MetroWest

METROWEST PHASE 1
Outline Business Case

Appendix 2.5

WebTAG Workbooks

December 2017

travelwest

Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire councils working together to improve your local transport

MetroWest Phase 1
WebTAG Workbooks

Prepared for

West of England Councils

December 2017

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Contents

Document History

MetroWest Phase 1
Outline Business Case – Economic Case
WebTAG Workbooks

FINAL REPORT

Reference Number: 674946.CM.64.01/WebTAG

Client Name: West of England Councils

This document has been issued and amended as follows:

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1.0	20th December 2017	PDF of Workbooks	GW	HS	HS

Acronyms and Abbreviations

AQMA	Air Quality Management Area
B&NES	Bath and North-East Somerset Council
BCC	Bristol City Council
BRITES	Bristol Integrated Transport and Environment Study
CP5	Control Period 5
CRD	City Region Deal
DCO	Development Consent Order
DfT	Department for Transport
EAST	Early Assessment Summary Tool
GLT	Guided Light Transit
GRIP	Governance for Railway Infrastructure Projects
GVA	Gross Value Added
GWML	Great Western Main Line
GWR	Great Western Railway
IEP	InterCity Express Programme
JLTP	Joint Local Transport Plan
JSP	Joint Spatial Plan
JTB	Joint Transport Board
JTS	Joint Transport Study
LEP	Local Enterprise Partnership
LTPP	Long Term Planning Process
NCN	National Cycle Network
NMU	Non-Motorised User
NR	Network Rail
NSC	North Somerset Council
OAR	Option Assessment Report
OBC	Outline Business Case
PBC	Preliminary Business Case
PEIR	Preliminary Environmental Impact Report
RUS	Route Utilisation Strategy
SEP	Strategic Economic Plan
SGC	South Gloucestershire Council
TAG	Transport Appraisal Guidance
TQEZ	Temple Quay Enterprise Zone
WoE	West of England

AST

Appraisal Summary Table

Date produced:	20/12/2017

Contact:	
Name	James Willcock
Organisation	North Somerset Council
Role	Project Manager

Name of scheme:	MetroWest Phase 1
Description of scheme:	Infrastructure and passenger train operations to provide a half-hourly service for the Severn Beach Line (to Avonmouth, hourly to Severn Beach); half hourly service for local stations on the Bath Spa Line; and hourly service for a reopened Portishead Line (new stations at Portishead and Pill).

Impacts		Summary of key impacts	Assessment			
			Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Journey time savings are significant in geographical areas where impacts are anticipated. This covers savings for public transport users as a result of the new stations at Portishead/Pill and frequency improvement, and for highway users as a result of decongestion in the highway network where modal shift to rail occurs. (NOTE - benefit split by journey times for highway only)	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: £18,545,216 | 2 to 5min: £3,736,568 | > 5min: £19,227	Not required	£46,438,407	Large beneficial distributional impact
	Reliability impact on Business users	Some reduction in highway traffic will result in small changes in journey time, and quantifiable reliability benefits for all users. Rail reliability has not been modelled.	NOTE - impact is highway only and total for all users	Not required	£1,823,385	
	Regeneration	The scheme links a number of regeneration and enterprise zones, and has the potential to generate new jobs, both during construction and operational stages.	1400 jobs & £57m GVA - construction stage 500 permanent jobs & £32m GVA per annum - operational	Not required	£264,781,565	
	Wider Impacts	The scheme improves productivity of local economy through improving transport provision, bringing businesses closer to each other and to the labour market.	£68.4m agglomeration benefits, £4.6m imperfect competition and £1.0m labour supply	Not required	£74,025,119	
Environmental	Noise	The increases in noise are due to the operation of the new rail service. These are not significant increases but the change in noise is sufficient to move a band in the noise worksheet. There would be a minor adverse impact at the Trinity Primary School in Portishead. Negligible impacts are expected within the Avon Gorge Woodlands SAC and SSSI and other designated areas along the route. No dwellings are expected to be eligible under the Noise Insulation Regulations. There are predicted to be no impacts are night due to the service only being operational during the day.	Households experiencing increased daytime noise in forecast year: 523 Households experiencing reduced daytime noise in forecast year: 0 Households experiencing increased night time noise in forecast year: 0 Households experiencing reduced night time noise in forecast year: 0	Not required	-£511,257	Minor adverse distributional impact
	Air Quality	The physical works for the Project cross a short section of the Bristol Air Quality Management Area (AQMA) and during operation passenger services from the scheme would extend from Portishead to Bristol passing through the AQMA from Parson Street Junction into Bristol. Air quality monitoring data suggest that AQS objectives are being met within the Project extent in North Somerset. The Project crosses one ecological designated site (Avon Gorge Woodlands SAC and SSSI) where baseline NOx levels are close to the critical level. The Project offers an alternative travel mode that promotes a Modal shift which leads to some beneficial air quality impacts in the surrounding area. These benefits are however offset by the additional diesel locomotives on the Portishead Branch Line which are expected to lead to an increase in NOx and PM10 emissions. These changes are likely to lead to adverse impacts at receptors nearest to the rail line. The Project is not predicted to result in any exceedances of the annual mean AQS objective for traffic pollutants.	**Assessment Score:** PM10: 586.09 NO2: 8,216.57 **Emissions:** PM10: +1 tonnes NOx: +936 tonnes	Not required	**AIR QUALITY VALUATION:** Value of change in PM10 concentrations: NPV: £-0.0m Value of change in NOx emissions: NPV: £-0.5m Total value of change in air quality: £-0.5m **MAIN-SENSITIVITY:** Value of change in PM10 concentrations: NPV: £-0.0m Value of change in NOx emissions: NPV: £-9.6m Total value of change in air quality: £-9.6m	Minor adverse distributional impact
	Greenhouse gases	The Project is expected to result in decrease in vehicle kilometers travelled across the road network which has the potential to result in a decrease in CO2 emissions. However, rail emissions associated with the Project are expected to contribute to an increase in CO2 emissions.	Change in non-traded carbon over 60y (CO2e): N/A Change in traded carbon over 60y (CO2e): N/A	Not required	£250,774	
	Landscape	Area north of Avon Gorge and Avon Gorge itself: **slight adverse effect** due to vegetation clearance creating more open views of construction activities and of the railway when the DCO Scheme is in operation. Area south of Avon Gorge: **neutral/slight adverse effect** due to opening up of views in the landscape, although existing landscape already has dominant transport infrastructure features and urban land cover. Overall **slight adverse effect** due to the reasons set out above. DCO Scheme will affect areas of recognised landscape quality and will impact on certain views across the area.	N/A	Slight adverse	N/A	
	Townscape	**Neutral effect** on the townscape of the Ashton Gate/Ashton Vale area due to the fact that transport infrastructure (including the existing Portbury Freight Line) is already a dominant feature in the landscape, and many views are restricted by commercial/industrial buildings so would not change significantly with the DCO Scheme. Future trends in the area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes, so the DCO Scheme would fit this trend.	N/A	Neutral	N/A	
	Historic Environment	The DCO Scheme is assessed to have a direct **slight adverse/neutral** effect on non-designated cultural heritage assets during the enabling works and construction through the removal of known and hitherto unknown archaeological remains along the railway corridor. The adverse effects arising from these direct impacts on this resource can be adequately mitigated through preservation by record and the significance effect of the residual impact is assessed to be neutral and not significant in regards to the EIA Regulations. The effect of the DCO Scheme on the setting of the designated cultural heritage assets along the route during construction and operation is generally neutral and not significant in regards to the EIA Regulations. This results largely from the lack of inter-visibility between the DCO Scheme and heritage assets.	N/A	Slight adverse/Neutral	N/A	
	Biodiversity	The Portishead to Pill line will have **slight adverse** effects on Field east of M5 Motorway, Lodway Wildlife Site due to loss of habitat, however this impact is considered to be negligible in magnitude due to the minor loss of habitat anticipated. **Slight adverse** effects are also considered possible on protected species such as great crested newts, other amphibian species, badgers, otter and bats through the fragmentation of habitats and disturbance and death/injury from direct collision with trains. The operational maintenance of the railway corridor may also cause **slight adverse** effects on habitats such as woodland, trees and scrub due to direct loss, as well as Japanese knotweed due to the potential of facilitating the spread of this invasive species. The impact on North Somerset and Mendips Bats SAC is **to be assessed** following further bat survey in 2018. The Freight Line section of the DCO is assessed to have a **slight adverse** effect on internationally and nationally important sites/species such as the Avon Gorge and Woodlands SAC/SSSI, Leigh Woods NNR and Ancient Woodland and the notable and the important plant species these sites support, these impacts are likely to arise through the routine maintenance and clearance of the railway corridor, however they will be mitigated through the implementation of a Site Vegetation Management Statement which will be developed in consultation with Natural England. A slight adverse effect is also anticipated on the internationally important site Bath and Bradford on Avon Bats SAC, however this assessment is ongoing due to further assessment on the use and value of the tunnels to bats. A number of Local Wildlife Sites are also predicted to have potentially **slight adverse** effects due to the Freight Line section of the scheme. These include Bower Ashton BWNS, River Avon NSWS and River Avon SNCI, effects on these sites will arise due to habitat loss. A **slight adverse** effect may also occur on protected species such as badger, otters and bats through the fragmentation of habitats, disturbance and death/injury from direct collision with trains. Habitats that may be subject to a slight adverse impact includes ephemeral/short perennials which may be effected due to the routine maintenance and clearance of the railway corridor. In addition a slight adverse effect may occur due to the potential spread of invasive plant species during this routine maintenance and clearance.	N/A	Slight adverse	N/A	
	Water Environment	The water environment is typical of the locality with watercourses mostly comprising small watercourse with primarily a drainage function (some man-made) of low to medium importance discharging directly into the tidal River (Bristol) Avon which is of Very High importance. Groundwater is of Medium to High importance on a local to regional scale. The larger watercourses - Severn Estuary, River (Bristol) Avon and Easton-in-Gordano Stream are of High quality, whereas the smaller watercourses are of medium to low quality. Most are important on a local scale, with on the River (Bristol) Avon being important at a regional scale and the Severn Estuary at a national scale due to its size and ecological designations. There will be little impact upon the water environment as the scheme involves minimal additional impermeable surfaces (mostly relating to the stations and associated car parking areas) and results in little change in water quality, with some improvement in some areas through the removal of contaminated old sleepers and renewal of ballast. As the scheme involves very little change from the existing situation the magnitude of all the impacts is considered to be negligible, except for a slight adverse impact relating to the increased flood risk to the railway line from the River (Bristol) Avon, which will worsen over time. This results in a significance score of "Insignificant" for all of the impacts, apart from two exceptions for which the significance score is "Low Significance". The first exception is the flood risk to the railway from the River (Bristol) Avon and the second from the coastal flood risk from the Severn Estuary which is considered to be of very high	N/A	Neutral	N/A	
Social	Commuting and Other users	Journey time savings are significant in geographical areas where impacts are anticipated. This covers savings for public transport users as a result of the new stations at Portishead/Pill and frequency improvement, and for highway users as a result of decongestion in the highway network where modal shift to rail occurs. (NOTE - benefit split by journey times for highway only)	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: £23,997,886 | 2 to 5min: £3,821,405 | > 5min: £37,577	Not required	£198,842,893	Evenly spread across vulnerability
	Reliability impact on Commuting and Other users	Some reduction in highway traffic will result in small changes in journey time, and quantifiable reliability benefits for all users. Rail reliability has not been modelled.	NOTE - impact is highway only and total for all users	Not required	£1,823,385	
	Physical activity	The proposed scheme accounts for cyclists, pedestrians and equestrians by delivering and planning for measures to minimise the interaction between these modes and motorised traffic (including trains). The measures provided for Non-Motorised Users (NMUs) that will be delivered as part of the scheme ensures that the opportunity to undertake trips through active modes will be enhanced. Based on the work undertaken, the assessment suggests that the scheme will have an overall slight beneficial impact on physical activity.	N/A	Slight beneficial	N/A	
	Journey quality	Improved frequencies on the Severn Beach line and local stations to Bath will help reduce the extent of overcrowding and lower traveller stress by improved ease and convenience. The analysis also suggests that there will be neutral impacts on other factors such as cleanliness, facilities, information and traveller's views. With the introduction of passenger rail services to Pill and Portishead, there will be larger beneficial impacts such as new facilities at the railway stations, smoothness of ride, traveller views and integration into existing national railway information portals. Based on the evidence, it is concluded that there will be a moderate beneficial impact.	N/A	Moderate beneficial	N/A	
	Accidents	A full assessment of the likely impacts of the scheme was undertaken, and this suggests that as MetroWest is a rail scheme, with minimal changes on other parts of the network.	A saving of 130 accidents	Not required	£5,845,450	
	Security	The new rail stations will enhance the security of both locations by providing additional footfall, CCTV, emergency contact points and improved lighting. However, while there will be a general improvement in security of the area, rail stations can also attract crime. The scheme is therefore envisaged to have a neutral impact on security.	N/A	Neutral	N/A	
	Access to services	MetroWest Phase 1 will generally enhance the public transport offer in area served, thus improving links to key services. There is a more substantial enhancement to the public transport offer in Portishead and Pill. Overall, MetroWest Phase 1 is assessed to have a slight beneficial on access to services.	N/A	Slight beneficial	N/A	Evenly spread across vulnerability
	Affordability	The assessment indicates there will be beneficial affordability impacts from reduced fuel costs, shorter journeys and reduced congestion. However, this needs to be set against the additional costs of rail fares and car parking charges (if travelling to the stations by car).Improved frequencies are expected to increase the numbers travelling by rail, but there may be some extraction from existing public transport provision which could impact on affordability. Based on the evidence, it is concluded that MetroWest Phase 1 will result in a neutral impact.	N/A	Neutral	N/A	
	Severance	Negative impacts are expected at the various at-grade crossing points affected by the Scheme. The negative impact is a result of increased journey times opposed to safety. It is expected that the overall safety of pedestrians and cyclists will be improved, particularly at Ashton Vale.Overall the scheme has a slight adverse impact on severance.	N/A	Slight adverse	N/A	
	Option and non-use values	The scheme will add a rail option to a public transport offer that currently only includes bus, and a bus service that is adversely affected by traffic congestion	26,235 population within 2km of new rail station	Not required	£25,480,590	
Public Account	Cost to Broad Transport Budget	Public sector costs associated with investments for scheme implementation and ongoing support/maintenance, such as capital investment, operating costs and revenue income.	N/A	Not required	£93,642,672	
	Indirect Tax Revenues	The impact on tax and fuel duty loss as a result of reduction in fuel consumption.	N/A	Not required	-£12,677,961	

Cost proforma

Appraisal Cost Proforma Summary Sheet

Assumptions:

Price Year Base (Earliest - 1998)	2017

Note: Promoters are requested to enter the price year base they are using into the above

Investment cost optimism bias (%)	18
Operating cost optimism bias (%)	1

QRA P(80) (total)	£20.2m
QRA P(50) (total)	n/a
Design Year Operating Cost (usually 15 years from opening year) in £000s, discounted to 2010 prices	49,354
Operating Cost (all years total) in £000s, discounted to 2010 prices	126,221

COST BREAKDOWN:

All values in £,000's (thousands)

Financial Year	Investment Cost (in price year base in cell C3, excluding risk)	Cost including real cost inflation (Base Cost)	Risk adjusted cost using QRA P (mean)	Risk adjusted cost including Optimism Bias	Risk adjusted cost including OB deflated and discounted to 2010 Market Prices
2017/18	2,282	2,418	2,851	3,364	2,823
2018/19	3,731	3,953	4,662	5,501	4,542
2019/20	8,850	9,375	11,056	13,047	10,558
2020/21	33,540	35,532	41,904	49,447	39,131
2021/22	32,683	34,623	40,833	48,183	37,314

Totals for remaining appraisal years:

Totals:	81,086	85,900	101,307	119,543	94,369

TEE, AMCB & PSA (main & sensitivity)

Analysis of Monetised Costs and Benefits

AMCB Table

Noise	167	*(12)*
Local Air Quality	22	*(13)*
Greenhouse Gases	251	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	5,845	*(17)*
Economic Efficiency: Consumer Users (Commuting)	144440.2652	*(1a)*
Economic Efficiency: Consumer Users (Other)	54394.35764	*(1b)*
Economic Efficiency: Business Users and Providers	46438.40715	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	12677.961	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	238,881	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	97323.046	*(10)*
Present Value of Costs (see notes) (PVC)	97323.046	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	141,558	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.454512339	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-126769.972				-126769.972	
Operating costs	126221.013				126221.013	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	-548.959	*(8)*	0	0	-548.959	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	12677.961	*(9)*	12677.961			
TOTALS						
Broad Transport Budget	97323.046	*(10) = (7) + (8)*				
Wider Public Finances	12677.961	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

TEE table

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	143130.0519		18808.82594		124321.226	
Vehicle operating costs	1420.373266		1420.373266			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
COMMUTING	144440.2652	*(1a)*	20229.19921	0	124211.066	0

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	53968.94841		7092.099411		46876.849	
Vehicle operating costs	535.5692287		535.5692287			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
NET NON-BUSINESS BENEFITS: OTHER	54394.35764	*(1b)*	7627.668639	0	46766.689	0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	43662.33758		15626.30634	3678.315239	24357.716			
Vehicle operating costs	2996.389567		2289.963572	706.425995				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	46438.40715	*(2)*	17916.26992	4384.741234	24137.396	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	46438.40715	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	245273.03	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S1 - AMCB Table

Noise	179	*(12)*
Local Air Quality	24	*(13)*
Greenhouse Gases	265	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	6,184	*(17)*
Economic Efficiency: Consumer Users (Commuting)	152230.6346	*(1a)*
Economic Efficiency: Consumer Users (Other)	57330.21167	*(1b)*
Economic Efficiency: Business Users and Providers	52334.73343	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	12031.1066	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	256,516	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	88656.96529	*(10)*
Present Value of Costs (see notes) (PVC)	88656.96529	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	167,859	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.893354644	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S1 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-135436.0527				-135436.0527	
Operating costs	126221.013				126221.013	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	-9215.039707	*(8)*	0	0	-9215.039707	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	12031.1066	*(9)*	12031.1066			
TOTALS						
Broad Transport Budget	88656.96529	*(10) = (7) + (8)*				
Wider Public Finances	12031.1066	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

S1 - TEE table

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	151249.6032		18204.91974			133044.6834		
Vehicle operating costs	1091.191378		1091.191378					
User charges	0							
During Construction & Maintenance	-110.16					-110.16		
COMMUTING	152230.6346	*(1a)*	19296.11112		0	132934.5234		0

Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	57028.93599		6864.197862			50164.73813		
Vehicle operating costs	411.4356796		411.4356796					
User charges	0							
During Construction & Maintenance	-110.16					-110.16		
NET NON-BUSINESS BENEFITS: OTHER	57330.21167	*(1b)*	7275.633541		0	50054.57813		0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	49580.19929		18346.38152	5166.909081	26066.90868			
Vehicle operating costs	2974.854146		2098.6836	876.170546				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	52334.73343	*(2)*	20445.06512	6043.079627	25846.58868	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	52334.73343	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	261895.5797	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S2 - AMCB Table

Noise	153	*(12)*
Local Air Quality	21	*(13)*
Greenhouse Gases	257	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	5,988	*(17)*
Economic Efficiency: Consumer Users (Commuting)	133226.9813	*(1a)*
Economic Efficiency: Consumer Users (Other)	50167.87127	*(1b)*
Economic Efficiency: Business Users and Providers	43795.24466	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	11566.526	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	222,042	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	107785.7889	*(10)*
Present Value of Costs (see notes) (PVC)	107785.7889	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	114,256	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.060026583	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S2 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-116307.2291				-116307.2291	
Operating costs	126221.013				126221.013	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	9913.783872	*(8)*	0	0	9913.783872	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	11566.526	*(9)*	11566.526			
TOTALS						
Broad Transport Budget	107785.7889	*(10) = (7) + (8)*				
Wider Public Finances	11566.526	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

S2 - TEE table

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	131800.1079		17965.74321		113834.3647	
Vehicle operating costs	1537.033317		1537.033317			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
COMMUTING	133226.9813	*(1a)*	19502.77652	0	113724.2047	0

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	49698.45525		6774.423016		42924.03224	
Vehicle operating costs	579.5760166		579.5760166			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
NET NON-BUSINESS BENEFITS: OTHER	50167.87127	*(1b)*	7353.999033	0	42813.87224	0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	41264.57019		15249.14994	3712.391039	22303.02921			
Vehicle operating costs	2750.994463		2172.961176	578.0332873				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	43795.24466	*(2)*	17422.11112	4290.424326	22082.70921	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	43795.24466	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	227190.0972	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S3 - AMCB Table

Noise	145	*(12)*
Local Air Quality	20	*(13)*
Greenhouse Gases	257	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	5,988	*(17)*
Economic Efficiency: Consumer Users (Commuting)	127360.4804	*(1a)*
Economic Efficiency: Consumer Users (Other)	47966.42171	*(1b)*
Economic Efficiency: Business Users and Providers	42645.598	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	11566.526	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	212,815	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	112791.4399	*(10)*
Present Value of Costs (see notes) (PVC)	112791.4399	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	100,023	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.886800403	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S3 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-111301.5781				-111301.5781	
Operating costs	126221.013				126221.013	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	14919.43486	*(8)*	0	0	14919.43486	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	11566.526	*(9)*	11566.526			
TOTALS						
Broad Transport Budget	112791.4399	*(10) = (7) + (8)*				
Wider Public Finances	11566.526	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

AMCB Table **S6 - TEE table**

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	125933.7004		17964.65244		107969.0479	
Vehicle operating costs	1536.939998		1536.939998			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
COMMUTING	127360.4804	*(1a)*	19501.59244	0	107858.8879	0

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	47496.91237		6775.513783		40721.39859	
Vehicle operating costs	579.6693356		579.6693356			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
NET NON-BUSINESS BENEFITS: OTHER	47966.42171	*(1b)*	7355.183119	0	40611.23859	0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	40114.92353		15249.14994	3712.391039	21153.38255			
Vehicle operating costs	2750.994463		2172.961176	578.0332873				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	42645.598	*(2)*	17422.11112	4290.424326	20933.06255	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	42645.598	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	217972.5001	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S4 - AMCB Table

Noise	187	*(12)*
Local Air Quality	25	*(13)*
Greenhouse Gases	265	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	6,184	*(17)*
Economic Efficiency: Consumer Users (Commuting)	158055.4611	*(1a)*
Economic Efficiency: Consumer Users (Other)	59493.33008	*(1b)*
Economic Efficiency: Business Users and Providers	53477.25433	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	12031.1066	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	265,656	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	85031.05378	*(10)*
Present Value of Costs (see notes) (PVC)	85031.05378	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	180,625	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	3.12421909	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S4 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-139061.9642				-139061.9642	
Operating costs	126221.013				126221.013	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	-12840.95122	*(8)*	0	0	-12840.95122	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	12031.1066	*(9)*	12031.1066			
TOTALS						
Broad Transport Budget	85031.05378	*(10) = (7) + (8)*				
Wider Public Finances	12031.1066	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

S4 - TEE table

Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	157074.2637		18207.69041			138866.5733		
Vehicle operating costs	1091.35745		1091.35745					
User charges	0							
During Construction & Maintenance	-110.16					-110.16		
COMMUTING	158055.4611	*(1a)*	19299.04786		0	138756.4133		0

Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	59192.22048		6861.427199			52330.79328		
Vehicle operating costs	411.2696078		411.2696078					
User charges	0							
During Construction & Maintenance	-110.16					-110.16		
NET NON-BUSINESS BENEFITS: OTHER	59493.33008	*(1b)*	7272.696806		0	52220.63328		0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	50722.72018		18346.38152	5166.909081	27209.42958			
Vehicle operating costs	2974.854146		2098.6836	876.170546				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	53477.25433	*(2)*	20445.06512	6043.079627	26989.10958	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	53477.25433	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	271026.0455	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S5 - AMCB Table

Noise	167	*(12)*
Local Air Quality	22	*(13)*
Greenhouse Gases	251	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	5,845	*(17)*
Economic Efficiency: Consumer Users (Commuting)	144440.2652	*(1a)*
Economic Efficiency: Consumer Users (Other)	54394.35764	*(1b)*
Economic Efficiency: Business Users and Providers	46438.40715	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	12677.961	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	238,881	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	123880.7167	*(10)*
Present Value of Costs (see notes) (PVC)	123880.7167	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	115,000	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.928311554	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S5 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.918		-176.918			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	98048.923				98048.923	
NET IMPACT	97872.005	*(7)*	-176.918	-176.918	98048.923	0
Central Government Funding: Transport						
Revenue	-126769.972				-126769.972	
Operating costs	152778.6837				152778.6837	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	26008.71168	*(8)*	0	0	26008.71168	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	12677.961	*(9)*	12677.961			
TOTALS						
Broad Transport Budget	123880.7167	*(10) = (7) + (8)*				
Wider Public Finances	12677.961	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

S5 - TEE table

Non-business: Commuting	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
User benefits	TOTAL		Private Cars and LGVs	Passengers	Passengers	
Travel time	143130.0519		18808.82594		124321.226	
Vehicle operating costs	1420.373266		1420.373266			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
COMMUTING	144440.2652	(1a)	20229.19921	0	124211.066	0

Non-business: Other	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
User benefits	TOTAL		Private Cars and LGVs	Passengers	Passengers	
Travel time	53968.94841		7092.099411		46876.849	
Vehicle operating costs	535.5692287		535.5692287			
User charges	0					
During Construction & Maintenance	-110.16				-110.16	
NET NON-BUSINESS BENEFITS: OTHER	54394.35764	(1b)	7627.668639	0	46766.689	0

Business								
User benefits			Goods Vehicles	Business Cars & LGVs	Passengers	Freight	Passengers	
Travel time	43662.33758		15626.30634	3678.315239	24357.716			
Vehicle operating costs	2996.389567		2289.963572	706.425995				
User charges	0							
During Construction & Maintenance	-220.32				-220.32			
Subtotal	46438.40715	(2)	17916.26992	4384.741234	24137.396	0	0	0
Private sector provider impacts						Freight	Passengers	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	(3)			0	0	0	0
Other business impacts								
Developer contributions	0	(4)						
NET BUSINESS IMPACT	46438.40715	(5) = (2) + (3) + (4)						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	245273.03	(6) = (1a) + (1b) + (5)

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Analysis of Monetised Costs and Benefits

S6 - AMCB Table

Noise	167	*(12)*
Local Air Quality	22	*(13)*
Greenhouse Gases	251	*(14)*
Journey Quality	0	*(15)*
Physical Activity	0	*(16)*
Accidents	5,845	*(17)*
Economic Efficiency: Consumer Users (Commuting)	149658.3301	*(1a)*
Economic Efficiency: Consumer Users (Other)	56364.46932	*(1b)*
Economic Efficiency: Business Users and Providers	48059.8873	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	12678.16456	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	247,690	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	93642.67247	*(10)*
Present Value of Costs (see notes) (PVC)	93642.67247	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	154,047	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.645055543	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Public Accounts (PA) Table

S6 - PA Table

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	0					
Operating Costs	-176.9178304		-176.9178304			
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	94368.54972				94368.54972	
NET IMPACT	94191.63189	*(7)*	-176.9178304	-176.918	94368.54972	0
Central Government Funding: Transport						
Revenue	-126769.9722				-126769.9722	
Operating costs	126221.0128				126221.0128	
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	-548.9594147	*(8)*	0	0	-548.9594147	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	12678.16456	*(9)*	12678.16456			
TOTALS						
Broad Transport Budget	93642.67247	*(10) = (7) + (8)*				
Wider Public Finances	12678.16456	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

