	Personal Injury Collisions
PM10	Particulate Matter
PRoW	Public Rights of Way
PSSR	Preliminary Sources Study Report
PVB	Present Value of Benefits
PVC	Present Value of Costs
QUADRO	Queues and Delays at Roadworks
RIGS	Regionally Important Geological Site
RoF	Region of Focus
RIP	Road Investment Programme
RIS	Road Investment Strategy
RIU	Regional Intelligence Indicators
RMS	Road Management Services
RPG	Registered Parks and Gardens

Abbreviation	Definition
RSPB	Royal Society for the Protection of Birds
RTF	Road Traffic Forecasts
RTM	Regional Transport Models
RTSR	Road Tunnel Safety Regulations
S2	Single lane Carriageway
SAC	Special Area of Conservation
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SEB	Statutory Environment Bodies
SEP	Strategic Economic Plan
SGAR	Stage Gate Assessment Review
SNA	Strategic Nature Area
SPOSH	Significant Possibility of Significant Harm
SPOPCOW	Significant Possibility of Significant Pollution to Controlled Waters
SRN	Strategy Road Network
SSD	Stopping Sight Distance
SSSI	Site of Special Scientific Interest
SU2	Single Urban Carriageway
SWRTM	South West Regional Traffic Model
TAG	Transport Analysis Guidance
TAR	Technical Appraisal Report
TBM	Tunnel Boring Machine
TEMPRO	Trip End Model Presentation Program
TPO	Tree Preservation Order
TUBA	Transport Users Benefit Appraisal software
VOC	Vehicle operating costs
VfM	Value for Money
VMS	Variable Message Signs
WebTAG	Transport Analysis Guidance
WFD	Water Framework Directive
WITA	Wider Impact in Transport Appraisal
WS2	Wide Single lane Carriageway

Appendix B – Environmental constraints plan



Notes

Key to Symbols

- 1km Buffer (Brockworth Rbt to Cowley Rbt)
- 2km buffer (Brockworth Rbt to Cowley Rbt)
- Shurdington Road (A417/A46) to Cowley Rdbt
- Contours
- Area of Outstanding Natural Beauty
- Ancient Woodland
- AQMA
- Public Rights of Way**
- - - Footpath
- - - Bridleway
- - - National Trail - Cotswold Way
- - - Cycle Paths
- Authorised Landfill
- Historic Landfill
- Flood Zone 2
- Flood Zone 3
- ▲ Listed Building
- ✕ Buried Archaeology
- Scheduled Monument
- Local Development Area
- Local Nature Reserve
- National Nature Reserve
- National Trust Land Ownership
- National Trust Land Leasehold
- Open Access Land
- Strategic Nature Area (SNA)
- Country Park
- Gloucester Wildlife Trust Land Ownership
- Noise Important Area
- Registered Common Land
- Registered Park & Garden
- Tree Preservation Orders
- Biological Site of Special Scientific Interest
- Geological Site of Special Scientific Interest
- Special Area of Conservation
- Waterbodies
- Woodland Trust Tree Boundaries

PO2	20/01/17	Drawing updated to include additional environmental constraints and updated template	SH	CU	GH
PO1	21/11/16	Drawing produced	SH	JB	AC
Rev	Date	Amendment Details	Drw'n	Chk'd	App'd



Drawing Status	Suitability
Fit for Information	S3

Project Title	A417 'Missing Link' at Air Balloon
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Drawing Title	Environmental Constraints Plan
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Scale	1:15,000	Designed	SH	Drawn	SH	Checked	CU	Approved	GH
Original Size	A1	Date	21/11/16	Date	20/01/17	Date	24/01/17	Date	25/01/17
Drawing Number	HE PIN	Originator	Volume	Project Ref. No.		Revision			
000	DR	LE	00002	551506		P02			
Location	Type	Role	Number						



Appendix C – Appraisal summary tables

Appraisal Summary Table - Option 3		Date produced:	10	01	2018	Contact:			
Name of scheme:	A417 Missing Link at Air Balloon	Name	Michael Goddard				Organisation	Highways England	
Description of scheme:	The A417/A419 provides an important link between the Midlands and the South of England; between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 3, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 3 comprises a 4.7km route, containing a 1km tunnel section south west of Crickley Hill where it aligns offline, joining at Cowley Roundabout.	Role	Promoter/Official						
Impacts	Summary of key impacts	Assessment							
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp		
Economy	Business users & transport providers Journey time benefits arise from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Net journey time changes are the net of positive and negatives in a given time band. Monetary (NPV) includes benefits from journey time savings, vehicle operating cost impacts and changes in user charges.	Value of journey time changes (£m)		213.4		N/A	£248.4 million	N/A	
		Net journey time changes (£m)							
		0 to 2min	2 to 5min	> 5min					
		-45.8	195.9	63.3					
	Reliability impact on Business users Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£21.3 million			Moderate Beneficial	£21.3 million			
	Regeneration The scheme is not in close proximity to a regeneration area.	N/A			N/A	N/A			
	Wider Impacts In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DfT VFM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.	£24.8 million			N/A	£24.8 million			
Environmental	Noise Option 3 would provide a short tunnel, resulting in some noise reductions. The option would also pass through an area with a relatively low number of residential properties, resulting in a similar number of both noise increases and decreases at sensitive receptors. This option would not be effective at diverting traffic onto the new road and away from the existing alignment. A small number of properties with high noise levels and large noise changes are the result of the new road moving closer to those properties when compared to the baseline, and in some cases anomalies in OS addresspoint data. These will be addressed in the next iteration of the AST.	139 households experiencing increased daytime noise in forecast year 2039. 181 households experiencing reduced daytime noise in forecast year 2039. 184 households experiencing increased night time noise in forecast year 2039. 179 households experiencing reduced night time noise in forecast year 2039.			N/A	£0.9 million		N/A	
	Air Quality Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA.	Local Air Quality Assessment Score in Year of Opening: 2024: NO2: +333.9 PM10: +54.1 Regional Emissions (Over 60 year appraisal period) NOx: +1,890 tonnes			N/A	PM10 NPV: -£0.2 million NOx NPV: -£1.0 million Total value of change in air quality: -£1.2 million		N/A	
	Greenhouse gases There is an overall increase in greenhouse gases as a result of the scheme. The reason for the increase is because of an increase in road traffic with the scheme in place. This option would result in a notable increase in vehicle kilometres travelled which would result in an increase in emissions. Relatively low average speeds and low proportions of HDVs using the new road would minimise this overall increase in emissions.	Change in non-traded carbon over 60y (CO2e)		543,673		N/A	-£24.1 million		
	Change in traded carbon over 60y (CO2e)		2366						
	Landscape Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. Around 25% of the Scheme would run in tunnel, limiting the visual prominence of the Scheme in this specific area. However, the surface sections, particularly those offline, and the two new junctions at the scheme extents would have an adverse impact on landscape features. The overall significance of effect is considered to be Large Adverse due to the potential for the scheme to damage the high quality landscape of NCA107, diminishing its quality, decreasing tranquillity, disrupting fine and valued views of the area and resulting in an adverse impact upon the scale and pattern of the landscape.	N/A			Large Adverse	N/A			
	Townscape Given the highly rural nature of the route, the scheme would not pass through any developed settlements greater than individual farmsteads. No village settlements would be directly affected by the route. A townscape appraisal is not considered necessary for this option due to the lack of urban features. Instead, the landscape appraisal should be referenced with regard to this route option.	N/A			No Impact	N/A			
	Historic Environment The west portal of Option 3 would cause a significant Moderate adverse impact upon the setting of Crickley Hill Camp Scheduled Monument. There is also a potential for adverse impacts upon the rural setting of surrounding listed buildings including the Grade II Harding's Barn and Grade II Hill Barn from the construction of the new road and tunnel portals. There would be Moderate adverse impacts upon archaeological remains during construction groundworks. This includes possible remains associated with Crickley Hill Camp Scheduled Monument. Where the Option is in tunnel this will remove the impact to setting and archaeology, however, the tunnel portals will have a significant adverse impact on the surrounding rural character. The overall significance of effect is considered to be Moderate Adverse.	N/A			Moderate Adverse	N/A			
Biodiversity Bats have been valued as 'High' in this assessment and an Intermediate Negative impact is possible, resulting in a Large Adverse effect. The assessment of 'High' value is based on the precautionary principal at this early stage of assessment, as the presence of Nationally Important bat populations cannot be ruled out until more detailed surveys have been undertaken. The proposals could damage or destroy roosts, remove commuting routes, and result in killing and injury of bats in relation to traffic. Intermediate Negative impacts are identified for 'Medium' valued barn owl and hedgerow habitats due to potential loss and fragmentation of habitats, resulting in Moderate Adverse effects. Standard mitigation has been included in the assessment of likely impacts. There are considerable opportunities for additional ecological enhancement measures along the scheme corridor, including the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts due to the uncertainty of these measures. The overall appraisal score is based on the most adverse category assessment.	N/A			Large Adverse	N/A				
Water Environment Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse Impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.	N/A			Very Large Adverse	N/A				
Social	Commuting and Other users Journey time benefits arise from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Net journey time changes are the net of positive and negatives in a given time band. Monetary (NPV) includes benefits from journey time savings, vehicle operating cost impacts and changes in user charges.	Value of journey time changes (£m)		162.6		N/A	£91.7 million	N/A	
		Net journey time changes (£m)							
		0 to 2min	2 to 5min	> 5min					
			-43.9	154.4	52.1				
	Reliability impact on Commuting and Other users Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£16.3 million			Moderate Beneficial	£16.3 million			
	Physical activity This option has the potential to result in the realignment of some Non-motorised User (NMU) routes, including the Cotswold Way National Trail, leading to an increase in journey times and potentially discouraging people from using routes which may result in a disbenefit for NMUs. However, the provision of new routes such as dedicated crossings, additional cycle paths and footpaths and retention of NMU routes where possible, would have the potential to increase the number of people choosing alternative modes of transport to vehicles, such as on foot or bicycle, resulting in an improvement in the levels of physical activity. On balance, there would be an overall Slight Beneficial effect on physical activity.	N/A			Slight Beneficial	N/A			
	Journey quality Option 3 is anticipated to slightly improve traveller care for vehicle travellers through the provision of new signs and potentially new laybys, the locations of which would be identified at Stage 2. Traveller stress is predicted to moderately improve with this option for vehicle travellers; with a reduction in frustration due to better journey times and reliability, route uncertainty with good design and layout of new and existing signs and also in the fear of potential accidents through the delivery of new NMU facilities and safety related infrastructure. For NMUs, journey times and reliability are likely to alter with numerous NMU facilities likely to be directly affected, as well as barriers between people and traffic and traffic flows for roads alongside NMU facilities also likely to change. The potential provision of NMU facilities at appropriate locations would minimise effects on journey quality for NMUs.	N/A			Moderate Beneficial	N/A			
	Accidents A reduction in the number of personal injury accidents and casualties of all types results from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Savings on the improved section are offset to a degree by increases in traffic (and accidents) in the A417 corridor although the net result is beneficial.	Reduction in PIAs: 29.9 Reduction in casualties Fatal: 1.5 Serious: 15.2 Slight: 36			N/A	£4.1 million		N/A	
	Security Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.	N/A			Neutral	N/A		N/A	
	Access to services This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.	N/A			Neutral	N/A		N/A	
Affordability The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.	N/A			Slight Beneficial	N/A		N/A		
Severance There are no community facilities within 250m of this option however there is the potential for severance to occur to additional facilities further than 250m from the option. There is potential for severance to approximately five NMU routes, including footpaths, National Trails and cycle paths, which could lead to NMUs being dissuaded from making journeys to facilities. However, NMU facilities would be retained where possible and the provision of replacement and additional facilities such as crossings would reduce severance impacts to journeys. On balance, there would be an overall Neutral effect on severance.	N/A			Neutral	N/A		N/A		
Option and non-use values The scheme does not include measures that will substantially change the availability of transport services in the study area.	N/A			Neutral	N/A				
Public Account	Cost to Broad Transport Budget The scheme will be funded through Central Government Funds	Central Govt funding: £533.1 million			N/A	£533.1 million			
	Indirect Tax Revenues There would be some increase in the tax being paid to the Exchequer	Central Govt funding: Wider Public Finances = -£51.9 million			N/A	-£51.9 million			