Economic Efficiency of the Transport System (TEE)

S6 - TEE table

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	148342.9412		24021.71493		124321.2263	
Vehicle operating costs	1421.414184		1421.414184			
User charges	0					
During Construction & Maintenance	-106.0252709				-106.0252709	
COMMUTING	149658.3301	*(1a)*	25443.12912	0	124215.201	0

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	55934.53287		9057.683451		46876.84942	
Vehicle operating costs	535.9617235		535.9617235			
User charges	0					
During Construction & Maintenance	-106.0252709				-106.0252709	
NET NON-BUSINESS BENEFITS: OTHER	56364.46932	*(1b)*	9593.645174	0	46770.82415	0

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	45275.28583		16931.92221	3985.647416	24357.7162			
Vehicle operating costs	2996.652007		2290.164139	706.4878675				
User charges	0							
During Construction & Maintenance	-212.0505419				-212.0505419			
Subtotal	48059.8873	*(2)*	19222.08635	4692.135283	24145.66566	0	0	0
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	0							
Operating costs	0							
Investment costs	0							
Grant/subsidy	0							
Subtotal	0	*(3)*			0	0	0	0
Other business impacts								
Developer contributions	0	*(4)*						
NET BUSINESS IMPACT	48059.8873	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	254082.6867	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Air Quality calculations

Air Quality Valuation Workbook - Calculations

		2010	2011	2012	2013	2014	2015	2016	2017

Appraisal period

Opening year	**2021** *Opening_year*								
Opening year		0	0	0	0	0	0	0	0
Forecast year	**2036** *Forecast_year*								
Forecast year		0	0	0	0	0	0	0	0
Difference (years)	15 *Interpolation_period_length*								
Appraisal period length (years)	60 *Appraisal_period_length*								
Interpolation		0	0	0	0	0	0	0	0
Extrapolation		0	0	0	0	0	0	0	0
Appraisal period		0	0	0	0	0	0	0	0
Check	TRUE								

NOx emissions

Without scheme (tonnes)

	2021								
Opening year NOx emissions	32.7 *Opening_year_without_scheme_NOx_emissions*								
	2036								
Forecast year NOx emissions	32.7 *Forecast_year_without_scheme_NOx_emissions*								
Difference	0 *Difference_without_scheme_NOx_emissions*								
Opening year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

With scheme (tonnes)

	2021								
Opening year NOx emissions	48.3 *Opening_year_with_scheme_NOx_emissions*								
	2036								
Forecast year NOx emissions	48.3 *Forecast_year_with_scheme_NOx_emissions*								
Difference	0 *Difference_with_scheme_NOx_emissions*								
Opening year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total change in NOx emissions (tonnes)		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Change over 60 years	936 *TOTAL_emissions_change_60years*								

EU emission exceedance values

Exceedance method	**Urban**	*Exceedance_method*
Urban	**1**	*Urban_mask*
National	**0**	*National_mask*
Rail	**0**	*Rail_mask*
Custom	**0**	*Custom_mask*

Urban NOx emissions (tonnes)

Urban emission exceedance (%)	**59.9%**	**55.2%**	**50.5%**	**45.7%**	**41.0%**	**36.3%**	**30.5%**	**24.8%**
Urban without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

National NOx emissions (tonnes)

National emission exceedance (%)	**17.1%**	**16.0%**	**14.9%**	**13.8%**	**12.7%**	**11.6%**	**9.8%**	**8.0%**
National without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
National with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
National difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Rail NOx emissions (tonnes)

Rail emission exceedance (%)	**8.40%**	**7.74%**	**7.08%**	**6.42%**	**5.76%**	**5.10%**	**4.28%**	**3.46%**
Rail without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rail with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rail difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Custom NOx emissions (tonnes)

Custom emission exceedance (%)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Custom without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NOx emissions in areas of exceedance

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
With scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Without scheme opening year	2.08	*Without_scheme_opening_year_exceedance*
With scheme opening year	3.07	*With_scheme_opening_year_exceedance*
Change	0.99	*Change_opening_year_exceedance*
Without scheme forecast year	0.00	*Without_scheme_forecast_year_exceedance*
With scheme forecast year	0.00	*With_scheme_forecast_year_exceedance*
Change	0.00	*Change_forecast_year_exceedance*

NOx emissions not in areas of exceedance

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
With scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Without scheme opening year	30.62	*Without_scheme_opening_year_not_in_exceedance*
With scheme opening year	45.23	*With_scheme_opening_year_not_in_exceedance*
Change	14.61	*Change_opening_year_not_in_exceedance*
Without scheme forecast year	32.70	*Without_scheme_forecast_year_not_in_exceedance*
With scheme forecast year	48.30	*With_scheme_forecast_year_not_in_exceedance*
Change	15.60	*Change_forecast_year_not_in_exceedance*

PM10 concentrations

Without scheme

	2021		
Opening year PM10 concentrations	0.96	*Opening_year_without_scheme_PM10_concentrations*	
	2036		
Forecast year PM10 concentrations	0.96	*Forecast_year_without_scheme_PM10_concentrations*	
Difference	0	*Difference_without_scheme_PM10_concentrations*	

Opening year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

With scheme

	2021		
Opening year PM10 concentrations	1.48		*Opening_year_with_scheme_PM10_concentrations*
	2036		
Forecast year PM10 concentrations	1.48		*Forecast_year_with_scheme_PM10_concentrations*
Difference		0	*Difference_with_scheme_PM10_concentrations*

Opening year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in PM10 net total assessment	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Opening year net route assessment 0.52 *Opening_year_net_route_assessment*

Emissions and concentrations valuations

Income and price adjustment

	2010	2011	2012	2013	2014	2015	2016	2017
GDP deflator index	100.00	102.01	103.58	105.55	107.29	107.88	109.75	111.72
Real GDP per household index	120.73	121.77	122.41	124.52	128.01	129.35	131.43	132.79
Real GDP per capita index	135.20	136.11	136.98	138.73	141.90	143.87	145.27	147.16

Income base for emission/concentration values	2010	*Income_base_values*
GDP per capita index - values	135.20	*GDP_capita_base_values*
GDP per household index - values	120.73	*GDP_household_base_values*
Price base for emission/concentration values	2010	*Price_base_values*
GDP deflator index - values	100.00	*GDP_deflator_base_values*
Price base for outputs	2010	*Price_base_outputs*
GDP deflator index - for outputs	100.00	*GDP_deflator_outputs*
Price base adjustment	1.00	*Price_adjustment*

NOx damage costs (£/tonne)

Low base value	744	*NOx_damage_base_value_low*
Central base value	955	*NOx_damage_base_value_central*
High base value	1085	*NOx_damage_base_value_high*

Low	744	749	754	763	781	792	799	810
Central	955	961	968	980	1002	1016	1026	1039
High	1085	1092	1099	1113	1139	1155	1166	1181

NOx abatement costs (£/tonne)

Low base value	27000	*NOx_abatement_base_value_low*
Central base value	29000	*NOx_abatement_base_value_central*
High base value	73000	*NOx_abatement_base_value_high*

Low	27000	27000	27000	27000	27000	27000	27000	27000
Central	29000	29000	29000	29000	29000	29000	29000	29000
High	73000	73000	73000	73000	73000	73000	73000	73000

PM10 damage costs (£/HH/1µgm-3)

Low base value	48.6	*PM10_damage_base_value_low*
Central base value	92.7	*PM10_damage_base_value_central*
High base value	105.4	*PM10_damage_base_value_high*

Low	49	49	49	50	52	52	53	53
Central	93	94	94	96	98	99	101	102
High	105	106	107	109	112	113	115	116

NOx emissions benefits not in areas of exceedance									
(positive values represent a benefit - an improvement in air quality)									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0
NOx emissions benefits in areas of exceedance									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0
PM10 concentrations benefits									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0

Discounting and present values

Discount period									
Current year	2017	*Current_year*							
PV base year	2010	*PV_base_year*							
discount period 1	30	*Discount_period_1*							
discount period 2	75	*Discount_period_2*							
discount period 3	125	*Discount_period_3*							
Masks									
Discount period 1			0	1	1	1	1	1	1	1
Discount period 2			0	0	0	0	0	0	0	0
Discount period 3			0	0	0	0	0	0	0	0
Discount rates and factors									
discount rate 1	3.5%	*Discount_rate_1*							
discount rate 2	3.0%	*Discount_rate_2*							
discount rate 3	2.5%	*Discount_rate_3*							
Discount rate profile			0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1		1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27
Discounted benefits for NOx emissions not in areas of exceedance									
(positive values represent a benefit - a reduction in noise)									
Low (£)			0	0	0	0	0	0	0	0
Central (£)			0	0	0	0	0	0	0	0
High (£)			0	0	0	0	0	0	0	0
Discounted benefits for NOx emissions in areas of exceedance									
Low (£)			0	0	0	0	0	0	0	0
Central (£)			0	0	0	0	0	0	0	0
High (£)			0	0	0	0	0	0	0	0
Discounted benefits for PM10 concentrations									
Low (£)			0	0	0	0	0	0	0	0
Central (£)			0	0	0	0	0	0	0	0
High (£)			0	0	0	0	0	0	0	0
NOx damage costs NPV estimates									
(positive values represent a benefit - an improvement in air quality)									
Low (£)	-364,538	*NOx_damage_NPV_low*							
Central (£)	-467,922	*NOx_damage_NPV_central*							
High (£)	-531,618	*NOx_damage_NPV_high*							
NOx abatement costs NPV estimates									

Low (£)	-63,799	*NOx_abatement_NPV_low*
Central (£)	-68,525	*NOx_abatement_NPV_central*
High (£)	-172,493	*NOx_abatement_NPV_high*

Total present value of change in NOx emissions

Low (£)	-428,337	*NOx_NPV_low*
Central (£)	-536,446	*NOx_NPV_central*
High (£)	-704,111	*NOx_NPV_high*

PM10 damage costs NPV estimates

Low (£)	-777	*PM10_damage_NPV_low*
Central (£)	-1,482	*PM10_damage_NPV_central*
High (£)	-1,684	*PM10_damage_NPV_high*

Total present value of change in air quality: £NPV

Low (£)	**-429,113**	*NPV_low*
Central (£)	**-537,928**	*NPV_central*
High (£)	**-705,795**	*NPV_high*

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1	1	1	1
0.00	0.00	0.00	32.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70
0.00	0.00	0.00	48.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30
0.00	**0.00**	**0.00**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**

19.1%	13.3%	7.6%	6.4%	5.2%	3.9%	2.7%	1.5%	1.3%	1.1%	0.8%	0.6%	0.4%	0.0%
0.00	0.00	0.00	2.08	1.68	1.29	0.89	0.50	0.42	0.35	0.27	0.20	0.12	0.00
0.00	0.00	0.00	3.07	2.49	1.90	1.32	0.73	0.62	0.51	0.40	0.29	0.18	0.00
0.00	0.00	0.00	0.99	0.80	0.61	0.43	0.24	0.20	0.16	0.13	0.09	0.06	0.00

6.1%	4.3%	2.5%	2.1%	1.7%	1.3%	0.9%	0.5%	0.4%	0.3%	0.3%	0.2%	0.1%	0.0%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.64%	1.82%	1.00%	0.84%	0.68%	0.52%	0.36%	0.20%	0.16%	0.12%	0.08%	0.04%	0.00%	0.00%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0.00	0.00	0.00	2.08	1.68	1.29	0.89	0.50	0.42	0.35	0.27	0.20	0.12	0.00
0.00	0.00	0.00	3.07	2.49	1.90	1.32	0.73	0.62	0.51	0.40	0.29	0.18	0.00
0.00	0.00	0.00	0.99	0.80	0.61	0.43	0.24	0.20	0.16	0.13	0.09	0.06	0.00

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0.00	0.00	0.00	30.62	31.02	31.41	31.81	32.20	32.28	32.35	32.43	32.50	32.58	32.70
0.00	0.00	0.00	45.23	45.81	46.40	46.98	47.57	47.68	47.79	47.90	48.01	48.12	48.30
0.00	0.00	0.00	14.61	14.80	14.99	15.17	15.36	15.40	15.44	15.47	15.51	15.54	15.60

0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96

0.00	0.00	0.00	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
0.00	**0.00**	**0.00**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
113.47	115.29	117.43	119.68	122.08	124.66	127.40	130.33	133.33	136.40	139.54	142.74	146.03	149.39
133.58	134.66	136.01	137.53	139.35	141.28	143.31	145.52	147.85	150.25	152.69	155.10	157.51	159.93
148.41	150.01	151.86	153.94	156.33	158.83	161.48	164.33	167.36	170.48	173.66	176.81	179.98	183.20

817	825	836	847	860	874	889	904	921	938	956	973	990	1008
1048	1060	1073	1087	1104	1122	1141	1161	1182	1204	1227	1249	1271	1294
1191	1204	1219	1235	1255	1275	1296	1319	1343	1368	1394	1419	1444	1470

27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000
29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000
73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000

54	54	55	55	56	57	58	59	60	60	61	62	63	64
103	103	104	106	107	109	110	112	114	115	117	119	121	123
117	118	119	120	122	123	125	127	129	131	133	135	137	140

0	0	0	-12,374	-12,728	-13,098	-13,484	-13,893	-14,182	-14,480	-14,784	-15,087	-15,393	-15,726
0	0	0	-15,883	-16,338	-16,812	-17,308	-17,833	-18,204	-18,587	-18,977	-19,366	-19,759	-20,187
0	0	0	-18,045	-18,562	-19,101	-19,664	-20,261	-20,682	-21,117	-21,560	-22,002	-22,448	-22,934
0	0	0	-26,803	-21,697	-16,590	-11,484	-6,377	-5,413	-4,450	-3,486	-2,522	-1,559	0
0	0	0	-28,788	-23,304	-17,819	-12,334	-6,850	-5,814	-4,779	-3,744	-2,709	-1,674	0
0	0	0	-72,467	-58,661	-44,855	-31,048	-17,242	-14,636	-12,031	-9,425	-6,819	-4,214	0
0	0	0	-29	-29	-30	-30	-30	-31	-31	-32	-32	-33	-33
0	0	0	-55	-56	-56	-57	-58	-59	-60	-61	-62	-63	-64
0	0	0	-62	-63	-64	-65	-66	-67	-68	-69	-70	-71	-73
1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79	1.86	1.92	1.99	2.06
0	0	0	-8,475	-8,423	-8,375	-8,330	-8,293	-8,179	-8,068	-7,959	-7,848	-7,736	-7,636
0	0	0	-10,879	-10,812	-10,750	-10,693	-10,645	-10,498	-10,357	-10,216	-10,073	-9,930	-9,802
0	0	0	-12,360	-12,284	-12,213	-12,148	-12,094	-11,927	-11,766	-11,607	-11,445	-11,282	-11,136
0	0	0	-18,359	-14,358	-10,608	-7,094	-3,806	-3,122	-2,479	-1,877	-1,312	-783	0
0	0	0	-19,719	-15,422	-11,394	-7,620	-4,088	-3,353	-2,663	-2,016	-1,409	-841	0
0	0	0	-49,636	-38,821	-28,680	-19,181	-10,292	-8,441	-6,704	-5,074	-3,547	-2,118	0
0	0	0	-20	-19	-19	-19	-18	-18	-18	-17	-17	-17	-16
0	0	0	-38	-37	-36	-35	-35	-34	-33	-33	-32	-32	-31
0	0	0	-43	-42	-41	-40	-39	-39	-38	-37	-37	-36	-35

Air Quality worksheets 2 & 3

Air Quality Valuation Workbook - Worksheet 2

Regional Air Quality

Scheme name: MetroWest Rail **Opening year:** 2021 **Forecast year:** 2036

		Without scheme		With scheme		Change in emissions	
		Opening year	Forecast year	Opening year	Forecast year	Opening year	Forecast year
NOx emissions in tonnes per year	Areas not exceeding limit values	30.62	32.70	45.23	48.30	14.61	15.60
	Areas exceeding limit values	2.08	0.00	3.07	0.00	0.99	0.00

Qualitative comments:

Data sources:

Air Quality Valuation Workbook - Worksheet 3

Scheme Name:	MetroWest Rail
Present Value Base Year	2010
Current Year	2017
Proposal Opening year:	2021
Project (Road/Rail or Road and Rail):	rail

Overall Assessment Score:

Present value of change in NOx emissions (£):	-£536,446
Present value of change in PM10 concentrations (£):	-£1,482
Total value of change in air quality (£):	-£537,928

*positive value reflects a **net benefit** (i.e. air quality improvement)

Quantitative Assessment:

Net total route assessment (opening year) for PM10 : (between 'with scheme' and 'without scheme' scenarios)	1
Change in NOX emissions over 60 year appraisal period: (between 'with scheme' and 'without scheme' scenarios)	936

Qualitative Comments:

Sensitivity Analysis:

Upper estimate net present value of change in air quality (£):	-£705,795
Lower estimate net present value of change in air quality (£):	-£429,113

Data Sources:

Air Quality sensitivity calculations

Air Quality Valuation Workbook - Inputs

Scheme details

Scheme name	MetroWest Rail	*Scheme_name*
Opening year	2021	*Opening_year_in*
Forecast year	2036	*Forecast_year_in*
Scheme type (select from list)	rail	*Scheme_type*
Current year	2017	*Current_year_in*
Is PM10 included in the appraisal?	Yes	

NOx emissions & PM10 concentrations

NOx emissions (tonnes)

	Opening year	
Without scheme	32.7	*Opening_year_without_scheme_NOx_emissions_in*
With scheme	48.3	*Opening_year_with_scheme_NOx_emissions_in*

	Forecast year	
Without scheme	32.7	*Forecast_year_without_scheme_NOx_emissions_in*
With scheme	48.3	*Forecast_year_with_scheme_NOx_emissions_in*

PM10 concentrations (assessment scores)

	Opening year	
Without scheme	1.0	*Opening_year_without_scheme_PM10_concentrations_in*
With scheme	1.5	*Opening_year_with_scheme_PM10_concentrations_in*

	Forecast year	
Without scheme	1.0	*Forecast_year_without_scheme_PM10_concentrations_in*
With scheme	1.5	*Forecast_year_with_scheme_PM10_concentrations_in*

Exceedances

Select the method used to

If using the 'custom' method, enter the appropriate percentages in row 46.

Exceedance method	Urban	*Exceedance_method_in*

Percentage of emissions exceeding limit values (all vehicles)

	2010	2011	2012	2013	2014	2015	2016
Urban (Road)	59.9%	55.2%	50.5%	45.7%	41.0%	36.3%	30.5%
National (Road)	17.1%	16.0%	14.9%	13.8%	12.7%	11.6%	9.8%
Rail	8.4%	7.7%	7.1%	6.4%	5.8%	5.1%	4.3%
Custom	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

source: Defra analysis

Emissions and concentrations values

Income base year	2010	*Income_base_values_in*
Price base year	2010	*Price_base_values_in*

NOx damage base values

Central	18,362	*NOx_damage_base_value_central_in*
Low	7,344	*NOx_damage_base_value_low_in*
High	29,379	*NOx_damage_base_value_high_in*

NOx abatement base values

Central	29,000	*NOx_abatement_base_value_central_in*
Low	27,000	*NOx_abatement_base_value_low_in*
High	73,000	*NOx_abatement_base_value_high_in*

PM10 damage base values

Central	92.7	*PM10_damage_base_value_central_in*
Low	49	*PM10_damage_base_value_low_in*
High	105.4	*PM10_damage_base_value_high_in*

source: TAG data book Table A3.2 (v1.3 November 2014)

Appraisal period and discounting

Appraisal period (years)	60	*Appraisal_period_length_in*
PV base year	2010	*PV_base_year_in*
Outputs price year	2010	*Price_base_outputs_in*
Discount period 1	30	*Discount_period_1_in*
Discount period 2	75	*Discount_period_2_in*
Discount period 3	125	*Discount_period_3_in*
Discount rate 1	3.5%	*Discount_rate_1_in*
Discount rate 2	3.0%	*Discount_rate_2_in*
Discount rate 3	2.5%	*Discount_rate_3_in*

source: TAG data book v1.5 (July 2016). Table A1.1.1

	2010	2011	2012	2013	2014	2015	2016
GDP deflator	100.00	102.01	103.58	105.55	107.29	107.65	108.83
Real GDP per household	120.73	121.77	122.41	124.57	128.16	129.62	130.94
Real GDP per capita	135.20	136.11	136.98	138.73	141.90	143.94	145.76

source: TAG data book v1.5 (July 2016). Annual parameters tab.

Air Quality Valuation Workbook - Calculations

		2010	2011	2012	2013	2014	2015	2016	2017

Appraisal period

Opening year	**2021** *Opening_year*								
Opening year		0	0	0	0	0	0	0	0
Forecast year	**2036** *Forecast_year*								
Forecast year		0	0	0	0	0	0	0	0
Difference (years)	15 *Interpolation_period_length*								
Appraisal period length (years)	60 *Appraisal_period_length*								
Interpolation		0	0	0	0	0	0	0	0
Extrapolation		0	0	0	0	0	0	0	0
Appraisal period		0	0	0	0	0	0	0	0
Check	TRUE								

NOx emissions

Without scheme (tonnes)

	2021								
Opening year NOx emissions	32.7 *Opening_year_without_scheme_NOx_emissions*								
	2036								
Forecast year NOx emissions	32.7 *Forecast_year_without_scheme_NOx_emissions*								
Difference	0 *Difference_without_scheme_NOx_emissions*								
Opening year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

With scheme (tonnes)

	2021								
Opening year NOx emissions	48.3 *Opening_year_with_scheme_NOx_emissions*								
	2036								
Forecast year NOx emissions	48.3 *Forecast_year_with_scheme_NOx_emissions*								
Difference	0 *Difference_with_scheme_NOx_emissions*								
Opening year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total change in NOx emissions (tonnes)		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Change over 60 years	936 *TOTAL_emissions_change_60years*								

EU emission exceedance values

Exceedance method	**Urban**	*Exceedance_method*
Urban	**1**	*Urban_mask*
National	**0**	*National_mask*
Rail	**0**	*Rail_mask*
Custom	**0**	*Custom_mask*

Urban NOx emissions (tonnes)

Urban emission exceedance (%)	**59.9%**	**55.2%**	**50.5%**	**45.7%**	**41.0%**	**36.3%**	**30.5%**	**24.8%**
Urban without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

National NOx emissions (tonnes)

National emission exceedance (%)	**17.1%**	**16.0%**	**14.9%**	**13.8%**	**12.7%**	**11.6%**	**9.8%**	**8.0%**
National without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
National with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
National difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Rail NOx emissions (tonnes)

Rail emission exceedance (%)	**8.40%**	**7.74%**	**7.08%**	**6.42%**	**5.76%**	**5.10%**	**4.28%**	**3.46%**
Rail without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rail with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rail difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Custom NOx emissions (tonnes)

Custom emission exceedance (%)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Custom without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom with scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NOx emissions in areas of exceedance

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
With scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Without scheme opening year	2.08	*Without_scheme_opening_year_exceedance*
With scheme opening year	3.07	*With_scheme_opening_year_exceedance*
Change	0.99	*Change_opening_year_exceedance*
Without scheme forecast year	0.00	*Without_scheme_forecast_year_exceedance*
With scheme forecast year	0.00	*With_scheme_forecast_year_exceedance*
Change	0.00	*Change_forecast_year_exceedance*

NOx emissions not in areas of exceedance

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Without scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
With scheme	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Without scheme opening year	30.62	*Without_scheme_opening_year_not_in_exceedance*
With scheme opening year	45.23	*With_scheme_opening_year_not_in_exceedance*
Change	14.61	*Change_opening_year_not_in_exceedance*
Without scheme forecast year	32.70	*Without_scheme_forecast_year_not_in_exceedance*
With scheme forecast year	48.30	*With_scheme_forecast_year_not_in_exceedance*
Change	15.60	*Change_forecast_year_not_in_exceedance*

PM10 concentrations

Without scheme

	2021		
Opening year PM10 concentrations	0.96		*Opening_year_without_scheme_PM10_concentrations*
	2036		
Forecast year PM10 concentrations	1		*Forecast_year_without_scheme_PM10_concentrations*
Difference		0.04	*Difference_without_scheme_PM10_concentrations*

Opening year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

With scheme

	2021		
Opening year PM10 concentrations	1.48		*Opening_year_with_scheme_PM10_concentrations*
	2036		
Forecast year PM10 concentrations	1.5		*Forecast_year_with_scheme_PM10_concentrations*
Difference		0.02	*Difference_with_scheme_PM10_concentrations*

Opening year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forecast year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interpolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Extrapolation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Change in PM10 net total assessment	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Opening year net route assessment 0.52 *Opening_year_net_route_assessment*

Emissions and concentrations valuations

Income and price adjustment

	2010	2011	2012	2013	2014	2015	2016	2017
GDP deflator index	100.00	102.01	103.58	105.55	107.29	107.65	108.83	110.90
Real GDP per household index	120.73	121.77	122.41	124.57	128.16	129.62	130.94	132.57
Real GDP per capita index	135.20	136.11	136.98	138.73	141.90	143.94	145.76	147.93

Income base for emission/concentration values	2010	*Income_base_values*
GDP per capita index - values	135.20	*GDP_capita_base_values*
GDP per household index - values	120.73	*GDP_household_base_values*
Price base for emission/concentration values	2010	*Price_base_values*
GDP deflator index - values	100.00	*GDP_deflator_base_values*
Price base for outputs	2010	*Price_base_outputs*
GDP deflator index - for outputs	100.00	*GDP_deflator_outputs*
Price base adjustment	1.00	*Price_adjustment*

NOx damage costs (£/tonne)

Low base value	7344.27	*NOx_damage_base_value_low*
Central base value	18361.98	*NOx_damage_base_value_central*
High base value	29378.83	*NOx_damage_base_value_high*

Low	7344	7393	7441	7536	7708	7819	7918	8036
Central	18362	18484	18604	18841	19271	19549	19795	20091
High	29379	29575	29765	30145	30834	31278	31672	32145

NOx abatement costs (£/tonne)

Low base value	27000	*NOx_abatement_base_value_low*
Central base value	29000	*NOx_abatement_base_value_central*
High base value	73000	*NOx_abatement_base_value_high*

Low	27000	27000	27000	27000	27000	27000	27000	27000
Central	29000	29000	29000	29000	29000	29000	29000	29000
High	73000	73000	73000	73000	73000	73000	73000	73000

PM10 damage costs (£/HH/1µgm-3)

Low base value	48.6	*PM10_damage_base_value_low*
Central base value	92.7	*PM10_damage_base_value_central*
High base value	105.4	*PM10_damage_base_value_high*

Low	49	49	49	50	52	52	53	53
Central	93	94	94	96	98	100	101	102
High	105	106	107	109	112	113	114	116

NOx emissions benefits not in areas of exceedance								
(positive values represent a benefit - an improvement in air quality)								
Low (£)	0	0	0	0	0	0	0	0
Central (£)	0	0	0	0	0	0	0	0
High (£)	0	0	0	0	0	0	0	0
NOx emissions benefits in areas of exceedance								
Low (£)	0	0	0	0	0	0	0	0
Central (£)	0	0	0	0	0	0	0	0
High (£)	0	0	0	0	0	0	0	0
PM10 concentrations benefits								
Low (£)	0	0	0	0	0	0	0	0
Central (£)	0	0	0	0	0	0	0	0
High (£)	0	0	0	0	0	0	0	0

Discounting and present values

Discount period

Current year	2017	*Current_year*
PV base year	2010	*PV_base_year*
discount period 1	30	*Discount_period_1*
discount period 2	75	*Discount_period_2*
discount period 3	125	*Discount_period_3*

Masks								
Discount period 1	0	1	1	1	1	1	1	1
Discount period 2	0	0	0	0	0	0	0	0
Discount period 3	0	0	0	0	0	0	0	0

Discount rates and factors

discount rate 1	3.5%	*Discount_rate_1*
discount rate 2	3.0%	*Discount_rate_2*
discount rate 3	2.5%	*Discount_rate_3*

Discount rate profile		0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1	1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27
Discounted benefits for NOx emissions not in areas of exceedance									
(positive values represent a benefit - a reduction in noise)									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0
Discounted benefits for NOx emissions in areas of exceedance									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0
Discounted benefits for PM10 concentrations									
Low (£)		0	0	0	0	0	0	0	0
Central (£)		0	0	0	0	0	0	0	0
High (£)		0	0	0	0	0	0	0	0

NOx damage costs NPV estimates

(positive values represent a benefit - an improvement in air quality)

Low (£)	########	*NOx_damage_NPV_low*
Central (£)	########	*NOx_damage_NPV_central*
High (£)	########	*NOx_damage_NPV_high*

NOx abatement costs NPV estimates

Low (£)	-63,799	*NOx_abatement_NPV_low*
Central (£)	-68,525	*NOx_abatement_NPV_central*
High (£)	-172,493	*NOx_abatement_NPV_high*

Total present value of change in NOx emissions

Low (£)	########	*NOx_NPV_low*
Central (£)	########	*NOx_NPV_central*
High (£)	########	*NOx_NPV_high*

PM10 damage costs NPV estimates

Low (£)	-796	*PM10_damage_NPV_low*
Central (£)	-1,520	*PM10_damage_NPV_central*
High (£)	-1,727	*PM10_damage_NPV_high*

Total present value of change in air quality: £NPV

Low (£)	**########**	*NPV_low*
Central (£)	**########**	*NPV_central*
High (£)	**########**	*NPV_high*

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1	1	1	1
0.00	0.00	0.00	32.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70	32.70
0.00	0.00	0.00	48.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30	48.30
0.00	**0.00**	**0.00**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**	**15.60**

19.1%	13.3%	7.6%	6.4%	5.2%	3.9%	2.7%	1.5%	1.3%	1.1%	0.8%	0.6%	0.4%	0.0%
0.00	0.00	0.00	2.08	1.68	1.29	0.89	0.50	0.42	0.35	0.27	0.20	0.12	0.00
0.00	0.00	0.00	3.07	2.49	1.90	1.32	0.73	0.62	0.51	0.40	0.29	0.18	0.00
0.00	0.00	0.00	0.99	0.80	0.61	0.43	0.24	0.20	0.16	0.13	0.09	0.06	0.00

6.1%	4.3%	2.5%	2.1%	1.7%	1.3%	0.9%	0.5%	0.4%	0.3%	0.3%	0.2%	0.1%	0.0%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.64%	1.82%	1.00%	0.84%	0.68%	0.52%	0.36%	0.20%	0.16%	0.12%	0.08%	0.04%	0.00%	0.00%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0.00	0.00	0.00	2.08	1.68	1.29	0.89	0.50	0.42	0.35	0.27	0.20	0.12	0.00
0.00	0.00	0.00	3.07	2.49	1.90	1.32	0.73	0.62	0.51	0.40	0.29	0.18	0.00
0.00	0.00	0.00	0.99	0.80	0.61	0.43	0.24	0.20	0.16	0.13	0.09	0.06	0.00

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0.00	0.00	0.00	30.62	31.02	31.41	31.81	32.20	32.28	32.35	32.43	32.50	32.58	32.70
0.00	0.00	0.00	45.23	45.81	46.40	46.98	47.57	47.68	47.79	47.90	48.01	48.12	48.30
0.00	0.00	0.00	14.61	14.80	14.99	15.17	15.36	15.40	15.44	15.47	15.51	15.54	15.60

0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.96	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.99
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.96	0.96	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.99

0.00	0.00	0.00	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.48	1.48	1.48	1.49	1.49	1.49	1.49	1.49	1.49	1.49
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.48	1.48	1.48	1.48	1.49	1.49	1.49	1.49	1.49	1.49	1.49
0.00	**0.00**	**0.00**	**0.52**	**0.52**	**0.52**	**0.52**	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
113.12	115.27	117.57	120.01	122.59	125.32	128.20	131.15	134.17	137.25	140.41	143.64	146.94	150.32
134.11	135.68	137.30	139.36	141.49	143.67	146.03	148.47	150.94	153.47	156.08	158.77	161.53	164.35
150.00	152.14	154.34	157.05	159.83	162.68	165.76	168.93	172.18	175.53	178.97	182.51	186.15	189.88

8148	8264	8384	8531	8682	8837	9004	9176	9353	9535	9722	9914	10111	10314
20372	20662	20961	21329	21706	22093	22512	22942	23384	23839	24306	24786	25280	25788
32594	33059	33537	34126	34730	35349	36019	36707	37414	38141	38889	39657	40448	41260

27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000	27000
29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000	29000
73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000	73000

54	55	55	56	57	58	59	60	61	62	63	64	65	66
103	104	105	107	109	110	112	114	116	118	120	122	124	126
117	118	120	122	123	125	127	130	132	134	136	139	141	143

0	0	0	-124,616	-128,462	-132,422	-136,635	-140,981	-144,031	-147,170	-150,402	-153,729	-157,153	-160,906
0	0	0	-311,562	-321,178	-331,079	-341,612	-352,478	-360,103	-367,952	-376,031	-384,349	-392,911	-402,293
0	0	0	-498,494	-513,879	-529,721	-546,573	-563,958	-576,159	-588,716	-601,643	-614,951	-628,651	-643,661
0	0	0	-26,803	-21,697	-16,590	-11,484	-6,377	-5,413	-4,450	-3,486	-2,522	-1,559	0
0	0	0	-28,788	-23,304	-17,819	-12,334	-6,850	-5,814	-4,779	-3,744	-2,709	-1,674	0
0	0	0	-72,467	-58,661	-44,855	-31,048	-17,242	-14,636	-12,031	-9,425	-6,819	-4,214	0
0	0	0	-29	-30	-30	-30	-31	-31	-32	-32	-33	-33	-34
0	0	0	-56	-56	-57	-58	-59	-60	-60	-61	-62	-63	-64
0	0	0	-63	-64	-65	-66	-67	-68	-69	-70	-71	-72	-73
1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79	1.86	1.92	1.99	2.06
0	0	0	-85,355	-85,014	-84,671	-84,411	-84,150	-83,064	-82,004	-80,970	-79,963	-78,980	-78,131
0	0	0	-213,403	-212,550	-211,694	-211,042	-210,391	-207,674	-205,024	-202,441	-199,921	-197,464	-195,342
0	0	0	-341,441	-340,077	-338,706	-337,663	-336,621	-332,274	-328,035	-323,901	-319,870	-315,938	-312,543
0	0	0	-18,359	-14,358	-10,608	-7,094	-3,806	-3,122	-2,479	-1,877	-1,312	-783	0
0	0	0	-19,719	-15,422	-11,394	-7,620	-4,088	-3,353	-2,663	-2,016	-1,409	-841	0
0	0	0	-49,636	-38,821	-28,680	-19,181	-10,292	-8,441	-6,704	-5,074	-3,547	-2,118	0
0	0	0	-20	-20	-19	-19	-18	-18	-18	-17	-17	-17	-16
0	0	0	-38	-37	-36	-36	-35	-34	-34	-33	-32	-32	-31
0	0	0	-43	-42	-41	-41	-40	-39	-38	-37	-37	-36	-35

Air Quality – other worksheets

Air Quality Valuation Workbook - Worksheet 2

Regional Air Quality

Scheme name: MetroWest Rail **Opening year:** 2021 **Forecast year:** 2036

		Without scheme		With scheme		Change in emissions	
		Opening year	Forecast year	Opening year	Forecast year	Opening year	Forecast year
NOx emissions in tonnes per year	Areas not exceeding limit values	30.62	32.70	45.23	48.30	14.61	15.60
	Areas exceeding limit values	2.08	0.00	3.07	0.00	0.99	0.00

Qualitative comments:

Data sources:

Air Quality Valuation Workbook - Worksheet 3

Scheme Name: MetroWest Rail

Present Value Base Year 2010

Current Year 2017

Proposal Opening year: 2021

Project (Road/Rail or Road and Rail): rail

Overall Assessment Score:

Present value of change in NOx emissions (£): -£9,638,495

Present value of change in PM10 concentrations (£): -£1,520

Total value of change in air quality (£): -£9,640,015

*positive value reflects a **net benefit** (i.e. air quality improvement)

Quantitative Assessment:

Net total route assessment (opening year) for PM10 : 1
(between 'with scheme' and 'without scheme' scenarios)

Change in NOX emissions over 60 year appraisal period: 936
(between 'with scheme' and 'without scheme' scenarios)

Qualitative Comments:

Sensitivity Analysis:

Upper estimate net present value of change in air quality (£): -£15,485,991

Lower estimate net present value of change in air quality (£): -£3,892,311

Data Sources:

Pollutant Concentration Entry

Please click the Button to Compile the Local Air Quality Results

Compile Local Air Quality Results

Road	NO_2 Concentrations								PM_{10} Concentrations							
	Do-Minimum				Do-Something				Do-Minimum				Do-Something			
	0-50m	50-100m	100-150m	150-200m	0-50m	50-100m	100-150m	150-200m	0-50m	50-100m	100-150m	150-200m	0-50m	50-100m	100-150m	150-200m
Rail Links	29.2	28.8	28.5	28.4	30.1	29.2	28.8	28.6	17.5	17.5	17.4	17.4	17.6	17.5	17.5	17.4

Property Count Entry

Please click the Button to Compile the Local Air Quality Results

Compile Local Air Quality Results

Road	Property Input							
	Do-Minimum				Do-Something			
	0-50m	50-100m	100-150m	150-200m	0-50m	50-100m	100-150m	150-200m
Rail Links	3733	5748	6163	6428	3733	5748	6163	6428

PM10, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	3733	5748	6163	6428	22072
Total properties across all routes (some)	3733	5748	6163	6428	22072
Do-minimum PM10 assessment across all routes	65506.83	100562.87	107526.36	112006.41	Total assessment PM10 (I): 385602.47
Do-something PM10 assessment across all routes	65733.89	100738.32	107631.91	112084.44	Total assessment PM10 (II): 386188.56
Net total assessment for PM10, all routes (II-I)					586.09
Number of properties with an improvement					*0*
Number of properties with no change					*0*
Number of properties with a deterioration					*22072*

Reference Sources:

Quantitative Measures:

Assessment Scores:

Qualitative Comments:

NO_2, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	3733	5748	6163	6428	22072
Total properties across all routes (some)	3733	5748	6163	6428	22072
Do-minimum NO_2 assessment across all routes	109152.92	165542.40	175707.13	182490.92	Total assessment NO_2 (I): 632893.37
Do-something NO_2 assessment across all routes	112325.97	168014.04	177186.25	183583.68	Total assessment NO_2 (II): 641109.94
Net total assessment for NO_2, all routes (II-I)					8216.57
Number of properties with an improvement					*0*
Number of properties with no change					*0*
Number of properties with a deterioration					*22072*

Reference Sources:

Quantitative Measures:

Assessment Scores:

Qualitative Comments:

	A	B	C	D	E	F	G
1							
2		**PM_{10}**	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
3		**Rail Links**	**(i)**	**(ii)**	**(iii)**	**(iv)**	**(v=i+ii+iii+iv)**
4		**Properties (amin)**	3733	5748	6163	6428	22072
5		**Properties (asome)**	3733	5748	6163	6428	22072
6		**PM_{10} concentration at average point**	At 20m:	At 70m:	At 115m:	At 175m:	**N/A**
7		**within band for *do-minimum* (bmin)**	17.55	17.50	17.45	17.42	
8		**PM_{10} concentration at average point**	At 20m:	At 70m:	At 115m:	At 175m:	**N/A**
9		**within band for *do-something* (bsome)**	17.61	17.53	17.46	17.44	
10		***Do-minimum* PM_{10} assessment**					Total route assess PM_{10} **(I)**:
11		***(c = amin*bmin)***	65506.83	100562.87	107526.36	112006.41	385602.47
12		***Do-something* PM_{10} assessment**					Total route assess PM_{10} **(II)**:
13		***(c = asome*bsome)***	65733.89	100738.32	107631.91	112084.44	386188.56
14		**Net total route assessment for PM_{10} (II-I)**					586.09

	H	I	J	K	L	M	N
1							
2		**NO_2**	**0-50m**	**50-100m**	**100-150m**	**150-200m**	**0-200m**
3		**Rail Links**	**(i)**	**(ii)**	**(iii)**	**(iv)**	**(v=i+ii+iii+iv)**
4		**Properties (amin)**	3733	5748	6163	6428	22072
5		**Properties (asome)**	3733	5748	6163	6428	22072
6		**NO_2 concentration at average point**	At 20m:	At 70m:	At 115m:	At 175m:	**N/A**
7		**within band for *do-minimum* (bmin)**	29.24	28.80	28.51	28.39	
8		**NO_2 concentration at average point**	At 20m:	At 70m:	At 115m:	At 175m:	**N/A**
9		**within band for *do-something* (bsome)**	30.09	29.23	28.75	28.56	
10		***Do-minimum* NO_2 assessment**					Total route assess NO_2 **(I)**:
11		***(c = amin*bmin)***	109152.92	165542.40	175707.13	182490.92	632893.37
12		***Do-something* NO_2 assessment**					Total route assess NO_2 **(II)**:
13		***(c = asome*bsome)***	112325.97	168014.04	177186.25	183583.68	641109.94
14		**Net total route assessment for NO_2 (II-I)**					8216.57

Greenhouse gas calculations

Greenhouse Gases Workbook - Inputs

Scheme details

Scheme name	MetroWest Rail	*Scheme_name*
Opening year	2021	*Opening_year_in*
Scheme type (select from list)	rail	*Scheme_type*
Current year	2017	*Current_year_in*

Emissions (tCO2e per year)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Non-traded sector														
Road without scheme														
Road with scheme														
Rail without scheme												1301		
Rail with scheme												1288		
Traded sector														
Road without scheme														
Road with scheme														
Rail without scheme														
Rail with scheme														

Emission values

Non-traded values (£/tCO2e)

price base year 2010 *CO2e_value_price_base_in*

price base year

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Low	26.1	26.5	26.9	27.3	27.7	28.1	28.5	28.9	29.4	29.8	30.3	30.8	31.3	31.8
Central	52.1	52.9	53.7	54.5	55.3	56.2	57.0	57.9	58.7	59.6	60.5	61.5	62.5	63.5
High	78.2	79.4	80.6	81.8	83.0	84.3	85.5	86.8	88.1	89.4	90.8	92.3	93.8	95.3

source: TAG data book v1.8.1 (July 2017)`. A3.4 tab.

Appraisal period and discounting

Appraisal period (years)	60	*Appraisal_period_length_in*
PV base year	2010	*PV_base_year_in*
Outputs price year	2010	*Price_base_outputs_in*
Discount period 1	30	*Discount_period_1_in*
Discount period 2	75	*Discount_period_2_in*
Discount period 3	125	*Discount_period_3_in*
Discount rate 1	3.5%	*Discount_rate_1_in*
Discount rate 2	3.0%	*Discount_rate_2_in*
Discount rate 3	2.5%	*Discount_rate_3_in*

source: TAG data book v1.5 (July 2016). Table A1.1.1

Carbon budget 1 start	2008	*Carbon_budget_1_start_in*
Carbon budget 1 end	2012	*Carbon_budget_1_end_in*
Carbon budget 2 start	2013	*Carbon_budget_2_start_in*
Carbon budget 2 end	2017	*Carbon_budget_2_end_in*
Carbon budget 3 start	2018	*Carbon_budget_3_start_in*
Carbon budget 3 end	2022	*Carbon_budget_3_end_in*
Carbon budget 4 start	2023	*Carbon_budget_4_start_in*
Carbon budget 4 end	2027	*Carbon_budget_4_end_in*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
GDP deflator	100.0	102.0	103.6	105.6	107.3	107.9	109.8	111.7	113.5	115.3	117.4	119.7	122.1	124.7

source: TAG data book v1.8.1 (July 2017)`. Annual parameters tab.

Greenhouse Gases Workbook - Calculations

		2010	2011	2012	2013	2014	2015	2016
Appraisal period								
Opening year	2021 *Opening_year*							
Opening year		0	0	0	0	0	0	0
Appraisal period length (years)	60 *Appraisal_period_length*							
Appraisal period		0	0	0	0	0	0	0
Check	TRUE							
Emissions (tCO2e)								
Non-traded sector								
Road without scheme		0	0	0	0	0	0	0
Road with scheme		0	0	0	0	0	0	0
Road - change in emissions		0	0	0	0	0	0	0
Rail without scheme		0	0	0	0	0	0	0
Rail with scheme		0	0	0	0	0	0	0
Rail - change in emissions		0	0	0	0	0	0	0
Total change in non-traded emissions		0	0	0	0	0	0	0
Change over 60 years (tCO2e)	-13 *Non_traded_emissions_change_60years*							
Traded sector								
Road without scheme		0	0	0	0	0	0	0
Road with scheme		0	0	0	0	0	0	0
Road - change in emissions		0	0	0	0	0	0	0
Rail without scheme		0	0	0	0	0	0	0
Rail with scheme		0	0	0	0	0	0	0
Rail - change in emissions		0	0	0	0	0	0	0
Total change in traded emissions		0	0	0	0	0	0	0
Change over 60 years (tCO2e)	0 *Traded_emissions_change_60years*							
Total change in CO2e emissions		**0**	**0**	**0**	**0**	**0**	**0**	**0**
Change over 60 years (tCO2e)	-13 *TOTAL_emissions_change_60years*							
Change in opening year (tCO2e)	-13 *TOTAL_emissions_change_opening_year*							
Carbon budget periods								
Carbon budget 1 start	2008 *Carbon_budget_1_start*							
Carbon budget 1 end	2012 *Carbon_budget_1_end*							
Carbon budget 2 start	2013 *Carbon_budget_2_start*							
Carbon budget 2 end	2017 *Carbon_budget_2_end*							
Carbon budget 3 start	2018 *Carbon_budget_3_start*							
Carbon budget 3 end	2022 *Carbon_budget_3_end*							
Carbon budget 4 start	2023 *Carbon_budget_4_start*							
Carbon budget 4 end	2027 *Carbon_budget_4_end*							
Masks								
Carbon Budget 1		1	1	1	0	0	0	0
Carbon Budget 2		0	0	0	1	1	1	1
Carbon Budget 3		0	0	0	0	0	0	0
Carbon Budget 4		0	0	0	0	0	0	0
Change in traded emissions (tCO2e)								
Carbon Budget 1	0 *Traded_emissions_change_Budget_1*							
Carbon Budget 2	0 *Traded_emissions_change_Budget_2*							
Carbon Budget 3	0 *Traded_emissions_change_Budget_3*							
Carbon Budget 4	0 *Traded_emissions_change_Budget_4*							
Change in non-traded emissions (tCO2e)								

Carbon Budget 1	0	*Non_traded_emissions_change_Budget_1*
Carbon Budget 2	0	*Non_traded_emissions_change_Budget_2*
Carbon Budget 3	-13	*Non_traded_emissions_change_Budget_3*
Carbon Budget 4	0	*Non_traded_emissions_change_Budget_4*

Emission valuations

Price adjustment

		2010	2011	2012	2013	2014	2015	2016
GDP deflator		100.0	102.0	103.6	105.6	107.3	107.9	109.8
CO2e values price base	2010	*CO2e_value_price_base*						
GDP deflator index - base	100	*GDP_deflator_base*						
Price base for outputs	2010	*Price_base_outputs*						
GDP deflator index - for outputs	100	*GDP_deflator_outputs*						
Price base adjustment	1.00	*Price_adjustment*						
Carbon values in 2010 prices								
low (£/tCO2e)		26.1	26.5	26.9	27.3	27.7	28.1	28.5
central (£/tCO2e)		52.1	52.9	53.7	54.5	55.3	56.2	57.0
high (£/tCO2e)		78.2	79.4	80.6	81.8	83.0	84.3	85.5

Valuing changes in emissions (£)

positive values represent a benefit - a reduction in GHG emissions

Low (£)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Central (£)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
High (£)		0.0	0.0	0.0	0.0	0.0	0.0	0.0

Discounting and present values

Discount period

Current year	2017	*Current_year*						
PV base year	2010	*PV_base_year*						
discount period 1	30	*Discount_period_1*						
discount period 2	75	*Discount_period_2*						
discount period 3	125	*Discount_period_3*						
Masks								
Discount period 1		0	1	1	1	1	1	1
Discount period 2		0	0	0	0	0	0	0
Discount period 3		0	0	0	0	0	0	0

Discount rates and factors

discount rate 1	3.5%	*Discount_rate_1*						
discount rate 2	3.0%	*Discount_rate_2*						
discount rate 3	2.5%	*Discount_rate_3*						
Discount rate profile		0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1	1.00	1.04	1.07	1.11	1.15	1.19	1.23

Discounted GHG benefits

Low (£)		0	0.0	0.0	0.0	0.0	0.0	0.0
Central (£)		0	0.0	0.0	0.0	0.0	0.0	0.0
High (£)		0	0.0	0.0	0.0	0.0	0.0	0.0

Present values

Low (£)	274	*NPV_low*
Central (£)	548	*NPV_central*
High (£)	822	*NPV_high*

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0	0	0	0	1	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	1	1

0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1301	0	0	0	0	0	0
0	0	0	0	1288	0	0	0	0	0	0
0	0	0	0	-13	0	0	0	0	0	0
0	0	0	0	-13	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0

0	**0**	**0**	**0**	**-13**	**0**	**0**	**0**	**0**	**0**	**0**

0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
0	1	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	1	1	1	1	1

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
	111.7	113.5	115.3	117.4	119.7	122.1	124.7	127.4	130.3	133.3	136.4
	28.9	29.4	29.8	30.3	30.8	31.3	31.8	32.3	32.8	33.3	33.8
	57.9	58.7	59.6	60.5	61.5	62.5	63.5	64.6	65.6	66.6	67.6
	86.8	88.1	89.4	90.8	92.3	93.8	95.3	96.8	98.3	99.9	101.4
	0.0	0.0	0.0	0.0	399.9	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	799.9	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	1199.8	0.0	0.0	0.0	0.0	0.0	0.0
	1	1	1	1	1	1	1	1	1	1	1
	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
	1.27	1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79
	0.0	0.0	0.0	0.0	273.9	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	547.9	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	821.8	0.0	0.0	0.0	0.0	0.0	0.0

Greenhouse gas proformas

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: MetroWest Rail

Present Value Base Year 2010

Current Year 2017

Proposal Opening year: 2021

Project (Road/Rail or Road and Rail): rail

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£): £548

*positive value reflects a **net benefit** (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes): -13
(between 'with scheme' and 'without scheme' scenarios)

Of which Traded 0

Change in carbon dioxide equivalent emissions in opening year (tonnes): -13
(between 'with scheme' and 'without scheme' scenarios)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	-13	0

Qualitative Comments:

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £822

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): £274

Data Sources:

Biodiversity

TAG Biodiversity Impacts Worksheet

Portishead to Pill

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Sites							
Severn Estuary SAC	Estuaries, mudflats, sandflats and Atlantic salt meadows. Qualifying species include sea lamprey *Petromyzon marinus* , river lamprey *Lampetra fluviatilis* and twaite shad *Alosa fallax* . Approximately 60 m to the DCO Scheme at closest point and 30 m of temporary construction sites.	International	Very High - The severn estuary SAC is considered one of the best areas in the UK to support a significant type of habitats and species.	The sea lamprey is common but has declined in parts of its range and is now extinct in a number of rivers. Populations of the river lamprey remain strong. The twaite shad has declined substantially throughout Europe, declines have been attributed to pollution, overfishing and migratory route obstructions.	Very High	Neutral - No direct or indirect effects considered likely as there will be no change in runoff from the DCO Scheme.	Neutral
Severn Estuary SPA	Internationally Important assemblage of overwintering birds including Bewick's swan *Cygnus columbianus bewickii* , curlew *Numenius arquata* , dunlin *Calidris alpina* , pintail *Anas acuta* , common redshank *Tringa totanus* and common shelduck *Tadorna tadorna* . Approximately 60 m to the scheme at closest point.	International	Very High - Supports an internationally important assemblage of overwintering birds.	Curlew, redshank & shelduck have experienced overwintering declines since the mid 1990s/2000s. Dunlin have suffered a significant decline since 1975/76.	Very High	Neutral. The Severn Estuary SPA/Ramsar is functionally linked to the Portishead to Pill section of the DCO Scheme via Portbury Wharf Nature Reserve. Assessment of bird survey data has indicated that a relatively small number of SPA/Ramsar birds use the nature reserve, this together with the small amount of potential habitat suitable for SPA/Ramsar species being lost by the construction of the DCO Scheme compared to the designated site as a whole, and the distance from the proposed works (at least 600 m away from pools/lagoons where SPA/Ramsar birds are most likely to occur), no indirect impacts are expected. No operational impacts expected.	Neutral
Severn Estuary Ramsar	Tidal range, estuarine communities, fish & waterfowl. Approximately 60 m to the scheme at the closest point.	International	Very High - The Severn estuary has the second largest tidal regime in the world which supports plant and animal communities typical of the extreme physical conditions.	See Severn Estuary SPA	Very High	See Severn Estuary SPA	See Severn Estuary SPA
North Somerset and Mendip Bats SAC	*Tilio-Acerion* forests of slopes, screes and ravines. Lesser horseshoe *Rhinolophus hipposideros* and Greater horseshoe *Rhinolophus ferrumequinum* bats. Approximately 8 km to the scheme at the closest point.	International	Very High - Supports Annex 1 habitats and Annex 2 species including hibernation sites for lesser and greater horseshoe bats and maternity sites for greater horseshoes	Around 12% of the UK is covered with trees/woodland, UK targets include expansion of woodland cover and increase areas in favourable condition. Lesser & greater horseshoe bat populations in the UK are considered to have increased overall since 1999	Very High	To be assessed - The railway line is a navigational route for bats including lesser and greater horseshoe bats and is considered to be of regional importance. A greater horseshoe bat (male) has been trapped on the Portishead to Pill line and radio-tracked to the North Somerset and Mendips Bats SAC. However, more trapping and radio-tracking surveys are planned for May/June 2018 so the impact is still to be assessed. Additional mitigation for bats may be required.	To be assessed
Severn Estuary SSSI	Boundary is within SAC, SPA and Ramsar. The intertidal zone of mudflats, sand banks, rocky platforms and saltmarsh is one of the largest and most important in Britain. The estuarine fauna includes: internationally important populations of waterfowl; invertebrate populations of considerable interest; and large populations of migratory fish. Approximately 60 m to the DCO Scheme at the closest point.	National	High - Located within internationally important sites. Supports range of intertidal habitats and estuarine fauna including waterfowl and migratory fish.	See Severn Estuary SPA, SAC & Ramsar	High	See Severn Estuary SAC & SPA	See Severn Estuary SAC & SPA