Appraisal Summary Table - Option 12		Date produced:	10	01	2018	Contact:		
Name of scheme: A417 Missing Link at Air Balloon Description of scheme: The A417/A419 provides an important link between the Midlands and the South of England, between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 12, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 12 comprises a 6.4km surface route following the existing A417 up to Grove Farm where it diverts south east of the Air Balloon through a 270m right hand bend before joining the existing A417 alignment west of the B4070 junction for 1km. The route then diverts offline to the west of Stockwell Farm before joining the existing A417 just to the south of Cowley Roundabout.		Name: Michael Goddard Organisation: Highways England Role: Promoter/Official						
Impacts	Summary of key impacts	Assessment						
		Quantitative		Qualitative	Monetary (£(NPV))	Distributional 7-pt scale/vulnerable grp		
Economy	Business users & transport providers	Value of journey time changes (£m) 141.5 Net journey time changes (£m)		N/A	£108.3 million	N/A		
	<table border="1"> <tr> <th>0 to 2min</th> <th>2 to 5min</th> <th>> 5min</th> </tr> <tr> <td>-21.8</td> <td>146.8</td> <td>16.5</td> </tr> </table>		0 to 2min				2 to 5min	> 5min
	0 to 2min	2 to 5min	> 5min					
	-21.8	146.8	16.5					
Reliability impact on Business users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£14.2 million		Moderate Beneficial	£14.2 million			
Regeneration	The scheme is not in close proximity to a regeneration area.	N/A		N/A	N/A			
Wider Impacts	In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DfT VIM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.	£10.8 million		N/A	£10.8 million			
Environmental	Noise	Option 12 is a surface route, and as such there would be not be any noise reductions achievable with a tunnel. However, this option would be reasonably effective at diverting traffic onto the new road and away from the existing alignment and would pass through an area with a relatively low number of residential properties, resulting in greater number of noise decreases than increases at sensitive receptors.	105 households experiencing increased daytime noise in forecast year 2039. 123 households experiencing reduced daytime noise in forecast year 2039. 41 households experiencing increased night time noise in forecast year 2039. 176 households experiencing reduced night time noise in forecast year 2039.		N/A	£1.1 million	N/A	
	Air Quality	Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA. For the purpose of this assessment, it was assumed that one property would be demolished for the scheme ("Woodside House" on Crickley Hill).	Local Air Quality Assessment Score in Year of Opening: 2024: NO2: +305 PM10: +76.2 Regional Emissions (Over 60 year appraisal period) NOx: +1,734 tonnes		N/A	PM10 NPV: -£0.3 million NOx NPV: -£0.9 million Total value of change in air quality: -£1.2 million	N/A	
	Greenhouse gases	There is an overall increase in greenhouse gases as a result of the scheme. The reason for the increase is because of an increase in road traffic with the scheme in place. This option would result in a small increase in vehicle kilometres travelled which would minimise emission increases. However, an increase in average speeds, and also a high proportion of HDVs using the new road would result in an increase in emissions.	Change in non-traded carbon over 60y (CO2e) 696,926 Change in traded carbon over 60y (CO2e) 1909		N/A	-£31.0 million		
	Landscape	Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. This option runs entirely at surface. The western half of the Scheme runs online and adjacent with the existing A417, but when offline, runs along the side of the scarp slope before crossing a rural scene over rising ground, traversing the Gloucestershire Way to the south of the Air Balloon junction and through countryside again at its most southerly extents. The new route would increase the level of disturbance in the area as it climbs up through the hillside to the east, opening views of the route as it traverses the escarpment, and again as it traverses contours north of Nettleton. The overall significance of effect is considered to be Large Adverse due to the potential for the scheme to damage the high quality landscape of NCA107, diminishing its quality, decreasing tranquillity, disrupting fine and valued views of the area and resulting in an adverse impact upon the scale and pattern of the landscape.	N/A		Large Adverse	N/A		
	Townscape	Given the highly rural nature of the route, the scheme would not pass through any developed settlements greater than individual farmsteads. No village settlements would be directly affected by the route. A townscape appraisal is not considered necessary for this option due to the lack of urban features. Instead, the landscape appraisal should be referenced with regard to this route option.	N/A		No Impact	N/A		
	Historic Environment	The Option 12 road corridor has the potential to cause a Moderate adverse impact upon the setting of Crickley Hill Camp Scheduled Monument and a Large Adverse impact on Emma's Grove Scheduled Monument where the road would sever the landscape, and vehicle movement and road lighting cause noise, light and air pollution. There would also be adverse impacts upon the setting of rural listed buildings located east of the proposed route including the Grade II Harding's Barn and Grade II Shab Hill Barn. There would be Moderate adverse impacts for this surface route option upon archaeological remains during construction groundworks. This would include archaeological remains potentially associated with Crickley Hill Camp Scheduled Monument and Emma's Grove Scheduled Monument. Following the precautionary principle, the overall significance of effect is considered to be Large Adverse.	N/A		Large Adverse	N/A		
	Biodiversity	Bats have been valued as 'High' in this assessment and an Intermediate Negative impact is possible, resulting in a Large Adverse effect. The assessment of 'High' value is based on the precautionary principle, as the presence of Nationally Important bat populations cannot be ruled out until more detailed surveys have been undertaken. The proposals could damage or destroy roosts, remove commuting routes, and result in killing and injury of bats. Large Adverse effects are identified for Bushley Muzzard SSSI due to potential groundwater impacts as the option may intersect the aquifer that is supplying the SSSI. Intermediate Negative impacts are identified for 'Medium' valued barn owl and hedgerow habitats due to potential loss and fragmentation of habitats, resulting in Moderate Adverse effects. Standard mitigation has been included in the assessment of likely impacts. There are considerable opportunities for additional ecological enhancement measures along the scheme corridor, including the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts due to the uncertainty of these measures. The overall appraisal score is based on the most adverse category assessment.	N/A		Large Adverse	N/A		
	Water Environment	Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation. A mainline cutting and embankment foundations/piles would intersect the Great Oolite aquifer upgradient of Bushley Muzzard SSSI, potentially leading to a reduction in water supply to this spring-fed wetland and associated habitat loss. The mainline cutting close to Air Balloon would potentially divert groundwater from one catchment to another. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.	N/A		Very Large Adverse	N/A		
	Social	Commuting and Other users	Value of journey time changes (£m) 111.5 Net journey time changes (£m)		N/A	£33.8 million		
		<table border="1"> <tr> <th>0 to 2min</th> <th>2 to 5min</th> <th>> 5min</th> </tr> <tr> <td>-18.9</td> <td>118.6</td> <td>12</td> </tr> </table>		0 to 2min				2 to 5min
0 to 2min		2 to 5min	> 5min					
-18.9		118.6	12					
Reliability impact on Commuting and Other users		Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£11.2 million		Moderate Beneficial	£11.2 million		
Physical activity		This option has the potential to result in the realignment of some Non-motorised User (NMU) routes, including the Cotswold Way National Trail, leading to an increase in journey times and potentially discouraging people from using routes which may result in a disbenefit for NMUs. However, the provision of new routes such as dedicated crossings, additional cycle paths and footpaths and retention of NMU routes where possible, would have the potential to increase the number of people choosing alternative modes of transport to vehicles, such as on foot or bicycle, resulting in an improvement in the levels of physical activity. On balance, there would be an overall Slight Beneficial effect on physical activity.	N/A		Slight Beneficial	N/A		
Journey quality		Option 12 is anticipated to slightly improve traveller care for vehicle travellers through the provision of new signs and potentially new laybys, the locations of which would be identified at Stage 2. The implementation of an appropriate landscape design would restrict views to the wider area for motorists. Traveller stress is predicted to slightly improve with this option in place for vehicle travellers; with a reduction in frustration due to better journey times and reliability, route uncertainty with good design and layout of new and existing signs and also in the fear of potential accidents through the delivery of new NMU facilities and safety related infrastructure. For NMUs, journey times and reliability are likely to alter with numerous NMU facilities likely to be directly affected, barriers between people and traffic and traffic flows for roads alongside NMU facilities are also likely to change. The potential provision of NMU facilities at appropriate locations would minimise effects on journey quality for NMUs.	N/A		Slight Beneficial	N/A		
Accidents		A reduction in the number of personal injury accidents and casualties of all types results from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Savings on the improved section are offset to a degree by increases in traffic (and accidents) in the A417 corridor although the net result is beneficial.	Reduction in PIAs: 16.8 Reduction in casualties Fatal: 1.4 Serious: 10.9 Slight: 23.5		N/A	£3.3 million	N/A	
Security		Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.	N/A		Neutral	N/A	N/A	
Access to services		This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.	N/A		Neutral	N/A	N/A	
Affordability	The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.	N/A		Slight Beneficial	N/A	N/A		
Severance	There are three community facilities within 250m of this option, although there is the potential for severance to occur to additional facilities further than 250m from the option. There is potential for approximately six NMU routes to be severed, including footpaths and National Trails, which could lead to NMUs being dissuaded from making journeys to facilities and having to travel further. However, NMU facilities would be retained where possible and the provision of replacement and additional facilities such as crossings would reduce severance impacts to journeys. On balance, there would be an overall Neutral effect on severance.	N/A		Neutral	N/A	N/A		
Option and non-use values	The scheme does not include measures that will substantially change the availability of transport services in the study area.	N/A		Neutral	N/A			
Public Account	Cost to Broad Transport Budget	The scheme will be funded through Central Government Funds		Central Govt funding: £276.6 million		N/A	£276.6 million	
	Indirect Tax Revenues	There would be some increase in the tax being paid to the Exchequer		Central Govt funding: Wider Public Finances = -£62.5 million		N/A	-£62.5 million	

Appraisal Summary Table - Option 21		Date produced:	10	01	2018	Contact:	
Name of scheme: A417 Missing Link at Air Balloon Description of scheme: The A417/A419 provides an important link between the Midlands and the South of England, between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 21, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 21 comprises an entirely offline route of 4.6km in length, containing a 3km tunnel from the base of Crickley Hill to Nettleton Bottom.		Name: Michael Goddard Organisation: Highways England Role: Promoter/Official					
Impacts	Summary of key impacts	Assessment					
		Quantitative		Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp	
Economy	Business users & transport providers	Value of journey time changes(£m) 220.1 Net journey time changes (£m) 0 to 2min 2 to 5min > 5min -58.6 198.7 80		N/A	£271.0 million	N/A	
	Reliability impact on Business users	£22.0 million		Moderate Beneficial	£22.0 million		
	Regeneration	The scheme is not in close proximity to a regeneration area.		N/A	N/A		
	Wider Impacts	In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DfT VIM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.		N/A	£27.1 million		
Environmental	Noise	64 households experiencing increased daytime noise in forecast year 2039. 202 households experiencing reduced daytime noise in forecast year 2039. 12 households experiencing increased night time noise in forecast year 2039. 180 households experiencing reduced night time noise in forecast year 2039.		N/A	£2.0 million	N/A	
	Air Quality	Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA.		N/A	PM10 NPV: -£0.2 million NOx NPV: -£0.6 million Total value of change in air quality	N/A	
	Greenhouse gases	Change in non-traded carbon over 60y (CO2e) 500,106 Change in traded carbon over 60y (CO2e) 2424		N/A	-£-22.2 million		
	Landscape	Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. Elevated views from the top of the escarpment have views westward over falling ground into the neighbouring vale. These elevated views may be altered where views capture the very westerly extent of the Scheme just prior to it entering the western tunnel portal. The majority of the Scheme would run in tunnel, limiting the visual prominence of the scheme, however two new junctions at the scheme extents would likely have an adverse impact on the surrounding landscape and visual receptors. The overall assessment score in light of the majority of the scheme being in tunnel is considered to be Moderate Adverse, as small sections at surface would still be at odds with the local pattern, and having a wider impact upon a landscape of recognised quality.		N/A	Moderate Adverse	N/A	
	Townscape	Given the highly rural nature of the route, the scheme would not pass through any developed settlements greater than individual farmsteads. No village settlements would be directly affected by the route. A townscape appraisal is not considered necessary for this option due to the lack of urban features. Instead, the landscape appraisal should be referenced with regard to this route option.		N/A	No Impact	N/A	
	Historic Environment	The Option 21 west portal would cause a Moderate adverse impact upon the setting of Crickley Hill Camp Scheduled Monument. The west portal would also adversely impact the setting of the Grade II listed Crickley Hill Farm. There is also a potential adverse impact upon the rural setting of the Grade II Harding's Barn and other listed buildings surrounding the east portal. Impacts to archaeological remains are reduced because Option 21 would largely be in tunnel, although where there are construction groundworks there is still a potential for Moderate adverse impacts upon unknown archaeological remains. The overall significance of effect is considered to be Moderate Adverse.		N/A	Moderate Adverse	N/A	
	Biodiversity	Minor Negative impacts are currently identified for designated sites which are valued as either 'Very High', 'High' or 'Medium'; for 'High' valued bats; and for 'Medium' valued broadleaved woodland, lowland calcareous grassland, hedgerows, standing water, watercourses, barn owl, badger, dormouse, great crested newt, reptiles and terrestrial invertebrates, resulting in a Slight Adverse effect. The proposals could potentially directly result in loss and fragmentation of habitats. There are considerable opportunities for ecological enhancement measures along the scheme corridor and wider landscape, including providing habitat connectivity between isolated areas of ancient woodland and calcareous grassland, and the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts at this stage due to the uncertainty of these measures. Option 21 is currently appraised as potentially resulting in a Slight Adverse effect on Biodiversity based on the most adverse category assessment.		N/A	Slight Adverse	N/A	
	Water Environment	Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse Impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.		N/A	Very Large Adverse	N/A	
Social	Commuting and Other users	Value of journey time changes(£m) 165.8 Net journey time changes (£m) 0 to 2min 2 to 5min > 5min -54.3 156.0 64.1		N/A	£96.8 million	N/A	
	Reliability impact on Commuting and Other users	£16.6 million		Moderate Beneficial	£16.6 million		
	Physical activity	N/A		Slight Beneficial	N/A		
	Journey quality	N/A		Moderate Beneficial	N/A		
	Accidents	Reduction in PIAs: 34.4 Reduction in casualties: Fatal: 1.4 Serious: 16.3 Slight: 39.5		N/A	£4.2 million	N/A	
	Security	Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.		N/A	Neutral	N/A	
	Access to services	This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.		N/A	Neutral	N/A	
	Affordability	The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.		N/A	Slight Beneficial	N/A	
	Severance	N/A		Neutral	N/A	N/A	
	Option and non-use values	N/A		Neutral	N/A		
	Public Accounts	Cost to Broad Transport Budget	The scheme will be funded through Central Government Funds		Central Govt funding: £956.5 million	N/A	£956.5 million
Indirect Tax Revenues		There would be some increase in the tax being paid to the Exchequer		Central Govt funding: Wider Public Finances = -£48.6 million	N/A	-£48.6 million	