TAG Biodiversity Impacts Worksheet

Portishead to Pill

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Weston Big Wood SSSI	Mixed deciduous ancient woodland. Approximately 1.2 km to the DCO Scheme at the closest point.	National	High - Mixed deciduous woodland with a rich variety of plant species. Remnant ancient forest.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	Neutral - no direct or indirect effects considered likely due to geographic separation to the DCO Scheme	Neutral
Horseshoe Bend, Shirehampton SSSI	Wooded river cliff and a narrow fringe of saltmarsh. Approximately 1.8 km to the scheme at the closest point.	National	High - Supports nationally rare tree species including the largest known English population of the nationally rare true service-tree *Sorbus domestica* .	Around 12% of the UK is covered with trees/woodland, UK targets include expansion of woodland cover and increase areas in favourable condition. It is estimated that, at the mean high water line, 24% of the English coastline consists of saltmarsh vegetation.	High	Neutral - Due to geographical separation from the scheme	Neutral
Portbury Wharf Nature Reserve North Somerset Wildlife Site (NSWS) (Avon Wildlife Trust (AWT) Nature Reserve from 2010 - 2015)	Marshy grassland, open water and associated habitats and species including otter, water vole, snipe and lapwing. Approximately 0 m to the scheme at the closest point.	County	Medium - Supports priority habitats such as Coastal and Floodplain Grazing Marsh & important species. Designated as a Wildlife Site.	The total UK area for eutrophic standing waters is likely to be around 1,785 km2. Trends in this habitat type are not known but they are under threat from infilling, agricultural run-off and other pollution, lack of management and over-stocking of fish.	Medium	Neutral - The Sheepway maintenance track will lead to a permanent loss of a small area of improved grassland at Portbury Wharf Nature Reserve. The proposed construction compound will lead to a temporary loss of improved grassland, which will be reinstated post construction. During the operation of the scheme the sheepway access track will be used about twice a month for van access and less than once in 12 months for low loader access. Due to the infrequent use it is anticipated that no direct or indirect effects will be likely	Neutral
Field east of M5 Motorway, Lodway NSWS	Marshy grassland and semi-improved neutral grassland. Approximately 0 m to the DCO Scheme at the closest point.	District	Medium - Marshy grassland and designated as a Wildlife Site.	Unknown	Medium	Neutral - The bridleway extension under the M5 will lead to a loss of habitat. The magnitude of impact is negligible and the significance of the effect is considered to be neutral due to the small area of land to be lost.	Neutral
Drove Rhyne and adjacent fields NSWS	Swamp, standing water (ditches) and semi-improved neutral grassland. Water vole population recorded here in 2007. Approximately 0 m from the DCO Scheme at closest point.	District	Medium - Due to habitats present and potential to support water vole population. Designated as a Wildlife Site.	Unknown	Medium	Neutral - Potential indirect effects from run off. Temporary impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Fields between railway line and A369, Portbury NSWS	Species rich marshy grassland. Approximately 0 m from the DCO Scheme at closest point.	District	Medium - Species rich marshy grassland and designated as a Wildlife Site.	Unknown	Medium	Neutral - Potential indirect effects from run off. Temporary impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Field east of Court House NSWS	Species rich unimproved neutral grassland. Approximately 0 m from the DCO Scheme at closest point.	District	Medium - Species rich unimproved neutral grassland and designated as a Wildlife Site.	Unknown	Medium	Neutral - Potential indirect effects from run off. Temporary impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Priory Farm (AWT Nature Reserve)	Wetland with reed bed. Approximately 0 m from the DCO Scheme at closest point.	County	Medium - Wetland and designated as a Wildlife Site.	Unknown	Medium	Neutral - Potential indirect effects from run off. Temporary impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Land adjacent to Severn Estuary SSSI (Portbury) NSWS	Species rich marshy grassland. Approximately 12 m to the DCO Scheme at closest point.	County	Medium - Species rich marshy grassland and designated as a Wildlife Site.	Unknown	Medium	See Severn Estuary SAC/SPA/Ramsar/SSSI	Neutral

TAG Biodiversity Impacts Worksheet

Portishead to Pill

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Fields between A369 and M5 Motorway, Portbury NSWS	Species rich marshy grassland. Many breeding sedge warblers and reed warblers. Approximately 22 m to the DCO Scheme at closest point.	County	Medium - Species rich marshy grassland and designated as a Wildlife Site.	Unknown	Medium	Neutral - Potential indirect effects from run off. Temporary impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Fields on Caswell Moor NSWS	Swamp, standing water (ditches), and semi-improved neutral grassland. Approximately 206 m to the DCO Scheme at closest point.	County	Medium - Semi-improved neutral grassland & swamp habitats. Designated as a Wildlife Site.	Unknown	Medium	Neutral - no significant direct or indirect effects likely due to geographical separation.	Neutral
Fields adjacent to M5 Motorway, Portbury NSWS	Species rich semi-improved neutral grassland. Approximately 254 m to the DCO Scheme at closest point.	County	Medium - Species rich semi-improved grassland and designated as a Wildlife Site.	Unknown	Medium	Neutral - no significant direct or indirect effects likely due to geographical separation and lack of hydrological connectivity.	Neutral
Lamplighter's Marsh SNCI	Brackish marshland, saltmarsh influenced grassland and secondary woodland. Approximately 304 m to the DCO Scheme at closest point.	County	Medium - Marsh habitats and designated as a SNCI.	Unknown	Medium	Neutral - no significant direct or indirect effects likely due to geographical separation.	Neutral
Lamplighter's Open Space Bristol Wildlife Network Site (BWNS)	Amenity parkland with trees. Approximately 351 m to the DCO Scheme at closest point.	County	Medium - due to designation as a Wildlife Site	Unknown	Medium	Neutral - no significant direct or indirect effects likely due to geographical separation.	Neutral
Species							
Great Crested Newt *Triturus cristatus*	Surveys carried out within 250 m of the scheme found four water bodies supporting small populations of great crested newt. eDNA surveys also found positive results for three further waterbodies although additional surveys did not identify any great crested newts.	Local	Medium	Populations widespread but patchy due to population declines in response to changes in framing practices and loss of habitat.	Medium	Minor negative - Habitat fragmentation and disturbance.	Slight adverse
Amphibians (Smooth newt *Lissotriton vulgaris* , Palmate newt *Lissotriton helveticus* , common frog *Rana temporaria* & common toad *Bufo bufo*)	All species thought to be widespread across the scheme footprint. Registered toad crossing also active adjacent to the scheme.	Local	Low	Palmate newt and common frog populations both thought to be declining. Common toad thought to be suffering rapid declines.	Low	Minor negative - habitat fragmentation, disturbance and potential for death and injury from collision.	Slight adverse
Badger *Meles meles*	Twelve badger setts were recorded along the disused section of the railway corridor. These consist of two active main setts, an active sett of unknown status, three active outlier setts and six disused outlier setts. Surveys suggest the potential existence of two social groups within the survey area.	Local	Medium – badger is not rare but several social groups are likely to be present and badger is a valuable part of local ecosystems as predator and scavenger.	British population thought to be stable. Although not rare in the UK, badgers receive a high level of legal protection due to concerns over their welfare and threats from persecution.	Medium	Minor Negative - There is potential for an increase in collision casualties as well as loss of foraging habitat.	Slight adverse
Bats	Common Pipistrelle *Pipistrellus pipistrellus* roost identified in Sheepway bridge	Immediate zone of influence	Medium - roosts are not large and species concerned are common and widespread.	The population of common pipistrelle in the UK are considered to have increased since 1999.	Medium	Minor negative - Although increased disturbance may cause bats to discontinue use of this roost it is not considered to have an impact on the wider population due to the availability of other suitable sites in the wider area and the provision of artificial roosts as compensation for the potential loss of the natural roost.	Slight adverse
	Common pipistrelle and Soprano pipistrelle *Pipistrellus pygmaeus* roost in Royal Portbury Dock Road Bridge.	Immediate zone of influence	Medium - roosts are not large and species concerned are common and widespread.	The populations of common and soprano pipistrelle bats are considered to have increased in the UK since 1999.	Medium	Minor negative - Although increased disturbance may cause bats to discontinue use of this roost it is not considered to have an impact on the wider population due to the availability of other suitable sites in the wider area and the provision of artificial roosts as compensation for the potential loss of the natural roost.	Slight adverse
	Lesser and greater horseshoe bats in a derelict store on the northern platform of Pill Station off Station Road	Local	Medium - Night roost only however feeding perches of Annex 1 species present	Lesser and greater horseshoe bat populations in the UK are considered to have increased overall since 1999	Medium	Minor negative - Although increased disturbance may cause bats to discontinue use of this roost it is not considered to have an impact on the wider population due to the availability of other suitable sites in the wider area.	Slight adverse

TAG Biodiversity Impacts Worksheet

Portishead to Pill

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
	Foraging and commuting route for bats.	Regional	High - integral part of a permeable landscape for lesser and greater horseshoe bats and of consequence to the populations of North Somerset and Mendip Bats SAC	See above	High	To be assessed - The railway line is a navigational route for bats including lesser and greater horseshoe bats and is considered to be of regional importance. A greater horseshoe bat (male) has been trapped on the Portishead to Pill line and radio-tracked to the North Somerset and Mendips Bats SAC. However, more trapping and radio-tracking surveys are planned for May/June 2018 so the impact is still to be assessed. Additional mitigation for bats may be required.	To be assessed
Birds (see also Severn Estuary SPA & Portbury Wharf NR)	Barn owl *Tyto alba* were not recorded during targeted surveys, however an adult bird was incidentally recorded on 25/07/2017 approximately 550 m from the disused section of railway. In addition 9 potential barn owl roosting/nesting locations were identified.	County	Medium - Barn owl are present within the area along with suitable nesting habitat	UK population has fallen by an estimated 90% since 1830, largely due to agricultural intensification.	Medium	Neutral - Low risk of collision due to low line speeds. Services will cease at midnight. There will be two train passes during operational hours including early morning and evenings. There will be dimmed lighting at Portishead and Pill Stations overnight.	Neutral
	The area provides numerous opportunities for nesting and foraging passerine species.	Local	Low	Unknown	Low	Neutral - It is anticipated that suitable nesting and foraging habitat will naturally re-establish during the operational phase.	Neutral
Reptiles	Slow worms *Anguis fragilis* and grass snake *Natrix natrix* have been recorded along the entire length of the DCO Scheme with survey findings suggesting that there is a small to medium population present along the disused line.	District	Medium - Potential for a medium to large population to be present.	Grass snake populations are thought to be in decline.	Medium	Neutral -Potential for killing, injury, habitat fragmentation and loss of habitat/disturbance. Impacts will be mitigated by displacement or trapping and relocation of reptiles and maintaining the mosaic of habitats suitable for reptiles along the railway corridor.	Neutral
European eel *Anguilla anguilla*	The Environment Agency has reported that there are records of European eel in the ditches and streams of the North Somerset coastal plains. There are a number of watercourses and drains passing beneath the DCO Scheme, however in most cases the watercourses are considered to be ephemeral features and unlikely to be of value to eels.	Immediate zone of influence	Low	Declining and now listed as Critically Endangered on the IUCN Red List.	Low	Neutral - no significant direct or indirect effects considered likely due to lack of valuable habitat.	Neutral
Otter *Lutra lutra*	Otter are present within Portbury Wharf Nature Reserve. The area to the east of the M5 near Pill is considered good otter habitat with a mammal pathway and possible resting place identified here.	District	Medium	Suffered historical decline, however recent studies suggest that it may be recovering and recolonising parts of its former range.	Medium	Minor negative - Potential for an increase in collision casualties and disturbance during construction. Construction mitigation will be employed such as minimise night time working, avoid construction lighting affecting otter habitat. Potential operation disturbance to otters will be restricted with services ceasing at midnight and the use of LED lighting and low level bollard lighting at Trinity footbridge and Pill Station.	Slight adverse
Water Vole *Arvicola amphibius*	A population of water vole was recorded in 2007 in Drove Rhyne approximately 0.75 km to the north of the disused section of the Portishead Branch Line scheme. The species has also been reintroduced to Portbury Wharf NR, which extends immediately north of the disused line.	Immediate zone of influence	Low	Declining in numbers and range	Low	Neutral - due to geographical separation from historical population. Portbury Wharf NR also has only a short section of around 10 m adjacent to the DCO Scheme with the majority of the site and suitable water vole habitat extended north of the scheme from this point.	Neutral
Japanese Knotweed *Fallopia japonica*	Identified within a section of railway east of Quays Avenue in Portishead	Local (no ecological value but invasive species)	Negligible	Unknown	Negligible	Minor negative - The habitat management regime for the railway corridor may lead to the spread of invasive plant species	Slight adverse
Habitats							

TAG Biodiversity Impacts Worksheet

Portishead to Pill

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Woodland, trees and scrub	Mature ash *Fraxinus excelsior* trees and silver birch *Betula pendula* are present along the disused railway corridor with small willow *Salix sp* . and alder *Alnus glutinosa* woodland with a bramble *Rubus fruticosa* agg. and hawthorn *Crataegus monogyna* understorey. Important foraging and commuting route for bats and also provides habitat connectivity with the wider landscape for a variety of species groups.	Regional	Medium - mature trees and scrub habitats provide a linear corridor for a number of species including bats, other mammal and bird species, invertebrates, amphibians and reptiles.	Around 12% of the UK is covered with trees/woodland, UK targets include expansion of woodland cover and increase areas in favourable condition.	Medium	Minor negative - Clearance in accordance with Network Rail standards (3-5m from the running rail), to maintain operational site widths and the application of herbicides to maintain this vegetation free corridor. Vegetation outside of the operational width will be retained and areas replanted where possible.	Slight adverse
Grassland	Two areas of semi-improved grassland, one to the west of Quays Avenue in Portishead (colt's-foot *Tussilago farfara* and sedge *Carex* sp. present with bramble and butterfly bush encroaching) and one at the far western end of this section near Pill (species include cock's-foot *Dactylis glomerata* , common bent *Agrostis capillaris* , teasel *Dipsacus fullonum* , vetch *Lathyrus* sp., white clover *Trifolium repens* and creeping cinquefoil *Potentilla reptans*) where patches of bare ground are present and bramble is starting to develop within the sward.	Immediate zone of influence	Low	Unknown	Low	Neutral - Loss of the small areas of grassland will not be significant	Neutral
Tall ruderals	Common nettle Urtica dioica is the dominant species, along with broad-leaved dock Rumex obtusifolius, rosebay willowherb Chamerion angustifolium and cleavers Galium aparine in areas surrounded by bramble.	Immediate zone of influence	Low	Unknown	Low	Neutral - Loss of the small areas of common species will not be significant	Neutral
Reedbeds and Wetlands	Stands of common reed *Phragmites australis* within the railway corridor were dry, except reed growing immediately east of Portbury Dock Road, which was associated with a wet ditch. Reed stands were species-poor and generally small in extent.	Immediate zone of influence	Low	Unknown	Low	Neutral - Loss of the small areas will not be significant, with the majority of the reed beds remaining intact.	Neutral
Watercourses and Ponds	A number of watercourses and drains are present passing beneath the DCO Scheme and draining parallel to the site. In most cases the watercourses were wet at the time of the survey and are considered to be ephemeral features. Ponds or standing water in ditches within the DCO Scheme are all shallow and shaded features of small extent and often covered with duckweed *Lemna minor* . There are a number of ponds outside the disused railway line boundary. They provide a link between other wetlands to the north and south.	Local	Medium	Trends in this habitat type are not known but they are under threat from floodplain development and modifications to river flows.	Medium	Neutral - no direct impacts on ponds. New culverts will be installed in some locations which will have minor impacts on the ditches. Temporary indirect impacts form construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
Portbury Freight Line							
Sites							
Avon Gorge Woodlands SAC/SSSI	*Tilio-Acerion* forests of slopes, screes and ravines. Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia.* The DCO Scheme passes through the site along the eastern border and footslopes of the Avon Gorge. The SSSI designation recognises that the habitats support an exceptional number of nationally rare and scarce plant species.	International	Very High - Supports Annex 1 habitats and plant species endemic to the Avon Gorge.	Around 12% of the UK is covered with trees/woodland, UK targets include expansion of woodland cover and increase areas in favourable condition.	Very High	Minor negative - The DCO Scheme runs the entire length of the designated site. It is anticipated that the grasslands within the site will be affected by operational management of the scheme (i.e. stone picking and vegetation removal) to maintain the railway corridor. Current design indicates that 9 rare whitebeam trees will be lost by the scheme. However, a Site Vegetation Management Statement will be drafted in consultation with Natural England for the management of vegetation for the passenger rail service within the Avon Gorge Woodlands SAC/SSSI, which will aim to mitigate any potential impacts on the site.	Slight adverse
Severn Estuary SAC	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	Neutral - No change in run-off.	Neutral

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Severn Estuary SPA	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	Neutral - Indirect impacts are considered to be neutral due to the small number of designated species within the survey area close to the scheme and those designated species were restricted to the intertidal area, which due to the topography is screened from the DCO Scheme. Also, the survey area is currently subject to a range of noise and visual disturbance, including the freight rail traffic, M5 traffic and dog walkers. Operational disturbance to Pill Marshes is not expected to change following increased rail movements from the scheme and the adjacent intertidal section of the River Severn are currently subject to a range of noise and visual disturbance, including the freight rail traffic, M5 traffic and dog walkers.	Neutral
Severn Estuary Ramsar	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Portishead to Pill	See Severn Estuary SPA above	See Severn Estuary SPA above
Bath and Bradford on Avon bats SAC	Lesser horseshoe, greater horseshoe and Bechstein's bats. Approximately 21.5 km to the DCO Scheme at closest point.	International	Very High - Supports hibernation sites for 15% of UK greater horseshoe population. Also supports small numbers of hibernating Bechstein's bats. Lesser horseshoe bats present as a qualifying feature.	Lesser & greater horseshoe bat populations in the UK are considered to have increased overall since 1999. The population size and trend of Bechstein's bats in the UK is unknown, the approximate population is 1500 and is found mainly in southern England (Dorset, Wiltshire and Hampshire).	Very High	Minor negative -No indirect impacts on bats but assessment (including surveys of tunnels) are still on-going.	Slight adverse
Leigh Woods NNR	Mix of ancient woodland, archaeology and flower rich limestone grassland. Located within the Avon Gorge SSSI. The DCO Scheme passes through the NNR.	National	High - Ancient woodland located within the SSSI. Designated as a National Nature Reserve.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	See Avon Gorge SAC/SSSI	Slight adverse
Leigh Woods/Oak Wood Ancient Woodland	Oak wood ancient woodland located adjacent to the DCO Scheme.	National	High	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	See Avon Gorge SAC/SSSI	Slight adverse
Rownham Wood Ancient Woodland	Ancient woodland located adjacent to the DCO Scheme.	National	High	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	Neutral - ancient woodland will not be directly affected. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidance.	Neutral
Ashton Court SSSI	Diverse and nationally scarce saproxylic invertebrate fauna and ancient trees. Located approximately 70 m from the DCO Scheme at closest point.	National	High - Nationally scarce species & designated a SSSI.		High	Neutral - no direct or indirect effects predicted. No run off issues anticipated as the site is located upslope from the DCO Scheme.	Neutral

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Step 2		Step 3				Step 4	Step 5
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Clifton Down Wood Ancient Woodland	Ancient and semi-natural woodland. Located approximately 150 m from the DCO Scheme at closest point.	National	High	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	Neutral - No direct or indirect effects considered likely due to geographical separation to the DCO Scheme; the woodland is separated from the DCO Scheme by the River Avon and the A4.	Neutral
Leigh Wood / Markham Bottom Ancient Woodland	Ancient woodland located approximately 100 m from the DCO Scheme at closest point.	National	High	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	High	Neutral - No direct or indirect effects considered likely. Run off issues considered unlikely as the site is located upslope of the DCO Scheme.	Neutral
Horseshoe Bend, Shirehampton SSSI	Saltmarsh and wooded river cliff. Located approximately 650 m from the DCO Scheme at closest point.	National	High - Saltmarsh and designated as a SSSI.	58% of saltmarsh features in the UK are reported to be in favourable condition. Coastal squeeze is a major cause of unfavourable condition in this habitat type.	High	Neutral - No direct or indirect effects considered likely due to geographic separation from the site; the site lies on the other side of the River Avon.	Neutral
Bower Ashton Playing Fields BWNS	Amenity grassland. Located adjacent to the DCO Scheme railway at closest point and part of the site re-developed as a permanent maintenance compound and access point to the railway.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Minor negative - Direct loss of land, impacts will be mitigated by appropriate planting and lighting design	Slight adverse
River Avon (part of) NSWS	Saltmarsh & saltmarsh influenced grassland. Located adjacent to the DCO Scheme at closest point.	District	Medium - Saltmarsh habitats and designated as a Wildlife Site.	58% of saltmarsh features in the UK are reported to be in favourable condition. Coastal squeeze is a major cause of unfavourable condition in this habitat type.	Medium	Minor negative - Indirect construction associated disturbance from noise, lighting vibration and human disturbance. The sites location adjacent to a regularly used River Avon tow path means it is already subject to a high level of disturbance and will therefore be tolerant to such impacts. As such this is considered to be slight adverse effect.	Slight adverse
River Avon (part of) SNCI	Saltmarsh habitats. Located adjacent to the DCO Scheme at closest point.	District	Medium - Saltmarsh habitat and designated as a SNCI.	58% of saltmarsh features in the UK are reported to be in favourable condition. Coastal squeeze is a major cause of unfavourable condition in this habitat type.	Medium	See River Avon (part of) NSWS	Slight adverse
Avon Gorge and Leigh Woods NSWS	Extremely diverse area including endemic species. Located adjacent to the DCO Scheme at closest point.	District	Medium - Supports endemic species and designated as a Wildlife Site.		Medium	See Avon Gorge SAC/SSSI	Slight adverse
Bower Ashton Allotments BWNS	Allotments. Located adjacent to the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - vegetation clearance will be required to facilitate the construction of the DCO Scheme. No impacts during the operation of the scheme.	Neutral
Land between railway line and the River Avon BWNS	Allotments and amenity grassland with trees. Located adjacent to the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral. No anticipated direct impact. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
White City Allotments BWNS	Allotments. Located adjacent to the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - No anticipated direct impact. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
Alderman Moore Allotments BWNS	Allotments & scrub. Located adjacent to the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - No anticipated direct impact. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral

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Bower Ashton Line BWNS	Linear scrub and hedgerow habitat. Located adjacent to the scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - No anticipated direct impact on the scrub and hedgerow habitat. All works will be within the existing freight line fence line. Temporary indirect impacts form construction, noise, dust and vibration mitigated by adherence to best practice guidelines.	Neutral
Railway line near Bedminster Down BWNS	Linear scrub and hedgerow habitat. Located adjacent to the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - No anticipated direct impact. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
Bower Ashton Mineral Railway (disused) SNCI	Scrub, ruderal communities and calcareous grassland. Located approximately 1 m from the DCO Scheme at closest point.	District	Medium - designated as an SNCI	Unknown	Medium	Neutral - No anticipated direct impact. Temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
Ashton Court Estate SNCI	Semi-improved grassland, broadleaved woodland, many ancient trees and ponds. Ancient trees are relicts of a former pasture-woodland land use system. Osier and Kitchen Garden include 20 species of grasses, sedges and rushes. Located approximately 20m from the DCO Scheme at closest point.	District	Medium - Supports broadleaf woodland with ancient trees and designated an SNCI	Unknown	Medium	Neutral. No direct impacts and temporary indirect impacts from construction, noise, dust and vibration mitigated by adherence to best practice guidelines	Neutral
Parson Street station BWNS	Linear scrub and hedgerow habitat. Located approximately 16 m from the DCO scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Bedminster Down Allotments BWNS	Allotments. Located approximately 29 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Lamplighter's Marsh SNCI	North of the railway line is an area of demolished pre-fabricated housing and a sports ground. South of the line there are areas of saltmarsh-influenced grassland, as well as ruderal communities, grassland, scrub & secondary woodland. Located approximately 52 m from the DCO Scheme at closest point.	District	Medium - designated as an SNCI	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Ashton Court Estate NSWS	Includes areas of priority habitat Lowland Calcareous Grassland. Unimproved and semi-improved calcareous and neutral grassland, with semi-natural broad-leaved woodland, mixed and broad-leaved woodland plantation. Located approximately 61 m from the DCO Scheme at closest point.	District	Medium - Supports priority habitats and designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Ilchester Crescent Open Space BWNS	Amenity parkland with trees. Located approximately 65 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Avon Gorge SNCI	Unimproved calcareous grassland, ancient and semi-natural broadleaved woodland including priority habitats Upland Mixed Ashwood, Lowland Mixed Deciduous Woodland and Lowland Calcareous Grassland, Natural cliffs and quarry, with scree, bracken and strandline saltmarsh. Located approximately 82 m from the DCO Scheme at closest point.	District	Medium - Supports priority habitats and designated as a SNCI.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Land between Hotwell Road and Sion Hill BWNS	Deciduous woodland. Located approximately 95 m from the DCO Scheme at closest point.	District	Medium - Supports deciduous woodland and designated a Wildlife Site.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition.	Medium	Neutral - no direct impacts considered likely.	Neutral
Cumberland Basin Lock BWNS	Canal lock. Located approximately 124 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Kennel Lodge Road Allotments BWNS	Allotments. Located approximately 141 m from the DCO Scheme at the closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Land between Sneyd Park and the Portway BWNS	Semi-improved grassland. Located approximately 148 m from the DCO Scheme.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Signal Station Allotments and Harbour Wall BWNS	Allotments with trees. Located approximately 160 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral

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Sneyd Park SNCI	Grazed unimproved and semi-improved species rich grassland. Located approximately 170 m from the DCO Scheme at closest point.	District	Medium - Supports species rich grassland and designated as a SNCI	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Colliter's Brook SNCI	Semi-improved calcareous grassland including priority habitat Lowland Calcareous Grassland, damp fields by Colliter's Brook, hedgerows and scrubby woodland. Part of the site is a restored landfill with neutral grassland, planted native shrub and tree species. Located approximately 190 m from the DCO Scheme.	District	Medium - Supports priority habitats and designated as a SNCI.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Land between Windsor Place and The Paragon BWNS	Deciduous woodland. Located approximately 191 m at its closest point from the DCO Scheme on the east side of the River Avon.	District	Medium - Supports deciduous woodland and designated as a Wildlife Site.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition.	Medium	Neutral - no direct impacts considered likely.	Neutral
Clifton and Durdham Downs SNCI	Unimproved and semi-improved calcareous grassland including small areas of priority habitat Lowland Calcareous Grassland, plus area of slightly acidic grassland SW Durdham Down, semi-natural broadleaved woodland, scattered trees and patches of dense scrub. Located approximately 203 m from the proposed scheme at closest point on the east side of the River Avon.	District	Medium - Supports priority habitats and designated as a SNCI.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Cumberland Basin BWNS	Canal with trees along the edges. Located approximately 221 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Butterfly Junction BWNS	Trees and scrub. Located approximately 269 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
River Trym confluence with River Avon BWNS	Tidal mudflats and saltmarsh. Located approximately 272 m from the DCO Scheme at closest point.	District	Medium - Tidal mudflats and sandflats and designated a Wildlife Site.	58% of saltmarsh features in the UK are reported to be in favourable condition. Coastal squeeze is a major cause of unfavourable condition in this habitat type.	Medium	Neutral - no direct impacts considered likely.	Neutral
Manor Farm Sports Ground and Playing Fields BWNS	Amenity grassland bordered by saltmarsh. Located approximately 299 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Malago Valley SNCI	Priority habitat Lowland Calcareous Grassland, semi-improved neutral grassland, semi-natural broadleaved woodland possibly priority habitat Lowland Mixed Deciduous Woodland (Criteria 3). Filled clay pit and earth cliffs. Hedgerows, scrub, stream and pond. Located approximately 295 m from the DCO Scheme at the closest point.	District	Medium - Supports priority habitats and designated as a SNCI.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Cornwallis Gardens BWNS	Deciduous woodlands. Located approximately 332 m from the DCO Scheme.	District	Medium - Deciduous woodland and designated as a Wildlife Site.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition.	Medium	Neutral - no direct impacts considered likely.	Neutral
Enterprise Allotments BWNS	Allotments located approximately 336 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site.	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Ashton Park School Playing fields BWNS	Amenity grassland bordered by trees. Located approximately 344 m from the DCO Scheme at the closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Land north of Ashton Vale fields BWNS	Semi-improved grassland. Located approximately 351 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
Lamplighter's Open Space Bristol Wildlife Network Site BWNS	Amenity parkland with trees. Located approximately 365 m from the scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral
City and Port of Bristol Sports Ground BWNS	Amenity grassland with trees boarded by saltmarsh. Located approximately 389 m from the DCO Scheme at closest point.	District	Medium - designated as a Wildlife Site	Unknown	Medium	Neutral - no direct impacts considered likely.	Neutral

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Trym Valley SNCI	River, semi-natural broadleaved woodland with ancient woodland indicator species, saltmarsh and amenity grassland. Located approximately 414 m from the DCO Scheme at closest point on the east side of the River Avon.	District	Medium - due to habitats present and designation as a Wildlife Site.	Around 12% of the UK is covered with trees/woodland, with 1.2% being ancient semi-natural. UK targets include expansion of woodland cover and increase areas in favourable condition. Ancient semi-natural woodland is a conservation priority.	Medium	Neutral - no direct impacts considered likely.	Neutral
Species							
Amphibians	One pond considered suitable for great crested newt was identified within the survey area but was visited in late spring 2016 and was found to be dry. The pond will be revaluated in the active great crested newt season of 2018 and an eDNA assessment will be undertaken if water levels allow. Common and palmate newts and toads are likely to be present across the scheme footprint.	Local	Low	Great crested newt populations widespread but patchy due to population declines in response to changes in framing practices and loss of habitat. Palmate newt populations both thought to be declining. Common toad thought to be suffering rapid declines.	Low	Neutral. Minor loss of habitat but Network Rail management of track and vegetation allows for a mosaic of habitats suitable for amphibians to be present along the railway corridor.	Neutral
Badgers	Two badger setts have been identified within the vicinity of the DCO Scheme comprising one active annex/subsidiary sett and one active outlier.	Local	Medium - Badger is not a rare species, however at least one social group likely to be active within the area and they play an important ecosystem role as predator and scavenger.	British population thought to be stable. Although not rare in the UK, badgers receive a high level of legal protection due to concerns over their welfare and threats from persecution.	Medium	Minor negative - There is potential for an increase in collision casualties.	Slight adverse
Bats	Common pipistrelle bats may roost in the Clifton Tunnel No. 1 during the summer. Numbers are either low or solitary bats.	Immediate zone of influence	Medium - roost sites are not large and species are common and widespread.	The population of common pipistrelle in the UK are considered to have increased since 1999.	Medium	Minor negative- The scheme may cause displacement of bats from roosts within the tunnel, however it is not considered to have an adverse effect on the favourable conservation status of the species due to the abundance of alternative roosting sites. Intermittent disturbance due to increased number of trains on the railway will have an impact on social activity however, given they are not swarming sites this is considered to be minor negative.	Slight adverse
	Low numbers of lesser horseshoe bats and M*yotis* sp. Bats use the Clifton Tunnel No. 2 as a roost. Social activity also recorded in vicinity of tunnel in Autumn from lesser and greater horseshoe bats and Myotis sp, however the activity recorded is much lower than that expected at a swarming site. Male brown long-eared *Plecotus auritus* also caught near tunnel portal in September and may have been gathering for mating.	Local	High - Several species recorded including Annex 1 species with variety of behaviour	Stable/declining	High	Minor negative- The scheme may cause displacement of bats from roosts within the tunnel, however it is not considered to have an adverse effect on the favourable conservation status of the species due to the abundance of alternative roosting sites. Intermittent disturbance due to increased number of trains on the railway will have an impact on social activity however, given they are not swarming sites this is considered to be minor negative.	Slight adverse
	Low number of bats are using Sandstone Tunnel for roosting, possibly all year round. Bat droppings confirmed use by serotine *Eptesicus serotinus* and a small bat species (DNA yet to confirm). Surveys in Autumn also confirm that this location is important for bat social activity. Level of activity significantly lower than that expected at swarming site, activity loggers suggest that greater horseshoes, Myotis sp and long-eared bats socialise at the tunnel. Trapping surveys caught male serotine bats, brown long-eared bats and Natterers *Myotis nattereri* which may have been gathering for mating.	Local	High - Several species recorded including Annex 1 species. Also possibility of being used throughout year.	Stable/declining	High	Minor negative - The DCO Scheme may cause displacement of bats from roosts within the tunnel, however it is not considered to have an adverse effect on the favourable conservation status of the species due to the abundance of alternative roosting sites. Intermittent disturbance due to increased number of trains on the railway will have an impact on social activity however, given they are not swarming sites this is considered to be minor negative.	Slight adverse

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	Pill Tunnel has roosting potential in brick crevices although no evidence was recorded. Evidence of social activity occurring here in the Autumn by greater horseshoes and Myotis sp, although activity lower than that recorded at other tunnels.	Immediate zone of influence	Medium - No evidence of roosting however Annex 1 species social activity.	Stable/declining	Medium	Minor negative - Intermittent disturbance due to increased number of trains on the railway will have an impact on social activity however, given they are not swarming sites this is considered to be minor negative.	Slight adverse
Birds (see also Severn Estuary SPA)	Peregrine falcon *Falco peregrinus* roosting and nesting habitat is present within close proximity to the DCO Scheme. Breeding did not appear to be successful here in 2017 but may occur in future years.	Local/County	Medium - Although breeding was not successful in 2017 peregrines often hold territories all year or are faithful to their breeding territories and therefore may be present in future years.	Numbers declined significantly during the 19th and 20th century due to human persecution. After the banning of pesticides numbers recovered by the late 1990s over much of their former range.	Medium	Neutral - The increase in frequency of trains is not anticipated to have a significant impact on the nesting attempt of peregrines in the vicinity of the DCO Scheme.	Neutral
	The area provides numerous opportunities for nesting and foraging passerine species.	Local	Low	Unknown	Low	Neutral - It is anticipated that suitable nesting and foraging habitat will naturally re-establish during the operational phase.	Neutral
Hazel Dormouse	The wider woodland around the DCO Scheme is considered to be of national importance for dormice. No dormice were recorded in the suitable habitat immediately adjacent to the DCO Scheme, however due to its location and connectivity with known populations and good quality habitat it should be assumed that dormice are present within the wider woodland.	Local	Medium - Although no dormice were present in suitable habitat immediately adjacent to the DCO Scheme the wider woodland is considered of national importance.	UK population is unknown but there has been a long term decline in both number and range. Decline appears to be slowing recently and as part of reintroduction programs the current range is slowly extending.	Medium	Neutral - No direct impact and woodland suitable for dormouse adjacent to the construction site by Pill Tunnel Eastern Portal and through Leigh Woods / Avon Woodlands will be fenced off to prevent accidental impacts.	Neutral
Reptiles	High numbers of slow worm and occasional grass snakes recorded during surveys, with records of common lizard also recorded in habitat adjacent to the freight line.	District	Medium	Grass snake populations are thought to be in decline.	Medium	Neutral - Risk of killing or injury and habitat fragmentation and loss of habitat/disturbance. Reptiles will be displaced prior to construction works in high risk areas and Network Rail vegetation management allows for a mosaic of habitats suitable for reptiles to be present along the railway corridor in the long term.	Neutral
Invertebrates	Numerous invertebrate records have been provided for the search area (BRERC, 2014), including records for notable beetles, dragonfly and other odonata, grasshoppers and crickets, butterflies and moths, many of which are listed on Schedule 5 of the WCA 1981, UK and Avon BAP and under Section 41 of the NERC Act 2006. Four notable species of butterflies have been recorded in Leigh Woods and Avon Gorge; white letter hairstreak *Satyrium w-albu* , chalk-hill blue *Lysandra corido* n, pearl-bordered fritillary *Boloria euphrosyne* and marsh fritillary *Euphydryas aurinia*	County	Medium	Both marsh and pearl-bordered fritillary and white letter hairstreak butterflies have suffered recent population declines. The chalk-hill blue appears to be stable but with a reduction in range.	Medium	Neutral - There will be some losses of woodland and grassland habitat used by invertebrates due to vegetation clearance for construction the DCO Scheme. However, extensive areas of suitable habitat will remain.	Neutral
Otter	Otter presence at Ham Lake was confirmed during surveys by the identification of spraint and is considered optimal habitat. The habitat adjacent to the freight line alongside the River Avon is also considered suitable otter habitat.	District	Medium - Although no holts were identified, otters were found to be present within optimal habitat.	Suffered historical decline, however recent studies suggest that it may be recovering and recolonising parts of its former range.	Medium	Minor negative - Potential for an increase in collision casualties. Potential operation disturbance to otters will be restricted with services ceasing at midnight and limited additional lighting and noise compared to existing disturbance from freight trains, road noise and use of the River Avon tow path between the freight line and River Avon.	Slight adverse

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Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Notable & Important Plant Species	The Avon Gorge is one of the top five richest botanical sites in Britain. 23 notable plant species have been identified in the Gorge; it is the most diverse site for whitebeams (*Sorbus* sp.) in the world.	National	High	Many classified as Critically endangered by the IUCN, nationally rare or nationally scarce. Species such as Avon whitebeam *Sorbus avonensis* are endemic to the Avon Gorge.	High	Minor negative - Notable and important plant species within NR land in the Avon Gorge SAC have been identified and will be avoided or translocated if necessary for the construction of the scheme. A Site Vegetation Management Statement will be drafted in consultation with Natural England for the management of vegetation for the passenger rail service within the Avon Gorge Woodlands SAC/SSSI, which will aim to mitigate any potential impacts on the site.	Slight adverse
Invasive Plant Species	21 non-native and potentially invasive plant species were recorded within the survey area, including 6 listed on Schedule 9 of the WCA.	Local (no ecological value but invasive species)	Low	Unknown	Low	Minor negative - The habitat management regime for the railway corridor may lead to the spread of invasive plant species.	Slight adverse
Habitats							
Ephemeral/short perennial	Sections of railway ballast along the track are distinctly species-rich and include species such as bristly ox-tongue *Helminthotheca echioides* , clover *Trifolium repens* , purslane *Claytonia sibirica* , germander speedwell *Veronica chamaedrys* , herb Robert *Geranium robertianum* , barren strawberry *Potentilla sterilis* and wood sedge *Carex sylvatica*	Zone of Influence	Low	Unknown	Low	Minor negative - to maintain operational site widths vegetation clearance alongside the application of herbicides to maintain a vegetation free corridor has the potential to negatively affect the environmental resource.	Slight adverse
Ruderals	There are some dense patches of common nettle Urtica dioica, along with broad-leaved dock Rumex obtusifolius, rosebay willowherb and cleavers in areas surrounded by bramble.	Zone of Influence	Low - due to habitat it provides for dormice, reptiles and amphibians	Unknown	Low	Neutral - Loss of the small areas of common species will not be significant	Neutral
Watercourses and Ponds	The River Avon runs parallel to the railway for much of its length. A number of ditches and streams run parallel and underneath the site. Two ponds lie approximately 50 m from the DCO Scheme near Ham Green with a further pond located within Leigh Woods.	District	Medium	Trends in this habitat type are not known but they are under threat from floodplain development and modifications to river flows.	Medium	Neutral - no direct impacts considered likely.	Neutral

Reference Sources

CH2M (Portishead Branch Line Preliminary Environmental Information Report (Chapter 9; Ecology and Biodiversity)

Summary Assessment Score

Slight adverse, with the exception of North Somerset and Mendips Bats SAC, which requires further assessment following further survey

Qualitative Comments

The overall assessment score is Slight adverse but the assessment on the North Somerset to Mendips Bats SAC can not be assessed at the current time due to further survey work being required. The railway line is a navigational route for bats including lesser and greater horseshoe bats and is considered to be of regional importance and a greater horseshoe bat (male) has been trapped on the Portishead to Pill line and radio-tracked to the North Somerset and Mendips Bats SAC. Another trapping and radio-tracking survey is planned for May/June 2018.
The associated works along the operational railway line is predicted to have slight adverse impacts on the Avon Gorge SAC and SSSI due to the routine clearance of vegetation along the operational corridor, however these impacts will be mitigated within the internationally and nationally important sites with the development of a Site Vegetation Management Statement. The operational maintenance of the corridor is also predicted to have a slight adverse impact upon a small number of locally important sites. Effects on protected species are predicted to be no worse that slight adverse through the increased risk of collision and disturbance.

Historic Environment

TAG Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	**Description**	**Scale it matters**	**Significance**	**Rarity**	**Impact**
Form	**Archaeological Remains:** Comprising three Scheduled Monuments, within 500m of the scheme and another just outside the 500m area (Conygar Iron Age Hill fort), historic railway infrastructure and potential previously unknown archaeological remains in compound locations **Built Heritage: comprises** Eight conservation areas, two registered parks and gardens and numerous listed buildings grade I, II* and II. **Historic Landscapes:** The Portbury Freight Line passes through or abuts 11 historic character areas, these do not have a heritage value and are used to establish 'time depth' of various areas when combined with other heritage and archaeology assets	**Archaeological Remains:** Scheduled Monuments- **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level** **Built Heritage**: National to Local depending upon the grade **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance ,non designated archaeological remains and potential remains would be of a local possibly regional significance **Built Heritage**: National to Local depending upon the grade **Historic Landscapes**: Local	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled monuments are all Iron Age Hill forts and as such are not considered uniquely rare **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown.** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic strcutures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect** **Historic Landscapes**: **neutral effect**
Survival	**Archaeological remains:** The archaeological survival of any previously unknown features is unknown **Built heritage:** The Scheduled Monuments represent upstanding structures that have survived various historic episodes, The listed buildings and conservation areas will have a good level of survival, though represent many different forms and phases of development. **Historic Landscapes:** Modern characterisation	**Archaeological Remains:** Scheduled Monuments - **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level** **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance ,non designated archaeological remains and potential remains would be of a local possibly regional significance. **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes**: Local	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled monuments are all Iron Age Hill forts and as such are not considered uniquely rare **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown.** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic strcutures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect.** **Historic Landscapes**: **neutral effect**
Condition	**Archaeological remains:** The archaeological survival of any previously unknown features is unknown. **Built heritage:** The Scheduled Monuments represent upstanding structures that have survived various historic episodes. The listed buildings and conservation areas will have a good level of survival, though represent many different forms and phases of development. **Historic Landscapes:** Modern Characterisation	**Archaeological Remains:** Scheduled Monuments - **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level** **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance ,non designated archaeological remains and potential remains would be of a local possibly regional significance. **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes**: Local	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled monuments are all Iron Age Hill forts and as such are not considered uniquely rare **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown.** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic structures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect.** **Historic Landscapes**: **neutral effect**
Complexity	**Archaeological remains:**The archaeological complexity of any previously unknown features is unknown. **Built heritage:** The Scheduled Monuments represent upstanding structures that have varying degrees of complexity. The listed buildings and conservation areas will have a range of complexity, particularly conservation areas, though represent many different forms and phases of development. **Historic Landscapes:** Range of potential complexities	**Archaeological Remains:** Scheduled Monuments - **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level** **Built Heritage**: National to Local depending upon the grade **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance, non designated archaeological remains and potential remains would be of a local possibly regional significance. **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes**: Local	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled monuments are all Iron Age Hill forts and as such are not considered uniquely rare **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown.** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic structures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect** **Historic Landscapes**: **neutral effect**
Context	**Archaeological remains:** The context of any features will be different from their historical context. **Built heritage:** The Scheduled Monuments and listed buildings will have seen their context change radically from their origianl construction and setting will represent a key hisotircal character period and context **Historic Landscapes:** These represent a time depth characerisation so the context now will be different to the defining context historically.	**Archaeological Remains:** Scheduled Monuments - **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level.** **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance ,non designated archaeological remains and potential remains would be of a local possibly regional significance. **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes**: Local.	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled Monuments are all Iron Age Hill forts and as such are not considered uniquely rare. **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown.** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic structures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect.** **Historic Landscapes**: **neutral effect**
Period	**Archaeological remains:** The archaeological periods represented is varied. The Scheduled Monuments are of Iron Age date. **Built heritage:** The listed buildings and conservation areas will generally have a good level of survival, though represent many different forms and phases of development. **Historic Landscapes:** These represent a range of periods.	**Archaeological Remains:** Scheduled Monuments - **National,** non designated archaeologial remains and potential remains would matter at a **local** possibly **regional level** **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes:** Local	**Archaeological Remains**: Scheduled Monuments - National significance, non designated archaeological remains and potential remains would be of a local possibly regional significance. **Built Heritage**: National to Local depending upon the grade. **Historic Landscapes**: Local	**Archaeological Remains**: Relatively **low** level of rarity. The Scheduled Monuments are all Iron Age Hill forts and as such are not considered uniquely rare **Built Heritage**: Listed Buildings are of varying form and determining levels of rarity is difficult, therefore the level of rarity is considered to be **Unknown** **Historic Landscapes**: n/a	**Archaeological Remains**: Removal of existing historic railway infrastructure and historic structures at Pill Station would be considered to have a **slight adverse to neutral effect** providing mitigation measures are implemented (re use of heritage assets by local groups and historic building recording). **Built Heritage**: Setting impacts are considered to result in **neutral effect.** **Historic Landscapes**: **neutral effect**

Reference Sources

Preliminary Environmental Information Report chapter

Step 5 - Summary Assessment Score

Slight Adverse to Neutral Effect

Qualitative Comments

The DCO Scheme is assessed to have a direct slight adverse effect on non-designated cultural heritage assets during the enabling works and construction through the removal of known and hitherto unknown archaeological remains along the railway corridor. The adverse effects arising from these direct impacts on this resource can be adequately mitigated through preservation by record and the significance effect of the residual impact is assessed to be neutral and not significant in regards to the EIA Regulations. The effect of the DCO Scheme on the setting of the designated cultural heritage assets along the route during construction and operation is generally neutral and not significant in regards to the EIA Regulations. This results largely from the lack of inter-visibility between the DCO Scheme and heritage assets.

Landscape

TAG Landscape Impacts Worksheet

	Step 2	Step 3				Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	Varied landscape with a pattern of woodland, scrub, grassland and large fields with a mixture of hedges and fences, the settlements of Portishead and Pill and an industrial and maritime area around Portbury Docks. The M5, M49 and A369 bisect the landscape introducing movement and severance. Further south there are areas of woodland, pastoral farmland and parkland. There are open views across the landscape, which is enclosed by ridges in the north and is mostly low and flat further south.	Locally important. Some features of the landscape are important in terms of heritage, geology and nature conservation.	Some features of the landscape such as geology and sites of conservation interest are regionally rare.	Locally important. Some features of the landscape are important in terms of heritage, geology and nature conservation.	Some features of the landscape such as geology and sites of conservation interest are regionally rare and could not be substituted.	As the linear feature of the disused railway line is already a constituent of this area, the physical works of the DCO Scheme would not result in a significant change in the pattern of the landscape once construction is complete. The removal of larger trees alongside the disused line may open up views from the M5 and Junction 19 northwards to the factories at Portbury Docks; however the replacement mitigation planting associated with the DCO Scheme would re-establish hedgerows and tree belts and reinstate the screening effect. Current trends in the area include more urban development; this combined with the DCO Scheme could result in an increasingly urban landscape. **Neutral/Slight adverse effect.**
Tranquillity	The area is tranquil in parts but the busy major roads and associated in the industrial Port area, are dominant features. Forces for change are likely to include increasing ribbon development and infill, and new development around Portishead, which is likely to reduce tranquility further.	Locally important.	Locally important - sense of tranquility may decline further due to future developments and increases in traffic.	Locally important.	Tranquility cannot be replaced.	As the linear feature of the disused railway line is already a constituent of some of this area, the physical works of the DCO Scheme would not result in a significant change in character once construction is complete. The introduction of passenger trains would add a new element of movement into the landscape. Existing features in this area already dilute the sense of tranquillity, such as views towards the Royal Portbury Dock, the M5 and the edge of Bristol. The removal of larger trees alongside the disused line may open up views from the M5 and Junction 19 northwards to the factories at Portbury Docks; however the replacement mitigation planting associated with the DCO Scheme would re-establish hedgerows and tree belts and reinstate the screening effect. Current trends in the area include more urban development; this combined with the DCO Scheme could result in an increasingly urban landscape which would be less tranquil. **Neutral/Slight adverse effect.**
Cultural	The area has historic features including listed buildings, remnants of industrial heritage, the registered park and garden of Leigh Court and potential presence of archaeological remains. Future trends may involve development which could damage any archaeological remains and dilute the historic character of the area through expansion of urban/industrial areas.	Historic features are locally important.	Historic features such as ancient woodland and parkland are regionally rare.	Historic features are locally important.	Historic features such as ancient woodland and parkland are regionally rare and could not be substituted.	As the linear feature of the disused railway line is already a constituent of this area, the physical works of the DCO Scheme would not result in a significant change in character once construction is complete. The removal of larger trees alongside the disused line may open up views from the M5 and Junction 19 northwards to the factories at Portbury Docks; however the replacement mitigation planting associated with the DCO Scheme would re-establish hedgerows and tree belts and reinstate the screening effect. Current trends in the area include more urban development; this combined with the DCO Scheme could result in an increasingly urban landscape. **Neutral/Slight adverse effect.**
Landcover	Varying land cover of rural, urban and industrial types. Main roads, Portbury Dock and Pill are dominant features. Woodland and parkland create a rural feel in southern parts of the area. Arable fields are enclosed by a mixture of poorly maintained hedges and fencing.	Locally important.	Some features of the landscape are regionally rare.	Locally important.	Some features of the landscape are regionally rare and could not be substituted.	As the linear feature of the disused railway line is already a constituent of this area, the physical works of the DCO Scheme would not result in a significant change in character once construction is complete. The removal of larger trees alongside the disused line may open up views from the M5 and Junction 19 northwards to the factories at Portbury Docks; however the replacement mitigation planting associated with the DCO Scheme would re-establish hedgerows and tree belts and reinstate the screening effect. Current trends in the area include more urban development; this combined with the DCO Scheme could result in an increasingly urban landscape. **Neutral/Slight adverse effect.**
Summary of character	Varied landscape with historic and rural character as well as large scale industrial areas and settlements. Important landscape features include woodland, parkland, industrial port and the village of Pill. Views are open and extensive east of Portishead and in the Sheepway area. Around the M5 Junction 19, Pill and Ham Green, views to and from the railway are more complex, with the railway line passing through tunnels and cuttings.	Locally important. Some features of the landscape are important in terms of heritage, geology and nature conservation.	Some features of the landscape are regionally rare.	Locally important. Some features of the landscape are important in terms of heritage, geology and nature conservation.	Some features of the landscape are regionally rare and could not be substituted. Others, such as industrial buildings at Portbury Dock, could be replaced if lost.	As the linear feature of the disused railway line is already a constituent of this area, the physical works of the DCO Scheme would not result in a significant change in character once construction is complete. The introduction of passenger trains would add a new element of movement into the landscape. In Portishead, the operational railway would increase the sense of urbanisation with the new station building and car park, and there will be an increased movement of trains in close proximity to people at Pill. However, existing features in this area already dilute the sense of tranquillity, such as views towards the Royal Portbury Dock, the M5 and the edge of Bristol. The removal of larger trees alongside the disused line may open up views from the M5 and Junction 19 northwards to the factories at Portbury Docks; however the replacement mitigation planting associated with the DCO Scheme would re-establish hedgerows and tree belts and reinstate the screening effect. Current trends in the area include more urban development; this combined with the DCO Scheme could result in an increasingly urban landscape. **Neutral/Slight adverse effect.**

Reference Sources

Land Use Consultants, 2005. North Somerset Landscape Character Assessment Supplementary Planning Document.

Step 5 - Summary Assessment Score

Neutral/Slight adverse effect due to opening up of views and through the introduction of movement in the form of the passing trains into the landscape, although screening will be reinstated by replacement mitigation planting.

Qualitative Comments

The area assessed here consists of the following North Somerset Local Authority Character Areas:
- A2 Clapton Moor
- C2 Portbury Settled Coastal Edge
- J6 Avon Rolling Valley Farmland

TAG Landscape Impacts Worksheet

	Step 2	Step 3				Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	The landscape of the Avon Gorge Character Area is characterised by the gorge and its exposed limestone faces and pattern of woodland, grassland and scrubland. The woodland clinging to the slopes creates an intimate, enclosed feel.	Regionally important.	The landscape character is regionally rare due to the presence of exposed limestone faces and ancient woodland, which could not be replaced if lost.	Important at a regional level.	Exposed limestone faces and ancient woodland could not be replaced, if lost.	The scheme would result in loss of vegetation adjacent to the track at the bottom of the Avon Gorge, primarily to install new fencing, in particular between the track and the River Avon Tow Path, and loss of some trees on the cliff. The pattern of the landscape would therefore be altered at a small but important scale. **Slight adverse effect.**
Tranquillity	This character area has a tranquil feel due to the presence of woodland, but this is countered by the sense of movement with the traffic on the busy Portway A4 road. Potential forces for change in the area are increasing signage, visual clutter and traffic noise, and development to urban fringe in adjacent landscape types. These future changes could reduce the tranquility of the area.	Regionally important.	Locally important - the sense of tranquility may decline in future due to development pressures and increasing traffic.	Important at a local level.	Not substitutable.	The introduction of passenger trains would add an increase in movement to the landscape and reduce the sense of remoteness and tranquility. The scheme would result in loss of vegetation adjacent to the track at the bottom of the Avon Gorge to install new fencing (although the fencing strategy is under review), in particular between the track and the River Avon Tow Path, and loss of some trees on the cliff as part of the management. This loss of screening may open up views of the railway line from the tow path, but there would be limited views from the upper areas as they would be mainly screened by the change in landform of the cliffs and by the woodland. However, the freight line is already a feature in the landscape and there is already existing noise from the A4 Portway road. Current trends and forces for change in the area include increased visual clutter and traffic noise. **Slight adverse effect.**
Cultural	Views from and to the Grade I listed Clifton Suspension Bridge are important and contribute to the historic character of the area. Any future development to the urban fringe nearby could impact on this historic character.	Views to Clifton Suspension Bridge are regionally important.	Regionally rare - Clifton Suspension Bridge is an unique historical feature of the landscape.	Important at a regional level.	Views to the Grade I listed Clifton Suspension Bridge cannot be substituted.	The historic and cultural landscape character of the area may be affected as the view of the Clifton Suspension Bridge may be altered by the loss of some trees on the cliff nearby. **Slight adverse effect.**
Landcover	Land cover is varied and consists of coppiced and ancient woodland, wood pasture, calcareous grassland, scrubland, and exposed limestone faces on the Avon Gorge itself. Limited maintenance of the woodland and recreational activities may cause degradation of these features without the scheme.	Nationally important.	Regionally rare - land cover is uncommon nationaly due to presence of exposed limestone faces, rare plant species and ancient woodland.	Important at a regional level due to presence of designated sites, ancient woodland and exposed limestone faces.	Overall not substitutable as the character area contains rare landcover types.	The scheme would result in loss of vegetation adjacent to the track at the bottom of the Avon Gorge to install new fencing, in particular between the track and the tow path, and loss of some trees on the cliff. The fencing strategy is under review. **Slight adverse effect.**
Summary of character	Overall, this is an area of varied habitats with an enclosed feel. There are views to the Clifton Suspension Bridge but views are otherwise restricted by wooded slopes and the Avon Gorge itself. The North Somerset District Council Character Assessment (2005) concludes that this character area is in good condition, with continued woodland management. However, the area is well used for recreation, resulting in erosion of paths, and the changing tide results in the build-up of rubbish to the banks of the Avon. In addition any future development to the urban fringe could impact on the rural character of this area.	Regionally important.	Regionally rare - the character area possesses designated sites and distinctive, special areas, such as Clifton Suspension Bridge, exposed limestone faces and ancient woodland.	Important at a regional level in terms of historic landscape character and landcover.	The important features of this character area would not be substitutable; these include views to Clifton Suspension Bridge, ancient woodland and exposed limestone faces.	The scheme would result in loss of vegetation adjacent to the track at the bottom of the Avon Gorge to install new fencing, in particular between the track and the River Avon Tow Path, and loss of some trees on the cliff. This would result in more open view to the track and the passing trains. **Slight adverse effect.**

Reference Sources

Land Use Consultants, 2005. North Somerset Landscape Character Assessment Supplementary Planning Document.