Appraisal Summary Table - Option 24		Date produced:	10	01	2018	Contact:				
Name of scheme:	A417 Missing Link at Air Balloon	Name	Michael Goddard							
Description of scheme:	The A417/A419 provides an important link between the Midlands and the South of England, between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 24, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 24 comprises an offline route of 6.1km in length and containing a 1.6km tunnel south of Birdlip where it joins the existing A417 at Cowley Roundabout.	Organisation	Highways England							
		Role	Promoter/Official							
Impacts	Summary of key impacts	Assessment								
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp			
Economy	Business users & transport providers	Value of journey time changes(£m)			206.3	N/A	£238.0 million	N/A		
		Net journey time changes (£m)								
		0 to 2min	2 to 5min	> 5min						
		-55.0	189.5	71.8						
	Reliability impact on Business users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.			£20.6 million	Moderate Beneficial	£20.6 million			
	Regeneration	The scheme is not in close proximity to a regeneration area.			N/A	N/A	N/A			
	Wider Impacts	In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DfT VIM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.			£23.8 million	N/A	£23.8 million			
Environmental	Noise	Option 24 would provide a tunnel, resulting in some noise reductions. This option would be effective at diverting traffic onto the new road and away from the existing alignment but would pass through an area with a relatively high number of residential properties, resulting in a similar number of noise increases and decreases at sensitive receptors. A small number of properties with high noise levels and large noise changes are the result of the new road moving closer to those properties when compared to the baseline, and in some cases anomalies in OS addresspoint data. These will be addressed in the next iteration of the AST.			243 households experiencing increased daytime noise in forecast year 2039. 243 households experiencing reduced daytime noise in forecast year 2039. 270 households experiencing increased night time noise in forecast year 2039. 253 households experiencing reduced night time noise in forecast year 2039.			N/A	£0.7 million	N/A
	Air Quality	Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA. For the purpose of this assessment, it was assumed that one property would be demolished for the scheme ("The Cottage" on Green Lane).			Local Air Quality Assessment Score in Year of Opening: 2024: NO2: +148.4 PM10: +18.7 Regional Emissions (Over 60 year appraisal period) NOx: +1,878 tonnes			N/A	PM10 NPV: -£0.1 million NOx NPV: -£1.0 million Total value of change in air quality: -£1.1 million	N/A
	Greenhouse gases	There is an overall increase in greenhouse gases as a result of the scheme. The reason for the increase is because of an increase in road traffic with the scheme in place. This option would result in an increase in vehicle kilometres travelled which would minimise emission increases. Average speeds would also be relatively low, although HDV proportions would be relatively high, which would result in an overall increase in emissions.			Change in non-traded carbon over 60y (CO2e)		745,029	N/A	-£33.2 million	
		Change in traded carbon over 60y (CO2e)		2770						
	Landscape	Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. Elevated views from the top of the escarpment have views westward over falling ground into the neighbouring vale, and would likely be affected by the presence of the Scheme as it sweeps from the A417 southwards before entering the western tunnel portal south west of Birdlip Hill. Around one third of the Scheme would run in tunnel, however the majority of the route would run offline through an unspoilt rural landscape, traversing local field boundaries and running perpendicular to the contour profile of the escarpment as it climbs eastwards, damaging the integrity of the scarp slope. As such the overall effect is considered to be Large Adverse as the scheme would also be visually intrusive and disrupt fine and valued views in the area as well as being at considerable variance with local landform, scale and pattern.			N/A	Large Adverse	N/A			
	Townscape	Option 24 would pass through a rural landscape with no interaction with a townscape environment. The closest it comes to a built environment of more than one or two properties is where the scheme would run approximately 100m (at its closest point) to the small hamlet of Little Witcombe. It is not considered that this qualifies as an urban environment and there would be no direct impact upon the hamlet itself. As such it is considered that the landscape appraisal is a more appropriate appraisal method with regard to this route option.			N/A	No Impact	N/A			
	Historic Environment	The Option 24 road corridor has the potential to cause adverse impacts upon the setting of several high value listed buildings in Little Witcombe, Great Witcombe and Brimpsfield, including the Grade I Listed Church of St Michael, the Grade I Listed Church of St Mary and the Grade II* Listed Beach Hall. There would also be potential Moderate adverse setting impacts upon Brimpsfield Castle and Mound Scheduled Monuments and Slight adverse Brimpsfield Conservation Area and surrounding grade II listed buildings to the east of the tunnel. Where there are construction groundworks there is a potential for Moderate adverse impacts upon unknown archaeological remains. Where the Option is in tunnel this will remove the impact to setting and archaeology, however, the tunnel portals will have a significant adverse impact on the surrounding rural character. The overall significance of effect is considered to be Moderate Adverse.			N/A	Moderate Adverse	N/A			
	Biodiversity	Intermediate Negative impacts are currently identified for the 'Very High' and 'High' valued Cotswolds Beechwoods SAC/SSSI due to the proximity of the western portal to the edge of the designated site and potential effects associated with air quality impacting on habitats and hydrological impacts associated with tunnelling, resulting in a Large Adverse effect. Intermediate Negative impacts are identified for the 'High' valued Bushley Muzzard SSSI with potential for significant impacts to hydrology affecting the wetland habitats within this SSSI. Bats have been valued as 'High' in this assessment and an Intermediate Negative impact is possible, resulting in a Large Adverse effect. The presence of Nationally Important bat populations cannot be ruled out at this stage until more detailed surveys have been undertaken. The proposals could damage or destroy roosts, remove commuting routes, and result in killing and injury of bats. Standard mitigation has been included in the assessment of likely impacts. There are considerable opportunities for ecological enhancement measures along the scheme corridor, including the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts due to the uncertainty of these measures. The overall appraisal score is based on the most adverse category assessment.			N/A	Large Adverse	N/A			
	Water Environment	Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation. A mainline cutting intersects the full thickness of the Great Oolite aquifer upgradient of Bushley Muzzard SSSI, potentially leading to loss of water supply to this spring-fed wetland. An access road and junction also crosses the SSSI. One or both are likely to result in substantial habitat loss. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse Impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) and also Bushley Muzzard Brimpsfield SSSI would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.			N/A	Very Large Adverse	N/A			
Social	Commuting and Other users	Journey time benefits arise from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements.			Value of journey time changes(£m)		157.2	N/A	£71.8 million	N/A
		Net journey time changes are the net of positive and negatives in a given time band. Monetary (NPV) includes benefits from journey time savings, vehicle operating cost impacts and changes in user charges.			Net journey time changes (£m)					
		0 to 2min	2 to 5min	> 5min						
		-50.1	149.1	58.2						
	Reliability impact on Commuting and Other users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.			£15.7 million	Moderate Beneficial	£15.7 million			
	Physical activity	This option has the potential to result in the realignment of some Non-motorised User (NMU) routes, including the Cotswold Way National Trail, leading to an increase in journey times and potentially discouraging people from using routes which may result in a disbenefit for NMUs. However, the provision of new routes such as dedicated crossings, additional cycle paths and footpaths and retention of NMU routes where possible, would have the potential to increase the number of people choosing alternative modes of transport to vehicles, such as on foot or bicycle, resulting in an improvement in the levels of physical activity. On balance, there would be an overall Slight Beneficial effect on physical activity.			N/A	Slight Beneficial	N/A			
	Journey quality	Option 24 is anticipated to slightly improve traveller care for vehicle travellers through the provision of new signs and potentially new laybys, the locations of which would be identified at Stage 2. Traveller stress is predicted to moderately improve with this option in place for vehicle travellers, with a reduction in frustration due to better journey times and reliability, route uncertainty with good design and layout of new and existing signs and also in the fear of potential accidents through the delivery of new NMU facilities and safety related infrastructure. For NMUs, journey times and reliability are likely to alter with numerous NMU facilities likely to be directly affected, barriers between people and traffic and traffic flows for roads alongside NMU facilities are also likely to change. The potential provision of NMU facilities at appropriate locations would minimise effects on journey quality for NMUs.			N/A	Moderate Beneficial	N/A			
	Accidents	A reduction in the number of personal injury accidents and casualties of all types results from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Savings on the improved section are offset to a degree by increases in traffic (and accidents) in the A417 corridor although the net result is beneficial.			Reduction in PIAs: 65.7 Reduction in casualties: Fatal: 2.7 Serious: 21.7 Slight: 83		Not applicable	£6.8 million	N/A	
	Security	Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.			N/A	Neutral	N/A	N/A		
	Access to services	This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.			N/A	Neutral	N/A	N/A		
	Affordability	The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.			N/A	Slight Beneficial	N/A	N/A		
	Severance	There are two community facilities within 250m of this option and there is the potential for severance to occur to additional facilities further than 250m from the option. There is potential for severance to approximately 11 NMU, including footpaths, National Trails and cycle paths, which could lead to NMUs being dissuaded from making journeys to facilities. However, NMU facilities would be retained where possible and the provision of replacement and additional facilities such as crossings would reduce severance impacts to journeys. On balance, there would be an overall Neutral effect on severance.			N/A	Neutral	N/A	N/A		
	Option and non-use values	The scheme does not include measures that will substantially change the availability of transport services in the study area.			N/A	Neutral	N/A			
Public Account	Cost to Broad Transport Budget	The scheme will be funded through Central Government Funds			Central Govt funding: Wider Public Finances = £726.2 million		N/A	£726.2 million		
	Indirect Tax Revenues	There would be some increase in the tax being paid to the Exchequer			Central Govt funding: Wider Public Finances = -£64.9 million		N/A	-£64.9 million		

Appraisal Summary Table - Option 29		Date produced:	10	01	2018	Contact:			
Name of scheme:	A417 Missing Link at Air Balloon	Name	Michael Goddard						
Description of scheme:	The A417/A419 provides an important link between the Midlands and the South of England, between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 29, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 29 comprises an offline route of 5.7km in length, and containing a 1.7km tunnel north of Birdlip where it joins the existing A417 at Cowley Roundabout.	Organisation	Highways England						
		Role	Promoter/Official						
Impacts	Summary of key impacts	Assessment							
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/vulnerable grp		
Economy	Business users & transport providers	Journey time benefits arise from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Net journey time changes are the net of positive and negatives in a given time band. Monetary (NPV) includes benefits from journey time savings, vehicle operating cost impacts and changes in user charges.	Value of journey time changes(£m)		211.7	N/A	£248.4 million	N/A	
	Net journey time changes (£m)		0 to 2min	2 to 5min	> 5min				
			-58.8	193.8	76.6				
	Reliability impact on Business users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£21.2 million			Moderate Beneficial	£21.2 million		
	Regeneration	The scheme is not in close proximity to a regeneration area.	N/A			N/A	N/A		
	Wider Impacts	In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DIT VIM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.	£24.8 million			N/A	£24.8 million		
Environmental	Noise	Option 29 would provide a tunnel, resulting in some noise reductions. This option would be effective at diverting traffic onto the new road and away from the existing alignment but would pass through an area with a relatively high number of residential properties, resulting in a greater number of noise increases than decreases at sensitive receptors. A small number of properties with high noise levels and large noise changes are the result of the new road moving closer to those properties when compared to the baseline, and in some cases anomalies in OS addresspoint data. These will be addressed in the next iteration of the AST.	197 households experiencing increased daytime noise in forecast year 2039. 212 households experiencing reduced daytime noise in forecast year 2039. 226 households experiencing increased night time noise in forecast year 2039. 21 households experiencing reduced night time noise in forecast year 2039.			N/A	£0.6 million	N/A	
	Air Quality	Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA. For the purpose of this assessment, it was assumed that two properties would be demolished for the scheme ("The Cottage" on Green Lane and "Romanhurst Cottage" on Birdlip Hill).	Local Air Quality Assessment Score in Year of Opening: 2024: NO2: +321.7 PM10: +34.1 Regional Emissions (Over 60 year appraisal period) NOx: +1,937 tonnes			N/A	PM10 NPV: -£0.1 million NOX NPV: -£1.0 million Total value of change in air quality: -£1.1 million	N/A	
	Greenhouse gases	There is an overall increase in greenhouse gases as a result of the scheme. The reason for the increase is because of an increase in road traffic with the scheme in place. This option would result in an increase in vehicle kilometres travelled which would minimise emission increases. Average speeds would be relatively high, although HDV proportions would be relatively low which would result in an overall increase in emissions.	Change in non-traded carbon over 60y (CO2e)		522,261	N/A	-£23.2 million		
			Change in traded carbon over 60y (CO2e)		2301				
		Landscape	Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. Elevated views from the top of the escarpment have views westward over falling ground into the neighbouring vale and, would likely be affected by the presence of the Scheme as it sweeps from the A417 southwards before entering the western tunnel portal at Birdlip Hill. Around one third of the scheme would run in tunnel, however the remaining route would run offshore as a new linear feature through an unspoilt landscape as it traverses the local landscape and contour profile of the escarpment as the route climbs eastwards, damaging the integrity of the scarp slope. Large scale junctions at either end of the scheme would also have a notable impact at considerable variance with the scale and pattern of the local landscape. Due to the likely disruption to valued views, and the degradation of key features within this landscape that can not be fully mitigated for, the overall significance of effect is Large Adverse.	N/A			Large Adverse	N/A	
		Townscape	Option 29 would pass through a rural landscape with no interaction with a townscape environment. The closest it comes to a built environment of more than one or two properties is where the scheme would run approximately 100m (at its closest point) to the small hamlet of Little Witcombe. It is not considered that this qualifies as an urban environment and there would be no direct impact upon the hamlet itself. As such it is considered that the landscape appraisal is a more appropriate appraisal method with regard to this route option.	N/A			No Impact	N/A	
		Historic Environment	The Option 29 road corridor has the potential to cause an overall Moderate adverse impact upon Listed Buildings. There would be an adverse impact on the setting of several high value listed buildings in Little Witcombe, Great Witcombe, including the Grade I Listed Church of St Mary and the Grade II* Listed Beach Hall. There would also be an adverse impact upon the setting of surrounding grade II listed buildings including the Golden Heart Inn and buildings located in Birdlip. There would be a Moderate adverse impact on Crickley Hill Camp Scheduled Monument and Brimsfield Castle and Mound Scheduled Monuments. Where there are construction groundworks there is a potential Moderate adverse impact upon unknown archaeological remains. Where the Option is in tunnel this will remove the impact to setting and archaeology, however, the tunnel portals will have a significant adverse impact on the surrounding rural character. The overall significance of effect is considered to be Moderate Adverse.	N/A			Moderate Adverse	N/A	
		Biodiversity	Intermediate Negative impacts are currently identified for the 'Very High' and 'High' valued Cotswolds Beechwoods SAC/SSSI due to the proximity of the western portal to the edge of the designated site and potential effects associated with changes to air quality impacting on habitats. Additionally, the impact of tunnels on hydrology is currently unknown and this has potential to result in significant effects upon habitats. Bats have been valued as 'High' in this assessment and an Intermediate Negative impact is possible, resulting in a Large Adverse effect. The presence of Nationally important bat populations cannot be ruled out at this stage until more detailed surveys have been undertaken. The proposals could damage or destroy roosts, remove commuting routes, and result in killing and injury of bats. Intermediate Negative impacts are identified for 'Medium' valued barn owl and hedgerows. There are considerable opportunities for ecological enhancement measures along the scheme corridor, including the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts due to the uncertainty of these measures. The overall appraisal score is based on the most adverse category assessment.	N/A			Large Adverse	N/A	
		Water Environment	Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation of the scheme. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse Impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.	N/A			Very Large Adverse	N/A	
	Social	Commuting and Other users	Journey time benefits arise from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Net journey time changes are the net of positive and negatives in a given time band. Monetary (NPV) includes benefits from journey time savings, vehicle operating cost impacts and changes in user charges.	Value of journey time changes(£m)		157.8	N/A	£89.5 million	N/A
Net journey time changes (£m)		0 to 2min	2 to 5min	> 5min					
		-54.1	152.0	59.9					
		Reliability impact on Commuting and Other users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.	£15.8 million			Moderate Beneficial	£15.8 million	
		Physical activity	This option has the potential to result in the realignment of some Non-motorised User (NMU) routes, including the Cotswold Way National Trail, leading to an increase in journey times and potentially discouraging people from using routes which may result in a disbenefit for NMUs. However, the provision of new routes such as dedicated crossings, additional cycle paths and footpaths and retention of NMU routes where possible, would have the potential to increase the number of people choosing alternative modes of transport to vehicles, such as on foot or bicycle, resulting in an improvement in the levels of physical activity. On balance, there would be an overall Slight Beneficial effect on physical activity.	N/A			Slight Beneficial	N/A	
		Journey quality	Option 29 is anticipated to slightly improve traveller care for vehicle travellers through the provision of new signs and potentially new laybys, the locations of which would be identified at Stage 2. Traveller stress is predicted to moderately improve with this option for vehicle travellers; with a reduction in frustration due to better journey times and reliability, route uncertainty with good design and layout of new and existing signs and also in the fear of potential accidents through the delivery of new NMU facilities and safety related infrastructure. For NMUs, journey times and reliability are likely to alter with numerous NMU facilities likely to be directly affected, barriers between people and traffic and traffic flows for roads alongside NMU facilities are also likely to change. The potential provision of NMU facilities at appropriate locations would minimise effects on journey quality for NMUs.	N/A			Moderate Beneficial	N/A	
		Accidents	A reduction in the number of personal injury accidents and casualties of all types results from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Savings on the improved section are offset to a degree by increases in traffic (and accidents) in the A417 corridor although the net result is beneficial.	Reduction in PIAs: 55.4 Reduction in casualties Fatal: 2.7 Serious: 20.4 Slight: 71.2			N/A	£6.2 million	N/A
		Security	Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.	N/A			Neutral	N/A	N/A
		Access to services	This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.	N/A			Neutral	N/A	N/A
	Affordability	The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.	N/A			Slight Beneficial	N/A	N/A	
	Severance	There are three community facilities within 250m of this option and there is the potential for severance to occur to additional facilities further than 250m from the option. There is potential for severance to approximately 12 NMU routes, including footpaths, National Trails and cycle paths, which could lead to NMUs being dissuaded from making journeys to facilities. However, NMU facilities would be retained where possible and the provision of replacement and additional facilities such as crossings would reduce severance impacts to journeys. On balance, there would be an overall Neutral effect on severance.	N/A			Neutral	N/A	N/A	
	Option and non-use values	The scheme does not include measures that will substantially change the availability of transport services in the study area.	N/A			Neutral	N/A		
Public Account	Cost to Broad Transport Budget	The scheme will be funded through Central Government Funds	Central Govt funding: £742.7 million			N/A	£742.7 million		
	Indirect Tax Revenues	There would be some increase in the tax being paid to the Exchequer	Central Govt funding: Wider Public Finances = -£49.9 million			N/A	-£49.9 million		

Appraisal Summary Table - Option 30		Date produced:	10	01	2018	Contact:		
Name of scheme: A417 Missing Link at Air Balloon Description of scheme: The A417/A419 provides an important link between the Midlands and the South of England, between Gloucester and Swindon, and as an alternative to the M5/M4 route via Bristol. Its performance is hindered by the capacity limitations on the one single carriageway section of the A417 that has two at-grade roundabouts restricting traffic flow between Brockworth bypass and Cowley roundabout, as well as a priority junction with the B4070 on Birdlip Bypass. In December 2014, proposals were announced to develop a free flowing dual carriageway link between the Brockworth Bypass and the Cowley Roundabout, taking account of both the environmental sensitivity of the site and the importance of the route to the local economy. This AST has subsequently been produced during PCF Stage 1 to provide decision makers with a concise, across-the-board overview of the impacts of Option 30, taking account of all the economic, social, environmental and financial impacts of an intervention as set out in the Treasury Green Book. Option 30 comprises a 5.5km surface route following the existing A417 up to Grove Farm where it diverts south east of the Air Balloon through Shab Hill, where it joins the existing A417 at Cowley Roundabout.		Name: Michael Goddard Organisation: Highways England Role: Promoter/Official						
Impacts	Summary of key impacts	Assessment						
		Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp			
Economy	Business users & transport providers	Value of journey time changes(£m)		184.6	N/A	£170.9 million	N/A	
		Net journey time changes (£m)						
		0 to 2min	2 to 5min	> 5min				
	Reliability impact on Business users	Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.		£18.5 million	Moderate Beneficial	£18.5 million		
Regeneration	The scheme is not in close proximity to a regeneration area.		N/A	N/A	N/A			
Wider Impacts	In the absence of a WITA analysis the simplified approach to estimating wider economic benefits set out in the DfT VIM guidance has been adopted. This recommends that an indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to Business User Benefits.		£17.1 million	N/A	£17.1 million			
Environmental	Noise	Option 30 is a surface route, and as such there would be not be any noise reductions achievable with a tunnel. However, this option would be reasonably effective at diverting traffic onto the new road and away from the existing alignment and would pass through an area with a relatively low number of residential properties, resulting in a greater number of noise decreases than increases at sensitive receptors. A small number of properties with high noise levels and large noise changes are the result of the new road moving closer to those properties when compared to the baseline, and in some cases anomalies in OS addresspoint data. These will be addressed in the next iteration of the AST.		97 households experiencing increased daytime noise in forecast year 2039. 167 households experiencing reduced daytime noise in forecast year 2039. 116 households experiencing increased night time noise in forecast year 2039. 158 households experiencing reduced night time noise in forecast year 2039.		N/A	£0.8 million	N/A
	Air Quality	Overall there is a net worsening in local and regional air quality as a result of the scheme. This is because of the rerouting of vehicles on to the A417 and M5 away from the M40 and A34 which results in a longer route with a greater number of properties along it. There would be no new exceedances as a result. The Scheme is predicted to improve air quality at properties within the Birdlip AQMA and Oxford AQMA. For the purpose of this assessment, it was assumed that one property would be demolished for the scheme ("Woodside House" on Crickley Hill).		Local Air Quality Assessment Score in Year of Opening: 2024: NO2: +628.1 PM10: +99.2 Regional Emissions (Over 60 year appraisal period) NOx: +1,681 tonnes		N/A	PM10 NPV: -£0.3 million NOx NPV: -£0.9 million Total value of change in air quality: -£1.1 million	N/A
	Greenhouse gases	There is an overall increase in greenhouse gases as a result of the scheme. The reason for the increase is because of an increase in road traffic with the scheme in place. This option would result in an increase in vehicle kilometres travelled which would minimise emission increases. Average speeds would be high, as would the proportion of HDVs using the new road which would result in an overall increase in emissions.		Change in non-traded carbon over 60y (CO2e) 687,721 Change in traded carbon over 60y (CO2e) 2190		N/A	-£30.6 million	
	Landscape	Features and elements typical of the locality include a mixture of arable and pasture, with the dramatic limestone scarp rising above adjacent lowlands. Located in the most part within National Character Area 107 Cotswolds, and entirely within the Cotswolds AONB, the area is designated for its high landscape value. Elevated views from the top of the escarpment have views westward over falling ground into the neighbouring vale, and views from Barrow Wake and the associated ridge line would likely be affected by the presence of the Scheme as it runs close by to the A417 west of the Air Balloon junction. This option runs entirely at surface. The western half of the Scheme runs online with the existing A417, but when offline, runs across a rural scene over rising ground. The new junction at Shab Hill would increase the level of disturbance of the area as it climbs up through the hillside to the east, opening views of the route as it traverses the escarpment. The overall significance of effect is considered to be Large Adverse due to the potential for the scheme to damage the high quality landscape of NCA107, diminishing its quality, decreasing tranquillity, disrupting fine and valued views of the area and resulting in an adverse impact upon the scale and pattern of the landscape.		N/A	Large Adverse	N/A		
	Townscape	Given the highly rural nature of the route, the scheme would not pass through any developed settlements greater than individual farmsteads. No village settlements would be directly affected by the route. A townscape appraisal is not considered necessary for this option due to the lack of urban features. Instead, the landscape appraisal should be referenced with regard to this route option.		N/A	No Impact	N/A		
	Historic Environment	The Option 30 road corridor has the potential to cause an adverse impact upon the setting of Crickley Hill Camp Scheduled Monument and Emma's Grove Scheduled Monument where the road severs the landscape and vehicle movement and road lighting cause noise, light and air pollution. There would also be adverse impacts upon the setting of rural listed buildings located east of the proposed surface route option including the Grade II Harding's Barn and Grade II Shab Hill Barn. There would be adverse impacts upon archaeological remains during construction groundworks. This includes archaeological remains potentially associated with Crickley Hill Camp Scheduled Monument and Emma's Grove Scheduled Monument. Following the precautionary principle, the overall significance of effect is considered to be Large Adverse.		N/A	Large Adverse	N/A		
	Biodiversity	Bats have been valued as 'High' in this assessment and an Intermediate Negative impact is possible, resulting in a Large Adverse effect. The assessment of 'High' value is based on the precautionary principal, as the presence of Nationally Important bat populations cannot be ruled out until more detailed surveys have been undertaken. The proposals could potentially directly impact on populations of these species, reduce available habitat, result in habitat fragmentation and the mortality of bats in relation to traffic. Intermediate Negative impacts are identified for 'Medium' valued barn owl and hedgerow habitats due to potential loss and fragmentation of habitats. Standard mitigation has been included in the assessment of likely impacts. There are considerable opportunities for ecological enhancement measures along the scheme corridor, including the provision of a green bridge at the Air Balloon roundabout. These benefits have not been included in the assessment of impacts due to the uncertainty of these measures. The overall appraisal score is based on the most adverse category assessment.		N/A	Large Adverse	N/A		
	Water Environment	Potentially adverse effects on direct groundwater receptors (groundwater bodies) and indirect groundwater receptors (springs, streams, wetland and abstractions) during construction and operation. In accordance with the TAG Unit A3 guidance, a potential impact magnitude of Moderate Adverse on a water feature of Very High importance results in a Highly Significant potential impact. Highly Significant potential impacts on two or more water features results in a Very Large Adverse impact assessment score. Therefore, in the absence of ground investigation baseline data, and detailed design and mitigation measures, the potential impact assessment score for groundwater receptors including the Burford Jurassic groundwater body and Severn Vale - Jurassic Limestone Cotswolds Edge South groundwater body (both Great and Inferior Oolite) would be Very Large Adverse. The potential impact assessment score for surface water receptors would be Slight Adverse, due to standard mitigation measures implemented through the CEMP.		N/A	Very Large Adverse	N/A		
	Social	Commuting and Other users	Value of journey time changes(£m)		141.3	N/A	£62.4 million	N/A
			Net journey time changes (£m)					
0 to 2min			2 to 5min	> 5min				
Reliability impact on Commuting and Other users		Reliability benefits have been assessed using the stress based approach set out in TAG Unit A1.3 Appendix C.5. The outcome of this assessment has indicated a moderate beneficial impact as a result of the scheme. Monetised benefits have been estimated as a 10% uplift to travel time benefits.		£14.1 million	Moderate Beneficial	£14.1 million		
Physical activity		This option has the potential to result in the realignment of some Non-motorised User (NMU) routes, including the Cotswold Way National Trail, leading to an increase in journey times and potentially discouraging people from using routes which may result in a disbenefit for NMUs. However, the provision of new routes such as dedicated crossings, additional cycle paths and footpaths and retention of NMU routes where possible, would have the potential to increase the number of people choosing alternative modes of transport to vehicles, such as on foot or bicycle, resulting in an improvement in the levels of physical activity. On balance, there would be an overall Slight Beneficial effect on physical activity.		N/A	Slight Beneficial	N/A		
Journey quality		Option 30 is anticipated to slightly improve traveller care for vehicle travellers through the provision of new signs and potentially new laybys, the locations of which would be identified at Stage 2. The implementation of an appropriate landscape design would restrict views to the wider area for motorists. Traveller stress is predicted to slightly improve with this option in place for vehicle travellers; with a reduction in frustration due to better journey times and reliability, route uncertainty with good design and layout of new and existing signs and also in the fear of potential accidents through the delivery of new NMU facilities and safety related infrastructure. For NMUs, journey times and reliability are likely to alter with numerous NMU facilities likely to be directly affected, barriers between people and traffic and traffic flows for roads alongside NMU facilities are also likely to change. The potential provision of NMU facilities at appropriate locations would minimise effects on journey quality for NMUs.		N/A	Slight Beneficial	N/A		
Accidents		A reduction in the number of personal injury accidents and casualties of all types results from the conversion of the existing single carriageway section of the A417 to a modern dual carriageway, with associated junction improvements. Savings on the improved section are offset to a degree by increases in traffic (and accidents) in the A417 corridor although the net result is beneficial.		Reduction in PIAs: 36.6 Reduction in casualties: Fatal: 2.0 Serious: 13.1 Slight: 48.3		N/A	£4.3 million	N/A
Security		Effects on security as a result of this option are anticipated to be Neutral, as it is unlikely that there would be any changes to security indicators and therefore freedom from crime.		N/A	Neutral	N/A	N/A	
Access to services		This option is not anticipated to affect access to services within the vicinity of the option and effects on public transport accessibility would be Neutral.		N/A	Neutral	N/A	N/A	
Affordability		The scheme should reduce highway journey times (and costs) for trunk road traffic. Some local movements will experience increases in journey distance as a result of the scheme.		N/A	Slight Beneficial	N/A	N/A	
Severance	There is one community facility within 250m of this option and there is the potential for severance to occur to additional facilities further than 250m from the option. There is potential for severance to approximately six NMU routes, including footpaths, National Trails and cycle paths, which could lead to NMUs being dissuaded from making journeys to facilities. However, NMU facilities would be retained where possible and the provision of replacement and additional facilities such as crossings would reduce severance impacts to journeys. On balance, there would be an overall Neutral effect on severance.		N/A	Neutral	N/A	N/A		
Option and non-use values	The scheme does not include measures that will substantially change the availability of transport services in the study area.		N/A	Neutral	N/A			
Public Account	Cost to Broad Transport Budget	The scheme will be funded through Central Government Funds		Central Govt funding: £286.4 million		N/A	£286.4 million	
	Indirect Tax Revenues	There would be some increase in the tax being paid to the Exchequer		Central Govt funding: Wider Public Finances = -£62.9 million		N/A	-£62.9 million	