Step 5 - Summary Assessment Score

Slight adverse effect due to opening up of views and introduction of movement into the landscape.

Qualitative Comments

The area assessed here consists of North Somerset Local Authority Character Area D1 Avon Gorge.

TAG Landscape Impacts Worksheet

	Step 2	Step 3				Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	This landscape has a pattern of elevated ridges, a flat upland area, a narrow and a generally unsettled lowland area and a wide rolling valley. There are a number of working and disused limestone quarries, large areas of ancient broad-leaved woodland, pastoral farmland and mature parkland. Suburban settlements and ribbon development break up the rural pattern in some areas, whereas others have only occasional farmsteads. The area immediately south of the Avon Gorge is urban in character with elevated roads a dominant feature.	Locally important	Elements of the landscape pattern are rare, including the limestone quarries, ancient woodland and historic parkland.	Regionally important	Elements of the landscape pattern could not be replaced if lost, such as ancient woodland and historic parkland.	No effect is expected during operation as the freight line is already a feature within the landscape and minor modifications to Winterstoke Road and the railway alignment would fit within the existing transport infrastructure and built up area on the edge of the character area. **Neutral effect.**
Tranquillity	The area is tranquil in places such as the woodland and parkland areas, but areas around the commercial units are busier. The southern part of the area is influenced by the urban edge of Bristol and the busy A370, which reduces tranquility. Forces for change include increasing abundance of rural/urban fringe activities including recreation and quarrying, increasing ribbon development and traffic.	Locally important.	Locally important.	Locally important.	Tranquility in the woodland and parkland areas would be difficult to replace if lost.	No effect is expected during operation as the freight line is already a feature within the landscape and minor modifications to Winterstoke Road and to the railway alignment would fit within the existing transport infrastructure and built up area on the edge of the character area. **Neutral effect.**
Cultural	There are several features of the landscape that contribute to a historical character, namely Ashton Court estate, ancient and broad-leaved woodland at Leigh Woods and limestone quarries.	Regionally important historical features including parkland at Ashton Court and woodland at Leigh Woods.	The historic character of the area is regionally rare - ancient woodland and parkland.	Regionally important	The historic elements of the landscape could not be replaced if lost, such as ancient woodland and historic parkland.	No effect expected during operation as the freight line is already a feature within the landscape and minor modifications to Winterstoke Road and to the railway alignment would fit within the existing transport infrastructure and built up area on the edge of the character area. **Neutral effect.**
Landcover	Landcover is varied but includes woodland, parkland, ribbon development, land for recreation such as horse paddocks, arable fields, commercial areas, roads and other infrastructure, and quarries. Forces for change include increasing abundance of rural/urban fringe activities including recreation and quarrying and increasing ribbon development.	Regionally important	Elements of the landcover are rare, including the limestone quarries, ancient woodland and historic parkland.	Regionally important	Elements of the landcover could not be replaced if lost, such as the quarries, ancient woodland and historic parkland.	No effect expected during operation as the freight line is already a feature within the landscape and minor modifications to Winterstoke Road and to the railway alignment would fit within the existing transport infrastructure and built up area on the edge of the character area. **Neutral effect.**
Summary of character	This is an area characterised by both uplands, lowland with a variety of land cover types. It is tranquil in the more rural areas and within the historic parkland and woodland but developed areas, roads and recreational areas feel less peaceful. There are long views out to Ashton Court, but views in the Winterstoke Road area are restricted by large industrial and commercial buildings and roads. In future, development may increase and the rural/urban fringe will become busier.	Regionally important	Elements of the landscape pattern are rare, including the limestone quarries, ancient woodland and historic parkland.	Regionally important	Elements of the landscape could not be replaced if lost, such as the quarries, ancient woodland and historic parkland.	No effect expected during operation as the freight line is already a feature within the landscape and minor modifications to Winterstoke Road and to the railway alignment would fit within the existing transport infrastructure and built up area on the edge of the character area. **Neutral effect.**

Reference Sources

Land Use Consultants, 2005. North Somerset Landscape Character Assessment Supplementary Planning Document.

Step 5 - Summary Assessment Score

Neutral as existing landscape already has dominant transport infrastructure features and urban landcover.

Qualitative Comments

The area assessed here consists of the following Local Authority Character Areas:
- E5 Tickenham Ridge
- G2 Failand Settled Limestone Plateau
- B1 Yeo and Kenn River Floodplain
- J5 Land Yeo and Kenn Rolling Valley Farmland

Noise calculations

Noise Workbook - Inputs

Scheme details

Scheme name	Metrowest Phase 1	*Scheme_name_in*
Opening year	2021	*Opening_year_in*
Forecast year	2036	*Forecast_year_in*
Scheme type (select from list)	rail	*Scheme_type_in*
Current year	2017	*Current_year_in*

Noise modelling inputs

Night noise impact: yes — *Night_noise_impact_in*

If night time noise (and sleep disturbance impacts) are to be included, select 'yes'. If night time impacts are to be excluded, select 'no'.

Night noise (dB Lnight) modelling: yes — *Night_noise_modelling_in*

If night time (sleep disturbance) impacts are to be calculated from modelling of the Lnight period, select 'yes'. If night time impacts are to be translated from daytime noise metrics (for roads only), select 'no'.

Opening year: no. of households experiencing 'without scheme' and 'with scheme' noise levels

(dB Leq, 16h)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69	69-72	72-75	75-78	78-81	81+	
Without scheme																
<45			7													*Opening_without_45_*
45-48			313	43												*Opening_without_45_*
48-51				1359	357											*Opening_without_48_*
51-54					338	1										*Opening_without_51_*
54-57						175										*Opening_without_54_*
57-60							112									*Opening_without_57_*
60-63								130								*Opening_without_60_*
63-66									126							*Opening_without_63_*
66-69										51						*Opening_without_66_*
69-72											17					*Opening_without_69_*
72-75												35				*Opening_without_72_*
75-78													8			*Opening_without_75_*
78-81																*Opening_without_78_*
81+																*Opening_without_81_*

(dB Lnight)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69	69-72	72-75	75-78	78-81	81+	
Without scheme																
<45		1098														*Opening_without_45_*
45-48			1273													*Opening_without_45_*
48-51				222												*Opening_without_48_*
51-54					51											*Opening_without_51_*
54-57						177										*Opening_without_54_*
57-60							105									*Opening_without_57_*
60-63								86								*Opening_without_60_*
63-66									1							*Opening_without_63_*
66-69										51						*Opening_without_66_*
69-72											8					*Opening_without_69_*
72-75																*Opening_without_72_*
75-78																*Opening_without_75_*
78-81																*Opening_without_78_*
81+																*Opening_without_81_*

Forecast year: no. of households experiencing 'without scheme' and 'with scheme' noise levels

(dB Leq, 16h)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69	69-72	72-75	75-78	78-81	81+	
Without scheme																
<45			4	3												*Forecast_without_45_*
45-48			291	65												*Forecast_without_45_*
48-51				1318	398											*Forecast_without_48_*
51-54					338		1									*Forecast_without_51_*
54-57						165	10									*Forecast_without_54_*
57-60							84	28								*Forecast_without_57_*
60-63								116	14							*Forecast_without_60_*
63-66									126							*Forecast_without_63_*
66-69										51						*Forecast_without_66_*
69-72											17					*Forecast_without_69_*
72-75												35				*Forecast_without_72_*
75-78													8			*Forecast_without_75_*
78-81																*Forecast_without_78_*
81+																*Forecast_without_81_*

(dB Lnight)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69	69-72	72-75	75-78	78-81	81+	
Without scheme																
<45		1098														*Forecast_without_45_*
45-48			1273													*Forecast_without_45_*
48-51				222												*Forecast_without_48_*
51-54					51											*Forecast_without_51_*
54-57						177										*Forecast_without_54_*
57-60							105									*Forecast_without_57_*
60-63								86								*Forecast_without_60_*
63-66									1							*Forecast_without_63_*
66-69										26						*Forecast_without_66_*
69-72											33					*Forecast_without_69_*
72-75																*Forecast_without_72_*
75-78																*Forecast_without_75_*
78-81																*Forecast_without_78_*
81+																*Forecast_without_81_*

Value of a 1dB change in noise, £/HH/annum

Income base year	2010	*Income_base_values_in*
Price base year	2010	*Price_base_values_in*
Assumed average household size	2.3	*Default_HH_size_in*

Road

Noise change in the interval, (dB Leq, 16hr)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**
Sleep disturbance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.83	24.90	26.96	29.03	31.09	33.16	35.22	37.29	39.35
Amenity	0.00	10.05	10.23	10.53	10.94	11.47	12.11	12.86	13.72	14.70	15.79	16.99	18.30	19.73	21.27	22.93
AMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73	3.87	5.04
Stroke	0.00	0.00	0.00	2.31	2.32	2.32	2.33	2.34	2.34	2.35	2.35	2.36	2.36	2.37	2.38	2.38
Dementia	0.00	0.00	0.00	3.50	3.51	3.52	3.53	3.53	3.54	3.55	3.56	3.56	3.57	3.58	3.59	3.60

Noise change in the interval, (Lnight)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**
Sleep disturbance	0.00	25.93	28.48	31.03	33.58	36.13	38.68	41.23	43.78	46.33	48.88	51.43	53.98	56.53	59.08	61.62

Rail

Noise change in the interval, (dB Leq, 16hr)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**

Amenity	0.00	3.46	3.51	3.65	3.91	4.27	4.73	5.31	5.99	6.77	7.67	8.66	9.77	10.98	12.30	13.73
AMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73
Stroke	0.00	0.00	0.00	0.00	0.00	0.00	2.52	2.53	2.53	2.54	2.55	2.55	2.56	2.57	2.57	2.58
Dementia	0.00	0.00	0.00	0.00	0.00	0.00	3.82	3.83	3.83	3.84	3.85	3.86	3.87	3.88	3.89	3.90

Noise change in the interval, (Lnight)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**
Sleep disturbance	0.00	12.07	13.37	14.67	15.98	17.28	18.58	19.88	21.19	22.49	23.79	25.09	26.39	27.70	29.00	30.30

Aviation

Noise change in the interval, (dB Leq, 16hr)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**
Amenity	0.00	13.87	15.74	17.60	19.45	21.28	23.10	24.90	26.70	28.48	30.24	31.99	33.73	35.45	37.17	38.86
AMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73
Stroke	0.00	0.00	0.00	0.00	0.00	0.00	4.49	4.51	4.53	4.56	4.58	4.60	4.62	4.65	4.67	4.69
Dementia	0.00	0.00	0.00	0.00	0.00	0.00	6.79	6.82	6.85	6.87	6.90	6.93	6.96	6.99	7.02	7.05

Noise change in the interval, (Lnight)	**<**	**45.00**	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**
	45.00	**46.00**	**47.00**	**48.00**	**49.00**	**50.00**	**51.00**	**52.00**	**53.00**	**54.00**	**55.00**	**56.00**	**57.00**	**58.00**	**59.00**	**60.00**
Sleep disturbance	0.00	33.68	36.22	38.77	41.31	43.85	46.40	48.94	51.48	54.02	56.57	59.11	61.65	64.19	66.74	69.28

source: TAG data book v1.8.2 (October) 2017). Table A3.1

Appraisal period and discounting

Appraisal period (years)	60	*Appraisal_period_length_in*
PV base year	2010	*PV_base_year_in*
Outputs price year	2010	*Price_base_outputs_in*
discount period 1	30	*Discount_period_1_in*
discount period 2	75	*Discount_period_2_in*
discount period 3	125	*Discount_period_3_in*
discount rate 1	3.5%	*Discount_rate_1_in*
discount rate 2	3.0%	*Discount_rate_2_in*
discount rate 3	2.5%	*Discount_rate_3_in*

source: TAG data book v1.8.2 (October 2017). Table A1.1.1

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
GDP deflator	100.00	102.01	103.58	105.55	107.29	107.88	109.75	111.72	113.47	115.29	117.43	119.68	122.08	124.66	127.40	130.33
Real GDP per capita	135.20	136.11	136.98	138.73	141.90	143.87	145.27	147.16	148.41	150.01	151.86	153.94	156.33	158.83	161.48	164.33

source: TAG data book v1.8.2 (October 2017). Annual parameters tab.

Household size - user input	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30

Noise Workbook - Calculations

Noise modelling inputs

Opening year: no. of households experiencing 'without scheme' and 'with scheme' noise levels

(dB Leq, 16h)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0	7	0	0	0	0	0	0
45-48		0	313	43	0	0	0	0	0
48-51		0	0	1359	357	0	0	0	0
51-54		0	0	0	338	1	0	0	0
54-57		0	0	0	0	175	0	0	0
57-60		0	0	0	0	0	112	0	0
60-63		0	0	0	0	0	0	130	0
63-66		0	0	0	0	0	0	0	126
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

(dB Lnight)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		1098	0	0	0	0	0	0	0
45-48		0	1273	0	0	0	0	0	0
48-51		0	0	222	0	0	0	0	0
51-54		0	0	0	51	0	0	0	0
54-57		0	0	0	0	177	0	0	0
57-60		0	0	0	0	0	105	0	0
60-63		0	0	0	0	0	0	86	0
63-66		0	0	0	0	0	0	0	1
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

Forecast year: no. of households experiencing 'without scheme' and 'with scheme' noise levels

(dB Leq, 16h)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0	4	3	0	0	0	0	0
45-48		0	291	65	0	0	0	0	0
48-51		0	0	1318	398	0	0	0	0
51-54		0	0	0	338	0	1	0	0
54-57		0	0	0	0	165	10	0	0
57-60		0	0	0	0	0	84	28	0
60-63		0	0	0	0	0	0	116	14
63-66		0	0	0	0	0	0	0	126
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

HH with decrease in noise		0	0	0	0	0	0	0	0

Forecast year: no. of households experiencing 'without scheme' and 'with scheme' noise levels

(dB Lnight)	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		1098	0	0	0	0	0	0	0
45-48		0	1273	0	0	0	0	0	0
48-51		0	0	222	0	0	0	0	0
51-54		0	0	0	51	0	0	0	0
54-57		0	0	0	0	177	0	0	0
57-60		0	0	0	0	0	105	0	0
60-63		0	0	0	0	0	0	86	0

63-66		0	0	0	0	0	0	0	1
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

HH with decrease in noise		0	0	0	0	0	0	0	0

Households experiencing increase (day)	523	*Total_HH_increase_day*
Households experiencing decrease (day)	0	*Total_HH_reduction_day*
Households experiencing increase (night)	0	*Total_HH_increase_night*
Households experiencing decrease (night)	0	*Total_HH_reduction_night*

Noise valuations, £/household/annum

Mode	**rail**		*Scheme_type*
Road		**0**	*Road_mask*
Rail		**1**	*Rail_mask*
Aviation		**0**	*Aviation_mask*
Night noise impact	**yes**		*Night_noise_impact*
Impact on night noise		**1**	*Night_impact_mask*
No impact on night noise		**0**	*Non_night_impact_mask*
Night-noise modelling	**yes**		*Night_noise_modelling*
Leq night modelled		**1**	*Night_modelling_mask*
Leq night not modelled		**0**	*Non_night_modelling_mask*

Sleep disturbance

Noise change in the interval		<	45	46	47	48	49	50	51
	Masks	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
Road value (Lnight)	0	0.00	25.93	28.48	31.03	33.58	36.13	38.68	41.23
Rail value (Lnight)	1	0.00	12.07	13.37	14.67	15.98	17.28	18.58	19.88
Aviation value (Lnight)	0	0.00	33.68	36.22	38.77	41.31	43.85	46.40	48.94
Road value (dB Leq, 16hr)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.83

	<	45	46	47	48	49	50	51
Noise change in the interval, (dB Lnight)	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
Value of the change	0.00	12.07	13.37	14.67	15.98	17.28	18.58	19.88

lower bound 3dB band								
contribution of 1dB band values to values by 3dB bands	<45	1.00	1.00	0.50					
	45-48			0.50	1.00	1.00	0.50		
	48-51						0.50	1.00	1.00
	51-54								
	54-57								
	57-60								
	60-63								
	63-66								
	66-69								
	69-72								
	72-75								
	75-78								
	78-81								

Noise change in the interval	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
	45-48	**48-51**	**51-54**	**54-57**	**57-60**	**60-63**	**63-66**	**66-69**
Value of the change	18.76	45.98	57.70	69.42	81.14	92.86	104.58	113.69

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	-18.76	-64.73	-122.43	-191.84	-272.98	-365.83	-470.41
45-48		18.76	0.00	-45.98	-103.67	-173.09	-254.22	-347.08	-451.66
48-51		64.73	45.98	0.00	-57.70	-127.11	-208.25	-301.10	-405.68
51-54		122.43	103.67	57.70	0.00	-69.42	-150.55	-243.41	-347.99
54-57		191.84	173.09	127.11	69.42	0.00	-81.14	-173.99	-278.57
57-60		272.98	254.22	208.25	150.55	81.14	0.00	-92.86	-197.43
60-63		365.83	347.08	301.10	243.41	173.99	92.86	0.00	-104.58

63-66		470.41	451.66	405.68	347.99	278.57	197.43	104.58	0.00
66-69		584.10	565.35	519.37	461.68	392.26	311.13	218.27	113.69
69-72		698.45	679.69	633.72	576.02	506.61	425.47	332.61	228.04
72-75		812.79	794.04	748.06	690.37	620.95	539.81	446.96	342.38
75-78		927.14	908.38	862.41	804.71	735.29	654.16	561.30	456.72
78-81		1041.48	1022.72	976.75	919.05	849.64	768.50	675.64	571.07
81+		1155.94	1137.18	1091.20	1033.51	964.09	882.96	790.10	685.52

Amenity

Noise change in the interval, (dB Leq, 16hr)	Masks	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Road value	0	0.00	10.05	10.23	10.53	10.94	11.47	12.11	12.86
Rail value	1	0.00	3.46	3.51	3.65	3.91	4.27	4.73	5.31
Aviation value	0	0.00	13.87	15.74	17.60	19.45	21.28	23.10	24.90

Noise change in the interval, (dB Leq, 16hr)	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Value of the change	0.00	3.46	3.51	3.65	3.91	4.27	4.73	5.31

lower bound 3dB band contribution of 1dB band values to values by 3dB bands		<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
	<45	1.00	1.00	0.50					
	45-48			0.50	1.00	1.00	0.50		
	48-51						0.50	1.00	1.00
	51-54								
	54-57								
	57-60								
	60-63								
	63-66								
	66-69								
	69-72								
	72-75								
	75-78								
	78-81								

Noise change in the interval, (dB Leq, 16hr)	<45 45-48	45-48 48-51	48-51 51-54	51-54 54-57	54-57 57-60	57-60 60-63	60-63 63-66	63-66 66-69
Value of the change	5.22	11.44	15.17	21.76	31.23	43.58	58.80	76.89

Without scheme \ With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	0.00	-5.22	-16.66	-31.83	-53.59	-84.83	-128.41	-187.21
45-48	5.22	0.00	-11.44	-26.61	-48.38	-79.61	-123.19	-181.99
48-51	16.66	11.44	0.00	-15.17	-36.93	-68.17	-111.75	-170.55
51-54	31.83	26.61	15.17	0.00	-21.76	-53.00	-96.58	-155.38
54-57	53.59	48.38	36.93	21.76	0.00	-31.23	-74.81	-133.61
57-60	84.83	79.61	68.17	53.00	31.23	0.00	-43.58	-102.38
60-63	128.41	123.19	111.75	96.58	74.81	43.58	0.00	-58.80
63-66	187.21	181.99	170.55	155.38	133.61	102.38	58.80	0.00
66-69	264.10	258.88	247.44	232.27	210.51	179.27	135.69	76.89
69-72	361.96	356.75	345.30	330.14	308.37	277.14	233.56	174.76
72-75	483.67	478.45	467.01	451.84	430.08	398.84	355.26	296.46
75-78	630.48	625.26	613.82	598.65	576.89	545.65	502.07	443.27
78-81	783.49	778.27	766.83	751.66	729.90	698.66	655.08	596.28
81+	936.65	931.43	919.99	904.82	883.05	851.82	808.24	749.44

AMI

Noise change in the interval, (dB Leq, 16hr)	Masks	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Road value	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rail value	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aviation value	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Noise change in the interval, (dB Leq, 16hr)	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Value of the change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

lower bound 3dB band contribution of 1dB band values to values by 3dB bands		<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
	<45	1.00	1.00	0.50					
	45-48			0.50	1.00	1.00	0.50		
	48-51						0.50	1.00	1.00
	51-54								
	54-57								

57-60								
60-63								
63-66								
66-69								
69-72								
72-75								
75-78								
78-81								

Noise change in the interval, (dB Leq, 16hr)	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69
Value of the change	0.00	0.00	0.00	0.00	0.69	9.80	20.62	32.27

Without scheme \ With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	0.00	0.00	0.00	0.00	0.00	-0.69	-10.49	-31.12
45-48	0.00	0.00	0.00	0.00	0.00	-0.69	-10.49	-31.12
48-51	0.00	0.00	0.00	0.00	0.00	-0.69	-10.49	-31.12
51-54	0.00	0.00	0.00	0.00	0.00	-0.69	-10.49	-31.12
54-57	0.00	0.00	0.00	0.00	0.00	-0.69	-10.49	-31.12
57-60	0.69	0.69	0.69	0.69	0.69	0.00	-9.80	-30.43
60-63	10.49	10.49	10.49	10.49	10.49	9.80	0.00	-20.62
63-66	31.12	31.12	31.12	31.12	31.12	30.43	20.62	0.00
66-69	63.38	63.38	63.38	63.38	63.38	62.69	52.89	32.27
69-72	108.24	108.24	108.24	108.24	108.24	107.55	97.75	77.13
72-75	166.65	166.65	166.65	166.65	166.65	165.96	156.16	135.53
75-78	239.55	239.55	239.55	239.55	239.55	238.86	229.06	208.43
78-81	327.89	327.89	327.89	327.89	327.89	327.20	317.40	296.78
81+	428.96	428.96	428.96	428.96	428.96	428.27	418.47	397.85

Stroke

Noise change in the interval, (dB Leq, 16hr)	Masks	<	45	46	47	48	49	50	51
		45	46	47	48	49	50	51	52
Road value	0	0.00	0.00	0.00	2.31	2.32	2.32	2.33	2.34
Rail value	1	0.00	0.00	0.00	0.00	0.00	0.00	2.52	2.53
Aviation value	0	0.00	0.00	0.00	0.00	0.00	0.00	4.49	4.51

Noise change in the interval, (dB Leq, 16hr)	<	45	46	47	48	49	50	51
	45	46	47	48	49	50	51	52
Value of the change	0.00	0.00	0.00	0.00	0.00	0.00	2.52	2.53

contribution of 1dB band values to values by 3dB bands \ lower bound 3dB band	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	1.00	1.00	0.50					
45-48			0.50	1.00	1.00	0.50		
48-51						0.50	1.00	1.00
51-54								
54-57								
57-60								
60-63								
63-66								
66-69								
69-72								
72-75								
75-78								
78-81								

Noise change in the interval, (dB Leq, 16hr)	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
	45-48	48-51	51-54	54-57	57-60	60-63	63-66	66-69
Value of the change	0.00	0.00	6.31	7.63	7.69	7.76	7.82	7.88

Without scheme \ With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	0.00	0.00	0.00	-6.31	-13.94	-21.63	-29.39	-37.21
45-48	0.00	0.00	0.00	-6.31	-13.94	-21.63	-29.39	-37.21
48-51	0.00	0.00	0.00	-6.31	-13.94	-21.63	-29.39	-37.21
51-54	6.31	6.31	6.31	0.00	-7.63	-15.32	-23.08	-30.90
54-57	13.94	13.94	13.94	7.63	0.00	-7.69	-15.45	-23.27
57-60	21.63	21.63	21.63	15.32	7.69	0.00	-7.76	-15.57
60-63	29.39	29.39	29.39	23.08	15.45	7.76	0.00	-7.82
63-66	37.21	37.21	37.21	30.90	23.27	15.57	7.82	0.00
66-69	45.09	45.09	45.09	38.78	31.15	23.46	15.70	7.88
69-72	53.04	53.04	53.04	46.73	39.10	31.41	23.65	15.83
72-75	61.05	61.05	61.05	54.74	47.11	39.42	31.67	23.85

75-78		69.13	69.13	69.13	62.82	55.19	47.50	39.74	31.92
78-81		77.22	77.22	77.22	70.91	63.28	55.59	47.84	40.02
81+		85.32	85.32	85.32	79.01	71.38	63.69	55.94	48.12

Dementia

Noise change in the interval, (dB Leq, 16hr)	Masks	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Road value	0	0.00	0.00	0.00	3.50	3.51	3.52	3.53	3.53
Rail value	1	0.00	0.00	0.00	0.00	0.00	0.00	3.82	3.83
Aviation value	0	0.00	0.00	0.00	0.00	0.00	0.00	6.79	6.82

Noise change in the interval, (dB Leq, 16hr)	< 45	45 46	46 47	47 48	48 49	49 50	50 51	51 52
Value of the change	0.00	0.00	0.00	0.00	0.00	0.00	3.82	3.83

contribution of 1dB band values to values by 3dB bands	lower bound 3dB band							
	<45	1.00	1.00	0.50					
	45-48			0.50	1.00	1.00	0.50		
	48-51						0.50	1.00	1.00
	51-54								
	54-57								
	57-60								
	60-63								
	63-66								
	66-69								
	69-72								
	72-75								
	75-78								
	78-81								