Appendix D –Early Assessment and Sifting Tool Plus methodology and assessment process

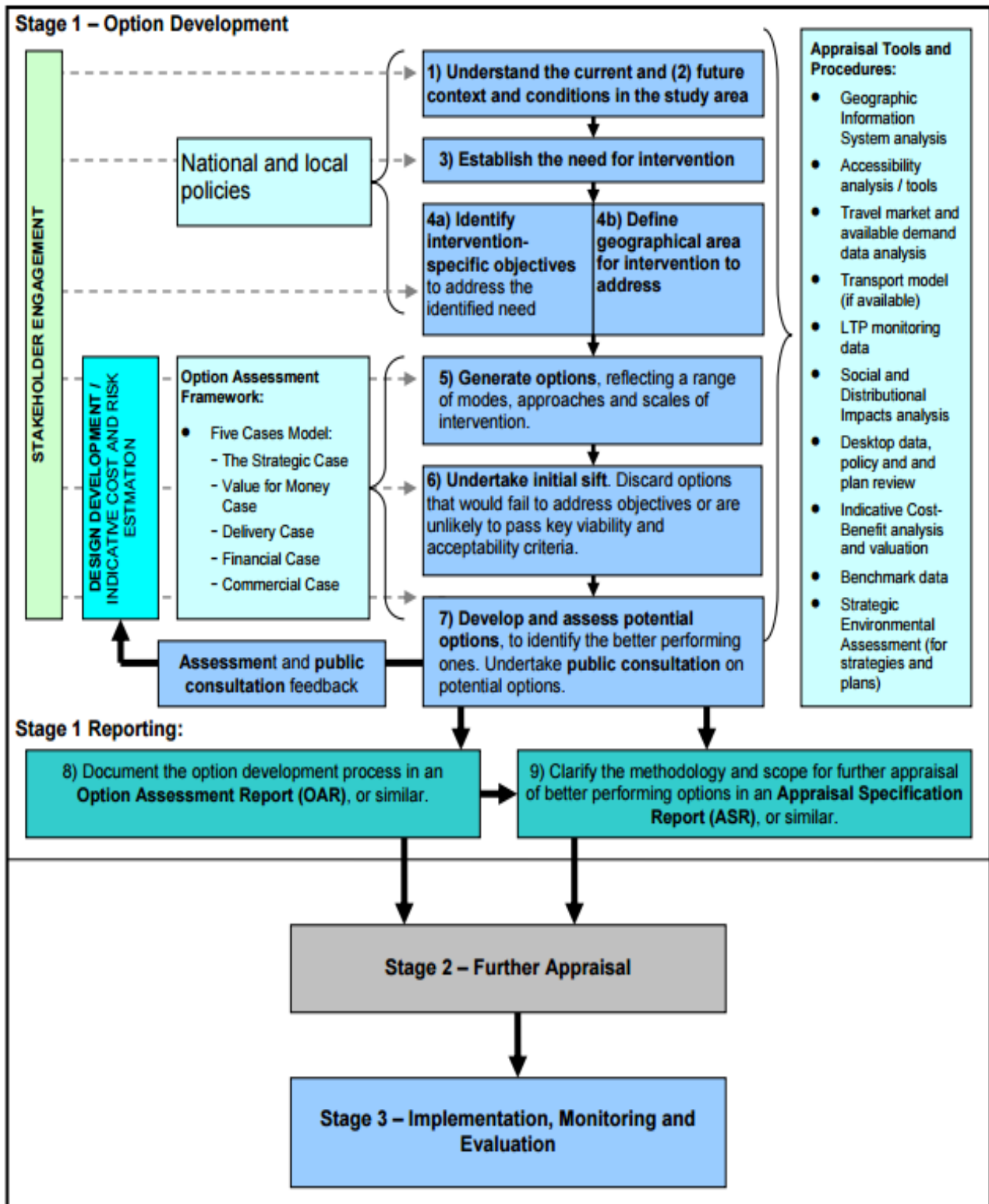
1. Transport appraisal process

1.1 Introduction

- 1.1.1 The Department for Transport (DfT) has produced the Transport Analysis Guidance (WebTAG) which provides details on how transport schemes should be appraised and consists of 3 stages. Stages 1 and 2 of the Transport Appraisal Process outlined in WebTAG are intended to reduce the number of options at each sift in order to produce a Preferred Option. Stage 3 looks at the Implementation, Monitoring and Evaluation.
- 1.1.2 At Stage 1 of the Transport Appraisal Process outlined in WebTAG, potential options are generated and then sifted to promote the most suitable options available which are then taken forward for further analysis and assessment. WebTAG splits Stage 1 into 9 steps:
- Step 1: Understanding the Current Situation
 - Step 2: Understanding the Future Situation
 - Step 3: Establishing the Need for Intervention
 - Step 4a: Identifying Objectives
 - Step 4b: Define Geographic Area of Impact to be Addressed by the Intervention
 - Step 5: Generating Options
 - Step 6: Initial Sifting
 - Step 7: Development and Assessment of Potential Options
 - Step 8: Produce Option Assessment Report, or similar
 - Step 9: Clarify Modelling and Appraisal Methodology
- 1.1.3 Steps 1 to 3 above have been considered as part of Project control framework (PCF) Stage 0 for the project, which provides an overall mandate for the project under the content of the Client Scheme Requirements (CSR). The CSR is effectively the scope of the project defined between Highways England and DfT.
- 1.1.4 Step 4 was also considered as part of PCF Stage 0. However, the approach to Stakeholder engagement has meant that a series of specific project objectives have been agreed which extend beyond the basic strategic objectives for this improvement scheme.
- 1.1.5 The scheme is at step 8 in Highways England PCF Stage 1, where an initial sift of all the options has been undertaken so that any impracticable options are discarded at an early stage, developed and assessed. No guidance has been provided in the Design Manual for Roads and Bridges (DMRB) as to the methodology for the initial sifting in Stage 1, but WebTAG suggests that “options should be considered and progressed or discarded on the basis of evidence and EAST can be used to facilitate this process”. EAST is the Department for Transport’s Early Assessment and Sifting Tool. The project team has augmented the EAST process to ensure that the sifting criteria are specific to this particular project and this is discussed in more detail with the following text.

1.1.6 The process is represented in the following illustration taken from the WebTAG Guidance.

Figure 1.1: Sifting Process



2. Early Assessment Sifting Tool Plus

2.1 Background

- 2.1.1 For the initial sifting exercise an augmented version of the DfT sifting tool, Early Assessment and Sifting Tool (EAST), is used. This is referred to as EAST Plus. This section will look at all the criteria listed in the EAST spreadsheet, the limitations associated with its use and how the project team has chosen to augment the assessment criteria.
- 2.1.2 Each option has been measured against the criteria, set out below, to provide both moderation and a direct comparison between the options, before progressing to the next criteria.
- 2.1.3 Due to the limitations of EAST, a scoring system has been created for the purpose of ranking all the options based on the result of the initial sift, as EAST does not provide this. Creating a scoring system allows each option to be directly compared against one another.
- 2.1.4 EAST is split into 5 areas of consideration which looks at different aspects of the proposed options, these are:
- Strategic
 - Economic
 - Managerial
 - Financial
 - Commercial
- 2.1.5 These are sub-divided further and are discussed in detail below.
- 2.1.6 At this stage, all options have been scored with consideration of a green bridge located on Crickley Hill.

2.2 Strategic

- 2.2.1 This aspect is provided to assess whether the proposed options meet with pre-identified scheme objectives and it is broken down into the following areas:
- Scale of Impact
 - Fit with wider transport and government objectives (NPS)
 - Fit with other scheme specific objectives (CSR)
 - Key Uncertainties
 - Degree of consensus over outcomes

Scale of impact (Road Investment Strategy)

- 2.2.2 The Scale of Impact utilises the objectives set out in the Road Investment Strategy (RIS) (for the 2015/16-2019/20 Road Period) which are outlined below:

- Providing capacity and connectivity to support national and local economic activity
- Supporting and improving journey quality, reliability and safety
- Joining our communities and linking effectively to each other
- Supporting delivery of environmental goals and the move to a low carbon economy

2.2.3 Due to the development of scheme specific objectives and sub-objectives the RIS objectives will not be scored as they are a repetition of other scored objectives. Refer to Chapter 3 for full details of removed objectives of the EAST Plus Assessment.

Fit with wider transport and government objectives (National Policy Statement).

2.2.4 In this section, wider transport and government objectives are identified. Using the National Policy Statement for National Networks as this reflects government and transport objectives and are set out below:

- Environmental and Social Impacts
- Emissions
- Safety
- Technology
- Sustainable Transport
- Accessibility
- Road tolling and charging

2.2.5 The Environmental and Social Impacts and Emissions measures will be assessed individually and will be scored on a scale of 1-5 to reflect the existing choices provided in EAST. The table below, found in the EAST Guidance, shall be used to assist in the scoring of each option.

Table 2.1: Fit with wider transport and government objectives

Rating	Description	Expanded definition
1	Poor fit	There is significant conflict with other policies / options affecting the study area which needs to be resolved. Possibly also conflicts with other modes.
2	Low fit	There is some conflict with other policies / options or modes.
3	Reasonable fit	Overall the option fits well with other policies affecting the study area.
4	Good fit	The option fits very well with other policies affecting the study area.
5	Excellent fit	Option complements other policies/proposals affecting study area, has no negative impacts on other modes or outcomes and demonstrates 'doing more with less'.

Source: Early Assessment and Sifting Tool (EAST) Guidance

2.2.6 For the measure, does the option make use of technology, all routes have been scored as “Reasonable Fit” as technology details are not known at this stage of the project. The existing will score poor as it has limited technology.

2.2.7 For the measure, road tolling and charging, all routes will be scored not applicable (N/A) as this has not been proposed on any of the options put forward.

2.2.8 Safety, Sustainable Transport and Accessibility measures will not be scored as they are repetition of the scheme objectives. Refer to Chapter 3 for full details of removed objectives of EAST Plus assessment.

Fit with other objectives (CSR)

2.2.9 This variable refers to how well the proposed options are aligned with other objectives. It is usual to replicate the Client Scheme Requirements (CSR) as they are considered to represent scheme specific objectives. However, given the landscape led approach to the scheme and the interest of specific stakeholders, the project team, working closely with stakeholders, have developed a series of scheme specific objectives and sub objectives. Refer to Section 2 of the Technical Appraisal Report for full list of specific scheme objectives and sub-objectives.

2.2.10 These objectives and sub-objectives have been mapped against the CSR objectives to produce a top down cascade of information that fits within the overall RIS objectives. Refer to Figure 2.1 as an example of the mapping of the objectives.

2.2.11 The CSR objectives for this scheme are:

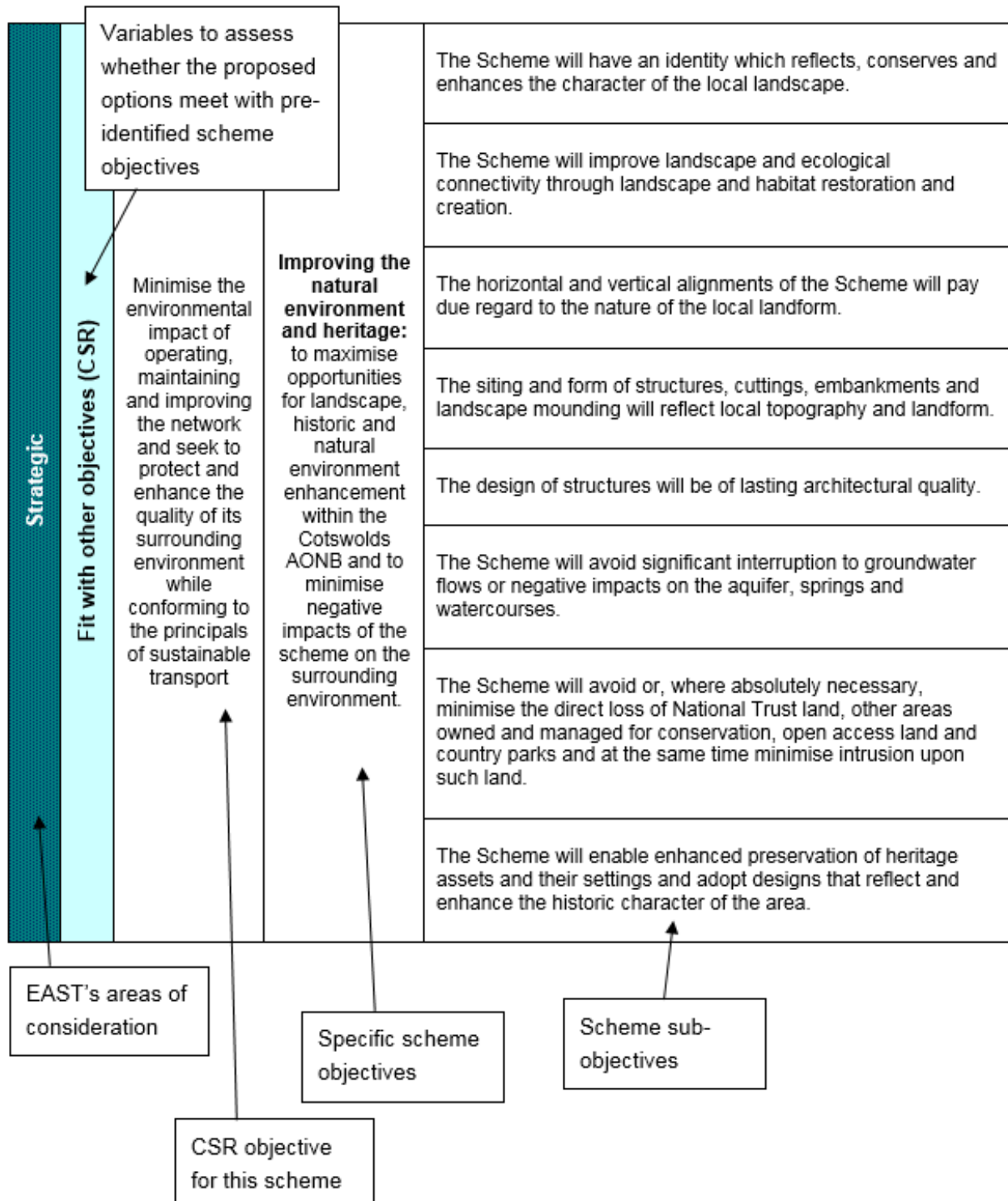
- Improve the operation and efficiency of the existing transport network
- Deliver capacity enhancements to the strategic road network
- Safety improvements for customers and operational staff
- Support economic growth
- Improve connectivity and community cohesion
- Enhance & protect the quality of the surrounding environment while conforming to the principles of sustainable transport

2.2.12 The specific scheme objectives are:

- **Safe, resilient and efficient network:** to create a high quality resilient route that helps to resolve traffic problems and achieves reliable journey times between the Thames Valley and West Midlands as well as providing appropriate connections to the local road network.
- **Supporting economic growth:** To facilitate economic growth, benefit local businesses and improve prosperity by the provision of a free-flowing road giving people more reliable local and strategic journeys.
- **Community & access:** to enhance the quality of life for local residents and visitors by reducing traffic intrusion and pollution, discouraging rat-running through villages and substantially improving public access for the enjoyment of the countryside.

- Improving the natural environment and heritage:** to maximise opportunities for landscape, historic and natural environment enhancement within the Cotswolds Area of Outstanding Natural Beauty (AONB) and to minimise negative impacts of the scheme on the surrounding environment.

Figure 2.1: Example of objectives top down cascade from CSR's to scheme specific objectives and sub-objectives



2.2.13 More details of the scheme objectives and sub objectives are provided within Chapter 2 of the Technical Appraisal Report. Each option was scored against these objectives using the scoring criteria in table 2.2.

Table 2.2: Fit with other objectives

Rating	Description	Expanded definition
1	Poor fit	There is significant conflict with other objectives / options affecting the study area which needs to be resolved. Possibly also conflicts with other modes.
2	Low fit	There is some conflict with other objectives / options or modes.
3	Reasonable fit	Overall the option fits well with other objectives affecting the study area.
4	Good fit	The option fits very well with other objectives affecting the study area.
5	Excellent fit	Option complements other objectives / proposals affecting study area, has no negative impacts on other modes or outcomes and demonstrates 'doing more with less'.

Source: Early Assessment and Sifting Tool (EAST) Guidance

Rationalisation

2.2.14 The use of a hierarchical mapping process from the RIS objectives (which are linked to the NPS outcomes), through the CSR to the specific scheme objectives and sub-objectives ultimately leads to some repetition. A clear display of this is the inclusion of connectivity objectives at nearly every level. It has therefore been necessary to rationalise the content of the strategic objectives to ensure that these objectives do not gain higher weightings through repetition. Where this repetition is identified the specific scheme objectives and sub-objectives will be selected to represent the content of the objective. Full details of strategic objectives removed from the EAST Plus assessment are shown in Chapter 3.

Key uncertainties

2.2.15 In this section a text box is available to input any key uncertainties that are associated with the proposed options. No score has been provided for this section.

Degree of consensus over outcomes

2.2.16 This section seeks to assess the level of consensus that will be achieved for each of the proposed schemes. The Table below shows the scoring criteria.

Table 2.3: Degree of consensus over outcomes

Rating	Description
1	Little or no consultation has taken place yet, or consultation has revealed a high level of disagreement about the option's ability to deliver the stated outcomes.

Rating	Description
2	Little consultation and/or strong reasons to suggest the outcomes are controversial.
3	Some consultation has taken place with some agreement.
4	Wide consultation and broad agreement on the outcomes, possibly one or two areas of disagreement remaining.
5	Extensive consultation has taken place with a high degree of consensus on the outcomes.

Source: Early Assessment and Sifting Tool (EAST) Guidance

2.2.17 Due to the extended period of time between Stage 1 and earlier options identification phases in the early 2000's, all options will be scored 1, little or no consultation.

2.3 Economic

2.3.1 For the Economics field, EAST provides a Red, Red-Amber, Amber, Green-Amber and Green (RAG) responses to answer the relevant fields. This is subjective as there is no direct correlation with how the sub-headings have been scored in the following sections:

- Economic growth
- Carbon emissions
- Socio-distributional impacts
- Local environment
- Well Being

2.3.2 To respond to this section accurately and remove the opportunity to be subjective, they are scored using a 7-point scale (-3 to +3) based on the DfT TAG Unit A3 – Environmental Impact Appraisal to answer all the questions provided under each heading. This system shall be used to replace the RAG analysis as it does not provide a sufficiently fine analysis to distinguish between the options.

Table 2.4: 7-point Scale used

Impact	Score
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
Neutral	0
Slightly adverse	-1
Moderately adverse	-2
Largely Adverse	-3

Source: DfT TAG Unit A3 – Environmental Impact Appraisal

Economic growth

2.3.3 In EAST, economic growth is further broken down into 5 criteria which are:

- Connectivity
- Reliability
- Resilience
- Delivery of housing
- Wider economic impacts

2.3.4 Under each of these headings, EAST provides questions allowing the respondent to answer each of the proposed options in a standardised way.

2.3.5 For connectivity, respondents are asked to determine whether the proposed option will provide a journey that is shorter/quicker and/or cheaper compared to the existing A417. At Stage 1 this will be based on the proposed route lengths to determine journey times. All the options will have a beneficial impact as the existing route has two at grade junctions and all the proposed solutions are anticipated to have grade separated junctions allowing the free flow of traffic. The shortest routes will score better. See below the criteria adopted to score connectivity base on route length.

Table 2.5: Option length based scores for connectivity

Option Length	Impact	Score
<6000 m	Largely beneficial	+3
6000 – 6500 m	Moderately beneficial	+2
>6500 m	Slightly beneficial	+1
N/A	Neutral	0
N/A	Slightly adverse	-1
Existing route (at grade junctions)	Moderately adverse	-2
N/A	Largely adverse	-3

2.3.6 The objective “Does it have an impact on the cost of travel (vehicle operating costs, fares, etc.)?” has been removed as it is repeated within the Carbon missions and well-being objectives. Refer to Chapter 3 for details of objectives removed from the assessment criteria.

2.3.7 Under the section devoted to reliability, it has been determined whether each of the proposed options will have any variation in their day-to-day journey times, this will allow for gradient and the distance of each option and its susceptibility to bad weather. It will also need to be determined what the impact on the number of incidents compared to the existing A417 will be.

2.3.8 Resilience provides an opportunity to judge what impact each option has on the resilience of the network due to terrorism, severe weather conditions or long-term effects due to climate change.

- 2.3.9 Delivery of housing will determine what impact the individual options have on their ability to support a specific planned development and/or has the ability to provide additional road capacity that will facilitate future housing without causing deterioration in traffic conditions. All options have been scored slightly beneficial as all will facilitate new housing development in the wider catchment.
- 2.3.10 In wider economic impacts the respondent has an opportunity to note whether there will be any impacts relating to that option which will need further analysis in the appraisal process.

Carbon emissions

- 2.3.11 Carbon emissions is split into 5 different sections these are:
- Activity
 - Embedded carbon
 - Carbon content
 - Efficiency
 - Overall effect on carbon emissions
- 2.3.12 The purpose of activity is to consider whether the proposed scheme will lead to a change in public transport usage or if the number of private vehicle trips and journey lengths will be altered by the proposed option. The proposed option has been measured against their anticipated vehicle-km change for all transportation modes based on a Do-Nothing scenario. A score based on options length assuming constant flow has been adopted and it is shown in the table below.

Table 2.6: Option length based scores

Option length	Impact	Score
< 5500 m	Largely beneficial	+3
5500 – 6000 m	Moderately beneficial	+2
6000 – 6500 m	Slightly beneficial	+1
6500 – 7000 m	Neutral	0
> 7000 m	Slightly adverse	-1
N/A	Moderately adverse	-2
N/A	Largely Adverse	-3

- 2.3.13 The section devoted to embedded carbon, asks whether “significant construction work is required?” In this section it is not considered appropriate to use the 7-point scale used elsewhere in the economics section and therefore a binary score system will be applied where No will receive a 0 score and Yes will receive a -1. All options have been scored as yes as major works are required for all of them.
- 2.3.14 The section carbon content, aims to distinguish the options by the type of fuel to be used. Since all the options are at an early stage it is expected that the same

fuel type will be used and therefore all options have received the same Neutral score of 0.

2.3.15 In the Efficiency category, it must be determined whether the option will cause a more efficient use of vehicles or a change in behaviour of drivers compared to the existing situation. The options have been assessed based on the proposed vertical gradient. There is no score for routes with a gradient greater than 10% as these will be removed through the engineering assessment. Refer to Chapter 5 of the Technical Appraisal Report for the options gradients.

Table 2.7: Criteria for gradient based scores

Vertical Gradient	Impact	Score
< 6%	Largely beneficial	+3
6% - 8%	Moderately beneficial	+2
8% - 9%	Slightly beneficial	+1
9% - 10%	Neutral	0
> 10%	Slightly adverse	-1
N/A	Moderately adverse	-2
N/A	Largely adverse	-3

2.3.16 EAST requires that the overall effect on carbon emissions for the proposed options are assessed. These scores have been based on distance of each alignment assuming constant flow and this criteria is shown in the table below.

Table 2.8: Route option length based scores

Option length	Impact	Score
< 5500 m	Largely beneficial	+3
5500 – 6000 m	Moderately beneficial	+2
6000 – 6500 m	Slightly beneficial	+1
6500 – 7000 m	Neutral	0
> 7000 m	Slightly adverse	-1
N/A	Moderately adverse	-2
N/A	Largely Adverse	-3

Socio-distributional impacts and the regions

2.3.17 This section seeks to measure what the social impacts will be due to the proposed options. This aspect is further broken down into three sections:

- Social and distributional impacts and the regions
- Regeneration
- Regional imbalance

2.3.18 Social and distributional impacts and the regions is measured against 8 social and distributional impacts (SDIs) which are noise, air quality, severance,

accessibility, personal affordability, accidents, security and user benefits. As all these impacts are repeated in other scored measures, the SDI metric will be discounted. Refer to Chapter 3 for full details of removed objectives from the EAST Plus assessment.

- 2.3.19 Regeneration seeks to measure what impact the scheme will have on a targeted regeneration area and what the impact will be. The options will be assessed against how well they will facilitate development. All options have been scored neutral because it is not a targeted regeneration area.
- 2.3.20 Regional imbalance is intended to identify whether the scheme is in a region which is underperforming compared to the rest of the country. In addition to this, the respondent is required to determine whether the individual options will impact economic growth within the region.
- 2.3.21 There are 2 metrics to score the regional imbalance. The first one is “If this is a weak region, what is the impact of the option on the region?” in which all options have been scored neutral as is not a weak region. The second metric is “How will this impact economic growth?” in which all options are scored largely beneficial due to the regional economy and standard of living.