Noise change in the interval, (dB Leq, 16hr)	<45 45-48	45-48 48-51	48-51 51-54	51-54 54-57	54-57 57-60	57-60 60-63	60-63 63-66	63-66 66-69
Value of the change	0.00	0.00	9.56	11.54	11.62	11.70	11.79	11.87

Without scheme \ With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	0.00	0.00	0.00	-9.56	-21.10	-32.72	-44.43	-56.21
45-48	0.00	0.00	0.00	-9.56	-21.10	-32.72	-44.43	-56.21
48-51	0.00	0.00	0.00	-9.56	-21.10	-32.72	-44.43	-56.21
51-54	9.56	9.56	9.56	0.00	-11.54	-23.16	-34.87	-46.65
54-57	21.10	21.10	21.10	11.54	0.00	-11.62	-23.33	-35.11
57-60	32.72	32.72	32.72	23.16	11.62	0.00	-11.70	-23.49
60-63	44.43	44.43	44.43	34.87	23.33	11.70	0.00	-11.79
63-66	56.21	56.21	56.21	46.65	35.11	23.49	11.79	0.00
66-69	68.08	68.08	68.08	58.52	46.98	35.36	23.65	11.87
69-72	80.03	80.03	80.03	70.47	58.93	47.31	35.60	23.82
72-75	92.07	92.07	92.07	82.51	70.97	59.34	47.64	35.85
75-78	104.18	104.18	104.18	94.62	83.08	71.46	59.75	47.97
78-81	116.31	116.31	116.31	106.75	95.21	83.59	71.88	60.10
81+	128.46	128.46	128.46	118.90	107.36	95.73	84.03	72.24

Noise cost

Opening year: sleep disturbance

Without scheme \ With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
<45	0	0	0	0	0	0	0	0
45-48	0	0	0	0	0	0	0	0
48-51	0	0	0	0	0	0	0	0
51-54	0	0	0	0	0	0	0	0
54-57	0	0	0	0	0	0	0	0
57-60	0	0	0	0	0	0	0	0
60-63	0	0	0	0	0	0	0	0
63-66	0	0	0	0	0	0	0	0
66-69	0	0	0	0	0	0	0	0
69-72	0	0	0	0	0	0	0	0
72-75	0	0	0	0	0	0	0	0
75-78	0	0	0	0	0	0	0	0
78-81	0	0	0	0	0	0	0	0
81+	0	0	0	0	0	0	0	0

Opening year sleep disturbance cost	£0	*Opening_year_sleep_disturbance_cost*

Forecast year: sleep disturbance

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Forecast year sleep disturbance cost	£0	*Forecast_year_sleep_disturbance_cost*
Difference in sleep disturbance c	£0	*Difference_sleep_disturbance_cost*

Opening year: amenity

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	-36.52	0.00	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	-492.12	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	-5414.57	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	-21.76	0.00	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Opening year amenity cost	-£5,965	*Opening_year_amenity_cost*

Forecast year: amenity

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	-20.87	-49.98	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	-743.90	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	-6036.41	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	0.00	-53.00	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	-312.35	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	-1220.24	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-823.20
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Forecast year amenity cost	-£9,260	*Forecast_year_amenity_cost*
Difference in amenity cost	-£3,295	*Difference_amenity_cost*

Opening year: AMI

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									

<45		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Opening year AMI cost £0 *Opening_year_AMI_cost*

Forecast year: AMI

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	0.00	-0.69	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	-6.90	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	-274.49	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-288.71
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Forecast year AMI cost -£571 *Forecast_year_AMI_cost*

Difference in AMI cost -£571 *Difference_AMI_cost*

Opening year: stroke

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-48		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48-51		0.00	0.00	0.00	-2253.08	0.00	0.00	0.00	0.00
51-54		0.00	0.00	0.00	0.00	-7.63	0.00	0.00	0.00
54-57		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57-60		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60-63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
63-66		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66-69		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
69-72		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-75		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-78		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-81		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81+		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Opening year stroke cost -£2,261 *Opening_year_stroke_cost*

Forecast year: stroke

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0	0	0	0	0	0	0	0
45-48		0	0	0	0	0	0	0	0
48-51		0	0	0	-2511.84	0	0	0	0
51-54		0	0	0	0	0	-15.3214	0	0
54-57		0	0	0	0	0	-76.9208	0	0
57-60		0	0	0	0	0	0	-217.151	0
60-63		0	0	0	0	0	0	0	-109.47
63-66		0	0	0	0	0	0	0	0
66-69		0	0	0	0	0	0	0	0

69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

Forecast year stroke cost -£2,931 *Forecast_year_stroke_cost*

Difference in stroke cost -£670 *Difference_stroke_cost*

Opening year: dementia

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0	0	0	0	0	0	0	0
45-48		0	0	0	0	0	0	0	0
48-51		0	0	0	-3412.39	0	0	0	0
51-54		0	0	0	0	-11.5422	0	0	0
54-57		0	0	0	0	0	0	0	0
57-60		0	0	0	0	0	0	0	0
60-63		0	0	0	0	0	0	0	0
63-66		0	0	0	0	0	0	0	0
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

Opening year dementia cost -£3,424 *Opening_year_dementia_cost*

Forecast year: dementia

	With scheme	<45	45-48	48-51	51-54	54-57	57-60	60-63	63-66
Without scheme									
<45		0	0	0	0	0	0	0	0
45-48		0	0	0	0	0	0	0	0
48-51		0	0	0	-3804.29	0	0	0	0
51-54		0	0	0	0	0	-23.165	0	0
54-57		0	0	0	0	0	-116.227	0	0
57-60		0	0	0	0	0	0	-327.708	0
60-63		0	0	0	0	0	0	0	-164.998
63-66		0	0	0	0	0	0	0	0
66-69		0	0	0	0	0	0	0	0
69-72		0	0	0	0	0	0	0	0
72-75		0	0	0	0	0	0	0	0
75-78		0	0	0	0	0	0	0	0
78-81		0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0

Forecast year dementia cost -£4,436 *Forecast_year_dementia_cost*

Difference in dementia cost -£1,012 *Difference_dementia_cost*

Appraisal period

		2010	2011	2012	2013	2014	2015	2016	2017
Opening year	**2021** *Opening_year*								
Opening year		0	0	0	0	0	0	0	0
Forecast year	**2036** *Forecast_year*								
Forecast year		0	0	0	0	0	0	0	0
Difference (years)	15 *Forecast_and_opening_year_difference*								
Appraisal period length (years)	60 *Appraisal_period_length*								
Interpolation		0	0	0	0	0	0	0	0
Extrapolation		0	0	0	0	0	0	0	0
Appraisal period		0	0	0	0	0	0	0	0

Check TRUE

Annual sleep disturbance cost

	2010	2011	2012	2013	2014	2015	2016	2017
Opening year	0	0	0	0	0	0	0	0
Forecast year	0	0	0	0	0	0	0	0
Interpolation	0	0	0	0	0	0	0	0
Extrapolation	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Annual amenity cost

	2010	2011	2012	2013	2014	2015	2016	2017
Opening year	0	0	0	0	0	0	0	0
Forecast year	0	0	0	0	0	0	0	0
Interpolation	0	0	0	0	0	0	0	0
Extrapolation	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Annual AMI cost

	2010	2011	2012	2013	2014	2015	2016	2017
Opening year	0	0	0	0	0	0	0	0
Forecast year	0	0	0	0	0	0	0	0
Interpolation	0	0	0	0	0	0	0	0
Extrapolation	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Annual stroke cost

	2010	2011	2012	2013	2014	2015	2016	2017
Opening year	0	0	0	0	0	0	0	0
Forecast year	0	0	0	0	0	0	0	0
Interpolation	0	0	0	0	0	0	0	0
Extrapolation	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Annual dementia cost

	2010	2011	2012	2013	2014	2015	2016	2017
Opening year	0	0	0	0	0	0	0	0
Forecast year	0	0	0	0	0	0	0	0
Interpolation	0	0	0	0	0	0	0	0
Extrapolation	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Income and price adjustment

	2010	2011	2012	2013	2014	2015	2016	2017
GDP deflator index	100.00	102.01	103.58	105.55	107.29	107.88	109.75	111.72
Real GDP per capita	135.20	136.11	136.98	138.73	141.90	143.87	145.27	147.16

Noise values price base	2010	*Noise_values_price_base*
GDP deflator index - base	100.00	*GDP_deflator_base*
Outputs price base	2010	*Outputs_price_base*
GDP deflator index - for outp	100	*GDP_deflator_outputs*
Price base adjustment	1.00	*Price_adjustment*
Noise values income base	2010	*Noise_values_income_base*
GDP per capita index - base	135.20	*GDP_capita_base*

Valuing changes in noise (£)

	2010	2011	2012	2013	2014	2015	2016	2017
Sleep disturbance	0	0	0	0	0	0	0	0
Amenity	0	0	0	0	0	0	0	0
AMI	0	0	0	0	0	0	0	0
Stroke	0	0	0	0	0	0	0	0
Dementia	0	0	0	0	0	0	0	0

Valuing changes in noise - household size adjusted (£):

Household size	**2.3**	*Default_HH_size*

	2010	2011	2012	2013	2014	2015	2016	2017
Household size - user input	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Household size multiplier	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

	2010	2011	2012	2013	2014	2015	2016	2017
Sleep disturbance	0	0	0	0	0	0	0	0
Amenity	0	0	0	0	0	0	0	0
AMI	0	0	0	0	0	0	0	0
Stroke	0	0	0	0	0	0	0	0
Dementia	0	0	0	0	0	0	0	0

Discounting and present values

Discount period

Current year	2017	*Current_year*
PV base year	2010	*PV_base_year*
discount period 1	30	*Discount_period_1*
discount period 2	75	*Discount_period_2*
discount period 3	125	*Discount_period_3*

	2010	2011	2012	2013	2014	2015	2016	2017
Masks								
Discount period 1	0	1	1	1	1	1	1	1
Discount period 2	0	0	0	0	0	0	0	0
Discount period 3	0	0	0	0	0	0	0	0

Discount rates and factors

discount rate 1	3.5%	*Discount_rate_1*
discount rate 2	3.0%	*Discount_rate_2*
discount rate 3	2.5%	*Discount_rate_3*

		2010	2011	2012	2013	2014	2015	2016	2017
Discount rate profile		0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1	1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27

Discounted noise benefits

(positive values represent a benefit - a reduction in noise)

	2010	2011	2012	2013	2014	2015	2016	2017
Sleep disturbance	0	0	0	0	0	0	0	0
Amenity	0	0	0	0	0	0	0	0
AMI	0	0	0	0	0	0	0	0
Stroke	0	0	0	0	0	0	0	0
Dementia	0	0	0	0	0	0	0	0

Total present value of noise impact pathway

Sleep disturbance	£0	*Total_discounted_sleep_disturbance_valuation*
Amenity	-£273,507	*Total_discounted_amenity_valuation*
AMI	-£14,741	*Total_discounted_AMI_valuation*
Stroke	-£88,711	*Total_discounted_stroke_valuation*
Dementia	-£134,298	*Total_discounted_dementia_valuation*

Total present value of change in noise: £NPV

Noise NPV	-£511,257	*Total_noise_net_present_value*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Opening_without_45_with_xx*
0	0	0	0	0	0	*Opening_without_45_48_with_xx*
0	0	0	0	0	0	*Opening_without_48_51_with_xx*
0	0	0	0	0	0	*Opening_without_51_54_with_xx*
0	0	0	0	0	0	*Opening_without_54_57_with_xx*
0	0	0	0	0	0	*Opening_without_57_60_with_xx*
0	0	0	0	0	0	*Opening_without_60_63_with_xx*
0	0	0	0	0	0	*Opening_without_63_66_with_xx*
51	0	0	0	0	0	*Opening_without_66_69_with_xx*
0	17	0	0	0	0	*Opening_without_69_72_with_xx*
0	0	35	0	0	0	*Opening_without_72_75_with_xx*
0	0	0	8	0	0	*Opening_without_75_78_with_xx*
0	0	0	0	0	0	*Opening_without_78_81_with_xx*
0	0	0	0	0	0	*Opening_without_81_with_xx*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Opening_without_45_with_xx_night*
0	0	0	0	0	0	*Opening_without_45_48_with_xx_night*
0	0	0	0	0	0	*Opening_without_48_51_with_xx_night*
0	0	0	0	0	0	*Opening_without_51_54_with_xx_night*
0	0	0	0	0	0	*Opening_without_54_57_with_xx_night*
0	0	0	0	0	0	*Opening_without_57_60_with_xx_night*
0	0	0	0	0	0	*Opening_without_60_63_with_xx_night*
0	0	0	0	0	0	*Opening_without_63_66_with_xx_night*
51	0	0	0	0	0	*Opening_without_66_69_with_xx_night*
0	8	0	0	0	0	*Opening_without_69_72_with_xx_night*
0	0	0	0	0	0	*Opening_without_72_75_with_xx_night*
0	0	0	0	0	0	*Opening_without_75_78_with_xx_night*
0	0	0	0	0	0	*Opening_without_78_81_with_xx_night*
0	0	0	0	0	0	*Opening_without_81_with_xx_night*

66-69	69-72	72-75	75-78	78-81	81+		HH with increased noise
							Forecast_HH_increased_noise_day
0	0	0	0	0	0	*Forecast_without_45_with_xx*	7
0	0	0	0	0	0	*Forecast_without_45_48_with_xx*	65
0	0	0	0	0	0	*Forecast_without_48_51_with_xx*	398
0	0	0	0	0	0	*Forecast_without_51_54_with_xx*	1
0	0	0	0	0	0	*Forecast_without_54_57_with_xx*	10
0	0	0	0	0	0	*Forecast_without_57_60_with_xx*	28
0	0	0	0	0	0	*Forecast_without_60_63_with_xx*	14
0	0	0	0	0	0	*Forecast_without_63_66_with_xx*	0
51	0	0	0	0	0	*Forecast_without_66_69_with_xx*	0
0	17	0	0	0	0	*Forecast_without_69_72_with_xx*	0
0	0	35	0	0	0	*Forecast_without_72_75_with_xx*	0
0	0	0	8	0	0	*Forecast_without_75_78_with_xx*	0
0	0	0	0	0	0	*Forecast_without_78_81_with_xx*	0
0	0	0	0	0	0	*Forecast_without_81_with_xx*	
0	0	0	0	0		*Forecast_HH_decreased_noise_day*	

66-69	69-72	72-75	75-78	78-81	81+		HH with increased noise
							Forecast_HH_increased_noise_night
0	0	0	0	0	0	*Forecast_without_45_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_45_48_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_48_51_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_51_54_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_54_57_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_57_60_with_xx_night*	0
0	0	0	0	0	0	*Forecast_without_60_63_with_xx_night*	0

0	0	0	0	0	0	*Forecast_without_63_66_with_xx_night* 0
26	0	0	0	0	0	*Forecast_without_66_69_with_xx_night* 0
0	33	0	0	0	0	*Forecast_without_69_72_with_xx_night* 0
0	0	0	0	0	0	*Forecast_without_72_75_with_xx_night* 0
0	0	0	0	0	0	*Forecast_without_75_78_with_xx_night* 0
0	0	0	0	0	0	*Forecast_without_78_81_with_xx_night* 0
0	0	0	0	0	0	*Forecast_without_81_with_xx_night*

0 0 0 0 0 0 *Forecast_HH_decreased_noise_night*

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
43.78	46.33	48.88	51.43	53.98	56.53	59.08	61.62	64.17	66.72	69.27	71.82	74.37	76.92
21.19	22.49	23.79	25.09	26.39	27.70	29.00	30.30	31.60	32.91	34.21	35.51	36.81	38.11
51.48	54.02	56.57	59.11	61.65	64.19	66.74	69.28	71.82	74.37	76.91	79.45	81.99	84.54
24.90	26.96	29.03	31.09	33.16	35.22	37.29	39.35	41.42	43.48	45.55	47.61	49.68	51.74

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
21.19	22.49	23.79	25.09	26.39	27.70	29.00	30.30	31.60	32.91	34.21	35.51	36.81	38.11

0.50													
0.50	1.00	1.00	0.50										
			0.50	1.00	1.00	0.50							
						0.50	1.00	1.00	0.50				
									0.50	1.00	1.00	0.50	
												0.50	1.00

66-69	**69-72**	**72-75**	**75-78**	**78-81**	
69-72	**72-75**	**75-78**	**78-81**	**81+**	
114.34	114.34	114.34	114.34	114.46	*Sleep_disturbance_values_3dB_table*

66-69	69-72	72-75	75-78	78-81	81+	*Noise_3dB_bands*
-584.10	-698.45	-812.79	-927.14	-1041.48	-1155.94	*Without_45_with_xx_sleep_disturbance_value*
-565.35	-679.69	-794.04	-908.38	-1022.72	-1137.18	*Without_45_48_with_xx_sleep_disturbance_value*
-519.37	-633.72	-748.06	-862.41	-976.75	-1091.20	*Without_48_51_with_xx_sleep_disturbance_value*
-461.68	-576.02	-690.37	-804.71	-919.05	-1033.51	*Without_51_54_with_xx_sleep_disturbance_value*
-392.26	-506.61	-620.95	-735.29	-849.64	-964.09	*Without_54_57_with_xx_sleep_disturbance_value*
-311.13	-425.47	-539.81	-654.16	-768.50	-882.96	*Without_57_60_with_xx_sleep_disturbance_value*
-218.27	-332.61	-446.96	-561.30	-675.64	-790.10	*Without_60_63_with_xx_sleep_disturbance_value*

-113.69	-228.04	-342.38	-456.72	-571.07	-685.52	*Without_63_66_with_xx_sleep_disturbance_value*
0.00	-114.34	-228.69	-343.03	-457.38	-571.83	*Without_66_69_with_xx_sleep_disturbance_value*
114.34	0.00	-114.34	-228.69	-343.03	-457.49	*Without_69_72_with_xx_sleep_disturbance_value*
228.69	114.34	0.00	-114.34	-228.69	-343.14	*Without_72_75_with_xx_sleep_disturbance_value*
343.03	228.69	114.34	0.00	-114.34	-228.80	*Without_75_78_with_xx_sleep_disturbance_value*
457.38	343.03	228.69	114.34	0.00	-114.46	*Without_78_81_with_xx_sleep_disturbance_value*
571.83	457.49	343.14	228.80	114.46	0.00	*Without_81_with_xx_sleep_disturbance_value*

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
13.72	14.70	15.79	16.99	18.30	19.73	21.27	22.93	24.69	26.58	28.57	30.68	32.89	35.23
5.99	6.77	7.67	8.66	9.77	10.98	12.30	13.73	15.26	16.89	18.64	20.49	22.45	24.51
26.70	28.48	30.24	31.99	33.73	35.45	37.17	38.86	40.55	42.22	43.87	45.52	47.15	48.76

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
5.99	6.77	7.67	8.66	9.77	10.98	12.30	13.73	15.26	16.89	18.64	20.49	22.45	24.51

0.50													
0.50	1.00	1.00	0.50										
			0.50	1.00	1.00	0.50							
						0.50	1.00	1.00	0.50				
									0.50	1.00	1.00	0.50	
												0.50	1.00

66-69	**69-72**	**72-75**	**75-78**	**78-81**	
69-72	**72-75**	**75-78**	**78-81**	**81+**	
97.86	121.71	146.81	153.01	153.16	*Amenity_values_3db_table*

66-69	69-72	72-75	75-78	78-81	81+	*Noise_3dB_bands*
-264.10	-361.96	-483.67	-630.48	-783.49	-936.65	*Without_45_with_xx_amenity_value*
-258.88	-356.75	-478.45	-625.26	-778.27	-931.43	*Without_45_48_with_xx_amenity_value*
-247.44	-345.30	-467.01	-613.82	-766.83	-919.99	*Without_48_51_with_xx_amenity_value*
-232.27	-330.14	-451.84	-598.65	-751.66	-904.82	*Without_51_54_with_xx_amenity_value*
-210.51	-308.37	-430.08	-576.89	-729.90	-883.05	*Without_54_57_with_xx_amenity_value*
-179.27	-277.14	-398.84	-545.65	-698.66	-851.82	*Without_57_60_with_xx_amenity_value*
-135.69	-233.56	-355.26	-502.07	-655.08	-808.24	*Without_60_63_with_xx_amenity_value*
-76.89	-174.76	-296.46	-443.27	-596.28	-749.44	*Without_63_66_with_xx_amenity_value*
0.00	-97.86	-219.57	-366.38	-519.39	-672.55	*Without_66_69_with_xx_amenity_value*
97.86	0.00	-121.71	-268.51	-421.52	-574.68	*Without_69_72_with_xx_amenity_value*
219.57	121.71	0.00	-146.81	-299.82	-452.98	*Without_72_75_with_xx_amenity_value*
366.38	268.51	146.81	0.00	-153.01	-306.17	*Without_75_78_with_xx_amenity_value*
519.39	421.52	299.82	153.01	0.00	-153.16	*Without_78_81_with_xx_amenity_value*
672.55	574.68	452.98	306.17	153.16	0.00	*Without_81_with_xx_amenity_value*

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
0.00	0.00	0.00	0.00	1.38	2.73	3.87	5.04	6.24	7.48	8.76	10.07	11.42	12.80
0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73	3.87	5.04	6.24	7.48	8.76	10.07
0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73	3.87	5.04	6.24	7.48	8.76	10.07

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.73	3.87	5.04	6.24	7.48	8.76	10.07

0.50													
0.50	1.00	1.00	0.50										
			0.50	1.00	1.00	0.50							

						0.50	1.00	1.00	0.50				
									0.50	1.00	1.00	0.50	
												0.50	1.00

66-69	**69-72**	**72-75**	**75-78**	**78-81**	
69-72	**72-75**	**75-78**	**78-81**	**81+**	
44.86	58.41	72.90	88.34	101.07	*AMI_values_3db_table*

66-69	69-72	72-75	75-78	78-81	81+	*Noise_3dB_bands*
-63.38	-108.24	-166.65	-239.55	-327.89	-428.96	*Without_45_with_xx_AMI_value*
-63.38	-108.24	-166.65	-239.55	-327.89	-428.96	*Without_45_48_with_xx_AMI_value*
-63.38	-108.24	-166.65	-239.55	-327.89	-428.96	*Without_48_51_with_xx_AMI_value*
-63.38	-108.24	-166.65	-239.55	-327.89	-428.96	*Without_51_54_with_xx_AMI_value*
-63.38	-108.24	-166.65	-239.55	-327.89	-428.96	*Without_54_57_with_xx_AMI_value*
-62.69	-107.55	-165.96	-238.86	-327.20	-428.27	*Without_57_60_with_xx_AMI_value*
-52.89	-97.75	-156.16	-229.06	-317.40	-418.47	*Without_60_63_with_xx_AMI_value*
-32.27	-77.13	-135.53	-208.43	-296.78	-397.85	*Without_63_66_with_xx_AMI_value*
0.00	-44.86	-103.27	-176.17	-264.51	-365.58	*Without_66_69_with_xx_AMI_value*
44.86	0.00	-58.41	-131.31	-219.65	-320.72	*Without_69_72_with_xx_AMI_value*
103.27	58.41	0.00	-72.90	-161.24	-262.31	*Without_72_75_with_xx_AMI_value*
176.17	131.31	72.90	0.00	-88.34	-189.41	*Without_75_78_with_xx_AMI_value*
264.51	219.65	161.24	88.34	0.00	-101.07	*Without_78_81_with_xx_AMI_value*
365.58	320.72	262.31	189.41	101.07	0.00	*Without_81_with_xx_AMI_value*

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
2.34	2.35	2.35	2.36	2.36	2.37	2.38	2.38	2.39	2.39	2.40	2.41	2.41	2.42
2.53	2.54	2.55	2.55	2.56	2.57	2.57	2.58	2.59	2.60	2.60	2.61	2.62	2.62
4.53	4.56	4.58	4.60	4.62	4.65	4.67	4.69	4.72	4.74	4.76	4.79	4.81	4.83

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
2.53	2.54	2.55	2.55	2.56	2.57	2.57	2.58	2.59	2.60	2.60	2.61	2.62	2.62

0.50													
0.50	1.00	1.00	0.50										
			0.50	1.00	1.00	0.50							
						0.50	1.00	1.00	0.50				
									0.50	1.00	1.00	0.50	
												0.50	1.00

66-69	**69-72**	**72-75**	**75-78**	**78-81**	
69-72	**72-75**	**75-78**	**78-81**	**81+**	
7.95	8.01	8.08	8.09	8.10	*Stroke_values_3db_table*

66-69	69-72	72-75	75-78	78-81	81+	*Noise_3dB_bands*
-45.09	-53.04	-61.05	-69.13	-77.22	-85.32	*Without_45_with_xx_stroke_value*
-45.09	-53.04	-61.05	-69.13	-77.22	-85.32	*Without_45_48_with_xx_stroke_value*
-45.09	-53.04	-61.05	-69.13	-77.22	-85.32	*Without_48_51_with_xx_stroke_value*
-38.78	-46.73	-54.74	-62.82	-70.91	-79.01	*Without_51_54_with_xx_stroke_value*
-31.15	-39.10	-47.11	-55.19	-63.28	-71.38	*Without_54_57_with_xx_stroke_value*
-23.46	-31.41	-39.42	-47.50	-55.59	-63.69	*Without_57_60_with_xx_stroke_value*
-15.70	-23.65	-31.67	-39.74	-47.84	-55.94	*Without_60_63_with_xx_stroke_value*
-7.88	-15.83	-23.85	-31.92	-40.02	-48.12	*Without_63_66_with_xx_stroke_value*
0.00	-7.95	-15.96	-24.04	-32.13	-40.23	*Without_66_69_with_xx_stroke_value*
7.95	0.00	-8.01	-16.09	-24.18	-32.28	*Without_69_72_with_xx_stroke_value*
15.96	8.01	0.00	-8.08	-16.17	-24.27	*Without_72_75_with_xx_stroke_value*

24.04	16.09	8.08	0.00	-8.09	-16.19	*Without_75_78_with_xx_stroke_value*
32.13	24.18	16.17	8.09	0.00	-8.10	*Without_78_81_with_xx_stroke_value*
40.23	32.28	24.27	16.19	8.10	0.00	*Without_81_with_xx_stroke_value*

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
3.54	3.55	3.56	3.56	3.57	3.58	3.59	3.60	3.60	3.61	3.62	3.63	3.63	3.64
3.83	3.84	3.85	3.86	3.87	3.88	3.89	3.90	3.91	3.91	3.92	3.93	3.94	3.95
6.85	6.87	6.90	6.93	6.96	6.99	7.02	7.05	7.07	7.10	7.13	7.16	7.19	7.22

52	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**
53	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
3.83	3.84	3.85	3.86	3.87	3.88	3.89	3.90	3.91	3.91	3.92	3.93	3.94	3.95

0.50													
0.50	1.00	1.00	0.50										
			0.50	1.00	1.00	0.50							
						0.50	1.00	1.00	0.50				
									0.50	1.00	1.00	0.50	
												0.50	1.00

66-69	**69-72**	**72-75**	**75-78**	**78-81**	
69-72	**72-75**	**75-78**	**78-81**	**81+**	
11.95	12.03	12.11	12.13	12.14	*dementia_values_3db_table*