Local environment

- 2.3.22 This aspect of EAST looks to determine the impact each of the potential options will have on the local environment and has been split into 4 sections provide below:
 - Air quality
 - Noise
 - Natural environment, heritage and landscape
 - Streetscape and urban environment
- 2.3.23 The section devoted to air quality looks to evaluate whether the options comply with the Air Quality Strategy for the UK, which has set limits for 9 air pollutants and 2 for the protection of ecosystems. The table below shows the scoring against air quality depending of the impact that each option will have.

Table 2.9: Scoring for air quality impact on proposed options

Impact	Score
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
No change	0
Slightly adverse	-1
Moderately adverse	-2
Largely beneficial	-3

2.3.24 Also under air quality, EAST asks the respondent to determine if any Air Quality Management Areas (AQMAs) are located within the scheme extents. If an AQMA is found to be present then it must be determined how many households will be impacted, the table below sets out how is intended to score this section if an AQMA is present. If an AQMA is not present, then it must be determined whether an AQMA will need to be created to reflect the impact of the new route and the scoring for this scenario is provided in table below.

Table 2.10: Scoring for proposed options where an AQMA is already present

AQMA present	Households affected	Score
Yes	Many	+2
Yes	Few	+1
No	Few	-1
No	Many	-2

2.3.25 For evaluation of noise 2 metrics are scored. One will measure the impact of each option on the reduction of disturbance from noise. The table below shows the scoring criteria that will be adopted depending on the impact.

Table 2.11: Scoring for air quality impact on proposed options

Impact	Positive impact
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
No change	0
Slightly adverse	-1
Moderately adverse	-2
Largely adverse	-3

2.3.26 For the other metric, a reference should be made to the DEFRA Noise Action Plan to determine whether the proposed options will have an impact on an existing noise problem area. If the option will affect a Noise Important Area then the option will receive a score of 0 otherwise it will receive a +1 score.

2.3.27 Natural environment, heritage and landscape gives the respondent the opportunity to determine what the overall impact on the natural environment is. The scoring criteria adopted is shown in the table below. Where this impact will be assessed as negative, a second question must be answered to assess the value of the environment affected. For this question, a binary scoring system will be applied, where High receives 0 and Low a +1 score.

Table 2.12: Scoring for natural environment, heritage and landscape impact on proposed options

Impact	Positive impact
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
No change	0
Slightly adverse	-1
Moderately adverse	-2
Largely adverse	-3

2.3.28 Streetscape and urban environment gives the respondent an opportunity to determine what the impact of the proposed options will be on the urban environment. The same scoring criteria than for the metric above will be used to score this one. As in the previous case, where the impact is assessed to be negative, a second question must be answered to assess the value of the environment affected with the same binary scoring system applied.

Well being

2.3.29 This section of EAST consists of the following sections:

- Severance
- Physical activity
- Injury or deaths
- Crime
- Enjoying access to a range of goods, services, people and places

2.3.30 For the severance criteria it will need to be determined what impact the proposed options will have on existing routes and the impact on all road users including Non-Motorised Users. The 2 metrics to measure the severance ask the respondent to assess the impact of each option against the increase of the possibility of cross street / corridor connections between neighbourhoods and if more or less people will be outside the public realm as a result. The criteria or the scoring of the first question is shown in the table 2.13. For the second one, all options will score neutral as there is no public realm in the area.

Table 2.13: Scoring for connectivity impact

Impact	Score
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
No impact	0
Slightly adverse	-1
Moderately adverse	-2
Largely adverse	-3

- 2.3.31 For physical activity, it must be determined whether the options will have an impact on physical activity levels and impacts an area of deprivation or poor health. As the proposed options will not have an impact, all receive a Neutral Score of 0.
- 2.3.32 For injury or deaths, it is determined whether the proposed options will lead to decreased Killed and Serious Injuries (KSIs) compared to the existing A417, based on evidence of similar standard roads. Consideration should also be given to how the proposals shall be maintained and what risk this poses to maintenance workers.
- 2.3.33 All options will need to be assessed to determine their impact on crime and the impact it will have on people’s fear of crime. All the options will be given a Neutral score as all will have the same impact on crime.
- 2.3.34 In enjoy access to a range of goods, services, people and places, it must be determined what impact the option will have on journey time, reliability, access to key services, journey time reliability and the number of traffic incidents. The scoring criteria for this metric is shown in the table below

Table 2.14: Scoring Enjoy access to a range of goods, services, people and places

Impact	Positive impact
Largely beneficial	+3
Moderately beneficial	+2
Slightly beneficial	+1
No impact	0
Slightly adverse	-1
Moderately adverse	-2
Largely adverse	-3

- 2.3.35 Metrics related with journey time and journey time reliability will be removed in this section as they are repeated in the economic growth section. Refer to Chapter 3 for details of objectives removed from the assessment criteria.
- 2.3.36 Metrics assessing the impact on the cost travel and the number of incidents have been scored based on options length assuming constant flow. The criteria is shown in the table below.

Table 2.15: Option length based scores

Option length	Impact	Score
< 5500 m	Largely beneficial	+3
5500 – 6000 m	Moderately beneficial	+2
6000 – 6500 m	Slightly beneficial	+1
6500 – 7000 m	Neutral	0
> 7000 m	Slightly adverse	-1

Option length	Impact	Score
N/A	Moderately adverse	-2
N/A	Largely Adverse	-3

Expected value for money category

2.3.37 EAST categorises value for money (VfM) into the following ranges based on the Benefit Cost Ratio (BCR):

- Poor (<1)
- Low (1 - 1.5)
- Medium (1.5 – 2)
- High (2 – 4)
- Very High (>4)

2.3.38 The assessment of VfM does not consider Monetisation of Landscape.

2.4 Managerial

Implementation tables

2.4.1 The purpose of this section is to provide an estimate of the timescales for each option from inception to delivery. As the A417 is being developed as part of the RIS1, construction will be required to start early in RIS2 currently identified as mid-2021, with an assumption made that the construction duration will be in the order of 3 years for all proposed options.

2.4.2 This section will be scored using the options provided in EAST which provides a score on a scale of 1-7, where 1 is for a scheme that will be completed within 1 month and 7 for a scheme that will require more than 10 years. This conflicts with the scoring system that has been devised to compare the options, as a longer implementation should score less than those with a shorter timetable. To resolve this issue, the rating in EAST was amended so as to be compatible with the intended scoring system and is shown below.

Table 2.16: Scoring system for implementation timetable

Rating provided in EAST	Score
0-1 Months	7
1-6 Months	6
6-12 Months	5
1-2 Years	4
2-5 Years	3
5-10 Years	2
10+ Years	1

Source: EAST

- 2.4.3 All options will require 5-10 years to implement as they are required to follow the Development Consent Order (DCO) process and are anticipated to begin construction mid-2021.

Public acceptability

- 2.4.4 This field provides an opportunity to say if there are any perceived issues with the public. The result for this section will be on a scale of 1-5 with 1 being low acceptance and 5 being high. This reflects the options provided directly within EAST.
- 2.4.5 All options will be scored as medium acceptability as they have not all been presented to stakeholders at this early stage.

Practical feasibility

- 2.4.6 The practical feasibility section is devoted to determining whether the options being analysed have been tested and have produced outcomes that are both practicable and effective, taking into account any local planning decisions in the area and the practicality in constructing the proposed option.
- 2.4.7 The EAST Guidance document asks the respondent to identify who will operate the scheme and whether the operator will have the legal statutory powers to do so. At this early stage all options are considered to be operated by Highways England. The existing A417 route is currently managed through a Design, Build, Finance and Operate contract or DBFO due to cease in 2026. As the proposed Missing Link solution will be completed within approximately 2 years of the end of the DBFO contract it is assumed Highways England will operate the new section of carriageway until handover of the remainder of the A417.
- 2.4.8 Ease of construction will be reviewed in this section. Off-line and a combination of off-line / on-line construction methods will be considered here.

Quality of the supporting evidence

- 2.4.9 This section allows the user to evaluate the quality of the supporting evidence that has been used to sift the proposed options. All options will be scored as reasonable, as the level of evidence available is considered to be the same at PCF Stage 1.
- 2.4.10 A scale of 1-5 has been used which reflects the available responses provided in EAST, with the table below provided in the EAST Guidance.

Table 2.17: Quality of supporting evidence

Rating	Description
1	Low level of supporting evidence – a scheme in the very early stages of development that has not been implemented elsewhere with little supporting data and/or analysis.
2	Poor level of supporting evidence – may be some underlying data or some informal analysis.
3	Reasonable level of supporting evidence – good underlying data explaining the problem and some analysis of the outcomes.
4	Good level of supporting evidence, possibly including some modelling and/or sensitivity testing demonstrating robust outcomes.
5	High level of supporting evidence – option has been modelled in detail or subjected to a Transport Business Case appraisal.

Source: Early Assessment and Sifting Tool (EAST) Guidance

Key risks

2.4.11 This section is provided to enable the respondent to note in a text field any key risks that have been identified with that particular option. Any risk provided here should be reflected in other fields to ensure that the risk has been captured. This section is not scored.

2.5 Financial

2.5.1 This section sets out the financial impacts of all the proposed schemes. Where available, estimates of the costs associated with each option should be provided, as this enables a direct comparison of all the proposed options. Where values are provided, present values should be used, discounted to the Department of Transport’s standard base year as ‘this implies that benefits received far in the future are given less weight than benefits received today’.

2.5.2 Financial aspects are split into 5 areas of consideration and are given below:

- Affordability
- Capital costs
- Revenue costs
- Cost profile
- Overall cost risks

2.5.3 The 5 areas considered will be reviewed and scored however due to the uncertainty around budgets for the scheme at PCF Stage 1 the areas will not be included in the overall ranking of the EAST Plus outputs.

Affordability

2.5.4 The purpose of this section is to set out whether the scheme is to be considered affordable in terms of the available budget as well as the budget period.

2.5.5 This section will be scored on a scale to reflect the responses provided in EAST, with 1 being unaffordable and 5 being affordable. As the scheme is being developed as part of the RIS1, all the potential options must be ready for construction, planned to begin early in RIS2, currently identified as mid-2021.

2.5.6 At the time of writing Highways England has a budget of £255m. There is no fixed budget for the scheme but for the purpose of this assessment the following criteria applies.

Table 2.18: Affordability criteria

Cost	Affordability	Value for final score
> 600 m	Not affordable	1
500 – 600 m		2
400 – 500 m		3
300 – 400 m		4
< 300 m	Affordable	5

2.5.7 Affordability will be removed from the overall score due to the uncertainty concerning the budget.

Capital costs

2.5.8 This field provides the ability to supply the estimated capital costs of all the potential options. In EAST the capital cost is scored on a scale of 1-10, with 1 being the lowest scheme estimate and 10 being the most expensive.

2.5.9 At Stage 0, only 1 option was costed by Highways England, Option 12 or the Modified Brown Route. This option estimate (£255m) will be used as a basis to develop indicative costs for all 20 options to enable this field to be scored.

2.5.10 At this stage no schemes will be removed based on capital cost due to the consensus that the current Highways England budget does not align the scale of the project.

2.5.11 The capital cost ranges used to score the options are shown below.

Table 2.19: Capital cost criteria

Capital cost	Value for final score
0 – 100 million	1
100 – 200 million	2
200 – 300 million	3
300 – 400 million	4
400 – 500 million	5
500 – 600 million	6

Capital cost	Value for final score
600 – 700 million	7
700 – 800 million	8
800 – 900 million	9
> 900 million	10

2.5.12 Capital cost will be removed from the overall score.

Revenue costs

2.5.13 This figure provides an estimate of the maintenance and other costs that will be required for upkeep. At this stage in the scheme it is not possible to say how many new structures will be required, pavement layout or the drainage strategy will be and it is therefore decided to nullify this section.

Cost profile

2.5.14 For cost profile an assessment will need to be made as to whether previous assessments have fully considered all the implementation, operation, maintenance and enforcement costs including administration. Consideration should also be made to determine whether there is the potential for a disproportionate burden on small business and can this be mitigated.

2.5.15 It is decided to nullify this measure as no cost profile for the options can be determined at this stage.

Overall cost risk

2.5.16 In this section an assessment of the options overall cost risk on a scale of 1-5, where 1 is high risk and 5 is low risk. Where a cost risk has not been considered in other fields, it may be pertinent to include them here. Any supporting evidence based on the experiences of cost variations where relevant should be provided here.

2.6 Commercial

Flexibility of option

2.6.1 This field will be used to say what flexibility for changing the features of the proposed options based on the level of funding available. At this early stage it is expected that some changes will be made to the alignment of the proposed options. All options are proposed to be grade-separated and have free-flowing junctions.

2.6.2 This field will be scored on a scale of 1-5 to reflect the options provided in EAST, where 1 is static and 5 is dynamic.

Where is funding from?

2.6.3 The A417 Missing Link is being undertaken as part of the Road Investment Strategy (RIS) with the development phases within RIS 1 and construction in RIS 2. As such, it is anticipated that the majority of the funding for the scheme is being provided by Highways England. However during PCF Stage 1, Option Identification, Gloucester County Council have provided £1 million of funding towards the scheme development costs.

Any income generated

2.6.4 As at this stage there is no intention for any of the options to generate any type of further income all the options will be scored 1 – None.

2.7 Scoring

2.7.1 Once the fields in EAST are completed it is necessary to convert the answers provided into an overall score. This will be achieved by adding together all of the individual scores that the proposed options received when measured against all the criteria. This allows the options to be directly compared against each other.

2.7.2 It is essential that the sifting process is inclusive and robust and that the initial sift should maximise the range of options going forward to the next stage. To maximise the effective range of options going forward it was agreed to take the best performing routes from each corridor through into the next element of the evaluation.

3. Removed objectives from EAST Plus assessment

Identified problems and objectives of the option	EAST Headings	Sub-headings / objectives	Objectives removed	Comments	Objectives conserved	EAST Headings and sub heading
Strategic Scale of impact (RIS)	Providing capacity and connectivity to support national and local economic activity		Providing capacity and connectivity to support national and local economic activity	Capacity repeat - Removed from overall	The scheme will be designed to provide greater road traffic capacity, improved network resilience and better journey time reliability for strategic and local journeys.	Strategic - fit with other objectives CSR - Safe, resilient and efficient network
					The scheme will reduce rat-running on local roads through provision of a more reliable strategic route with improved capacity, thereby enhancing the amenity of local settlements.	Strategic - fit with other objectives CSR - Community and access
	Supporting and improving journey quality, reliability and safety		Supporting and improving journey quality, reliability and safety	Safety repeat - Removed from overall	Road safety will be improved by designing to current standards and better separating strategic and local traffic.	Strategic - fit with other objectives CSR - Safe, resilient and efficient network
					What impact does the option have on the number injured or killed in traffic accidents?	Economic - Wellbeing - Injury or deaths
					What will happen to the number of incidents?	Economic - Wellbeing - Enjoying access to a range of goods, services, people and places
	Joining our communities and linking effectively to each other		Joining our communities and linking effectively to each other	Connectivity repeat - Removed from overall	The scheme will enhance community cohesion by improving local connectivity and accessibility by helping to separate strategic and local traffic.	Strategic - fit with other objectives CSR - Community and access
					Does it increase the possibility of cross street/corridor connections between neighbourhoods	Economic - Wellbeing - Severance
					Does the option improve access to key locations (supermarkets, doctors, hospitals, etc.)?	Economic - Wellbeing - Enjoying access to a range of goods, services, people and places
	Supporting delivery of environmental goals and the move to a low carbon economy		Supporting delivery of environmental goals and the move to a low carbon economy	Carbon emissions repeat - Removed from overall	Does option help the government meet its targets to reduce emissions in terms of carbon and air quality?	Strategic - Fit with wider transport and government objectives (NPS) - Emissions
					Overall effect on Carbon emissions	Economic - Carbon emissions - Overall effect on Carbon emissions
Fit with wider transport and government objectives (NPS)	Safety	Has the opportunity been made to improve road safety, including introducing the most modern and efficient safety	Has the opportunity been made to improve road safety, including introducing the most modern and efficient safety measures where proportionate	Safety repeat - Removed from overall	Road safety will be improved by designing to current standards and better separating strategic and local traffic.	Strategic - fit with other objectives CSR - Safe, resilient and efficient network

	Sustainable Transport	measures where proportionate				What impact does the option have on the number injured or killed in traffic accidents?	Economic - Wellbeing - Injury or deaths
						What will happen to the number of incidents?	Economic - Wellbeing - Enjoying access to a range of goods, services, people and places
		Does option assist in developing cycling and walking networks?	Does option assist in developing cycling and walking networks?	Walking and cycling repeat - Removed from overall	The scheme will improve continuity to public rights of way (including the Cotswold Way National Trail and Gloucestershire Way).	Strategic - fit with other objectives CSR - Community and access	
					The scheme will enhance community and recreational opportunities through improved provision for motorised and non-motorised users.	Strategic - fit with other objectives CSR - Community and access	
					What impact does the option have on levels of physical activity?	Economic - Wellbeing - Physical activity	
		Accessibility	Does option assist in creating a more accessible network that provides a range of opportunities and choices for people to connect with job, services and friends and family?	Does option assist in creating a more accessible network that provides a range of opportunities and choices for people to connect with job, services and friends and family?	Connectivity repeat - Removed from overall	The scheme will enhance community cohesion by improving local connectivity and accessibility by helping to separate strategic and local traffic.	Strategic - fit with other objectives CSR - Community and access
	Does it increase the possibility of cross street/corridor connections between neighbourhoods?				Economic - Wellbeing - Severance		
	Does the option improve access to key locations (supermarkets, doctors, hospitals, etc.)?				Economic - Wellbeing - Enjoying access to a range of goods, services, people and places		
	Economic	Economic growth	Does it have an impact on the cost of travel (vehicle operating costs, fares, etc.)?	Does it have an impact on the cost of travel (vehicle operating costs, fares, etc.)?	Vehicles km repeat - Removed from overall	Does vehicle-km change?	Economic - Carbon emissions - Activity
						Does it have an impact on the cost of travel (vehicle operating costs, fares, etc.)?	Economic - Wellbeing - Enjoying access to a range of goods, services, people and places
Socio-distributional impacts and the regions		Social and Distributional Impacts	Does the option have an impact on accessibility/ affordability/ availability/ acceptability for vulnerable groups (low income, disabled, the elderly, etc.)?	Does the option have an impact on accessibility/ affordability/ availability/ acceptability for vulnerable groups (low income, disabled, the elderly, etc.)?	Impacts repetition - Removed from overall	Does this option reduce absolute disturbance from noise?	Economic - Local environment - Noise
						What impact does the option have on local air quality?	Economic - Local environment - Air quality
						Does it increase the possibility of cross street/corridor connections between neighbourhoods?	Economic - Wellbeing - Severance
						The scheme will enhance community cohesion by improving local connectivity and accessibility by helping to separate strategic and local traffic.	Strategic - fit with other objectives CSR - Community and access
						What impact does the option have on the number injured or killed in traffic accidents?	Economic - Wellbeing - Injury or deaths
						What impact will this option have on crime?	Economic - Wellbeing - Crime
Well being		Enjoying access to a range of goods, services, people and places	What impact does it have on end-to-end journey time?	What impact does it have on end-to-end journey time?	Journey time repeat - Removed from overall	What impact does it have on end-to-end journey time?	Economic - Economic growth - Connectivity

			Impact on day-to-day variability in journey time or average minutes of lateness?	Impact on day-to-day variability in journey time or average minutes of lateness?	Journey time variability repeat - Removed from overall	Impact on day-to-day variability in journey time or average minutes of lateness?	Economic - Economic growth - Reliability
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4. Option lengths and gradients

Table 4.1: Option lengths and gradients

Option	Length (m)	Gradient (%)
1	5,034	8
2	5,266	8
3	4,722	8.6
5	6,100	8
6	5,665	8
7	7,985	8
9	5,357	8
12	6,430	8.4
13	4,600	8
14	5,072	8
15	5,900	8.5
20	4,582	4.5
21	4,630	5
22	4,528	5.2
23	6,208	8
24	6,103	6
26	7,736	8
28	6,030	8
29	5,667	6
30	5,540	7.5

5. Objectives to be considered in each ranking group

5.1 Introduction

5.1.1 When developing the output table for consideration of the options the categories were divided into:

- Scheme objectives (CSR).
- Overall (excluding cost).
- Capital cost / BCR.
- Environmental objectives.
- Landscape objectives.
- Strategic objectives.
- Economic objectives.

5.1.2 **Scheme objectives (CSR)** – to include the “Fit with other objectives (CSR)” objectives (within the strategic objectives) – includes the A417 objectives and sub-objectives.

5.1.3 **Overall** – this score to include all the criteria apart from the RIS objectives, economic objectives and Value for Money (VfM).

5.1.4 **Capital cost / BCR** – to include VfM and Financial objectives. See table below.

Economic	Expected VfM Category	
Financial	Affordability	
	Capital Cost (£m)?	
	Revenue Costs (£m)?	n/a
	Cost Profile	n/a
	Overall cost risk	
	Other costs	n/a

5.1.5 **Environmental objectives** – to include all “Improving the natural environment and heritage” sub-objectives and sub-objectives 3d, 3e and 3f within the scheme objectives and the local environment objectives within the wider economic objectives. See table below.

	Identified problems and objectives of the option	EAST Headings	Sub-headings / objectives	Sub-objectives	Final criteria (including Engineering and Environmental)	
Strategic	Fit with other objectives (CSR)	Support economic growth	Community & access: to enhance the quality of life for local residents and visitors by reducing traffic intrusion and pollution, discouraging rat-running through villages and substantially improving public access for the enjoyment of the countryside.	The Scheme will improve air quality by reducing pollution from traffic congestion.	The Scheme will improve air quality by reducing pollution from traffic congestion.	
				The Scheme will minimise road noise by applying sensitive noise mitigation measures where required.	The Scheme will minimise road noise by applying sensitive noise mitigation measures where required.	
				The Scheme will minimise light pollution through sensitive structural, junction, and lighting design and sign illumination.	The Scheme will minimise light pollution through sensitive structural, junction, and lighting design and sign illumination.	
		Minimise the environmental impact of operating, maintaining and improving the network and seek to protect and enhance the quality of its surrounding environment while conforming to the principals of sustainable transport	Improving the natural environment and heritage: to maximise opportunities for landscape, historic and natural environment enhancement within the Cotswolds AONB and to minimise negative impacts of the scheme on the surrounding environment.		The Scheme will have an identity which reflects, conserves and enhances the character of the local landscape.	The Scheme will have an identity which reflects, conserves and enhances the character of the local landscape. The scheme will avoid adverse impact on geology and soils
					The Scheme will improve landscape and ecological connectivity through landscape and habitat restoration and creation.	The Scheme will improve landscape and ecological connectivity through landscape and habitat restoration and creation.
					The horizontal and vertical alignments of the Scheme will pay due regard to the nature of the local landform.	The horizontal and vertical alignments of the Scheme will pay due regard to the nature of the local landform.
					The siting and form of structures, cuttings, embankments and landscape mounding will reflect local topography and landform.	The siting and form of structures, cuttings, embankments and landscape mounding will reflect local topography and landform.
					The design of structures will be of lasting architectural quality.	The design of structures will be of lasting architectural quality.
					The Scheme will avoid or, where absolutely necessary, minimise the direct loss of National Trust land, other areas owned and managed for conservation, open access land and country parks and at the same time minimise intrusion upon such land.	The Scheme will avoid or, where absolutely necessary, minimise the direct loss of National Trust land, other areas owned and managed for conservation, open access land and country parks and at the same time minimise intrusion upon such land.

	Identified problems and objectives of the option	EAST Headings	Sub-headings / objectives	Sub-objectives	Final criteria (including Engineering and Environmental)
				The Scheme will enable enhanced preservation of heritage assets and their settings and adopt designs that reflect and enhance the historic character of the area.	The Scheme will enable enhanced preservation of heritage assets and their settings and adopt designs that reflect and enhance the historic character of the area.
				The Scheme will avoid significant interruption to groundwater flows or negative impacts on the aquifer, springs and watercourses.	The Scheme will avoid significant interruption to groundwater flows or negative impacts on the aquifer, springs and watercourses.
Economic	Local environment	Air Quality	What impact does the option have on local air quality?		What impact does the option have on local air quality?
			Is an AQMA affected? If YES: How many households are affected		Is an AQMA affected? If YES: How many households are affected
			Is an AQMA affected? If NO: Is it likely to create the need for an AQMA?		Is an AQMA affected? If NO: Is it likely to create the need for an AQMA?
		Noise	Does this option reduce absolute disturbance from noise?		Does this option reduce absolute disturbance from noise?
			Does it affect a problem area?		Does it affect a problem area?
		Natural environment, heritage and landscape	What is the overall impact on the natural environment?		What is the overall impact on the natural environment?
			If negative, what is the value of the environment affected?		If negative, what is the value of the environment affected?
		Improve streetscape and urban environment	What is the overall impact on the urban environment?		What is the overall impact on the urban environment?
			If negative, what is the value of the environment affected?		If negative, what is the value of the environment affected?

5.1.6 **Landscape objectives** – to include the landscape focused objectives within the “Improving the natural environment and heritage” sub-objectives (2a, 2b, 2c, 2d, 2e, 2g and 2h). See table below.

	Identified problems and objectives of the option	EAST Headings	Sub-headings / objectives	Sub - objectives	Final criteria (including Engineering and Environmental)
Strategic	Fit with other objectives (CSR)	Minimise the environmental impact of operating, maintaining and improving the network and seek to protect and enhance the quality of its surrounding environment while conforming to the principals of sustainable transport	Improving the natural environment and heritage: to maximise opportunities for landscape, historic and natural environment enhancement within the Cotswolds AONB and to minimise negative impacts of the scheme on the surrounding environment.	The scheme will have an identity which reflects, conserves and enhances the character of the local landscape.	The Scheme will have an identity which reflects, conserves and enhances the character of the local landscape. The scheme will avoid adverse impact on geology and soils
				The scheme will improve landscape and ecological connectivity through landscape and habitat restoration and creation.	The Scheme will improve landscape and ecological connectivity through landscape and habitat restoration and creation.
				The horizontal and vertical alignments of the scheme will pay due regard to the nature of the local landform.	The horizontal and vertical alignments of the scheme will pay due regard to the nature of the local landform.
				The siting and form of structures, cuttings, embankments and landscape mounding will reflect local topography and landform.	The siting and form of structures, cuttings, embankments and landscape mounding will reflect local topography and landform.
				The design of structures will be of lasting architectural quality.	The design of structures will be of lasting architectural quality.
				The scheme will avoid loss of land or, where absolutely necessary, minimise intrusion upon designated nature conservation sites, National Trust land, open access land and country parks.	The scheme will avoid loss of land or, where absolutely necessary, minimise intrusion upon designated nature conservation sites, National Trust land, open access land and country parks.
				The scheme will enable enhanced preservation of heritage assets and their settings and adopt designs that reflect and enhance the historic character of the area	The scheme will enable enhanced preservation of heritage assets and their settings and adopt designs that reflect and enhance the historic character of the area

5.1.7 **Strategic** – to include all strategic objectives (NPS, CSR and Degree of consensus) apart from RIS objectives.

5.1.8 **Economic objectives** – to include all the economics objectives (Economic growth, Carbon emissions, Local environment, Wellbeing and Expected VfM Category (not scored)).

6. EAST Plus (v20) outputs