66-69	69-72	72-75	75-78	78-81	81+	*Noise_3dB_bands*
-68.08	-80.03	-92.07	-104.18	-116.31	-128.46	*Without_45_with_xx_dementia_value*
-68.08	-80.03	-92.07	-104.18	-116.31	-128.46	*Without_45_48_with_xx_dementia_value*
-68.08	-80.03	-92.07	-104.18	-116.31	-128.46	*Without_48_51_with_xx_dementia_value*
-58.52	-70.47	-82.51	-94.62	-106.75	-118.90	*Without_51_54_with_xx_dementia_value*
-46.98	-58.93	-70.97	-83.08	-95.21	-107.36	*Without_54_57_with_xx_dementia_value*
-35.36	-47.31	-59.34	-71.46	-83.59	-95.73	*Without_57_60_with_xx_dementia_value*
-23.65	-35.60	-47.64	-59.75	-71.88	-84.03	*Without_60_63_with_xx_dementia_value*
-11.87	-23.82	-35.85	-47.97	-60.10	-72.24	*Without_63_66_with_xx_dementia_value*
0.00	-11.95	-23.99	-36.10	-48.23	-60.38	*Without_66_69_with_xx_dementia_value*
11.95	0.00	-12.03	-24.15	-36.28	-48.42	*Without_69_72_with_xx_dementia_value*
23.99	12.03	0.00	-12.11	-24.25	-36.39	*Without_72_75_with_xx_dementia_value*
36.10	24.15	12.11	0.00	-12.13	-24.28	*Without_75_78_with_xx_dementia_value*
48.23	36.28	24.25	12.13	0.00	-12.14	*Without_78_81_with_xx_dementia_value*
60.38	48.42	36.39	24.28	12.14	0.00	*Without_81_with_xx_dementia_value*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Opening_without_45_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_45_48_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_48_51_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_51_54_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_54_57_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_57_60_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_60_63_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_63_66_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_66_69_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_69_72_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_72_75_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_75_78_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_78_81_with_xx_sleep_disturbance_cost*
0	0	0	0	0	0	*Opening_without_81_with_xx_sleep_disturbance_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_48_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_48_51_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_51_54_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_54_57_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_57_60_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_60_63_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_63_66_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_66_69_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_69_72_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_72_75_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_75_78_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_78_81_with_xx_sleep_disturbance_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_81_with_xx_sleep_disturbance_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_48_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_48_51_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_51_54_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_54_57_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_57_60_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_60_63_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_63_66_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_66_69_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_69_72_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_72_75_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_75_78_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_78_81_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_81_with_xx_amenity_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_48_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_48_51_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_51_54_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_54_57_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_57_60_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_60_63_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_63_66_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_66_69_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_69_72_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_72_75_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_75_78_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_78_81_with_xx_amenity_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_81_with_xx_amenity_cost*

66-69	69-72	72-75	75-78	78-81	81+

0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_48_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_48_51_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_51_54_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_54_57_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_57_60_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_60_63_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_63_66_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_66_69_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_69_72_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_72_75_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_75_78_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_78_81_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_81_with_xx_AMI_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_45_48_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_48_51_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_51_54_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_54_57_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_57_60_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_60_63_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_63_66_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_66_69_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_69_72_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_72_75_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_75_78_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_78_81_with_xx_AMI_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Forecast_without_81_with_xx_AMI_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_45_48_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_48_51_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_51_54_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_54_57_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_57_60_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_60_63_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_63_66_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_66_69_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_69_72_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_72_75_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_75_78_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_78_81_with_xx_stroke_cost*
0.00	0.00	0.00	0.00	0.00	0.00	*Opening_without_81_with_xx_stroke_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Forecast_without_45_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_45_48_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_48_51_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_51_54_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_54_57_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_57_60_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_60_63_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_63_66_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_66_69_with_xx_stroke_cost*

0	0	0	0	0	0	*Forecast_without_69_72_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_72_75_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_75_78_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_78_81_with_xx_stroke_cost*
0	0	0	0	0	0	*Forecast_without_81_with_xx_stroke_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Opening_without_45_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_45_48_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_48_51_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_51_54_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_54_57_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_57_60_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_60_63_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_63_66_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_66_69_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_69_72_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_72_75_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_75_78_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_78_81_with_xx_dementia_cost*
0	0	0	0	0	0	*Opening_without_81_with_xx_dementia_cost*

66-69	69-72	72-75	75-78	78-81	81+	
0	0	0	0	0	0	*Forecast_without_45_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_45_48_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_48_51_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_51_54_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_54_57_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_57_60_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_60_63_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_63_66_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_66_69_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_69_72_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_72_75_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_75_78_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_78_81_with_xx_dementia_cost*
0	0	0	0	0	0	*Forecast_without_81_with_xx_dementia_cost*

2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1	1	1	1

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	-5965	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	-6185	-6404	-6624	-6844	-7063	-7283	-7503	-7722	-7942	-8162
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-5965	-6185	-6404	-6624	-6844	-7063	-7283	-7503	-7722	-7942	-8162

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	-38	-76	-114	-152	-190	-228	-266	-304	-342	-381
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	-38	-76	-114	-152	-190	-228	-266	-304	-342	-381

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	-2261	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	-2305	-2350	-2395	-2439	-2484	-2529	-2573	-2618	-2663	-2707
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-2261	-2305	-2350	-2395	-2439	-2484	-2529	-2573	-2618	-2663	-2707

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	-3424	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	-3491	-3559	-3626	-3694	-3761	-3829	-3896	-3964	-4031	-4099
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-3424	-3491	-3559	-3626	-3694	-3761	-3829	-3896	-3964	-4031	-4099

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
113.47	115.29	117.43	119.68	122.08	124.66	127.40	130.33	133.33	136.40	139.54	142.74	146.03	149.39
148.41	150.01	151.86	153.94	156.33	158.83	161.48	164.33	167.36	170.48	173.66	176.81	179.98	183.20

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-6792	-7151	-7524	-7911	-8318	-8743	-9183	-9637	-10099	-10572	-11059
0	0	0	0	-44	-89	-136	-185	-236	-288	-342	-398	-456	-516
0	0	0	-2574	-2666	-2761	-2860	-2965	-3075	-3189	-3305	-3424	-3545	-3668
0	0	0	-3898	-4037	-4181	-4331	-4490	-4656	-4828	-5005	-5184	-5367	-5554

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-6792	-7151	-7524	-7911	-8318	-8743	-9183	-9637	-10099	-10572	-11059
0	0	0	0	-44	-89	-136	-185	-236	-288	-342	-398	-456	-516
0	0	0	-2574	-2666	-2761	-2860	-2965	-3075	-3189	-3305	-3424	-3545	-3668
0	0	0	-3898	-4037	-4181	-4331	-4490	-4656	-4828	-5005	-5184	-5367	-5554

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79	1.86	1.92	1.99	2.06

2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	-4652	-4732	-4811	-4887	-4965	-5042	-5117	-5188	-5253	-5313	-5370
0	0	0	0	-29	-57	-84	-110	-136	-160	-184	-207	-229	-250
0	0	0	-1763	-1764	-1765	-1767	-1770	-1773	-1777	-1779	-1781	-1781	-1781
0	0	0	-2670	-2672	-2673	-2676	-2680	-2685	-2690	-2694	-2696	-2697	-2697

Noise output

Noise Workbook - Worksheet 1

Proposal Name: Metrowest Phase 1

Present Value Base Year	2010
Current Year	2017
Proposal Opening year:	2021
Project (Road, Rail or Aviation):	rail

Net present value of change in noise (£):	-£511,257

*positive value reflects a **net benefit** (i.e. a reduction in noise)

Net present value of impact on sleep disturbance (£):	£0
Net present value of impact on amenity (£):	-£273,507
Net present value of impact on AMI (£):	-£14,741
Net present value of impact on stroke (£):	-£88,711
Net present value of impact on dementia (£):	-£134,298

Quantitative results

Households experiencing increased daytime noise in forecast year:	523
Households experiencing reduced daytime noise in forecast year:	0
Households experiencing increased night time noise in forecast year:	0
Households experiencing reduced night time noise in forecast year:	0

Qualitative Comments:

Data Sources:

Noise levels taken from PEIR model.

Townscape

TAG Townscape Impacts Worksheet

	Step 2	Step 3					Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Changes in Without-scheme case**	**Impact**
Layout	The Ashton Gate/Ashton Vale area is the main urban area in the vicinity of the DCO Scheme. It is characterised by large industrial buildings and commercial areas, in addition to some residential streets and small public parks. The area is bisected by busy roads and railway infrastructure.	Local scale.	The layout of the townscape is not rare, but some individual features within the townscape such as the allotments and A Bond and B Bond industrial buildings are regionally rare.	Features within the townscape are locally important - allotments, urban parks, riverside paths, Ashton Gate Stadium.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent feature of this area, the DCO Scheme would not result in a significant change in the layout of the townscape. **Neutral effect.**
Density and mix	Dominant buildings in the townscape are large industrial and commercial buildings with associated large car parks. There are also areas of residential streets, an allotment and public parks, which reduce the density of development.	Local scale.	The density and mix of the townscape is not rare.	Locally important.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in the density and mix of the townscape. **Neutral effect.**
Scale	The area is generally flat, with views currently constrained by the A370/A3029 Brunel Way, which is elevated on a viaduct over the Cumberland Basin docks area, and tall, large-scale industrial/commercial buildings.	Local scale.	The scale of the townscape is not rare.	Locally important.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in the scale of the townscape. **Neutral effect.**
Appearance	The area is dominated by road and rail transport infrastructure. It has a complex urban character and appears sprawling and disjointed in places. The brick A Bond and B Bond buildings contribute to a sense of industrial heritage in the Cumberland Basin, but the majority of the buildings are more recently built commercial buildings and residential properties of no special character. The commercial buildings have associated metal security fences, lighting and large car parks.	Local scale.	The appearance of the townscape is not rare but some individual features within the townscape such as the allotments and A Bond and B Bond industrial buildings are regionally rare.	Locally important.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in the appearance of the townscape. **Neutral effect.**
Human interaction	The area is used mainly for employment - the industrial estate and dock areas are dominant features. The residential areas have access to parks, riverside paths and the allotments, and increasing numbers of shops and restaurants moving away from the DCO Scheme alignment and into the city. Ashton Park School and the University of West England's Bower Ashton Campus is on the western edge of this urban area. Ashton Gate stadium is also within this area.	Local scale.	The allotments are used by the community and are locally rare.	The allotments, public parks, riverside paths and Ashton Gate stadium are locally important for recreation/leisure. The commercial areas are locally important for employment.	Heritage industrial buildings could not be substituted. Parks would be very difficult to replace in locations that the local communities could still access easily.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in the human interaction with the townscape. The closure of Barons Close level crossing could result in individuals viewing the townscape differently from their new, diverted path, but this will be a minor change. **Neutral effect.**
Cultural	The historic industrial buildings A Bond and B Bond buildings contribute to the industrial heritage feel of the Cumberland Basin area. There are two conservation areas: Bower Ashton and City Docks. The rest of the area has a complex structure with commercial units of varying styles.	Local scale.	The historic industrial buildings A Bond and B Bond buildings are regionally rare.	Locally important.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in the cultural character of the townscape. **Neutral effect.**
Land use	Land use is mainly industrial/commercial, with some residential streets and areas for recreation.	Local scale.	The allotments are locally rare.	Locally important.	Heritage industrial buildings could not be substituted.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in land use. **Neutral effect.**
Summary of character	The primary features of the townscape are road and rail networks, commercial areas and residential streets. This is a complex urban area that appears sprawling and disjointed in places. Views are generally restricted by large buildings and the A370/Brunel Way.	Local scale. Features are generally common and are not regionally important.	The character of the townscape is not rare but some individual features within the townscape such as the allotments and S Bond and B Bond industrial buildings are regionally rare.	Locally important.	Heritage industrial buildings could not be substituted. Parks and allotments would be difficult to replace in locations that the local communities could still access easily.	Future trends in this urban area are likely to include increased development and expansion outwards into the urban/rural fringe, and increased traffic volumes.	As the linear feature of the disused railway line is already a constituent of this area the DCO Scheme would not result in a significant change in townscape character. **Neutral effect.**

Reference Sources

Step 5 - Summary Assessment Score

Neutral effect. Transport infrastructure (including the existing Portbury Freight Line) is already a feature in the landscape, and many views are restricted by commercial/industrial buildings so would not change significantly with the DCO Scheme.

Qualitative Comments

Area assessed here: Ashton Gate/Ashton Vale area of Bristol, based on Site Specific Character Areas assessed within the PEIR chapter 11 (Landscape and Visual Impact Assessment).

Water Environment

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study Area: Severn Estuary									
Potential Impacts: Coastal flood risk to the proposed railway between Portishead and Pill, Portishead railway station and car park.	Severn Estuary	Floodplain: conveyance of flood flows	High	National	High	Not possible	Very High	Negligible - The risk of coastal flooding is insignificant for the present day scenario (2015) and increases in the future due future sea level rise. For the future (2135) scenario, there is simulated flooding on the proposed Portishead station car park for events with return periods 100 years and higher and at the pedestrian crossing of Portbury ditch for events with return periods 75 years and higher.	**Low significance**
Study Area: River (Bristol) Avon									
Potential impact: Scheme potentially leads to loss of floodplain in this location.	River (Bristol) Avon	Floodplain: conveyance of flood flows	High - flooding of the DCO Scheme would occur approximately once every 5 to 10 years for the present day.	Regional	Medium	Not possible	Very High	Negligible - Floodplain compensation requirements not required as loss is insignificant and overall the scheme provides a net increase in storage.	**Insignificant**
Potential impact: Tidal River Avon flood risk to the DCO Scheme proposed railway near Bower Ashton. Flooding would occur approximately once every 5 to 10 years for the present day and more frequently in the future due to projected future sea level rise.								Slight adverse/Minor - Develop flood plan in consultation with Network Rail, North Somerset Council and Bristol City Council. This will specify operational responses and triggers to cease operation during flooding and evacuation procedures. Significant but manageable through well-considered flood plan.	**Low significance**
Potential impact: presence of permanent storage area off Clanage Road located within the floodplain.								Negligible - not proposed to construct any buildings or use the site for long term storage of any plant or materials at this site, in order to avoid changes to flood conveyance or storage. Mitigation will include appropriate use of Environment Agency flood warning service and development of a flood plan.	**Insignificant**
Potential impact: pollution of surface waters via discharge of drainage from rail network, stations or associated development activities (e.g. car parks).		River: transport and dilution of waste products /biodiversity	Mixed, macro, extensive intertidal transitional waterbody. Heavily modified. Classified under WFD (Cycle 2) as having Good Ecological Potential and Good Chemical Status. Downstream of Pill, the River Avon forms part of the Severn Estuary SAC, SPA, Ramsar site and SSSI.					Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Study Area: Portbury Ditch									
Potential impact: flood risk. All proposed works over Portbury Ditch are at the top level of the existing crossing (approx. 7.5 mAOD) and above anticipated flood levels as there is significant lower lying Portbury Ditch floodplain storage.	Portbury Ditch	Floodplain: conveyance of flood flows	Medium - Main River. Moderate ecological potential and good chemical quality. Artificial watercourse (land drainage).	Local	Low	Limited	Medium	Negligible - Will not result in displacement of floodplain storage. No requirement for floodplain compensation storage	**Insignificant**
Potential Impacts: To receive drainage from Portishead Station - car park - changes to water quality		River: transport and dilution of waste products						Negligible - drainage design ongoing.	**Insignificant**
Potential Impacts: To receive drainage from Portishead Station car park - changes in flows		conveyance of flow and material						Negligible - drainage design ongoing.	**Insignificant**
Potential Impacts: To receive drainage from Portishead Station car park - physical impacts due to new outfall structure in channel		channel morphology						Negligible - localised impact on already urbanised stretch of watercourse. Design to be minimal and follow best practice.	**Insignificant**
Study Area: The Cut									
Potential Impacts: To receive drainage from Portishead Station roof and platforms - changes in flows	The Cut	conveyance of flow and material	Low - Ordinary watercourse (North Somerset Internal Drainage Board). Not classified under WFD.	Local	Low	Limited	Low	Neglible - attenuation not anticipated to be required.	**Insignificant**
Potential Impacts: To receive drainage from Portishead Station - roof and platforms - changes to water quality		River: transport and dilution of waste products						Neglible - attenuation not anticipated to be required.	**Insignificant**
Potential Impacts: To receive drainage from Portishead Station roof and platforms - physical impacts due to new outfall structure in channel		channel morphology						Negligible - localised impact on already urbanised stretch of watercourse. Design to be minimal and follow best practice.	**Insignificant**
Study Area: Easton-in-Gordano Strean									
Potential impact: Enlarge Easton-in-Gordano Stream flood culvert to mitigate infilling of Cattle Creep underbridge and loss of informal flood route. Very small changes in flood levels up and downstream of culvert compared with existing.	Easton-in-Gordano Stream	Floodplain: conveyance of flood flows	High - Ordinary watercourse (EA). Artificial watercourse (land drainage and flood protection). Good ecological potential (WFD cycle 1, not classified under cycle 2). Adjacent to Local Wildlife Site.	Local	Low	Limited	High	Negligible - changes in flood risk will be localised and not significant. No compensation storage is therefore proposed. Replacement culvert will provide formalised flood flow route. . modelled fluvial flood levels are below the disused railway embankment top level for the 1000-year return period event, for the present day (2015) and future (2135) scenarios.	**Insignificant**
Potential impact: scheme potentially leads to loss of floodplain in this location.								Negligible - Floodplain compensation requirements not required as loss is insignificant and overall the scheme provides a net increase in storage.	**Insignificant**
Potential impact: pollution of surface waters via discharge of drainage from rail network.		River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation						Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential Impact: watercourse is culverted under the railway. Increasing the size of the Easton-in-Gordano Stream culvert (replacing the existing culvert with a 1200 mm diameter culvert) to provide flood flow route. Physical impacts due to enlarged culvert.		channel morphology						Negligible - localised impact on already urbanised stretch of watercourse. Design to be minimal and follow best practice.	**Insignificant**
Study Area: Drove Rhyne									
Potential impact: flood risk	Drove Rhyne	Floodplain: conveyance of flood flows	Low - Main River. Not classified under WFD. Highly modified with controlled water levels.	Local	Low	Limited	Low	Negligible - modelled flows in Drove Rhyne and its tributaries remain in-bank up to the 100 year return period for the present day (2015), and are in bank for the 30 year return period flood for the future scenario (2135). For the events with out of bank flood levels, modelled out of bank flooding is localised to Drove Rhyne and its tributaries. The DCO Scheme railway embankment level is above the modelled 1000-year return period flood level for the present day (2015) and future (2135) scenarios, and so not considered to be at risk of flooding from Drove Rhyne. the impact at the DCO Scheme of increased tide locking of Drove Rhyne due to joint fluvial and tidal flood events is minor.	**Insignificant**
Potential impact: pollution of surface waters via discharge of drainage from rail network.		River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation						Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Study Area: Chapel Pill									
Potential impact: pollution of surface waters via discharge of drainage from rail network. Currently receive runoff from railway and Pill Tunnel and will continue to do so.	Chapel Pill (Ham Green Lake)	River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation	Medium - Ordinary watercourse. Moderate Ecological Status (cycle 1). Located within local wildlife site.	Local	Low	Limited	Medium	Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Study Area: Markham Brook									
Potential impact: pollution of surface waters via discharge of drainage from rail network. Discharge from Pill Station proposed to open/tidal section of Markham Brook immediately after it emerges from culvert.	Markham Brook	River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation	Medium - Main River (downstream of A369). Classified under WFD cycle 1 as having moderate ecological status. Located within Local Wildlife Site.	Local	Low	Limited	Medium	Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Potential Impacts: To discharge drainage from Pill Station - physical impacts due to new outfall structure in channel		channel morphology						Negligible - localised impact. Design to be minimal and follow best practice.	**Insignificant**
Study Area: Ashton Brook/Longmoor Brook									
Potential impact: flood risk	Ashton Brook/ Longmoor Brook	Floodplain: conveyance of flood flows	Low - For the present day (2015) scenario only the 1000 year return period flood results in flooding of the railway and in the Ashton Gate area. For the 100 year return period there is no flooding on the railway. The water just reaches the railway at Ashton Vale without flooding.	Local	Low	Limited	Low	Negligible (For the future (2135) scenario flooding of the railway is simulated for the 75 year return period event and above.)	**Insignificant**
Potential impact: pollution of surface waters via discharge of drainage from rail network.		River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation	Low - Small catchment (semi-urban). Located within local wildlife site. Culverted for significant lengths.					Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Study Area: Colliter's Brook									
Potential impact: flood risk	Colliter's Brook	Floodplain: conveyance of flood flows	Low - For the present day (2015) scenario only the 1000 year return period flood results in flooding of the railway and in the Ashton Gate area. For the 100 year return period there is no flooding on the railway. The water just reaches the railway at Ashton Vale without flooding.	Local	Low	Limited	Medium	Negligible (For the future (2135) scenario flooding of the railway is simulated for the 75 year return period event and above.)	**Insignificant**
Potential impact: pollution of surface waters via discharge of drainage from rail network.		River: transport and dilution of waste products /biodiversity/ aesthetics/ recreation/ conveyance of flow and material/ navigation	Medium - Main River. Classified under WFD cycle 1 as having moderate ecological potential. Heavily modified waterbody.					Negligible - mitigation to include incorporation of appropriate drainage system where possible. Ballast renewal. Appropriate management of wastewater from trains. Removal of existing sources of pollutants such as contaminated ballast and wooden sleepers.	**Insignificant**
Study Area: Portishead Mercia Mudstone									

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Potential impact: pollution of groundwaters via discharge of drainage from rail network.	Portishead Mercia Mudstone	Groundwater: transport and dilution of waste products	Medium - Good quantitative and chemical quality. Secondary A and B aquifer. Drinking water protected area. Supports groundwater absraction in study area (500m).	Local	Medium	Limited	Medium	Negligible - only small quantities of pollutants will be present. Mitigation ncludes: the presence of ballast material will provide some prevention of migration of contaminants into groundwater. Appropriate management of wastewater from trains. Incorporation of new track drainage systems where appropriate.	**Insignificant**
Study Area: Carboniferous Limestone (Bristol)									
Potential impact: pollution of groundwaters via discharge of drainage from rail network.	Carboniferous Limestone (Bristol)	Groundwater: transport and dilution of waste products	High - Good quantitative and chemical quality. Principal aquifer and Secondary A aquifer. Drinking water protected area.	Local	Medium	Limited	High	Negligible - only small quantities of pollutants will be present. Mitigation ncludes: the presence of ballast material will provide some prevention of migration of contaminants into groundwater. Appropriate management of wastewater from trains. Incorporation of new track drainage systems where appropriate.	**Insignificant**
Study Area: Bristol Triassic									
Potential impact: pollution of groundwaters via discharge of drainage from rail network.	Bristol Triassic	Groundwater: transport and dilution of waste products	Medium - Good quantitative and poor chemical quality. Drinking water protected area. Secondary A aquifer.	Regional	High	Limited	High	Negligible - only small quantities of pollutants will be present. Mitigation includes: the presence of ballast material will provide some prevention of migration of contaminants into groundwater. Appropriate management of wastewater from trains. Incorporation of new track drainage systems where appropriate.	**Insignificant**

Reference Sources

MetroWest Phase 1 Preliminary Environmental Information Report (October 2017) and supporting appendices including draft Flood Risk Assessment. http://environment.data.gov.uk/catchment-planning/

Summary Assessment Score

Neutral

Qualitative Comments

The water environment is typical of the locality with watercourses mostly comprising small watercourse with primarily a drainage function (some man-made) of low to medium importance discharging directly into the tidal River (Bristol) Avon which is of Very High importance. Groundwater is of Medium to High importance on a local to regional scale. The larger watercourses - Severn Estuary, River (Bristol) Avon and Easton-in-Gordano Stream are of High quality, whereas the smaller watrcourses are of medium to low quality. Most are important on a local scale, with on the River (Bristol) Avon being important at a regional scale and the Severn Estuary at a national scale due to its size and ecological designations. There will be little impact upon the water environment as the scheme involves minimal additional impermeable surfaces (mostly relating to the stations and associated car parking areas) and results in little change in water quality, with some improvement in some areas through the removal of contaminated old sleepers and renewal of ballast. As the scheme involves very little change from the existing situation the magnitude of all the impacts is considered to be negligible, except for a slight adverse impact relating to the increased flood risk to the railway line from the River (Bristol) Avon, which will worsen over time. This results in a significance score of “Insignificant” for all of the impacts, apart from two exceptions for which the significance score is “Low Significance”. The first exception is the flood risk to the railway from the River (Bristol) Avon and the second from the coastal flood risk from the Severn Estuary which is considered to be of very high importance and therefore any impact is of Low significance or greater.

Journey Quality

TAG Journey Quality Impacts Worksheet

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness		All MW1	
	Facilities	Portishead	Severn Beach/Bath	
	Information		All MW1	
	Environment	All MW1		
Travellers' Views	-	Portishead	Severn Beach/Bath	
Traveller Stress	Frustration	All MW1		
	Fear of potential accidents	All MW1		
	Route uncertainty	All MW1		

Reference Source

Summary Assessment Score

Moderate Beneficial Impact

Qualitative Comments

The assessment does not identify any factors that will be worse off. Whilst there are some neutral impacts, the Scheme will bring benefits such as overcrowding and traveller stress such as making routes more convenient and easier to use.

Physical Activity

TAG Physical Activity Impacts Worksheet (Basic)

	Pedestrians (i)	Cyclists (ii)	Equestrians and Others (iii)
Numbers affected (a)			
Change in journey time in minutes (b)			
Combined impact (c=a*b)			

Reference Source

Summary Assessment Score

Qualitative Comments

Security

TAG Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters, entrances and exits	High	Poor	High
Formal surveillance	Medium	Poor	Moderate
Informal surveillance	Medium	Poor	Moderate
Landscaping	Medium	Poor	Moderate/High
Lighting and visibility	High	Moderate	Moderate/High
Emergency call	Medium	Poor	Moderate

Approximate Number of Users Affected

Reference Source

TAG Unit A4.1 Section 4

Summary Assessment Score

Neutral

Qualitative Comments

No adverse impacts are expected but there will be some moderate benefits associated with the new station at Portishead and re-developmed station at Pill. The investment will lead to more activity in the area, including unlocking the development potential of both Portishead and Pill. However, while there will be a general improvement in security of the area, rail stations can also attract crime. The scheme is therefore envisaged to have

Severance

TAG Severance Impacts Worksheet

Change in Severance	Population Affected					
	Portishead	**Trinity PS**	**Sheepway**	**Portbury**	**M5**	**Ashton Vale**
Large negative						>1000
Moderate negative		>200; <1000				
Slight negative			<200	<200	<200	
Neutral	>1000					
Slight positive						
Moderate positive						
Large positive						

Reference Source

TAG Unit A4.1 Section 5. Data for flows at Trinity PS obtained from survey undertaken at existing crossing in September 2014.

Summary Assessment Score

Slight Negative

Qualitative Comments

Negative impacts are expected at the various at-grade crossing points affected by the Scheme. However, the negative impact is a result of incresaed journey times as opposed to safety. It is, in fact, expected that the overall safety of pedestrians and cyclists will be improved particularly at Ashton Vale.